Vice vs. Virtue Investing

Abstract

Whether virtue investing yields abnormal positive stock returns, has been under scrutiny for years. Academic findings on socially responsible investing (SRI) reveal heterogeneous results for the performance of SRI indices. However, recent research indicates an outperformance of sin stocks. Can investors then better their performance by incorporating virtue or vice screens into their investment process? Answering this question is the key contribution of our paper. Extending prior studies on sin investment, we find that publicly traded companies involved in the alcohol, gambling, tobacco, sex, arms and nuclear power industry are able to generate abnormal returns. Employing a self-constructed worldwide index of more than 700 unethical firms, we provide evidence that the risk-return characteristics of sin stocks are superior in comparison to regular stocks as well as socially responsible stocks.

JEL classification: G12, G19, J71.

Keywords: Socially responsible investing, Sin stocks, financial markets, indices.

Vice vs. Virtue Investing

1 Introduction

In the past decade, ethical or socially responsible investment (SRI) broke away from its niche existence and became a broad-based investment approach. Socially responsible mutual funds in particular have experienced considerable growth over the last decade. The number of funds rose to 200 alone in the United States, where in 2005 around ten percent of the total assets under management were involved in socially related investing[1]. The scope of this investment approach varies from an investment in ethically classified companies, e.g. environment friendly, charitable giving or profit sharing firms, to the method of avoiding investments in unethical or "sinful" business by imposing constraints based on ethical principles.

On the other hand, there is the U.S. based Vice Fund, raising the flag for an unethical investment approach by investing only in sinful industries such as gambling, tobacco, alcohol and defense. Launched in August 2002 the Vice Fund has managed to handily outperform the market[2] and its one and three-year return rank in the top one percent among more than 600 funds in the multi-cap core category of the Lipper mutual fund research and rating service.

The performance of social investing has been examined in various forms. Recent research studies whether SRI stock indices exhibit a different performance compared to conventional benchmark indices mainly conclude that SRI investments do not exhibit a different risk-adjusted return or significant outperformance[3]. Studies on social irresponsible investing on the other hand are still very straightforward. A basis for this investment approach is provided by Hong and Kacperczyk, who find evidence that publicly traded American companies dedicated in the industries known as the "Triumvirate of Sin" - alcohol, tobacco and gaming - are able to generate abnormal returns and provide significant superior risk-adjusted

[1] See Social Investment Forum (2006), p. 4.

[2] See Vice-Fund Annual Report (2007), p. 3.

[3] See Hamilton, Jo, and Statman (1993), p. 64 - 66.

performance. The authors conclude that, despite higher returns, financial investors are willing to forego higher returns in order to comply with societal norms.

Assuming the role of advocatus diaboli the objective of this study is to answer the question of the superior financial investment strategy: To invest socially responsible or not? The paper contributes to prior research on social investing by comparing SRI indices not only to conventional benchmarks but also to its antagonists: unethical indices. This is achieved by comparing the main risk-return characteristics of the most important SRI indices to a set of comparable Sin-indices consisting of publicly-traded socially "irresponsible" stocks.

Since there is no commonly accepted definition of sin stocks, we use the screening approaches of social investors to identify sinful firms, i.e. companies involved in the alcohol, animal testing, weapons, gambling, nuclear power, sex and tobacco business. The analysis is based on a set of 32 SRI stock indices and their comparable Sin-indices during the period 1995 to 2007. Due to the set of social indices, which cover different regions and screening approaches, and a globally constructed Sin Index, which consists of more than 500 companies, we are able to draw general conclusions about the performance of ethical and unethical investing. The performance of the indices is estimated with single- as well as multi-equation models. Furthermore, cross-sections of the indices are used to improve the quality of the analysis.

The paper proceeds as follows: The characteristics of ethical and unethical investment are examined in Section 2. In Section 3 we review prior research and in Section 4 the research design and index-creation is illustrated. In Section 5 we take a closer look at the financial characteristics of our self-constructed unethical index and its sub-indices. Thereupon, the performance of 32 socially responsible indices is compared to the performance of the comparable Sin-indices in Section 6. Section 7 concludes.

2 Ethical and Unethical Investment

2.1 Concept

This paper analyzes the financial outcome of ethical, respectively socially responsible investments in contrast to unethical investments. Social investing combines maximizing not only financial return but social good as well. According to Haigh and Hazelton (2004), SRI refers to the practice of directing investment in ways which combine financial objectives with the commitment to social concerns, such as social justice, economic development, peace or a healthy environment[4].

Usually, the process of social investing proceeds in four steps: screening, divesting, shareholder activism and positive investing. The screening strategy evaluates companies for social criteria like company policies, corporate governance, product safety, human and indigenous peoples' rights or community relations, and it excludes companies with insufficient social ratings. Divesting describes removing firms from the portfolios of social investors due to socially irresponsible business activities. Shareholder activism attempts to influence the company's behaviour towards a socially responsible course. The positive investing strategy invests in companies in order to generate a positive social impact. Examples for this approach are the so called micro-credits in developing countries to poor entrepreneurs, who are not considered creditworthy[5].

Judging what an unethical investment constitutes is not an easy task. First, ethical behaviour or social concern are difficult to detect and to quantify. Second, since everyone tends to have different attitudes towards ethical and moral questions, "ethics" is a much disputed term. The Oxford English Dictionary, for example, defines "ethical" as "relating to moral principles or the branch of knowledge concerned with these"; however, the word "immoral" is defined as "not conforming to accepted standards of morality"[6]. We conclude that defining "ethics" is a vague effort at best.

[4]Haigh, and Hazelton (2004), p. 59.

[5]See Asongu (2007), p. 4-8.

[6] See The Oxford English Dictionary (2004), Headwords: ethical and immoral.

2.2 Identification of Unethical Companies

Since there is no formal definition of sin stocks, we identify unethical firms by adopting the excluding criteria used in the negative screening processes of the social investors, illustrated in *Table 1*. As there are different kinds of criteria used by social investors, the most common factors, namely alcohol, animal testing, gambling, nuclear power, pornography, tobacco and weapons are considered in this research because of their addictive, immorally or dangerous connotation.

In exceptional cases, other criteria such as child labour, production of unsafe products or fraudulent business practices are also used. Disregarding the indices without excluding criteria, the least applied criterion is animal testing which is used by only 19 percent of the indices. Due to this low value and the problem of detecting firms that test their products on animals, this criterion is not further employed in this paper.

2.3 "Sin" Industries: a Bit of History

Alcohol has been central to social, religious and personal use throughout history[7]. The ancient Egyptians brewed beer, as did pre-Columbian civilisations, where alcoholic beverages were used for pleasure or nutrition as well as medical and ritual purposes[8]. Although Egyptians did not define inebriety as a problem, they cautioned against taverns and excessive drinking[9]. Until the 18th century, the attitude toward drinking was characterized by recognition of its positive nature when consumed in a moderate way. However, as a result of industrialization and the demand for a reliable work force, social, personal, and moral problems were blamed on alcohol[10]. In the 19th century, temperance movements emerged, trying not only to prevent drunkenness but to ban any alcohol consumption. This movement led to a total

[7] See Hanson (1995), p. 3.

[8] See Cherrington (1925), p. 405.

[9] See Lutz (1922), p. 97.

[10] See Abel (2001), p. 401.

prohibition in 1920, banning the sale and manufacture of alcohol in the U.S[11]. In the 20th century, the consideration of alcohol being a human vice was strengthened by the detection that consumption of alcohol leads to a spectrum of harmful consequences[12].

The first records of **tobacco** were found in the 11th century, describing Mayans smoking a roll of tobacco leaves tied with a string. The perception of smoking has changed over time from a holy, sophisticated and healthy habit to a sinful, offensive and life-threatening addiction[13]. Tobacco was introduced into Europe in the 16th century for its supposed virtues as a panacea. When smoking spread across all Europe in the 17th century, several attempts were made to restrict the use of tobacco. An example for this is the ban on smoking in 1634 on pain of execution by the Russian patriarch who considered smoking a deadly sin[14]. The deadly effects of smoking were already shown in 1912, but it was not until 1964 that smoking was concluded to be causally related to lung cancer by a report of the Surgeon General's Advisory Committee[15]. Thus, only in the latter half of the 20th century did tobacco, the former darling of the social scene become antisocial not only by public health systems.

Gambling has existed in various forms for thousands of years. The first references of games of hazard date back to 2300 B.C. in China. The ancient Greeks and Romans were known to bet in games of chance, although it was punished by the authorities. During the industrialisation, the European nations developed different attitudes towards gambling. While some nations forbid all games of hazard by law, others allowed public gambling since it was regarded less destructive than hidden private gaming[16]. The history of gambling in the U.S. is characterized by fluctuations from prohibition to popularity. In colonial times, games of hazard were generally regarded as illegal and considered as sinful with the exception of state and private lotteries. In

[11] See Thornton (1991), p. 9.

[12] See Worman (1995), p. 3.

[13] See Sessa, Conte, Meroni, and Battini (2000), p. 1-10.

[14] See Gilman, and Zhou (2004), p. 113.

[15] See Adler (1912), p. 3-12.

[16] See Giżycki, and Górny (1970), p. 50.

the 20th century however, the concept changed from gambling being a sin to its being a vice. Gamblers were no longer considered fallen in the eyes of God, but as victims of their own weaknesses[17].

The rise of **nuclear power** as a major source of energy began in 1934, when nuclear fission was first experimentally achieved by Enrico Fermi[18]. The use of nuclear power to generate electricity began in the late 1950s and, by century's end, more than 16 percent of the electricity worldwide was already generated by nuclear power. The understanding of nuclear technology being vicious is affected by the use of nuclear weapons during World War II. Although it has always been a controversial energy source, the movement against nuclear power first arose after the reactor meltdown at Chernobyl in 1986. Based on the fear of a possible nuclear accident and nuclear proliferation, the construction of new nuclear power plants has considerably declined and several countries even started a nuclear power phase-out[19].

The history of **pornography** is obscure because it was usually not thought worthy of preservation. In the artwork of many societies, including ancient Greece and Rome, erotic imagery was nothing extraordinary and frequently appeared in religious contexts[20]. In the 19th century, pornography became considered as smut and so in 1857 the world's first law criminalizing pornography was enacted in the United Kingdom to prevent the masses from divulging. Despite a change in attitude towards pornography, legal, religious and women's rights groups oppose pornography to protect family values and morality in the 20th century[21].

In the Neolithic period, tools were already being used as **weapons**. The consideration of weapons as being sinful goes hand in hand with the pacifism movement covering a broad range of ideas with the opposition to militarism as the common denominator. The first genuinely pacifist movement was Buddhism, whose founder demanded absolute abstention from any act of violence. In the 19th century, the idea inspired an interest in general disarmament and pacifism genuinely became an expression of

[17] See West's Encyclopedia of American Law (2005), Headword: Gaming.

[18] See Mazuzan, and Walker (1985), p. 4.

[19] See Breslow (2002), Headword: Nuclear Power.

[20] See Encyclopaedia Britannica (2005), Headword: Pornography.

[21] See Ross (1990), p. 244-246.

social ethics. Whereas pacifists are against violence in general, the rising antimilitarism of the 20th century opposes war and argues with social and political arguments against military tendencies[22].

3 Literature Review

3.1 Socially Responsible Investment

Empirical analysis of socially responsible investment dates back to a study on a portfolio of socially responsible companies by Moskowitz (1972)[23]. Since this paper, much research has been done relating to ethical investing, however often resulting in quite different findings.

In their paper, "The Financial Performance of Ethical Investment Funds" Mallin et al. compare the financial performance of UK based SRI funds with that of conventional funds and benchmark portfolios. They find that on a risk-adjusted basis the SRI funds tend to historically underperform the market and the social funds manage to outperform their conventional comparables. Using the Jensen, Treynor and Sharpe ratios the authors report a modest superior performance of the social funds[24].

More advanced studies on socially responsible investing in the 21th century - as evinced by Bauer et al. (2005) - reason that there is no significant performance difference of socially responsible investment. In their research, Bauer et al. compare portfolios of SRI funds with portfolios of conventional funds using Carhart's four-factor pricing model[25]. In line with further academic studies[26], they conclude that there is no significant performance gap of socially investment.

[22] See Di Leonardo (1985), p. 599.

[23] See Moskowitz (1972), p. 71-75.

[24] See Mallin, Saadouni, and Briston (1995), p. 495.

[25] See Bauer, Koedijk, and Otten (2005), p. 1767.

[26] See e.g. Statman (2005) or Kreander, Gray, Power, and Sinclair (2005).

However in 2005, Derwall et al. yield a different overall result evaluating two equity portfolios with unequal eco-efficiency scores. They provide evidence for an „Eco-Efficiency Premium Puzzle" as they are able to detect an abnormal outperformance of an eco-efficiency portfolio[27]. In contrast to this study, Geczky et al. (2005) explore the costs to an investor who is uniquely invested in socially responsible funds. The authors detect that these investors pay a price for their socially investment due to additional costs of over 30 basis points per month as result of their asset allocation[28].

However, despite increasing academic interest in the consequences of socially responsible investing, no significant gap between social and conventional fund performance has been detected. The hypothesis that SRI funds perform worse than their regular comparables has therefore been rejected[29].

In contrast to prior research, the research method of Schröder (2005) concentrates not on socially responsible funds but on SRI indices. Such an approach has the advantage that no filtering for factors such as transaction costs, management skills or timing activities of the fund managers is needed to analyze the performance of socially responsible equities. Applying single-factor models as well as multi-equation models, he quantifies the performance of SRI indices. His findings confirm prior results because the SRI indices do not provide significant outperformance and have higher risk relative to their benchmarks. Furthermore, by conducting spanning tests, he finds that spanning cannot be rejected for around 30 percent of the SRI indices, indicating that about one third of the SRI indices have the same risk and return characteristics as their market proxies[30].

Statman (2005) explores in his study the characteristics of socially responsible companies by comparing the stocks in the S&P 500 Index to several SRI indices. He finds that the mean social scores of the SRI indices differ significantly in the emphasis they place on social characteristics. However, the mean social scores are reported higher for the SRI indices in comparison to the conventional benchmarks.

[27] See Derwall, Guenster, Bauer, and Koedijk (2005), p. 63.

[28] See Geczy, Stambaugh, and Levin (2005), p. 27-28.

[29] See Schröder (2003), p. 23-25.

[30] See Schröder (2005), p. 19-20.

Kempf and Osthoff analyze the effects of socially responsible investing on portfolio performance using different trading strategies in 2007. They find that by following a simple strategy of buying stocks with high social ratings and selling stocks with low ratings, abnormal returns of up to 8.7 percent per year can be achieved[31].

3.2 Sin Investment

The research on unethical investment amounts to only a few academic studies. Merton (1987) examines the characteristics of neglected stocks. The author claims that the higher litigation risk of these firms are the reason for the increase in the expected returns of the stocks. Concerning tobacco companies, he illustrates why neglected stocks are underpriced and perform better than similar companies[32].

As they expected social norms against investing in "unsocial" sectors, Hong and Kacperczyk (2005) study the effects of social norms on markets by examining an equally-weighted portfolio of American sin stocks, i.e. companies involved in the alcohol, tobacco and gambling industry[33]. They find evidence that investors pay a price for avoiding these firms by proving significant outperformance of sinful companies in relation to comparable stocks. Unethically stocks seem to behave like value stocks as they provide higher expected returns consisting of a neglect effect.

In conformity with Merton, they attribute the lower valuation to the limited risk sharing of the sinful industries. The authors find that unethical stocks outperform the market because they exhibit less institutional ownership and less analyst coverage compared to non-sinful stocks with similar characteristics. Pension funds, banks and insurance companies particularly seem to avoid these companies due to social norm pressures. Despite the ongoing increase of SRI funds, conventional mutual and hedge funds do not share this behaviour as they are natural arbitrageurs in the market and also buy unethical stocks if they are underpriced.

[31] See Kempf, and Osthoff (2007), p. 13-14.

[32] See Merton (1987), p. 499-502.

[33] See Hong, and Kacperczyk (2005), p. 3.

The findings of Hong and Kacperczyk imply that sinful companies seem to be disregarded because of social norms rather than the danger of litigation risk, which is inconsistent with portfolio theory. They conclude that the aversion to these stocks is based on a preference for following these norms rather than for economic reasons.

Olsson (2005), reports that investors who fund companies that promote human vice get rewarded for their sinful behaviour[34]. The author points out that American sin stocks behave like value stocks and were able to outperform the market in the period 1985 to 2004 by 6.84 percent per annum. Using the single-factor model he calculates the reward for a sinful investment to 87 basis points per month. Applying the Carhart model, this number decreases to 55 basis points. Further, the author finds evidence that time variations in social norms have an impact on stock returns, using the tobacco industry, for example, which has been considered sinful since the 1960's. The analysis reveals that this sector did not outperform the market until smoking became a human vice. After this change in opinion, tobacco stocks started to behave like value stocks and performed better than the market.

Kim and Venkatachalam (2006) offer further evidence on potential disadvantages of avoiding unethically companies and explore other explanations to the disregard of sin stocks. Consistent to prior findings, the authors exhibit that unethical stocks tend to be larger, have lower book-to-market ratios and higher annual earnings per share. They further find that sin stocks exhibit more persistent earnings and have accruals that are better predictors for future cash flows. The authors conclude that, despite superior returns and financial reporting quality, investors are willing to accept lower returns in order to comply with societal norms[35].

Salaber (2005) investigates the time-series variation on average stock returns on a sample of European tobacco, alcohol and gaming firms. She finds that due to social norms over the period 1975-2006, sin stocks outperform conventional stocks in Protestant countries. Furthermore the author reports that in countries with high excise taxation or higher litigation risk sinful investment is able to achieve abnormal returns. Unlike previous studies tracing back the higher adjusted-returns of sin stocks

[34] See Olsson (2005), p. 30.

[35] See Kim, and Venkatachalam (2006), p. 7.

to social norms, the author provides evidence that the returns also substantially depend on legal and cultural characteristics, namely religious preference, level of taxation and litigation risk[36].

4 Research Design

4.1 Description of the Data

The paper focuses on a set of 32 international SRI equity indices and their Sin comparables over the period July 1995 to July 2007. The indices have been constructed and published by 15 supplier companies, including index families such as KLD, Kempen, ECPI, Ethibel, FTSE4Good, SNS or Dow Jones Sustainability Indexes. The remaining SRI indices considered in this study are the ASPI, Calvert Social Index, Jantzi Social Index, Naturaktienindex, HVB Nachhaltigkeitsindex and JSE SRI Index. The indices cover different investment regions: seven indices cover the global market, eight indices use the United States as investment area and 18 are addressed to the European market, of which seven are restricted to the Euro zone alone. The remaining indices invest in Australia, Canada, Japan, South Africa and the United Kingdom. The maturity of the indices varies from 28 months to 145 month with average available data of 94 months. The data for the SRI indices is mainly derived from Thomson DataStream, which provides monthly data of total return and price indices from January 1995 to July 2007. The remaining data is directly obtained from the supplier companies. For the performance analysis, the official benchmark indices, chosen by the supplier companies of the SRI indices, are applied. To test the financial characteristics of the indices, the variables of the time-series regression SMB, HML and MOM are derived from the website of Kenneth French[37]. For the risk-free rate the three month T-Bill is used.

[36] See Salaber (2005), p. 3.

[37] See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html , as of August 8th, 2007.

4.2 Creation of an Unethical Index

To ensure the explanatory power and empirical correctness of the analysis, prior approaches to investigate sinful investment have been enhanced by creating both total return and price value-weighted indices, instead of using equally-weighted portfolios. In an equally-weighted portfolio all firms are given the same weights, which could result in an overestimation of the average returns since large firms have in general lower returns than small firms[38]. To compare our results to the previous research equally weighted indices have also been created.

4.2.1 Stock Selection

Based on the selection of unethically business segments we identify sin stocks from the stock universe using the following approach. Contrary to earlier studies we do not use the Fama and French Standard Industrial Classification Code (SIC) because of its unfavourable selection method; for example, there is no classification of the gambling sector. In this study, the industry classification system provided by FTSE Group and Dow Jones Indices, the so called Industry Classification Benchmark (ICB) is used due to more accurate search results.

The alcohol industry consists of the brewing industry, i.e. manufacturers and shippers of cider or malt products, as well as the distiller and vintner industry, i.e. producers, distillers, vintners, blenders and shippers of wine or spirits such as whisky or rum. The gambling industry includes providers of gambling and casino facilities, such as online casinos, racetracks or manufacturers of casino and lottery equipment. Manufacturers and distributors of cigarettes, cigars and other tobacco products, including tobacco plantations, represent the tobacco industry. The weapons industry is represented by aerospace and defense stocks consisting of manufacturers, assemblers and distributors of aircrafts and producers of components for the defense industry, including military aircraft, radar equipment and weapons.

[38] See Banz (1981), p. 3.

Since there are no sector codes for nuclear power and pornography, different approaches are applied to identify companies involved in these sectors. To determine firms in the pornography, respectively the sex or adult entertainment industries, the extended business descriptions of Thomson One Banker are screened for adult and sexual related content. To confirm the accuracy, the resulting list is completed and cross-checked with lists from popular books on sinful investing and likewise online sources such as the adult entertainment list provided by Hoover's[39]. Stocks in the nuclear power business are identified using different approaches. First, the companies of the two nuclear power indices S-BOX Nuclear-Power Index and the Deutsche Börse World Nuclear-Power Index are selected. Second, the ZKB Kernenergie-Basket certificate provides further firms to the set of stocks, which is then extended by a list of uranium stocks from Rohstoff-Welt.de[40]. Third, the resulting list is reviewed and completed by checking for current and former nuclear power and uranium stocks on Thomson One Banker.

To ensure the completeness, the set of selected stocks is compared and cross-checked with the sin stocks described in popular books by Ahrens[41] and Waxler[42] and the firms identified by Hong and Kacperczyk[43].

4.2.2 Data for the Unethical Index

The list of publicly-traded sin firms at hand, the data for the set of stocks is mainly derived from Thomson DataStream, which provides monthly data of stock prices, shares outstanding, return and price indices, dividend yield, number of trades and free-float number of shares in U.S. dollars from January 1995 to July 2007.

Since omitting dead funds can lead to overrating performance, this could also be true for sin stocks[44]. To avoid this possible survivorship bias, delisted stocks are included

[39] See http://www.hoovers.com/industry/adult-entertainment/companies, as of August 8th, 2007.

[40] See http://www.rohstoff-welt.de, as of August 8th, 2007.

[41] See Ahrens (2004).

[42] See Waxler (2004).

[43] A list of sin stocks can be obtained from the authors' web-site.

[44] See Brown, Goetzmann, Ibbotson, and Ross (1992), p. 555.

in the sample until they disappear. After cleaning the dataset, a total number of 755 stocks across 51 countries can be reported in July 2007. The set includes 188 companies in the alcohol business, 40 companies involved in the tobacco, 178 in the defense, 139 in the gambling and 21 in the sex business. 189 companies are involved in the nuclear power industry.

We notice a substantial increase during the last twelve years in the number of stocks. The raise is especially noteworthy for the gambling industry, which undertook a remarkable growth in the 1990's due to the deregulation of the industry in the United States. However, these numbers are to be considered with caution: Due to some shortcomings in the data set available, especially of delisted small-cap stocks, the completeness over the whole time-period cannot be guaranteed. The impact of these shortcomings, though, could only affect the equally-weighted index, since the impact of small cap firms for the value-weighted index is only of minor extent. Considering these facts the index of sinful stocks consists of 755 firms around the world.[45]

4.2.3 Index Calculation Method

The Sin-indices are calculated as value-weighted indices, whose components are weighted according to the total market value of their shares outstanding. The impact of a stock's price change is assumed to be proportional to the firm's overall market value, which is the share price multiplied with the number of shares outstanding. The weighting of each firm constantly alters with changes in the stock price and the number of shares outstanding. Since the free-float data to calculate the shares outstanding has only been available since May 2002, the adjustment of the free-float had to be omitted and the float-adjusted market-value weighted indices are replaced by full market-value weighted indices. The Sin-indices are calculated using the Laspeyres formula:

$$Index_t = \frac{\sum_{i=1}^{n}(p_{it} \cdot q_{it} \cdot X_{it}^{USD})}{C_t \cdot \sum_{i=1}^{n}(p_{i0} \cdot q_{i0} \cdot X_{i0}^{USD})} \cdot base\ value \qquad (1)$$

[45] The total list of sin stocks is available from the authors.

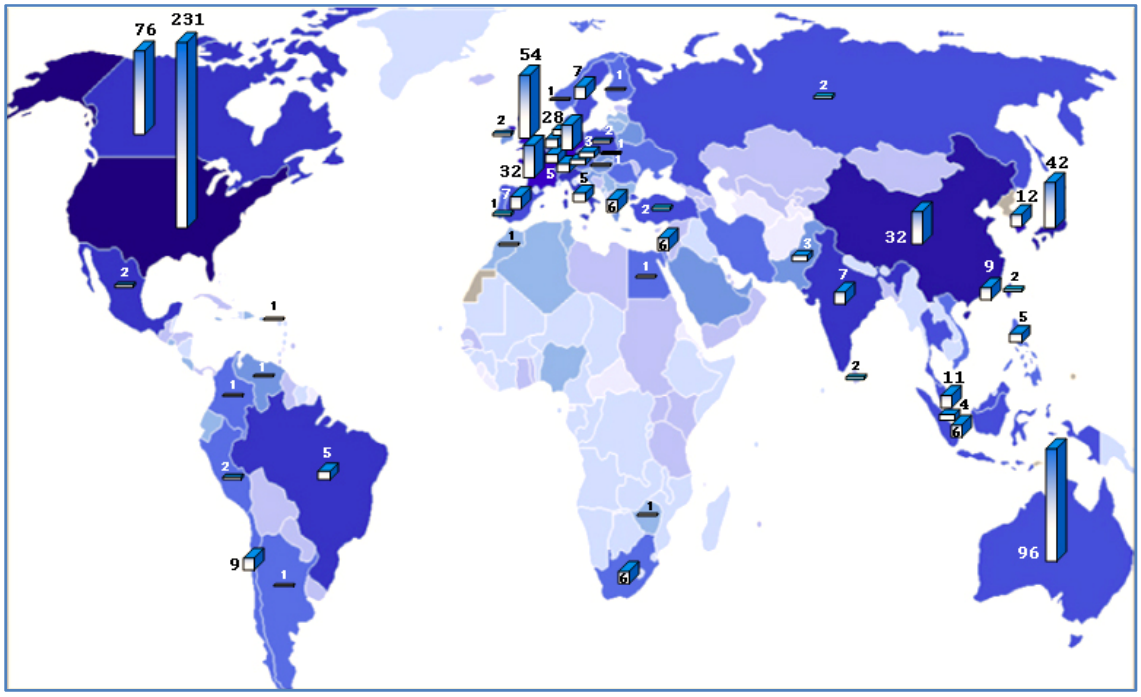
where n = number of stocks in the index, p_{i0}= closing price of stock i at the base date, i.e. January 01, 1995, q_{i0}= number of shares of stock i at the base date, p_{it}= price of stock i at time t, q_{it}= number of shares of stock i at time t, C_t = adjustment factor for the base date market capitalization, X_{it}^{USD}= cross rate, i.e. domestic currencies in U.S. dollar of stock i at time t, base value = 1000 on the base date.

Furthermore, the indices are calculated as price and total return indices to provide more meaningful results when compared to the SRI indices. The Sin price indices measure market price performance only, while the Sin total-return indices calculate the performance, assuming that all dividends and distributions are reinvested.

4.2.4 Index Weightings

To show the influence of several countries on the Sin Index, the numbers of stocks per country are illustrated in *Figure 1*.

Figure 1: Number of Sin Stocks per Country

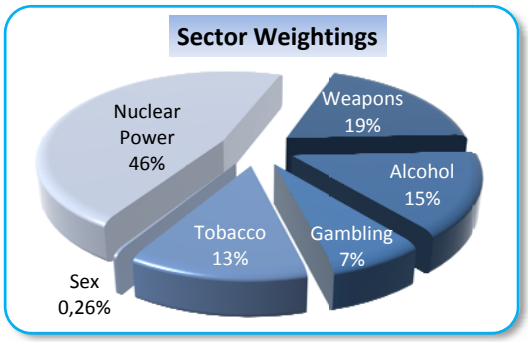


The far greatest share of firms is located in the U.S. with 231 companies, followed by 96 Australian and 76 Canadian stocks. The greatest influence is exerted by the North American continent accounting for 41 percent of the index, followed by

Europe with 23 percent. While Canada owes its share to its high amount of uranium stocks, the superiority in the weightings of the U.S. stocks is not limited to a specific Sin-sector. In fact, only for the alcohol and nuclear sectors the U.S. companies do not exert the greatest share. The U.S. companies actually account for more than half of the Weapons, Sex and Gambling index-weightings.

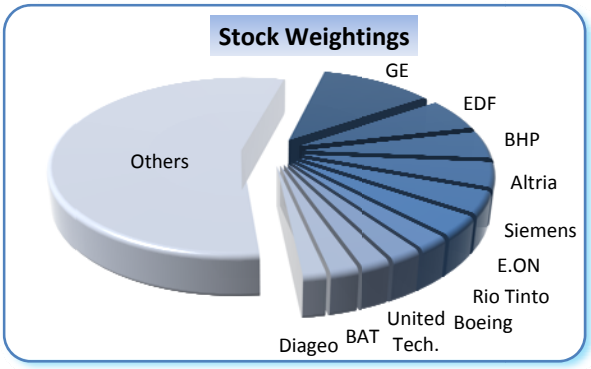
The sector-weightings presented in *Figure 2* highlight the Nuclear Power Index accounting for 46 percent of the Sin Index. This is not a result of the number of companies but rather arises from index heavyweights.

Figure 2: Sin-Index Sector Weightings



The marginal influence of the sex industry, however, is not due to the small dimension of the sector itself, but most of the companies, such as the world's largest adult film producer, the Vivid Entertainment Group, are private companies and can therefore be not included in the sample. Accounting for six of the ten biggest companies, the nuclear power sector dominates the Sin Index, followed by the weapons and tobacco sectors with two firms, which is displayed in *Figure 3*.

Figure 3: Sin-Index Stock Weightings



Despite the fact that the index has a total market value of 3.400 billion U.S. dollars in 2007, the size of several firms is underlined by the fact that the eleven biggest companies represent 44 percent of the index weightings. Conglomerates such as the index-heavyweight General Electric are responsible, for example, for 12 percent of the index market value. Despite the fact that GE's energy business represents only about 10 percent of its $160 billion in annual revenues, the firm is the major provider of boiling water reactors which can be found in 81 of the world's 442 nuclear plants. Therefore - despite its other business activities - it has been included as a component of the Nuclear Index.

4.3 Methodology

4.3.1 CAPM

The classical Capital Asset Pricing Model (CAPM) developed inter alia by Sharpe (1964) and Lintner (1965) is used in this study. It offers widely used predictions of risk, expected return and their relations among each other. The basic equation used to measure the performance of an index is the linear regression of the excess returns of the benchmark index - , i.e. the return[46] minus the risk-free rate, on the excess returns of the index - :

(2)

[46] The method used to calculate returns in this paper are simple returns.

where R_{it} = the return on index *i* in month *t*, R_{ft} = the return on a three month T-Bill in month *t*, R_{mt}= the return on the benchmark index *m* in month *t*, ε_{it}= an *i.i.d.* error term with zero mean. The idea behind the model is that investors need to be compensated for the time value of money and the risk the investors take. The time value of money is represented by the risk-free rate. The second half of the formula measures the amount of compensation the investor receives for accepting additional risk. This risk is calculated by the use of the risk measure beta, comparing the returns of the portfolio to the market premium $(R_{mt}- R_{ft})$ over a period of time.

The intercept α_i gives the Jensen's alpha, which can be interpreted as a measure of out- or underperformance relative to the market proxy. The alpha-coefficient measures the abnormal return, i.e. the extra-return not explained by the exposure of risk in reference to the benchmark[47]. The beta of the model (β_i) used to analyze relative risk, can be interpreted as a measure of the market risk exposure of an index. According to the CAPM, a beta coefficient greater than one indicates a higher risk in comparison to the benchmark. By definition, the market itself has an underlying beta of one, suggesting that the index and its benchmark share the same level of risk if the index takes a value of one. For a beta less than one, the index has a lower risk-exposure compared to the benchmark.

To detect if socially responsible, respectively irresponsible investing leads to different performance compared to their benchmarks, spanning tests are applied using the approach of Huberman and Kandel[48]. By testing the joint hypothesis H_0: (α_i= 0 and β_i= 1) the spanning test detects if an index can be directly replaced by its benchmark. If the null hypothesis cannot be rejected, an investment in the benchmark is equivalent to an investment in the index by risk and return.

4.3.2 Multi-Factor Model

Despite the widespread use of the single-factor model, this method's accuracy could be improved. Academic findings reveal an incorrectness of the model as soon as

[47] See Jensen (1968), p. 391.

[48] See Huberman, and Kandel (1997), p. 875-879.

realized returns are compared to the CAPM predictions. Therefore, the single-factor model has been expanded to a multi-factor model, improving the explanatory power by adding other factors that are able to affect the expected returns.

Starting with the observation that stocks with small market capitalization and stocks with high book-value-to-price ratio have historically tended to outperform the market, Fama and French find that by expanding the CAPM for two factors a more descriptive and predictive model is provided. They argue that if assets are priced rationally variables related to stock returns must proxy for the sensitivity to common risk factors in returns. By adding a size and value factor to the CAPM, the authors create the Fama and French three-factor model[49].

Finding that small stocks have higher risk-adjusted returns than large stocks, Banz (1981) first documented the size effect[50]. The premium for investing in stocks with relative small market capitalization is represented in the three-factor model by the factor SMB (Small Minus Big), taking into account the difference in returns between small and big firms. A positive SMB factor is an indicator for outperformance of stocks with a small market capitalization and vice versa. The premium for "value" stocks, i.e. stocks with a high book-to-market ratio, is represented by the factor HML (High Minus Low). The factor captures the return difference between stocks with high and low book-to-market ratios. A positive HML factor hereby indicates an outperformance of value stocks and vice versa[51].

After having detected abnormal returns in portfolios sorted according to momentum that could not be explained by the Fama and French model, Carhart (1997) supplemented the model by adding a momentum factor (MOM) which captures the return difference between the past year's out- and underperformers[52]. This momentum anomaly was detected by Jegadeesh and Titman, who show that by taking a long (short) position in well (poorly) performing stocks, depending on the performance over the previous 12 months, abnormal returns can be achieved[53]. The

[49] See Fama, and French (1993), p. 3–56.

[50] See Banz, (1981), p. 3.

[51] See Fama, and French (1995), p. 133.

[52] See Carhart, (1997), p. 57.

[53] See Jegadeesh, and Titman (1993), p. 67.

momentum coefficient illustrates the exposure of the asset to trends in returns. One positive factor is an indicator of an outperformance of stocks with high prior returns and vice versa. The factor itself is calculated by deducting the average return on two high prior return portfolios from average returns on two low prior return portfolios. The resulting Carhart 4-factor model leads to the following time-series regression, explaining the excess returns on a portfolio *i* by the equation:

$$R_{it} - R_{ft} = \alpha_i + \beta_i MKT_t + \beta_{is} SMB_t + \beta_{iH} HML_t + \beta_{iM} MOM_t + \varepsilon_{it} \qquad (3)$$

where MKT_t= the market return minus the risk-free rate at time *t*, SMB_t= the return difference between a small cap portfolio and a large cap portfolio at time *t*, HML_t= the return difference between a value and growth portfolio at time *t*, MOM_t= the return difference between a portfolio of past years winners and a portfolio of past years losers at time *t*.

The model can be interpreted as a performance attribution model in which the coefficients indicate the proportion of average return attributed to the four abnormalities. Similar to the CAPM the slopes in the multiple regressions are represented by the β-coefficients of MKT_t, SMB_t, HML_t and MOM_t, illustrating the exposure to market, size and value risk as well as trends. Due to the new added factors the betas - akin to the CAPM - will have different values compared to the single-factor model. In the Carhart-model, the α-coefficient gives that part of the index returns that cannot be explained by overall market performance, the effects of size, value and momentum.

4.4 Procedure

4.4.1 Univariate Time Series Modelling

The parameters of estimations are tested by using the Ordinary Least Squares (OLS) estimator. Before the estimation begins, unit root tests are performed for each series of excess returns as non-stationary time series can cause substantial problems with regression models. The term “stationary” implies that the series do not have a constant mean, i.e. a mean that does not vary over time. Those series that are found

to be non-stationary are excluded from the set of observations. The tests are carried out using the Augmented Dickey Fuller test, which tests for a unit root that includes lagged chances of the variable as regressors.

Using the Newey-West approach, the residuals are corrected for autocorrelation and heteroscedasticity by adjusting the standard errors. Applying the Durbin-Watson approach, the fitted residuals are tested for autoregressive properties[54]. Finally, the relation of the coefficients has been tested using the Wald-Coefficient-Test.

4.4.2 Multivariate Time Series Modelling

In equilibrium models such as the CAPM, it is desirable to model the joint behaviour of multiple time series. Since single- and multi-factor models imply parameter restrictions, possible efficiency gains - due to the joint estimation of a system of time series models - can be achieved. Unlike multivariate models, univariate models cannot capture complex interactions between the variables or the error structure across models. Instead of estimating the model separately for each index and its Sin-counterpart, the equations are grouped in a system and estimated jointly[55]. Additionally, it is possible in a system of equations to restrict certain coefficients to be the same across equations[56].

At the outset, all model equations for the SRI and Sin-indices form a system of equations whose parameters are not restricted. Then groups of indices form separate systems whose procedure provides a more detailed look at how SRI and Sin-indices perform when compared to their benchmarks. In each system, the constants are also tested for equality in order to be able to answer the question of difference in performance of SRI and Sin-indices. The parameters are tested using the Seemingly Unrelated Regression (SUR) estimator because this estimator, contrary to the OLS estimator, is also efficient in a system with an unequally number of observations.

[54] See Newey, and West (1987), p. 703-708.

[55] See Greene (2002), section 15.4.

[56] For a more detailed discussion see Greene (2002).

Moreover, problems such as heteroscedasticity and cross-sectional correlation are reduced[57].

Even though the SUR estimator has been used, the residuals are worth looking at. The residuals of each regression are tested for autocorrelation using the Breusch-Godfrey test of residual autocorrelation. The number of lags included is twelve[58], as it seems reasonable that the returns of today may be dependent on last year's returns, but not much on returns dating further back in time. For the series to be found auto-correlated, the corresponding equation is excluded from the system.

4.5 Performance Measurement

The performance of the indices is analyzed using three performance measures, combining risk and return performance into a single value to evaluate the indices.

4.5.1 The Sharpe Measure

The Sharpe, or reward-to-variability ratio quantifies the return earned in excess of the risk free rate to the portfolio's total risk measured by the standard deviation in its returns over the measurement period[59]. The higher the Sharpe index, the better the performance. The Sharpe ratio constitutes an appropriate measure of performance for an overall portfolio particularly when compared to another index:

$$S_i = \frac{\mu_i - R_f}{\sigma_i} \tag{4}$$

where S_i = the Sharpe performance index, σ_i = the standard deviation of the returns, μ_i = the portfolio annualised mean return and R_f = the risk-free interest rate.

[57] See Zellner (1962), p. 501.

[58] As proposed by Greene (2002).

[59] See Sharpe (1966), p. 121.

4.5.2 The Treynor Measure

The Treynor ratio quantifies the excess return to non-diversifiable risk since it describes the ratio of a portfolio's average excess return in comparison to beta of the portfolio. The ratio measures the returns earned in excess of those that could have been earned on a riskless investment per unit of market risk assumed[60]:

$$T_i = \frac{\mu_i - R_f}{\beta_i} \tag{5}$$

where T_i = the Treynor performance index and β_i = the beta of the portfolio. The higher the Treynor index, the better the performance under analysis. The Sharpe and Treynor ratios seem similar but differ in so far as the Treynor ratio uses the beta instead of the standard deviation. Like the Sharpe ratio, the Treynor ratio is a ranking criterion only. In general, the Sharpe ratio is more appropriate for well diversified portfolios and the Treynor ratio for individual assets.

4.5.3 The Jensen Measure

Jensen's alpha, an alternative method of performance measurement and ranking indices, quantifies the added return as the excess return above the security market line in the capital asset pricing model. The alpha reflects the difference between a portfolio's actual return and those that could have been achieved on a benchmark portfolio with similar risk. Caveats apply, since it will only produce convincing results if it is used to compare two portfolios holding similar betas. Is the α-coefficient positive, the portfolio earned excess returns and was able to outperform the market in the analyzed past[61]. The alpha coefficient can be interpreted as the part of the excess returns that can be attributed to its being an SRI or Sin-index. If the index outperforms its benchmark, the alpha should be significantly greater than zero, but respectively smaller when they underperform the benchmark.

[60] See Treynor (1965), p. 65.

[61] See Jensen (1968), p. 391.

5 Sinful Investment Analysis

5.1 Sin-Index

Taking a look at the Sin Index analysis we obtain the following results. The value-weighted total-return Sin Index provides an annual mean excess return of 6.7 percent and a standard deviation of 12.4 percent, illustrated in column 2 and 3 of *Table 2*. The comparison to the MSCI World implies that the higher returns are not due to a higher volatility of the returns.

These favourable characteristics are strengthened by a beta of 0.74, which is clearly located below one, suggesting a lower risk than the market proxy.

A look at the output of the single regression reveals a relative small value of 0.646 for the adjusted R^2, suggesting that around 65 percent of the performance is explained by its risk exposure, as measured by beta. The coefficient of determination represents the proportion of variability accounted for by the model as it is a statistical measure of how well the regression line approximates the real data.

Figure 4: Chart of the Sin-Index

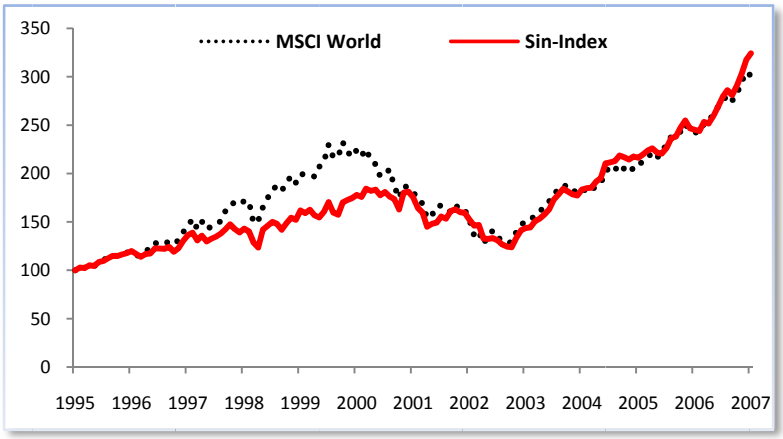


Figure 4 illustrates the historical excess-returns of the Sin Index and the MSCI World. The low volatility of the Sin Index is noteworthy as it indicates the tendency to be a steady performer in both prosperous and hard times. The sinful index was unable to keep pace with the MSCI World until the end of the dot-com bubble in 2001; in particular, at the climax of the bubble in 2000, the MSCI World provided higher returns. The Sin Index started to catch up with the market index at the end of

2001 and since 2004 the index constantly reveals higher returns with only few exceptions.

Looking at the performance, we find that the Sin Index was able to outperform the MSCI World in all three performance ratios. The positive monthly Jensen's Alpha of 0.18 percent shows a slightly better performance albeit without statistical evidence. Also the Sharpe and Treynor-ratios provide evidence that the Sin Index is able to beat the market since the performance measures report greater values when compared to the market proxy, illustrated in column 7 and 8 of *Table 2*.

The outcomes of the estimated parameters of the four-factor model are presented in *Table 3*. A closer look reveals a slight increase for the adjusted R^2 to 0.664 confirming the incremental explanatory power of the multivariate framework. The Sin Index earned an average factor-adjusted return of 0.05 percent per month, although without statistical significance. The additional determinants of the Carhart model SMB, HML, and MOM report significant loadings only for the HML factor. The significant positive loadings on HML suggest that the index is somewhat tilted toward value stocks during the period examined. This value premium is consistent with the relatively low price-to-book ratio for the sinful firms. The SMB and MOM factors do not lead to a conclusive statement due to relatively poor significances. However the loadings on the MOM factor imply a modest impact of trends.

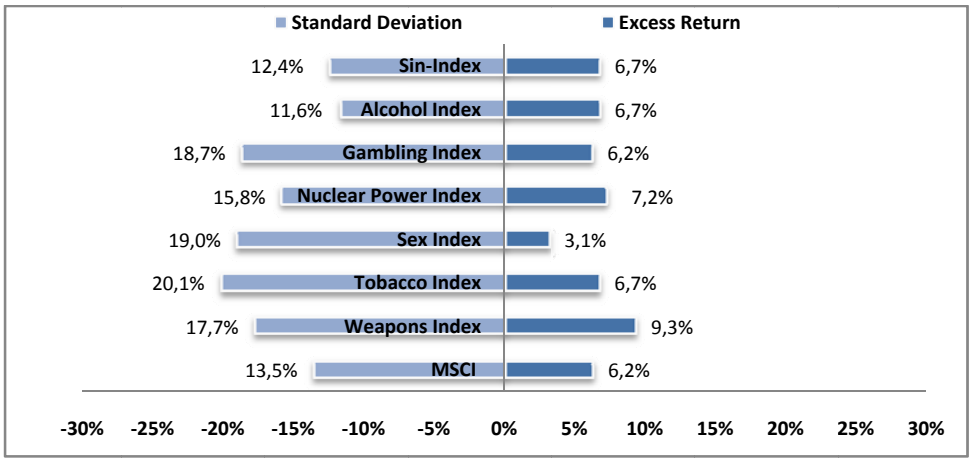
In summary, sin stocks tend to be recession proof, have a blend of small and large-cap stocks, behave like value stocks and are less prone to the cyclical fluctuations of the economy. For example, gambling, tobacco and alcohol are all habit-forming activities, performed regardless of economic conditions. For instance, when the MSCI World fell 20 percent between 2001 and 2002, tobacco stocks rose 8 percent and even gambling stocks 20 percent over the same period. To examine these findings, we take a closer look to the sector indices in the next section.

5.2 Sector Sin-Indices

The six sub indices provide different results, since not all Sector Sin-indices behave in the same way, summarized in *Table 2*.

The risk-return characteristics are displayed in *Figure 5*, showing that the highest excess returns are reached by the Weapons Index, followed by the Nuclear Power and Alcohol indices. The annualized mean excess-returns of the sector indices vary from 0.093 of the Weapons Index to 0.031 of the Sex Index. The lowest standard deviation can be detected by the alcohol sector with 11.6 percent; the highest value is achieved by the Tobacco Index with 20.1 percent. The correlations of the sector Sin-indices with the MSCI World are below 0.52 for every single index, what indicates a high independence of the sector indices in comparison to the market proxy.

Figure 5: Risk/Return Characteristics of the Sector Sin-Indices



The adjusted R^2 takes relative small values between 0.56 for the Nuclear Power and 0.07 for the Tobacco Index. The β-coefficients reveal a discrepancy between the sectors with low betas of around 0.4 for the Alcohol and Tobacco indices and values of over 0.8 for the Nuclear Power and Weapons indices. That the Sector indices provide betas under one, illustrates their low risk exposure.

Table 4 provides an overview of the estimations on the four-factor model. The incremental explanatory power of this multivariate framework is confirmed by higher adjusted R^2, with the exception to the Sex Index. The Tobacco Index reaches an adjusted R^2 of only 15 percent, which has in prior research already been

detected[62]. After adjusting for a multivariate framework, still no significant Carhart-alpha coefficients appear. Besides the Nuclear Power Index, smaller average factor-adjusted returns are reported for every index. The α-coefficients for the Alcohol and the Sex indices even report negative values, indicating an underperformance relative to the benchmark, albeit with low statistical significance. The factor loadings on the additional determinants - SMB, HML, and MOM - vary over the indices. The loading on the SMB factor is significant negative for the Nuclear Power Index, implying a bias towards large-cap stocks. The Alcohol, Weapons and Gambling indices report positive significant factor loadings, indicating a bias towards small-cap stocks of these indices. The significant positive factor loadings on HML suggest that the Alcohol, Tobacco and Weapons indices have been somewhat value-stock oriented during the period examined. We also observe a significant negative loading on the MOM factor for the Gambling Index, suggesting that gambling stocks are not active in cyclical businesses. As for the factor loadings, the results confirm that there are significant differences in styles or risk sensitivities between the different sectors.

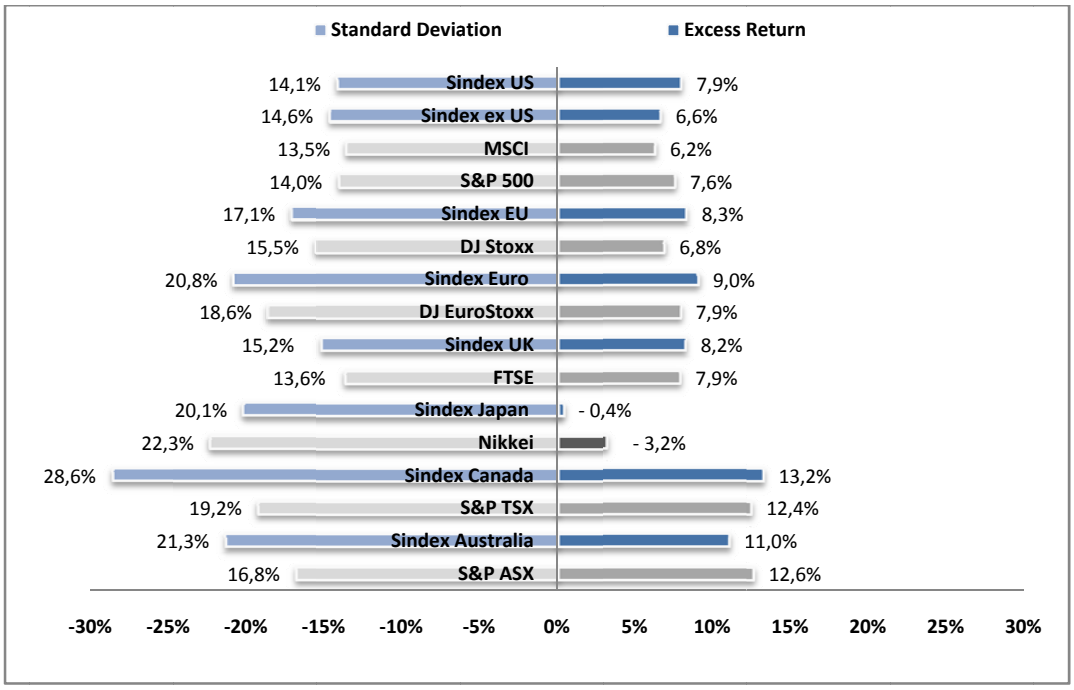
Depending on the measure used, the performance comparison shows different results. Summarized for the Alpha and Treynor measures, five of the six sector-indices perform better than the MSCI World and only the Sex Index is underperforming the benchmark. The Sharpe-ratio reveals an underperformance for the Gambling, Nuclear Power, Tobacco and Sex indices. Historically, the alcohol sector stands out as the best performing sector, followed by the weapons and tobacco sectors. In contrast to this, the sex sector swayed around its starting value till 2006 and is the worst performing index from every point of view.

5.3 Regional Sin-Indices

In this section we take a look at regional Sin-indices with the U.S., the world except the U.S., Europe and the Euro zone, the United Kingdom, Canada, Australia and Japan as investment universe. To be able to draw meaningful results, we use the most common and fitting conventional indices to analyze the regional Sin-indices.

[62] See Hong, and Kacperczyk (2005), p. 9.

Figure 6: Risk/Return Characteristics of the Regional Sin-Indices and their Benchmarks



To compare the U.S. index with the global index except the U.S. we use the MSCI Word Index. However, the analysis of U.S. index alone is performed using the S&P 500 as benchmark. The European Sin Index is compared to the DowJones Stoxx, the Sin Index with the Euro zone as investment region is compared to the DowJones EuroStoxx. The FTSE All Share serves as benchmark for the British, the Nikkei 225 for the Japanese, the S&P TSX 60 for the Canadian and the S&P ASX 200 for the Australian Sin Index. A graphical risk-return comparison of the Sin-indices and their benchmarks is presented in *Figure 6*.

Regarding the excess returns, the Canadian Sin Index stands out with a value of 13, 2 percent. The index though pays a price for its returns as it reports also the highest volatility of the returns. The Japanese index reaches the lowest excess returns achieving a negative return of 0.4. The Canadian index has the highest volatility followed by the Australian Sin Index; the lowest standard deviation provides the U.S. Sin Index, indicating a low volatility of the returns. In comparison to the fitting conventional indices, the Sin-indices reveal higher excess returns for every index, with the exception of the Australian Sin Index. These higher returns are mainly due

to higher standard deviations, except the Japanese Sin Index, which reports a lower volatility than the Nikkei 225 index.

The single-regression model reveals no significant Jensen's alpha for the Sin-indices, illustrated in *Table 5*. The adjusted coefficient of determination of the Sin-indices alters between 0.38 for the Canadian and 0.74 for the Australian index, indicating that 74 percent of the performance of the Australian index is explained by its risk exposure. The beta-coefficients are below one for every index besides the Australian Sin Index, indicating a higher risk for this index when compared to the Australian S&P ASX. Due to insufficient data for the regional variables of the four-factor regression, an analysis on the factor loadings had to be omitted.

The performance comparison between the sinful and conventional benchmarks reveals different results. Using the Jensen's alpha as performance criterion, every Sin Index apart from the Australian is able to outperform its benchmark. The Treynor measure confirms these findings as it reports only for the Australian index lower ratios. The Sharpe ratio, however detects an underperformance also for the British and Canadian indices.

The comparison between the global Sin Index except the U.S. and the U.S. Sin Index reveals an unambiguous winner with the U.S. Sin Index, which outperforms its counterpart in every performance measure. The lower standard deviation, higher abnormal return and lower beta-coefficients of the American index are the reasons for this. *Table 6* displays the estimations of the Carhart-model, illustrating different loadings for the two indices. While the U.S. index has significant negative loadings on the SMB factor, implying a bias towards large capitalization stocks, the non-U.S. index has significant positive loadings, indicating a bias towards small-cap firms. The factor loadings on HML suggest a value orientation of the non-U.S index.

5.4 Equally-Weighted Sin-Indices

To examine whether our results are sensitive to the index weighting scheme and to compare the results of this paper to prior findings on sinful investment, we also form

equally-weighted indices. The results achieved are similar to those obtained by value-weighted indices, albeit the results tend to differ in the significance of the coefficients. The excess returns and standard deviations are persistently higher and the standard deviations provide lower outcomes for the global and U.S. Sin-indices, illustrated in *Table 7*. Furthermore, all three performance measures reveal an over-performance of the equally-weighted indices in comparison to the Value Line Arithmetic Index, which serves as a suitable market proxy[63].

The results nevertheless change somewhat if - adopting the approach of Hong and Kacperczyk - only the sectors gambling, alcohol and tobacco are used. The performance measures for the U.S. Triumvirate Sin Index, i.e. a Sin Index created with alcohol, gambling and tobacco stocks, reveals outperformance for the Jensen and Treynor-measures, but not for the Sharpe ratio. A closer look at the factor loadings of the multifactor model puts prior results into perspective. Using the equally-weighted index, the alpha value of the global Sin Index provides a significant abnormal return of 0.5 percent, the equally-weighted U.S. Triumvirate Index, though used in prior research, has a p-value of only 0.32, indicating that the α-coefficient is not significant[64]. The greater amount of companies used to form the equally-weighted index, the different selection method and the longer timescale of our index are the influencing factors here.

A closer look at the equally-weighted sector Sin-indices reveals similar results compared to the value-weighted index, illustrated in *Table 8*. Besides the Sex Index, all sector indices outperform the Value Line Arithmetic Index. Confirming expectations, the factor loadings on the SMB factor are highly significantly positive for most of the indices, implying a bias towards small-cap stocks for all Sin-indices with exception of the Tobacco Index. The significant negative loading on the MOM factor for the Sex Index suggests that sex stocks do not follow cycles.

[63] The CSRP index, used in prior research, was replaced by the Value Line Arithmetic Index, representing an appropriate benchmark for the global equally-weighted indices.

[64] This result is also true for the CSRP index.

6 SRI versus Sin Investing

6.1 Preliminaries

The aim of this section is to detect the superior investment strategy between socially responsible and irresponsible investing. We investigate the differences between SRI indices and their sinful comparables, including the measurement of risk as well as performance comparisons. The performance tests are separately conducted for the SRI and Sin-indices as well as for groups of indices.

The 32 SRI indices are sorted by their investment regions, compared with benchmarks, which are determined by their provider companies, as well as to comparable Sin-indices. Only for the JSE SRI Index the comparable sinful index with the same investment region has not been used, due to unfavourable characteristics of the South African Sin Index consisting of only six companies within two Sin-sectors. Therefore, the global Sin Index provides an adequate replacement for this index. Almost all SRI indices are performance indices and thereby compared to performance Sin-indices, with exception to the DowJones and HVB price indices, which are compared to the price Sin-indices.

To avoid a bias of double-counting similar SRI-indices such as the four DowJones SRI-indices, which exist with and without the sectors gambling, tobacco, alcohol and weapons, an adjusted set of 26 SRI-indices has been created in addition to the complete list of 32 indices. Besides the DowJones, also the ESI Excellence Global and KLD Large Cap indices are excluded to draw objective conclusions. Several problems pointed out by the statistical tests justify these exclusions. Problems such as multicollinearity, resulting from high correlation between the indices of the same provider, for example, the DJSI World and the DJSI World ex TAGFA (Tobacco, Gambling, Alcohol, Firearms and Armaments) with a correlation of 99.9 percent, can be avoided with to this procedure.

6.2 Risk-Return Characteristics

The analysis of the excess returns reveals that 50 percent of the SRI indices have higher returns than their benchmarks. In comparison to the conventional indices, the Sin-indices provide higher returns in 84 percent of the cases, illustrated in *Table 9*. Revealing higher excess returns for 75 percent of the indices, the vice investment turns out to be the superior investment strategy in comparison to virtue investing. This result remains unchanged when the adjusted list of indices is used; however, the supremacy of the Sin-indices diminishes slightly to a percentage of 65 percent. The mean excess return adds up to 0.094 for the conventional indices, 0.101 for the social and 0.107 for the sinful indices.

Since a higher mean return might only be a result of higher risk-exposure, the standard deviations have also been analyzed. The standard deviations of the SRI indices are in 84 percent of the indices higher than values of the benchmark indices, indicating a higher volatility of the socially responsible indices returns. The Sin-indices achieve a balanced result with 16 higher and 16 lower coefficients compared to the conventional indices. The sinful investment strategy, with its lower risk-exposure, is here again the better financial strategy with a slim majority of 66 percent of the indices. Regarding the adjusted list, the results do not vary by more than one percent. The mean standard deviations report the lowest mean for the conventional indices with volatilities of 14.9 percent, followed by the Sin-indices with 15.3 percent and the SRI-indices with 16.3 percent.

6.3 Results on Standard Regression

6.3.1 Single-Factor Regression

The results of the single regression are summarized in *Table 10*. As columns 2 and 3 report, there are seven significant Jensen's alphas for the SRI indices comprised of four positive and three negative coefficients and also five positive abnormal returns for the Sin-indices. The detailed analysis of the α-coefficients follows in Section 6.5.

Regarding the β-coefficients, the 32 SRI indices reveal for 66 percent of the indices coefficients which are greater than one, illustrating a higher exposure to market risk of these indices. The maximum value of 1.235 is reached by the Calvert Social Index, implying a movement of 1.235 for this index, while the Russell 1000 performs a movement of one. The Sin-indices, on the other hand, provide only for the Canadian and the Australian indices coefficients greater than one, indicating that the Sin-indices carry only for 6 percent of the indices a higher risk compared to the conventional benchmark. A comparison between the SRI and Sin-indices also reveals only for these two indices greater betas for the Sin-indices than for the SRI-indices, implying less risk of the Sin-indices for 94 percent of the indices. Using the adjusted list of indices, the results remain largely unchanged; only the percentage of superior Sin-indices decreases to 92. The analysis of the mean β-coefficients of 1.03 for the SRI and 0.79 for the Sin-indices confirm the prior finding that Sin-indices carry less risk than the SRI indices.

The adjusted coefficient of determination of the SRI indices amounts to a mean coefficient of 0.87, indicating that 87 percent of the performance is explained by its risk exposure. The sinful comparables indicate with a value of 0.59 percent a smaller capture of the variation. The generally high values for the SRI indices indicate that the majority of the indices can be basically approximated by the benchmark indices. Due to lower coefficients, this is only partly true for the Sin-indices.

In the next step spanning tests have been performed to examine if the investment strategy of the SRI and Sin-indices significantly differs from the strategy of the benchmark. The test reveals that 17 of the 32 SRI indices and four of the Sin-benchmarks can be replaced by their benchmark since investing in the benchmark is equivalent to invest in these indices without differences in risk or return. The adjusted list reveals that 50 percent of the SRI indices as well as twelve percent of the Sin-comparables do not pass the spanning test. The reason for the rejection in most cases is based on the difference of the relative risk compared to the benchmark. These indices exhibit in almost every case the same adjusted return but higher betas.

6.3.2 Multi-Factor Regression

Table 11 shows the estimates resulting from the four-factor model and reports several prominent differences towards the results of *Table 10*. First, the adjusted R^2 from the models have increased with only few exceptions, confirming the incremental explanatory power of the multivariate framework. We see that the adjusted R^2 is substantially higher for the SRI indices than for the Sin-comparables, indicating that there are more factors driving the performance of the SRI indices.

Seven out of 32 SRI indices reveal significant Carhart alpha-coefficients, indicating positive average factor-adjusted returns. In comparison to the single regression model, we detect only one significant negative coefficient for the FTSE4Good Europe; also the percentage of positive coefficients increased to 86 percent. The average factor-adjusted returns of the Sin-indices shrinks to only three significant values of which two have positive factor loadings. In line with the outcomes within the CAPM framework, the SRI indices do not significantly differ in exposure to market risk, since the indices reveal for one half of the indices coefficients greater than one. Note that the average percentage of β-coefficient below one increased from 38 percent to 54 percent, indicating a lower exposure to market risk. Using the four-factor model, the distribution of the sinful betas remains unchanged.

Comparing additional factors, we find some interesting insights and report several prominent differences between social responsible and irresponsible investing, as illustrated in *Table 12*. First, the loadings on the SMB coefficients report significant values for twelve SRI indices and nine Sin indices. The significant negative factor loadings in 70 percent of the adjusted social list imply a modest bias towards large capitalization stocks of the social indices. The sinful comparables, however, report significant positive factor loadings, which indicates an outperformance of stocks with a small market capitalization. The factor loadings on HML suggest that the social indices were somewhat growth-stock oriented during the examined period since the loadings are negative for all eleven significant factors. With 17 significant positive factor loadings, however, the sinful counterparts report the diametric opposite, indicating a significant positive impact of value stocks. The difference between the investment approaches also exists for the momentum factor. On the virtue side, there

are six significant negative factor loadings for the responsible indices, implying that the indices are not active in cyclical businesses. On the vice side, we detect seven significant positive MOM factor loadings for the Sin indices, suggesting an outperformance of stocks with high prior returns.

6.4 Results on Index Groups

In this section, groups of SRI indices are analyzed to increase the quality of the prior parameter tests. The tests are conducted using the information in the cross-section of the SRI and Sin-indices and by estimating a system of equations to overcome restrictions that stem from the short history of available data series for many of the SRI indices[65].

6.4.1 Different Time Series

The first groups are constructed with regard to the length of the available time series illustrated in *Table 13*. The five groups are defined according to three different time intervals, including a full and long-term time period (twelve and ten years), a medium-term (eight years) and two short time periods (six and four years). An index is included into a group if the time series is at least as long as the period under consideration[66].

The groups of different time-series are relatively heterogeneous, since they include indices that differ in the screening approach and their investment region. Therefore the analysis should provide representative results for socially responsible investment, in particular. Column 4 in *Table 13* summarizes the results of the Chi-square-test statistic for the joint tests of the Jensen's alpha. The results of the single-factor model extend the results of the single equations, revealing significant alpha-coefficients for the SRI-indices for every time-interval. The sinful counterpart groups report similar

[65] N.B.: These tests make a statement only about the existence of different performance, but not if this difference is of a positive or a negative nature.

[66] To achieve sound results, the adjusted list of indices is used due to problems of multicorrelation.

findings regarding the abnormal returns, with exception of the three indices forming the full-term group which does not differ significantly from zero. The results for the joint test of the beta are reported in column 5, displaying similar results for both SRI and Sin-indices. Confirming the findings of the prior tests, the beta-coefficients for every group deviate significantly from one. The outcomes of the joint spanning tests describe a homogeneous picture. For every group of social responsible and irresponsible investment the spanning tests can be rejected, indicating that the groups do not hold the same risk and return characteristics than their benchmarks. Using the multi-factor model, we observe a slight change in the outcomes of the α–coefficients, illustrated in column 7. Due to the implementation of the additional four factors to the model, we are able to improve the robustness of the analysis.

The multi-factor model confirms the results achieved by the single-factor model, with exception of the full-term group of twelve year old Sin-indices, which hereby report also a significant alpha-coefficient. In summary, the joint significant tests on different time series reveal only few differences in the degree of the coefficients between the ethical and unethical approaches.

6.4.2 Different Index Families

In this section, we concentrate on the effects of the specific screening methods used by suppliers of socially responsible investing. *Table 14* presents six groups formed by different index families, such as the DowJones Sustainable Index or the FTSE4Good Index families. The estimations refer to the longest available common time-period for which the data is available. Contrary to the previous time-series groups, the groups of SRI index families are homogeneous. The indices within the groups, therefore, vary mainly because of the investment universe and not of their screening approach. For the ECPI and FTSE4Good families, the estimated alpha-coefficients significantly differ from zero and - using the multi-factor model - also the KLD family joins this list. The set of the Sin-comparable groups reports significant values for three groups, but this list decreases to the FTSE4GOOD Sin-comparable, which uses the multi-factor model. The spanning tests are not rejected only for the ESI and SNS index families, suggesting that - besides these two families

- the groups cannot be replaced by their benchmarks. As for the sinful counterparts, this statement is only true for the FTSE4Good sinful comparable group. The results suggest that the investment methods of the social investors are not always comparable among each other, as some social index providers are able to achieve significant alpha-coefficients and some are not. In conclusion, the comparison between the families reveals more significant abnormal returns for the SRI-index providers with respect to the sinful counterparts and a difference in the spanning only for the SNS index family.

6.4.3 Different Investment Regions

Here we focus on impacts of different investment regions on the results of ethical and unethical investment. To investigate these effects, we have created five groups of indices with a global, U.S., Euro zone, Europe or the United Kingdom based investment universe. *Table 15* summarizes the results for the five groups, illustrating significant outperformance of the European and in the Euro zone invested SRI indices for the single-factor model. This list is completed by the American SRI indices, which reveal significant values using the multi-factor model. The single-factor model of the Sin-indices, however, provides significant alphas for the U.S. American, European and the British indices. This list, however, is reduced to the American Sin Indices when the multi-factor approach is applied. The spanning tests are rejected for every investment region for the ethical and unethical groups, indicating that the indices cannot be directly replicated by benchmarks of the same investment region. Historically, it seems that the U.S. and the Euro zone SRI indices have a significantly different performance in contrast to their counterparts. Summarizing our results for this section, the joint coefficients tests on different time-series reveal that several socially responsible and irresponsible indices are indeed able to exhibit significant out- or underperformance in comparison to conventional benchmarks. This result is also true for some of the index providers and several indices limited to a specific investment universe. Generally, the SRI indices are more often able to generate significant alpha values than their sinful comparables. We note

that except with some index families, the indices cannot be replaced by their benchmark.

6.5 Performance Measurement

The following section reports the results of the performance estimations on the SRI indices and their sinful counterparts, illustrated in *Table 16*.

The first performance measure used is the **Jensen's alpha**, representing the excess return that cannot be explained by the risk exposure of the index with respect to its benchmark. The monthly α-coefficient of the SRI indices compared to the conventional benchmarks report in 56 percent of the indices values larger than zero. The Sin-indices however provide an outperformance in 91 percent of the cases. The comparison between the ethical and unethical investment approaches reveals higher abnormal returns in 28 cases or at 88 percent of the Sin-indices, indicating a superior performance of the socially irresponsible indices. These findings change only slightly when the adjusted list of indices is employed. The outperformance of the Sin-indices over the SRI indices reduces to 85 percent. The average monthly alpha amounts to 0.0003 for the SRI indices, indicating a minimal average outperformance of the SRI indices. The mean monthly Jensen's alpha for the sinful comparables is 0.0027 and consequently takes a value greater than zero. The results though are for almost every case not significantly different from zero, indicating that the performance of most of the indices does not deviate systematically from their conventional benchmark indices.

The results of the **Treynor-measure** confirm the prior findings on the performance of the investment approaches. The Treynor ratios of the SRI-indices compared to their official benchmarks demonstrate a slight outperformance for 53 percent of the indices. The Sin-indices are once more able to outperform the conventional indices in 91 percent. The competition between the opposite social indices results in a clear winner in the unethical indices, which outperform the ethical indices in 88 percent of the cases. Similar to the Jensen measure, this value decreases to 85 percent if the adjusted list is applied. The remaining results stay mainly unchanged; only the

outperformance of the Sin-indices decreases slightly from 91 to 88 percent. The average value of the adjusted Treynor list is 0.0078 for the market indices and 0.0080 for the SRI-indices, indicating a comparable performance. The average ratio for the sinful indices comes to a value of 0.0116 for the Sin-indices.

The evaluation of the **Sharpe ratios** reveals different outcomes than the prior findings as the SRI indices do on average not outperform the conventional indices. With 44 percent an outperformance of the SRI indices can only be detected for fewer than the half of the indices. The ratios of the Sin-comparables on the other side still report a high percentage of outperformance in 84 percent of the cases when compared to the standard indices. The comparison between the SRI and Sin-indices reveals again the vice investment as the superior investment strategy, outperforming the virtue indices for three-quarter of the 32 indices. With a percentage of outperforming indices of only 42 percent, the poor performance of the SRI indices decreases even more when the adjusted list is applied. The value of unethical indices which perform better than the ethical indices decreases to 69 percent if the adjusted list is used. A look at the average ratios emphasises the superiority of the Sin-indices with a mean reward-to-variability ratio of 0.22 in comparison to 0.19 of the conventional and 0.18 of the SRI-indices.

7 Conclusions

The debate on the performance of virtue investing in the equity markets has been going on for years and seems rather inconclusive. Academic findings on socially responsible investing reveal different results for the performance of SRI indices; however, there are indications from recent research suggesting an outperformance by sin stocks. This raises the question whether investors can increase their performance more by incorporating social or unsocial screens into their investment process. Answering this question is the key contribution of our paper. Extending prior studies on sin investment, we find that publicly traded companies involved in alcohol, gambling, tobacco, sex and nuclear power industries are able to generate abnormal returns. Using a worldwide index of 732 unethical firms, we provide evidence that

the risk-return characteristics of sin stocks are superior in comparison to regular stocks as well as socially responsible stocks.

Our analysis of the Sin Index reveals the following main results:

(I) The Sin Index provides higher returns which are not due to higher volatility. We report risk-adjusted return of 18 basis points for the single-factor regression and 5 basis points per month for the four-factor regression. Looking at the outcomes of the other factors we detect that the index is tilted toward value stocks. Furthermore the index manages to outperform the MSCI World for every performance measure. (II) The findings on the sector indices show an underperformance only for the Sex Index; other indices such as the Alcohol, Weapons and Tobacco indices reveal even superior performance when compared to the Sin Index. The analysis of the regional indices reveals an outperformance for every index except the Australian index. (III) The equally-weighted Sin-indices put the findings of Hong and Kacperczyk into perspective. Assuringly, we find a high risk-adjusted performance, but in most of the cases these findings are not significant.

The comparison between the virtue and vice investment approaches reports several remarkable results. The analysis of the factor loadings of the multi-factor model shows opposite characteristics: While the SRI indices are tilted towards small stocks the sinful counterparts indicate a bias towards small-cap firms. The loadings on the HML factor imply that the ethical indices have a growth and the unethical indices a value stock orientation. Furthermore, the socially responsible indices seem in contrast to their Sin-comparables not to be active in cyclical businesses. The tests on systems of different time-series reveal that the two investment approaches are able to generate a performance that differs significantly from conventional benchmarks. This result is also true for several index families and regions. In general, the SRI indices provide more significant performance differences than their counterparts.

In the comparison of vice to virtue we find that the returns of the SRI indices were lower than those of their Sin-counterparts during the overall 1995 - 2007 period but not in every sub-period. In general, SRI indices did better than their counterparts until the end of the dot-com bubble and in 2001 it appeared that virtue had gained the upper hand but during the bust of the early 2000s the social indices fell more and

more back. The performance tests of the SRI indices confirm the results of prior studies since the indices neither lead to a significant outperformance nor an underperformance compared to their benchmarks. The Sin-indices on the other hand achieve for all three performance ratios an outperformance of on average 79 percent of the indices. Summarizing the findings of the performance comparison, we are able to detect a clear financial winner in the competition between vice and virtue investing in the socially irresponsible approach. The Sin-indices outperform the SRI indices in 85 percent of the cases using the Jensen and Treynor measures and also the Sharpe-ratio demonstrates greater values for the sinful comparables in 69 percent of the indices.

In summary, the Sin Index outperforms both conventional and socially responsible indices even after adjusting for common risk-factors. Despite the low significance of the alpha values, all three performance measures demonstrate an unambiguous higher performance by the Sin indices (Sin premium) compared to the SRI indices, which leads to the conclusion that the superior financial investment strategy seems to be the sinful one. To paraphrase Wall Street movie's character Gordon Gekko "sin is good", or in this case, better than investing in conventional or "social responsible" areas.

Overall, our results suggest that socially irresponsible investing provides higher risk-adjusted returns. Where do these abnormal returns stem from? Is it a sin or disgust premium? Does it result from mispricing in the market or additional risk factors? Answering these questions is left for future research.

Appendix

Table 1: Excluding Criteria of the Socially Responsible Indices

SRI Indices	Region	Alcohol	Animal Testing	Gambling	Nuclear Power	Porno-graphy	Tobacco	Weapons	No Criteria
DJSI World	Global								X
DJSI World ex TAGFA	Global	X		X			X	X	
ESI Pioneer Global	Global	X	X	X	X	X	X	X	
ESI Excellence Global	Global	X	X	X	X	X	X	X	
Ethical Global	Global	X		X	X	X	X	X	
FTSE4GOOD Global	Global				X		X	X	
NAI	Global		X		X			X	
Calvert Social	USA	X		X	X		X	X	
DJSI US	USA								X
DJSI US ex TAGFA	USA	X		X			X	X	
Domini 400 Social	USA	X		X	X	X	X	X	
FTSE4GOOD USA	USA				X		X	X	
KLD Broad Market	USA	X		X	X	X	X	X	
KLD Large Cap Social	USA						X		
KLD Select Social	USA	X		X	X	X	X	X	
ASPI	Eurozone								X
DJSI EuroStoxx	Eurozone								X
DJSI EuroStoxx ex TAGFA	Eurozone	X		X			X	X	
Ethical Eurozone	Eurozone	X		X	X	X	X	X	
DJSI Stoxx	Europe								
DJSI Stoxx ex TAGFA	Europe	X		X			X	X	
ESI Excellence Europe	Europe	X	X	X	X	X	X	X	
Ethical Euro	Europe	X		X	X	X	X	X	
FTSE4GOOD Europe	Europe				X		X	X	
HVB Nachhaltigkeit	Europe	X	X	X	X	X	X	X	
Kempen SNS Smaller EU	Europe						X		
FTSE4GOOD UK	UK				X		X	X	
Kempen SNS Smaller UK	UK						X		
Jantzi Social	Canada				X		X	X	
JSE	RSA								X
Australian SAM	Australia								X
FTSE4GOOD Japan	Japan				X		X	X	

Notes: In this table the excluding criteria of 32 socially responsible indices are presented. The names of the indices are reported in Column 1. The full names of the SRI indices can be found in the List of Abbreviations. In Column 2 the investment region of the indices is presented. The use of a criterion is marked with an X.

Table 2: Summary Statistics for the Time Series Regression of the Sin-Index and its Sub-Indices

Index	Excess Return	STD	Alpha	Beta	adj. R^2	Sharpe	Treynor
MSCI World Index	0,0625	0,1353	0,0000	1,0000	1,000	0,1333	0,0625
Sin-Index	0,0673	0,1244	0,0018	0,7401	0,646	0,1563	0,0910
Alcohol Index	0,0673	0,1156	0,0035	0,4048	0,219	0,1680	0,1661
Gambling Index	0,0620	0,1866	0,0012	0,7562	0,296	0,0960	0,0820
Nuclear Power Index	0,0723	0,1580	0,0015	0,8772	0,561	0,1321	0,0824
Sex Index	0,0314	0,1898	-0,0014	0,7640	0,292	0,0477	0,0410
Tobacco Index	0,0670	0,2013	0,0034	0,4284	0,076	0,0961	0,1565
Weapons Index	0,0931	0,1773	0,0035	0,8266	0,393	0,1515	0,1126

Notes: This table shows the results of the estimations on different sinful indices and the MSCI World Index. Column 2 gives the monthly return, net of the risk-free rate and Column 3 the standard deviation of the excess returns. Column 4, 7 and 8 display the results of Jensen's alpha, the Sharpe-ratio and the Treynor-measure. Column 5 gives the outcomes of single regression for the beta-coefficient and Column 6 presents the results for the coefficient of determination of the regression.*** 1% significance; ** 5% significance; * 10% significance. Note the significance for the beta is not marked. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 3: Return Performance of the Sin-Index

Variable	Alpha	MKT	SMB	HML	MOM	adj. R^2
Sin-Index	0,0018	0,740058***				0,646
	0,0017	0,0484				
Sin-Index	0,0019	0,747404***	-0,058739			0,648
	0,0018	0,0473	0,0484			
Sin-Index	0,0005	0,811972***	0,016267	0,182377***		0,667
	0,0016	0,0617	0,0490	0,0642		
Sin-Index	0,0005	0,812916***	0,015786	0,182731***	0,002349	0,664
	0,0017	0,0616	0,0503	0,0666	0,0410	

Notes: This Table reports the results for the multi-factor time series regressions for the Sin Index using one, two, three and four-factor regressions. All results are presented in the form of a fitted regression equation with standard errors in the second line. The depended variable is the monthly value-weighted return of the Sin Index minus the risk-free rate. The independent variables are four zero-investment factor portfolios. MKT represents the return on the market proxy (MSCI World) in excess of the risk-free rate, SMB denotes the difference in return between a small-cap portfolio and a large-cap portfolio, HML denotes the difference in returns between a value portfolio and a growth portfolio and MOM is the return difference between a prior 12-month winner portfolio and a 12-month looser portfolio. *** 1% significance; ** 5% significance; * 10% significance. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 4: Return Performance of the Sector Sin-Indices

Index	ALPHA	MKT	SMB	HML	MOM	R^2
SIN Index	0,0018	0,740058***				0,646
	0,0017	0,0484				
SIN Index	0,0005	0,812916***	0,015786	0,182731***	0,002349	0,664
	0,0017	0,0616	0,0503	0,0666	0,0410	
Alcohol	0,0035	0,404849***				0,219
	0,0024	0,0819				
Alcohol	-0,0004	0,600357***	0,113264**	0,450530***	0,085623	0,368
	0,0020	0,0782	0,0543	0,0775	0,0595	
Gambling	0,0012	0,756196***				0,296
	0,0048	0,1044				
Gambling	0,0010	0,711841***	0,457778***	0,177318	-0,187111**	0,390
	0,0050	0,1052	0,1037	0,1445	0,0775	
Nuclear Power	0,0015	0,877206***				0,561
	0,0020	0,0681				
Nuclear Power	0,0023	0,854811***	-0,157915**	-0,131713	0,035713	0,568
	0,0022	0,0726	0,0685	0,1008	0,0523	
Sex	-0,0014	0,763998***				0,292
	0,0034	0,1046				
Sex	-0,0030	0,831398***	0,103179	0,175219	0,029361	0,286
	0,0036	0,1101	0,1354	0,1268	0,0727	
Tobacco	0,0034	0,428393***				0,076
	0,0049	0,1192				
Tobacco	0,0000	0,621376***	0,129508	0,564103***	-0,061983	0,149
	0,0041	0,1070	0,1723	0,1866	0,1105	
Weapons	0,0035	0,82660***				0,393
	0,0033	0,1012				
Weapons	0,0007	0,982108***	0,203747**	0,538976***	-0,119075	0,496
	0,0029	0,1181	0,0927	0,1009	0,0812	

Notes: This Table reports the results for the multi-factor time series regressions for the Sin Index and the six sector Sin-indices using one, two, three and four-factor regressions. All results are presented in the form of a fitted regression equation with standard errors in the second line. The depended variable is the monthly value-weighted return of the Sin Index minus the risk-free rate. The independent variables are four zero-investment factor portfolios. MKT represents the return on the market proxy (MSCI World) in excess of the risk-free rate, SMB denotes the difference in return between a small-cap portfolio and a large-cap portfolio, HML denotes the difference in returns between a value portfolio and a growth portfolio and MOM is the return difference between a prior 12-month winner portfolio and a 12-month looser portfolio. *** 1% significance; ** 5% significance; * 10% significance. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 5: Summary Statistics for the Regional Sin-Indices

Index	Excess Return	STD	Alpha	Beta	adj. R^2	Sharpe	Treynor
Sin Index US	0,0794	0,1412	0,0018	0,7622	0,571	0,1623	0,1042
S&P 500	0,0755	0,1404	0,0000	1,0000	1,000	0,1553	0,0755
Sin Index US (PI)	0,0828	0,1706	0,0017	0,9124	0,688	0,1401	0,0907
DJSTOXX	0,0685	0,1553	0,0000	1,0000	1,000	0,1272	0,0685
Sin Index Euro (PI)	0,0902	0,2077	0,0018	0,8721	0,604	0,1253	0,1034
DJEUSTOXX	0,0791	0,1856	0,0000	1,0000	1,000	0,1230	0,0791
Sin Index UK	0,0823	0,1515	0,0016	0,7948	0,505	0,1568	0,1035
FTSE	0,0789	0,1360	0,0000	1,0000	1,000	0,1675	0,0789
Sin Index Japan (PI)	-0,0036	0,2015	0,0017	0,7533	0,693	-0,0051	-0,0047
Nikkei	-0,0317	0,2229	0,0000	1,0000	1,000	-0,0410	-0,0317
Sin Index Canada	0,1322	0,2859	0,0015	0,9173	0,376	0,1335	0,1441
S&P TSX 60	0,1243	0,1921	0,0000	1,0000	1,000	0,1867	0,1243
Sin Index Australia	0,1102	0,2131	-0,0023	1,0978	0,743	0,1494	0,1004
S&P ASX 200	0,1258	0,1675	0,0000	1,0000	1,000	0,2168	0,1258
Sin Index US	0,0794	0,1412	0,0030	0,6857	0,428	0,1623	0,1158
Sin Index ex US	0,0661	0,1461	0,0013	0,8142	0,565	0,1306	0,0812
MSCI World	0,0625	0,1353	0,0000	1,0000	1,000	0,1333	0,0625

Notes: The table reports the results of the estimations on several regional Sin indices and their benchmarks. Below each regional Sin-Index the market proxy for the index is given. Since the DowJones Stoxx, Dow Jones Euro Stoxx and Nikkei 225 indices were available only as price indices they are compared to the price Sin-indices, indicated with (PI). The last three rows illustrate the outcomes for the U.S and non U.S. Sin-indices for which the MSCI World serves as benchmark. Column 2 gives the monthly return, net of the risk-free rate and Column 3 the standard deviation of the excess returns. Column 4, 7 and 8 display the results of the Jensen alpha, Sharpe-ratio and Treynor-measure. Column 5 gives the outcomes of single regression for the beta-coefficient and Column 6 presents the results for the coefficient of determination of the regression.*** 1% significance; ** 5% significance; * 10% significance. Note the significance for the beta is not marked. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 6: Return Performance of the U.S. and non-U.S. Sin-Indices

Variable	ALPHA	MKT	SMB	HML	MOM	R^2
Sin-Index	0,0018	0,740058***				0,646
	0,0017	0,0484				
	0,0005	0,812916***	0,015786	0,182731***	0,002349	0,664
	0,0017	0,0616	0,0503	0,0666	0,0410	
Sin-Index U.S.	0,0030	0,685701***				0,428
	0,0022	0,0741				
	0,0030	0,752854***	-0,232817***	0,1103	-0,021250	0,505
	0,0022	0,0870	0,0776	0,1033	0,0504	
Sin-Index ex U.S.	0,0013	0,814173***				0,565
	0,0024	0,0501				
	-0,0014	0,899728***	0,301844***	0,27421***	0,0384	0,630
	0,0022	0,0588	0,0482	0,0577	0,0375	

Notes: This Table reports the results for the one and four-factor time series regressions for the Sin Index, the U.S. Sin Index and the Sin Index except U.S. stocks. The market proxy used for the regression is the MSCI World index. *Sin-Index* denotes the global Sin Index, *Sin-Index U.S.* is the American Sin-Index and *Sin-Index ex U.S.* denotes the global Sin Index except American stocks. All results are presented in the form of a fitted regression equation with standard errors in the second line. The depended variable is the monthly value-weighted return of the Sin Index minus the risk-free rate. The independent variables are four zero-investment factor portfolios. MKT represents the return on the market proxy (MSCI World) in excess of the risk-free rate, SMB denotes the difference in return between a small-cap portfolio and a large-cap portfolio, HML denotes the difference in returns between a value portfolio and a growth portfolio and MOM is the return difference between a prior 12-month winner portfolio and a 12-month looser portfolio. *** 1% significance; ** 5% significance; * 10% significance. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 7: Summary Statistics for the Time Series Regression of the Equally-Weighted Sin-Index and its Sub-Indices

Index	Excess Return	STD	Alpha	Beta	adj. R^2	Sharpe	Treynor
E-W Sin Index	0,1267	0,1372	0,0054*	0,5839	0,4917	0,9238	0,2171
E-W Sin Index U.S.	0,1298	0,1714	0,0047	0,6890	0,4382	0,7577	0,1884
E-W Triumvirate	0,1040	0,1172	0,0046	0,4629	0,4223	0,8874	0,2247
E-W Triumvirate U.S.	0,1269	0,2082	0,0047	0,6646	0,2735	0,6095	0,1909
E-W Alcohol Index	0,0766	0,0988	0,0034	0,3400	0,3193	0,7759	0,2254
E-W Gambling Index	0,1449	0,2004	0,0062	0,6698	0,3005	0,7230	0,2163
E-W Nuclear Power Index	0,2121	0,2655	0,0110	0,7603	0,2188	0,7991	0,2790
E-W Sex Index	-0,0125	0,2697	-0,0075	0,7266	0,1928	-0,0462	-0,0172
E-W Tobacco Index	0,1104	0,1420	0,0051	0,4607	0,2826	0,7773	0,2396
E-W Weapons Index	0,1193	0,1469	0,0039	0,6826	0,5876	0,8126	0,1748
Value Line Index	0,1060	0,1653	0,0000	1,0000	1,0000	0,6413	0,1060
E-W Triumphirat U.S. (CSPR)	0,1269	0,2082	0,0065	0,6056	0,1845	0,6095	0,2095
CSRP Index	0,0798	0,1499	0,0000	1,0000	1,0000	0,5324	0,0798

Notes: The Table reports the results for the calculations on several equally-weighted Sin-indices. The Value Line Arithmetic Index serves market proxy for every index, with exception of the *E-W Triumvirate U.S. (CSPR)* index, which was compared to the CSRP index. The equally-weighted Triumvirate Index represents an equally-weighted index created with stock in the alcohol, gambling and tobacco business. Column 2 gives the monthly return, net of the risk-free rate and Column 3 the standard deviation of the excess returns. Column 4, 7 and 8 display the results of the Jensen alpha, Sharpe-ratio and Treynor-measure. Column 5 gives the outcomes of single regression for the beta-coefficient and Column 6 presents the results for the coefficient of determination of the regression.*** 1% significance; ** 5% significance; * 10% significance. Note the significance for the beta is not marked. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 8: Return Performance of the Equally-Weighted Sin-Indices

Index	ALPHA	MKT	SMB	HML	MOM	R^2
E-W Sin Index	0,005*	0,5280	0,258***	0,0330	0,0020	0,5420
	0,0030	0,0480	0,0480	0,0820	0,0480	
E-W Sin Index US	0,0060	0,5360	0,44***	0,0700	-0,1250	0,5255
	0,0040	0,0730	0,0540	0,1210	0,0860	
E-W Triumvirate	0,005*	0,3960	0,215***	0,0050	-0,0290	0,4673
	0,0030	0,0420	0,0430	0,0690	0,0440	
E-W Triumvirate US	0,0070	0,4400	0,524***	-0,0240	-0,1880	0,3688
	0,0050	0,0960	0,0810	0,1250	0,1160	
E-W Alcohol Index	0,0020	0,3510	0,098**	0,092*	0,0310	0,3275
	0,0020	0,0400	0,0420	0,0520	0,0340	
E-W Gambling Index	0,009*	0,4290	0,488***	-0,1600	-0,1730	0,4193
	0,0050	0,0800	0,0750	0,1400	0,0870	
E-W Nuclear Power Index	0,0090	0,7740	0,278**	0,0660	0,1480	0,2368
	0,0070	0,1310	0,1390	0,1550	0,0970	
E-W Sex Index	-0,0030	0,4870	0,236*	-0,1120	-0,331***	0,2195
	0,0080	0,1100	0,1350	0,1650	0,1020	
E-W Tobacco Index	0,0040	0,4950	0,0220	0,0390	0,0660	0,2744
	0,0030	0,0640	0,0930	0,1050	0,0690	
E-W Weapons Index	0,0030	0,6180	0,322***	0,0730	-0,0010	0,6571
	0,0020	0,0500	0,0460	0,0970	0,0530	

Notes: This Table reports the results for the four-factor time series regressions for the equally-weighted global and U.S. Sin-indices, the global and U.S. Triumvirate Sin Index and six equally weighted Sin-sector indices. All results are presented in the form of a fitted regression equation with standard errors in the second line. The depended variable is the monthly value-weighted return of the Sin Index minus the risk-free rate. The independent variables are four zero-investment factor portfolios. MKT represents the return on the market proxy (MSCI World) in excess of the risk-free rate, SMB denotes the difference in return between a small-cap portfolio and a large-cap portfolio, HML denotes the difference in returns between a value portfolio and a growth portfolio and MOM is the return difference between a prior 12-month winner portfolio and a 12-month looser portfolio. *** 1% significance; ** 5% significance; * 10% significance. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 9: Risk-Return Comparison of Virtue and Vice Investment

Region	SRI Index	Benchmark	Sin-Index	ER SRI	ER BM	ER SIN	STD SRI	STD BM	STD SIN
Global	DJSI World	DJGI	Sin Index	0,058	0,048	0,068	0,152	0,140	0,127
Global	DJSI World EX	DJGI	Sin Index	0,058	0,048	0,068	0,153	0,140	0,127
Global	ESI Pioneer Global	S&P Global	Sin Index	0,056	0,057	0,066	0,158	0,138	0,132
Global	ESI Excellence Global	S&P Global	Sin Index	0,165	0,166	0,189	0,097	0,085	0,087
Global	Ethical Global	MSCI World	Sin Index	0,037	0,046	0,070	0,134	0,133	0,122
Global	FTSE4GOOD Global	FTSE All World	Sin Index	0,076	0,062	0,062	0,156	0,143	0,129
Global	NAI	MSCI World	Sin Index	0,281	0,119	0,173	0,152	0,078	0,084
USA	Calvert Social	Russell 1000	Sin-Index U.S.	-0,020	-0,013	0,033	0,159	0,137	0,128
USA	DJSI US	Dow Jones	Sin-Index U.S.	0,003	0,022	0,040	0,154	0,142	0,141
USA	DJSI US EX	Dow Jones	Sin-Index U.S.	0,004	0,022	0,040	0,159	0,142	0,141
USA	Domini 400 Social	S&P 500	Sin-Index U.S.	0,078	0,076	0,079	0,154	0,140	0,141
USA	FTSE4GOOD USA	FTSE AW USA	Sin-Index U.S.	0,061	0,057	0,067	0,165	0,153	0,145
USA	KLD Broad Market	Russell 3000	Sin-Index U.S.	0,020	0,012	0,028	0,153	0,136	0,128
USA	KLD Large-Cap	Russell 1000	Sin-Index U.S.	0,014	0,005	0,028	0,153	0,133	0,128
USA	KLD Select Social	Russell 1000	Sin-Index U.S.	0,070	0,070	0,096	0,076	0,076	0,076
Canada	Jantzi Social	S&P/TSX 60	Sin-Index Can	0,067	0,110	0,119	0,144	0,184	0,326
Eurozone	ASPI Indices	DJ Euro Stoxx	Sin-Index Euro	0,108	0,079	0,090	0,187	0,186	0,204
Eurozone	DJSI EuroStoxx	DJ Euro Stoxx	Sin-Index Euro	0,038	0,033	0,098	0,211	0,191	0,222
Eurozone	DJSI EuroStoxx EX	DJ Euro Stoxx	Sin-Index Euro	0,039	0,033	0,098	0,212	0,191	0,222
Eurozone	Ethical Eurozone	DJ Euro Stoxx	Sin-Index Euro	0,229	0,180	0,235	0,135	0,140	0,179
Europe	DJSI Stoxx	DJ Stoxx	Sin-Index EU	0,030	0,037	0,094	0,162	0,160	0,172
Europe	DJSI Stoxx EX	DJ Stoxx	Sin-Index EU	0,029	0,037	0,094	0,164	0,160	0,172
Europe	ESI Excellence EU	DJ Stoxx	Sin-Index EU	0,209	0,194	0,244	0,149	0,118	0,140
Europe	Ethical Euro	DJ Stoxx	Sin-Index EU	0,062	0,056	0,121	0,176	0,161	0,164
Europe	FTSE4GOOD Europe	FTSE Europe	Sin-Index EU	0,100	0,133	0,081	0,172	0,162	0,172
Europe	HVB Nachhaltigkeit	DJ Euro Stoxx	Sin-Index EU	0,100	0,066	0,114	0,200	0,197	0,222
Europe	SNS Smaller EU	HSBC Small EU	Sin-Index EU	0,142	0,132	0,094	0,212	0,176	0,167
UK	FTSE4GOOD UK	FTSE All Share	Sin-Index UK	0,074	0,079	0,081	0,137	0,142	0,156
UK	SNS Smaller UK	HSBC Small UK	Sin-Index UK	0,094	0,135	0,085	0,265	0,183	0,140
RSA	JSE SRI	FTSE/JSE	Sin-Index	0,319	0,322	0,163	0,213	0,215	0,080
Australia	Australian SAM	S&P ASX 200	Sin-Index AUS	0,217	0,219	0,207	0,138	0,128	0,198
Japan	FTSE4GOOD Japan	FTSE Japan	Sin-Index JP	0,106	0,112	0,164	0,118	0,116	0,092

Notes: This Table reports summary statistics for the 32 SRI indices, their benchmarks and sinful comparable indices. In Column 1 the investment region of the SRI indices is shown. Column 2 reports the names of the socially responsible indices and Column 3 the official benchmarks of the SRI indices with exception of the FTSE4Good Japan. Column 4 presents the Sin-indices used to the comparison with the socially indices, with exception of the South African (RSA) index, the Sin-indices have the same investment region than the SRI index. Column 5 reports the monthly excess returns and the last Column the standard deviations of the excess returns of the socially responsible indices, their benchmarks and sinful comparables.

Table 10: Single-Regression Results and Spanning Tests of Virtue and Vice Investment

Name	Alpha SRI	Alpha SIN	Beta SRI	Beta SIN	R^2 SRI	R^2 SIN	Spanning SRI	Spanning SIN
DJSI World	0,00066	0,00258	1,055	0,773	0,937	0,721	**	***
DJSI World ex TAGFA	0,00063	0,00258	1,061	0,773	0,935	0,721	**	***
ESI Pioneer Global	-0,00016	0,00195	1,015	0,754	0,791	0,622	not rejected	***
ESI Excellence Global	-0,00012	0,00354*	1,005	0,884	0,774	0,747	not rejected	*
Ethical Global	-0,00077	0,00291	0,995	0,764	0,985	0,698	not rejected	***
FTSE4GOOD Global	0,00078	0,00114	1,071	0,783	0,966	0,743	***	***
NAI	0,00761*	0,00563***	1,588	0,888	0,660	0,685	***	**
Calvert Social	-0,00044	0,00345	1,135	0,638	0,956	0,459	***	***
DJSI US	-0,00149	0,00196	0,936	0,720	0,746	0,521	not rejected	***
DJSI US ex TAGFA	-0,00143	0,00196	0,951	0,720	0,720	0,521	not rejected	***
Domini 400 Social	0,00024	0,00182	1,001	0,762	0,836	0,571	not rejected	***
FTSE4GOOD USA	0,00013	0,00231	1,057	0,695	0,963	0,531	**	***
KLD Broad Market	0,00057	0,00165	1,049	0,656	0,862	0,480	not rejected	***
KLD Large Cap Social	0,00070	0,00200	1,058	0,676	0,851	0,492	not rejected	***
KLD Select Social	0,00081	0,00408	0,856	0,666	0,738	0,439	*	*
Jantzi Social	-0,00011	0,00005	0,619	1,070	0,626	0,358	***	not rejected
ASPI Indices	0,00244***	0,00189	0,996	0,853	0,979	0,597	***	***
DJSI EuroStoxx	0,00015	0,00556	1,091	0,938	0,977	0,651	***	not rejected
DJSI EuroStoxx ex TAGFA	0,00017	0,00556	1,096	0,938	0,977	0,651	***	not rejected
Ethical Eurozone	0,00484***	0,00697	0,951	0,841	0,963	0,420	***	**
DJSI Stoxx	-0,00054*	0,00506	1,004	0,921	0,977	0,728	not rejected	**
DJSI Stoxx ex TAGFA	-0,000698*	0,00506	1,016	0,921	0,975	0,728	not rejected	**
ESI Excellence Europe	0,00114	0,00520	1,008	0,934	0,624	0,608	not rejected	not rejected
Ethical Euro	0,00014	0,00598*	1,066	0,867	0,953	0,725	not rejected	***
FTSE4GOOD Europe	-0,00334***	-0,00311	1,052	0,883	0,973	0,683	***	***
HVB Nachhaltigkeit	0,00309**	0,00446	0,949	0,913	0,880	0,654	**	*
Kempen SNS Smaller EU	0,00018	-0,00027	1,059	0,734	0,767	0,591	not rejected	***
FTSE4GOOD UK	-0,00004	0,00153	0,945	0,784	0,954	0,504	not rejected	***
Kempen SNS Smaller UK	0,00008	0,00606***	0,986	0,280	0,987	0,553	not rejected	***
JSE SRI	-0,00518	0,00159	1,158	0,494	0,639	0,410	**	***
Australian SAM	-0,00133	-0,00731	1,064	1,341	0,966	0,737	not rejected	**
FTSE4GOOD Japan	-0,00042	0,00769**	0,988	0,641	0,945	0,638	not rejected	***

Notes: This Table reports the results for the single-factor time series regressions for the 32 SRI indices and their Sin comparables. Column 2 and 3 contains the estimated values for the Jensen's alpha, H_0: (all $\alpha_i = 0$) a rejection of the null hypothesis is indicated by asterisk. Column 4 and 5 show the results for the β-coefficient and the test H_0: (all $\beta_i = 1$), as the Null hypothesis is rejected for every beta the significance is not indicated. In Column 8 and 9 the outcomes of the spanning tests H_0: (all $\alpha_i = 0$ and all $\beta_i = 1$) is documented, a rejection of the null hypothesis is indicated by asterisk. *** 1% significance; ** 5% significance; * 10% significance. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 11: Results of the Multi-Factor Regression (Part 1)

Name	Alpha SRI	Alpha SIN	Beta SRI	Beta SIN	adj. R^2 SRI	adj. R^2 SIN
DJSI World	0,0007	0,0008	1,0760	0,9173	0,942	0,787
DJSI World ex TAGFA	0,0008	0,0008	1,0761	0,9173	0,941	0,787
ESI Pioneer Global	0,0020	0,0005	0,9240	0,8338	0,829	0,637
ESI Excellence Global	-0,0001	0,0018	1,0781	0,8666	0,771	0,766
Ethical Global	-0,0007	0,0005	0,9915	0,8887	0,984	0,741
FTSE4GOOD Global	0,0015	-0,0013	1,0431	0,9074	0,969	0,791
NAI	0,0082	0,0033	1,3223	0,9036	0,693	0,699
Calvert Social	0,0016**	0,0009	1,0107	0,8119	0,977	0,535
DJSI US	0,0019	0,0015	0,8387	0,7586	0,881	0,539
DJSI US ex TAGFA	0,0024	0,0015	0,8454	0,7586	0,868	0,539
Domini 400 Social	0,0015	-0,0003	0,9357	0,8917	0,844	0,645
FTSE4GOOD USA	0,0003	-0,0008	1,0427	0,8772	0,964	0,624
KLD Broad Market	0,0010	-0,0001	0,9282	0,8095	0,873	0,526
KLD Large Cap Social	0,0013	-0,0001	0,9208	0,8158	0,868	0,534
KLD Select Social	0,0029**	0,0008	0,7796	0,7890	0,760	0,457
Jantzi Social	0,0037	-0,0089	0,5310	1,1264	0,692	0,410
ASPI Indices	0,0026***	0,0008	0,9912	0,8230	0,978	0,628
DJSI EuroStoxx	0,0002	0,0037	1,0984	0,8799	0,976	0,688
DJSI EuroStoxx ex TAGFA	0,0001	0,0037	1,1020	0,8799	0,977	0,688
Ethical Eurozone	0,0048***	0,0052	0,9191	0,7816	0,967	0,401
DJSI Stoxx	0,0001	0,0020	1,0291	0,9742	0,983	0,757
DJSI Stoxx ex TAGFA	0,0000	0,0020	1,0383	0,9742	0,981	0,757
ESI Excellence Europe	-0,0002	0,0046	0,9997	0,9444	0,635	0,609
Ethical Euro	0,003***	0,0037	1,0391	0,9626	0,971	0,762
FTSE4GOOD Europe	-0,0033***	-0,0062**	1,0669	0,9342	0,978	0,723
HVB Nachhaltigkeit	0,0045**	0,0025	0,9506	0,8669	0,892	0,690
Kempen SNS Smaller EU	0,0007	-0,0014	1,0015	0,7547	0,787	0,595
FTSE4GOOD UK	0,0002	-0,0022	0,9352	0,8797	0,954	0,581
Kempen SNS Smaller UK	-0,0005	0,0065*	0,9721	0,2531	0,988	0,518
JSE SRI	-0,0024	-0,0007	1,0092	0,5928	0,698	0,454
Australian SAM	-0,0016	-0,0040	1,0532	1,0271	0,963	0,812
FTSE4GOOD Japan	-0,0009	0,0083***	0,9671	0,6052	0,950	0,611

Notes: This Table reports first part of the results for the Carhart four-factor regressions for the 32 SRI indices and their Sin comparables. Column 2 and 3 contains the estimated values for the Jensen's alpha, H_0: (all $\alpha_i = 0$) a rejection of the null hypothesis is indicated by asterisk. Column 4 and 5 show the results for the β-coefficient and the test H_0: (all $\beta_i = 1$), as the Null hypothesis is rejected for every beta the significance is not indicated. *** 1% significance; ** 5% significance; * 10% significance. In Column 6 and 7 the outcomes of the adjusted R^2 are illustrated. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 12: Results of the Multi-Factor Regression (Part 2)

Name	SMB SRI	SMB SIN	HML SRI	HML SIN	MOM SRI	MOM SIN
DJSI World	-0,0938***	-0,0720	-0,0189	0,2608***	0,0255	0,0308
DJSI World ex TAGFA	-0,1005***	-0,0720	-0,0336	0,2608***	0,0233	0,0308
ESI Pioneer Global	-0,1120**	0,0085	-0,296***	0,1710***	0,0152	0,0320
ESI Excellence Global	-0,1315	0,0390	-0,0536	0,3098*	0,0845	-0,0245
Ethical Global	0,0045	0,0104	-0,0171	0,2379**	0,0038	0,0660
FTSE4GOOD Global	-0,0505**	0,0238	-0,0925***	0,2684***	0,0112	0,0427
NAI	0,5016***	0,0158	0,1662	0,3053	0,0637	-0,0185
Calvert Social	0,0168	-0,1083	-0,2033***	0,3221**	-0,0418***	0,0043
DJSI US	-0,0512	-0,0897	-0,4503***	0,1089	-0,0181	0,0424
DJSI US ex TAGFA	-0,0667	-0,0897	-0,4911***	0,1089	-0,0164	0,0424
Domini 400 Social	-0,0497	-0,0983	-0,1657***	0,2765***	-0,0003	0,0468
FTSE4GOOD USA	0,0456	-0,0129	-0,0239	0,4040***	-0,0130	0,0231
KLD Broad Market	0,0513	-0,1265	-0,0570	0,3260*	-0,1039*	0,0107
KLD Large Cap Social	0,0296	-0,0714	-0,0692	0,3410*	-0,1233**	0,0042
KLD Select Social	0,1099	-0,0644	-0,1804**	0,3545	-0,1289	0,0158
Jantzi Social	-0,0334	0,3439	-0,2168**	0,7393**	-0,1451***	-0,2816
ASPI Indices	0,0100	0,2845***	-0,0027	0,0454	-0,0136	0,0469
DJSI EuroStoxx	-0,0164	0,2814***	0,0111	-0,0065	-0,0014	0,0595
DJSI EuroStoxx ex TAGFA	-0,0097	0,2814***	0,0155	-0,0065	-0,0022	0,0595
Ethical Eurozone	0,1430**	0,2747	-0,0281	0,2615	-0,0003	0,0360
DJSI Stoxx	-0,0974***	0,1466**	-0,0149	0,2169***	0,0033	0,0875**
DJSI Stoxx ex TAGFA	-0,1008***	0,1466**	-0,0204	0,2169***	-0,0029	0,0875**
ESI Excellence Europe	-0,0926	0,0394	0,2474	0,1043	-0,2096*	0,18764*
Ethical Euro	-0,1162***	0,0797	-0,2144***	0,1021	-0,0143	0,1679***
FTSE4GOOD Europe	-0,0907***	0,2137***	-0,0262*	0,2647***	0,0214	0,0779**
HVB Nachhaltigkeit	-0,1389*	0,3160***	-0,0518	0,0386	-0,0559*	0,0358
Kempen SNS Smaller EU	0,1183	0,0313	-0,1388	0,0144	0,0479	0,0971
FTSE4GOOD UK	0,0163	0,2098**	-0,0138	0,3835***	-0,0175	0,0823**
Kempen SNS Smaller UK	-0,0093	0,0865	0,0961	0,0130	0,0978	0,0458
JSE SRI	0,2046	-0,0942	-0,3744*	0,1402*	0,0007	0,1431***
Australian SAM	0,0198	0,8506***	0,0927	0,3415	0,0083	0,3306
FTSE4GOOD Japan	0,1876***	0,1209	0,1328	-0,0601	-0,0558	0,0588

Notes: This Table reports second part of the results for the Carhart four-factor regressions for the 32 SRI indices and their Sin comparables. Column 2 and 3 contains the estimated values for the factor SMB. Column 4 and 5 show the results for the HML factor and in Column 6 and 7 the outcomes of factor MOM are illustrated. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied. SMB denotes the difference in return between a small-cap portfolio and a large-cap portfolio, HML denotes the difference in returns between a value portfolio and a growth portfolio and MOM is the return difference between a prior 12-month winner portfolio and a 12-month looser portfolio. *** 1% significance; ** 5% significance; * 10% significance. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

Table 13: Joint Coefficients-Tests for Different Time Intervals

Different Time Intervals SRI Indices			Single-Factor Model			Multi-Factor Model
Time Interval	Included	Start	H_0: all α_i=0	H_0: all β_i=1	Spanning Test	H_0: all α_i=0
12 Years SRI	3	7/1995	14,38***	7,26***	21,75***	15,35***
10 Years SRI	7	7/1997	42,87***	36,92***	77,48***	47,53***
8 Years SRI	14	7/1999	88,05***	100,23***	189,62***	93,52***
6 Years SRI	19	7/2001	155,1***	243,27***	415,01***	171,84***
4 Years SRI	21	7/2003	157,6***	280,36***	512,14***	170,56***
12 Years SIN	3	7/1995	3,37	59,28***	63,0208***	54,10***
10 Years SIN	7	7/1997	22,13***	335,66***	379,85***	39,88***
8 Years SIN	14	7/1999	44,09***	1332,13***	1539,70***	39,84***
6 Years SIN	19	7/2001	59,25***	1646,76***	2084,50***	27,75***
4 Years SIN	21	7/2003	82,41***	1169,59***	1731,94***	153,46***

Notes: The H_0 for Table 14, 15 and 16 are tested using Chi-squared-Tests. The Degrees of freedom are equal to the number of indices included for the single-regression tests and for the joint hypothesis the degrees of freedom are equal to the number of indices multiplied by two. The figures illustrate the values of the test statistics. The *, **, *** = H_0 rejected at a significance level of 10, 5 or 1 percent, respectively. For the estimations Newey/West-corrected standard errors have been used. Column 1 shows the different groups, first the SRI groups are given followed by the comparable sinful Groups. Column 2 gives the number of indices included in the group. The results of the single-factor estimation are given in Column 4, 5 and 6. Column 4 displays the outcomes of the Chi-square-test for the joint tests of the Jensen's alpha, H_0: (all α_i= 0). The results for the joint- test H_0: (all β_i= 1) are reported in Column 5. Column 6 refers to the joint spanning test, H_0: (all α_i= 0 and all β_i= 1). Column 7 gives the results of the multi-factor estimation for H_0: (all α_i= 0). The 12 year old index group contains the three indices DJSI World ex TAGFA, Domini 400 Social and the ASPI index. The 10 year group includes additionally to the prior indices the global, U.S, European and the UK FTSE4Good indices. The 14 indices building the group of indices who are at least eight years old contain also the ESI Pioneer Global, HVB Nachhaltigkeit, DJSI US ex TAGFA, Kempen SNS Smaller EU, Kempen SNS Smaller UK, and DJSI EuroStoxx ex TAGFA and the DJSI Stoxx ex TAGFA index. Together with the Jantzi Social, Calvert Social Ethical Euro, Ethical Global and KLD Broad Market indices the short group of at least 6 year old indices is formed. The youngest group contains 21 indices that are at least four years old and include also the Ethical Eurozone and ESI Excellence Europe indices.

Table 14: Joint Coefficients-Tests for Index Families

Different Index Families SRI Indices			Single-Factor Model			Multi-Factor Model
Index Group	Included	Start	H_0: all α_i=0	H_0: all β_i=1	Spanning Test	H_0: all α_i=0
Dow Jones SRI	4	3/1999	2,94	44,54	47,92***	1,98
ESI SRI	2	3/2003	0,12	0,01	0,14	0,00
ECPI SRI	3	3/2001	24,70***	10,14	31,78***	34,00***
FTSE4GOOD SRI	5	8/1996	30,79***	30,17	57,86***	36,83***
KLD SRI	4	2/2001	4,73	51,67	57,63***	12,36**
SNS SRI	2	2/1999	0,01	1,71	1,86	0,24
Dow Jones Sin	4	3/1999	2,94	44,54	47,92***	2,90
ESI Sin	2	3/2003	3,56	2,89	4,56	1,68
ECPI Sin	3	3/2001	6,43*	20,08	25,9***	2,09
FTSE4GOOD Sin	5	8/1996	13,09**	92,53	104,42***	16,19**
KLD Sin	4	2/2001	4,62	321,94	363,89***	2,61
SNS Sin	2	2/1999	5,43*	343,97	373,01***	5,26*

Notes: The H_0 for Table 14, 15 and 16 are tested using Chi-squared-Tests. The Degrees of freedom are equal to the number of indices included for the single-regression tests and for the joint hypothesis the degrees of freedom are equal to the number of indices multiplied by two. The figures illustrate the values of the test statistics. The *, **, *** = H_0 rejected at a significance level of 10, 5 or 1 percent, respectively. For the estimations Newey/West-corrected standard errors have been used. Column 1 shows the different groups, first the SRI groups are given followed by the comparable sinful Groups. Column 2 gives the number of indices included in the group. The results of the single-factor estimation are given in Column 4, 5 and 6. Column 4 displays the outcomes of the Chi-square-test for the joint tests of the Jensen's alpha, H_0: (all α_i= 0). The results for the joint- test H_0: (all β_i= 1) are reported in Column 5. Column 6 refers to the joint spanning test, H_0: (all α_i= 0 and all β_i= 1). Column 7 gives the results of the multi-factor estimation for H_0: (all α_i= 0). The DowJones group contains of the four Dow Jones indices DJSI EuroStoxx ex TAGFA, DJSI Stoxx ex TAGFA, DJSI US ex TAGFA and DJSI World ex TAGFA. The ESI group contains the indices ESI Excellence Europe and ESI Excellence Global. The Ethical Euro Ethical Eurozone and Ethical Global form the ECPI group. The KLD Select Social, KLD Broad Market, KLD Large Cap Social and Domini 400 Social represent the KLD index group. The SNS group consists of the two indices Kempen SNS Smaller EU and Kempen SNS Smaller UK.

Table 15: Joint Coefficients-Tests for Index Regions

Different Index Regions SRI Indices			Single-Factor Model			Multi-Factor Model
Index Group	Included	Start	H_0: all $\alpha_i=0$	H_0: all $\beta_i=1$	Spanning Test	H_0: all $\alpha_i=0$
Global SRI	5	2/2001	7,13	31,21***	47,21***	7,64
USA SRI	6	2/2001	9,73	79,47***	90,59***	17,58***
Eurozone SRI	3	12/2000	42,29***	43,23***	80,03***	49,75***
Europe SRI	6	12/2000	59,76***	18,41***	75,87***	59,73***
UK SRI	2	2/1999	0,10	9,40***	9,91**	0,37
Global Sin	5	2/2001	8,39	318,37***	332,41***	5,08
USA Sin	6	2/2001	12,69**	420,80***	465,89***	4,43
Eurozone Sin	3	12/2000	4,44	129,50***	132,27***	2,91
Europe Sin	6	12/2000	63,55***	313,68***	536,86***	58,23***
UK Sin	2	2/1999	8,08**	338,18***	369,84***	4,51

Notes: The H_0 for Table 14, 15 and 16 are tested using Chi-squared-Tests. The Degrees of freedom are equal to the number of indices included for the single-regression tests and for the joint hypothesis the degrees of freedom are equal to the number of indices multiplied by two. The figures illustrate the values of the test statistics. The *, **, *** = H_0 rejected at a significance level of 10, 5 or 1 percent, respectively. For the estimations Newey/West-corrected standard errors have been used. Column 1 shows the different groups, first the SRI groups are given followed by the comparable sinful Groups. Column 2 gives the number of indices included in the group. The results of the single-factor estimation are given in Column 4, 5 and 6. Column 4 displays the outcomes of the Chi-square-test for the joint tests of the Jensen's alpha, H_0: (all $\alpha_i= 0$). The results for the joint- test H_0: (all $\beta_i= 1$) are reported in Column 5. Column 6 refers to the joint spanning test, H_0: (all $\alpha_i= 0$ and all $\beta_i= 1$). Column 7 gives the results of the multi-factor estimation for H_0: (all $\alpha_i= 0$). The DJSI World ex TAGFA, ESI Pioneer Global, Ethical Global, FTSE4GOOD Global and the NAI form the Global group of indices. The Calvert Social, DJSI US ex TAGFA, Domini 400 Social, FTSE4GOOD US, KLD Broad Market and the KLD Select Social are the six indices forming the U.S. group. The Euro zone is represented by the ASPI Index, the DJSI EuroStoxx ex TAGFA and the Ethical Eurozone index. DJSI Stoxx ex TAGFA, ESI Excellence Europe, Ethical Euro, FTSE4GOOD Europe, HVB Nachhaltigkeitsindex and the Kempen SNS Smaller EU are the six indices forming the European group. The FTSE4GOOD UK and Kempen SNS Smaller UK represent the United Kingdom.

Table 16: Virtue vs. Vice Investment Performance

SRI Index	Alpha SRI	Alpha Sin	Treynor SRI	Treynor BM	Treynor Sin	Sharpe SRI	Sharpe BM	Sharpe Sin
DJSI World	0,0007	0,0026	0,0046	0,0040	0,0073	0,1101	0,0982	0,1539
DJSI World ex TAGFA	0,0006	0,0026	0,0046	0,0040	0,0073	0,1092	0,0982	0,1539
ESI Pioneer Global	-0,0002	0,0020	0,0046	0,0048	0,0073	0,1027	0,1192	0,1457
ESI Excellence Global	-0,0001	0,0035	0,0137	0,0138	0,0178	0,4900	0,5603	0,6270
Ethical Global	-0,0008	0,0029	0,0031	0,0038	0,0076	0,0790	0,0997	0,1663
FTSE4GOOD Global	0,0008	0,0011	0,0059	0,0051	0,0066	0,1401	0,1249	0,1383
NAI	0,0076	0,0056	0,0147	0,0099	0,0163	0,5313	0,4387	0,5979
Calvert Social	-0,0004	0,0035	-0,0014	-0,0011	0,0044	-0,0358	-0,0268	0,0753
DJSI US	-0,0015	0,0020	0,0003	0,0019	0,0046	0,0058	0,0455	0,0812
DJSI US ex TAGFA	-0,0014	0,0020	0,0004	0,0019	0,0046	0,0076	0,0455	0,0812
Domini 400 Social	0,0002	0,0018	0,0065	0,0063	0,0087	0,1476	0,1553	0,1623
FTSE4GOOD USA	0,0001	0,0023	0,0048	0,0047	0,0080	0,1073	0,1067	0,1331
KLD Broad Market	0,0006	0,0016	0,0016	0,0010	0,0035	0,0369	0,0257	0,0626
KLD Large Cap Social	0,0007	0,0020	0,0011	0,0005	0,0034	0,0267	0,0118	0,0626
KLD Select Social	0,0008	0,0041	0,0068	0,0058	0,0120	0,2650	0,2641	0,3650
Jantzi Social	-0,0001	0,0000	0,0090	0,0092	0,0092	0,1347	0,1732	0,1051
ASPI Indices	0,0024	0,0019	0,0090	0,0066	0,0088	0,1670	0,1230	0,1273
DJSI EuroStoxx	0,0001	0,0056	0,0029	0,0028	0,0087	0,0521	0,0503	0,1275
DJSI EuroStoxx ex TAGFA	0,0002	0,0056	0,0029	0,0028	0,0087	0,0525	0,0503	0,1275
Ethical Eurozone	0,0048	0,0070	0,0201	0,0150	0,0233	0,4889	0,3718	0,3790
DJSI Stoxx	-0,0005	0,0051	0,0025	0,0031	0,0085	0,0539	0,0662	0,1582
DJSI Stoxx ex TAGFA	-0,0007	0,0051	0,0024	0,0031	0,0085	0,0506	0,0662	0,1582
ESI Excellence Europe	0,0011	0,0052	0,0173	0,0162	0,0218	0,4046	0,4761	0,5020
Ethical Euro	0,0001	0,0060	0,0048	0,0047	0,0116	0,1010	0,1006	0,2120
FTSE4GOOD Europe	-0,0033	-0,0031	0,0079	0,0111	0,0076	0,1680	0,2384	0,1349
HVB Nachhaltigkeit	0,0031	0,0045	0,0088	0,0055	0,0104	0,1447	0,0971	0,1482
Kempen SNS Smaller EU	0,0002	-0,0003	0,0112	0,0110	0,0106	0,1932	0,2169	0,1617
FTSE4GOOD UK	0,0000	0,0015	0,0066	0,0066	0,0086	0,1567	0,1614	0,1490
Kempen SNS Smaller UK	0,0001	0,0061	0,0079	0,0112	0,0255	0,1022	0,2121	0,1759
JSE SRI	-0,0052	0,0016	0,0229	0,0269	0,0275	0,4323	0,4337	0,5893
Australian SAM	-0,0013	-0,0073	0,0170	0,0183	0,0128	0,4550	0,4965	0,3012
FTSE4GOOD Japan	-0,0004	0,0077	0,0089	0,0094	0,0213	0,2600	0,2798	0,5150

Notes: This Table provides an overview of the performance comparison between ethically indices and their counterparts. Column 2 and 3 give the results of the Jensen alpha for the two investment approaches. Column 4, 5 and 6 display the results of the Treynor-measure for the SRI indices, their benchmarks and unethically comparables. Column 7, 8 and 9 report the outcomes of Sharpe-ratio for the SRI indices, their benchmarks and unethically comparables. Note the significance for the coefficients is not marked. All estimations have been done for the total time series available from the start date in July 1995 until July 2007. The estimations are based on the excess returns of the indices, denominated in U.S. dollars. Newey-West (1987)-corrected standard errors have been applied.

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List of Abbreviations

AF	Adjustment Factor
Alpha	Jensen's Alpha
AUS	Australia
ASPI	Advanced Sustainable Performance Indices
Australian SAM	Australian SAM Index
Beta	Beta Coefficient
C	Adjustment Factor
CAN	Canada
Calvert Social	Calvert Social Index
CAP	Capitalisation
CAPM	Capital Asset Pricing Model
CSPR	CRSP Index
DJ	Dow Jones
DJGI	Dow Jones Global Indexes
DJ EuroStoxx	Dow Jones Euro Stoxx 50 Index
DJ Stoxx	Dow Jones Stoxx 600 Index
DJSI	Dow Jones Sustainability Indexes
DJSI EuroStoxx	Dow Jones EURO STOXX 50 Index
DJSI Stoxx	Dow Jones STOXX Sustainability Index
DJSI US	Dow Jones Sustainability United States Index
DJSI World	Dow Jones Sustainability World Index
Domini 400 Social	Domini 400 Social Index
DY	Dividend Yield
ECPI	E. Capital Partners Index Family
ER	Excess Returns
ESI Pioneer Global	ESI Pioneer Global Index
ESI Excellence Global	ESI Excellence Global Index
ESI Excellence Europe	ESI Excellence Europe Index
Ethical Euro	Ethical Index Euro Index
Ethical Eurozone	Ethical Euro Zone Index

Ethical Global	Ethical Index Global Index
Eur	Euro Zone
Euro	Euro Zone
EU	Europe
E-W	Equally-Weighted
FTSE	Financial Times Stock Exchange All-Share Index
FTSE All World	FTSE All World Developed Index
FTSE AW USA	FTSE All World US Index
FTSE Europe	FTSE Developed Europe Index
FTSE Japan	FTSE Japan Index
FTSE4GOOD	FTSE4Good Index Series
FTSE4GOOD Global	FTSE4GOOD Global Index
FTSE4GOOD Europe	FTSE4GOOD Europe Index
FTSE4GOOD Japan	FTSE4GOOD Japan Index
FTSE4GOOD UK	FTSE4GOOD UK Index
FTSE4GOOD USA	FTSE4GOOD US Index
FTSE/JSE	FTSE/JSE Africa Index
GE	General Electric
HML	High Minus Low
HSBC Small EU	HSBC Small Europe Index
HSBC Small UK	HSBC Small UK Index
HVB Nachhaltigkeit	HVB Nachhaltigkeitsindex
ICB	Industry Classification Benchmark
Jantzi Social	Jantzi Social Index
JP	Japan
JSE	JSE Socially Responsible Index
SNS Smaller EU	Kempen SNS Smaller EU Index
SNS Smaller UK	Kempen SNS Smaller UK Index
KLD Broad Market	KLD Broad Market Social Index
KLD Large Cap Social	KLD Large Cap Social Index
KLD Select Social	KLD Select Social Index
MSCI	Morgan Stanley Capital International Index
MOM	Momentum Factor

MV	Market Value
NAI	Natur-Aktien-Index
NOSH	Number of Shares
NOSHFF	Free-Float Number of Shares
OLS	Ordinary Least Squares
P	Closing Price
PI	Price Index
RI	Return Index
RSA	Republic South Africa
Russell 1000	Russell 1000 Index
Russell 3000	Russell 3000 Index
S&P 500	Standard & Poor´s 500 Index
S&P Global	S&P Global 1200 Index
S&P ASX	S&P ASX 200 Index
S&P/TSX	S&P/TSX 60 Index
SIC	Standard Industrial Classification
SIN	Sinful Investment
SMB	Small Minus Big
SRI	Socially Responsible Investment
SR	Sharpe-Ratio
STD	Standard Deviation
SUR	Seemingly Unrelated Regression
T-Bill	Treasury Bill
TAGFA	Tobacco, Alcohol, Gambling, Firearms, Armaments
TM	Treynor Measure
TR	Total Return Index
UK	United Kingdom
US	United States
Value Line	Value Line Arithmetic Index

List of Symbols

α	Jensen's Alpha
β	Beta of the Portfolio
σ	Standard Deviation
ε	i.i.d. Error Term with Zero Mean
μ	Expected Return
n	Number of Stocks
q_{i0}	Number of shares of stock i at the base date
q_{it}	Number of Shares of Stock i at Time t
p_{i0}	Closing Price of Stock i at the Base Date
p_{it}	Price of Stock i at Time t
R^2	Coefficient of Determination
R_{it}	Return on Index i in Month t
r_f	Risk-Free Rate
R_{ft}	Return on a three Month T-Bill in Month t
R_{mt}	Return on the Benchmark Index m in Month t
S_i	Sharpe Performance Index
T_i	Treynor Performance Index
X_{it}^{USD}	Cross Rate of Stock i at time t