Canadian Socially Responsible Investment Mutual Funds Performance Evaluation Using Data Envelopment Analysis

Mohamed A. Ayadi, Zouhour Ben Ghazi, and Habib Chabchoub

Abstract Socially responsible investment (SRI) mutual funds, which rely on social, environmental and ethical considerations in the investment decision-making process, have experienced significant growth over the past 20 years worldwide. This chapter examines the performance, over the 2008–2011 period, of a survivorship bias-free sample of 85 Canadian SRI funds, using a Data Envelopment Analysis (DEA) approach. This technique does not require the specification of benchmarks and allows measuring the relative efficiency of decision making units/funds in the presence of a multiple input-output setting. Various performance indicators or efficiency scores are derived using higher-order moments and tail-risk measures, fee structures, net returns, and fund size. The results confirm the suitability of the DEA-based performance setting and suggest that front-end loads and fund size are the main causes of the inefficiency of Canadian SRI mutual funds. These findings carry important implications for the fund-selection process and performance persistence, and would be of interest to regulators, practitioners, and institutional and individual investors.

Keywords Performance evaluation • SRI mutual funds • Data Envelopment Analysis

JEL Classification G11 • G32

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1 Introduction

Performance measurement and evaluation of actively managed funds continue to receive wide interest among academics and practitioners. The variety of interested parties who are involved in and benefit from the assessment of fund performance suggests the need for a robust measure. At first, it was simply about computing the historical returns without taking into account other factors: the higher the return, the better the performance. With the development of modern portfolio theory by Markowitz (1952), risk was included into the decision-making process, and pioneering measures were proposed by Treynor (1965), Sharpe (1966), and Jensen (1969). Since these contributions, alternative approaches have been proposed in the literature; where they differ is in the way risk is considered, such as the use of multifactor models (Lehmann and Modest 1987; Carhart 1997) and the adoption of the stochastic discount factor-based methodology (Chen and Knez 1996; Farnsworth et al. 2002; Ayadi and Kryzanowski 2005, 2008).

Nevertheless, there is an ample literature arguing that different managerial attributes and other fund characteristics can affect mutual fund performance. These characteristics include the fund size (Indro et al. 1999), management fees (Elton et al. 1993), expenses (Malkiel 1995), and loads (Carhart 1997). Furthermore, Glosten and Jagannathan (1994) provide evidence that actively managed mutual funds have non-normal return distributions with negative skewness and fat tails due to investment restrictions or limitations, such as short-selling restrictions, the use of derivative instruments to hedge risk, and the increasing use of option-like trading or dynamic strategies. They contend that traditional or classical measures of performance would be inappropriate and would lead to a biased assessment of fund managers' true selection ability.[1] This finding was recently corroborated by Ayadi and Kryzanowski (2013) on a sample of Canadian equity mutual funds, and by Agarwal et al. (2014) for several hedge fund portfolios. Both papers advocate the use of nonlinear benchmarks for such investment portfolios.[2]

[1] The asset pricing literature lends strong theoretical and empirical support to the hypothesis that higher moments (co-skewness and co-kurtosis with the market portfolio) are priced by rational risk-averse investors (Harvey and Siddique 2000; Dittmar 2002).

[2] The nonlinear-based benchmarks are used extensively in hedge fund performance measurement. These models are empirically supported by Fung and Hsieh (2001), who show similarity in the payoffs of the trend-following strategies and those of a lookback straddle strategy. Agarwal and Naik (2004) confirm these results for a large number of equity-oriented hedge fund strategies with payoffs resembling a short position in a put option on the market index. Similarly, Chan et al. (2007) develop new measures of hedge fund systematic risks such as illiquidity risk exposure and nonlinear factor models.

The inadequacy of traditional measures in a non-normal world and for portfolios with nonlinear payoffs has led to the development of alternative methods named *frontier analysis methods*. Data Envelopment Analysis is a powerful non-parametric frontier method founded by Charnes et al. (1978) that takes into consideration the dynamics of fund strategies and the various fund characteristics. DEA is suitable to assess and rank mutual fund performance in a (nonlinear) risk-return framework based on several input and output variables, even with a non-parametric relationship for these variables. DEA-based measures of performance offer insights into the level of fund efficiency, given the set of input and output variables. Such information is useful to individual and institutional investors as well to fund managers to uncover the importance of the included variables through their efficiency contributions.

One type of investment portfolio that has experienced tremendous growth in the past 20 years is the socially responsible investment (SRI) mutual fund.[3] The investment strategies of such funds are governed by ethical rules and social screens to select or exclude assets. Advocates of these special investments argue that the inclusion of social and environmental considerations in the investment decision-making process improves investment returns. Therefore, assessing the performance of SRI investments or mutual funds is of interest to various players in the financial system.[4] We build on the previous research by using the DEA method to develop new performance measures for a comprehensive sample of Canadian SRI funds over the 2008–2011 period.[5] Our approach takes into consideration key variables such as net returns, linear and nonlinear risk measures, total assets, and fee structures. In this vein, Basso and Funari (2008) study the performance of ethical mutual funds on the European market and develop new efficiency scores. They find that ethical funds have higher scores only when the employed DEA model considers the ethical level among the output variables. In parallel, Pérez-Gladish et al. (2013) use the same method to examine the performance of a sample of US

[3] The growth in assets under management (AUM) and the number of SRI funds has been rapid over the past 20 years, worldwide. AUMs for Canadian SRI retail mutual funds under SRI guidelines remained unchanged from 2004 to 2011, at 4.4 billion CDN, but are down from 5.5 billion CDN in 2008 (SIO 2013). The corresponding AUMs under SRI guidelines for all Canadian funds are 57.9, 600.9, and 566.7 billion CDN in 2004, 2011, and 2008, respectively. Their estimated share of total AUM in Canada is 3.2 %, 20.1 %, and 20.4 % in 2004, 2011, and 2008, respectively.

[4] Two other related streams of research in SRI fund performance: The first stream focuses on the role of the screening mechanisms adopted by SRI funds, such as negative screening, positive screening and norms-based screening. In particular, various studies test the association between these strategies and performance/risk (see Barnett and Salomon 2006; Lee et al. 2010; Laurel 2011; Humphrey and Lee 2011). The second stream examines the important smart money effect for the relationship between SRI fund performance and money flows (see Renneboog et al. 2007, 2008; Benson and Humphrey 2008).

[5] Mutual funds in Canada are often registered as investment trusts and competition is restricted by not permitting foreign-domiciled funds to register for sale domestically. Fund management services are subject to domestic consumption taxes in Canada and the Canadian distribution model uses financial advisors selling and servicing no-load funds (Alpert et al. 2013).

mutual funds. They conclude that there are no significant performance (efficiency scores) differences between conventional and SRI funds.

The remainder of this chapter is organized as follows. In the next section we introduce socially responsible investments mutual funds and their strategies, with a brief review of the literature on their performance. In Sect. 3, we discuss the DEA approach as an alternative non-parametric performance index. We also highlight the use of DEA in the evaluation of mutual fund performance. Section 4 explains the empirical implementation of the DEA approach, with a description of the data and key variables. It also discusses the obtained results. Finally, the conclusion reviews the major results and identifies possible avenues of future research.

2 Socially Responsible Investments Mutual Funds

Socially responsible investments (SRI) mutual funds, also known in the literature as ethical funds, are special investments that aim to harmonize investors' financial and ethical objectives. Instead of relying solely on financial criteria, ethical funds integrate moral and social issues. The Social Investment Organization defines socially responsible investing (SRI) as the inclusion of social, environmental, and governance (ESG) considerations into the management and selection of investments.[6] This organization claims that socially responsible mutual funds, when compared to conventional funds, offer an additional level of analysis and investment by using one SRI strategy or a combination of several. These strategies and previous SRI performance research are presented and discussed in the next sub-section.

2.1 SRI Strategies

Several organizations, such as the US Sustainable and Responsible Investment Forum, the European Sustainable Investment Forum, the Association for Sustainable and Responsible Investment in Asia, the Responsible Investment Association Australasia, and the Canadian Social Investment Organization, recognize five major investment strategies (Social Investment Organization 2013).

Screening This is the most adopted strategy and can be divided into three groups: negative screening, positive screening, and standards-based screening. Negative screening is used to exclude companies that are involved in unethical activities, such as tobacco manufacturing, alcohol production, military or weapons-related contracting, gambling, nuclear power, or pornography. Positive screening "is a

[6] Available from the Social Investment Organization http://www.socialinvestment.ca.

proactive process designed to select companies that demonstrate leadership in a variety of environmental, social, and governance issues."[7] This, for example, includes protection of the environment, protection of human rights, ensuring employee standards, or supporting alternative energy. Finally, standards-based screening involves the selection of investments that respect international standards, such as the United Nations Universal Declaration of Human Rights or the UNICEF Convention on the Rights of the Child.

Integration This involves the consideration of ESG factors in investment research and in the decision-making process. It differs from screening in the sense that it combines ESG data, research, and analysis, together with financial and other factors, in making investment decisions.

Sustainability-themed funds Sustainability-themed investing involves selecting assets on the basis of investment themes such as clean energy, green technology, or sustainable agriculture. Investments are directed at companies or industries that offer innovative solutions to existing problems or that otherwise enhance sustainability practices.

Impact investing Impact investing refers to targeted investments that are made in private markets and that aim at solving social or environmental problems while also generating financial returns. Impact investing includes community investing, where capital is specifically directed to traditionally underserving individuals or communities, to businesses with a clear social or environmental purpose, or to revenue-generating non-profits.

Corporate engagement and shareholder action This strategy aims at influencing corporate behaviour through various strategies including communicating with senior management and/or boards of directors, filing shareholder proposals, and proxy voting.

2.2 Literature Review

Viewed from three different perspectives, the phenomenon of ethical funds has been discussed by several researchers. Each of these standpoints is based either on an underperformance, outperformance, or no-effect hypothesis (Hamilton et al. 1993). The first hypothesis claims that ethical funds underperform their conventional peers. The reasons for this underperformance are discussed by Bauer et al. (2007): First, investing in ethical funds limits the diversification of the portfolio because ethical funds can exclude companies with a good financial performance, for ethical considerations. Second, there are costs to developing ethical investment screens and corporate-social-responsibility rankings. Third,

[7] Available from Qtrade Financial Group http://www.qtrade.ca.

irresponsible activities are perceived as more lucrative and recession-proof than are responsible investments. The second hypothesis suggests that ethical funds can outperform conventional funds. The outperformance of ethical funds occurs when "sound social and environmental performance signals high managerial quality, which translates into favourable financial performance" (Renneboog et al. 2008). Outperformance could also be related to the fact that responsible investments avoid paying for the consequences of non-ethical behaviours, for instance, government fees. Finally, the 'no-effect-hypothesis' supposes that there is no significant difference between the performance of ethical and conventional funds. In other words, the social responsibility feature does not affect the stock price (Hamilton et al. 1993).

Several empirical studies have been conducted in various countries to confirm or disconfirm these hypotheses. The majority of the studies focus on the US market, such as Hamilton et al. (1993), Statman (2000), Bauer et al. (2005), Benson et al. (2006), and Renneboog et al. (2008). They all conclude that there is no significant performance difference between ethical and conventional funds. The same conclusion is drawn by Luther et al. (1992), Mallin and Saadouni (1995), Gregory et al. (1997), Kreander et al. (2005), and Renneboog et al. (2008), who examine the performance of ethical funds in the European market. Furthermore, the Australian and Canadian evidence (Bauer et al. 2006, 2007; Humphrey and Lee 2011; Ayadi et al. 2015) supports the no-effect hypothesis. Nevertheless, few studies confirm the underperformance or outperformance hypothesis, such as Chang and Witte (2010), whose findings show a significant underperformance of US SRI funds over 5-, 10- and 15-year periods, but not over the 3-year period.

The above-mentioned studies use classic performance measures, mainly Jensen's alpha, based either on the CAPM, or on the Carhart four-factor-model, Sharpe ratio, and Treynor ratio. However, the comparison is regarded as meaningless if the ethical and conventional funds do not have the same characteristics (age, size, market, investing area, etc).

3 Data Envelopment Analysis for Performance Evaluation

3.1 Introduction

Most classical or parametric performance measures rely on the Markowitz portfolio theory (1952). This approach uses the efficient-frontier concept, which is defined as a set of non-dominated portfolios in the mean-variance space; in other words, the efficient frontier consists of portfolios that maximize returns for a given level of risk, or alternatively, minimize risk for a given expected return (Kroll et al. 1984). Similarly, alternative methods of frontier analysis are based on the concept of the production frontier, which illustrates the maximum potential output that a production unit can achieve under a given set of inputs. These methods were initiated by

Farrell (1957) in an attempt to present an efficiency measure that overcomes the problems of index numbers in dealing with multiple inputs. All production units aim at reaching the efficient frontier but may fail due to reasons within or beyond their control. Farrell assumed that a production unit can be inefficient either if it produces less than the maximum output available from a set of inputs (*technical inefficiency*) or if it does not consume the best proportion of inputs in view of their prices (*price* or *allocative inefficiency*).

One non-parametric frontier-analysis approach referred to as *Data Envelopment Analysis* (DEA) was developed by Charnes, Cooper, and Rhodes in 1978 as a solution to the problem introduced by Farrell (1957) in measuring efficiency. It has been a useful tool to evaluate non-profit and public sector organizations. Unlike parametric methods, which require the specification of a functional form of the efficient frontier, the DEA approach is based on mathematical programming to define the efficient frontier and to calculate the efficiency scores. Moreover, it does not assume a precise relation between input and output variables, which would offer flexibility and less susceptibility to specification error. However, DEA does not allow for random error; instead, it attributes all deviation from the frontier to inefficiencies. Further, DEA is sensitive to the choice of input and output variables; adding an important number of inputs and outputs may decrease the model's accuracy. DEA is also vulnerable to the *curse of dimensionality,* which is related to problems associated with a low number of decision-making units (DMU)[8] relative to the number of input-output variables.[9] Finally, the DEA model relies on the following basic assumptions: (1) The positivity of the employed variables; (2) Conditions on the number of DMU to be evaluated; for example, Cooper et al. (2007) claim that if the number of DMUs (n) is less than the combined number of inputs plus outputs (m + s), a large portion of the DMUs will be identified as efficient, and efficiency discrimination among DMUs is lost; (3) The homogeneity of the DMUs.

[8] DEA has several advantages over traditional methods of performance measurement. First, it avoids the benchmark specification problem since there is no need to identify any theoretical model (like CAPM) as a benchmark. Instead, DEA measures the performance of a fund relative to the best-performing ones. Second, DEA is a multidimensional approach that can take into account many inputs and outputs. Hence, it is possible to consider, along with risk and return, other factors that could serve in the evaluation of a fund's performance. Finally, DEA not only measures performance, it also has a powerful ability to identify the reasons behind a fund's poor performance. In fact, slack variables in DEA present the major source of inefficiency and give insight into how a fund can ameliorate its performance (Choi and Murthi 2001).

[9] Charnes et al. (1978) use the term 'decision-making unit' to refer to the unit under evaluation. "Generically a DMU is regarded as the entity responsible for converting inputs into outputs and whose performances are to be evaluated" (see Cooper et al. 2007).

3.2 The DEA Model

We adopt the BCC (Banker, Charnes, and Cooper 1984) DEA model based on variable returns to scale, because if one can assume that economies of scale change as fund size increases, then constant-return-to-scale-type DEA models are not an adequate choice. Further, we choose an input-oriented model that emphasizes the reduction of inputs to improve efficiency, as we suppose that mutual-fund managers have more control over inputs than outputs.

The DEA model can be formulated in its dual form as follows:

$$\begin{aligned} &\text{Min} && z_o - \varepsilon\left(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S_r^+\right) \\ &\text{Subject to} && \sum_{j=1}^{n} x_{ij}\,\lambda_j + S_i^- = z_o x_{io} \quad i = 1, 2, \ldots, m \\ &&& \sum_{j=1}^{n} y_{rj}\,\lambda_j + S_r^+ = y_{ro} \quad r = 1, 2, \ldots, s \\ &&& \lambda_j \geq 0 \quad j = 1, 2, \ldots, n \end{aligned} \tag{1}$$

where we denote by: $j = 1, 2, \ldots, n$ funds; $r = 1, 2, \ldots, s$ outputs; $i = 1, 2, \ldots, m$ inputs; y_{rj} amount of output r for the fund j, x_{ij} amount of input i for fund j. S_i^- and S_r^+ represent input and output slack variables, respectively. z_o represents the efficiency score for the fund under evaluation. λ_j ($j = 1, \ldots, n$) are non-negative scalars. ε is a non-Archimedean element (a very small positive number).

The dual leads to the same value of the objective function as the primal. However, while the number of constraints of the primal depends on the number of the DMU evaluated, the dual constraints depend on the number of inputs and outputs. Ramanathan (2003) argues and demonstrates that the use of the dual formulation is computationally more efficient because the computational efficiency of linear programing codes depends upon the number of constraints.

According to Cooper et al. (2011), an efficient fund is one that satisfies the following conditions: $z_o^* = 1$ and all slack variables are equal to zero. When a fund has an efficiency score equal to one and there are some slacks different from zero, it is considered weakly efficient.

Cooper et al. (2007) explain that a DMU can become efficient by reducing its inputs by the ratio z_o and eliminating the negative slacks S_i^-. A similar efficiency can be attained if output values are augmented by the positive slacks S_r^+. The gross improvements of inputs and outputs are given by the following formulas:

$$\begin{aligned} \Delta x_{io} &= x_{io} - \left(z_o x_{io} - S_i^-\right) = (1 - z_o)x_{io} + S_i^- \\ \Delta y_{ro} &= S_r^+ \end{aligned} \tag{2}$$

The projection of the inefficient DMU into the frontier is defined by the following formulas:

$$\widetilde{x_{io}} = x_{io} - \Delta x_{io} \tag{3}$$
$$\widetilde{y_{ro}} = y_{ro} + \Delta y_{ro}$$

While the CCR model relies on two assumptions, namely, the convexity of the efficient frontier and the constant returns to scale, the BCC model (Banker et al. 1984) relaxes the latter assumption in order to handle variable returns to scale. The following constraint was introduced into the envelopment model:

$$\sum_j^n \lambda_j = 1 \tag{4}$$

3.3 *Literature Review on DEA Applications to Evaluate Mutual Fund Performance*

Murthi et al. (1997) are the first researchers attempting to apply the DEA methodology to assess the performance of mutual funds. Their objective is to overcome the shortcomings of traditional performance measures, especially their inability to consider transaction costs in the analysis. They propose a new performance index called the DEA portfolio efficiency index that takes into account risk, return and transactions costs. The main CCR DEA model is applied to 731 mutual funds in 1993 using the actual return as the output variable, and four input variables: expense ratio, loads, turnover, and standard deviation of returns. As a result, Murthi et al. indicate that mutual funds are approximately mean-variance-efficient and that efficiency is not related to transaction costs. While Murthi et al. (1997) adopt the basic DEA assuming constant returns-to-scale and do not survey the issue of scale effects on mutual funds, McMullen and Strong (1998) estimate a DEA model that assumes variable returns-to-scale to analyze 135 common stock mutual funds. They consider as outputs the returns over different lengths of time and, as inputs the sales charge, expense ratio, minimum initial investment (instead of turnover), and semi-deviation of return measured over 3 years. In addition, seeing that DEA can assign very low weights to some undesirable inputs and outputs in order to increase the efficiency measure, they set constraints upon the weights in order to ensure that not all attributes are disregarded. In a second step, Choi and Murthi (2001) apply a different DEA formulation to the data they used before, and propose a non-oriented additive model that considers the same inputs and outputs of the DPEI index. This approach allows for the control of the scale effects.

Whereas pioneering works focused on return as an output in the DEA model and considered only standard deviation and transaction costs as inputs, subsequent studies include other variables. Basso and Funari (2001) propose a DEA-based performance index taking into account different risk measures and investment costs. They consider both subscription and redemption costs. The risk measures include the return standard deviation, the beta coefficient, and the half-variance risk. Furthermore, they define a new index that reflects an additional output, a stochastic dominance indicator in order to describe the investor's preferences, and

the occurrence of returns. In an empirical analysis of the Italian financial market, these authors evaluate the performance of 47 mutual funds and find that redemption costs are an important variable in determining fund rankings. In a subsequent paper, Basso and Funari (2003) develop DEA models that encompass ethical criteria, as in recent decades, investors have become more concerned with satisfying both their financial and their ethical aims. First, they propose a generalization of DEA indexes by adding the ethical measure as a second output. Then, they develop an exogenously fixed output model that contains an ethical level and presents it as a fixed variable. However, these indexes do not take into account the nature of the information available about the ethical level, as in practice, only binary information on the ethical/non-ethical nature, or a ranking of funds according to their ethical level are available. For this reason, these authors present a DEA categorical model with an exogenously fixed output. They test these indices on 50 simulated mutual funds. Subscription and redemption costs, the standard deviation of returns, and beta coefficient are chosen as inputs; and the expected return and an ethical indicator are selected as outputs. Moreover, Basso and Funari (2005) extend their previous indexes so that they can take into account the results of traditional performance measures. Hence, a generalized DEA performance metric, which adds to the outputs the value of the traditional performance indexes, is proposed. Moreover, they present the cross-efficiency matrix, which makes it possible to measure the performance of each fund, using different optimal weights for the other funds.

Considering that the risk measures introduced in previous DEA models do not reflect the characteristics of the funds' return distributions, such as asymmetry and fat-tailedness, Gregoriou et al. (2005) focus on different downside risk measures to examine 614 hedge funds for the period from 1997 to 2001. Chen and Lin (2006) propose a DEA model that considers the value at risk (VaR) and the conditional value at risk (CVaR) as inputs in a test of 22 different input-output specifications. Lamb and Tee (2012) develop a new method with a suitable form of returns to scale and convenient risk measures. Their model directly allows for diversification and employs the mean return as an input, and the maximum between CVaR and zero as an output. Recently, Pérez-Gladish et al. (2013) use the DEA to evaluate the performance of a sample of 46 US domiciled large-cap equity mutual funds. They use the following inputs: turnover ratio, annual report gross, expense ratio, deferred loads, and front loads. As outputs, they use a financial criterion, namely, the mean return, as well as nonfinancial criteria, namely, social and environmental responsibility (SER) level, and quality of the SRI management.

4 Data, Implementation, and Results

We first present the sample of SRI funds and the key variables used in different DEA models. A discussion of the descriptive statistics of these variables is also provided. In the second part, we fully show the construction of various DEA

Table 1 Summary statistics for Canadian SRI mutual funds returns

Statistics	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
Mean	−0.002	0.002	0.079	−0.124	0.043	−0.718	3.974
Median	−0.001	0.002	0.080	−0.126	0.047	−0.674	3.577
Std. Dev.	0.005	0.005	0.034	0.067	0.018	0.531	1.614
Minimum	−0.015	−0.008	0.002	−0.374	0.001	−2.353	2.032
Maximum	0.006	0.017	0.162	0.000	0.084	1.586	10.425

This table reports summary statistics (mean, median, maximum, minimum, standard deviation, skewness, and kurtosis) of individual fund returns of 85 Canadian SRI mutual funds, using monthly data from May 2008 through December 2011 (maximum of 44 observations)

models, with a discussion of the efficiency results implied by each model. All the tests and efficiency scores of SRI mutual funds are conducted using the "FxDEA," software.

4.1 Data and Variables

The sample used in the present chapter is provided from the *Fundata* database and consists of monthly data for 85 Canadian SRI mutual funds over the period of May 2008 to December 2011. To control for selection and survival biases, we include all active and terminated funds in our portfolio tests. Summary statistics of SRI mutual fund returns are provided in Table 1.

We use various input/output variables to assess the performance of our sample of Canadian SRI funds. Most of them are based on earlier studies. The output variables include the net return of the fund and the skewness of fund returns. The return is given by the changes in the net asset values per share (NAVPS), and is adjusted for all distributions. The skewness of fund returns is estimated by the third moment and measures the asymmetry of the return distribution (Joro and Na 2006; Pendaraki 2012). The set of input variables includes the following fund characteristics: (1) The fund size, which is proxied by total net asset (TNA) value (Daraio and Simar 2006); (2) The return standard deviation is given by the second moment and is a measure of fund total risk (Basso and Funari 2003; Daraio and Simar 2006; Chen and Lin 2006; Joro and Na 2006); (3) The value at risk (VaR 95 %), which describes an investment's possible loss that is not exceeded with a probability of 95 % (Gregoriou et al. 2005; Chen and Lin 2006); (4) The kurtosis of fund returns is given by the fourth moment and measures of the degree of the peakness of the return distribution; (5) The management expense ratio (MER), defined as the mutual fund's annual fees, which includes the management fees and other operating expenses, expressed as a percentage of the total fund value (Daraio and Simar 2006; Chen and Lin 2006; Ayadi et al. 2015); This is an important variable that

differentiate SRI and non-SRI funds. In effect, management expenses are expected to be higher for SRI versus non-SRI mutual funds for one or more of the following reasons: First, SRI funds incur additional monitoring costs of the firms in which they invest to ensure that they maintain socially responsible policies (Gil-Bazo et al. 2010); Second, investors in SRI funds are likely to be less performance sensitive (Gil-Bazo et al. 2010) and studies find that management fees are inversely related with investor performance sensitivity (Christoffersen and Musto 2002; Gil-Bazo and Ruiz-Verdu 2009); and third, SRI funds may have higher management expenses since the smaller size of their sponsors and their assets under management lead to less economies from scale (as reported by Bauer et al. 2005, for German and UK funds, and by Bauer et al. 2006, for Australian funds). (6) Front-end loads and back-end loads, representing sales and deferred sales charges (Daraio and Simar 2006). Our framework is consistent with the axiomatic microeconomic theory suggesting that investors prefer positive skewness and have an aversion to kurtosis (Scott and Horvath 1980; Hwang and Satchell 1999).

Table 2 reports summary statistics of the included input/output variables. It is clear that some of the funds of our sample exhibit negative average returns and negative skewness. In order to satisfy the DEA's non-negative requirement on variables used, we use the translation invariance property of the input-BCC model and normalize returns and skewness through the addition of a constant.

Furthermore, since every variable should be able to bring new information to the analysis, a desired property for each model is the independence of the selected variables. Jenkins and Anderson (2003) reveal that including highly correlated variables in the DEA can significantly affect the efficiency results. Therefore, it is necessary to make sure that the variables are not highly correlated. The input variables' correlation matrix is shown in Table 3. It can be seen that the correlation between back-end loads and front-end loads is equal to 0.75. In order to avoid including the same type of information twice, it is necessary to drop one of the highly correlated variables from the analysis.

4.2 Results and Discussion

The DEA program is designed and tested in four different forms that have different combinations of input and output variables. In the first model (DEA-1), standard deviation is considered an input, and net returns, an output (which resembles the mean-variance framework). An extended model, where the management-expense ratio (MER), front-end loads, and total assets are added as inputs, is proposed for DEA-2. The third model, DEA-3, relies on the value at risk as a measure of risk instead of the standard deviation of returns. Finally, model DEA-4 incorporates higher-moment risk variables into the analysis (kurtosis and skewness). Our setup

Table 2 Summary statistics for employed variables for Canadian SRI mutual funds

Statistics	Return	Skew.	Std. Dev.	Total assets	Front-end load	Back-end load	MER	VaR 95 %	Kurt.
Mean	−0.002	−0.718	0.043	61.846	0.018	0.025	0.019	0.069	3.974
Median	−0.001	−0.674	0.047	9.994	0.000	0.000	0.019	0.074	3.577
Std. Dev.	0.005	0.531	0.018	178.571	0.025	0.029	0.008	0.031	1.614
Skewness	−0.800	−0.040	−0.406	5.195	0.710	0.284	−0.327	−0.537	2.417
Kurtosis	0.961	5.100	0.068	28.790	−1.486	−1.944	−0.914	−0.482	6.427
Minimum	−0.015	−2.353	0.001	0.008	0.000	0.000	0.001	0.000	2.032
Maximum	0.006	1.586	0.084	1124.474	0.060	0.060	0.031	0.122	10.425

This table reports summary statistics for the variables employed in the analysis. These variables include the net return and skewness (Skew.) as outputs, and the following inputs: standard deviation (Std. Dev.), total assets, front-end load, back-end load, management expense ratio (MER), value at risk (VaR 95 %), and kurtosis of returns (Kurt.). The data cover the period from May 2008 to December 2011, for a total of 44 observations

Table 3 Input/output correlation matrix

	Return	Skew.	Std. Dev.	Total assets	Front-end load	Back-end load	MER	VaR 95 %	Kurt.
Return	1.000								
Skew.	0.554	1.000							
Std. Dev.	−0.731	−0.468	1.000						
Total assets	−0.043	0.030	0.178	1.000					
Front-end load	−0.093	−0.049	0.014	0.030	1.000				
Back-end load	−0.308	−0.146	0.189	0.288	0.746	1.000			
MER	−0.534	−0.365	0.418	0.223	0.462	0.722	1.000		
VaR 95 %	−0.583	−0.247	0.893	0.194	0.066	0.162	0.363	1.000	
Kurt.	−0.624	−0.819	0.442	−0.042	0.065	0.241	0.338	0.143	1.000

This table presents the correlation matrix of the input/output variables used in the analysis. These variables include the net return and skewness (Skew.) as outputs, and the following inputs: standard deviation (Std. Dev.), total assets, front-end load, back-end load, management expense ratio (MER), value at risk (VaR 95 %), and kurtosis of returns (Kurt.). The data cover the period from May 2008 to December 2011, for a total of 44 observations

in all DEA models is consistent with the rule of thumb suggested by Banker et al. (1989) where $n = 85 > \max(s \times m, 3(s+m)) = \max(2 \times 6, 3 \times (2+6)) = 24$.

Table 4 reports the input and output data for each fund and the empirical results of the analysis. In addition, Table 5 compares the efficient set and the minimum and average efficiency scores obtained with each of the employed models.

In the mean-variance framework (DEA-1), only two funds are identified as efficient. However, the other funds have efficiency scores of less than one; thus, they are inefficient. This evidence suggests that not all SRI mutual funds are mean-variance efficient (this result is further confirmed using the Sharpe ratio measure).

By adding the front-end loads, MER and total-assets variables into the standard mean-variance framework (DEA-2), the number of efficient funds and the average efficiency increase significantly. In effect, the average efficiency score is 12.5 % and 49.9 % in the first and second applications, respectively. In addition, the number of efficient funds becomes twelve, representing almost 14 % of our sample. Ten inefficient funds in the mean variance framework turn out to be efficient according to the second application. It is worth noting that adding back-end loads into the analysis did not alter these results.

Table 4 Empirical results of the analysis of the performance of the Canadian SRI mutual funds

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	VaR 95 %	Kurt.	DEA-1	DEA-2	DEA-3	DEA-4
Ethical Canadian Dividend Fund Series A	−0.036	−0.707	0.041	249.788	0.050	0.025	0.075	2.870	0.015	0.201	0.160	0.708
Ethical Canadian Dividend Fund Series F	0.073	−0.703	0.041	2.011	0.000	0.015	0.074	2.864	0.027	0.453	0.392	0.880
GWL Ethics Fund (G) NL	−0.257	−1.179	0.053	28.006	0.000	0.029	0.085	5.266	0.012	0.223	0.204	0.433
GWL Ethics Fund (G) DSC	−0.239	−1.179	0.053	30.057	0.000	0.027	0.085	5.266	0.012	0.234	0.214	0.440
Meritas Jantzi Social Index Fund	−0.227	−0.520	0.055	72.407	0.050	0.020	0.083	3.412	0.011	0.246	0.234	0.652
London Life Ethics Fund (GWLIM)	−0.219	−1.190	0.053	83.647	0.000	0.028	0.085	5.317	0.012	0.209	0.191	0.427
MFS MB Responsible Canadian Equity Fund	−0.109	−0.593	0.054	78.630	0.000	0.018	0.091	3.577	0.011	0.270	0.243	0.642
PH&N Community Values Canadian Equity Fund Ser D	−0.099	−0.301	0.053	22.427	0.000	0.013	0.084	2.804	0.011	0.359	0.331	0.828
PH&N Community Values Canadian Equity Fund Ser O	−0.000	−0.291	0.053	35.025	0.000	0.001	0.083	2.784	0.011	1.000	1.000	1.000
Meritas Monthly Dividend and Income Fund	0.036	−0.561	0.038	22.355	0.050	0.025	0.057	2.850	0.016	0.259	0.247	0.713
iShares Jantzi Social Index Fund	−0.107	−0.513	0.056	20.768	0.000	0.005	0.083	3.413	0.011	0.503	0.498	0.858
RBC Jantzi Canadian Equity Fund Series A	0.047	−0.673	0.048	22.202	0.000	0.021	0.069	3.928	0.013	0.287	0.272	0.584
RBC Jantzi Canadian Equity Fund Series F	0.140	−0.673	0.048	0.813	0.000	0.010	0.068	3.930	0.047	0.717	0.717	0.805
RBC Jantzi Canadian Equity Fund Series D	0.119	−0.674	0.048	1.221	0.000	0.012	0.068	3.933	0.039	0.530	0.530	0.751
PH&N Community Values Canadian Equity Fund Ser B	−0.151	−0.304	0.053	0.292	0.000	0.019	0.085	2.810	0.011	0.525	0.528	0.912

(continued)

Table 4 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	VaR 95 %	Kurt.	DEA-1	DEA-2	DEA-3	DEA-4
PH&N Community Values Canadian Equity Fund Ser F	−0.073	−0.300	0.053	0.223	0.000	0.011	0.084	2.792	0.011	0.866	0.866	1.000
Meritas Jantzi Social Index Fund Series F	−0.134	−0.507	0.055	4.080	0.000	0.010	0.082	3.384	0.011	0.442	0.417	0.854
Meritas Monthly Dividend and Income Fund Series F	0.127	−0.565	0.038	0.867	0.000	0.015	0.056	2.857	0.054	0.540	0.534	0.940
Acuity Social Values Balanced Fund	0.048	−1.254	0.042	62.931	0.060	0.030	0.061	5.794	0.015	0.209	0.199	0.407
Ethical Balanced Fund Class A	−0.081	−0.952	0.026	336.301	0.050	0.023	0.036	4.011	0.024	0.281	0.223	0.574
Ethical Balanced Fund Class F	0.010	−0.951	0.026	0.873	0.000	0.012	0.035	4.003	0.024	0.644	0.639	0.826
NEI Canadian Bond Class A	0.440	−0.447	0.010	253.968	0.050	0.016	0.011	3.093	0.750	0.750	0.658	0.856
Meritas Canadian Bond Fund	0.389	−0.026	0.009	38.494	0.050	0.020	0.011	2.108	0.762	0.796	0.643	0.990
MFS MB Responsible Fixed Income Fund	0.574	−0.156	0.011	117.395	0.000	0.015	0.010	2.636	0.943	0.960	1.000	1.000
PH&N Community Values Bond Fund Series D	0.544	−0.736	0.010	18.902	0.000	0.007	0.011	3.674	0.919	0.993	0.990	0.993
PH&N Community Values Bond Fund Series O	0.591	−0.726	0.010	88.963	0.000	0.001	0.010	3.658	1,000	1.000	1.000	1.000
NEI Canadian Bond Class F	0.463	−0.431	0.010	49.543	0.000	0.011	0.011	3.195	0.803	0.949	0.978	0.949
PH&N Community Values Bond Fund Series B	0.517	−0.736	0.010	0.355	0.000	0.010	0.011	3.685	0.870	1.000	1.000	1.000
PH&N Community Values Bond Fund Series F	0.544	−0.720	0.010	5.493	0.000	0.007	0.011	3.624	0.920	1.000	1.000	1.000
Meritas Canadian Bond Fund Series F	0.404	0.016	0.009	5.726	0.000	0.017	0.011	2.032	0.782	1.000	1.000	1.000

Ethical Select Conservative Portfolio Class A	0.141	−1.217	0.017	61.998	0.050	0.022	0.024	5.551	0.133	0.370	0.311	0.500
Ethical Select Conservative Portfolio Class F	0.237	−1.176	0.018	0.062	0.000	0.011	0.024	5.131	0.226	1.000	1.000	1.000
Ethical Growth Fund Series A	−0.330	−0.845	0.047	307.373	0.050	0.023	0.062	3.781	0.013	0.179	0.160	0.579
Investors Summa SRI Fund Series C	−0.546	−0.587	0.071	1118.804	0.000	0.029	0.121	3.798	0.009	0.142	0.086	0.547
Acuity Social Values Canadian Equity Fund	−0.209	−1.123	0.064	39.500	0.060	0.030	0.100	5.153	0.010	0.195	0.183	0.431
Investors Summa SRI Class A	−0.521	−0.559	0.070	45.480	0.000	0.027	0.120	3.760	0.009	0.207	0.185	0.560
Acuity Pooled Social Values Canadian Equity Fund	0.013	−1.122	0.064	8.659	0.050	0.002	0.099	5.133	0.010	1.000	1.000	1.000
Investors Summa SRI Fund Series A	−0.532	−0.582	0.071	1124.474	0.000	0.027	0.122	3.806	0.009	0.142	0.086	0.556
Ethical Growth Fund Series F	−0.239	−0.844	0.047	1.093	0.000	0.013	0.062	3.777	0.013	0.534	0.537	0.770
Alpha Social Values Portfolio	−0.321	−1.324	0.051	12.711	0.060	0.028	0.072	5.336	0.012	0.243	0.236	0.451
Acuity Clean Environment Equity Fund	−0.956	−1.328	0.065	80.181	0.060	0.029	0.098	5.107	0.009	0.184	0.174	0.435
Matrix Sierra Equity Fund	−1.547	−2.353	0.084	4.375	0.050	0.031	0.112	10.425	0.007	0.216	0.214	0.300
Matrix Sierra Equity Fund Class F	−1.531	−2.289	0.084	0.008	0.000	0.021	0.112	10.086	0.007	1.000	1.000	1.000
Meritas Money Market Fund Series A	0.046	1.586	0.001	6.409	0.050	0.007	0.000	4.303	1,000	1.000	1.000	1.000
PH&N Community Values Balanced Fund Series D	0.089	−0.551	0.030	10.503	0.000	0.011	0.043	3.513	0.046	0.522	0.499	0.791
PH&N Community Values Balanced Fund Series O	0.155	−0.541	0.030	1.135	0.000	0.003	0.042	3.490	0.085	1.000	1.000	1.000
Meritas Balanced Portfolio Series A	−0.010	−0.748	0.022	17.653	0.050	0.026	0.033	4.005	0.027	0.318	0.275	0.552

(continued)

Table 4 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	VaR 95 %	Kurt.	DEA-1	DEA-2	DEA-3	DEA-4
PH&N Community Values Balanced Fund Series B	0.037	−0.543	0.030	0.153	0.000	0.017	0.043	3.494	0.020	0.621	0.621	1.000
Meritas Balanced Portfolio Series F	0.181	−0.404	0.024	0.191	0.000	0.016	0.032	3.876	0.128	0.681	0.673	1.000
Ethical Special Equity Fund Series A	0.189	−0.891	0.049	249.960	0.050	0.027	0.108	4.211	0.064	0.174	0.142	0.512
Ethical Special Equity Fund Series F	0.284	−0.897	0.049	4.735	0.000	0.017	0.107	4.208	0.099	0.373	0.291	0.643
Ethical Global Equity Fund Class A	−0.328	−0.242	0.045	32.054	0.050	0.026	0.078	2.573	0.014	0.237	0.216	0.790
Acuity Social Values Global Equity Fund	−0.442	−0.857	0.040	16.575	0.060	0.030	0.064	3.978	0.015	0.242	0.226	0.524
MFS MB Responsible Global Research Fund	−0.275	−0.402	0.040	74.033	0.000	0.019	0.063	2.572	0.015	0.288	0.265	0.815
Mac Universal Sustainable Opportunities Class A	−0.440	−0.737	0.049	19.276	0.050	0.024	0.112	3.123	0.012	0.249	0.207	0.661
PH&N Community Values Global Equity Fund Series D	−0.306	−0.411	0.049	6.010	0.000	0.014	0.103	3.036	0.012	0.399	0.315	0.837
PH&N Community Values Global Equity Fund Series O	−0.218	−0.386	0.049	47.560	0.000	0.002	0.102	3.051	0.012	0.785	0.725	0.938
Ethical Global Equity Fund Class F	−0.230	−0.248	0.045	0.943	0.000	0.016	0.077	2.570	0.014	0.497	0.492	0.951
RBC Jantzi Global Equity Fund	−0.487	−0.733	0.038	9.215	0.000	0.022	0.071	3.011	0.016	0.333	0.289	0.700
RBC Jantzi Global Equity Fund Series D	−0.408	−0.732	0.038	0.261	0.000	0.013	0.070	3.010	0.016	0.753	0.750	0.976
RBC Jantzi Global Equity Fund Series F	−0.370	−0.744	0.038	0.268	0.000	0.010	0.070	3.020	0.016	0.892	0.891	1.000

TD Global Sustainability Fund Investor Series	−0.944	−1.048	0.047	9.994	0.000	0.024	0.094	4.562	0.013	0.291	0.245	0.527
TD Global Sustainability Fund Advisor Series	−0.935	−1.017	0.047	9.994	0.050	0.024	0.094	4.481	0.013	0.279	0.240	0.533
TD Global Sustainability Fund—Series F	−0.823	−1.002	0.047	9.871	0.000	0.012	0.094	4.430	0.013	0.413	0.340	0.651
Ethical Global Dividend Fund Series A	−0.114	−0.563	0.050	7.291	0.050	0.025	0.091	3.218	0.012	0.280	0.248	0.656
Ethical Global Dividend Fund Series F	−0.027	−0.567	0.050	0.321	0.000	0.016	0.091	3.222	0.012	0.588	0.587	0.844
Investors Summa Global SRI Fund Series A	−0.507	−0.443	0.049	7.433	0.000	0.027	0.081	3.434	0.012	0.282	0.256	0.620
Investors Summa Global SRI Class Series A	−0.553	−0.466	0.051	5.192	0.000	0.027	0.082	3.309	0.012	0.288	0.261	0.672
Investors Summa Global SRI Fund Series C	−0.521	−0.442	0.049	9.854	0.000	0.029	0.082	3.424	0.012	0.264	0.239	0.594
PH&N Community Values Global Equity Fund Series F	−0.268	−0.403	0.049	0.011	0.000	0.010	0.103	3.006	0.012	1.000	1.000	1.000
Mac Universal Sustainable Opportunities Class T6	−0.433	−0.739	0.049	0.044	0.050	0.021	0.112	3.125	0.012	0.732	0.667	0.960
Mac Universal Sustainable Opportunities Class T8	−0.121	−0.898	0.049	0.015	0.050	0.022	0.112	3.526	0.013	1.000	1.000	1.000
RBC Jantzi Balanced Fund Series D	−0.060	−1.153	0.025	0.488	0.000	0.015	0.039	4.300	0.025	0.650	0.638	0.784
MFS MB Responsible Balanced Fund	0.087	−0.747	0.026	88.002	0.000	0.011	0.038	3.583	0.052	0.408	0.382	0.751
Investors Summa Global Environ Leaders Fund Series A	−1.216	−1.961	0.065	9.900	0.000	0.027	0.063	8.946	0.009	0.248	0.269	0.322
Investors Summa Global Environ Leaders Class Series A	−1.240	−1.943	0.065	3.451	0.000	0.027	0.063	8.890	0.009	0.267	0.293	0.357

(continued)

Table 4 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	VaR 95 %	Kurt.	DEA-1	DEA-2	DEA-3	DEA-4
Investors Summa Global Environ Leaders Fund Series C	−1.230	−1.971	0.065	11.766	0.000	0.029	0.063	8.978	0.009	0.235	0.253	0.315
Meritas International Equity Fund Series A	−0.592	−0.472	0.040	25.087	0.050	0.029	0.068	3.066	0.015	0.230	0.211	0.663
Ethical International Equity Fund Series A	−0.730	−0.887	0.049	45.768	0.050	0.029	0.072	4.362	0.013	0.211	0.200	0.491
Ethical International Equity Fund Series F	−0.640	−0.880	0.049	1.018	0.050	0.019	0.071	4.338	0.013	0.436	0.432	0.665
Meritas International Equity Fund Series F	−0.488	−0.438	0.040	1.697	0.000	0.019	0.066	3.042	0.015	0.406	0.375	0.845
Ethical American Multi-Strategy Fund Series A	0.043	0.030	0.047	41.428	0.050	0.024	0.079	2.513	0.013	0.241	0.221	0.817
Meritas U.S. Equity Fund	−0.319	−0.332	0.042	10.519	0.050	0.029	0.083	3.056	0.015	0.263	0.229	0.665
Ethical American Multi-Strategy Fund Series F	0.149	0.048	0.046	0.306	0.000	0.014	0.077	2.494	0.053	0.681	0.681	1.000
Meritas U.S. Equity Fund Series F	−0.217	−0.322	0.042	2.026	0.000	0.012	0.082	3.052	0.015	0.499	0.424	0.897

This table lists the efficiency scores (columns 10–13) according to each of the four DEA models for 85 SRI mutual funds. Efficient funds have efficiency scores equal to one. However, inefficient funds are characterized by an efficiency rating of less than one

Table 5 Comparison of the efficient set and the minimum and average efficiency scores obtained with DEA-1, DEA-2, DEA-3, and DEA-4 models

Efficient funds	DEA-1	DEA-2	DEA-3	DEA-4
PH&N Community Values Canadian Equity Fund Ser O		●	●	●
PH&N Community Values Canadian Equity Fund Ser F				●
MFS MB Responsible Fixed Income Fund			●	●
PH&N Community Values Bond Fund Series O	●	●	●	●
PH&N Community Values Bond Fund Series B		●	●	●
PH&N Community Values Bond Fund Series F		●	●	●
Meritas Canadian Bond Fund Series F		●	●	●
Ethical Select Conservative Portfolio Class F		●	●	●
Acuity Pooled Social Values Canadian Equity Fund		●	●	●
Matrix Sierra Equity Fund Class F		●	●	●
Meritas Money Market Fund Series A	●	●	●	●
PH&N Community Values Balanced Fund Series O		●	●	●
PH&N Community Values Balanced Fund Series B				●
Meritas Balanced Portfolio Series F				●
RBC Jantzi Global Equity Fund Series F				●
PH&N Community Values Global Equity Fund Series F		●	●	●
Mac Universal Sustainable Opportunities Class T8		●	●	●
Ethical American Multi-Strategy Fund Series F				●
Number of efficient funds	2	12	13	18
Minimum score	0.007	0.142	0.086	0.300
Average score	0.125	0.499	0.478	0.747

This table presents the names and the number of efficient SRI funds according to the four DEA models. It also provides the minimum score and the average efficiency score for each model

In the third application (DEA-3), we introduce the value at risk as a measure of tail risk, instead of the standard deviation. The results show that the efficient set did not change considerably from the second application since only one additional fund is a member of the new efficient set.

In the fourth application (DEA-4), we incorporate higher-moment risk variables (kurtosis and skewness) into the analysis. The results improve in a substantial manner, where six additional funds turn out to be efficient, in comparison with the DEA-2 results. This would suggest the importance and the contribution of these higher moment variables in the assessment of the performance of our sampled funds. This last specification is consistent with the higher moment SDF model of Ayadi and Kryzanowski (2013) for the evaluation of Canadian domestic equity funds. For this extended DEA model, the efficient target values, efficient peer groups, optimal weights, and lambda values for the fourth DEA model are reported in Tables 6, 7, 8, and 9, respectively.

Table 6 Target values of input and output variables for the fourth DEA model

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
Ethical Canadian Dividend Fund Series A	0.004	0.015	0.009	5.726	0.000	0.017	2.032
Ethical Canadian Dividend Fund Series F	0.002	−0.067	0.036	1.770	0.000	0.013	2.521
GWL Ethics Fund (G) NL	0.003	−0.083	0.020	12.116	0.000	0.012	2.278
GWL Ethics Fund (G) DSC	0.003	−0.099	0.022	13.238	0.000	0.012	2.319
Meritas Jantzi Social Index Fund	0.003	−0.062	0.020	13.188	0.000	0.013	2.224
London Life Ethics Fund (GWLIM)	0.003	−0.082	0.022	15.166	0.000	0.012	2.271
MFS MB Responsible Canadian Equity Fund	0.003	−0.092	0.025	16.048	0.000	0.011	2.297
PH&N Community Values Canadian Equity Fund Ser D	0.002	−0.103	0.026	17.052	0.000	0.011	2.323
PH&N Community Values Canadian Equity Fund Ser O	0.000	−0.291	0.053	35.025	0.000	0.001	2.784
Meritas Monthly Dividend and Income Fund	0.004	0.015	0.009	5.726	0.000	0.017	2.032
iShares Jantzi Social Index Fund	0.001	−0.335	0.038	17.809	0.000	0.004	2.926
RBC Jantzi Canadian Equity Fund Series A	0.003	−0.089	0.021	12.956	0.000	0.012	2.292
RBC Jantzi Canadian Equity Fund Series F	0.001	−0.403	0.036	0.654	0.000	0.008	3.163
RBC Jantzi Canadian Equity Fund Series D	0.002	−0.240	0.036	0.917	0.000	0.009	2.953
PH&N Community Values Canadian Equity Fund Ser B	0.001	−0.012	0.047	0.266	0.000	0.014	2.563
PH&N Community Values Canadian Equity Fund Ser F	−0.001	−0.300	0.053	0.223	0.000	0.011	2.792
Meritas Jantzi Social Index Fund Series F	0.003	−0.313	0.022	3.486	0.000	0.008	2.891
Meritas Monthly Dividend and Income Fund Series F	0.002	−0.110	0.036	0.815	0.000	0.014	2.687
Acuity Social Values Balanced Fund	0.004	−0.126	0.017	20.737	0.000	0.012	2.358
Ethical Balanced Fund Class A	0.004	−0.103	0.015	18.412	0.000	0.013	2.303

(continued)

Table 6 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
Ethical Balanced Fund Class F	0.004	−0.494	0.021	0.721	0.000	0.010	3.308
NEI Canadian Bond Class A	0.004	0.065	0.009	52.011	0.006	0.014	2.646
Meritas Canadian Bond Fund	0.004	0.053	0.009	5.742	0.001	0.016	2.087
MFS MB Responsible Fixed Income Fund	0.006	−0.156	0.011	117.395	0.000	0.015	2.636
PH&N Community Values Bond Fund Series D	0.005	−0.680	0.010	18.778	0.000	0.006	3.541
PH&N Community Values Bond Fund Series O	0.006	−0.727	0.010	88.963	0.000	0.001	3.658
NEI Canadian Bond Class F	0.005	−0.298	0.009	40.845	0.000	0.010	2.718
PH&N Community Values Bond Fund Series B	0.005	−0.736	0.010	0.355	0.000	0.010	3.685
PH&N Community Values Bond Fund Series F	0.005	−0.720	0.010	5.493	0.000	0.007	3.624
Meritas Canadian Bond Fund Series F	0.004	0.015	0.009	5.726	0.000	0.017	2.032
Ethical Select Conservative Portfolio Class A	0.004	−0.092	0.009	30.970	0.004	0.011	2.773
Ethical Select Conservative Portfolio Class F	0.002	−1.176	0.018	0.062	0.000	0.011	5.131
Ethical Growth Fund Series A	0.003	−0.049	0.018	11.882	0.000	0.013	2.190
Investors Summa SRI Fund Series C	0.004	−0.003	0.012	7.506	0.000	0.016	2.078
Acuity Social Values Canadian Equity Fund	0.003	−0.061	0.020	13.093	0.000	0.013	2.221
Investors Summa SRI Class A	0.004	−0.014	0.013	8.550	0.000	0.015	2.105
Acuity Pooled Social Values Canadian Equity Fund	0.000	−1.122	0.064	8.659	0.050	0.002	5.133
Investors Summa SRI Fund Series A	0.004	−0.018	0.014	8.958	0.000	0.015	2.115
Ethical Growth Fund Series F	0.002	−0.216	0.037	0.841	0.000	0.010	2.908
Alpha Social Values Portfolio	0.003	−0.128	0.016	5.734	0.000	0.013	2.407

(continued)

Table 6 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
Acuity Clean Environment Equity Fund	0.003	−0.061	0.020	13.031	0.000	0.013	2.220
Matrix Sierra Equity Fund	0.003	−0.389	0.025	1.311	0.000	0.009	3.124
Matrix Sierra Equity Fund Class F	−0.015	−2.289	0.084	0.008	0.000	0.021	10.086
Meritas Money Market Fund Series A	0.000	1.586	0.001	6.409	0.050	0.007	4.302
PH&N Community Values Balanced Fund Series D	0.002	−0.273	0.024	8.307	0.000	0.008	2.778
PH&N Community Values Balanced Fund Series O	0.002	−0.541	0.030	1.135	0.000	0.003	3.490
Meritas Balanced Portfolio Series A	0.004	−0.057	0.012	9.739	0.000	0.015	2.209
PH&N Community Values Balanced Fund Series B	0.000	−0.543	0.030	0.153	0.000	0.017	3.494
Meritas Balanced Portfolio Series F	0.002	−0.404	0.024	0.191	0.000	0.016	3.876
Ethical Special Equity Fund Series A	0.003	−0.035	0.016	10.582	0.000	0.014	2.157
Ethical Special Equity Fund Series F	0.003	−0.218	0.022	3.045	0.000	0.011	2.706
Ethical Global Equity Fund Class A	0.004	0.015	0.009	5.726	0.000	0.017	2.032
Acuity Social Values Global Equity Fund	0.004	−0.005	0.012	7.699	0.000	0.016	2.083
MFS MB Responsible Global Research Fund	0.004	−0.010	0.013	8.193	0.000	0.015	2.095
Mac Universal Sustainable Opportunities Class A	0.004	0.002	0.011	7.024	0.000	0.016	2.065
PH&N Community Values Global Equity Fund Series D	0.003	−0.179	0.017	5.030	0.000	0.012	2.541
PH&N Community Values Global Equity Fund Series O	0.001	−0.332	0.046	40.464	0.000	0.002	2.861
Ethical Global Equity Fund Class F	0.002	0.044	0.042	0.897	0.000	0.014	2.444
RBC Jantzi Global Equity Fund	0.004	−0.014	0.011	6.454	0.000	0.016	2.109

(continued)

Table 6 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
RBC Jantzi Global Equity Fund Series D	0.002	−0.268	0.037	0.255	0.000	0.012	2.937
RBC Jantzi Global Equity Fund Series F	−0.004	−0.744	0.038	0.268	0.000	0.010	3.020
TD Global Sustainability Fund—Investor Series	0.003	−0.126	0.015	5.264	0.000	0.013	2.403
TD Global Sustainability Fund—Advisor Series	0.003	−0.120	0.015	5.324	0.000	0.013	2.387
TD Global Sustainability Fund—Series F	0.002	−0.311	0.025	6.426	0.000	0.008	2.884
Ethical Global Dividend Fund Series A	0.004	0.021	0.015	4.786	0.000	0.016	2.112
Ethical Global Dividend Fund Series F	0.001	−0.115	0.042	0.271	0.000	0.013	2.718
Investors Summa Global SRI Fund Series A	0.004	0.022	0.017	4.606	0.000	0.016	2.128
Investors Summa Global SRI Class Series A	0.003	0.029	0.024	3.488	0.000	0.016	2.223
Investors Summa Global SRI Fund Series C	0.004	0.015	0.009	5.726	0.000	0.017	2.032
PH&N Community Values Global Equity Fund Series F	−0.003	−0.403	0.049	0.011	0.000	0.010	3.006
Mac Universal Sustainable Opportunities Class T6	−0.002	−0.388	0.048	0.042	0.000	0.010	3.000
Mac Universal Sustainable Opportunities Class T8	−0.001	−0.898	0.049	0.015	0.050	0.022	3.526
RBC Jantzi Balanced Fund Series D	0.004	−0.531	0.019	0.382	0.000	0.011	3.370
MFS MB Responsible Balanced Fund	0.004	−0.276	0.019	37.263	0.000	0.008	2.689
Investors Summa Global Environ Leaders Fund Ser A	0.003	−0.310	0.021	3.186	0.000	0.009	2.879
Investors Summa Global Environ Leaders Class Ser A	0.003	−0.426	0.023	1.233	0.000	0.010	3.177
Investors Summa Global Environ Leaders Fund Ser C	0.003	−0.289	0.020	3.705	0.000	0.009	2.827
Meritas International Equity Fund Series A	0.004	0.015	0.009	5.726	0.000	0.017	2.032

(continued)

Table 6 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
Ethical International Equity Fund Series A	0.003	−0.030	0.016	10.088	0.000	0.014	2.144
Ethical International Equity Fund Series F	0.003	−0.224	0.032	0.677	0.000	0.012	2.884
Meritas International Equity Fund Series F	0.003	−0.071	0.033	1.433	0.000	0.014	2.570
Ethical American Multi-Strategy Fund Series A	0.004	0.030	0.009	5.732	0.000	0.017	2.052
Meritas U.S. Equity Fund	0.004	0.015	0.009	5.726	0.000	0.017	2.032
Ethical American Multi-Strategy Fund Series F	0.001	0.048	0.046	0.306	0.000	0.014	2.495
Meritas U.S. Equity Fund Series F	0.001	−0.268	0.037	1.819	0.000	0.011	2.739

This table presents the target values of all input and output variables under the fourth DEA application. The analysis uses the net return and skewness (Skew.) as outputs, and the fund return standard deviation (Std. Dev.), total assets, front-end load, management expense ratio (MER), and kurtosis of returns (Kurt.) as inputs. The data cover 85 SRI funds over the period May 2008 to December 2011

Twelve Canadian SRI funds are efficient under the DEA runs: DEA-2, DEA-3, and DEA-4. This persistency characterizes them as the best-performing SRI funds of the sample under evaluation. On the other hand, 67 funds are found to be inefficient in all DEA runs, which qualify them as the worst-performing funds of the sample.

In order to uncover the reasons for poor fund performance, we compute for each fund the input slack variables, which reflect the improvements needed for an inefficient fund to become efficient (Table 10). The investigation of these slack variables and the relative mean slacks shows that the size of the fund, measured by the total assets, and the loads are the major sources of inefficiency. In this regard, inefficient funds basically need to reduce their loads and size in order to improve their efficiency.

Table 7 Peer groups of SRI funds for the fourth DEA model

Fund name	Peer group
Ethical Canadian Dividend Fund Series A	Meritas Canadian Bond Fund Series F
Ethical Canadian Dividend Fund Series F	PH&N Community Values Canadian Equity Fund Ser F, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
GWL Ethics Fund (G) NL	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
GWL Ethics Fund (G) DSC	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
Meritas Jantzi Social Index Fund	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
London Life Ethics Fund (GWLIM)	PH&N Community Values Canadian Equity Fund Ser O, PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F
MFS MB Responsible Canadian Equity Fund	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
PH&N Community Values Canadian Equity Fund Ser D	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
PH&N Community Values Canadian Equity Fund Ser O	PH&N Community Values Canadian Equity Fund Ser O
Meritas Monthly Dividend and Income Fund	Meritas Canadian Bond Fund Series F
iShares Jantzi Social Index Fund	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
RBC Jantzi Canadian Equity Fund Series A	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
RBC Jantzi Canadian Equity Fund Series F	PH&N Community Values Canadian Equity Fund Ser F, PH&N Community Values Bond Fund Series B, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
RBC Jantzi Canadian Equity Fund Series D	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
PH&N Community Values Canadian Equity Fund Ser B	PH&N Community Values Global Equity Fund Series F, Ethical American Multi-Strategy Fund Series F
PH&N Community Values Canadian Equity Fund Ser F	PH&N Community Values Canadian Equity Fund Ser F
Meritas Jantzi Social Index Fund Series F	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O

(continued)

Table 7 (continued)

Fund name	Peer group
Meritas Monthly Dividend and Income Fund Series F	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, Ethical American Multi-Strategy Fund Series F
Acuity Social Values Balanced Fund	PH&N Community Values Canadian Equity Fund Ser O, PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F
Ethical Balanced Fund Class A	PH&N Community Values Canadian Equity Fund Ser O, PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F
Ethical Balanced Fund Class F	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
NEI Canadian Bond Class A	MFS MB Responsible Fixed Income Fund, PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F, Meritas Money Market Fund Series A
Meritas Canadian Bond Fund	Meritas Canadian Bond Fund Series F, Meritas Money Market Fund Series A
MFS MB Responsible Fixed Income Fund	MFS MB Responsible Fixed Income Fund
PH&N Community Values Bond Fund Series D	PH&N Community Values Bond Fund Series O, PH&N Community Values Bond Fund Series F, Meritas Canadian Bond Fund Series F
PH&N Community Values Bond Fund Series O	PH&N Community Values Bond Fund Series O
NEI Canadian Bond Class F	PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F
PH&N Community Values Bond Fund Series B	PH&N Community Values Bond Fund Series B
PH&N Community Values Bond Fund Series F	PH&N Community Values Bond Fund Series F
Meritas Canadian Bond Fund Series F	Meritas Canadian Bond Fund Series F
Ethical Select Conservative Portfolio Class A	PH&N Community Values Bond Fund Series O, PH&N Community Values Bond Fund Series F, Meritas Canadian Bond Fund Series F, Meritas Money Market Fund Series A
Ethical Select Conservative Portfolio Class F	Ethical Select Conservative Portfolio Class F
Ethical Growth Fund Series A	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
Investors Summa SRI Fund Series C	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
Acuity Social Values Canadian Equity Fund	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
Investors Summa SRI Class A	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F

(continued)

Table 7 (continued)

Fund name	Peer group
Acuity Pooled Social Values Canadian Equity Fund	Acuity Pooled Social Values Canadian Equity Fund
Investors Summa SRI Fund Series A	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
Ethical Growth Fund Series F	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
Alpha Social Values Portfolio	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
Acuity Clean Environment Equity Fund	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
Matrix Sierra Equity Fund	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
Matrix Sierra Equity Fund Class F	Matrix Sierra Equity Fund Class F
Meritas Money Market Fund Series A	Meritas Money Market Fund Series A
PH&N Community Values Balanced Fund Series D	PH&N Community Values Canadian Equity Fund Ser O, PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
PH&N Community Values Balanced Fund Series O	PH&N Community Values Balanced Fund Series O
Meritas Balanced Portfolio Series A	PH&N Community Values Canadian Equity Fund Ser O, PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
PH&N Community Values Balanced Fund Series B	PH&N Community Values Balanced Fund Series B
Meritas Balanced Portfolio Series F	Meritas Balanced Portfolio Series F
Ethical Special Equity Fund Series A	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
Ethical Special Equity Fund Series F	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
Ethical Global Equity Fund Class A	Meritas Canadian Bond Fund Series F
Acuity Social Values Global Equity Fund	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
MFS MB Responsible Global Research Fund	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F

(continued)

Table 7 (continued)

Fund name	Peer group
Mac Universal Sustainable Opportunities Class A	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
PH&N Community Values Global Equity Fund Series D	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
PH&N Community Values Global Equity Fund Series O	PH&N Community Values Canadian Equity Fund Ser O, PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F
Ethical Global Equity Fund Class F	Meritas Canadian Bond Fund Series F, Ethical American Multi-Strategy Fund Series F
RBC Jantzi Global Equity Fund	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
RBC Jantzi Global Equity Fund Series D	PH&N Community Values Bond Fund Series B, PH&N Community Values Global Equity Fund Series F, Ethical American Multi-Strategy Fund Series F
RBC Jantzi Global Equity Fund Series F	RBC Jantzi Global Equity Fund Series F
TD Global Sustainability Fund—Investor Series	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
TD Global Sustainability Fund—Advisor Series	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
TD Global Sustainability Fund—Series F	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
Ethical Global Dividend Fund Series A	Meritas Canadian Bond Fund Series F, Ethical American Multi-Strategy Fund Series F
Ethical Global Dividend Fund Series F	PH&N Community Values Bond Fund Series B, PH&N Community Values Global Equity Fund Series F, Ethical American Multi-Strategy Fund Series F
Investors Summa Global SRI Fund Series A	Meritas Canadian Bond Fund Series F, Ethical American Multi-Strategy Fund Series F
Investors Summa Global SRI Class Series A	Meritas Canadian Bond Fund Series F, Ethical American Multi-Strategy Fund Series F
Investors Summa Global SRI Fund Series C	Meritas Canadian Bond Fund Series F
PH&N Community Values Global Equity Fund Series F	PH&N Community Values Global Equity Fund Series F
Mac Universal Sustainable Opportunities Class T6	PH&N Community Values Bond Fund Series B, PH&N Community Values Global Equity Fund Series F, Ethical American Multi-Strategy Fund Series F
Mac Universal Sustainable Opportunities Class T8	Ethical Select Conservative Portfolio Class F, PH&N Community Values Global Equity Fund Series F, Mac Universal Sustainable Opportunities Class T8

(continued)

Table 7 (continued)

Fund name	Peer group
RBC Jantzi Balanced Fund Series D	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, Ethical American Multi-Strategy Fund Series F
MFS MB Responsible Balanced Fund	PH&N Community Values Canadian Equity Fund Ser O, PH&N Community Values Bond Fund Series O, Meritas Canadian Bond Fund Series F
Investors Summa Global Environ Leaders Fund Ser A	PH&N Community Values Bond Fund Series O, PH&N Community Values Bond Fund Series F, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
Investors Summa Global Environ Leaders Class Ser A	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
Investors Summa Global Environ Leaders Fund Ser C	PH&N Community Values Bond Fund Series O, PH&N Community Values Bond Fund Series F, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O
Meritas International Equity Fund Series A	Meritas Canadian Bond Fund Series F
Ethical International Equity Fund Series A	PH&N Community Values Canadian Equity Fund Ser O, Meritas Canadian Bond Fund Series F
Ethical International Equity Fund Series F	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O, Ethical American Multi-Strategy Fund Series F
Meritas International Equity Fund Series F	PH&N Community Values Bond Fund Series B, Meritas Canadian Bond Fund Series F, Ethical American Multi-Strategy Fund Series F
Ethical American Multi-Strategy Fund Series A	Meritas Canadian Bond Fund Series F, Meritas Money Market Fund Series A
Meritas U.S. Equity Fund	Meritas Canadian Bond Fund Series F
Ethical American Multi-Strategy Fund Series F	Ethical American Multi-Strategy Fund Series F
Meritas U.S. Equity Fund Series F	PH&N Community Values Canadian Equity Fund Ser F, Meritas Canadian Bond Fund Series F, PH&N Community Values Balanced Fund Series O

This table presents efficient peers for each SRI funds under the fourth DEA application. The analysis uses the net return and skewness (Skew.) as outputs, and the fund return standard deviation (Std. Dev.), total assets, front-end load, management expense ratio (MER), and kurtosis of fund returns (Kurt.) as inputs. The data cover 85 SRI funds over the period May 2008 to December 2011

Table 8 Optimal weights in the fourth DEA model

Fund name	Return	Skew.	Std. dev.	Total assets	Front-end load	MER	Kurt.
Ethical Canadian Dividend Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.348
Ethical Canadian Dividend Fund Series F	0.000	0.000	0.485	0.014	0.000	20.042	0.228
GWL Ethics Fund (G) NL	0.000	0.000	0.000	0.003	0.000	11.077	0.114
GWL Ethics Fund (G) DSC	0.000	0.000	0.000	0.003	0.000	11.278	0.117
Meritas Jantzi Social Index Fund	0.000	0.000	0.000	0.000	0.000	11.297	0.228
London Life Ethics Fund (GWLIM)	0.000	0.000	2.087	0.000	0.000	11.411	0.108
MFS MB Responsible Canadian Equity Fund	0.000	0.000	0.000	0.000	0.000	11.131	0.225
PH&N Community Values Canadian Equity Fund Ser D	0.000	0.000	0.000	0.000	0.000	14.357	0.290
PH&N Community Values Canadian Equity Fund Ser O	0.000	0.000	0.000	0.007	0.000	25.605	0.265
Meritas Monthly Dividend and Income Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.351
iShares Jantzi Social Index Fund	0.000	0.000	0.000	0.006	0.000	21.957	0.227
RBC Jantzi Canadian Equity Fund Series A	0.000	0.000	0.000	0.004	0.000	14.942	0.154
RBC Jantzi Canadian Equity Fund Series F	24.162	0.000	0.000	0.159	0.000	25.190	0.161
RBC Jantzi Canadian Equity Fund Series D	0.000	0.000	4.027	0.037	0.000	10.804	0.160
PH&N Community Values Canadian Equity Fund Ser B	0.000	0.000	0.000	0.523	0.000	0.000	0.302
PH&N Community Values Canadian Equity Fund Ser F	0.333	0.000	0.479	0.016	0.000	22.914	0.260
Meritas Jantzi Social Index Fund Series F	0.000	0.000	0.000	0.006	0.000	21.878	0.226
Meritas Monthly Dividend and Income Fund Series F	0.000	0.000	7.592	0.072	0.000	0.000	0.227
Acuity Social Values Balanced Fund	0.000	0.000	1.989	0.000	0.000	10.871	0.103

(continued)

Table 8 (continued)

Fund name	Return	Skew.	Std. dev.	Total assets	Front-end load	MER	Kurt.
Ethical Balanced Fund Class A	0.000	0.000	2.806	0.000	0.000	15.341	0.145
Ethical Balanced Fund Class F	0.000	0.000	4.432	0.040	0.000	11.890	0.176
NEI Canadian Bond Class A	90.757	0.000	60.811	0.000	0.000	4.831	0.099
Meritas Canadian Bond Fund	0.000	0.000	60.580	0.000	0.000	0.000	0.221
MFS MB Responsible Fixed Income Fund	78.533	0.000	0.000	0.000	0.000	18.883	0.272
PH&N Community Values Bond Fund Series D	94.956	0.000	96.206	0.001	9.164	0.000	0.000
PH&N Community Values Bond Fund Series O	48.812	0.000	0.000	0.002	0.000	27.728	0.215
NEI Canadian Bond Class F	0.000	0.000	91.339	0.000	16.676	8.124	0.000
PH&N Community Values Bond Fund Series B	3.641	0.000	3.612	0.132	0.000	21.034	0.192
PH&N Community Values Bond Fund Series F	54.413	0.000	0.000	0.020	0.000	24.239	0.201
Meritas Canadian Bond Fund Series F	0.333	0.000	0.478	0.016	0.000	22.877	0.259
Ethical Select Conservative Portfolio Class A	0.000	0.000	7.054	0.001	0.000	15.201	0.088
Ethical Select Conservative Portfolio Class F	0.000	0.000	4.454	0.515	0.000	67.819	0.028
Ethical Growth Fund Series A	0.000	0.000	0.000	0.000	0.000	10.039	0.203
Investors Summa SRI Fund Series C	0.000	0.000	0.000	0.000	0.000	9.481	0.192
Acuity Social Values Canadian Equity Fund	0.000	0.000	0.000	0.000	0.000	7.472	0.151
Investors Summa SRI Class A	0.000	0.000	0.000	0.000	0.000	9.702	0.196
Acuity Pooled Social Values Canadian Equity Fund	0.000	0.000	0.000	0.013	0.000	305.185	0.046
Investors Summa SRI Fund Series A	0.000	0.000	0.000	0.000	0.000	9.632	0.195

(continued)

Table 8 (continued)

Fund name	Return	Skew.	Std. dev.	Total assets	Front-end load	MER	Kurt.
Ethical Growth Fund Series F	0.000	0.000	4.129	0.038	0.000	11.079	0.164
Alpha Social Values Portfolio	0.000	0.000	0.000	0.003	0.000	11.550	0.119
Acuity Clean Environment Equity Fund	0.000	0.000	0.000	0.000	0.000	7.534	0.152
Matrix Sierra Equity Fund	0.000	0.000	1.607	0.015	0.000	4.311	0.064
Matrix Sierra Equity Fund Class F	0.000	0.000	6.291	63.162	0.000	0.000	0.000
Meritas Money Market Fund Series A	0.000	0.135	0.000	0.006	0.000	23.267	0.184
PH&N Community Values Balanced Fund Series D	0.000	0.000	4.697	0.001	0.000	24.272	0.167
PH&N Community Values Balanced Fund Series O	0.333	0.000	0.479	0.016	0.000	22.896	0.260
Meritas Balanced Portfolio Series A	0.000	0.000	3.276	0.001	0.000	16.929	0.116
PH&N Community Values Balanced Fund Series B	0.000	0.000	10.804	0.920	0.000	0.000	0.153
Meritas Balanced Portfolio Series F	0.000	0.177	10.154	0.652	0.000	0.000	0.164
Ethical Special Equity Fund Series A	0.000	0.000	0.000	0.000	0.000	8.877	0.180
Ethical Special Equity Fund Series F	32.571	0.000	0.000	0.022	0.000	14.696	0.154
Ethical Global Equity Fund Class A	0.000	0.000	0.000	0.000	0.000	0.000	0.389
Acuity Social Values Global Equity Fund	0.000	0.000	0.000	0.000	0.000	9.076	0.184
MFS MB Responsible Global Research Fund	0.000	0.000	0.000	0.000	0.000	14.123	0.286
Mac Universal Sustainable Opportunities Class A	0.000	0.000	0.000	0.000	0.000	11.462	0.232
PH&N Community Values Global Equity Fund Series D	0.000	0.000	0.000	0.005	0.000	21.428	0.221

(continued)

Table 8 (continued)

Fund name	Return	Skew.	Std. dev.	Total assets	Front-end load	MER	Kurt.
PH&N Community Values Global Equity Fund Series O	0.000	0.000	4.583	0.000	0.000	25.052	0.237
Ethical Global Equity Fund Class F	0.000	0.000	0.000	0.032	0.000	0.000	0.377
RBC Jantzi Global Equity Fund	0.000	0.000	0.000	0.005	0.000	17.934	0.185
RBC Jantzi Global Equity Fund Series D	0.000	0.000	7.298	0.422	0.000	0.000	0.204
RBC Jantzi Global Equity Fund Series F	0.000	0.000	2.735	0.094	0.000	21.578	0.216
TD Global Sustainability Fund—Investor Series	0.000	0.000	0.000	0.003	0.000	13.486	0.139
TD Global Sustainability Fund—Advisor Series	0.000	0.000	0.000	0.003	0.000	13.639	0.141
TD Global Sustainability Fund—Series F	0.000	0.000	0.000	0.004	0.000	16.668	0.172
Ethical Global Dividend Fund Series A	0.000	0.000	0.000	0.022	0.000	0.000	0.260
Ethical Global Dividend Fund Series F	0.000	0.000	6.311	0.365	0.000	0.000	0.176
Investors Summa Global SRI Fund Series A	0.000	0.000	0.000	0.021	0.000	0.000	0.246
Investors Summa Global SRI Class Series A	0.000	0.000	0.000	0.023	0.000	0.000	0.267
Investors Summa Global SRI Fund Series C	0.000	0.000	0.000	0.000	0.000	0.000	0.292
PH&N Community Values Global Equity Fund Series F	0.000	0.008	2.893	0.104	0.000	21.990	0.211
Mac Universal Sustainable Opportunities Class T6	0.000	0.000	7.181	0.416	0.000	0.000	0.200
Mac Universal Sustainable Opportunities Class T8	76.562	0.000	4.867	1.887	0.000	0.000	0.209
RBC Jantzi Balanced Fund Series D	0.000	0.000	6.328	0.060	0.000	0.000	0.189
MFS MB Responsible Balanced Fund	0.000	0.000	3.667	0.000	0.000	20.048	0.189

(continued)

Table 8 (continued)

Fund name	Return	Skew.	Std. dev.	Total assets	Front-end load	MER	Kurt.
Investors Summa Global Environ Leaders Fund Ser A	0.000	0.000	2.669	0.001	0.000	10.247	0.061
Investors Summa Global Environ Leaders Class Ser A	0.000	0.000	1.917	0.017	0.000	5.142	0.076
Investors Summa Global Environ Leaders Fund Ser C	0.000	0.000	2.611	0.001	0.000	10.026	0.060
Meritas International Equity Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.326
Ethical International Equity Fund Series A	0.000	0.000	0.000	0.000	0.000	8.519	0.172
Ethical International Equity Fund Series F	0.000	0.000	3.566	0.033	0.000	9.567	0.142
Meritas International Equity Fund Series F	0.000	0.000	6.818	0.065	0.000	0.000	0.204
Ethical American Multi-Strategy Fund Series A	0.000	0.575	0.000	0.000	0.000	0.000	0.398
Meritas U.S. Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.327
Ethical American Multi-Strategy Fund Series F	0.333	0.000	0.479	0.016	0.000	22.897	0.260
Meritas U.S. Equity Fund Series F	0.000	0.000	0.000	0.010	0.000	21.744	0.237

This table presents the optimal weights in the fourth DEA application. The analysis uses the net return and skewness (Skew.) as outputs, and the fund return standard deviation (Std. Dev.), total assets, front-end load, management expense ratio (MER), and kurtosis of fund returns (Kurt.) as inputs. The data cover 85 SRI funds over the period May 2008 to December 2011

These results present some advantages to either potential investors or mutual fund managers. On the one hand, they help investors identify the best-performing SRI mutual funds and offer insight into the factors they should consider when investing in SRI mutual funds. On the other hand, the results help mutual-fund managers to identify which of their peers are outperforming them, and what are the success factors for SRI funds in order to improve their operational behaviour.

Table 9 Lambda values in the fourth DEA model

Fund name	PH&N Community Values Canadian Equity Fund Ser O	PH&N Community Values Canadian Equity Fund Ser F	MFS MB Responsible Fixed Income Fund	PH&N Community Values Bond Fund Series O	PH&N Community Values Bond Fund Series B	PH&N Community Values Bond Fund Series F	Meritas Canadian Bond Fund Series F	Ethical Select Conservative Portfolio Class F	Acuity Pooled Social Values Canadian Equity Fund
Ethical Canadian Dividend Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Ethical Canadian Dividend Fund Series F	0.000	0.122	0.000	0.000	0.000	0.000	0.255	0.000	0.000
GWL Ethics Fund (G) NL	0.226	0.000	0.000	0.000	0.000	0.000	0.722	0.000	0.000
GWL Ethics Fund (G) DSC	0.266	0.000	0.000	0.000	0.000	0.000	0.674	0.000	0.000
Meritas Jantzi Social Index Fund	0.255	0.000	0.000	0.000	0.000	0.000	0.745	0.000	0.000
London Life Ethics Fund (GWLIM)	0.306	0.000	0.000	0.006	0.000	0.000	0.689	0.000	0.000
MFS MB Responsible Canadian Equity Fund	0.352	0.000	0.000	0.000	0.000	0.000	0.648	0.000	0.000
PH&N Community Values Canadian Equity Fund Ser D	0.387	0.000	0.000	0.000	0.000	0.000	0.613	0.000	0.000
PH&N Community Values Canadian Equity Fund Ser O	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

(continued)

Table 9 (continued)

Fund name	PH&N Community Values Canadian Equity Fund Ser O	PH&N Community Values Canadian Equity Fund Ser F	MFS MB Responsible Fixed Income Fund	PH&N Community Values Bond Fund Series O	PH&N Community Values Bond Fund Series B	PH&N Community Values Bond Fund Series F	Meritas Canadian Bond Fund Series F	Ethical Select Conservative Portfolio Class F	Acuity Pooled Social Values Canadian Equity Fund
Meritas Monthly Dividend and Income Fund	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
iShares Jantzi Social Index Fund	0.470	0.000	0.000	0.000	0.000	0.000	0.159	0.000	0.000
RBC Jantzi Canadian Equity Fund Series A	0.254	0.000	0.000	0.000	0.000	0.000	0.698	0.000	0.000
RBC Jantzi Canadian Equity Fund Series F	0.000	0.266	0.000	0.000	0.128	0.000	0.000	0.000	0.000
RBC Jantzi Canadian Equity Fund Series D	0.000	0.000	0.000	0.000	0.036	0.000	0.045	0.000	0.000
PH&N Community Values Canadian Equity Fund Ser B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Canadian Equity Fund Ser F	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Jantzi Social Index Fund Series F	0.015	0.000	0.000	0.000	0.000	0.000	0.403	0.000	0.000
Meritas Monthly Dividend and Income Fund Series F	0.000	0.000	0.000	0.000	0.197	0.000	0.092	0.000	0.000
Acuity Social Values Balanced Fund	0.182	0.000	0.000	0.116	0.000	0.000	0.701	0.000	0.000
Ethical Balanced Fund Class A	0.131	0.000	0.000	0.106	0.000	0.000	0.763	0.000	0.000

Ethical Balanced Fund Class F	0.000	0.000	0.000	0.000	0.574	0.000	0.048	0.000	0.000
NEI Canadian Bond Class A	0.000	0.000	0.345	0.092	0.000	0.000	0.450	0.000	0.000
Meritas Canadian Bond Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.976	0.000	0.000
MFS MB Responsible Fixed Income Fund	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Bond Fund Series D	0.000	0.000	0.000	0.159	0.000	0.785	0.056	0.000	0.000
PH&N Community Values Bond Fund Series O	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
NEI Canadian Bond Class F	0.000	0.000	0.000	0.422	0.000	0.000	0.578	0.000	0.000
PH&N Community Values Bond Fund Series B	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
PH&N Community Values Bond Fund Series F	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
Meritas Canadian Bond Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Ethical Select Conservative Portfolio Class A	0.000	0.000	0.000	0.303	0.000	0.030	0.579	0.000	0.000
Ethical Select Conservative Portfolio Class F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
Ethical Growth Fund Series A	0.210	0.000	0.000	0.000	0.000	0.000	0.790	0.000	0.000

(continued)

Table 9 (continued)

Fund name	PH&N Community Values Canadian Equity Fund Ser O	PH&N Community Values Canadian Equity Fund Ser F	MFS MB Responsible Fixed Income Fund	PH&N Community Values Bond Fund Series O	PH&N Community Values Bond Fund Series B	PH&N Community Values Bond Fund Series F	Meritas Canadian Bond Fund Series F	Ethical Select Conservative Portfolio Class F	Acuity Pooled Social Values Canadian Equity Fund
Investors Summa SRI Fund Series C	0.061	0.000	0.000	0.000	0.000	0.000	0.939	0.000	0.000
Acuity Social Values Canadian Equity Fund	0.251	0.000	0.000	0.000	0.000	0.000	0.749	0.000	0.000
Investors Summa SRI Class A	0.096	0.000	0.000	0.000	0.000	0.000	0.904	0.000	0.000
Acuity Pooled Social Values Canadian Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Investors Summa SRI Fund Series A	0.110	0.000	0.000	0.000	0.000	0.000	0.890	0.000	0.000
Ethical Growth Fund Series F	0.000	0.000	0.000	0.000	0.068	0.000	0.044	0.000	0.000
Alpha Social Values Portfolio	0.038	0.000	0.000	0.000	0.000	0.000	0.725	0.000	0.000
Acuity Clean Environment Equity Fund	0.249	0.000	0.000	0.000	0.000	0.000	0.751	0.000	0.000
Matrix Sierra Equity Fund	0.000	0.000	0.000	0.000	0.306	0.000	0.133	0.000	0.000
Matrix Sierra Equity Fund Class F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Money Market Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

PH&N Community Values Balanced Fund Series D	0.130	0.000	0.000	0.009	0.000	0.000	0.426	0.000	0.000
PH&N Community Values Balanced Fund Series O	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Balanced Portfolio Series A	0.046	0.000	0.000	0.035	0.000	0.000	0.860	0.000	0.000
PH&N Community Values Balanced Fund Series B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Balanced Portfolio Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Special Equity Fund Series A	0.166	0.000	0.000	0.000	0.000	0.000	0.834	0.000	0.000
Ethical Special Equity Fund Series F	0.000	0.000	0.000	0.000	0.049	0.000	0.449	0.000	0.000
Ethical Global Equity Fund Class A	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Acuity Social Values Global Equity Fund	0.067	0.000	0.000	0.000	0.000	0.000	0.933	0.000	0.000
MFS MB Responsible Global Research Fund	0.084	0.000	0.000	0.000	0.000	0.000	0.916	0.000	0.000
Mac Universal Sustainable Opportunities Class A	0.044	0.000	0.000	0.000	0.000	0.000	0.956	0.000	0.000
PH&N Community Values Global Equity Fund Series D	0.029	0.000	0.000	0.000	0.000	0.000	0.637	0.000	0.000
PH&N Community Values Global Equity Fund Series O	0.836	0.000	0.000	0.123	0.000	0.000	0.041	0.000	0.000

(continued)

Table 9 (continued)

Fund name	PH&N Community Values Canadian Equity Fund Ser O	PH&N Community Values Canadian Equity Fund Ser F	MFS MB Responsible Fixed Income Fund	PH&N Community Values Bond Fund Series O	PH&N Community Values Bond Fund Series B	PH&N Community Values Bond Fund Series F	Meritas Canadian Bond Fund Series F	Ethical Select Conservative Portfolio Class F	Acuity Pooled Social Values Canadian Equity Fund
Ethical Global Equity Fund Class F	0.000	0.000	0.000	0.000	0.000	0.000	0.109	0.000	0.000
RBC Jantzi Global Equity Fund	0.031	0.000	0.000	0.000	0.000	0.000	0.933	0.000	0.000
RBC Jantzi Global Equity Fund Series D	0.000	0.000	0.000	0.000	0.278	0.000	0.000	0.000	0.000
RBC Jantzi Global Equity Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TD Global Sustainability Fund —Investor Series	0.022	0.000	0.000	0.000	0.000	0.000	0.735	0.000	0.000
TD Global Sustainability Fund —Advisor Series	0.023	0.000	0.000	0.000	0.000	0.000	0.746	0.000	0.000
TD Global Sustainability Fund —Series F	0.107	0.000	0.000	0.000	0.000	0.000	0.364	0.000	0.000
Ethical Global Dividend Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.827	0.000	0.000
Ethical Global Dividend Fund Series F	0.000	0.000	0.000	0.000	0.129	0.000	0.000	0.000	0.000
Investors Summa Global SRI Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.793	0.000	0.000

Investors Summa Global SRI Class Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.587	0.000	0.000
Investors Summa Global SRI Fund Series C	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
PH&N Community Values Global Equity Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mac Universal Sustainable Opportunities Class T6	0.000	0.000	0.000	0.000	0.038	0.000	0.000	0.000	0.000
Mac Universal Sustainable Opportunities Class T8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RBC Jantzi Balanced Fund Series D	0.000	0.000	0.000	0.000	0.739	0.000	0.007	0.000	0.000
MFS MB Responsible Balanced Fund	0.226	0.000	0.000	0.299	0.000	0.000	0.475	0.000	0.000
Investors Summa Global Environ Leaders Fund Ser A	0.000	0.000	0.000	0.000	0.000	0.019	0.421	0.000	0.000
Investors Summa Global Environ Leaders Class Ser A	0.000	0.000	0.000	0.000	0.392	0.000	0.125	0.000	0.000

(continued)

Table 9 (continued)

Fund name	PH&N Community Values Canadian Equity Fund Ser O	PH&N Community Values Canadian Equity Fund Ser F	MFS MB Responsible Fixed Income Fund	PH&N Community Values Bond Fund Series O	PH&N Community Values Bond Fund Series B	PH&N Community Values Bond Fund Series F	Meritas Canadian Bond Fund Series F	Ethical Select Conservative Portfolio Class F	Acuity Pooled Social Values Canadian Equity Fund
Investors Summa Global Environ Leaders Fund Ser C	0.000	0.000	0.000	0.005	0.000	0.001	0.455	0.000	0.000
Meritas International Equity Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Ethical International Equity Fund Series A	0.149	0.000	0.000	0.000	0.000	0.000	0.851	0.000	0.000
Ethical International Equity Fund Series F	0.000	0.000	0.000	0.000	0.304	0.000	0.057	0.000	0.000
Meritas International Equity Fund Series F	0.000	0.000	0.000	0.000	0.143	0.000	0.207	0.000	0.000
Ethical American Multi-Strategy Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.991	0.000	0.000
Meritas U.S. Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Ethical American Multi-Strategy Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas U.S. Equity Fund Series F	0.000	0.540	0.000	0.000	0.000	0.000	0.256	0.000	0.000

Fund name	Matrix Sierra Equity Fund Class F	Meritas Money Market Fund Series A	PH&N Community Values Balanced Fund Series O	PH&N Community Values Balanced Fund Series B	Meritas Balanced Portfolio Series F	RBC Jantzi Global Equity Fund Series F	PH&N Community Values Global Equity Fund Series F	Mac Universal Sustainable Opportunities Class T8	Ethical American Multi-Strategy Fund Series F
Ethical Canadian Dividend Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Canadian Dividend Fund Series F	0.000	0.000	0.109	0.000	0.000	0.000	0.000	0.000	0.513
GWL Ethics Fund (G) NL	0.000	0.000	0.052	0.000	0.000	0.000	0.000	0.000	0.000
GWL Ethics Fund (G) DSC	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Jantzi Social Index Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
London Life Ethics Fund (GWLIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MFS MB Responsible Canadian Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Canadian Equity Fund Ser D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Canadian Equity Fund Ser O	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Monthly Dividend and Income Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
iShares Jantzi Social Index Fund	0.000	0.000	0.371	0.000	0.000	0.000	0.000	0.000	0.000
RBC Jantzi Canadian Equity Fund Series A	0.000	0.000	0.047	0.000	0.000	0.000	0.000	0.000	0.000
RBC Jantzi Canadian Equity Fund Series F	0.000	0.000	0.439	0.000	0.000	0.000	0.000	0.000	0.167

(continued)

Table 9 (continued)

Fund name	Matrix Sierra Equity Fund Class F	Meritas Money Market Fund Series A	PH&N Community Values Balanced Fund Series O	PH&N Community Values Balanced Fund Series B	Meritas Balanced Portfolio Series F	RBC Jantzi Global Equity Fund Series F	PH&N Community Values Global Equity Fund Series F	Mac Universal Sustainable Opportunities Class T8	Ethical American Multi-Strategy Fund Series F
RBC Jantzi Canadian Equity Fund Series D	0.000	0.000	0.439	0.000	0.000	0.000	0.000	0.000	0.480
PH&N Community Values Canadian Equity Fund Ser B	0.000	0.000	0.000	0.000	0.000	0.000	0.133	0.000	0.867
PH&N Community Values Canadian Equity Fund Ser F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Jantzi Social Index Fund Series F	0.000	0.000	0.582	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Monthly Dividend and Income Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.710
Acuity Social Values Balanced Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Balanced Fund Class A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Balanced Fund Class F	0.000	0.000	0.153	0.000	0.000	0.000	0.000	0.000	0.225
NEI Canadian Bond Class A	0.000	0.113	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Canadian Bond Fund	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MFS MB Responsible Fixed Income Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Bond Fund Series D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Bond Fund Series O	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NEI Canadian Bond Class F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

PH&N Community Values Bond Fund Series B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Bond Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Canadian Bond Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Select Conservative Portfolio Class A	0.000	0.089	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Select Conservative Portfolio Class F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Growth Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Investors Summa SRI Fund Series C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acuity Social Values Canadian Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Investors Summa SRI Class A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acuity Pooled Social Values Canadian Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Investors Summa SRI Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Growth Fund Series F	0.000	0.000	0.354	0.000	0.000	0.000	0.000	0.000	0.533
Alpha Social Values Portfolio	0.000	0.000	0.238	0.000	0.000	0.000	0.000	0.000	0.000
Acuity Clean Environment Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Matrix Sierra Equity Fund	0.000	0.000	0.328	0.000	0.000	0.000	0.000	0.000	0.234
Matrix Sierra Equity Fund Class F	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Money Market Fund Series A	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

(continued)

Table 9 (continued)

Fund name	Matrix Sierra Equity Fund Class F	Meritas Money Market Fund Series A	PH&N Community Values Balanced Fund Series O	PH&N Community Values Balanced Fund Series B	Meritas Balanced Portfolio Series F	RBC Jantzi Global Equity Fund Series F	PH&N Community Values Global Equity Fund Series F	Mac Universal Sustainable Opportunities Class T8	Ethical American Multi-Strategy Fund Series F
PH&N Community Values Balanced Fund Series D	0.000	0.000	0.434	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Balanced Fund Series O	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas Balanced Portfolio Series A	0.000	0.000	0.059	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Balanced Fund Series B	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Meritas Balanced Portfolio Series F	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Ethical Special Equity Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Special Equity Fund Series F	0.000	0.000	0.363	0.000	0.000	0.000	0.000	0.000	0.139
Ethical Global Equity Fund Class A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acuity Social Values Global Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MFS MB Responsible Global Research Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mac Universal Sustainable Opportunities Class A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Global Equity Fund Series D	0.000	0.000	0.334	0.000	0.000	0.000	0.000	0.000	0.000

PH&N Community Values Global Equity Fund Series O	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Global Equity Fund Class F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.891
RBC Jantzi Global Equity Fund	0.000	0.000	0.037	0.000	0.000	0.000	0.000	0.000	0.000
RBC Jantzi Global Equity Fund Series D	0.000	0.000	0.000	0.000	0.000	0.000	0.218	0.000	0.504
RBC Jantzi Global Equity Fund Series F	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
TD Global Sustainability Fund—Investor Series	0.000	0.000	0.243	0.000	0.000	0.000	0.000	0.000	0.000
TD Global Sustainability Fund—Advisor Series	0.000	0.000	0.232	0.000	0.000	0.000	0.000	0.000	0.000
TD Global Sustainability Fund—Series F	0.000	0.000	0.529	0.000	0.000	0.000	0.000	0.000	0.000
Ethical Global Dividend Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.173
Ethical Global Dividend Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.138	0.000	0.733
Investors Summa Global SRI Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.207
Investors Summa Global SRI Class Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.413
Investors Summa Global SRI Fund Series C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PH&N Community Values Global Equity Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Mac Universal Sustainable Opportunities Class T6	0.000	0.000	0.000	0.000	0.000	0.000	0.901	0.000	0.061
Mac Universal Sustainable Opportunities Class T8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
RBC Jantzi Balanced Fund Series D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.254

(continued)

Table 9 (continued)

Fund name	Matrix Sierra Equity Fund Class F	Meritas Money Market Fund Series A	PH&N Community Values Balanced Fund Series O	PH&N Community Values Balanced Fund Series B	Meritas Balanced Portfolio Series F	RBC Jantzi Global Equity Fund Series F	PH&N Community Values Global Equity Fund Series F	Mac Universal Sustainable Opportunities Class T8	Ethical American Multi-Strategy Fund Series F
MFS MB Responsible Balanced Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Investors Summa Global Environ Leaders Fund Ser A	0.000	0.000	0.560	0.000	0.000	0.000	0.000	0.000	0.000
Investors Summa Global Environ Leaders Class Ser A	0.000	0.000	0.276	0.000	0.000	0.000	0.000	0.000	0.207
Investors Summa Global Environ Leaders Fund Ser C	0.000	0.000	0.539	0.000	0.000	0.000	0.000	0.000	0.000
Meritas International Equity Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical International Equity Fund Series A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical International Equity Fund Series F	0.000	0.000	0.054	0.000	0.000	0.000	0.000	0.000	0.584
Meritas International Equity Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.650
Ethical American Multi-Strategy Fund Series A	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Meritas U.S. Equity Fund	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethical American Multi-Strategy Fund Series F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Meritas U.S. Equity Fund Series F	0.000	0.000	0.203	0.000	0.000	0.000	0.000	0.000	0.000

This table presents the lambdas values in the fourth DEA application where 18 SRI funds are efficient. The analysis uses the net return and skewness (Skew.) as outputs, and the fund return standard deviation (Std. Dev.), total assets, front-end load, management expense ratio (MER), and kurtosis of fund returns (Kurt.) as inputs. The data cover 85 SRI funds over the period May 2008 to December 2011

Table 10 Slacks of input and output variables for the fourth DEA model

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
Ethical Canadian Dividend Fund Series A	0.004	0.722	0.032	244.062	0.050	0.009	0.837
Ethical Canadian Dividend Fund Series F	0.001	0.636	0.005	0.241	0.000	0.002	0.343
GWL Ethics Fund (G) NL	0.006	1.097	0.033	15.890	0.000	0.016	2.988
GWL Ethics Fund (G) DSC	0.005	1.080	0.031	16.819	0.000	0.015	2.947
Meritas Jantzi Social Index Fund	0.005	0.457	0.035	59.220	0.050	0.007	1.188
London Life Ethics Fund (GWLIM)	0.005	1.108	0.030	68.482	0.000	0.016	3.046
MFS MB Responsible Canadian Equity Fund	0.004	0.501	0.030	62.581	0.000	0.006	1.280
PH&N Community Values Canadian Equity Fund Ser D	0.003	0.198	0.027	5.376	0.000	0.002	0.482
Meritas Monthly Dividend and Income Fund	0.004	0.577	0.029	16.629	0.050	0.008	0.818
iShares Jantzi Social Index Fund	0.002	0.178	0.018	2.959	0.000	0.001	0.486
RBC Jantzi Canadian Equity Fund Series A	0.002	0.584	0.027	9.246	0.000	0.009	1.636
RBC Jantzi Canadian Equity Fund Series F	0.000	0.270	0.012	0.159	0.000	0.002	0.767
RBC Jantzi Canadian Equity Fund Series D	0.001	0.434	0.012	0.304	0.000	0.003	0.980
PH&N Community Values Canadian Equity Fund Ser B	0.002	0.292	0.007	0.026	0.000	0.005	0.247
Meritas Jantzi Social Index Fund Series F	0.004	0.194	0.033	0.594	0.000	0.001	0.493
Meritas Monthly Dividend and Income Fund Series F	0.001	0.455	0.002	0.052	0.000	0.001	0.170
Acuity Social Values Balanced Fund	0.003	1.127	0.025	42.194	0.060	0.017	3.436
Ethical Balanced Fund Class A	0.005	0.849	0.011	317.889	0.050	0.010	1.707
Ethical Balanced Fund Class F	0.004	0.457	0.004	0.152	0.000	0.002	0.695
NEI Canadian Bond Class A	0.000	0.512	0.001	201.956	0.044	0.002	0.446
Meritas Canadian Bond Fund	0.000	0.079	0.000	32.751	0.049	0.003	0.022
PH&N Community Values Bond Fund Series D	0.000	0.055	0.000	0.124	0.000	0.000	0.133

(continued)

Table 10 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
NEI Canadian Bond Class F	0.000	0.133	0.001	8.698	0.000	0.001	0.477
Ethical Select Conservative Portfolio Class A	0.003	1.125	0.009	31.028	0.046	0.011	2.778
Ethical Growth Fund Series A	0.006	0.796	0.029	295.491	0.050	0.010	1.591
Investors Summa SRI Fund Series C	0.009	0.584	0.059	1111.299	0.000	0.013	1.721
Acuity Social Values Canadian Equity Fund	0.005	1.061	0.044	26.407	0.060	0.017	2.931
Investors Summa SRI Class A	0.009	0.545	0.056	36.929	0.000	0.012	1.655
Investors Summa SRI Fund Series A	0.009	0.564	0.057	1115.516	0.000	0.012	1.691
Ethical Growth Fund Series F	0.004	0.628	0.011	0.251	0.000	0.003	0.869
Alpha Social Values Portfolio	0.007	1.196	0.035	6.977	0.060	0.015	2.929
Acuity Clean Environment Equity Fund	0.013	1.267	0.045	67.150	0.060	0.017	2.887
Matrix Sierra Equity Fund	0.018	1.964	0.059	3.064	0.050	0.022	7.302
PH&N Community Values Balanced Fund Series D	0.002	0.279	0.006	2.196	0.000	0.002	0.734
Meritas Balanced Portfolio Series A	0.004	0.691	0.010	7.914	0.050	0.012	1.795
Ethical Special Equity Fund Series A	0.001	0.856	0.033	239.378	0.050	0.013	2.054
Ethical Special Equity Fund Series F	0.000	0.679	0.027	1.690	0.000	0.006	1.502
Ethical Global Equity Fund Class A	0.007	0.257	0.036	26.328	0.050	0.009	0.541
Acuity Social Values Global Equity Fund	0.008	0.852	0.028	8.875	0.060	0.014	1.895
MFS MB Responsible Global Research Fund	0.006	0.391	0.027	65.839	0.000	0.003	0.476
Mac Universal Sustainable Opportunities Class A	0.008	0.739	0.039	12.252	0.050	0.008	1.058
PH&N Community Values Global Equity Fund Series D	0.006	0.232	0.032	0.981	0.000	0.002	0.495
PH&N Community Values Global Equity Fund Series O	0.003	0.054	0.003	7.096	0.000	0.000	0.190
Ethical Global Equity Fund Class F	0.004	0.292	0.002	0.046	0.000	0.001	0.126

(continued)

Table 10 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
RBC Jantzi Global Equity Fund	0.009	0.719	0.027	2.761	0.000	0.007	0.902
RBC Jantzi Global Equity Fund Series D	0.006	0.464	0.001	0.006	0.000	0.001	0.073
TD Global Sustainability Fund—Investor Series	0.013	0.922	0.032	4.731	0.000	0.012	2.159
TD Global Sustainability Fund—Advisor Series	0.013	0.896	0.032	4.671	0.050	0.011	2.094
TD Global Sustainability Fund—Series F	0.011	0.690	0.022	3.446	0.000	0.004	1.546
Ethical Global Dividend Fund Series A	0.005	0.585	0.034	2.505	0.050	0.009	1.106
Ethical Global Dividend Fund Series F	0.002	0.452	0.008	0.050	0.000	0.003	0.503
Investors Summa Global SRI Fund Series A	0.009	0.465	0.033	2.827	0.000	0.011	1.306
Investors Summa Global SRI Class Series A	0.009	0.495	0.026	1.704	0.000	0.011	1.086
Investors Summa Global SRI Fund Series C	0.009	0.458	0.040	4.128	0.000	0.012	1.392
Mac Universal Sustainable Opportunities Class T6	0.002	0.351	0.002	0.002	0.050	0.010	0.125
RBC Jantzi Balanced Fund Series D	0.005	0.622	0.005	0.105	0.000	0.004	0.929
MFS MB Responsible Balanced Fund	0.003	0.471	0.006	50.739	0.000	0.003	0.894
Investors Summa Global Environ Leaders Fund Ser A	0.015	1.651	0.044	6.714	0.000	0.018	6.066
Investors Summa Global Environ Leaders Class Ser A	0.016	1.517	0.041	2.218	0.000	0.017	5.713
Investors Summa Global Environ Leaders Fund Ser C	0.015	1.682	0.044	8.061	0.000	0.020	6.151
Meritas International Equity Fund Series A	0.010	0.487	0.031	19.362	0.050	0.012	1.034
Ethical International Equity Fund Series A	0.011	0.857	0.033	35.679	0.050	0.015	2.218
Ethical International Equity Fund Series F	0.009	0.656	0.016	0.341	0.050	0.006	1.454
Meritas International Equity Fund Series F	0.007	0.367	0.006	0.264	0.000	0.005	0.473
Ethical American Multi-Strategy Fund Series A	0.004	0.000	0.038	35.696	0.050	0.008	0.460

(continued)

Table 10 (continued)

Fund name	Return	Skew.	Std. Dev.	Total assets	Front-end load	MER	Kurt.
Meritas U.S. Equity Fund	0.007	0.348	0.033	4.793	0.050	0.012	1.024
Meritas U.S. Equity Fund Series F	0.003	0.054	0.005	0.208	0.000	0.001	0.313

This table presents the slacks values for all input and output variables under the fourth DEA application. The analysis uses the net return and skewness (Skew.) as outputs, and the fund return standard deviation (Std. Dev.), total assets, front-end load, management expense ratio (MER), and kurtosis of returns (Kurt.) as inputs. The data cover 67 inefficient SRI funds over the period May 2008 to December 2011

5 Conclusion

The present chapter uses the non-parametric technique of data envelopment analysis (DEA) to investigate the efficiency of 85 Canadian SRI funds during the period of 2008–2011. It extends the previous research in at least two ways. First, and so far as we are aware, it represents the first attempt to apply the DEA to assess the performance of SRI mutual funds in Canada. Moreover, by specifically focusing on the input slacks, measured using the DEA, this chapter offers insights into specific aspects of managerial behaviour that can be improved, rather than merely addressing the summary efficiency score. The evidence suggests that loads and the SRI fund's size are the main sources of inefficiency.

There are at least three ways in which this research could be extended. First, we can use DEA models that can highlight changes in the efficiency of SRI funds over the years. A second extension would be to compare the results of DEA with those of parametric frontier analysis methods. Finally, we can develop advanced models that would include both efficiency and effectiveness components into the performance analysis.

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References

Agarwal, V., Bakshi, G., & Huij, J. (2014). *Do higher-moment equity risks explain hedge fund returns?* (Working Paper). University of Maryland.

Agarwal, V., & Naik, N. (2004). Risks and portfolio decisions involving hedge funds. *Review of Financial Studies, 17*, 63–98.

Alpert, B., Rekenthaler, J., & Suh, S. (2013). Global fund investor experience 2013. *Morningstar research papers*. Available at: https://corporate.morningstar.com/us/documents/MethodologyDocuments/FactSheets/Global-Fund-Investor-Experience-Report-2013.pdf

Ayadi, M. A., Ben-Ameur, H., & Kryzanowski, L. (2015). Typical and tail performance of Canadian SRI equity mutual funds. *Journal of Financial Services Research*, Forthcoming.

Ayadi, M. A., & Kryzanowski, L. (2005). Portfolio performance measurement using APM-free kernel models. *Journal of Banking and Finance, 29*, 623–659.

Ayadi, M. A., & Kryzanowski, L. (2008). Portfolio performance measurement for various asset pricing kernels. *Computers and Operational Research, 35*, 171–185.

Ayadi, M. A., & Kryzanowski, L. (2013). Mutual fund performance measurement with nonlinear stochastic discount factors. *Advances in Quantitative Analysis of Finance and Accounting, 11*, 207–228.

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating of technical and scale inefficiencies in data envelopment analysis. *Management Science, 30*, 1078–1092.

Banker, R. D., Das, S., & Datar, S. M. (1989). Analysis of cost variances for management control in hospitals. *Research in Governmental and Nonprofit Accounting, 5*, 269–291.

Barnett, M. L., & Salomon, R. M. (2006). Beyond dichotomy: The curvilinear relationship between social responsibility and financial performance. *Strategic Management Journal, 27*, 1101–1122.

Basso, A., & Funari, S. (2001). A data envelopment analysis approach to measure the mutual fund performance. *European Journal of Operational Research, 135*, 477–492.

Basso, A., & Funari, S. (2003). Measuring the performance of ethical mutual funds: A DEA approach. *Journal of the Operational Research Society, 54*, 521–531.

Basso, A., & Funari, S. (2005). A generalized performance attribution technique for mutual funds. *Central European Journal of Operations Research, 13*, 65–84.

Basso, A., & Funari, S. (2008). DEA models for ethical and non-ethical mutual funds. *Mathematical Methods in Economics and Finance, 2*, 21–40.

Bauer, R., Derwall, J., & Otten, R. (2007). The ethical mutual funds performance debate: New evidence for Canada. *Journal of Business Ethics, 70*, 111–124.

Bauer, R., Koedijk, K., & Otten, R. (2005). International evidence on ethical mutual fund performance and investment style. *Journal of Banking and Finance, 29*, 1751–1767.

Bauer, R., Otten, R., & Tourani Rad, A. (2006). Ethical investing in Australia: Is there a financial penalty? *Pacific-Basin Finance Journal, 14*, 33–48.

Benson, K., Brailsford, T., & Humphrey, J. (2006). Do socially responsible fund managers really invest differently? *Journal of Business Ethics, 65*, 337–357.

Benson, L., & Humphrey, J. E. (2008). Socially responsible investment funds: Investor reaction to current and past returns. *Journal of Banking and Finance, 32*, 850–859.

Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance, 52*, 57–82.

Chan, N., Getmansky, M., Hass, S. M., & Lo, A. (2007). Systematic risk and hedge funds. In M. Carey & R. Stulz (Eds.), *The risks of financial institutions and the financial sector*. Chicago: University of Chicago Press.

Chang, C. E., & Witte, H. D. (2010). Performance evaluation of U.S. socially responsible mutual funds: Revisiting doing good and doing well. *American Journal of Business, 25*, 9–22.

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research, 2*, 429–444.

Chen, Z., & Knez, P. J. (1996). Portfolio performance measurement: Theory and applications. *Review of Financial Studies, 9*, 511–555.

Chen, Z., & Lin, R. (2006). Mutual fund performance evaluation using data envelopment analysis with new risk measures. *OR Spectrum, 28*, 375–398.

Choi, Y. K., & Murthi, B. P. S. (2001). Relative performance evaluation of mutual funds: A non-parametric approach. *Journal of Business Finance and Accounting, 28*, 853–876.

Christoffersen, S., & Musto, D. (2002). Demand curves and the pricing of money management. *Review of Financial Studies, 15*, 1499–1524.

Cooper, W., Seiford, L. M., & Tone, K. (2007). *Data envelopment analysis: A comprehensive text with models, applications, references and DEA-solver software* (2nd ed.). New York: Springer.

Cooper, W., Seiford, L. M., & Zhu, J. (2011). *Handbook on data envelopment analysis* (2nd ed.). New York: Springer.

Daraio, C., & Simar, L. (2006). A robust nonparametric approach to evaluate and explain the performance of mutual funds. *European Journal of Operational Research, 175*, 516–542.

Dittmar, R. (2002). Nonlinear SDFs, kurtosis preference, and evidence from the cross-section of equity returns. *Journal of Finance, 57*, 369–403.

Elton, E. J., Gruber, M. J., Das, S., & Hlavka, M. (1993). Efficiency with costly information: A reinterpretation of evidence from managed portfolios. *Review of Financial Studies, 6*, 1–22.

Farnsworth, H., Ferson, W. E., Jackson, D., & Todd, S. (2002). Performance evaluation with stochastic discount factors. *Journal of Business, 75*, 473–503.

Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of Royal Statistical Society (Series A), 120*, 253–281.

Fung, W., & Hsieh, D. (2001). The risk in hedge fund strategies: Theory and evidence from trend followers. *Review of Financial Studies, 14*, 313–341.

Gil-Bazo, J., & Ruiz-Verdu, P. (2009). The relation between price and performance in the mutual fund industry. *Journal of Finance, 64*, 2153–2183.

Gil-Bazo, J., Ruiz-Verdú, P., & Santos, A. A. P. (2010). The performance of socially responsible mutual funds: The role of fees and management companies. *Journal of Business Ethics, 94*, 243–263.

Glosten, L., & Jagannathan, R. (1994). A contingent claims approach to performance evaluation. *Journal of Empirical Finance, 1*, 133–166.

Gregoriou, G. N., Sedzro, K., & Zhu, J. (2005). Hedge fund performance appraisal using data envelopment analysis. *European Journal of Operational Research, 164*, 555–571.

Gregory, A., Matatko, J., & Luther, R. (1997). Ethical unit trust financial performance: Small company effects and fund size effects. *Journal of Business Finance and Accounting, 24*, 705–725.

Hamilton, S., Jo, H., & Statman, M. (1993). Doing well while doing good? The investment performance of socially responsible mutual funds. *Financial Analysts Journal, 49*, 62–66.

Harvey, C. R., & Siddique, A. (2000). Conditional skewness in asset pricing tests. *Journal of Finance, 55*, 1263–1295.

Humphrey, J. E., & Lee, D. D. (2011). Australian socially responsible funds: Performance, risk and screening intensity. *Journal of Business Ethics, 102*, 519–533.

Hwang, S., & Satchell, S. (1999). Modelling emerging market risk premia using higher moments. *Journal of Financial Economics, 4*, 271–296.

Indro, D. C., Jiang, C. X., Hu, M. Y., & Lee, W. Y. (1999). Mutual fund performance: Does fund size matter? *Financial Analysts Journal, 55*, 74–87.

Jenkins, L., & Anderson, M. (2003). A multivariate statistical approach to reducing the number of variables in data envelopment analysis. *European Journal of Operational Research, 147*, 51–61.

Jensen, M. C. (1969). Risk, the pricing of capital assets and the evaluation of investment performance. *Journal of Business, 42*, 167–247.

Joro, T., & Na, P. (2006). Portfolio performance evaluation in a mean–variance–skewness framework. *European Journal of Operational Research, 175*, 446–461.

Kreander, N., Gray, R. H., Power, D. M., & Sinclair, C. D. (2005). Evaluating the performance of ethical and non-ethical funds: A matched pair analysis. *Journal of Business Finance and Accounting, 32*, 1306–1686.

Kroll, Y., Levy, H., & Markowitz, H. M. (1984). Mean-variance versus direct utility maximization. *Journal of Finance, 34*, 47–61.

Lamb, J. D., & Tee, K. H. (2012). Data envelopment analysis models of investment funds. *European Journal of Operational Research, 216*, 687–696.

Laurel, D. (2011). *Socially responsible investments in Europe: The effects of screening on risk and the clusters in the fund space*. (Working Paper). Politecnico di Milano.

Lee, D. D., Humphrey, J. E., Benson, K. L., & Ahn, J. Y. K. (2010). Socially responsible investment fund performance: The impact of screening intensity. *Accounting and Finance, 50*, 351–370.

Lehmann, B. N., & Modest, D. M. (1987). Mutual fund performance evaluation: A comparison of benchmarks and benchmark comparisons. *Journal of Finance, 42*, 233–265.

Luther, R., Matatko, J., & Corner, D. (1992). The investment performance of UK "ethical" unit trusts. *Accounting Auditing and Accountability Journal, 5*, 57–70.

Malkiel, B. G. (1995). Returns from investing in equity mutual funds from 1971 to 1991. *Journal of Finance, 50*, 549–572.

Mallin, C. A., & Saadouni, B. (1995). The financial performance of ethical investment funds. *Journal of Business Finance and Accounting, 22*, 483–496.

Markowitz, H. (1952). Portfolio selection. *Journal of Finance, 7*, 77–91.

McMullen, P. R., & Strong, R. A. (1998). Selection of mutual funds using data envelopment analysis. *Journal of Business and Economic Studies, 4*, 1–12.

Murthi, B. P. S., Choi, Y. K., & Desai, P. (1997). Efficiency of mutual funds and portfolio performance measurement: A non-parametric approach. *European Journal of Operational Research, 98*, 408–418.

Pendaraki, K. (2012). Mutual fund performance evaluation using data envelopment analysis with higher moments. *Journal of Applied Finance and Banking, 2*, 97–112.

Pérez-Gladish, B., Rodríguez, P. M., M'zali, B., & Lang, P. (2013). Mutual funds efficiency measurement under financial and social responsibility criteria. *Journal of Multi-Criteria Decision Analysis, 20*, 109–125.

Ramanathan, R. (2003). *An introduction to data envelopment analysis: A tool for performance measurement*. New Delhi: Sage.

Renneboog, L., ter Horst, J., & Zhang, C. (2007). *Socially responsible investments: Methodology, risk, and performance* (Working Paper). Tilburg University and European Corporate Governance Institute.

Renneboog, L., ter Horst, J., & Zhang, C. (2008). The price of ethics and stakeholder governance: The performance of socially responsible mutual funds. *Journal of Corporate Finance, 14*, 302–322.

Scott, R. C., & Horvath, P. A. (1980). On the direction of preference for moments of higher order than the variance. *Journal of Finance, 35*, 915–919.

Sharpe, W. F. (1966). Mutual fund performance. *Journal of Business, 39*, 119–138.

SIO. (2013). *Canadian socially responsible investment review 2012*. Toronto: Social Investment Organization. Available at: http://riacanada.ca/sri-review/.

Statman, M. (2000). Socially responsible mutual funds. *Financial Analysts Journal, 56*, 30–39.

Treynor, J. L. (1965). How to rate management of investment funds. *Harvard Business Review, 44*, 131–136.