SUSTAINABLE MUTUAL FUNDS AND INVESTOR BEHAVIOR

A STUDY ON SWEDISH SUSTAINABLE MUTUAL EQUITY FUNDS

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Sustainable Mutual Funds and Investor Behavior: A Study on Swedish Socially Responsible Mutual Equity Funds.

Abstract:

In this thesis, we examine the financial performance, the performance-sensitivity of investors, and the volatility of investor fund flow of Swedish sustainable mutual equity funds. To analyze the financial performance of the funds, we use the Capital Asset Pricing Model, the Fama-French three-factor model and Carhart's four-factor model, and to assess the difference in financial return between sustainable and conventional funds, we include a dummy variable. To analyze the relationship between flow and performance, we use a linear regression model where we regress annual fund flow to performance lagged one year. To analyze volatility, we measure the standard deviation of monthly fund flows. Regarding investor behavior, we create a matched sample in order to control for differences such as age, size and risk exposure of the funds. We find evidence that sustainable funds outperform their factor benchmark however, we also find evidence that sustainable funds perform worse than conventional funds. Furthermore, we find strong indications that investors in mature sustainable funds are less sensitive to negative returns than in conventional funds. We could not find evidence that the volatility of fund flow of sustainable funds is significantly different than the volatility of conventional funds.

Keywords:
Sustainability, Socially Responsible Investment, Sustainable Funds, Performance, Fund Flow

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1. Introduction

1.1. Background

Due to long-sightedness and sustainability focus from investors with high level of influence, the interest in sustainable investments has increased since the financial crisis of 2008 (Swedish Sustainable Investment Forum, 2018). However, in Pia Lundkvist and Viktoria Nacksten's (2018) bachelor thesis from the Stockholm School of Economics named *On the Performance of Sustainable Funds During Periods of Crisis and Non-Crisis*, focusing on the potential performance of Swedish sustainable funds during times of crisis, it was concluded that "no evidence that sustainable funds differ in financial performance compared to conventional funds in pre-crisis and crisis periods" (Lundkvist & Nacksten, 2018, p. 37). They also found that "sustainable funds significantly underperform funds characterized as conventional during the period of post-crisis" (Lundkvist & Nacksten, 2018, p. 37).

Yet, the question regarding if and how the behavior of the investors investing in sustainable funds differs from the behavior of investors investing in conventional funds is something neither Swedish Sustainable Investment Forum (later referred to as SWESIF) nor Lundkvist and Nacksten (2018) have taken a deeper look into. Therefore, we take a deeper look into the behavior, and the potential difference in loyalty, investors display when investing in socially responsible funds versus when investing in conventional funds. This is necessary for trying to understand why this interest in sustainable investments has increased, even though no evidence was found of sustainable funds performing better financially than conventional funds.

In the Foreword to Eurosif's (2018) *European SRI [Socially Responsible Investment] Study 2018*, the Vice-President of the European Commission for the Euro and Social Dialogue also in charge of Financial Stability, Financial Services and the Capital Markets Union, Valdis Dombrovskis, wrote

> [t]he world is heading towards 3 or even 3.5 degrees warming. [---] To avoid this catastrophic scenario, what we need is large-scale investment to enact deep emissions reductions across a range of sectors [---] According to our estimates, Europe needs at least €180bn in additional annual investment over the next decade to meet our Paris [agreement] goals. The European Commission has already proposed that the EU should devote a quarter of its budget to climate-related action as of 2021. But public finance alone will not be enough.

Thus, investments from private investors will be needed for a sustainable future.

Eurosif's (2018) *European SRI Study 2018* also states that the market for SRI in Sweden is mature and that it has been characterized by exclusion strategies ever since the 1980's. Today, these kinds of strategies have gotten a more holistic approach, including not only exclusion, but also engagement and voting. If so, would this interest in engagement and voting in the sustainable funds result in the investors in keeping their money for a longer consecutive period of time in these sustainable funds compared to a

conventional fund? In other words, would the net cash flow from investors in socially responsible funds be lower compared to the net cash flow from investors in conventional funds, and how are these cash flows affected by the fund's earlier performance? The trust, or (as we chose to refer to it in this study) loyalty, in the SR funds would therefore be showed by a low volatility in fund flows.

In this analysis, we measure the cash flows into and out of the funds (fund flow) divided by the total net assets of the funds. A low percentage net flow will show off a high loyalty, and a high percentage net flow will show off a low loyalty. This is since a loyal investor is assumed to express their loyalty by keeping their investments in the fund, thus being loyal, and a disloyal investor is assumed not to keep their investments in the fund and therefore withdraw it. The measurement of loyalty is then made through a comparison between the SRI funds and the conventional funds, and where the different outcomes are compared to each other. Those comparisons will then show if the SR funds have a lower fund flow than conventional funds on average, or if the opposite is true. Investors may view investing in an SRI fund as consuming the "SR attribute", and thus in order to smooth consumption of the attribute, subscription and redemption from SRI funds may be more regular than in conventional funds.

Furthermore, we make an additional analysis in an attempt to measure the performance sensitivity of investors in sustainable funds. Since earlier performances would show off how well the fund is performing on the market and therefore affect how the investor is perceiving the fund's performance, the data on loyalty is also related to the funds' performance in the earlier period, and a comparison of the potential difference in loyalty between SRI funds and conventional funds is then made.

This has then been put in the area of SRI to identify the specific behavior of investors investing in SRI funds where the yearly fund flows for these funds are used as measurements. This market is used since it has been growing for a long time, but also since there is a natural behavioral perspective in the choice of either engaging in SRI or not. The focus is then put on new subscriptions and redemptions. A proper assumption is that fund managers in general would like to find stable investors to their funds, thus they want anything but negative fund flows. Also, as far as we know, this is the first study that has been done in Sweden which examines the performance sensitivity and loyalty to Swedish funds.

1.2. Purpose

There are three general purposes of this study. One is to examine the performance of Swedish sustainable funds and compare it with the performance of conventional funds. Another purpose is to investigate whether investors in Swedish sustainable funds are more sensitive to performance than in the case of conventional funds. A final purpose is to investigate whether the volatility of the fund flows of sustainable funds is higher than that of conventional funds.

1.3. Definition

In this study, the definition of a sustainable fund has been based on Morningstar's sustainability definition in an attempt to standardize and measure the non-existing definition of sustainability. However, earlier studies which we refer to differ in their use of the word "sustainable" and "socially responsible" when discussing similar topics. Also, since a common question is whether sustainability is a part of social responsibility, or vice versa, we have decided to follow Morningstar's definition and use the word "sustainable" when we refer to these topics in our discussion since we believe that the word better refers to what we are focusing on. However, throughout the study you may find the words "sustainable" and "socially responsible" used as synonyms, and that is since when referring to authors we choose to use the word the authors choose to use.

2. Literature Review

Investing in Socially Responsible Mutual Funds is the title of Christopher C. Geczy, Robert F. Stambaugh and David Levin's paper published in 2005 as a part of the Penn Libraries at the University of Pennsylvania. The paper centers around the construction as well as the cost of optimal performing portfolios where attention was put into objectives regarding so called socially responsible investments (SRIs).

Geczy et al. (2005) found that the investors choosing to "do good deeds" by investing in socially responsible equity mutual funds may pay a price for their charitable act, and that this price is connected to the fraction of the investor's wealth put in the SRI fund as well as the psychological reason behind their beliefs in the fund-manager's skills as well as in the pricing model. Yet, their results are based on the assumption that a lower bound is put on the non-financial utility from making SRIs. However, they also found that this bound (on the non-financial utility) has no specified weight and instead it can range widely, mostly depending on the views of pricing models and the belief in the skill of the fund manager from the perspective of the investor. Thus, doing good deeds by making sustainable investments costs extra, but maybe not a lot extra. In fact, investing for the sake of something else than monetary returns may yield just as high returns, at least according to Statman (2002).

In the article *Socially Responsible Mutual Funds (corrected)*, Meir Statman (2002) took a deep dive into the different sides of SRIs. He presented two opposing views, one claimed that it is good to reach social goals whilst investing, another that it does harm. Statman tried to separate facts from beliefs to find a proper conclusion on what is the best truth[*]. Thus, he compared the Domini Social Index (DSI - an index of socially responsible stocks) to the S&P 500 Index and concluded that "[…] pooling investing power for something other than making money is no worse at making money than pooling it for money alone" (Statman, 2000, p. 38), since no statistically significant difference was to be found in the performance of these two different portfolios. The two types of funds are hardly different after all, and the main difference seems to be the higher loyalty of the SR investors. Both Nicolas P. B. Bollen and Zakri Y. Bello confirmed this assumption.

In Bollen's article *Mutual Fund Attributes and Investor Behavior* from 2007 he concluded that the performance of socially responsible investments is not necessarily higher than that of other investments only focusing on the economic profitability. He stated that "[t]he general conclusion one can draw from existing studies is that SR [Socially Responsible] mutual fund performance is not significantly different from the performance of funds that do not screen on social criteria" (Bollen, 2007, p. 684). The ethical investors' interest in SRIs was also discussed. Bollen compared the net fund flow of SRI funds to that of conventional funds in order to investigate whether the behavior of investors in socially responsible mutual funds differs from the behavior of investors in

[*] The expression "the best truth" is used in an attempt to highlight what this study is examining: how people's beliefs cause differences in their investments.

conventional funds. In order to examine differences regarding loyalty to these funds, he measured the monthly volatility of the net cash flows of US funds in the Center for Research in Security Prices (CRSP) database during 1962 to 2001, and found that it is significantly lower in socially responsible funds than in conventional funds. However, in the article *Socially Responsible Investing and Portfolio Diversification* by Zakri Y. Bello (2005), Bello presents that no significant difference was to be found between assets held, portfolio diversification, and variable effects of diversification on investment performance for SRI funds compared to conventional funds. Thus, no difference between these two kinds of funds was to be found in the area of asset characteristics, degree of portfolio diversification, nor long-run investment performance. Bello (2005) also found that there is no difference in the performance of an SR fund compared to a conventional fund after adjustments had been made for the degree of portfolio diversification. Similarly, no correlation was to be found between the degree of diversification and the performance of a specific fund. So, why would the behavior of the investors doing SR-investments differ from investors doing conventional investments if it cannot be accounted for by the financial measures? Well, ethical investors seem to like taking social responsibility, and corporate social and environmental reporting (CSR) gives insight into these kinds of actions. Therefore, CSR might attract those investors interesting in making investments for non-financial reasons and that is what Andrew L. Friedman and Samantha Miles suggested in 2001.

In the article *Socially Responsible Investment and Corporate Social and Environmental Reporting in the UK: An Exploratory Study*, Andrew L. Friedman and Samantha Miles (2001) looked into the connection between CSR and SRI. They found that CSR allows investors to be more concerned with how their assets are invested, and in line with that they also forecast that the forthcoming increase in SRIs would improve the investors' ability to influence the corporate behavior significantly. This indicates that CSR makes the investors more concerned while performing SRIs. Yet, the report does not highlight the loyalty from the investors to the fund. However, that was what Luc Renneboog, Jenke Ter Horst and Chendi Zhang studied in 2011. They took a deeper look into the loyalty, or more specifically the psychology, of ethical investors (people making sustainable investments) and their findings were presented in their article from 2011 named *Is ethical money financially smart? Nonfinancial attributes and money flows of socially responsible investment funds*. They found that "[t]his group of [ethical] investors cares about the nonfinancial attributes of investment funds" (Renneboog et al., 2011, p. 586), thus confirming the statement regarding the need of influence presented by Friedman & Miles (2001). But, higher interest in a fund means there might be lower returns and was stated by Meir Statman in 2002. He found that the trends in the fund flows in and out of SR funds are connected to the fund's performance. More specifically, Statman found that increased amount of positive fund flows, in other words when more investors subscribe to a fund, may actually decrease the fund's expected return. This means that when positive information regarding increased inflow to the fund is presented to the current investors, that information should also be interpreted as a warning signal

for potential decreases in the expected return. Thus, it seems like investors actually do not know where to invest, and instead just look at who did well in the past and accordingly invest in that fund.

Hence, investors appear to put a lot of trust into a previously successful fund manager's skill, and it could be believed that media plays an important role. Erik R. Sirri and Peter Tufano (1998) studied the fund flows into and out of equity mutual funds and presented their research in their article from 1998 named *Costly Search and Mutual Fund Flows*. They found that investors, as a consequence of them not being formally trained in portfolio analysis, base their investment on information regarding the specific fund's prior performance. Correspondingly, the fund flows were found to be affected by the amount of attention the investment was given in the media, mainly since choosing these investments was an easy way for the investors to lower their own costs of research. Obviously, attention in the media matters, because how else would investors know about high past returns. This is important, because the interest of the fund manager and the interest of the investors are fundamentally at odds, so the investors need to believe in the fund manager's skills in navigating this conflict with mutual benefit, otherwise they would not trust the fund. Accordingly, Judit A. Chevalier and Glenn D. Ellison (1995) focused on fund flow as a performance measure for fund performance. In their article *Risk Taking by Mutual Funds as a Response to Incentives* from 1995, they conclude that there are different opinions on what a fund manager's main task is. On one hand, a fund manager mainly wants to increase the fund flow into the fund, but on the other hand, the investors instead want the fund manager to maximize for risk adjusted fund return. That, in turn, may cause disturbances between the investors and the fund manager as a consequence of the fund manager taking on initiatives to only increase own revenue by increased fund flow, whilst the investors' needs of maximized risk adjusted fund return are left unfulfilled. This connects to what in the beginning of this section was presented by Geczy et al. (2005), that the investor's belief in the skill of the fund manager determines how much money the investor chooses to invest in or withdraw from the fund. Thus, the fund flow depends on the perceived skill of the fund manager.

3. Hypotheses

In this section, we develop our hypotheses explored in this thesis, which are based partly on existing literature and previous studies, and partly on our own beliefs.

Based on the statements made by Statman (2002), Bello (2005) as well as Bollen (2007), there should be no difference in the performance of an SR fund compared to a conventional fund. However, recalling that these findings were made before the financial crisis of 2008 and that Lundkvist and Nacksten (2018) found that in Sweden, "sustainable funds significantly underperform funds characterized as conventional during the period of post-crisis" (Lundkvist & Nacksten, 2018, p. 37), the general hypothesis we make is thus that the Swedish sustainable funds would have been performing worse than the conventional funds. Therefore, we expect the sustainable funds to perform worse than conventional funds.

> **Hypothesis 1:** Sustainable funds perform worse than conventional funds.

In Eurosif's (2018) *European SRI Study 2018* it was stated that engagement and voting has gained a lot more attention in people's SRI strategies. Friedman and Miles (2001) found that as CSR allows investors to be more concerned with how their assets are invested, and Chevalier and Ellison (1995) confirmed that CSR allows for the investor to look deeper into the fund and thus also the fund-manager's performance. When Geczy et al. (2005) then presented their finding that the fund flow to a fund depends on the perceived skill of the fund manager, the process of investing in an SR fund would make the investor take a deeper look into the fund and also evaluate the fund manager's performance.

Also, consider what Sirri and Tufano (1998) stated about that fund flows usually are found to be affected by the investor's perception of the fund's prior performance. Statman (2002) looked deeper into this and found that increased amount of positive fund flows may decrease the fund's expected return. Thus, a considerable number of investors choosing to invest in sustainable funds are concerned with consuming the SR attribute, and are for this reason not as focused on performance. We thus believe that fund flows to sustainable funds are less sensitive to past performance than that of conventional funds.

> **Hypothesis 2:** Fund flows to sustainable funds are less sensitive to past performance than that of conventional funds.

Given the expected difference in the investor behavior outlined above, the ethical investors' interest in SRIs as measured by the volatility in the fund flows of the sustainable funds is also interesting to take a deeper look into. We expect the loyalty from

the investors to sustainable funds to be higher than to conventional funds, thus we believe that fund flows to sustainable funds would be less volatile than the flows to conventional funds. This has earlier been dicussed by Renneboog et al. (2011) who found that the people who invest in SR funds care about the non-financial attributes of investment funds. This was also mentioned by Bollen (2007) who found that the net fund flow of SRI funds is significantly lower than in conventional funds, thus confirming the statement regarding the loyalty to these funds.

Hypothesis 3: Fund flows to sustainable funds are less volatile than fund flows to conventional funds.

4. Data

In this section, we explain the data used in the study. We explain the data source used, as well as the process of creating the sample. We discuss the variables and data collected, and lastly, we discuss some potential data issues.

4.1. Data sources

The primary data source for this thesis is Morningstar Direct. This is an independent, web-based research platform for investment analysis in stocks and funds, which provides data regarding several aspects of stocks and funds. We use Morningstar Direct to determine the sample of the funds, and to download the return series, fund size, estimated fund flow, fund identification numbers, the inception date and a sustainability variable of each of the selected funds. The process Morningstar uses to estimate fund flow and determine the sustainability variable is explained further in section 4.2 and 4.3.

We collect the monthly Fama-French factors for the Swedish market from the Swedish House of Finance Research Data Center, which covers the period 1988-02 to 2017-01.

4.2. Creating the sample

We obtained a list of all the mutual funds classified by Morningstar as Swedish and as equity funds. Our focus lies on equity funds since the volatility and cross-sectional variation of these funds make them more suitable for studies on the dynamics of fund flow.

We retrieve the data point *Sustainable Investment – overall* from Morningstar Direct. Morningstar defines a *Sustainable Investment fund* as a fund explicitly indicating any kind of sustainability impact, or ESG strategy in their prospectus or offering documents (Morningstar Direct, 2018). We use this classification to divide the sample into two groups: sustainable funds and conventional funds.

Using this process, we obtain a sample consisting of 30 sustainable funds and 69 conventional funds.

4.3. Data and Variables

The funds' monthly and yearly return series, monthly and yearly estimated fund sizes, and monthly estimated fund flow are downloaded from Morningstar Direct. The return series are measured from the inception date of the fund, however estimated fund size and monthly estimated fund flow are recorded from 2006 for most of the funds with prior inception date. Hence, our time period regarding our study on performance of the funds is from 1988 to 2016, which the time period covered by the Fama-French factors. Our

time period regarding investor behavior is 2006 to 2018, where we have data on fund size and estimated fund flow.

Yearly estimated fund flow is calculated by summarizing the monthly estimated fund flow during the course of a year. The variable *total return* is calculated by taking the change in total net assets during the period, and reinvesting, if applicable, all income and capital gains distributions during the period, and dividing by the beginning total net assets of the fund. The variable *fund size* is the surveyed total net assets of the fund. Morningstar calculates estimated net fund flow on a monthly basis using total net assets and returns for different time periods. In order to calculate investor returns, Morningstar first calculates the monthly cash inflows or outflows for each fund. The *fund flow* estimate for a month is the difference in beginning and ending total net assets that cannot be explained by the monthly total return.

The *risk-free rate*, retrieved from the Swedish House of Finance Research Data Center, is the 1-month Swedish T-bill. The *market factor* is the index MSCI Sweden NR SEK. The *size* (SMB), *book-to-market* (HML) and *momentum* (MOM) factor, also retrieved from the Swedish House of Finance Research Data Center, are calculated over every Swedish Stock, aggregated by month.

4.4. Potential Data Issues

Since funds that have been merged or closed during this time period have not been included in our sample, it is possible that the results of this study suffer from survivorship bias. This means that the returns may have been overestimated, and there is a possibility that our conclusions would differ if closed or merged funds would have been included in our sample. There is, however, no reason to assume the amount of closed funds would not be equally distributed between the sustainable and conventional funds.

The relatively small sample size used could limit the accuracy of the study and increase the error margin. We also have a large imbalance, with more than twice as many conventional funds as sustainable ones.

Our definition of a sustainable fund is based on proclamation of the fund company itself, and there are no independent actors responsible for conforming these statements. It is also difficult to distinguish a sustainable fund from a conventional fund. Furthermore, it is important in our study what the common investor views as a sustainable fund. Morningstar provides an indication, but it is possible that investors use other sources to get an idea of which fund is sustainable and which is not, and there might be funds that we define as sustainable that some investors view as conventional and vice versa. Another weakness of the dataset is that we assume that the funds remain sustainable (or conventional) for the whole period of study.

Furthermore, data points regarding monthly estimated fund flow and monthly estimated fund size are missing for some months for some funds. This leads to a few estimated yearly fund flows being wrong and to fewer data points for the volatility analysis, which affects the result. However, since the amount was small, this will only

have a minor impact on the output. For one fund, data on estimated fund size and fund flow was missing entirely and it was removed for the tests regarding investor behavior. For another fund, data regarding yearly return was missing and it was removed from the regressions regarding performance.

5. Method

In order to make a complete evaluation of risk-adjusted performance of sustainable and conventional funds, we use the Capital Asset Pricing Model (CAPM), the Fama-French three-factor model, and Carhart's four-factor model. In order to compare the performance between sustainable and conventional funds, we also include a dummy variable that captures the difference in return between sustainable and conventional funds. These models are explained in detail in section 5.1.

In order to study the relation between fund flow and performance regarding conventional funds, we use a methodology developed by Bollen (2007) explained in section 5.2.1. We measure the volatility of these funds as explained in section 5.2.2. Lastly, in order to control for differences in age, size and risk exposure between the conventional and sustainable funds, we create a matched sample, explained further in section 5.2.3.

5.1. Performance

5.1.1. Capital Asset Pricing Model

In the book *Corporate Finance* by Jonathan Berk and Peter DeMarzo (2017), the Capital Asset Pricing Model, or CAPM as it is usually referred to, is highlighted as one the most important models for evaluating the cost of capital for a stock or a portfolio. The model consists of the beta coefficient indicating the systematic risk for the portfolio, multiplied by the market risk premium for the portfolio (the risk premium that the investor can earn by holding market risk exceeding the risk-free return) plus the risk-free interest rate. Thus, CAPM uses the market return to explain the excess return for a specific portfolio and the model is therefore common for doing investment return evaluations. It establishes the connection between two different kinds of risks: the systematic risk and the unsystematic risk, and these are used to forecast the required return for investors. In the CAPM, the market risk is the systematic risk that the investor cannot diversify away, and it is depicted by the beta coefficient in the model as an indication of how much the investors should be compensated for their additional risk undertaken. On the other hand, the unsystematic risk can be diversified away since it does not correlate with the market. The unsystematic risk is then measured by using the residual standard deviation as a measuring of how accurate the expected return of the fund has been. This is combined in the model presented below:

$$r_t - rf_t = \alpha + \beta^{rM} * (rM_t - rf_t) + \varepsilon_t$$

Definitions of the variables:
$r_t - rf_t$ = Return at time *t* less the risk-free rate at time *t*
α = Risk-adjusted excess return
β^{rM} = Sensitivity to market fluctuations
rM_t = Market return at time *t*
rf_t = Risk-free rate at time *t*
ε_t = Error term at time *t*

5.1.2. Fama-French three-factor model

In the article *The Cross-Section of Expected Stock Returns*, Eugene F. Fama and Kenneth R. French (1992) presented the Fama-French model. A model that, in addition to CAPM only considering the market factor, included two easily measured factors, namely size of the fund and the book-to-market equity. These are then used to capture the cross-sectional variation in average stock returns and were applied in their study of US stocks between 1963 and 1990. Consequently, they made two robust findings: firstly, there is a negative relationship between size and average return, and secondly, there is a positive relation between book-to-market equity and average return. These findings were then concluded in the statement that, when explaining the average return, the book-to-market equity generally has a greater weight than the size factor. These two variables have been given the following definitions: Small Minus Big (SMB), and High Minus Low (HML), and are furthermore applied in the model below as portfolios:

$$r_t - rf_t = \alpha + \beta^{rM} * (rM_t - rf_t) + \beta^{SMB} * SMB_t + \beta^{HML} * HML_t + \varepsilon_t$$

Definitions of the additional variables:
β^{SMB} = Exposure to size factor
SMB_t = Size factor at time *t*
β^{HML} = Exposure to book-to-market equity factor
HML_t = Book to market factor at time *t*

5.1.3. Carhart's four-factor model

In Mark M. Carhart's article *On Persistence in Mutual Fund Performance* (1997) he presented the Carhart's four-factor model which added another risk factor named Momentum (referred to as MOM). This risk factor describes the connection between the possibility of continuing rises in price of a fund after a period of rise, but also the possibility of continuing declines in price of a fund after a period of decline. In combination with the earlier presented models, we now present a model consisting of the four risk factor variables below:

$$r_t - rf_t = \alpha + \beta^{rM} * (rM_t - rf_t) + \beta^{SMB} * SMB_t + \beta^{HML} * HML_t$$

$$+\beta^{MOM} * MOM_t + \varepsilon_t$$

Definitions of additional variables:
β^{MOM} = Exposure to momentum factor
MOM_t = Momentum factor at time *t*

5.1.4. Dummy model

In order to compare the risk-adjusted performance of sustainable and conventional funds, we use one more model. In this model we create a dummy variable called "Sustainable" in order to compare the risk-adjusted performance between sustainable and conventional funds.

$$r_t - rf_t = \alpha + \beta^{rM} * (rM_t - rf_t) + \beta^{SMB} * SMB_t + \beta^{HML} * HML_t$$

$$+\beta^{MOM} * MOM_t + \beta^{SUS} * Sus_t + \varepsilon_t$$

Definition of additional variables:
β^{SUS} = The difference in risk-adjusted return for sustainable funds compared to conventional funds
Sus_t = 1 if the fund is sustainable and 0 otherwise

5.1.5. Additional issues

Heteroskedasticity

When there is heteroskedasticity, the variance of the residuals is not constant, which means that when the value of an independent value increases, the unexplained variation in the dependent variable will either increase or decrease. The OLS regression requires minimum residuals. The variance of the residuals needs to be homogenic, otherwise the regression will yield incorrect significance values. We test for this using a Breusch-Pagan test, which in our model showed signs of heteroskedasticity. Because of this reason, the models are performed with robust standard errors, which eliminates the effect of heteroskedasticity. The result of the test is presented in the appendix.

Multicollinearity

Multicollinearity means that two or more independent variables are highly correlated with each other in the regression. When this is the case, the effects of the variables would be hard to identify from each other. In order to check if multicollinearity in our model, the

Variance Inflation Factor (VIF) was examined. No signs of multicollinearity were found. The results of the test are presented in the appendix.

5.2. Investor Behavior

5.2.1. Flow-performance model

To study the relationship between flow and performance, we use a methodology developed and described in *Mutual Fund Attributes and Investor Behavior* (2007) by Nicolas P. B. Bollen. The OLS-regression estimates the relation between return lagged one year to annual fund flow and can be viewed as an aggregate response over the course of a year to the performance of a fund the year before. The decision of using one year as a lag period is made to prevent potential misspecifications of the response function.

The asymmetry is framed around a return of 0, which makes the regression coefficients easier to interpret. It can also be viewed as a reasonable benchmark in investor decision-making. A positive beta coefficient corresponds to a cash inflow, whereas a negative beta coefficient corresponds to a cash outflow.

The model is presented below:

$$F_{i,t} = \alpha_0 + \alpha_1 S_i + \left(\beta_0 I^1_{i,t-1} + \beta_1 I^2_{i,t-1} + \beta_2 I^3_{i,t-1} + \beta_3 I^4_{i,t-1}\right) R_{i,t-1} + \varepsilon_{i,t}$$

Definitions of the variables:
$F_{i,t}$ = Fund flow for fund *i* at time *t* as a percentage of total net assets at the beginning of the year
$S_i = 1$ if fund *i* is a sustainable fund and 0 otherwise
$I^0_{i,t-1} = 1$ if fund *i* is a sustainable fund and has a negative lagged return, 0 otherwise
β_0 = Sensitivity of fund flow to sustainable funds following negative returns
$I^1_{i,t-1} = 1$ if fund *i* is a sustainable fund and has a positive lagged return, 0 otherwise
β_1 = Sensitivity of fund flow to sustainable funds following positive returns
$I^2_{i,t-1} = 1$ if fund *i* is a conventional fund and has a negative lagged return, 0 otherwise
β_2 = Sensitivity of fund flow to conventional funds following negative returns
$I^3_{i,t-1} = 1$ if fund *i* is a conventional fund and has a positive lagged return, 0 otherwise
β_3 = Sensitivity of fund flow to conventional funds following positive returns
$R_{i,t-1}$ = Lagged return for fund *i* at time *t*
$\varepsilon_{i,t}$ = Error term for fund *i* at time *t*

In addition to the OLS-regression we perform an LAD-regression in order to control for the potential presence of outliers in the observations. The LAD-regression is used since it minimizes the sum of absolute errors, thus placing less weight on outliers.

5.2.2. Volatility

In order to measure the flow of money into and out of funds, we estimate the volatility of the sustainable and conventional funds. We define volatility simply as the time-series standard deviation of monthly fund flow as a percentage of the beginning-of-month fund size, using all observations of each fund during the time-period 2006-01 to 2018-12.

5.2.3. Control group

There are several other factors that influence the volatility of fund flow and the sensitivity of performance. Following the discussion and methodology described in the article by P. B. Bollen (2007), two possibly significant determinants of fund flow to take into consideration are risk exposure and fund size. Similarly to Bollen, we aim to create a matched sample using a least distance approach, with risk exposure and fund size as matching criteria, in order to control for differences between the sustainable and conventional funds regarding risk and size. Another possible solution would be to include additional explanatory variables in the flow-performance regression model; however, the assumption of linearity may be inappropriate.

For a given sustainable fund, all the conventional funds are scored based on the distance between the conventional fund's risk exposure and size. The distance from a given sustainable fund (*i*) to each conventional fund (*j*) is calculated using the following algorithm:

$$Distance_{i,j} = \left(\frac{\beta_i - \beta_j}{\sigma_\beta}\right)^2 + \left(\frac{TNA_i - TNA_j}{\sigma_{TNA}}\right)^2$$

Definition of variables:
β = correlation with the market factor, estimated with OLS regression using the CAPM for each fund
σ_β = the cross-sectional standard deviation of β
TNA = the maximum yearly estimated fund size reached by a fund during the time period 2006 to 2018
σ_{TNA} = the cross-sectional standard deviation of TNA

Dividing by the standard deviation of the beta coefficients and the fund size normalizes the weights placed on the two matching criteria. For each sustainable fund, the conventional fund with the shortest distance gets matched and gets included in the matched sample. In order to avoid two sustainable funds being matched with the same conventional fund, when a conventional fund has been matched, that fund is removed from the sample for the remaining sustainable funds that has not been matched.

6. Summary Statistics

Table 1 lists the number of funds, the median and average age of the funds year by year. Figure 1 shows the growth in total number of funds year by year since 1988. Both are divided into sustainable and conventional funds.

Table 1. Summary statistics.
The table shows the number and the average and median age of the funds included at the beginning of the year since 1988.

	Conventional			Sustainable		
	No. of funds	Avg. age	Med. age	No. of funds	Avg. age	Med. age
1988	8	5.8	3.6	1	0.2	0.2
1989	9	6.2	4.4	4	0.8	0.7
1990	10	6.6	5.2	4	1.8	1.7
1991	11	6.9	6.1	5	2.3	2.6
1992	12	7.3	5.7	6	2.8	3.6
1993	13	7.7	5.4	6	3.8	4.6
1994	14	8.2	6.4	7	4.2	5.6
1995	17	7.6	7.0	7	5.2	6.6
1996	19	7.7	6.9	7	6.2	7.6
1997	19	8.7	7.9	7	7.2	8.6
1998	21	8.9	7.1	7	8.2	9.6
1999	25	8.3	7.0	8	8.2	9.6
2000	28	8.4	6.2	13	5.8	6.2
2001	31	8.5	6.3	13	6.8	7.2
2002	32	9.2	7.3	13	7.8	8.2
2003	34	9.6	7.8	13	8.8	9.2
2004	34	10.6	8.8	14	9.2	8.1
2005	35	11.3	9.4	16	9.0	6.4
2006	35	12.3	10.4	16	10.0	7.4
2007	37	12.6	11.2	16	11.0	8.4
2008	40	12.7	10.5	17	11.3	8.8
2009	45	12.2	10.1	17	12.3	9.8
2010	47	12.8	11.1	18	12.6	10.8
2011	48	13.4	12.0	18	13.6	11.8
2012	50	13.8	12.8	19	13.9	12.7
2013	53	14.0	13.8	20	14.1	13.5
2014	54	14.8	14.8	21	14.4	14.3
2015	56	15.2	15.1	22	14.7	15.2
2016	57	15.9	15.4	23	15.1	16.2
2017	61	15.8	16.3	24	15.4	17.2
2018	66	15.6	15.1	28	14.1	14.5
2019	69	15.9	14.7	30	14.1	14.5

Figure 1. Growth in the Swedish mutual fund industry.
The figure illustrates the number of Swedish mutual equity funds year by year since 1988.

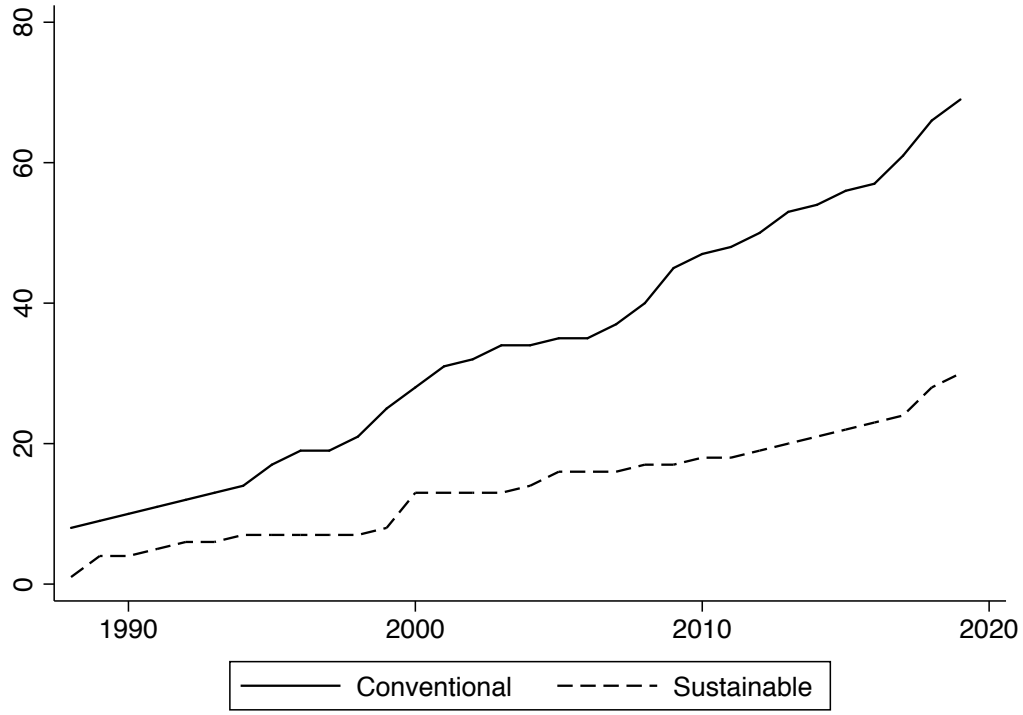
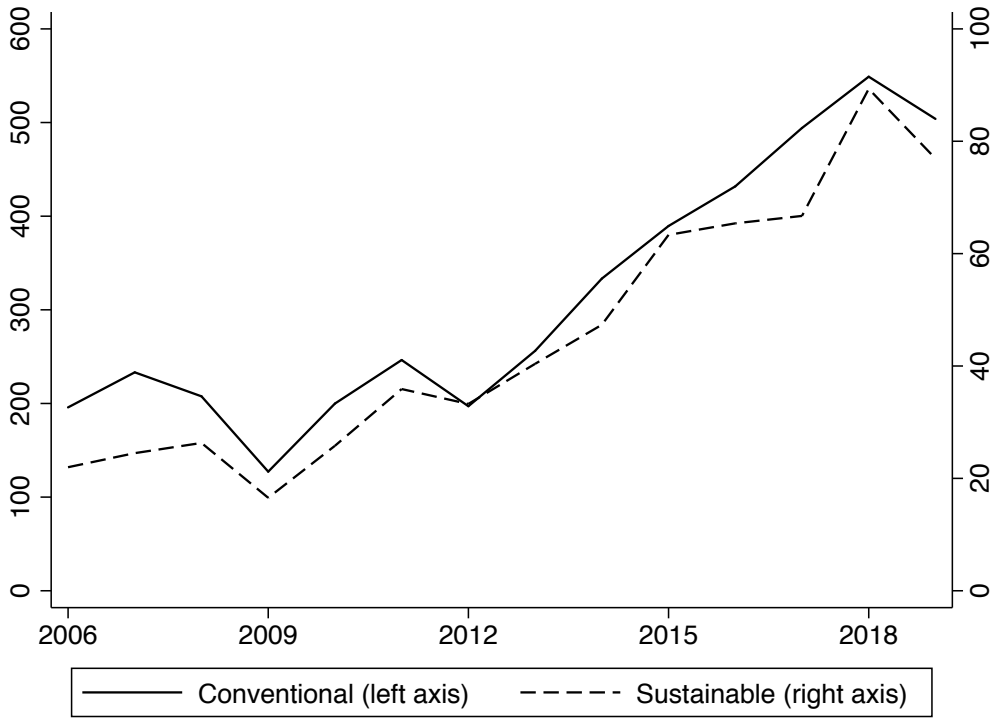


Table 2 lists the number of funds, the median and average size of the funds year by year since 2006. Figure 2 shows the total size of the funds year by year since 2006. Both are divided into sustainable and conventional funds.

Table 2. Summary statistics.
The table shows the average and median size (in 100 million SEK) of the funds included year by year since the beginning of 2006.

	Conventional			Sustainable		
	No. of funds	Avg. size	Med. size	No. of funds	Avg. size	Med. size
2006	35	61.2	36.1	16	16.9	11.7
2007	37	72.9	47.0	16	18.8	10.7
2008	40	62.9	37.9	17	18.8	10.2
2009	45	33.4	12.8	17	9.7	6.0
2010	47	48.8	21.8	18	13.5	10.5
2011	48	57.3	27.0	18	18.9	12.6
2012	50	41.9	16.5	19	16.6	11.7
2013	53	52.3	19.9	20	19.2	13.8
2014	54	66.7	29.0	21	21.5	16.4
2015	56	76.4	32.7	22	27.5	15.2
2016	57	80.0	36.8	23	27.2	14.8
2017	61	83.8	36.9	24	26.7	14.5
2018	66	80.7	31.5	28	28.8	17.9
2019	69	74.1	30.8	30	24.8	16.6

Figure 2. Growth in the Swedish mutual fund industry.
The figure shows the growth in the total net assets of the funds regarding the conventional and sustainable funds, year by year since the beginning of 2006 (in 100 million SEK).



We see that there has been a substantial growth in the Swedish mutual equity fund industry, both in terms of number of equity funds and size. The sustainable funds have grown at roughly the same rate as the conventional funds.

Table 3 shows the equally weighted average return year by year, together with the *p*-value for t-test for means. We see here that the sustainable funds have lower return every year since 2000 except for 2007 and 2012, and that there is a significant difference at the 5% level at 2013, 2014, 2015 and 2018.

Figure 3 shows the value-weighted average return of the sustainable and conventional funds during the years 2010 to 2018 and we can see that the two series are similar. Figure 4 also illustrates the aggregate fund flow for sustainable and conventional funds, as a percentage of total size of the funds at the beginning of the year.

Table 3. Equally weighted percentage returns.

The table shows the equally weighted average percentage return for the years 1989 to 2018. The *p*-value corresponds to a two-sided t-test for difference of means.

	Conventional	Sustainable	Difference	*p*-value
1989	32.8	33.4	-0.6	0.9330
1990	-21.4	-22.7	1.4	0.7368
1991	10.4	11.2	-0.8	0.8723
1992	7.8	7.5	0.3	0.9765
1993	55.1	72.9	-17.8	0.1129
1994	10.5	12.4	-2.0	0.5602
1995	17.9	19.2	-1.3	0.5774
1996	44.4	40.2	4.2	0.3421
1997	28.6	25.7	2.9	0.2370
1998	8.3	18.9	-10.6	0.0713
1999	58.5	62.3	-3.8	0.4114
2000	-2.5	-9.8	7.3	0.0174
2001	-8.1	-11.0	2.9	0.4019
2002	-30.7	-37.0	6.3	0.0061
2003	33.4	29.5	3.8	0.3206
2004	16.4	14.9	1.4	0.4239
2005	36.7	35.1	1.6	0.5076
2006	27.2	26.8	0.4	0.8614
2007	-4.3	-2.0	-2.3	0.0747
2008	-37.7	-38.3	0.6	0.6886
2009	57.6	57.1	0.5	0.8980
2010	25.9	24.2	1.8	0.3789
2011	-14.4	-16.5	2.1	0.1007
2012	14.7	15.0	-0.2	0.8356
2013	30.0	24.6	5.4	0.0046
2014	19.3	16.4	2.9	0.0185
2015	19.0	10.7	8.2	0.0046
2016	9.8	8.5	1.3	0.2128
2017	11.5	10.5	1.0	0.2543
2018	-4.2	-6.9	2.7	0.0079

Figure 3. Value-weighted performance.
The diagram shows the value-weighted average return of the funds in the table, divided into sustainable and conventional funds, year by year during 2006 to 2018.

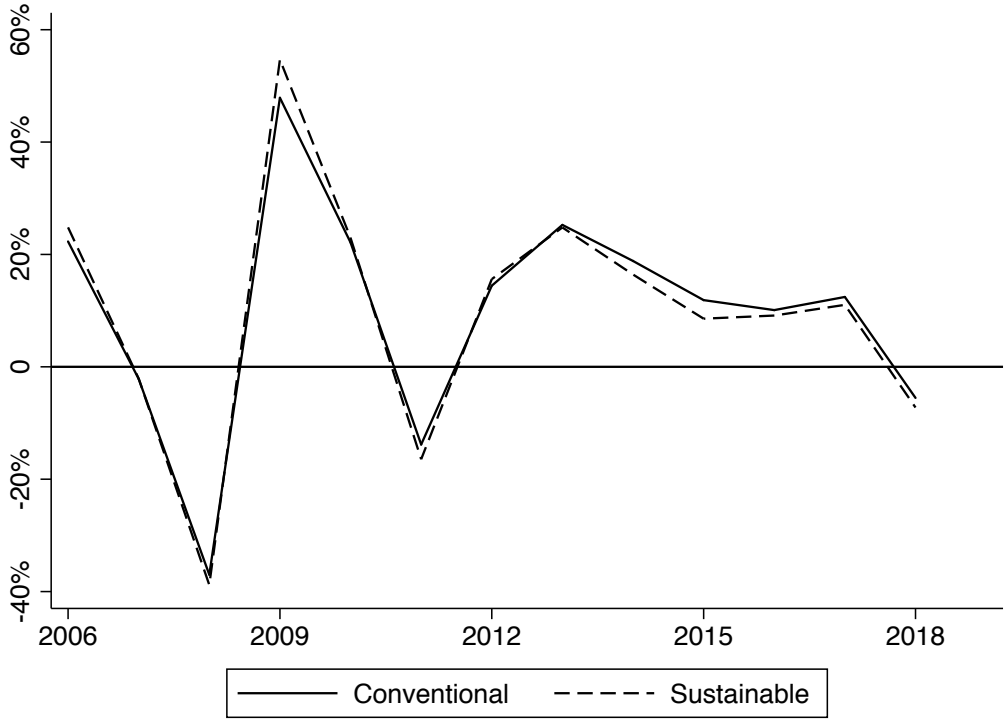
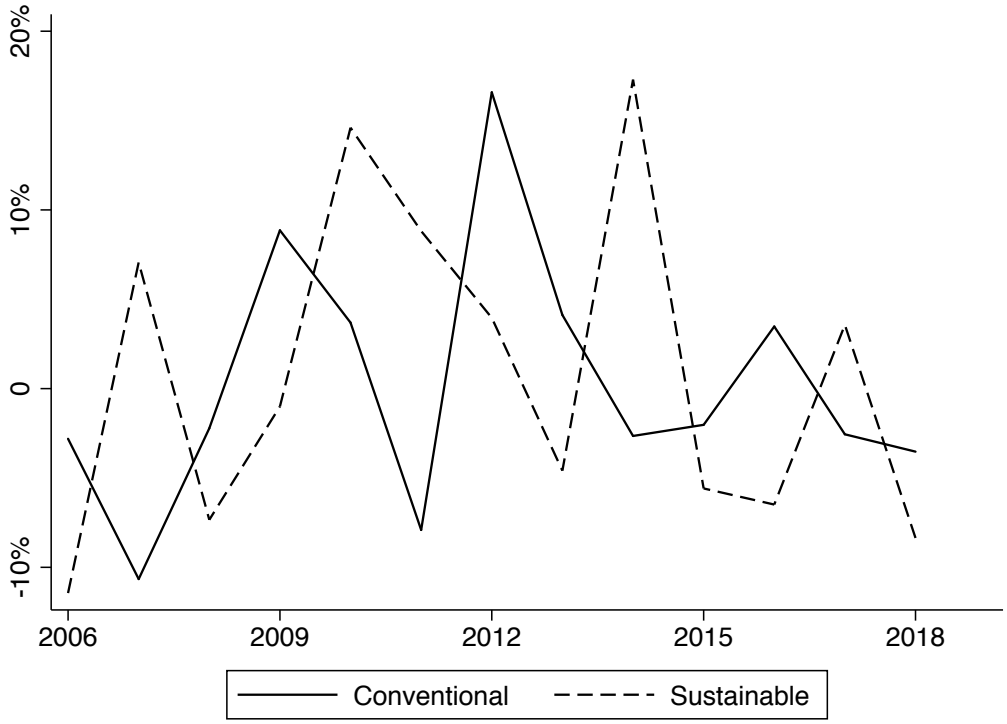


Figure 4. Aggregated fund flow.
The diagram shows the aggregated fund flow as a percentage of the beginning-of-year fund size for the sustainable and conventional funds, year-by-year during 2006 to 2018.



7. Results

We split this section into two segments. The first section concerns the results regarding the performance of the funds, and the second section shows the results regarding our studies on investor behavior, including the flow-performance relationship and volatility.

7.1. Performance

The regression statistics estimated from the CAPM, the Fama-French three-factor model and Carhart's four-factor model are summarized in Table 4. The alpha-constant indicates if the funds have outperformed their factor benchmarks. Table 5 shows the regression statistics estimated from the dummy model, where the beta coefficient indicates if there is a significant difference in risk-adjusted performance between sustainable and conventional funds.

Table 4. Regression analysis.
The table summarizes the results of the OLS regression analysis using the CAPM, the Fama-French three-factor model and Carhart's four-factor model, for both sustainable and conventional funds.

	α	$\beta(rM-rf)$	βSMB	βHML	βMOM	R^2	OBS
CAPM							
Sustainable	0.190***	0.824***				0.853	4,337
	(0.0312)	(0.0105)					
Conventional	0.323***	0.790***				0.786	10,943
	(0.0238)	(0.00614)					
Fama-French							
Sustainable	0.173***	0.829***	-0.0126*	0.0438***		0.855	4,337
	(0.0315)	(0.0105)	(0.00663)	(0.0129)			
Conventional	0.308***	0.794***	-0.00915*	0.0409***		0.788	10,943
	(0.0238)	(0.00602)	(0.00517)	(0.00850)			
Carhart							
Sustainable	0.187***	0.819***	-0.0223***	0.0336***	-0.0243***	0.856	4,337
	(0.0109)	(0.0109)	(0.00687)	(0.0125)	(0.00744)		
Conventional	0.321***	0.786***	-0.0183**	0.0314***	-0.0231***	0.788	10,943
	(0.0242)	(0.00536)	(0.00532)	(0.00836)	(0.00536)		

Significance level: ***p<0.01, **p<0.05, *p<0.1
Robust standard errors in parenthesis.

We see that using the CAPM, we get an alpha of 0.190%, statistically significant at the α = 1% level, for sustainable funds, indicating that the sustainable funds have outperformed their factor benchmarks. We get an alpha of 0.323%, statistically significant at the α = 1% level, for conventional funds, which indicates that the conventional funds also outperform their factor benchmark. We see that both the sustainable and conventional funds are underexposed to the market with a beta coefficient under 1, indicating that the sample funds are less volatile than the market.

The Fama-French model yields similar results. The alpha for the sustainable funds is 0.173% and 0.308% for the conventional funds, both significant at the $\alpha = 1\%$ level. We see that both the sustainable and conventional funds are significantly underexposed to small capitalization companies. The sustainable and conventional funds are also underexposed to value companies, significantly so at the $\alpha = 1\%$ level

The Carhart's model includes the momentum factor in the regression. With this model, the sustainable funds have a statistically significant value of alpha at the $\alpha = 1\%$ level of 0.187%. The statistically significant value of alpha for conventional funds is 0.321%. Both the sustainable and the conventional funds are significantly underexposed to the momentum factor.

The results are similar when conducting the Fama-French three-factor model and Carhart's four factor model. The value of R-squared for these regression models are slightly higher than the CAPM, indicating that the inclusion of the additional risk factors implies a better fit.

We see that the value of alpha for conventional funds is higher than the value of alpha for sustainable funds, indicating that these funds perform better during the time period. To test whether there is statistically significant difference regarding the risk-adjusted performance between sustainable and conventional funds, we run a regression model with the dummy variable described in section 5.1.4. The summary of the regression is presented in Table 5.

Table 5. Regression analysis.
The table shows the…

α	$\beta(rM-rf)$	βSMB	βHML	βMOM	βSUS	R^2	OBS
0.314***	0.795***	-0.0195***	0.0319***	-0.0235***	-0.111***	0.8074	15,280
(0.0241)	(0.00543)	(0.00428)	(0.00694)	(0.00438)	(0.0396)		

Significance level: ***p<0.01, **p<0.05, *p<0.1
Robust standard errors in parenthesis.

We see from Table 5 that the beta coefficient of the dummy variable is -0.111%, indicating that the sustainable funds perform worse than the conventional funds, significant at the $\alpha = 1\%$ level. For this reason, we conclude that there is a difference regarding risk-adjusted financial performance between sustainable and conventional funds, the sustainable funds perform worse than the conventional funds.

7.2. Investor Behavior

The regression statistics estimated from the flow-performance model described in section 5.2.1 are summarized in Table 6.

Table 6. Regression analysis, flow-performance model.

The table shows the results of the flow-performance model described in section 5.2.1, both OLS-regression and LAD-regression, using the sustainable funds and all the conventional funds. "All funds" show results when observations are included from a fund's entire life, beginning from 2006. "Mature funds" shows results when only observations for fund age six years or greater are included, and "young funds" shows results when only observations for fund age five years or less are included.

OLS-regression

	All funds N = 803			Mature funds N = 683			Young funds N = 120		
		t-stat	*p*-value		t-stat	*p*-value		t-stat	*p*-value
R^2	0.0023			0.0049					
β_0	-0.241	-0.18	0.858	-0.301	-0.37	0.711	-.0277	-0.00	0.997
β_1	0.545	0.60	0.551	0.179	0.33	0.742	3.789	0.62	0.535
β_2	-0.319	-0.35	0.730	-0.527	-0.96	0.336	1.515	0.24	0.814
β_3	0.277	0.51	0.608	0.0801	0.23	0.817	.245	0.10	0.923

LAD-regression

	All funds N = 803			Mature funds N = 683			Young funds N = 120		
		t-stat	*p*-value		t-stat	*p*-value		t-stat	*p*-value
R^2	0.0078			0.0108			0.0154		
β_0	-0.199	-1.70	0.090	-0.219	-1.93	0.054	-0.317	-0.44	0.658
β_1	0.0916	1.16	0.248	0.0978	1.29	0.197	2.743	5.12	0.000
β_2	-0.392	-4.90	0.000	-0.361	-4.72	0.000	-0.172	0.762	0.762
β_3	0.0654	1.39	0.163	0.077	1.59	0.112	0.0585	0.792	0.792

Looking at all funds, we find that the fund flow into sustainable funds increases by 0.545% by every 1 percentage point increase in return in prior year when the return is positive. Fund flow out of sustainable funds increase by 0.241% by every 1 percentage point decrease in prior year return. Similarly, fund flow into conventional funds increase by 0.277% by every 1 percentage point increase in prior year return. Fund flow out of conventional funds increase by 0.545% by every 1 percentage point decrease in prior year return. These values are however not significantly different from zero, but they indicate that investors in sustainable funds are less sensitive to negative returns than investors in conventional funds. Similarly, investors in sustainable funds are more sensitive to positive returns than investors in conventional funds. Looking at the mature funds, we see similar results, and we see from Table 7 that the funds with inception date prior to 2008 yields similar results as well. The results regarding younger funds differ, which can partly be explained by the abnormal fund flow during the first years of a fund. Using the LAD-regression, yields similar results.

Table 7. Regression analysis, flow-performance model.
The table shows the results of the flow-performance model described in section 5.2.1, both OLS-regression and LAD-regression, with funds with inception date prior to 2008-01.

OLS-regression N = 683		t-stat	*p*-value
R^2	0.0460		
β_0	-0.383	-1.23	0.218
β_1	0.427	2.02	0.044
β_2	-1.0936	-5.03	0.000
β_3	0.410	3.06	0.002
LAD-regression N = 683		t-stat	*p*-value
R^2	0.0162		
β_0	-0.219	-2.06	0.039
β_1	0.106	1.47	0.143
β_2	-0.446	-6.00	0.000
β_3	0.0845	1.84	0.066

The results regarding the volatility comparison are presented in Table 8.

Table 8. Volatility.
Listed are the values of the 25th, 50th and 75th percentiles, as well as the means of the cross-sectional distribution of monthly volatility of percentage fund flows for sustainable and conventional funds. The *p*-value corresponds to a two-sided t-test for a significant difference of means. "All funds" show results when observations are included from a fund's entire life, beginning from 2006. "Mature funds" shows results when only observations for fund age six years or greater are included, and "young funds" shows results when only observations for fund age five years or less are included.

	All funds		Mature funds		Young funds	
	Conventional	Sustainable	Conventional	Sustainable	Conventional	Sustainable
25th	0.02892	0.03086	0.02568	0.02225	0.0460	0.07206
50th	0.05289	0.06472	0.04013	0.06134	0.07829	0.1167
75th	0.1235	0.1239	0.05906	0.09033	0.1500	0.7431
No. of obs	63	24	50	20	36	9
Avg.	0.1300	0.1646	0.1225	0.06624	0.1688	0.3748
p-value		0.567		0.3801		0.0545

Using all observations to estimate the volatility of each fund, we find that the values of the 25th, the 50th and the 75th percentiles of the sustainable funds are higher than the conventional funds, as well as the mean. The sample means are 0.1646% for sustainable funds and 0.1300% for conventional funds, indicating that the volatility of the fund flow to sustainable funds is higher, although the difference is not statistically significant.

In order to control for differences regarding fund size and risk exposure, we perform the matching approach described in section 5.2.3, for a more robust result. We run the same tests regarding flow-performance and volatility, now with the matched conventional funds. The regression statistics estimated from the flow-performance model for the matched sample is summarized in Table 9.

Table 9. Regression analysis, flow-performance model, matched funds.
The table shows the results of the flow-performance model described in section 5.2.1, both OLS-regression and LAD-regression, using the sustainable funds and the matched conventional funds. "All funds" show results when observations are included from a fund's entire life, beginning from 2006. "Mature funds" shows results when only observations for fund age six years or greater are included, and "young funds" shows results when only observations for fund age five years or less are included.

OLS-regression

	All funds			Mature funds			Young funds		
	N = 460			N = 389			N = 71		
		t-stat	*p*-value		t-stat	*p*-value		t-stat	*p*-value
R^2	0.0086			0.0122			0.0116		
β_0	-0.241	-0.14	0.892	-0.301	-0.28	0.776	-0.0277	-0.00	0.998
β_1	0.545	0.46	0.649	0.179	0.25	0.801	3.789	0.48	0.636
β_2	-0.238	-0.12	0.905	-0.763	-0.65	0.513	5.290	0.37	0.710
β_3	0.662	0.57	0.569	0.273	0.37	0.713	-0.226	-0.04	0.968

LAD-regression

	All funds			Mature funds			Young funds		
	N = 460			N = 389			N = 71		
		t-stat	*p*-value		t-stat	*p*-value		t-stat	*p*-value
R^2	0.0072			0.0103			0.0174		
β_0	-0.199	-1.48	0.140	-0.219	-1.96	0.051	-0.317	-0.35	0.724
β_1	0.0916	1.01	0.315	0.0978	1.31	0.192	2.743	4.09	0.000
β_2	-0.523	-3.46	0.001	-0.832	-6.74	0.000	-0.122	-0.10	0.919
β_3	0.197	2.24	0.026	0.148	1.89	0.059	.0315	0.07	0.947

Looking at Table 9, we find that the matched conventional funds have lower sensitivity to negative returns, with an increase of 0.238% in fund outflow with every 1 percentage point decrease in prior year return, compared to all the conventional funds. We also see that the matched conventional funds have higher sensitivity to positive returns than all conventional funds. We see that the matched conventional funds are now slightly less sensitive to negative performance and more sensitive to positive returns than the sustainable funds, which is not in line with the results regarding all conventional funds. Looking at the LAD-regression, the same holds true regarding positive returns, however we see here that the matched conventional funds are more sensitive to negative performance.

Looking at the mature funds, we here see that it yields similar results as before regarding negative returns, that conventional funds have higher sensitivity to negative returns, which also holds true regarding the LAD-regression. However, regarding positive returns we now see that the matched, mature conventional funds receive higher fund inflow with a positive lagged performance compared to sustainable funds. The same holds true with funds with inception date prior to 2008, see Table 10.

The conclusions we can draw from this is ambiguous, however, we see that regarding mature funds, the results regarding negative performance holds true when controlling for size and risk exposure. Thus, we have found strong indications that investors in mature sustainable funds are less sensitive to negative returns than in conventional funds.

Table 10. Regression analysis, flow-performance model, matched funds.
The table shows the results of the flow-performance model described in section 5.2.1, both OLS-regression and LAD-regression, with funds with inception date prior to 2008-01, for the sustainable funds and the matched conventional funds.

OLS-regression			
N = 395			
		t-stat	*p*-value
R^2	0.0813		
β_0	-0.383	-1.04	0.299
β_1	0.427	1.70	0.089
β_2	-1.968	-4.72	0.000
β_3	1.0056	3.98	0.000
LAD-regression			
N = 395			
		t-stat	*p*-value
R^2	0.0177		
β_0	-0.219	-1.85	0.066
β_1	0.106	1.31	0.190
β_2	-0.551	-4.10	0.000
β_3	0.179	2.21	0.028

The results regarding the volatility comparison between the sustainable and matched conventional funds is presented in Table 11.

Table 11. Volatility, matched funds.
Listed are the values of the 25th, 50th and 75th percentiles, as well as the means of the cross-sectional distribution of monthly volatility of percentage fund flows for sustainable and matched conventional funds. The *p*-value corresponds to a two-sided t-test for a significant difference of means. "All funds" show results when observations are included from a fund's entire life, beginning from 2006. "Mature funds" shows results when only observations for fund age six years or greater are included, and "young funds" shows results when only observations for fund age five years or less are included.

	All funds		Mature funds		Young funds	
	Conventional	Sustainable	Conventional	Sustainable	Conventional	Sustainable
25th	0.04163	0.03086	0.02588	0.0222	0.07310	0.07205
50th	0.06987	0.06472	0.04489	0.06133	0.1074	0.1167
75th	0.1498	0.1239	0.1477	0.09033	0.4007	0.7431
No. of obs	24	24	24	24	24	24
Avg.	0.2341	0.1646	0.2079	0.06623	0.2852	0.3748
p-value		0.567		0.123		0.580

Looking at Table 11, we see that the values of the 25th, the 50th and the 75th percentiles of the sustainable funds are now slightly lower than the matched conventional funds, as well as the mean, which is inconsistent with the previous results. The difference in means is not statistically significant. Of these reasons, we cannot conclude that there is a difference in volatility regarding Swedish sustainable and conventional mutual equity funds.

8. Discussion

In this thesis, we use three similar models to evaluate performance. All three models find evidence that both sustainable funds and conventional funds outperform their factor benchmarks. The dummy model indicates that the sustainable funds perform worse than the conventional funds, thus confirming the statement made by Statman (2002), Bello (2005) and Bollen (2007), but it could also indicate a connection to the previous findings by Lundkvist and Nacksten (2018) that sustainable funds significantly underperform funds characterized as conventional during the period of post-crisis.

Yet, whilst Lundkvist and Nacksten only was looking at the time period around the most recent financial crisis, as we are looking at the period 1987 to 2019, questions regarding differences and similarities in our findings may erupt that connect to the wave of sustainable focus surrounding the everyday life of the western civilization of today. Also, when Lundkvist and Nacksten are focusing on the financial crisis they are actually referring to the general accepted economic term crisis, whilst we, on the other hand, are looking at more everyday fluctuations in the market. Bollen (2007) found that during the period from 1980 to 2002 period, "SR investors exhibit a significantly larger response to positive returns than investors in conventional funds, but a smaller response to negative returns than investors in conventional funds". Thus, our evidence that Swedish sustainable funds perform worse than conventional funds could be connected to and confirmed by other researchers' findings, not only around financial crises in Sweden but also in more general terms globally.

The flow-performance model showed that the investors in the sustainable funds are less sensitive to negative returns and more sensitive to positive returns than investors in conventional funds. However, when we took a deeper look at the age of the funds, we were able to find that younger funds differed from the general finding, which can partly be explained by the abnormal fund flow during the first years of a fund. When controlling for fund size and risk exposure the findings were ambiguous, however what was clear was that the results regarding negative performance holds true when controlling for size and risk exposure mature funds. This is partly in line with our hypothesis, and the assumption that fund flows to sustainable funds should be less sensitive to past performance than the fund flows to conventional funds were shown to be true in the case of negative returns, whilst the opposite was shown in the case of positive returns. The belief that corporate social reporting (CSR) would allow the investors to be more concerned with how their assets are invested, as presented by Friedman and Miles (2001) and Chevalier and Ellison (1995), is not necessarily consistent with making a proper evaluation of the fund manager's performance, at least not if we should trust that the fund flow to a fund depends on the perceived skill of the fund manager as presented by Geczy et al. (2005). Thus, the CSR could be assumed to not be directly correlated with a perceived good performance by the fund manager, but how about the connection to the perception of the fund's prior performance as presented by Sirri and Tufano (1998)?

Obviously, it has been shown that the sustainable funds' prior positive performance affects the sustainable funds' fund flows in a more extreme manner than what the performance of conventional funds does. In other words, it seems like the investors in sustainable funds are more sensitive to the positive performance of the fund, whilst the investors in conventional funds are more sensitive to the negative performance of the fund. Still, the finding that increased amount of positive fund flows may decrease the fund's expected return may still say something about the fund's perceived future performance, as stated by Statman (2002). Nonetheless, taking the other perspective and looking at what the past performance of a fund could tell about the future fund flow gives unclear answers. The matched OLS-regression showed that the sustainable funds would be more sensitive to negative returns and that conventional funds would be more sensitive to positive returns, whilst the matched LAD-regression showed a more general conclusion that conventional funds would follow more extreme shifts depending on the past fund flows than would be the case for a comparable sustainable fund. This increased fund flow could in turn indicate a future bad performance of the conventional fund, which in turn would result in an extreme negative fund flow from the conventional fund compared to a sustainable fund leading to a forecasted good performance by the conventional fund, and the cycle restarts. Would this mean that the connection between the performance and the fund flows of conventional funds would make it easier to predict the payoffs for the conventional funds compared to the sustainable ones?

Our findings indicate that the volatility of the fund flow to sustainable funds is higher than the fund flow to conventional funds, but these findings have been made without statistical significance. Thus, Bollen's (2007) finding that the sustainable funds "feature significantly lower monthly fund flow volatility than conventional funds" should be perceived as more accurate information. Thus, when we matched one conventional fund to each sustainable fund, we found that the matched conventional funds have higher sensitivity to performance than all our matched sustainable funds in the table, but we cannot conclude that the regression coefficients of the matched conventional funds significantly differ from zero. This is not directly contradictory to Renneboog et al. (2011) who found that the people who invest in SR funds care about the non-financial attributes of investment funds, but it may indicate that these people do not value the non-financial attributes as much as Renneboog et al. suggested. Also, this is somewhat contradictory to Bollen's findings from 2007 that the net fund flow of SRI funds should be significantly lower than in conventional funds. However, it is important to remember that our findings are not statistically significant – most likely due to the aforementioned small sample size – and thus they do not give grounds for any conclusive clams regarding either Renneboog et al.'s (2011) or Bollen's (2007) arguments.

Our thesis has been focused around the performance of sustainable and conventional funds, and the investor behavior resulting from these performances. We found that conventional funds significantly perform better than sustainable funds and that investors in mature sustainable funds are less sensitive to negative returns than in conventional funds. Thus, future studies might focus on the behavioral perspective and the psychology

behind these sensitivities in investment to better understand why the investors in sustainable funds are more sensitive to positive performance than investors in conventional funds. Also, it would be interesting to study the suggested correlation between fund flows and performance, and look deeper into the suggested connection that the relation between the performance and the fund flows of sustainable funds would make it easier to predict the payoffs for the sustainable funds.

9. Conclusions

The purposes of this thesis have been to examine the performance of Swedish sustainable mutual equity funds and to compare it with the performance of conventional funds, to investigate whether investors in Swedish sustainable funds are more sensitive to performance than conventional funds, and to investigate whether the volatility of the fund flow to sustainable funds is higher than that of conventional funds.

We find evidence that the sustainable funds outperform their risk factor benchmarks during 1987 to 2016. Furthermore, we find that conventional funds significantly perform better than sustainable funds. Moreover, we find strong indications that investors in mature sustainable funds are less sensitive to negative returns than in conventional funds. These findings hold when controlling for size and risk exposure of the funds. We find no evidence that there is a difference regarding the fund flow volatility of investor cash flow regarding Swedish sustainable and conventional mutual equity funds.

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11. Appendix

11.1. Sample data

Table 11. Conventional Funds.
The table presents all the funds defined as conventional in our sample.

	Inception date
Aktie-Ansvar Sverige	1992-01-01
Alfa Aktiv	2015-08-26
AMF Aktiefond Småbolag	2004-05-17
AMF Aktiefond Sverige	1998-12-30
AMF Aktiefond Världen	1998-12-30
C WorldWide Sweden	2009-12-01
C Worldwide Sweden Small Cap	2010-02-02
Carnegie Micro Cap	2017-01-31
Carnegie Småbolagsfond A	2012-01-31
Carnegie Sverige Select	2007-09-28
Carnegie Sverigefond	1987-01-08
Case All Star	1987-01-08
Catella Småbolag	1998-02-16
Cicero Focus	2007-03-01
Cliens Småbolag	2016-09-30
Consensus Sverige Select	2018-10-17
Danske Invest SICAV Sverige Småbolag	2018-08-27
Didner & Gerge Aktiefond	1994-10-21
Didner & Gerge Småbolag	2008-12-23
Ethos Aktiefond	2006-06-14
Evli Swedish Small Cap A	2008-05-29
Folksam LO Sverige	1999-03-18
Folksam LO Västfonden	1999-03-18
Handelsbanken AstraZeneca Allemans	1984-04-01
Handelsbanken Microcap Sverige	2016-11-30
Handelsbanken Svenska Småbolag	1994-11-21
Handelsbanken Sverige Selektiv	2016-03-08
Humle Småbolagsfond	2008-01-01
Indecap Guide 2	2018-06-13
Indecap Guide Q30	2017-10-04
Jämställda Bolag Sverige	2017-11-28
Lancelot Avalon	2012-11-01
Lannebo Småbolag	2000-08-04
Lannebo Småbolag Select	2000-10-31
Lannebo Sverige	2000-08-04
Lannebo Sverige Plus	2008-12-11
Länsförsäkringar Småbolag Sverige	1997-09-01
Länsförsäkringar Sverige Aktiv	1990-12-10
Movestic SICAV Movestic Sverige	2014-12-16
Nordea Alfa	1984-04-02
Nordea Olympia	1988-01-05
Nordea Småbolagsfond Sverige	2011-02-14
Nordea Swedish Ideas Equity	2014-04-29
Nordic Equities Sweden	2007-06-01
Norron Activ	2017-12-07
ODIN Sverige	1994-10-31
Öhman Sweden Micro Cap	1997-05-29
PriorNilsson Sverige Aktiv	2012-10-01
Quesada Sverige	2001-12-05
SEB Aktiesparfond	1978-10-31
SEB Sverige Expanderad	1973-11-11
SEB Sverige Småbolag	2013-02-28
SEB Sverigefond	1984-12-31

SEB Sverigefond Småbolag	1987-09-21
SEB Swedish Value Fund	2006-11-10
Simplicity Småbolag Sverige	2016-10-31
Skandia Småbolag Sverige	1998-12-09
Skandia SMART Offensiv	1995-08-28
Skandia Sverige	1991-03-05
Spiltan Aktiefond Investmentbolag	2011-11-30
Spiltan Aktiefond Småland	2008-06-25
Spiltan Aktiefond Stabil	2002-12-02
Spiltan Aktiefond Sverige	2002-12-02
Strand Småbolagsfond	2007-02-01
Swedbank Robur Aktiefond Pension	1999-03-15
Swedbank Robur Allemansfond Komplett	1989-02-28
Swedbank Robur Exportfond	1993-02-01
Swedbank Robur Kapitalinvest	1975-09-01
Swedbank Robur Småbolagsfond Sverige	1995-11-13

Table 12. Sustainable Funds.

The table presents all the funds defined as sustainable in our sample.

	Inception date
Alfred Berg Hållbar Tillväxt Sverige	2016-02-10
Cliens Sverige	2004-12-31
Cliens Sverige Fokus	2011-03-31
Danske Invest Alloc Horisont Aktie	2017-12-20
Danske Invest Sverige	2018-09-21
Danske Invest Sverige Beta	2017-11-10
Enter Select	2007-08-14
Enter Select Småbolag	2007-08-14
Enter Select Pro	2004-02-06
Enter Select Sverige	1999-11-30
Enter Select Sverige Pro	1999-11-30
GodFond Sverige & Världen	2009-04-22
Handelsbanken Sverigefond	1988-04-25
KPA Etisk Aktiefond	1999-03-01
Lannebo Sverige Hållbar	2018-12-20
Lärarfond 21-44 år	1999-04-08
Nordea Inst Aktief Sverige	2012-03-01
Nordea Institutionell Aktieförvaltn	2014-12-03
Nordea Swedish Stars	1999-10-26
Öhman Småbolagsfond	1991-09-20
Öhman Sverige Fokus	2017-12-08
Öhman Sverige Hållbar	2013-08-19
SEB Stiftelsefond Sverige	1998-01-14
SEB Sustainability Fund Sweden C	1993-10-25
Skandia Cancerfonden	1988-06-01
Skandia Sverige Hållbar	2017-12-14
Skandia Världsnaturfonden	1988-06-01
Swedbank Humanfond	1990-06-01
Swedbank Robur Ethica Sverige	1987-10-09
Swedbank Robur Ethica Sverige MEGA	2003-01-23

11.2. Tests performed

11.2.1. Heteroskedasticity

In Table 13, we present the result of the Breusch-Pagan test, performed on the dummy model described in section 5.1.4. Since there are significant signs of heteroskedasticity, we run our models using robust standard errors.

Table 13. Test for heteroskedasticity.
The table below present the result of the Breusch-Pagan test for heteroskedasticity.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity		
H_0: Constant variance		
Variables fitted values of excess return		
Chi2(**1**)	=	**412.15**
Prob > chi2	=	**0.0000**

11.2.2. Multicollinearity

In Table 14, the result of the VIF analysis is presented, performed on the dummy model described in section 5.1.4. In line with the discussion in Murray et. al (2012), critical values for the factor is typically 5 or 10.

Table 14. Test for multicollinearity
The table below present the values of the variance inflation factor of the variables included in our dummy model described in section 5.1.4.

Variable	VIF	1/VIF
MOM	1.35	0.742
SMB	1.34	0.745
HML	1.33	0.751
$rM_t - rf_t$	1.23	0.814
Sus_t	1.00	1.000
Mean VIF	1.25	