Chapter 12
Is Socially Responsible Investing More Risky? Australian Evidence

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Abstract Prior studies, which analyse the performance of socially responsible investments (SRIs) compared to conventional funds, have thus far ignored the assessment of risk. In response to this identified lack of research, we make a major attempt to fill the void by investigating whether daily returns of Australian equity socially responsible investment funds have different tail risk exposure in the return distribution compared to matched conventional equity funds. The Australian funds management industry provides a natural setting within which to study the risk exposure of SRI funds. The Australian funds management industry has one of the largest and fastest growing funds management sectors in the world. This growth is underpinned by Australia's government-mandated retirement scheme. In addition, Australia is the first country to introduce regulations that require issuers of financial products and financial advisors to disclose and advise on ethical, social, and governance (ESG) considerations. Using a sample of 26 funds spanning the period 1998–2013, we establish several new findings. First, in assessing tail risk exposure we observe no evidence of significant difference in riskiness amongst socially responsible investment compared to that of conventional funds with similar investment styles. Second, when comparing two downside risk measures across socially responsible and matched conventional funds, namely Value-at-Risk and expected shortfall, we find that return distributions amongst Australian funds do not exhibit particularly heavy tails. Taken together, we show that investors do not pay a penalty (in terms of higher risk) to invest ethically.

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12.1 Introduction

The central purpose of this study is to empirically test whether a penalty exists for pursuing an ethical approach to investing in Australia. In particular, we address two research questions. First, we investigate whether daily returns of Australian equity socially responsible investment funds have different tail risk exposure in the return distribution compared to that of matched conventional equity funds. We ask this question as Copp et al. (2010) identify that assessment of risk in SRIs is an area which is yet to be subjected to empirical investigation. Second, we compare two downside risk measures across socially responsible and matched conventional funds: Value-at-Risk and expected shortfall.

The literature on ethical investing is well established, as is the idea of costs/benefits incurred by investors in SRI funds, in search for an answer to the question of whether it is possible "to do well while doing good" as postulated by Hamilton et al. (1993). Traditionally, financial researchers assume that investors sole objective is to maximise returns for a given level of risk. This search for the holy grail of a mean-variance efficient portfolio necessitates holding a fully diversified portfolio of assets. This requirement of holding a well-diversified portfolio contravenes investing in SRI funds as they often impose negative screens restricting the opportunity set available for investing, resulting in the potential exclusion of entire industries (Humphrey and Lee 2011). Therefore, investing in SRI funds and having a fully diversified portfolio is simply not achievable (Hong and Kacperczyk 2009) implying further the likelihood of investors facing a penalty for following their social conscience. However, Humphrey and Lee (2011) state that the number of positive and negative screens has very little impact on returns but finds evidence to suggest the positive screening reduces risk. The literature fails to find conclusive support for the above argument with many empirical investigations reporting results that demonstrate that it is not necessary to sacrifice returns in order to pursue ethical considerations. We aim by way of an empirical investigation into SRI funds in Australia to fill this gap.

Research in this area traditionally focusses on whether SRI criteria for funds have any effect on performance compared to their conventional counterparts where performance may be measured by balance sheet or share price performance of the stocks in their investment portfolios. This type of analysis usually focuses on returns or excess returns as in, for example, Bauer et al. (2006) or Becchetti and Ciciretti (2009). We contribute to the literature by explicitly comparing the risk characteristics of SRI and conventional funds by studying tail risk exposures. This is a worthwhile question as conventional wisdom suggests that reduced diversification opportunities of SRI funds may lead to greater volatility in their portfolios. However, the less volatile nature of ethical investments could lead to steadier, more sustainable returns. If there is a difference in terms of risk, it is of interest to investors who wish to invest ethically without incurring a financial penalty.

Specifically, we look at two risk measures; Value-at-Risk (hereafter VaR) and expected shortfall (hereafter ES).[1] VaR is a threshold for the worst possible loss over a target horizon with a given level of confidence. It was famously created as a response to the financial crises at the end of the twentieth century, and the need for an easily calculated, all-encompassing risk measure that could some summarise all the risk of a trading book in a single number. VaR is widely used throughout the financial industry and is the recommended risk measure in the Basel II and Basel III accords. ES was created as a response to several criticisms of VaR both mathematically and conceptually. Whereas VaR only provides an upper limit for the worst possible loss, ES tells us the expected loss once VaR is exceeded. Unlike VaR, ES is a subadditive risk measure, i.e., ES of a portfolio is less than the sum of ES from its constituent assets. Subadditivity is important as it encourages diversification. Like VaR, ES can summarise the risk of a large portfolio of several different assets in a single number. However, ES is still not as widely used as VaR and much less is known about its performance and modelling.

Recent media exposure (Collett 2013; Liew 2012)[2] has attracted greater flow of funds into this type of investment as investors are attracted by the opportunity of benefiting from financial gains associated with investing in a portfolio that is more consistent with their social conscience (Lee et al. 2010). An argument has also been made that, given the ethical considerations which drive socially responsible investments (SRIs), investors might be willing to accept lower financial returns (Statman 2011); that is, incur a penalty for pursuing ethical investments.

The Australian funds management industry provides an interesting setting within which to study the risk exposure of SRI funds. Much of the research, which has tended to concentrate on performance-related issues and the impact of screening, has been conducted on the US market. The Australian funds management industry has one of the largest and fastest growing funds management sectors in the world. This growth is underpinned by Australia's government-mandated retirement scheme. Further strengthening this sector is the sophistication of Australia's investor base (Nordkvelde et al. 2013) which has resulted in the need for greater regulation and

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[1]We use three different estimates of VaR and ES. The three estimates are based on (a) the historical distribution of returns, (b) the assumption that returns follow a Gaussian distribution, and (c) extreme value theory (hereafter EVT). EVT has gained popularity in the risk management literature over the last twenty years. EVT provides a formal framework with which to study the tail behaviour of distributions. A rich and detailed summary of EVT and applications to risk management can be found in McNeil et al. (2005). It is generally accepted that EVT methods fit higher quantiles better than competing approaches, especially where heavy-tailed data are involved. The historical approach, however, makes less assumptions about the distribution of returns and the Gaussian approach is easy to implement. The appropriate model thus needs to be chosen by backtesting methods such as those developed by Christoffersen (1998) and Berkowitz and O'Brien (2002).

[2]The Perpetual Wholesale Ethical SRI Fund is the top-performing fund in 2012 (39.70% return). According to Mercer's latest investment return figures, the average equities fund manager achieved 20.30%.

forced disclosure by fund managers within the SRI space. Additionally, Australia has a resilient economy, a world-class regulatory environment, and a multilingual skilled workforce who demand choice with respect to their investment opportunities.

Australia's funds management industry is the largest in the Asia-Pacific region. Its size and sophistication reflects the nation's strengths in having the regions: largest pension fund industry; the largest share market (ex-Japan) measured by free-float market capitalisation; the fastest growing foreign exchange market; and third largest high-net-worth market after Japan and China.[3] Despite this, growth fund managers within the Australian market still have fewer investment opportunities, than US counterparts, that satisfy ESG criteria as stipulated by the Social Investment Forum (SIF).[4] Therefore, as previously identified by Humphrey and Lee (2011), it is possible that Australian SRI funds performance and hence risk exposure through lack of diversification opportunities may actually be worse than that of SRI funds in the US or other developed markets.

We find evidence that investors do not pay a penalty (in terms of higher risk) to invest ethically and hence fund managers of ethical funds are performing as well as fund managers of more conventional funds. Socially responsible investment (SRI) typically refers to a style of investment that aspires to consider both financial return and social good. SRI strategies are usually monitored according to (a) environment, (b) social justice, and (c) corporate governance criteria, or ESG for short. The most common SRI approaches include the positive or negative screening of investments based on their ESG performance, and the integration of ESG factors in financial analysis where these factors represent a core driver of both value and risk in companies and assets.[5] Our results will be of interest to SRI investors in other countries other than the USA where limited investment opportunities that meet ESG criteria are available and hence impact directly on the risk associated with such investment practices.

The rest of the paper is organised as follows. Section 12.2 presents a literature review. Section 12.3 describes the methods of risk measurement, detailing VaR, ES, modelling assumptions, and our backtesting approach. Section 12.4 describes the data and methodology. Section 12.5 presents the empirical findings. Section 12.6 concludes.

12.2 Literature Review

The Social Investment Forum, a national not-for-profit organisation charged with promoting the concept, practice, and growth of socially responsible investing (SRI), describes socially responsible investing as "an investment process that considers the

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[3]Lynch (2009).

[4]The SIF is a US membership association dedicated to advancing the concept, practice, and growth of SRI.

[5]In Australasia, the majority of SRI funds employ the ESG factor approach as noted by the O'Connor (2013).

social and environmental consequences of investments, biota positive and negative, within the context of rigorous financial analysis".

The early work within the SRI space trace back to the seminal work by Hamilton et al. (1993) who present three alternative hypotheses with respect to the relative returns of SRI shares compared with that of conventional companies. First, the authors postulate expected returns of socially responsible stocks are equal to the expected returns of conventional stocks. In such a world, supply and demand of such securities is matched resulting in no movement of the share price. This is termed the "no effect" hypothesis. The second hypothesis is the "doing good but not doing well" hypothesis. Here, the returns for SRI shares are lower than the expected returns of conventional shares. It is deduced there is a penalty for investing ethically.

The last hypothesis is the "doing well while doing good" hypothesis which assumes expected returns for SRI shares are higher than those of conventional shares. Proponents of such a way of thinking promote the benefit of social screening and argue that this enhances financial performance by eliminating companies of questionable business practices.

In more recent times, the literature has started to investigate these issues associated with SRI as it relates within the funds management industry. Much of this research has emerged post-2000[6] and has tended to concentrate on performance and in particular the effect of negative screening on performance (see, Lee et al. 2010; Humphrey and Lee 2011). Negative screening involves rejecting investment opportunities due to the nonsatisfaction of ESG criteria (e.g. shares are often excluded that invest in gambling, tobacco, and pornography industries amongst others), and the effect that this has on investment returns.

Theories advocating ESG propose that corporate social responsibility (CSR) increases NPVs and also acts as a signalling mechanism used by companies for indicating prosperity which in turn results in superior subsequent performance (Heal 2005; Fisman et al. 2006). These theories, however, are at odds with traditional economic thinking which states the imposition of noneconomic values by trustees of managed funds is inappropriate and that "the social responsibility of business is to increase profit" (Friedman 1970). Two main hypotheses are established within the SRI literature that associates SRI to share price (see, Derwall et al. 2011). First, the "shunned-stock hypothesis" which infers SRI leads to excess demand for CSR leader shares, and shortage of demand for CSR laggard shares, resulting in excess returns for the latter. Secondly, the "errors-in-expectations hypothesis" which implies that positive screens in favour of highly ranked CSR shares result in outperformance due to CSR signals not being priced correctly. Derwall et al. (2011) reconcile the two phenomena to coexist and show that outperformance of highly ranked CSR shares are eventually arbitraged away after longer time horizons where information contained in CSR is eventually impounded into share price.

[6]Table 12.7 summarises some of the key SRI studies dating back to 2000.

It has also argued that a reflexive effect could occur with investors diverting funds away from polluting companies which in turn cause companies to alter behaviour (Heinkel et al. 2001). From a financial perspective, yet an alternative theory predicts a cost in performance arises due to reduced diversification opportunities that are a direct cost of screening practices in place (Herzel and Nicolosi 2013).

Humphrey and Lee (2011) argue that due to the constraints in place for eliminating "sinful" industries from inclusion within their portfolios, it is logical to postulate that SRI funds are likely to underperform compared with both the broader market and unconstrained fund managers. Indeed, Ooi and Lajbcygier (2013) provide evidence that sinful industries outperform SRI both on average and with economic significance about 4% per annum.

Like the theoretical literature, much of the empirical literature is similarly split in its opinion of how much SRI penalises investors by way of lower returns or benefits an investment portfolio as a resulting of adhering to ESG criteria. In our review of this literature, we focus on studies which concentrate on the impact of SRI performance rather than on the strand of research that is concerned with investor behaviour.[7] Guerard (1997) finds no statistical difference exists in share returns when comparing ethically screened and unscreened universes. Similarly, Kurtz (1997) reports mixed evidence as to whether social factors such as environmental policies, employee relations, and research and development (R&D) spending is associated with abnormal returns. In contrast, Statman (2006, 2007) find evidence of higher SRI returns but also higher tracking errors of SRI portfolios compared to conventional benchmarks. Becchetti et al. (2008) look at performance of shares in the Domini Social Index and find that companies going into this index report higher return on equity and higher sales and productivity.

In two separate studies, Bauer et al. (2005, 2006) apply four-factor models to compare performance of ethical mutual funds against conventional counterparts. In both cases, the studies document that, after controlling for common factors (such as market, size, book-to-market, and momentum), there is no penalty in being an ethical investor. Interestingly, they observe a learning period where the performance of ethical fund managers gradually improves to catch up with the performance of conventional funds. Becchetti and Ciciretti (2009) investigate SRI performance comparing socially responsible portfolios versus a control sample and find no evidence of difference in excess returns. Renneboog et al. (2008) find evidence of underperformance of SRI funds and mixed evidence of a "smart money" effect in the case of SRI investors who are able to identify poorly performing funds but not outperforming funds. The link between SRI and book-to-market ratios is investigated by Galema et al. (2008) who find a negative effect exists which also affects alpha negatively. Hong and Kacperczyk (2009) look at sin shares from alcohol, tobacco, and gaming industries. They find less analyst coverage and institutional ownership which results in a significant price effect of 15–20%.

[7]For a discussion that relates to SRI and fund investor behaviour refer to the following articles: Bollen (2007), Benson and Humphrey (2008), and Renneboog et al. (2011).

They argue these shares tend to be cheaper as a result of higher litigation risk and being subject to more scrutinised accounting and regulation.

We now shift our attention to empirical evidence which investigates SRI within the Australian market. In an early study, Bauer et al. (2006) investigates the risk-adjusted performance of 25 Australian retail ethical funds and finds SRI underwent a significant catching up phase throughout the period 1992–1996, after which delivering returns similar to those of conventional funds in the later period 1996–2003. In a separate study which investigates the return performance of 89 SRI funds, Jones et al. (2008) document that ethical funds significantly underperform the market. In more recent times, Copp et al. (2010) find that systematic risk of SRI both in Australia and internationally increases more than that of conventional funds during economic downturns. Humphrey and Lee (2011) extend the work of Jones et al. (2008) in a study which investigates 24 Australian equity SRI funds. They find no significant difference between SRI and conventional counterparts with respect to return and postulate no penalty exists in terms of risk-adjusted returns for pursing a socially conscious investment strategy.

When examining the impact of SRI on market risk, one must consider that less-diversified SRI funds subjected to a restricted investment universe will be subject to more idiosyncratic risk. However, many SRI investors with would certainly be of the view that their investments are long term, sustainable, and above all else benefiting the world in which we live. Such an investment would be less volatile, less subject to corporate scandal, and offered more protection by the government. It is observed that ethical funds are less exposed to market variability than conventional funds (Bauer et al. 2005, 2006) and are more value-orientated than growth-orientated funds. Also, SRI portfolios exhibit lower conditional volatility and more robustness to shocks (Becchetti et al. 2008) after fitting GARCH(1,1) and APARCH(1,1) models. Prior research shows that negative screening significantly increases market risk and reduces funds abilities to form diversified portfolios (Humphrey and Lee 2011). Bollen (2007) compares volatility of monthly flows into SRI and conventional funds and finds SRI flows to be less volatile. He finds that US SRI fund flows are less sensitive to past negative returns than are conventional funds, but the flows of SRI funds are more sensitive to past positive returns. A similar study is carried out by Benson and Humphrey (2008) on monthly fund flows and the flow–performance relationship. They find more persistence in the case of SRI flows to that of conventional fund flows with SRI investors less sensitive to lagged returns and more likely to reinvest in similar shares. Renneboog et al. (2011) find that younger and smaller SRI funds have less volatile returns tending to attract more fund flows than other SRI funds but can find no evidence of superior performance.

It is important to consider how to measure risk. The volatility of returns is a standard tool used by investors to evaluate investments, for example, in technical analysis or Sharpe ratios. Despite this, however, volatility is not completely adequate because it does not contain information about tail behaviour, i.e. the extreme returns that can greatly affect an investments value. VaR and ES have provided potential solutions and EVT was developed with this practical application in mind. It is generally accepted that a risk measure should have the property of subadditivity

(McNeil et al. 2005). Subadditivity requires that the act of merging portfolios has no escalation in risk, i.e., it promotes diversification. ES demonstrates this property, as does VaR in most cases.

12.3 Methods for Estimating Value-at-Risk and Expected Shortfall

VaR and ES are risk measures used to determine expected losses with a given probability. Specifically, given a set of returns on an investment, the $(1-p)\%$ VaR, i.e. the VaR at the $(1-p)\%$ confidence level, is the p-quantile of the return distribution. VaR thus measures the maximum an investment can lose over a certain time horizon with probability p. One criticism of VaR is that it does not provide information on the shapes of the tails above or below the $(1-p)\%$ confidence level. Thus, we assign to each VaR an associated $(1-p)\%$ ES which measures the expected loss of the investment on the condition that the loss is greater than VaR. This study adopts the approach detailed in McNeil et al. (2005) and Jorion (1997) to measure and ES.[8] For our particular work, we study the 1-day VaR and ES for three confidence levels, 95, 99, and 99.5%. We are mainly interested in returns *less* than a certain amount, i.e. losses. Losses are generally described as the "left" tail of the distribution. If we define X_t as the time series of negative log returns, we can define the $(1-p)\%$ VaR at time t, denoted by $\mathrm{VaR}_{t,p}$, as

$$\mathrm{P}\left(X_{t+1} \leq -\mathrm{VaR}_{t,p}\right) = p, \tag{1}$$

with the associated $(1-p)\%$ ES given by

$$ES_{t,p} = \mathrm{E}\left[X_{t+1} \middle| X_{t+1} > \mathrm{VaR}_{t,p}\right] \tag{2}$$

where $\mathrm{E}[X|Y]$ represents the expectation of X conditional on Y.

We present three approaches for calculating the VaR in expression (1) and ES in expression (2).

The GARCH models are historically used to account for heteroscedasticity through a time-varying volatility. In this connection, we use the EGARCH which is more flexible than a standard GARCH as it can capture the asymmetric reactions of volatility to positive and negative shocks, i.e. the leverage effect. In addition to this, the volatility process should always be positive. The EGARCH model is characterised by the following return series dynamics:

[8] Fong Chan and Gray (2006) and (Gençay and Selçuk 2004) also perform similar risk analysis in the context of electricity and emerging markets.

$$X_t = \mu + \sigma_t Z_t \tag{3}$$

where the innovations $\{Z_t\}_{t \geq 0}$ are stationary i.i.d. and

$$\log \sigma_t^2 = w + \alpha \left| \frac{X_{t-1} - \mu}{\sigma_{\mathrm{t-1}}} \right| + \beta \log \sigma_{t-1}^2 + \gamma \frac{X_{t-1} - \mu}{\sigma_{\mathrm{t-1}}} \tag{4}$$

The model is stationary for $\beta < 1$; ω, α, and γ are parameters to be calibrated. We estimate the EGARCH model parameters using the semi-parametric approach of a quasi-maximum-likelihood estimation.

As in McNeil and Frey (2000), we then standardise the residuals and calculate one-day VaR and ES as

$$\mathrm{VaR}_{t,p} = \mu_{t+1} + \sigma_{t+1} \mathrm{VaR}_p(Z) \tag{5}$$

and

$$\mathrm{ES}_{t,p} = \mu_{t+1} \sigma_{t+1} \mathrm{ES}_p(Z). \tag{6}$$

As $\{\sigma_t\}t \geq 0$ is decided by the EGARCH calibration, the difference in modelling choices thus lies within the calculation of $\mathrm{VaR}_p(Z)$ and $\mathrm{ES}_p(Z)$. Different values will be obtained depending on the distributional assumptions our three modelling approaches make on (Z_t).

12.3.1 The Historical Approach

This approach estimates quantiles from the historical distribution of returns (Linsmeier and Pearson 2000). The underlying assumption of the historical approach is that the past distribution is a suitable proxy for the future.

For a sample of 1-day returns of length T, the $(1 - p)$% VaR is simply the estimated $(1 - p)$% quantile. ES can also be estimated empirically. We can write the ES of the marginal distribution of the residuals as

$$\mathrm{ES}_p(Z) = \mathrm{VaR}_p(Z) + e\left(\mathrm{VaR}_p(Z)\right) \tag{7}$$

where $e(u)$ is the average loss in excess of a threshold, u, conditional on the threshold having been exceeded.

12.3.2 The Gaussian Approach

A common approach is to assume that the marginal distribution of the residuals is a standard Gaussian (Jorion 1997). The $(1 - p)$% VaR is then simply given by the expression

$$\mathrm{VaR}_p(Z) = N^{-1}(p), \tag{8}$$

where N (−) is the cumulative distribution function of the standard Gaussian distribution. In addition, ES is known in closed form for Gaussian models. In particular, it is well known that

$$\mathrm{ES}_P(Z) = \frac{N'(\mathrm{VaR}_p(Z))}{p} \tag{9}$$

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12.3.3 The EVT Approach

Many financial time series exhibit heavy-tailed distributions. For this reason, it is desirable to have as much flexibility in modelling tail behaviour as possible. EVT was developed with this application in mind (McNeil and Frey 2000). Indeed, tail behaviour may be modelled directly using EVT without making assumptions on the return distribution as a whole. We adopt, in particular, the peaks over thresholds (POT) method where we identify extreme observations that exceed a high threshold u and model these "exceedances" separately from nonextreme observations.

For a sample of exceedances of size N_u the *exceedance magnitude* is the size of an exceedance over the threshold and is given by $Y_i = Z_i - u$ for $i = 1,..., N_u$. We then let F (−) be the marginal distribution function of Z_t for each $t \geq 0$. The probability distribution of $\{Y_t\}t \geq 0$ for a given threshold u defined by

$$\begin{aligned} Fu(y) &= \mathrm{P}(Zt - u \leq y | Zt > u) \\ &= \frac{F(y+u) - F(u)}{1 - F(u)} \end{aligned} \tag{10}$$

may then be written as

$$F(z) = [1 - F(z)]F_u(y) + F(u). \tag{11}$$

EVT provides the theory to describe the limiting distribution of (11) as $u \to z_+$, where z_+ denotes the upper (possibly infinite) limit of the distribution of Z_t. Indeed, Balkema and Haan (1974) and Pickands (1975) show that, for u sufficiently high, $F_u(-)$ is approximated by the generalised Pareto distribution (GPD). The cumulative distribution function of the GPD is given by

$$G_{\xi,\beta}(z) = \begin{cases} 1 - \left(1 + \dfrac{\xi z}{\beta}\right)^{-1/\xi} & \text{if } \xi \neq 0 \\ 1 - \exp(-z/\beta) & \text{if } \xi = 0, \end{cases} \tag{12}$$

where $\xi \in \mathrm{R}$ and $\beta > 0$ are called the shape and scale parameters, respectively. The parameters of the GPD can be found by a maximum-likelihood estimation (see, e.g. Embrechts et al. 1999). A value of $\xi > 0$ corresponds to heavy-tailed distributions.

For a data set of size T with N_u exceedances, we observe that $F\ (u)$ may be approximated empirically as

$$F(u) = 1 - \frac{N_u}{T}. \tag{13}$$

For sufficiently high u, Eq. (11) thus simplifies to

$$F(z) = 1 - \frac{N_u}{T}\left(1 + \frac{\xi(z-u)}{\beta}\right)^{-1/\xi} \tag{14}$$

Expression (14) is a *tail estimator*. It can be used to estimate VaR by observing that, by definition, we have

$$F\left(\mathrm{VaR}_{t,p}\right) = p. \tag{15}$$

By inverting this expression, we obtain

$$\mathrm{VaR}_p(Z) = u + \frac{\beta}{\xi}\left(\left(\frac{pT}{N_u}\right)^{-\xi} - 1\right) \tag{16}$$

Additionally, the ES can also be calculated in closed form through expression (7) to obtain

$$\mathrm{ES}_p(Z) = \frac{\mathrm{VaR}_p(Z) + \beta - \xi u}{1 - \xi}. \tag{17}$$

One downside of the POT analysis lies in the ad hoc determination of the threshold u. A certain balance needs to be struck between choosing a value of u high enough such that EVT is applicable and low enough such the number of exceedances is statistically significant. One method for choosing u is by analysis of the mean-excess function (MEF) plot (cf. Embrechts et al. 1999). The MEF for a GPD should be linear, and it may be possible to choose u such that the MEF is linear for all points above u. However, this method is time-consuming and often researchers will choose u such that the number of exceedances N_u is equal to some small, fixed percentage (e.g. 5%) of the size of the data sample.

12.3.4 Backtesting

Following, for example, Christoffersen (1998) and Berkowitz and O'Brien (2002), the relative performance of each VaR approach is determined by a *violation ratio*. The idea is that we compare the VaR estimated at time t with the actual return observed at time $t + 1$. A violation occurs if a realised loss is greater than the estimated VaR on a given day. The violation ratio is then defined as the total number of violations divided by the total number of estimated VaRs.

The motivation behind this is as follows. Given a VaR number at a certain confidence level $(1 - p)\%$, we can expect that approximately $p\%$ of the time it will be exceeded by the next days return. This follows from the definition of VaR as a p-quantile. The more accurate the model, the closer the violation ratio is to p. A violation ratio higher (lower) than the expected one indicates that the model consistently under (over-)-estimates the risk.

12.4 Data Description

12.4.1 Sample Selection

For the purpose of the empirical study within this chapter, we use daily time series return data sourced from Morningstar Direct for Australian open-ended equity SRI and matched conventional funds for the period January 1998–November 2013. The matching process is discussed in detail in Sect. 4.2. Our final data set consists of daily returns for 13 SRI and 13 matched conventional funds. In order to concentrate our analysis on the difference between SRI and conventional investing, we ensure that all funds satisfy the following two criteria; first, all funds must have at least 75% of their equity holdings in Australian markets; and secondly, we require at least 4 years of daily return data. We impose the minimum restriction of 75% because we wish to ensure that any difference in performance between SRI and conventional funds is driven by the SRI attribute and not by altering asset allocation. The requirement to have minimum of 4-year daily data is driven by the requirement to have sufficient data observations to enable us to be able to carry out EVT.

In addition to the daily returns of both the conventional and SRI funds sourced through Morningstar, we also access other variables such as base currency; share class; inception date; investment area; domicile; and assets undermanagement (AUM). For the sample period 1998–2013, there exist 92 equity funds that have a socially conscious classification and 2896 conventional funds. However, the same funds can be duplicated with different share classes of the same fund. To avoid duplication, we conduct analysis on a distinct portfolio basis by keeping only the parent share class. We concentrate solely on Australian equity funds and, to keep focus on issues relating to SRI, we eliminate funds that have less than 75% of their holdings in domestic equity. We remove funds with missing AUM, and we study funds with at least four years of daily data to allow sufficient analysis of tail behaviour. This leaves us with 13 parent class, domestic Australian equity-focused funds.

12.4.2 Matching Methodology

For each SRI fund, we select the conventional fund with the lowest distance score as its matched fund to compare VaR and ES risk measures. In order to identify conventional funds with the best possible fit to the 13 SRI funds included within our final sample, we conduct the following matching algorithm. Our prematched final data set consisting of 92 SRI and 2896 conventional funds reduces to 13 SRI and 269 conventional funds. We run a matching algorithm to pair each of the 13 SRI funds with a conventional fund based on fund style, age, and size. The matching algorithm is based on the Carhart (1997) 4-factor model. The factors used are provided by the authors of Gray et al. (2014) who calculate market minus risk-free asset (RMRFT), small minus big (SMB), high minus low (HML), and momentum (MOM) factor returns using data for ASX-listed stocks over the 1990–2012 period.

The Australian factors are constructed in the spirit of Fama and French (1993) with modifications to reflect distribution of market cap amongst Australian stocks. Following the work of Brailsford et al. (2012), the Gray et al. (2014) 4-factor construction uses a modification regarding cut-offs. Brailsford et al. (2012) noted that the distribution of size and book-to-market ratios in Australia was heavily skewed and therefore justified the modification to the standard Fama and French methodology of using median market cap to partition into small and big stocks was not adequate. Gray et al. (2014) identify a portfolio of approximately 300 "large" stocks by taking the stocks that contribute the top 90% of total market capitalisation and a portfolio of about 1700 "small" stocks that contribute the remaining 10%.

In line with Fama and French (1993), small minus big (SMB) and high minus low (HML) factors are constructed by averaging across portfolios. For example, SMB is the difference in return between the small and large portfolios. A momentum (MOM) factor is also constructed using six portfolios double-sorted on size and prior 12-month returns. This procedure provides a time series of monthly returns to SMB, HML, and MOM factor-mimicking portfolios. Each of the SMB, HML, and MOM portfolios is constructed for the Australian market.

We run the Carhart 4-factor regressions using the fund monthly returns using the following equation:

$$\begin{aligned} r_t - r_{f,t} = \alpha + \beta_{\mathrm{MKT}}\left(r_{\mathrm{MKT},t} - r_{f,t}\right) + \beta_{\mathrm{SMB}} r_{\mathrm{SMB},t} \\ + \beta_{\mathrm{HML}} r_{\mathrm{HML},t} + \beta_{\mathrm{MOM}} r_{\mathrm{MOM},t} + E_t \end{aligned} \tag{18}$$

where r_t represents the monthly returns of the fund; $r_{\mathrm{MKT},t}$, the monthly returns of the market; $r_{\mathrm{SMB},t}$, the monthly returns of the SMB portfolio; $r_{\mathrm{HML},t}$, the monthly returns of the HML portfolio; $r_{\mathrm{MOM},t}$, the monthly returns of the MOM portfolio; and $r_{f,t}$, represents the risk-free rate. In addition, α is the risk-adjusted performance estimate for the fund; β_{MKT}, β_{SMB}, β_{HML}, and β_{MOM} are the regression betas of the fund with respect to the market MKT, SMB, HML, MOM portfolios, respectively; and E_t are a series of i.i.d. innovations.

Our matching procedure is then similar to that of Bollen (2007) and Renneboog et al. (2011) who calculate a matching "score" for candidate funds that are no more than 2 years older or younger than the SRI fund and match whether they charge load fees or not. Specifically, for each SRI fund i and candidate fund j we calculate the score $S_{i,j}$ defined as

$$S_{i,j} = \frac{(\text{AUM}_i - \text{AUM}_j)^2}{\sigma^2_{\text{AUM}}} + \frac{(\beta_{\text{MKT},i} - \beta_{\text{MKT},j})^2}{\sigma^2_{\text{MKT}}} + \frac{(\beta_{\text{SMB},i} - \beta_{\text{SMB},j})^2}{\sigma^2_{\text{SMB}}} + \frac{(\beta_{\text{HML},i} - \beta_{\text{HML},j})^2}{\sigma^2_{\text{HML}}} + \frac{(\beta_{\text{MOM},i} - \beta_{\text{MOM},j})^2}{\sigma_{\text{MOM}}} \quad (19)$$

where AUM_k are the assets under-management of fund k. We also scale the difference in betas for variance where σ^2_{MKT}, σ^2_{SMB} σ^2_{HML}, and σ^2_{MOM} the cross-sectional variances of each beta across the total sample of funds for each of the MKT, SMB, HML, and MOM portfolios, respectively.

12.4.3 Summary Statistics

Table 12.1 reports descriptive statistics for daily returns for each SRI fund (refer Panel A) and each matched conventional fund (refer Panel B). For the SRI funds, the full sample sizes range from 1294 days for OnePath to 3035 days for the BT Ethical Share Fund, and for the matched conventional funds, the sizes range from 2113 of ANZ Australian Equity Share Fund to 3711 for Hyperion Small Growth Companies. On average conventional funds (0.04%) outperformed conventional funds (0.03.5%) although the SRI fund Perpetual Wholesale Ethical has the highest average return overall with 0.06%. In general, the funds have high standard deviations (volatility), are negatively skewed, and exhibit excess kurtosis indicating that log returns do not follow a Gaussian distribution. This helps to motivate the use of historical and EVT-based VaR estimates in our analysis. Indeed, the lowest kurtosis estimates are 3.83 for the SRI AMP Leaders Australian Share Fund and 3.80 for the conventional fund Advance Australian Smaller Companies which indicates heavy-tailed behaviour. It is clear that the Hyperion Small Growth Companies fund has the most extreme kurtosis.

In Table 12.2, we present the summary statistics for the residuals of each SRI fund and matched conventional fund, respectively. The residuals are obtained after fitting the EGARCH model described in Sect. 12.3. We can see from the kurtosis that in general the residuals show a reduction in heavy-tailed behaviour. We fit a GPD to each set of residuals and report the resulting parameter estimates (also in Table 12.2). For each fund, we chose the threshold u such that the number of

Table 12.1 Descriptive statistics for SRI and conventional funds

Panel A: SRI funds	Mean	Std. Dev.	Skew	Kurt	Min	Max	Q_1	Median	Q_3	JB test	p-value	Start	End	Count
AMP FLI AMP Sustainable Future Aus Shr	0.03	1.12	−0.29	4.96	−8.65	6.26	−0.50	0.06	0.63	4252.15	0.00	22/05/2001	13/11/2013	3020
BT Class Inv Ethical Shr	0.04	1.06	−0.36	4.41	−7.50	5.34	−0.49	0.10	0.61	3490.67	0.00	7/01/2002	14/11/2013	2808
BT Ethical Shr WS	0.04	1.05	−0.53	5.75	−8.20	5.48	−0.46	0.10	0.60	5754.06	0.00	2/05/2001	14/11/2013	3037
Perpetual Wholesale Ethical SRI	0.06	0.85	−0.62	6.86	−8.09	4.73	−0.34	0.13	0.51	7913.03	0.00	4/06/2002	14/11/2013	2698
Perennial Socially Responsive Shares Tr	0.03	1.11	−0.43	5.94	−8.68	5.42	−0.47	0.07	0.60	5521.31	0.00	3/01/2002	14/11/2013	2913
Hunter Hall Australian Value Trust	0.03	0.84	−0.71	5.85	−8.10	4.68	−0.37	0.06	0.48	5386.12	0.00	9/01/2002	14/11/2013	2934
Australian Ethical Smaller Companies	0.04	0.73	−0.57	4.12	−4.98	3.43	−0.32	0.06	0.46	2663.94	0.00	15/11/2002	14/11/2013	2687
Alphinity Socially Responsible Share	0.03	1.11	−0.11	8.61	−8.50	10.83	−0.46	0.07	0.58	11829.85	0.00	26/04/2002	14/11/2013	2751
BT Wholesale Australian Sustainable Shr	0.04	1.07	−0.29	4.63	−7.85	5.52	−0.49	0.07	0.60	3764.68	0.00	16/04/2002	14/11/2013	2728
BT PPSI Westpac Ins Aus Sust Shr	0.04	1.04	−0.34	5.06	−7.85	5.52	−0.46	0.06	0.58	4081.36	0.00	8/10/2001	14/11/2013	2980
AMP FLI Res Inv Leaders Aus Share	0.03	1.27	−0.16	3.86	−8.18	6.89	−0.61	0.05	0.75	1621.31	0.00	5/10/2005	13/11/2013	1989

(continued)

Table 12.1 (continued)

Panel A: SRI funds	Mean	Std. Dev.	Skew	Kurt	Min	Max	Q_1	Median	Q_3	JB test	p-value	Start	End	Count
OnePath OA IP AMP Cap Res Ldr Aus Shr EF	0.00	1.29	−0.40	4.05	−8.05	6.07	−0.61	0.03	0.73	2038.69	0.00	31/10/2007	12/11/2013	1302
SSgA Australian SAM Sustainability Index	0.04	1.06	−0.32	5.50	−8.30	5.92	−0.47	0.07	0.59	4563.22	0.00	15/11/2001	31/10/2013	2978
Panel B: Conventional Funds	**Mean**	**Std. Dev.**	**Skew**	**Kurt**	**Min**	**Max**	Q_1	**Median**	Q_3	**JB test**	**p −value**	**Start**	**End**	**Count**
Perpetual Wholesale Concentrated Equity	0.05	0.93	−0.35	4.96	−6.87	5.51	−0.42	0.10	0.57	4933.47	0.00	13/03/2000	21/11/2013	3255
ANZ OA IP −Vanguard Aus Shares Index EF	0.03	1.07	−0.08	7.12	−7.09	9.40	−0.46	0.05	0.57	10965.66	0.00	15/07/2003	20/11/2013	2120
Macquarie Australian Equities	0.05	1.20	−0.88	11.35	−14.02	5.86	−0.50	0.09	0.66	21591.77	0.00	14/07/2003	14/11/2013	2306
ANZ OA IP −Schroder Australian Equity EF	0.04	0.98	−0.44	5.04	−6.91	5.03	−0.42	0.04	0.54	5794.83	0.00	11/07/2003	20/11/2013	2140
CFS FC Inv −Ironbark Karara Aus Share Fund	0.03	1.21	−0.39	5.22	−8.94	5.76	−0.54	0.08	0.69	3201.06	0.00	1/12/2004	21/11/2013	2215
Advance Australia Smaller Companies	0.04	0.99	−0.58	3.81	−7.02	4.78	−0.42	0.09	0.57	2326.09	0.00	22/08/2002	21/11/2013	2769

(continued)

Table 12.1 (continued)

Panel B: Conventional Funds	Mean	Std. Dev.	Skew	Kurt	Min	Max	Q_1	Median	Q_3	JB test	p −value	Start	End	Count
Hyperion Small Growth Companies	0.05	0.92	−1.07	18.32	−11.31	10.43	−0.37	0.10	0.54	66196.97	0.00	4/08/1998	21/11/2013	3721
Maple−Brown Abbott Sharemarket	0.04	0.90	−0.30	3.91	−6,54	4.87	−0.43	0.07	0.53	3023.84	0.00	8/09/1999	22/11/2013	3461
Dimensional Aust Large Company Trust	0.04	1.08	−0.26	4.90	−8.24	5.96	−0.50	0.10	0.62	4884.68	0.00	15/09/2000	21/11/2013	3075
EQT Flagship Common No. 2	0.04	1.08	−0.23	4.87	−7.49	6.04	−0.46	0.07	0.60	3099.71	0.00	4/08/2003	21/11/2013	2563
AMP FLI−AMP Aus Share Enhanced Index	0.04	1.17	−0.30	4.54	−8.39	5.77	−0.53	0.06	0.67	2759.02	0.00	15/04/2004	21/11/2013	2325
BT−Vanguard Australian Shares Index	0.03	1.16	−0.32	4.47	−8.20	5.59	−0.54	0.06	0.67	2411.50	0.00	17/12/2004	21/11/2013	2187
BT Imputation Share Fund WS	0.05	0.01	−0.41	5.57	−7.81	5.58	−0.44	0.09	0.56	5934.28	0.00	15/06/2000	22/11/2013	3219

In this table, we report the descriptive statistics for the data set for each SRI fund (refer Panel A) and matched conventional fund (refer Panel B) including the mean, standard deviation, skewness, kurtosis, minimum, maximum, median, 25th (Q_1), and 75th percentile (Q_3) of each time series. Returns are reported in basis points (one hundredth of a percentage point). We also report the Jarque-Berra and associated p value, inception date for each fund, the last time series date for each fund, and the number of observations in each data set. The sample period is 2 May 2000 through 14 November 2013 for SRI funds; and 4 August 1998 through 22 November 2013 for matched conventional funds

Table 12.2 Summary statistics for EGARCH residuals

Panel A: SRI fund name	Mean	Sd	Skew	Kurtosis	ξ	β	u
AMP FLI-AMP Sustainable Future Aus Shr	−0.00	1.00	−0.35	1.23	0.37 (0.18)	0.35 (0.07)	2.15
BT Class Inv Ethical Shr	−0.01	1.00	−0.29	0.38	0.15 (0.15)	0.38 (0.07)	2.19
BT Ethical Shr WS	−0.01	1.00	−0.36	0.75	0.26 (0.16)	0.39 (0.07)	2.18
Perpetual Wholesale Ethical SRI	−0.02	1.00	−0.33	0.54	−0.11 (0.12)	0.58 (0.10)	2.22
Perennial Socially Responsive Shares Tr	−0.01	1.00	−0.37	0.72	0.03 (0.14)	0.62 (0.11)	2.06
Hunter Hall Australian Value Trust	−0.02	1.00	−0.17	1.58	0.06 (0.13)	0.60 (0.10)	2.12
Australian Ethical Smaller Companies	0.00	1.00	−0.11	4.03	0.05 (0.13)	0.66 (0.12)	2.10
Alphinity Socially Responsible Share	−0.00	1.00	−0.32	0.71	0.16 (0.17)	0.44 (0.09)	2.15
BT Wholesale Australian Sustainable Shr	−0.01	1.00	−0.20	0.76	0.33 (0.20)	0.32 (0.07)	2.11
BT PPSI-Westpac Ins Aus Sust Shr	−0.00	1.00	−0.37	1.08	0.47 (0.19)	0.32 (0.07)	2.12
AMP FLI-Res Inv Leaders Aus Share	−0.00	1.00	−0.22	0.50	0.14 (0.18)	0.42 (0.10)	2.07
OnePath OA IP-AMP Cap Res Ldr Aus Shr EF	−0.01	1.00	−0.29	0.64	−0.07 (0.17)	0.63 (0.15)	2.09
SSgA Australian SAM Sustainability Index	−0.00	1.00	−0.25	0.50	0.25 (0.17)	0.35 (0.07)	2.14
Panel B: Conventional fund names	**Mean**	**Sd**	**Skew**	**Kurtosis**	ξ	β	u
Perpetual Wholesale Concentrated Equity	−0.00	1.00	−0.28	0.65	−0.01 (0.11)	0.60 (0.10)	2.07
ANZ OA IP-Vanguard Aus Shares Index EF	−0.01	1.00	−0.32	1.31	0.23 (0.16)	0.43 (0.09)	2.15
Macquarie Australian Equities	−0.00	1.00	−0.35	0.96	0.31 (0.17)	0.35 (0.08)	2.14
ANZ OA IP-Schroder Australian Equity EF	−0.01	1.00	−0.19	1.85	0.12 (0.14)	0.51 (0.10)	2.11
CFS FC Inv-Ironbark Karara Aus Shr	−0.01	1.00	−0.35	0.55	0.27 (0.19)	0.36 (0.08)	2.12
Advance Australia Smaller Companies	−0.02	1.00	−0.26	0.76	0.04 (0.15)	0.54 (0.10)	2.11
Hyperion Small Growth Companies	−0.03	1.00	−0.39	5.49	0.20 (0.12)	0.69 (0.11)	2.00

(continued)

Table 12.2 (continued)

Panel B: Conventional fund names	Mean	Sd	Skew	Kurtosis	ξ	β	u
Maple-Brown Abbott Sharemarket	−0.00	1.00	−0.29	0.81	0.14 (0.14)	0.47 (0.08)	2.14
Dimensional Aust Large Company Trust	−0.00	1.00	−0.31	0.56	0.08 (0.16)	0.52 (0.10)	2.12
EQT Flagship Common No. 2	−0.01	1.00	−0.30	0.91	0.16 (0.14)	0.47 (0.09)	2.08
AMP FLI-AMP Aus Share Enhanced Index	−0.01	1.00	−0.29	0.58	0.12 (0.16)	0.45 (0.09)	2.10
BT-Vanguard Australian Shares Index	−0.01	1.00	−0.31	0.50	0.30 (0.22)	0.35 (0.09)	2.13
BT Imputation Shr WS	−0.01	1.00	−0.34	0.64	0.25 (0.17)	0.38 (0.08)	2.20

In this table, we present the summary statistics for the data sets of the residuals of each SRI and matched conventional fund including the mean, skewness, and kurtosis of each time series. Returns are reported in basis points (one hundredth of a percentage point). This table presents a generalised Pareto distribution to extreme losses and reports the scale and shape parameters, ξ and β. Standard errors are reported in parentheses. We identify extreme observations as those that exceed a high threshold u which we have chosen to be the 5% quantile of returns

exceedances N_u would be 5% of the total length of the time series. We also report the threshold parameter for transparency. As discussed, the parameter ξ indicates heavy-tailed behaviour in the range $\xi > 0$. On average, the funds in our data set appear to be heavy tailed, although this is not true in general. The "heaviness" of each tail is also not especially strong as values of $\xi = 0.5$ are not uncommon in financial markets (see, e.g. Fong Chan and Gray 2006) compared to our highest value of $\xi = 0.37$ for the AMP Sustainable Future Australian Share fund. Lastly, we note that there appears to be no noteworthy difference in the ξ parameter between SRI and their conventional funds.

12.5 Results

12.5.1 The Relative Risk of SRI and Conventional Funds

We now present the main result of our paper. We calculate the 95, 99, and 99.5 percentile 1-day VaR and ES for each SRI and matched conventional fund using the full data sample. Results are reported in Tables 12.3 and 12.4. We compute rolling VaR and ES using Eqs. (5) and (6). The methodology that we adopt to obtain our rolling estimates is as follows. We utilise a sliding window that is 70% of the size of the data set for each fund. The method is adaptive in that each model, VaR and ES are re-estimated as the window rolls through the data points. In this type of exercise, it is impractical to optimally determine a threshold value for each window as it

Table 12.3 Estimated VaR of SRI and conventional funds

	Gaussian VaR			Historical VaR			EVT VaR		
SRI fund name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
AMP FLI-AMP Sustainable Future Aus	1.65	2.33	2.58	1.67	2.53	3.00	2.15	2.93	3.44
BT Class Inv Ethical Shr	1.66	2.34	2.59	1.76	2.50	2.80	2.18	2.87	3.22
BT Ethical Shr WS	1.66	2.34	2.59	1.77	2.49	2.99	2.18	2.95	3.40
Perpetual Wholesale Ethical SRI	1.66	2.34	2.59	1.76	2.66	3.06	2.21	3.07	3.40
Perennial Socially Responsive Shares Tr	1.65	2.33	2.58	1.72	2.59	2.97	2.05	3.07	3.52
Hunter Hall Australian Value Trust	1.67	2.36	2.61	1.64	2.67	3.15	2.12	3.14	3.61
Australian Ethical Smaller Companies	1.65	2.33	2.58	1.64	2.72	3.00	2.10	3.21	3.71
Alphinity Socially Responsible Share	1.65	2.33	2.58	1.76	2.53	3.03	2.14	2.95	3.36
BT Wholesale Australian Sustainable Shr	1.65	2.33	2.58	1.73	2.41	2.97	2.11	2.80	3.22
BT PPSI-Westpac Ins Aus Sust Shr	1.65	2.33	2.58	1.69	2.40	3.08	2.11	2.88	3.44
AMP FLI-Res Inv Leaders Aus Share	1.65	2.34	2.59	1.77	2.49	2.71	2.07	2.82	3.20
OnePath OA IP-AMP Cap Res Ldr Aus Shr EF	1.66	2.34	2.59	1.71	2.65	2.96	2.08	3.05	3.43
SSgA Australian SAM Sustainability Index	1.65	2.33	2.58	1.70	2.47	2.90	2.13	2.82	3.22
	Gaussian VaR			Historical VaR			EVT VaR		
Conventional fund Name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
Perpetual Wholesale Concentrated Equity	1.65	2.33	2.58	1.72	2.59	2.91	2.07	3.02	3.42
ANZ OA IP-Vanguard Aus Shares Index	1.65	2.33	2.58	1.72	2.53	2.88	2.15	2.98	3.45
Macquarie Australian Equities	1.64	2.32	2.57	1.75	2.49	2.74	2.13	2.87	3.32
ANZ OA IP-Schroder Australian Equity	1.65	2.33	2.58	1.72	2.60	2.94	2.11	3.01	3.45
CFS FC Inv-Ironbark Karara Aus Shr	1.65	2.33	2.58	1.79	2.46	2.83	2.12	2.85	3.27
Advance Australia Smaller Companies	1.66	2.35	2.59	1.73	2.56	2.88	2.10	3.00	3.41
Hyperion Small Growth Companies	1.67	2.36	2.60	1.59	2.64	3.33	2.00	3.31	4.03
Maple-Brown Abbott Sharemarket	1.65	2.33	2.58	1.72	2.59	2.95	2.14	2.98	3.41

(continued)

Table 12.3 (continued)

	Gaussian VaR			Historical VaR			EVT VaR		
Conventional fund Name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
Dimensional Aust Large Company Trust	1.65	2.33	2.58	1.71	2.62	3.03	2.11	3.01	3.43
EQT Flagship Common No. 2	1.65	2.33	2.58	1.74	2.52	2.85	2.07	2.93	3.38
AMP FLI-AMP Aus Share Enhanced Index	1.65	2.33	2.58	1.73	2.55	2.85	2.09	2.90	3.30
BT-Vanguard Australian Shares Index	1.65	2.33	2.58	1.75	2.48	2.97	2.13	2.84	3.27
BT Imputation Shr WS	1.65	2.34	2.59	1.72	2.57	3.01	2.20	2.96	3.39

This table calculates the 1-day Value-at-Risk (VaR) for each SRI and matched conventional fund. We use the historical, Gaussian, and extreme value theory approaches to calculate the VaR. VaR is calculated for the 95, 99, and 99.5% confidence levels

progresses through the data set via examining the mean-excess function. Therefore, at each step we choose the number of exceedances to be equal to the upper 5% of ranked losses (negative returns). The literature is not clear in terms of what constitutes an appropriate threshold (cf. Hult et al. 2012). We selected 5% quantile of returns following a visual inspection of the mean-excess plots (essentially plots of exceedances verses u, see Hult et al. 2012) of a random sample of funds. It was found that this heuristic approach left a suitably ample sample size.

Table 12.3 presents the 1-day VaR for each SRI and matched conventional fund using the historical, Gaussian, and EVT estimates of VaR. The VaR estimates show that the SRI and matched conventional counterparts exhibit similar overall risk characteristics, e.g. a 95% VaR around 1.66. This lack of discernible significant difference is consistent when conducting sensitivity analysis at 95, 99, and 99.5% confidence levels. We can see similar results in Table 12.4 for the 1-day ES measure. Roughly half of the sample of SRI funds exhibit higher risk and roughly half exhibit lower risk than their matched conventional counterparts although the differences are slight. On this evidence, we are not able to reject the hypothesis that there is no significant difference in risk between SRI and conventional funds.

It is possible to draw very similar conclusions from both the results of the rolling VaR and ES estimations when observed graphically as in Fig. 12.1. Thus, to save space we have elected to present only the results for the 95% VaR.[9] The VaR numbers that we provide here are estimated using the Gaussian approach, except for the Hyperion Small Growth Companies fund where we use the historical approach. This is consistent with the backtesting procedure introduced in Sect. 12.3, the results of which are discussed below.

[9]The figures and tables for other confidence levels are available upon request.

Table 12.4 Estimated ES of SRI and conventional funds

	Gaussian ES			Historical ES			EVT ES		
SRI fund name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
AMP FLI-AMP Sustainable Future Aus Shr	2.05	2.64	2.86	2.28	3.26	3.75	2.71	3.95	4.76
BT Class Inv Ethical Shr	2.04	2.61	2.83	2.26	3.00	3.38	2.63	3.44	3.85
BT Ethical Shr WS	2.04	2.61	2.83	2.31	3.18	3.66	2.70	3.74	4.33
Perpetual Wholesale Ethical SRI	2.02	2.57	2.78	2.32	3.16	3.45	2.73	3.51	3.80
Perennial Socially Responsive Shares Tr	2.05	2.64	2.86	2.28	3.26	3.69	2.69	3.73	4.19
Hunter Hall Australian Value Trust	2.00	2.51	2.7	2.30	3.36	3.85	2.76	3.85	4.35
Australian Ethical Smaller Companies	2.06	2.65	2.86	2.32	3.42	3.91	2.79	3.97	4.50
Alphinity Socially Responsible Share	2.06	2.66	2.89	2.28	3.16	3.56	2.66	3.62	4.12
BT Wholesale Australian Sustainable Shr	2.04	2.63	2.85	2.24	3.05	3.48	2.59	3.61	4.24
BT PPSI-Westpac Ins Aus Sust Shr	2.06	2.66	2.89	2.27	3.27	3.83	2.71	4.16	5.21
AMP FLI-Res Inv Leaders Aus Share	2.04	2.61	2.82	2.22	3.02	3.41	2.55	3.43	3.87
OnePath OA IP-AMP Cap Res Ldr Aus Shr EF	2.03	2.59	2.8	2.28	3.2	3.49	2.67	3.58	3.93
SSgA Australian SAM Sustainability Index	2.06	2.66	2.88	2.24	3.06	3.45	2.60	3.52	4.05
	Gaussian ES			Historical ES			EVT ES		
Conventional fund Name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
Perpetual Wholesale Concentrated Equity	2.05	2.64	2.86	2.25	3.14	3.51	2.66	3.60	4.00
ANZ OA IP-Vanguard Aus Shares Index	2.04	2.62	2.84	2.31	3.24	3.77	2.70	3.78	4.38
Macquarie Australian Equities	2.06	2.67	2.91	2.28	3.15	3.65	2.64	3.72	4.38
ANZ OA IP-Schroder Australian Equity	2.05	2.64	2.87	2.29	3.21	3.67	2.68	3.71	4.21
CFS FC Inv-Ironbark Karara Aus Shr	2.06	2.66	2.89	2.27	3.08	3.48	2.61	3.60	4.17
Advance Australia Smaller Companies	2.02	2.57	2.78	2.27	3.18	3.62	2.66	3.60	4.03

(continued)

Table 12.4 (continued)

	Gaussian ES			Historical ES			EVT ES		
Conventional fund Name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
Hyperion Small Growth Companies	1.99	2.52	2.71	2.32	3.73	4.45	2.87	4.52	5.41
Maple-Brown Abbott Sharemarket	2.06	2.66	2.88	2.29	3.20	3.60	2.68	3.66	4.15
Dimensional Aust Large Company Trust	2.05	2.65	2.87	2.26	3.20	3.56	2.68	3.65	4.11
EQT Flagship Common No. 2	2.06	2.66	2.89	2.25	3.15	3.61	2.63	3.65	4.18
AMP FLI-AMP Aus Share Enhanced Index	2.05	2.65	2.88	2.25	3.10	3.47	2.61	3.53	3.98
BT-Vanguard Australian Shares Index	2.05	2.64	2.87	2.25	3.11	3.54	2.62	3.64	4.25
BT Imputation Shr WS	2.04	2.62	2.83	2.29	3.18	3.61	2.71	3.72	4.30

This table calculates the 1-day expected shortfall (ES) for each SRI and conventional fund. We use the historical, Gaussian, and extreme value theory approaches to calculate ES. ES is calculated for the 95, 99, and 99.5% confidence levels

Figure 12.1 therefore presents our key result, that is, the dynamic difference between risks as measured for SRI and conventional funds. We provide the 95% VaR for the SRI and conventional funds, the difference between the two, and 95% confidence levels for the value of this difference as calculated via bootstrapping. The main conclusion we can draw from this analysis is that there *does not* seem to be a consistent penalty of greater risk for SRI investors. In particular, the difference between risk measures is rarely above or below zero with 95% confidence.

On closer inspection, it appears that just after the beginning of 2011, many funds do enter into a period of decoupling, with regard to risk, from their matched counterparts. Once again the SRI funds are neither consistently more nor less risky than the conventional funds, with the actual ratio being near to 61% in favour of a decrease (SRI less risky). However, the average difference in risk does seem to be significantly different from 0. Observing the graphs again we may be convinced that this decoupling has something to do with a large increase in VaR numbers that also occurs at the beginning of 2011. This period in time actually corresponds to a decrease in Australian stock prices and volatility of the ASX share index. We therefore propose that the increase in VaR numbers is due to funds increasing their exposure during the low volatility period. The difference in risk numbers between SRI and conventional funds may be due to the different mechanics involved in rearranging the holdings of each style of fund. For example, in an SRI fund one

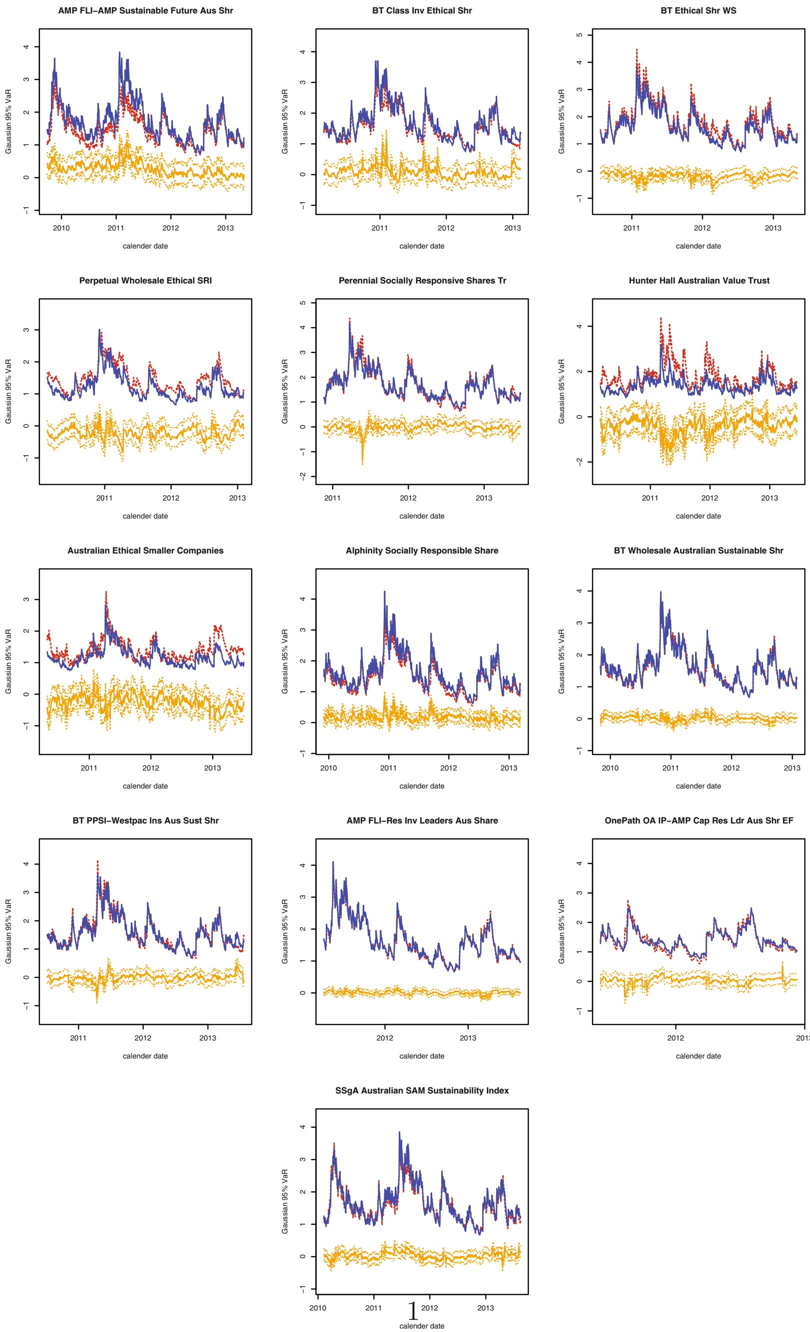

Fig. 12.1 Rolling 1-day Value-at-Risk at the 95% confidence level calculated with the Gaussian approach for each SRI fund (*blue*) and its matched conventional fund (*red-dashed*). We also give the differences (*orange*) with 95% confidence levels (*orange-dotted*) estimated via bootstrapping

must consider screening results and the inherent sinfulness of investments before acting. However, we possess the data regarding the number of positive and negative screenings that each SRI fund uses and can see no correlation between these and the increase or decrease in the risk difference to conventional funds in 2011. However, we also noticed the five funds with the largest AUM; BT Ethical Share, Perpetual Wholesale Ethical, Perennial Socially Responsive Shares, Hunter Hall Australian Value Trust, and Australian Ethical Smaller Companies all increased their risk to a lesser extent than their conventional counterparts. This may be due to their size making the mechanics of increasing risk more difficult. Coincidentally each of these funds have a large number of negative screens (6–8).

12.5.2 Robustness Checks

As discussed in Sect. 3.4, in order to check the validity and the robustness of the result to the model specification, backtesting procedures are conducted. Table 12.5 contains the violation ratios for each confidence level of VaR for each of the historical, Gaussian, and EVT approaches for the SRI and conventional funds. For a VaR with confidence levels $(1 - p)\%$, we select the model that has a violation ratio closest to $p\%$. In the event of a tie, we decided to favour the Gaussian due to its simplicity and on the strength of its overall performance.

We can see that the Gaussian approach proves more often to be the appropriate risk measure, especially for the lower confidence levels. In fact the Gaussian approach can be considered to perform better in the backtesting for every fund except for Hyperion Small Growth Companies at the 95% confidence level where the historical approach seems best. This result may be surprising since the Gaussian distribution is often considered to be an inadequate description of asset returns. However, on closer examination of QQ plots generated by the log returns,[10] we can see that our fund data are not as heavy tailed as various other financial time series. For example, the electricity markets or emerging markets studied in Fong Chan and Gray (2006) and Gençay and Selçuk (2004).

The violation ratio test also shows us that all three approaches seem to be consistently over estimating risk. This could be because the sliding window generally covers the credit crunch event and associated crises of 2008–2011 and is thus calibrated to a "riskier" state of the world. In order to test this, we repeated the analysis with a smaller rolling window such that we would not include the whole crisis period in every calibration. However, the numbers obtained were similar to those presented in this study.

[10]An example of a QQ plot demonstrating the tail distribution for the fund, AMP FLI-AMP Sustainable Future Australian Shares is presented in appendix Fig. 12.2. For interested readers, a full copy of all QQ plots is available upon request.

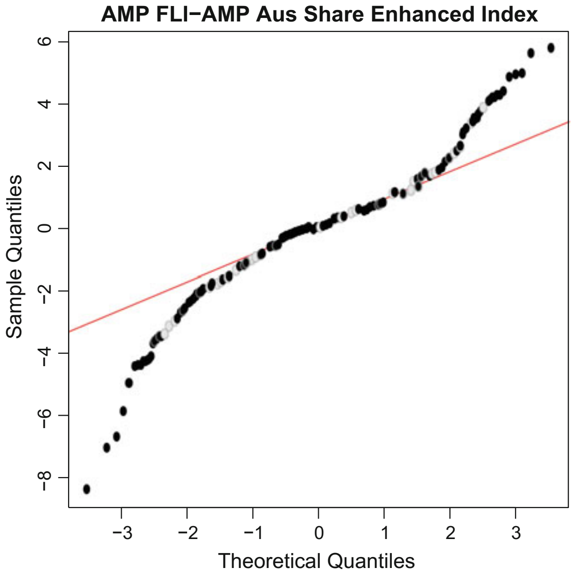

Fig. 12.2 QQ plots for the AMP FLI-AMP Sustainable Future Australian Shares fund overlaid with a Gaussian distribution

12.5.3 Performance Metrics of SRI and Conventional Funds

In this section, we compare risk-adjusted monthly fund performance metrics for our sample of Australian SRI and matched conventional funds. Fund mangers are mostly interested in overall performance comparison using monthly time horizons. Table 12.6 shows monthly Sharpe (1964), Treynor and Mazuy (1966), and Sortino and Forsey (1996) ratios for the funds. Along with the standard Sharpe ratio (returns minus risk-free rate divided by standard deviation), two other “modified Sharpe” ratios are calculated with the usual excess returns divided by VaR and Expected Shortfall. Treynor ratios are calculated as the excess return divided by CAPM beta, and Sortino ratios are calculated as excess returns divided by downside deviation (standard deviation of negative returns). The risk-free rate and CAPM market returns for the performance metrics are used from the series used in the matching process outlined in Sect. 4.2.

The results in Table 12.6 show slight outperformance (a paired t test for 65 metric differences shows significance at 1%) with the conventional funds, suggesting although SRI funds are not significantly riskier on a daily basis, they potentially can suffer in terms of performance over a 10-yr period. These reasons could be due to the costs that SRI funds face compared to conventional funds. These are reduced diversification opportunities but also the cost of researching,

Table 12.5 Violation ratios for SRI and conventional funds

	Gaussian ES			Historical ES			EVT ES		
SRI fund name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
AMP FLI-AMP Sustainable Future Aus Shr	2.10	0.11	0.00	1.88	0.00	0.00	0.33	0.00	0.00
BT Class Inv Ethical Shr	0.95	0.00	0.00	0.71	0.00	0.00	0.12	0.00	0.00
BT Ethical Shr WS	1.32	0.00	0.00	0.77	0.00	0.00	0.11	0.00	0.00
Perpetual Wholesale Ethical SRI	1.48	0.00	0.00	0.99	0.00	0.00	0.12	0.00	0.00
Perennial Socially Responsive Shares Tr	1.49	0.00	0.00	1.15	0.00	0.00	0.23	0.00	0.00
Hunter Hall Australian Value Trust	0.69	0.12	0.12	0.69	0.00	0.00	0.23	0.00	0.00
Australian Ethical Smaller Companies	2.73	0.50	0.37	2.23	0.37	0.12	0.87	0.12	0.00
Alphinity Socially Responsible Share	1.58	0.00	0.00	0.73	0.00	0.00	0.24	0.00	0.00
BT Wholesale Australian Sustainable Shr	1.34	0.00	0.00	0.98	0.00	0.00	0.24	0.00	0.00
BT PPSI-Westpac Ins Aus Sust Shr	1.57	0.11	0.00	0.89	0.00	0.00	0.22	0.00	0.00
AMP FLI-Res Inv Leaders Aus Share	2.18	0.17	0.00	1.34	0.17	0.00	0.34	0.00	0.00
OnePath OA IP-AMP Cap Res Ldr Aus Shr EF	1.80	0.26	0.00	1.55	0.00	0.00	0.52	0.00	0.00
SSgA Australian SAM Sustainability Index	2.02	0.11	0.00	0.79	0.00	0.00	0.22	0.00	0.00
	Gaussian ES			Historical ES			EVT ES		
Conventional fund name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
Perpetual Wholesale Concentrated Equity	1.94	0.10	0.00	1.23	0.00	0.00	0.10	0.00	0.00
ANZ OA IP-Vanguard Aus Shares Index	1.76	0.16	0.00	1.44	0.00	0.00	0.16	0.00	0.00
Macquarie Australian Equities	0.87	0.00	0.00	0.73	0.00	0.00	0.15	0.00	0.00
ANZ OA IP-Schroder Australian Equity	3.37	0.16	0.16	2.21	0.16	0.00	0.47	0.00	0.00
CFS FC Inv-Ironbark Karara Aus Shr	1.81	0.15	0.00	0.75	0.00	0.00	0.30	0.00	0.00
Advance Australia Smaller Companies	1.08	0.00	0.00	0.60	0.00	0.00	0.24	0.00	0.00
Hyperion Small Growth Companies	1.35	0.18	0.09	1.62	0.09	0.00	0.45	0.00	0.00

(continued)

Table 12.5 (continued)

	Gaussian ES			Historical ES			EVT ES		
Conventional fund name	95%	99%	99.5%	95%	99%	99.5%	95%	99%	99.5%
Maple-Brown Abbott Sharemarket	2.99	0.19	0.10	1.54	0.19	0.00	0.39	0.00	0.00
Dimensional Aust Large Company Trust	1.41	0.11	0.00	0.98	0.00	0.00	0.22	0.00	0.00
EQT Flagship Common No. 2	1.17	0.26	0.13	0.91	0.13	0.00	0.39	0.00	0.00
AMP FLI-AMP Aus Share Enhanced Index	1.72	0.14	0.00	1.29	0.14	0.00	0.29	0.00	0.00
BT-Vanguard Australian Shares Index	1.52	0.15	0.00	1.37	0.00	0.00	0.30	0.00	0.00
BT Imputation Shr WS	1.45	0.10	0.00	0.93	0.00	0.00	0.10	0.00	0.00

This table presents the number of Value-at-Risk (VaR) violation ratios for each SRI and conventional fund as a percentage of VaR estimates. For example, VaR measured at the $(1 - p)\%$ confidence level should approximately have a violation ratio of $p\%$

Table 12.6 Monthly risk performance metrics for SRI and conventional funds

SRI fund name	Sharpe Ratio (Std. Dev)	Sharp Ratio (VaR)	Sharp Ratio (ES)	Treyno Ratio	Sortin Ratio
AMP FLI-AMP Sustainable Future Aus Shr	0.0410	0.0239	0.0173	0.0096	0.0533
BT Class Inv Ethical Shr	0.0472	0.0279	0.0217	0.0128	0.0620
BT Ethical Shr WS	0.0686	0.0413	0.0321	0.0230	0.0919
Perpetual Wholesale Ethical SRI	0.1416	0.0966	0.0578	0.0642	0.2079
Perennial Socially Responsive Shares Tr	0.0321	0.0183	0.0119	0.0054	0.0410
Hunter Hall Australian Value Trust	0.0714	0.0437	0.0292	0.0260	0.0980
Australian Ethical Smaller Companies	0.1026	0.0686	0.0495	0.0505	0.1498
Alphinity Socially Responsible Share BT Wholesale Australian Sustainable Shr	0.0371	0.0222	0.0133	0.0108	0.0485
BT Wholesale Australian Sustainable Shr	0.0689	0.0417	0.0324	0.0238	0.0924
BT PPSI-Westpac Ins Aus Sust Shr	0.0421	0.0251	0.0199	0.0111	0.0555
AMP FLI-Res Inv Leaders Aus Share	0.0003	0.0001	0.0001	−0.0116	0.0003

(continued)

Table 12.6 (continued)

SRI fund name	Sharpe Ratio (Std. Dev)	Sharp Ratio (VaR)	Sharp Ratio (ES)	Treyno Ratio	Sortin Ratio
OnePath OA IP-AMP Cap Res Ldr Aus Shr EF	−0.1410	−0.0771	−0.0642	−0.0912	−0.1684
SSgA Australian SAM Sus- tainability Index	0.0537	0.0323	0.0239	0.0162	0.0717
Conventional fund name	**Sharpe Ratio (StdDev)**	**Sharp Ratio (VaR)**	**Sharp Ratio (ES)**	**Treyno Ratio**	**Sortin Ratio**
Perpetual Wholesale Concentrated Equity	0.1646	0.1073	0.0751	0.0699	0.2380
ANZ OA IP-Vanguard Aus Shares Index EF	0.0637	0.0374	0.0277	0.0211	0.0828
Macquarie Australian Equities	0.1047	0.0636	0.0474	0.0406	0.1415
ANZ OA IP-Schroder Australian Equity EF	0.1153	0.0743	0.0544	0.0481	0.1617
CFS FC Inv-Ironbark Karara Aus Shr	0.0038	0.0022	0.0016	−0.0096	0.0048
Advance Australia Smaller Companies	0.1038	0.0614	0.0406	0.0413	0.1391
Hyperion Small Growth Companies	0.1568	0.1064	0.0637	0.0888	0.2303
Maple-Brown Abbott Share- market	0.0925	0.0614	0.0460	0.0382	0.1314
Dimensional Aust Large Company Trust	0.0698	0.0423	0.0323	0.0235	0.0938
EQT Flagship Common No. 2	0.1237	0.0788	0.0620	0.0530	0.1736
AMP FLI-AMP Aus Share Enhanced Index	0.0507	0.0296	0.0223	0.0151	0.0653
BT-Vanguard Australian Shares Index	0.0251	0.0146	0.0114	0.0020	0.0323
BT Imputation Shr WS	0.1201	0.0748	0.0562	0.0475	0.1669

This table presents monthly fund Sharpe, Treynor, and Sortino ratios for each SRI and conventional fund in the sample period 1998–2012. Sharpe ratios are calculated in 3 variants where the denominator is either standard deviation, VaR, or ES. For the Treynor ratio, the benchmark ratio is the market return, and for the Sortino ratio, the minimum acceptable return is the risk-free rate

reviewing, and maintaining the portfolios meet corporate and socially responsible criteria. These aforementioned criteria can also mean costs adapting to changes where the threshold for exclusion should be set are constantly evolving, e.g. proposal and adoption of new screens such as exclusion of utilities due to fossil fuel exploration.

12.6 Conclusion

The main purpose of this paper is to contribute to the SRI literature by investigating if investors pay a penalty (in terms of higher risk) for pursuing ethical investment strategies. We do this by evaluating the performance of 13 selected SRI equity-managed funds in Australia using daily returns to see whether these funds have different tail risk exposures in the return distribution compared to that of matched conventional equity funds. The motivation for this work is that the assessment of risk in SRIs is an area still in its infancy with higher moments and the tails of the return distribution yet to be subjected to empirical investigation.

We show that overall risk is unlikely to differ between an SRI and a conventional portfolio. We have analysed the theoretical underpinning that suggests that fund managers who opt for reduced diversification opportunities as a result of positive and negative screens (which are common place with SRI funds) are likely to face greater volatility in their portfolios. However, we show that investors who wish to invest ethically do so without incurring a financial penalty in terms of tail risk. Even if an SRI manager avoids sin stocks, he or she is still likely to be able to hold at least 30–40 stocks together and therefore get most of the benefits of a Markowitz diversified portfolio. We show evidence therefore that a SRI-constrained investment universe is unlikely to affect risk and even more unlikely that any differences will manifest themselves in extreme returns in the tail(s) of the distribution.

We do observe slight outperformance by conventional funds compared to that of SRI across all of the performance metrics reported in this study. Our study is one of the number of studies for SRI funds in Australia. Cummings (2000), Tippet and Leung (2001), and Humphrey and Lee (2011) all find that the performance of SRI funds is similar to that of conventional funds in Australia. Our findings contradict these earlier studies but find support for Jones et al. (2008) who like us find that Australian SRI funds underperform conventional funds in comparison with the market benchmark. Like Jones et al. (2008) who examined the sample period 1986–2005 we also use a sample period exceeding 15 years. In contrast the previous studies which found no differences in return performance between SRI and conventional funds used shorter time periods within their analysis. As SRI is relatively in its infancy, the comparable performance of SRI versus conventional over a long term is still open for further debate.

There are several interesting possible directions for future research. Firstly, it is of great interest to further investigate the screening practices and sizes of SRI funds and determine whether the number of positive and negative screens has an impact on risk. A large cross section of SRI funds across different countries would thus represent a significant contribution to the literature. Secondly, it would be interesting to investigate the riskiness of sustainability indices as compared to the composite indices globally across different markets. This could be done using various models such as the variance-covariance, historical simulation, and extreme value theory approach to forecast VaR and ES, respectively. Finally, a closer look at performance measures on indices, such as Dow Jones Sustainability Index (DJSI)

Table 12.7 Some of the key SRI studies dating back to 2000.

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2000	FAJ	Statman	US	1990 1998	US Equity funds listed in Morningstar as September 1999 (31)	Dow Stock Index, S&P 500, Morningstar and Lipper	Jensen's alpha and risk-adjusted returns	Dow Stock Index (DSI) did as well as the S&P 500 Index over the 1990–1998 period; social responsible investments did worse than the S&P 500 and the DSI but no worse than conventional mutual funds
	JBF	Bauer, Koedijk and Otten	German, Uk & US	1990 2001	Ethical Mutual Funds (103)	CRSP	CAPM & 4-factor Carhart model	After controlling for investment style, no evidence of significant differences in risk-adjusted returns between ethical and conventional mutual fund (MF); the ethical MFs underwent a catching up phase, before delivering financial returns similar to conventional MFs; inclusion of ethical indexes is not incrementally capable of explaining ethical MF return variation

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2006	PBFJ	Bauer, Otten and Tourani Rad	Australia	1992 2003	Retail Ethical Funds (25)	Morningstar	CAPM & 4-factor Carhart model	By applying conditional 4-factor model and after controlling for investment style, time-variation in betas and home bias, no evidence of significant differences in risk-adjusted returns between ethical and conventional funds; during 1992–1996, domestic ethical funds underperform their conventional counterparts significantly, whereas during 1992–2003 ethical funds matched the performance of conventional funds more closely

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2006	JBE	Benson, Brailsford and Humphrey	US	1994 2003	Equity Funds (102)	Morningstar	Time series	SRI funds exhibit different industry betas consistent with different portfolio positions, but that these differences vary from year to year; It is also found that there is little difference in share-picking ability between the two groups of fund managers
2006	JPM	Statman	US	1990 2004	1 conventioanl index; 4 SRI indexes	KLD Research & Analytics	Sharpe ration, tracking error	Find that SRI indexes vary in composition and social responsibility scores but the mean social scores of each is higher than that of the S&P 500 Index (conventional index)
2007	JFQA	Bollen	US	1961 2002	Equity SRI (205)	CRSP	CAPM & 4-factor Carhart model; OLS	Monthly volatility of investor cash flows is lower in socially responsible funds than in conventional funds; strong evidence that cash flows into socially

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
								responsible funds are more sensitive to lagged positive returns than cash flows into conventional funds, and weaker evidence that cash outflows from socially responsible funds are less sensitive to lagged negative returns
2008	JBE	Jones, van der Laan, Frost and Loftus	Australia	1986 2005	SRI funds (89)	Morningstar	Fama & French 3-factor model	Find that ethical funds significantly underperform the market in Australia
2008	JBF	Galema, Plantinga and Scholtens	US	1992 2006	all shares covered by KLD	KLD Research & Analytics	Fama & French 3-factor, Fama-MacBeth, 4-factor Carhart model	Find that socially responsible investing (SRI) impacts on stock returns by lowering the book-to-market ratio and not by generating positive alphas

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2008	JBF	Benson and Humphrey	US	1991 2005	US Domestic equity funds (144 SRI & 4449 conventional)	CRSP	GMM	SRI Fund flows are less sensitive to returns than conventional funds; Flow is persistent and SRI investors are more likely to invest in a fund they already own relative to conventional funds
2008	JCF	Renneboog, Ter Horst and Zhang	Global Study (17 countries in total)	1991 2003	432 equity SRI funds	CRSP & Datastream	CAPM & 3-factor and 4-factor models	SRI funds in the USA, the UK, and in many continental European and Asia-Pacific countries underperform their domestic benchmarks; also find that the underperformance of SRI funds is not driven by loadings on an ethics style factor; finally, corporate governance and social screens yield lower risk-adjusted returns

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2008	AFE	Becchetti and Ciciretti	US	19902003	Domini Social Index 400 & Standard & Poor's 500 Composite Index	KLD Research & Analytics	APARCH & GARCH	Find that individual socially responsible shares have on average significantly lower returns and unconditional variance than conventional shares when controlling for industry effects; find individual socially responsible shares are significantly less risky when controlling for conditional heteroskedasticity; find there are no significant differences in risk-adjusted returns between the two buy-and-hold strategies on socially responsible and conventional portfolios; find the buy-and-hold strategies on the socially responsible portfolio exhibits significantly lower exposition to systematic nondiversifiable risk

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2009	JFE	Hong and Kacperck	US	1962 2003	Fama & French Portfolio (48)	CRSP & Compustat	Time series, cross-sectional regression	Sin shares are less likely to be held within pension plans that in mutual fund and hedge fund portfolios
2009	FAJ	Statman and Glushkov	US	1992 2007	198 Shunned Shares	KLD Research & Analytics	CAPM & 4-factor Carhart model.	Socially responsible investors tilt their portfolios towards shares of companies with high scores on social responsibility characteristics and shun shares of companies associated with tobacco, alcohol, gambling, firearms, and military or nuclear operations
2010	ARJ	Copp, Kremmer and Roca	Australia	1994 2009	4 Price Indexes	Morningstar	CAPM	Find the beta risk of SRI, both in Australia and internationally, increases more than that of conventional investment during economic downturns

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2010	AF	Lee, Humphrey, Benson and Ahn	US	1989 2006	61 US Equity Funds	Morningstar	4-factor Carhart model	Find a significant reduction in alpha of 70 basis points per screen using the Carhart performance model; increased screening results in lower systematic risk–in line with managers choosing lower beta shares to minimise overall risk
2010	RAF	Rodriguez	US	1997 2005	Morningstar Principia CD & CRSP (31)	CRSP	Graham & Harvey measure — volatility-match benchmark, Carhart model	On the basis of the raw returns, SRI performed better than some indexes, but this evidence of outperformance disappears once risk is incorporated into the analysis
2010	RAF	Rodriguez	US	1997 2005	Socially responsible mutual funds (31)	Morningstar Principia CD	Graham & Harvey measure	On the basis of the raw returns, socially responsible funds performed better than some market indexes, but this evidence of outperformance

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
								disappears once risk is incorporated into the analysis; consistent with previous studies, no evidence was found of outperformance by socially responsible funds. also, the difference between the performance of socially responsible mutual funds and conventional mutual funds is not statistically significant
2011	JBE	Humphrey and Lee	Australia	1996 2008	Conventional Funds (514); SRI funds (27)	Morningstar Direct; Ethical Investor; AGSM-CRIF; Datastream	1- and 4-factor models	No significant difference between the returns of SRI and conventional funds; positive screening significantly reduces funds risk; negative screening significantly increases risk + reduces ability to diversify portfolios

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2011	JFI	Renneboog, Ter Horst and Zhang	Global Study (17 countries in total)	1992 – 2003	Equity SRI funds (410)	CRSP & Micropal	CAPM & 3-factor & 4-factor Carhart	SRI money flows are less related to past fund returns; social attributes of SRI funds weaken the relation between money inflows and past positive returns; find no evidence of a smart money effect
2011	JBF	Derwall, Koedijk, and Horst	US	1992–2008	US public-listed shunned shares	KLD Research & Analytics	4-factor Carhart model	Although the profit-driven (positive screen) segment earns abnormal returns in the short run, these profit-generating opportunities do not persist in the long run for SRI shares
2011	JBE	Climent and Soriano	US	1987:03–2009:12	US Open-ended Equity funds (7 Greens & 19 SRI)	CRSP	Matched-pair analysis, CAPM & 4-factor	Environmental funds had lower performance than conventional funds with similar characteristics; for a subsample 2001–2009, green funds achieved adjusted returns nor significantly different from the rest of SRI and conventional mutual funds

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2012	AJM	Pérez-Gladish, Benson and Faff	Australia	2008	SRI funds (145)	Survey	Ordered probit analysis, principle component analysis	Socially responsible investors seek financial return as well as nonfinancial benefits; Social conscience and social health issues, as opposed to environmental issues, are relevant to investors; investor risk tolerance is a relatively unimportant factor in the choice of socially responsible investments; finally, in terms of socio-demographics, socially responsible investors tend to be middle-aged, be middle-income professionals and have tertiary qualifications

(continued)

Table 12.7 (continued)

Year	Journal	Authors	Country	Sample period	Sample fund (size)	Data source	Methodology	Major findings
2013	JBE	Ooi and Lajbcygier	US	1985–2006	US SRI Equity Mutual Fund (66)	CRSP/Compustat	Novel 3-factor (excluding SRI-prohibited industries)	When estimating alpha using the new 3-factor Fama and French model, evidence of statistically and economically significant alpha

The table reports the names of the authors, place, and year of publication, together with the sample period, sample size, source of data, methodology adopted within the study, and a summary of the main findings. The following abbreviations indicate the journal in which the studies are published: Accounting & Finance (AF); Applied Financial Economics (AFE); Australia Journal of Management (AJM); Accounting Research Journal (ARJ); Financial Analysis Journal (FAJ); Journal of Business Ethics (JBE); Journal of Banking and Finance (JBF); Journal of Corporate Finance (JCF); Journal of Financial Economics (JFE); Journal of Financial Intermediation (JFI); Journal of Financial and Quantitative Analysis (JFQA); Journal of Portfolio Management (JPM) Pacific Basin Finance Journal (PBFJ); and Review of Accounting and Finance (RAF) and DJSI Australia Index, that incorporate risk and downside risk, such as Sharpe, Sortino, and Treynor ratios, would further aid the discussion on the financial value of SRI.

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Appendix

See Table 12.7

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