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Abstract

We investigate a new dataset of internationally diverse socially responsible investing (SRI) exposures represented by rigorous rules-based and transparent SRI indices. We test the hypothesis whether the SRI screening process adds value to an investor's portfolio and find that return differences between SRI screened and conventional portfolios are not statistically significant. Our results also demonstrate that investors can expect higher risk-adjusted return levels vis-a-vis conventional portfolios. These findings are robust when accounting for common equity risk factors given by the CAPM as well as a 5-factor model. Our results also demonstrate that the benefit of SRI screened portfolios is not linked to a specific market sentiment and hence, investors can expect similar results out of sample.

Keywords: *Socially responsible investing (SRI), ethical investing, sustainable, ESG, passive SRI, CAPM alpha, 5-factor alpha*

JEL Classification: *C12, G11, G12, G14*

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1. Introduction

The importance of sustainable investments is steadily increasing. According to the figures presented in the Global Sustainable Investment Review, a total of USD 21.4trn of investments in broad terms pursues a socially responsible investing (SRI) approach as of the end of 2014[1]. Europe leads the way with a total of USD 13trn, followed by the US with USD 6.5trn. In Switzerland, SRI assets have exhibited an increase of +169% vs. 2014 and currently stand at CHF 190bn according to the figures published by Swiss Sustainable Finance (SSF) and the Forum Nachhaltige Geldanlage (FNG)[2]. The 2014 figures reveal that the most commonly used portfolio formation process is through negative screening, i.e. exclusion of certain business activities. More generally, SRI investments are managed according to one of three principles i) exclusion criteria, ii) best in class, and iii) minimum score (minimum rating) or a combination of those. While ethical investing became well-known in the 1990's, it is not a new phenomenon and in fact has ancient origins which date back as far as biblical times (Bauer, Koedijk and Otten 2005).

The debate surrounding the added value of SRI investment styles is still the subject of debate in academic literature. While the advocates of sustainable investing point out that SRI assets generate outperformance, critics of this approach argue the opposite. An early influential paper is by Moskowitz (1972) and finds that stocks with socially responsible attributes exhibit higher expected returns compared to conventional stocks because market participants are not able to correctly price social responsibility effects. Similarly, Hamilton, Jo and Statman (1993) argue that investors tend to underestimate the likelihood of negative news about companies that are considered to be controversial with regards to SRI standards and hence, these stocks have lower expected returns. In contrast, most empirical studies based on US data suggest that SRI restricted portfolios provide similar performance as non-screened portfolios, see for example Diltz (1995), Guerard (1997) and Sauer (1997) for early references. Similarly, Geczy, Stambaugh and Levin (2005) find that when the CAPM model is applied, actively managed SRI portfolios deliver almost identical results as unconstrained portfolios. The more recent studies, among others Derwall, Koedijk and ter Horst (2011) and Auer and Schuhmacher (2016) find that SRI screened portfolios do not deliver superior risk-adjusted returns compared to conventional or low rated SRI portfolios.

A large number of empirical studies have evaluated the added value of an SRI screening process based on the return differences between SRI and non-SRI mutual funds. For example, Statman (2000) investigates Jensen's alphas and finds support for the hypothesis that risk-adjusted returns of SRI mutual funds are not significantly different from those of conventional mutual funds. Also Goldreyer and Diltz (1999) find no measurable effect on performance by following an ethical investing approach based on ethical mutual funds using an extended sample of equity, bond and

[1] Alliance, G. S. I. Global Sustainable Investment Review 2014, February 2015, www.gsi-alliance.org. The report includes professionally managed assets in all the regions covered by Global Sustainable Investment Association member organizations, incl. public and private investments that consider environmental, social and governance (ESG) factors in portfolio selection and management.

[2] SFF 2015 Annual Report (www.sustainablefinance.ch) and Sustainable Investments in Switzerland (Excerpt from the Sustainable Investment Market Report 2016, http://www.forum-ng.org/de/fng/aktivitaeten/836-ueberdurchschnittliche-zuwaechse-bei-nachhaltigen-geldanlagen-in-deutschland-oesterreich-und-der-schweiz.html)

balanced funds. Luther, Matatko and Corner (1992) compare the returns of UK-based ethical unit trusts to the performance of broad stock universes and find some evidence of outperformance which they explain by a small cap bias present in their sample. Luther and Matatko (1994) and Mallin, Saadouni and Briston (1995) also report a small cap bias of SRI mutual funds. Both studies, after controlling for the size effect, still report an out-performance of SRI mutual fund versus conventional counterparts. However, DiBartolomeo (1996) and Kurtz (1997) find that if KLD 400[3] returns are corrected by the large cap and growth effect, most of the reported out-performance disappears. Also Renneboog , ter Horst and Zhang (2008) find that SRI funds in the US, UK and in many continental European and Asia-Pacific countries underperform their domestic benchmarks by between 2.2% to 6.5%. However, with the exception of some countries such as France, Japan and Sweden, the risk-adjusted returns of SRI funds are not statistically different from the performance of conventional funds.

However, the designs of some of the empirical studies may suffer from several drawbacks. First, Wimmer (2013) shows that valuations based on the environmental, social and governmental aspects (ESG-scores) only persist for approximately two years and that the persistence of the ESG-scores is terminated after approximately three years. This implies that investors who seek high ESG tilted investments cannot rely upon a long-term continuation of high ESG-scores and hence the classification of SRI funds can be misleading. Second, a number of effects make it difficult to measure the impact of the SRI screening process in isolation for mutual funds (see Kempf and Osthoff 2007, Sauer 1997). Third, as seen from the above discussion, the majority of the available literature is focused only on return characteristics of SRI screened portfolios vis-a-vis conventional investments. Very little empirical evidence has been documented showing whether SRI screened portfolios provide a better overall risk-return tradeoff[4]. Only recently, Nofsinger and Varma (2014) introduced downside risk measures, and Roca, Wong and Anand Tularam (2010) as well as Apergis et al. (2015) have completed this view by a joint analysis of SRI portfolios with conventional counterparts. They all report drawdown and diversification benefits for SRI screened portfolios. Based on the lack of existing literature fully focused on testing the benefits of the SRI screening process and in absence of other influential factors such as discretionary portfolio manager decisions, we extend the more recent work of Garz, Volk and Gilles (2002), Le Maux and Le Saout (2004) and Schröder (2007) by analyzing a more comprehensive sample as well as applying different risk-adjusting measures.

The purpose of this paper is to analyze whether there is a measurable risk-adjusted performance effect which is related *solely* to the SRI screening process. In contrast to most literature which has focused on active SRI portfolios, our analysis concentrates on rules-based index portfolios. As they are constructed by rigorous rules-based and transparent standards, they allow for a comparison between screened and non-screened performance without the shortcomings of the previous studies. In particular, our study design addresses the shortcomings of previous studies which are often unrelated to the specifics of an SRI approach. In fact, many of

[3] Domini 400 Social Index was launched in May 1990. Today, MSCI KLD 400 Social Index is part of the MSCI index family, index details available via: https://www.msci.com/.../index.../msci-kld-400-social-index.pdf

[4] Risk measured as market and/or factor risk, total risk, downside risk or even idiosyncratic risk

the SRI findings are driven by active portfolio management processes. To the best of our knowledge, there are only a few empirical studies using a comparable approach. Kurtz and DiBartolomeo (1996), Sauer (1997), DiBartolomeo and Kurtz (1999) as well as Statman (2000) analyzed SRI effects using index based data samples for US equity[5]. They found small but insignificant out-performance for rules-based SRI screened portfolios. Garz, Volk and Gilles (2002) studied SRI screening effects from a dataset covering the Dow Jones Sustainable Index (DJSI) for European stocks. Their results reveal a slight significance in the reported out-performance of the DJSI versus the Stoxx600 index returns. However, in most cases, monthly data are used or the focus is limited to only a few equity exposures. In contrast, the granularity of return data as well as the breadth of our study is considerably broader, and therefore allows us to derive more general findings.

Our findings demonstrate there is no difference in average performance between SRI and conventional portfolios. Furthermore, the evidence shown in this paper rejects the notion that SRI returns are mainly driven by common equity factors. The rest of the paper is organized as follows: Section 2 describes the data and provides insights into the statistical models applied. Section 3 discusses the main results while section 4 draws up the conclusions.

2. Data and Methodology

Our study investigates a new dataset of internationally diverse SRI exposures represented by rigorous rules-based and transparent SRI indices. The study analyses daily log returns of SRI-screened Total Return Net index constituents of six developed and one broad emerging equity market exposures as well as returns from the largest developed corporate bond market[6]. In order to ensure that our results are comparable across asset classes and regions, we have limited the source for all index level data to one single provider which has a consistent and comprehensive data history available. Currently in our view, only MSCI is in the position to deliver on these data requirements, and hence, the study is based on MSCI index data for equity and on MSCI/Barclays for bonds. In total, the dataset covers a market capitalization of USD 9.2trn.[7] as of May 2016. The daily data history spans from 1st October, 2007 for more than half of the analyzed equity exposures. However, for EMU exposure, daily returns are available from 27th May, 2010, and for UK and Emerging Markets, from 1st June, 2011 onwards. The shortest data sample is available for the bond exposure where daily return history starts from 30th May, 2013. All index level data used in this analysis end at 21st March, 2016.

Figure 1 presents descriptive statistics for the data sample divided into SRI and non-SRI portfolios and subdivided by equity and bonds as well as regions. The mean returns for the SRI portfolios have generally been higher than their non-SRI counterparts with the exception of the US. The biggest excess mean is from Emerging Markets SRI with more than 3.2% and for UK SRI with more than 2.3% annualized. Considering the volatilities, it becomes apparent that SRI portfolios have

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[5] Their study compared the results of the KLD 400 index returns with relevant conventional US stock market index returns

[6] The index return history includes the following SRI exposures: EMU, USA, UK, Japan, Emerging Markets, World, Pacific and US Corporate Bonds

[7] The market capitalization splits into 8.1trn. for developed market equities, 0.8trn. for emerging market equities and 0.3trn. for US liquid corporates

generally lower risk associated with them, the exception being the UK, Japan and Pacific (made up of c. 67% Japan). In case of Japan the excess standard deviation is around 1.2% higher for the SRI portfolio on an annualized basis. On a risk adjusted basis, it's only the USA which delivers an inferior risk-reward profile. Emerging Markets reports the best trade-off between mean and risk for the entire data sample.

Our analysis looks at the data from three different angles. In the first approach, we compare risk-adjusted performance. In the second, we run simple as well as extended regression models, in particular we add common equity factors, to understand if SRI performance is driven by systematic risk drivers. Thirdly, we look at valuations to test to what extent there is a inter-dependency between SRI-screened and conventional portfolios driven by market sentiment.

[FIGURE 1 ABOUT HERE]

2.1. Performance Hypothesis Testing using Different Risk-adjusted Measures

Firstly, we measure the added value of all SRI screened portfolios by calculating well known risk-adjusted performance measures: Treynor Ratio (TR), Information Ratio (IR) and Sharpe Ratio (SR). As these measures are widespread in academic literature as well as amongst practitioners, we refrain from providing further details about the formal calculation of these ratios with the exception of the SR. In order to rank the outcome in a consistent manner and to account for potential skew in the data, we apply the modified Sharpe Ratio (MSR) proposed by Zimmermann (2013)[8].

2.2. Performance Hypothesis Testing using Regression Models

A second hypothesis test uses different regression models. We therefore estimate the SRI alpha by regressing the excess return of the SRI-screened portfolio against conventional portfolio returns. To account for differentials in market risks of the different portfolios, we first estimate the SRI alpha using the CAPM framework. Specifically, we apply an ordinary least-squares (OLS) regression to estimate the model which is represented by:

$$r^{SRI}{}_t - r^{rf}{}_t = \alpha + \beta\left(r^{nSRI}{}_t - r^{rf}{}_t\right) + \varepsilon_t \quad (1)$$

where

r^{SRI}_t is the log return on the SRI portfolio on day t, *rf* is the risk free rate (one-month LIBOR rate in local currency) on day t, r^{nSRI}_t is the log return on the non-screened (conventional) portfolio on day t, and ε_t is the error term. We run the regression model for each and every SRI portfolio separately to understand whether there are regional or asset class differences.

In testing for other return drivers than market risk, we extend our single factor model by adding four common equity factors which are well supported by academic research. Our five factor model is of the form:

$$r^{SRI}{}_t - r^{rf}{}_t = \alpha + \beta_0\left(r^{nSRI}{}_t - r^{rf}{}_t\right) + \beta_1 HML^{nSRI}{}_t + \beta_2 LVOL^{nSRI}{}_t + \beta_3 QMJ^{nSRI}{}_t + \beta_4 TSY^{nSRI}{}_t + \varepsilon_t \quad (2)$$

[8] To receive more reliable rankings which are comparable to very broad benchmark portfolios, Zimmermann (2013) proposes to introduce the correlation to the benchmark to the standard SR calculation.

where

r^{SRI}_t is the log return on the SRI portfolio on day t, *rf* is the risk free rate (one-month LIBOR rate in local currency) on day t, r^{nSRI}_t is the log return on the non-screened (conventional) portfolio on day *t*, $\beta_1 HML^{nSRI}_t$ represents the factor capturing the value effect on day *t*, $\beta_2 LVOL^{nSRI}_t$ represents the factor capturing the low volatility effect on day *t*, $\beta_3 QMJ^{nSRI}_t$ represents the factor capturing the quality effect on day *t*, $\beta_4 TSY^{nSRI}_t$ represents the factor capturing the dividend yield effect on day *t*, and ε_t is the error term. Also note that this model is applied to each and every SRI portfolio separately.

2.3. Performance Hypothesis Testing using Relative Valuations

A third hypothesis test looks at the change in valuation of the SRI screened portfolio vs. non-screened portfolios over time. By comparing different valuation ratios to the change in performance of SRI screened portfolios, we aim to detect if potentially upwards (downwards) driven valuations of SRI stocks provide a meaningful explanation for the superior (inferior) performance of SRI screened portfolios. Utilizing the framework of Arnott et al. (2016), we use monthly cross-sectional Price-to-Book (P/B), Price-to-Cash Earnings (P/CE), Price-to-Earnings (P/E), Price-to-Forward Earnings (P/E Fwd) and Yield (Yld) valuation data and calculate relative (SRI over non-SRI) values on a time-series basis. By regressing the valuation against the performance series, we derive the level of the linear relationship between valuation and performance of SRI screened portfolios.

3. Empirical Results

Built on a extended pool of recent literature, our study uses some well-known risk-adjusting measures as well as a single and extended multifactor regression model to examine whether the SRI screening portfolio formation process delivers a measurable performance impact. The aim of this study is to confirm or reject the claim that SRI screened portfolios yield inferior performance as they hold a subset of the unconstrained market portfolio and hence, due to this limitation, forgoes relevant return opportunities (see e.g. Cortez, Silva and Areal 2009, Schröder 2007). Additionally, we test if a second claim holds true, which had been put forward by Bello (2005), Hong and Kacperczyk (2009), and Statman and Glushkov (2009) that the limitation of the SRI screening process results in higher risk levels due to constrained diversification characteristics.

3.1. Preliminary Findings Using Simple risk-adjusted Return Measures

Firstly, fully rules-based SRI screened portfolios for both equity as well as bond exposures exhibit better risk-adjusted performance figures compared to their conventional counterparts. We first report the three static measures of TR, IR and MSR which all show superior *return-per-unit-of-risk* values. This first finding, in general, contrasts with a wide range of literature where SRI screening results in lower returns while risk levels remain comparable to conventional investments (see for example Mill 2006, Jones et al. 2008). However, the results suggest, that the screening process represents a decision driven selection process which in many cases is able to deliver matching or even superior performance. Our results seem to support the hypothesis put forward by Renneboog , ter Horst and Zhang (2006 and

2008), that SRI portfolios benefit from lower cost arising from the avoidance or minimization of reputational damage, better management and customer satisfaction that leads to higher sales and revenues and finally transmits into less risky investments with higher risk-adjusted returns.

[FIGURE 2 ABOUT HERE]

Figure 2 reveals (with US equity as the only exception) that all SRI screened portfolios show superior risk-adjusted returns which indicates that rules-based implementations of SRI screening may offer a solution to refute the broadly cited cost-related criticisms of SRI portfolios. When focusing on the MSR differentials (screened minus non-screened) we find no evidence of a market cycle or volatility regime dependency as shown in Figure 3. This is important to note, especially as in two cases, our data sample represents a shorter data history (e.g. UK IMI and Emerging Markets since 01.06.2011). The independence from market or volatility regimes, in our view, supports the robustness of the results and indicates that the risk of having selected a favorable time window seems to be limited. In the case of EMU, UK and Japan, the differentials generally tend to fluctuate around a slightly positive average over a cycle of about three years whereas for the USA, Emerging Markets, World and Pacific, the observed frequency is higher.

[FIGURE 3 ABOUT HERE]

Considering the potentially biased estimates for simple ratios such as the IR, TR and MSR on account of their well-documented limitations (Henriksson and Merton 1981, Bernardo and Ledoit 2000 amongst others) we extend our hypothesis testing using a single and multi-factor model approach to arrive at more accurately estimated risk-adjusted excess returns for SRI portfolios.

3.2. CAPM Alpha Estimates for SRI Screened Portfolios

Figure 4 reports the parameter estimates for the single market risk model (CAPM) defined by Equation (1). Correspondent with the simple return-per-unit-of-risk measures, SRI screened portfolios, with the exception of US equity, all have positive alpha estimates while more than half exhibit less market risk compared to conventional portfolios. The alphas range from -0.01% to +2.91% for US and Emerging Markets respectively. However, the alphas reported in Figure 4 are statistically insignificant using HAC adjusted standard errors whereas all betas are highly significant. In other words, we find that SRI screened portfolios yield significantly neither better nor worse than conventional portfolios but in many cases bear slightly lower risk with betas significantly lower than one. Our results are consistent with those by Sauer (1997), Di Bartolomeo and Kurtz (1999), Statman (2000), Garz et al. 2002, Statman (2006), Barnett and Salomon (2006, 2012) and Schröder (2007) and Collision et al. (2008) as well as Lee et al. (2010) which also indicate that investing in SRI equity indices do not entail additional costs which affect returns negatively. For European SRI portfolios in particular, our results are in line with the findings of Garz et al. (2002) who also find positive but only slightly significant SRI alphas for European exposures.

[FIGURE 4 ABOUT HERE]

3.3. Alpha Estimates for SRI Screened Portfolios Using an Extended 5 Factor Model

Figure 5 shows the statistics from the extended regression analysis using four additional return drivers in order to refine our model. By introducing some of the most commonly used and well researched equity factors, we aim to analyze if there is any systematic equity factor which would drive the SRI returns. The sensitivity of SRI returns to the four equity factors are implemented using Equation (2). As the availability of fully rules- based daily factor returns with a regional break-down is limited to equities, and within equities to Eurozone and US, we are constrained in applying the extended regression model to all our SRI portfolios. We therefore repeat the regression analysis for only two SRI portfolios, Eurozone and US equities. However, as these two investment regions are seen as the most important exposures, at least for European based investors, we believe our results remain robust and allow for meaningful conclusions.

Firstly, we find that the signs of the reported alphas remain unchanged. For the European portfolio, we report a positive but insignificant alpha of 1.45% and for the US portfolio an insignificant negative alpha of -0.35% annualized. Both betas are significantly smaller than one, indicating that the risk exposure to the market is reduced. In particular for the US exposure, this risk is considerably lower with a beta of 0.89. Only two factor loads from the extended model are significant in case of the US portfolio. In contrast, adding equity factors in the European case leads to only insignificant factor loadings. In both cases, the reported R^2 figures indicate that the fitting of the model remains very good, and the reported alphas are reliable estimates for the true risk-adjusted excess returns.

[FIGURE 5 ABOUT HERE]

Whilst active SRI managers may display bias towards certain sectors, it could be of interest to add sector returns to the regression model to see if any of the sectors are a systematic drivers of the SRI returns (for this argument see for example Derwall et al. 2005). Since the SRI indices are formed to be sector neutral (i.e. keep sector allocation as in the conventional portfolio), it is of no need to run such analysis for our dataset.

Figure 6 summarizes the findings from our regression model analysis. By comparing the results from both regression models, we confirm that SRI portfolios yield non-different mean returns compared to conventional portfolios. This holds true for the single (beta being the only risk factor) as well for the extended five factor model. In both cases both alphas are not significantly different from zero, confirming that the SRI screening process does not deliver significantly different mean returns vis-à-vis conventional portfolios when adjusted by market and equity factor exposure. Furthermore, our results support the argument that the SRI screening process reduces the overall portfolio risk with market risk loadings of below one (in the case of the US, beta being 0.89). This may be the result of the fact that SRI portfolios restrict the holdings of companies which are involved in controversial activities and hence such stocks are understood to be affected the most when controversial discussions drive market risk and performance. In this respect our findings are in line with

Nofsinger and Varma (2014) who report smaller overall risk exposures for SRI screened strategies.

Contrary to our results, Balcilar, Demirer and Gupta (2016) find that SRI portfolios exhibit slightly higher return volatilities vs. non-screened portfolios and argue the SRI screened process does not necessarily shield the portfolio from common market risk shocks (for this argument see also Roca, Wong and Anand Tularam 2010). However, overall they confirm that SRI investments can provide significant diversification gains, in particular for European and global exposures.

[FIGURE 6 ABOUT HERE]

3.4. The Relative Valuation Argument

Following the critics that the observed out-performance of SRI screened portfolios may be a direct result of the buying (or selling) pressure from the market due to media and press attention, we also test the data sample by looking at relative valuation patterns over the entire sample period. To test whether SRI returns move concurrently relative to valuations due to over-attention from the buy-side (sell-side), Arnott et al. (2016) suggest to put relative valuations in relation to relative performance. They propose to compare rolling windows of multiple periods of the cross-sectional valuation ratios. Extending their framework to a number of commonly used valuations we find no clear trend in the time-series. Figure 7 reports the different valuation tests based on monthly data.

[FIGURE 7 ABOUT HERE]

Furthermore, we test the causal relationship between the price innovation and the cross-sectional change in valuations. With the only exception of the UK, we find only weak co-movement levels with R^2 figures ranging from 0.00 to 0.46. In case of the UK portfolio Figure 8 reports an R^2 clearly above 0.5. However, we don't believe that the UK result indicates a undermining of the general finding as the UK is the only portfolio which includes small cap stocks. As we look at a ratio which includes price information divided over book value, we understand that in the case of small caps such *ratio of ratios* (relative valuations) are very sensitive to price changes and hence co-move in greater amplitude to overall market sentiment and hence portfolio performance.

[FIGURE 8 ABOUT HERE]

In order to limit a selection bias when looking only at a specific valuation ratio, we extend the framework of Arnott et al. (2016) and repeat the valuation analysis for all commonly used ratios. Indeed, we find the selection of one single valuation seems to be arbitrary when deriving a general conclusion regarding the potential co-movement of SRI performance with respective valuations.

[FIGURE 9 ABOUT HERE]

As Figure 9 reveals, in the previously mentioned UK case, three out of five tested valuation ratios report R^2 figures below 0.5, P/CE and P/E in particular indicate that there is only a very week relationship. In our view this illustrates that the choice of the valuation ratios can have a significant influence over the reported results. In particular, we don’t find evidence that the performance of SRI portfolios can be explained by the innovation of valuation ratios and as a result of such a dependency, investors would be exposed to the risk of below average returns as valuations revert to their long-run mean.

4. Conclusions and Key Findings

Our study focuses on a new data sample of daily SRI screened equity and bond portfolios across regions. It aims to address some of the controversial discussions around the benefits of investing in SRI based portfolios by using a new sample of daily return data from October 2007 through March 2016. Our sample period includes a number of severe market corrections such as the Financial Crisis, European Sovereign Crisis, implications of large-scale interventions from various Central Banks around the world and therefore seems to be a relevant sample to test our hypothesis. To test the hypothesis as to whether the SRI screening process in isolation adds value to an investor's portfolio, we limit our analysis to fully rules-based, highly transparent SRI screened portfolios which can be easily added to an existing investment universe through index tracking solutions.

Our main finding is that there are insignificant return differences between SRI screened and conventional (non-screened) portfolios. We do not find evidence which would support the findings from a number of the previous literature that restricted SRI portfolios leave investors with lower expected levels of returns and higher levels of risk compared to unrestricted portfolios (for the cost argument see i.a. Le Maux and Le Saout 2004). In contrast, our results support the hypothesis that investors can expect higher risk-adjusted return levels vis-a-vis conventional portfolios which confirms similar findings of a number of earlier studies (Statman 2000, Garz et al. 2002, Statman 2006, Schröder 2007) where SRI alphas also were found to be insignificantly different from zero.

By looking at our results from the different regression models, we confirm that SRI screened portfolios have delivered positive but insignificant alphas vis-à-vis conventional exposures. This holds true for the single as well as for the extended five factor model which corrects the alpha estimates for common equity factors. Our results hold true also when price indices are considered, i.e. no dividends are re-invested. This indicates that even if non-SRI compliant companies compensate their value proposition for current and/or potential shareholders by increasing the level of dividend distributions, SRI screened portfolios still deliver the same level of return with lower level of risk, and hence, the benefit of SRI screening remains intact.

Our data sample also provides evidence that the return and risk results are robust when challenged with the relative valuation argument. We find no evidence that innovation in valuation ratios are closely linked with the performance of SRI portfolios. This consideration is very relevant because it also confirms that SRI screened portfolios have produced higher risk-adjusted returns regardless of the cross-sectional change in valuations and hence, the present market sentiment. Based on our relative valuation tests, the results support the hypothesis, that investors can expect similar risk and return characteristics for SRI screened portfolios out of sample.

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Figure 1: **Descriptive Statistics for SRI and Non-SRI exposures**

This table presents the summary statistics of the data, which include annualized means and standard deviations, the daily maximum and minimum returns, as well as reward-to-risk ratios (i.e. quotient of the mean return to standard deviation). The data history starts from October 1, 2007 and ends on March 21, 2016 with the exception of EMU (from May 27, 2010) as well UK IMI and Emerging Markets (both from June 1, 2011). All SRI portfolio are constructed according to fully rules based index calculation process. All equity SRI portfolios are based on the SRI framework of MSCI, while the bond portfolio is based on the Sustainable framework from MSCI/Barclays.

	SRI					Non-SRI				
Equity	Mean Return p.a.	Std. Dev. p.a.	Maximum Return (d)	Minimum Return (d)	Reward-to-risk	Mean Return p.a.	Std. Dev. p.a.	Maximum Return (d)	Minimum Return (d)	Reward-to-risk
EMU[1]	8.91%	19.13%	4.76%	-5.44%	0.466	7.21%	19.94%	5.16%	-5.48%	0.362
USA	4.67%	21.02%	9.80%	-9.30%	0.222	4.87%	21.70%	11.04%	-9.51%	0.225
UK[1]	7.18%	16.12%	4.13%	-4.93%	0.445	4.83%	15.60%	3.82%	-4.69%	0.309
Japan	-0.20%	25.90%	13.55%	-10.68%	-0.008	-1.02%	24.72%	13.06%	-10.44%	-0.041
Emerging Markets[1]	-1.29%	15.73%	5.22%	-6.35%	-0.082	-4.52%	16.30%	4.82%	-6.52%	-0.277
World	2.59%	18.00%	8.16%	-6.93%	0.144	2.11%	18.63%	9.10%	-7.32%	0.113
Pacific	0.60%	22.07%	9.99%	-9.35%	0.027	-0.22%	21.20%	9.83%	-9.18%	-0.010
Fixed Income	Mean Return p.a.	Std. Dev. p.a.	Maximum Return (d)	Minimum Return (d)	Reward-to-risk	Mean Return p.a.	Std. Dev. p.a.	Maximum Return (d)	Minimum Return (d)	Reward-to-risk
US Corporates[2]	3.00%	4.58%	0.83%	-1.10%	0.655	2.87%	4.66%	0.86%	-1.11%	0.614

1 Index rules include a 5% issuer cap

2 Sustainable thresholds used for bonds slightly differ from the ones used for Equities. For further details on index methodology differences between bonds and equities see MSCI website: www.msci.com.

Source: MSCI, UBS Asset Management, data per March 21, 2016

Figure 2: **Risk Adjusted Performance for SRI Exposures**

This table reports standard risk-adjusted ratios, Treynor Ratio (TR), Information Ratio (IR) and a modification of the Sharpe Ratio (MSR) for all analyzed SRI portfolios and in case of the MSR also for conventional portfolios. Pleases refer to Figure 1 with regards to the data range description.

The TR is calculated as the quotient of SRI excess return (SRI minus non-SRI mean) over beta. The IR is calculated as the quotient of SRI excess return (SRI minus non-SRI mean) over tracking risk (tracking error). For the MSR we introduce the correlation between SRI and non-SRI constituents in order to overcome the shortfall of the traditional SR calculation. By utilizing the framework proposed by Zimmermann (2013) for a modified Sharpe Ratio calculation we receive more reliable ranking results. Formally, we calculate the MSR as the quotient of excess return (mean minus risk free rate) over the product of volatility and correlation vs. market.

	SRI			Non-SRI
Equity	Treynor Ratio	Inform. Ratio	Mod. Sharpe Ratio	Mod. Sharpe Ratio
EMU[1]	0.018	0.601	0.470	0.362
USA	-0.002	-0.058	0.225	0.224
UK[1]	0.023	0.836	0.452	0.309
Japan	0.008	0.274	-0.008	-0.041
Emerging Markets[1]	0.035	0.755	-0.085	-0.277
World	0.005	0.212	0.145	0.113
Pacific	0.008	0.247	0.027	-0.011
Fixed Income	Treynor Ratio	Inform. Ratio	Mod. Sharpe Ratio	Mod. Sharpe Ratio
US Corporates[2]	0.001	0.000	0.654	0.612

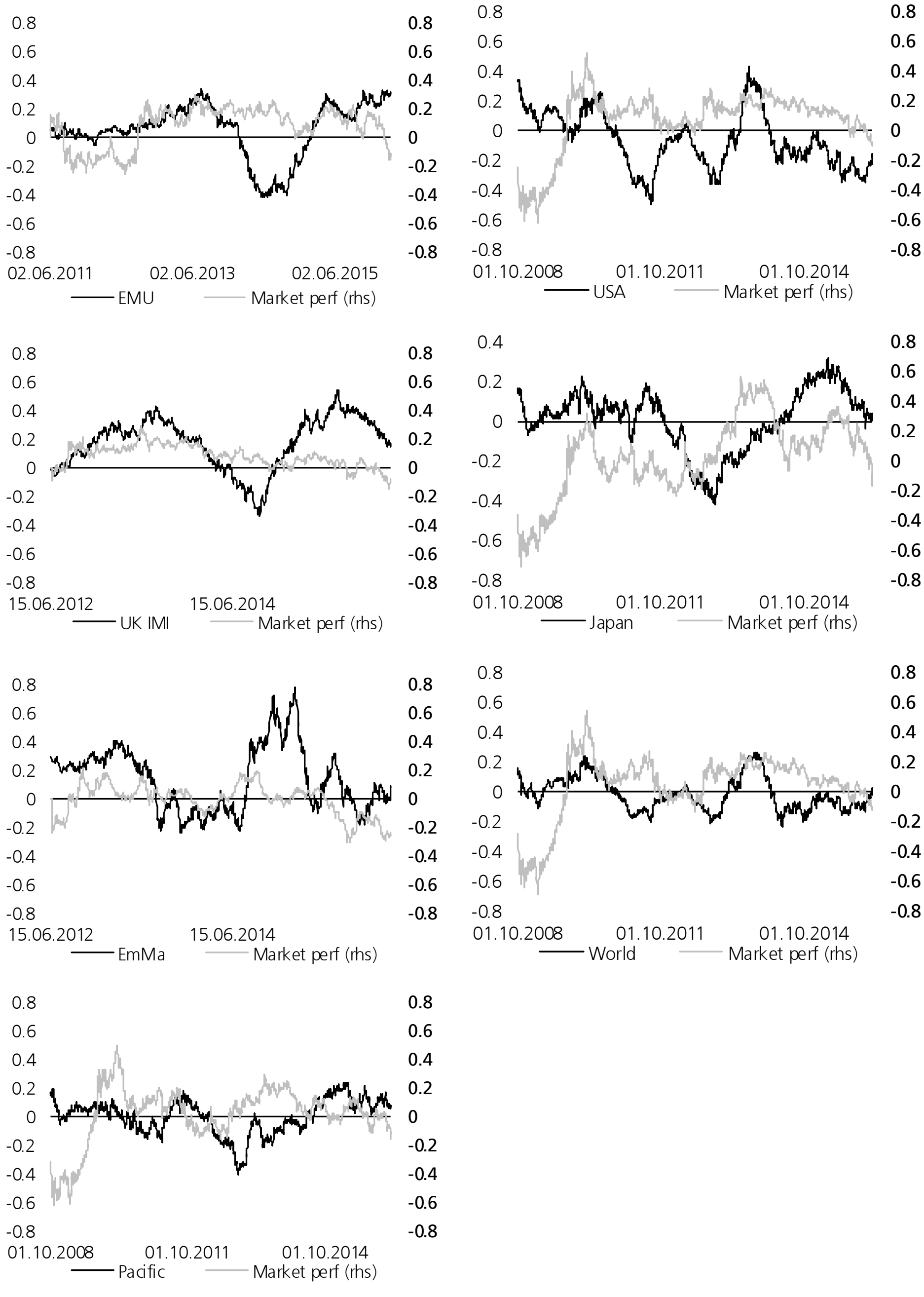
1 Index rules include a 5% issuer cap

2 Sustainable thresholds used for bonds slightly differ from the ones used for Equities. For further details on index methodology differences between bonds and equities see MSCI website: www.msci.com.

Source: MSCI, UBS Asset Management, data per March 21, 2016

Figure 3: **Modiefied Sharpe Ratio Differential vs. Market Performance**

The graphs show the time series of equity MSR differentials and the respective market performance. All MSR differentials are calculated as the simple difference between SRI and conventional portfolio. The MSR and market performance are calculated on a yearly rolling window as annualized values. We refer to Figure 1 with regards to the data range description.



Source: MSCI, UBS Asset Management, data per March 21, 2016

Figure 4: **Empirical Results From the 1-factor (CAPM) Model**

The table reports regression results for the 1-factor regressions. We use an ordinary least-squares (OLS) regression to estimate the model of the form described in Equation (1). Alpha and beta estimates are based on daily log returns and reported as daily (α daily) as well as annualized values (α annualized). Significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively using HAC adjusted standard errors. The number of observations (n), t-statistics, p-values and the adjusted R^2 value are also reported. We refer to Figure 1 with regards to the data range description

Exposure	Observ.	1-factor-alpha			$r_{nSRI,t}-r_{f,t}$		Coeff. of det.
	n	α (d)	α (p.a.)	t Stat *p-value*	Mkt	t Stat *p-value*	Adj. R^2
EMU[1]	1518	0.0001	2.04%	1.6225	0.95012 (***)	-10.81	0.981045
				0.1049		*0.0000*	
USA	2211	0.0000	-0.01%	-0.5027	0.95697 (***)	-6.5521	0.975621
				0.6152		*0.0000*	
UK[1]	1254	0.0001	2.28%	1.4518	1.01751 (***)	2.7982	0.969853
				0.1468		*0.0052*	
Japan	2211	0.0000	0.86%	0.5255	1.03756 (***)	8.3154	0.980847
				0.5993		*0.0000*	
Emerging Markets[1]	1254	0.0001	2.91%	1.4513	0.93105 (***)	-7.5783	0.930999
				0.1469		*0.0000*	
World	2211	0.0000	0.55%	0.0085	0.95896 (***)	-8.2462	0.985477
				0.9932		*0.0000*	
Pacific	2211	0.0000	0.84%	0.2350	1.02954 (***)	5.9864	0.978267
				0.8143		*0.0000*	
US Corporates[2]	703	0.0000	0.19%	-0.1006	0.98089 (***)	-7.8843	0.995936
				0.9199		*0.0000*	

1 Index rules include a 5% issuer cap
2 Sustainable thresholds used for bonds slightly differ from the ones used for Equities. For further details on index methodology differences between bonds and equities see MSCI website: www.msci.com.

Source: MSCI, UBS Asset Management, data per March 21, 2016

Figure 5: **Empirical Results From the 5-factor Model**

The table reports regression results for the 5-factor model. We use an ordinary least-squares (OLS) regression to estimate the model of the form described in equation (2). Alpha and beta estimates are based on daily log returns and reported as daily (α daily) as well as annualized values (α annualized). Factor loadings for the four common equity factors are reported as beat coefficients where HML represents the value effect, LVOL represents the low volatility effect, QMJ represents the quality effect and TSY represents the dividend yield effect. Significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively using HAC adjusted standard errors. The number of observations (n), t-statistics, p-values and the adjusted R^2 value are also reported. We refer to Figure 1 with regards to the data range description.

Exposure	Observ.	5-factor alpha			$r_{nSRI,t}-r_{f,t}$	Beta coefficent 1-4				Coeff. of det.
	n	α (d)	α (p.a.)	t Stat *p-value*	Mkt *p-value*	HML *p-value*	LVOL *p-value*	QMJ *p-value*	TSY *p-value*	Adj. R^2
EMU[1]	1393	0.0001	1.45%	1.2962	0.95488 (***)	-0.0267	0.0165	-0.0067	0.0232	0.981019
				0.1951	*0.0000*	*0.2695*	*0.4685*	*0.7983*	*0.2101*	
USA	2062	0.0000	-0.35%	-0.3001	0.88714 (***)	-0.0855 (**)	0.0193	-0.0462	0.2067 (***)	0.976306
				0.7641	*0.0000*	*0.0103*	*0.4255*	*0.2061*	*0.0000*	

1 Index rules include a 5% issuer cap

2 Sustainable thresholds used for bonds slightly differ from the ones used for Equities. For further details on index methodology differences between bonds and equities see MSCI website: www.msci.com.

Source: MSCI, UBS Asset Management, data per March 21, 2016

Figure 6: **Single and Five 5 Factor Model Result Comparison**

The table summarizes the results of the 1 (CAPM) and 5-factor regression models. We use an ordinary least-squares (OLS) regression to estimate the model of the form described in equation (1) and (2). Alpha and beta estimates are based on daily log returns and reported as daily (α daily) as well as annualized values (α annualized). Significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively using HAC adjusted standard errors. The number of observations (n), t-statistics, p-values and the adjusted R^2 value are also reported. We refer to Figure 1 with regards to the data range description.

Exposure	Observ.	n-factor Alpha			$r_{nSRI,t}-r_{f,t}$		Coeff. of det.
	n	α (d)	α (p.a.)	t Stat *p-value*	Mkt	t Stat *p-value*	Adj. R^2
1-factor model							
EMU[1]	1518	0.0001	2.04%	1.6225	0.95012 (***)	-10.810	0.981045
				0.1049		*0.0000*	
USA	2211	0.0000	-0.01%	-0.5027	0.95697 (***)	-6.552	0.975621
				0.6152		*0.0000*	
5-factor model							
EMU[1]	1393	0.0001	1.45%	1.2962	0.95488 (***)	0.955	0.981019
				0.1951		*0.0000*	
USA	2062	0.0000	-0.35%	-0.3001	0.88714 (***)	-4.520	0.976306
				0.7641		*0.0000*	

1 Index rules include a 5% issuer cap

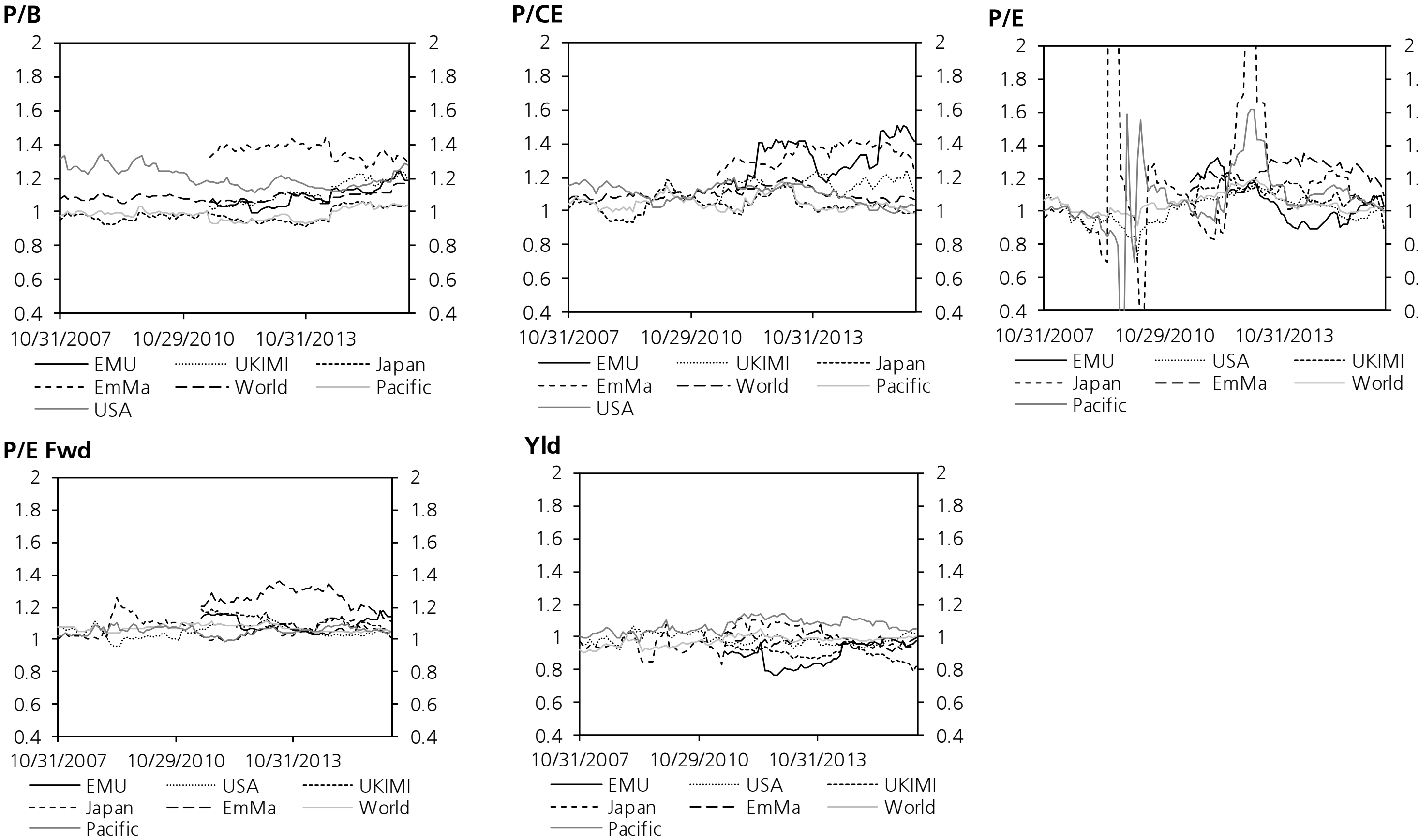
2 Sustainable thresholds used for bonds slightly differ from the ones used for Equities. For further details on index methodology differences between bonds and equities see MSCI website: www.msci.com.

Source: MSCI, UBS Asset Management, data per March 21, 2016

Figure 7: **Relative Valuation**

The graphs show time-series of cross-sectional averages of equity valuation ratios for all equity portfolios. The monthly data history starts from October 31, 2007 and ends on April 30, 2016 with the exception of EMU, UK IMI and Emerging Markets. For those exposures data history starts at June 30, 2011. All equity portfolios follow a fully rules based index calculation process based on the SRI framework of MSCI.

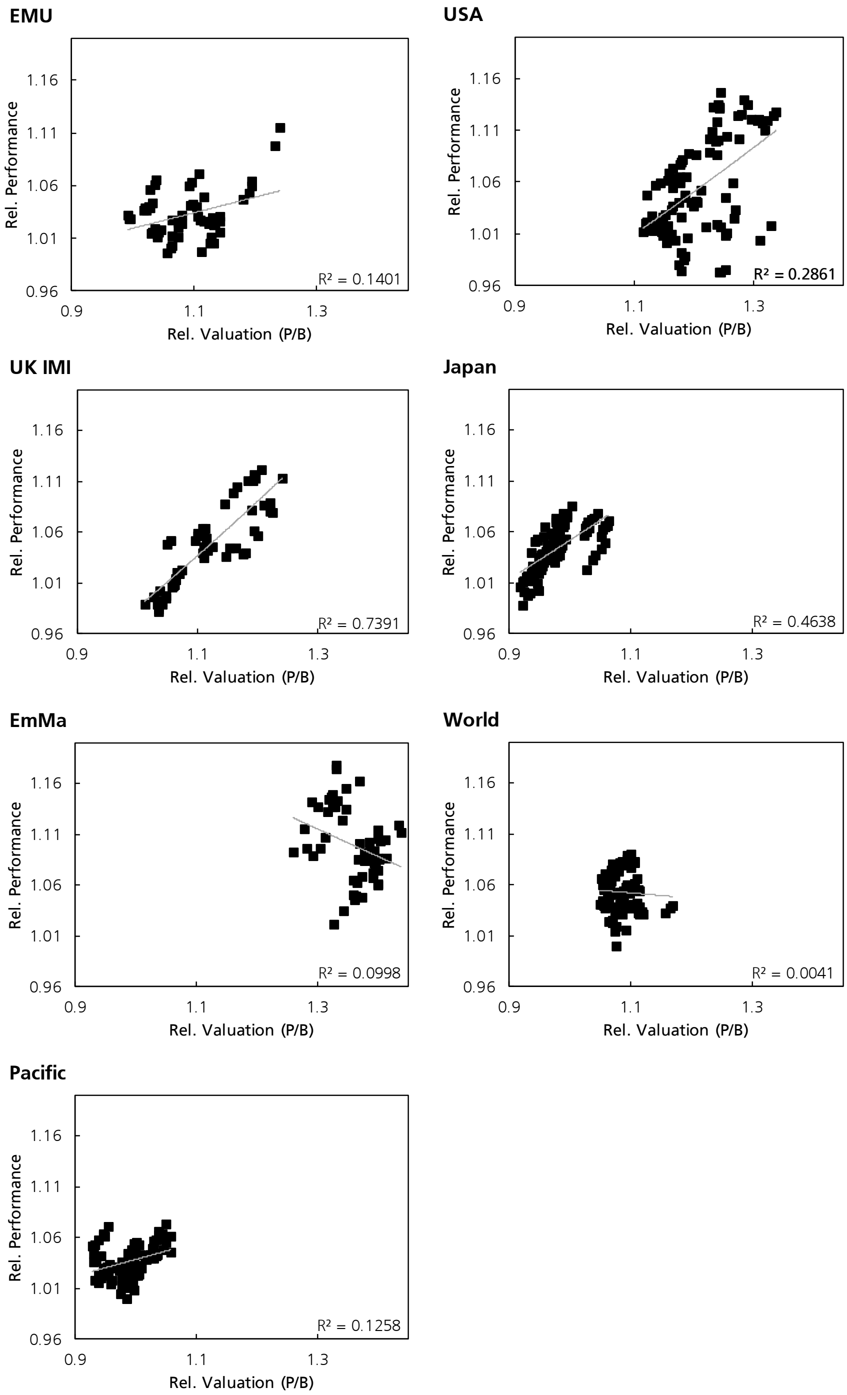
We use monthly cross-sectional Price-to-Book (P/B), Price-to-Cash Earnings (P/CE), Price-to-Earnings (P/E), Price-to- Earning Forwards (P/E Fwd) and Yield (Yld) valuation data and calculate relative (SRI over non-SRI) values on a time-series basis.



Source: MSCI, UBS Asset Management, data per April 30, 2016

Figure 8: **Performance vs. Price-to-Book Valuation**

The graphs report results from the linear regression tests for all equity SRI portfolios. Utilizing the framework of Arnott et al. (2016), we regress the cross-sectional valuation time-series of P/B against the change in performance of SRI portfolios to test the level of linear relationship between valuation and performance of SRI screened portfolios expressed by the coefficient of determination (R^2). The monthly data history starts from October 31, 2007 and ends on April 30, 2016 with the exception of EMU, UK IMI and Emerging Markets (from June 30, 2011). All portfolios follow a fully rules based index calculation process based on the SRI framework of MSCI.



Source: MSCI, UBS Asset Management, data per April 30, 2016

Figure 9: **R^2 from the Trend Regression Using Different Valuations**

This table summarizes the coefficient of determination (R^2) of the extended valuation regression tests for all tested valuations. We use monthly cross-sectional Price-to-Book (P/B), Price-to-Cash Earnings (P/CE), Price-to-Earnings (P/E), Price-to-Forward Earnings (P/E Fwd) and Yield (Yld) data and calculate relative (SRI over non-SRI) values on a time-series basis. The monthly data history starts from October 31, 2007 and ends on April 30, 2016 with the exception of EMU, UK IMI and Emerging Markets (from June 30, 2011). All portfolios follow a fully rules based index calculation process based on the SRI framework of MSCI.

	Trend Regression R^2				
Rel. Valuation	P/B	P/CE	P/E	P/E Fwd	Yld
EMU[1]	0.1401	0.5327	0.0043	0.0704	0.0440
USA	0.2861	0.0328	0.2787	0.0630	0.1855
UK[1]	0.7391	0.1288	0.1482	0.5685	0.4911
Japan	0.4638	0.0383	0.0096	0.0128	0.0935
Emerging Markets[1]	0.0998	0.3737	0.1021	0.0222	0.4717
World	0.0041	0.0396	0.0162	0.1404	0.0005
Pacific	0.1258	0.0060	0.0151	0.0047	0.0116

1 Index rules include a 5% issuer cap

Source: MSCI, UBS Asset Management, data per April 30, 2016

UBS