UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Do ESG investors pay a price for doing good?

A matched pair analysis of the Swedish fund market

ABSTRACT

In this thesis we examine the financial performance of Swedish mutual equity funds. We look at differences between sustainable, defined as ESG, and conventional funds. The financial performance is examined using the Capital Asset Pricing Model, the Fama-French three-factor model and Carhart's four-factor model. Further, the cross-sectional difference in performance between ESG and conventional funds is examined via a dummy model that differentiate the ESG attribute. To control for differences in fund attributes between the groups we use a matched pair analysis that controls for age, size and risk exposure. Our results show that both ESG and conventional funds outperform their market benchmark. Additionally, we conclude that ESG funds perform worse than conventional funds.

Keywords: ESG, sustainability, Sweden, ESG funds, conventional funds, financial performance, matched pair analysis

Albin Dahlin

Edvin Andersson

Morgan Thisted

Bachelor of Science (B.Sc.) in Finance
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1 Introduction

1.1 Background

Sustainability has never been higher on the global agenda of decision makers (Eurosif[1] 2021). Further, with time, it is becoming more apparent that sustainable investments are becoming a large and vital part of the financial markets around the globe. This is derived from the awareness about global challenges such as our environmental and ethical issues. It is obvious that a shift is needed to meet and counteract these issues, which is no less true for the financial markets. In the Foreword to Eurosif's 2021 report, the President of Eurosif writes

> *However, despite Sustainable and Responsible Investments (SRI) having expanded significantly in the last few years, the State of our Planet is still deteriorating. Scientific research repeatedly shows that we are nowhere near reversing negative sustainability impacts, be it on the climate and biodiversity front. Therefore, more than ever, investors need to refocus their efforts on where they can generate positive environmental and social outcomes. As recent academic research is showing, investors have valuable tools to generate 'investor impact' by influencing corporate behaviour through engagement and stewardship and redirecting capital towards sustainable businesses and projects. It is now time to refocus those tools on their primary purpose to achieve positive outcomes in the businesses and real-world (Eurosif 2021, p.5).*

Sustainable investing is a well-established concept, but the defined terminology ESG, the abbreviation for *environmental, social* and *governance*, has emerged more recently and entered mainstream finance practices in the 2010s (Preqin 2022). Financial data provider MSCI defines the term ESG investing as "a term that is often used interchangeably with sustainable investing, socially responsible investing, mission-related investing, or screening" (MSCI, 2022). Moreover, many policy frameworks have been presented and implemented by different recognized organizations such as the United Nations and the European Union. One of these legislative frameworks is The United Nations Principles for Responsible Investment (UNPRI) which was published in 2006 and was designed to provide principles for responsible investments. This framework paved the way for further legislative frameworks to encourage the implementation and transparency of ESG in investment strategies for companies and funds.

[1] Eurosif is the leading European association promoting Sustainable Finance

In March of 2021, the Sustainable Finance Disclosure Regulation (SFDR) was implemented by the European Union with the intention of promoting ESG values and increasing transparency of funds' holdings (European Commission, 2022). This legislation mandates fund managers to actively report whether their fund holdings fall under one of three "categories", showing the level of ESG implementation. Since the legislation was implemented, a large number of companies and funds have published reports with information about their environmental, social and governance work. Today there are many financial data providers such as Refinitiv, S&P Global and MSCI who provide investors with information about companies ESG performance and commitment. This is done not only to meet the legislative requirements, but also to satisfy investor demand for sustainable investment information. The demand continues to grow, although economic theories would suggest that investing in ESG would disregard shareholder interest to maximize profit, limit diversification and hurt returns. Is this really the case? Would investing in an ESG fund yield worse returns than investing in a conventional fund with less ESG consideration? This question forms the base to the purpose of this study.

1.2 ESG definition

Historically the concept of a sustainable investment has been referred to with several different terms, such as Ethical-, SR- (Socially Responsible), Green- and Sustainable investments. For the purpose of our thesis, to standardize and measure the concept of sustainable investments throughout the study, the label of Environmental, Social and Governance (ESG) from Refinitiv Lipper will be used as the definition of a sustainable investment. These terms should therefore be interpreted synonymously. In section 4.1.1, a more extensive explanation of Refinitiv's definitions of ESG will be presented.

1.3 Purpose

The general purpose of this study is to further examine the performance of ESG funds and compare it to conventional funds. In other words, to evaluate if there is a difference in returns. The study investigates the Swedish fund market for the past 10 years and will thereby add on to existing research in this field.

2 Previous literature

Academic interest around the world is following the increasing growth of sustainable investing. Naturally, several studies are being performed in this field. Based on previous literature it is difficult to establish definitive results regarding the difference in performance between ESG and conventional funds. The meta-analytic study Friede et al. (2015) summarizes the findings of over 2000 separate researchers' results. A part of their conclusion is that the relative performance of ESG funds compared to each respective market benchmark does not change over time during the period 1972 to 2012. However, their results for ESG funds active in the US show better relative performance than funds active in Europe. This suggests that the performance of an ESG fund varies depending on the geographical investment universe, but not with dependency of time.

On the contrary, there are studies that do find indications that ESG funds' performance progressively improves their relative returns over time. In Gonçalves et al. (2021) the authors analyze and compare the risk adjusted returns for European "green" and conventional funds for the period 2005 to 2020 making use of the Carhart model. They find that green funds exhibit lower risk-adjusted returns in relation to a global market benchmark. They also state in the conclusion that they find evidence of green funds outperforming their conventional peers since 2011. This is supported by Ibikunle et al. (2017), where they find statistically significant evidence of European green mutual funds significantly underperforming their conventional counterparts, but that the green (ESG) funds improve their performance progressively during the examination period 1991 to 2014. A study conducted on the US market is Climent et al. (2011) where differences in returns are compared between green and conventional funds for the period 1987 to 2009 and find that green funds overall underperformed their peers. Although, when dividing the observation into two sub-periods, the analysis shows that green funds went from performing worse than conventional funds (1987-2001) to making an improvement in relative returns, matching the conventional funds' performance in the later time period (2001-2009).

One of the most cited articles within the subject area is Mallin et al. (1995). The study compares the performance of 29 ethical and 29 conventional funds on the UK market during the period 1986 to 1993. They present results, opposing from previously discussed articles, that ethical

fund's risk-adjusted returns outperformed conventional funds. An important aspect to their study is highlighted when they match the control group to fit attributes found in the sample group. By doing this Mallin et al. (1995) suggests that the omitted variable bias can be partly minimized when comparing two groups to each other. The matched sample approach has since then been further developed and is commonly used by various researchers in similar studies, as in Kreander, et al. (2005) and Bollen (2007). Both studies expand the matched pair approach by including additional fund attribute criterias such as size, age, domicile and risk coefficients via algorithms. These matched pair studies show no significant difference in performance between sustainable and conventional funds

Another study that adopts and expands the matching procedure of Bollen (2007) is Renneboog, et al. (2008). This study looks at every sustainable fund globally and examines the relative performance to conventional funds with a matched pair approach for the period 1991 to 2003. Globally, there is evidence suggesting that SRI funds underperform their market benchmark and the conventional funds. However, when looking at the Swedish market individually the SRI funds strongly underperformed in relation to conventional peers. In other words, the Swedish SRI funds show worse performance than global SRI funds.

3 Hypothesis

Previous studies generally have a hypothesis along the lines of "*The expected returns of socially responsible portfolios are lower than the expected returns of conventional portfolios*", as in Climent, et al. (2011). It is stated that an explanatory reason to why many academics expect the sustainable portfolios to yield lower returns than its peers, could be found within Markowitz' (1952) widely accepted Modern Portfolio Theory. In Markowitz's article, the restrictive selection criteria for a sustainable fund limits its possibilities to reduce risk via portfolio diversification. Meanwhile, its conventional counterpart has no limits to diversification possibilities.

As mentioned in the literature review, the results of earlier studies vary. Gonçalves, et al. (2021), Ibikunle, et al. (2017), Climent, et al. (2011), Renneboog et al. (2008), find that *ESG funds performed worse than their peers*. On the contrary Bollen (2007) and Kreander, et al. (2005) suggest that *no difference should be expected*. Based on the previous authors' conclusions, our own assessments, and especially Renneboog et al. (2008) findings for the Swedish market, it is believed that Swedish ESG funds underperform against conventional funds. The hypothesis is conducted as:

Hypothesis: ESG funds perform worse than conventional funds

4 Data

This section covers the data the study uses. It explains the data sources, how ESG scores are defined and explains the process of selecting the sample of ESG funds. Moreover, the collected data and variables are explained and the data section is completed with discussing potential issues.

4.1 Data sources

4.1.1 Refinitiv Lipper

This thesis builds on the Refinitiv Lipper fund database, one of the world's largest independent providers of fund data. Refinitiv's program Eikon is used to collect the necessary data in the form of performance (monthly return), total net assets (TNA) between the years 2012-2021. Further, we also retrieved inception dates and ESG scores. The data is exported to Excel via the Refinitiv Eikon feature for analysis.

Since this thesis mainly revolves around the database that is used, it is important to establish its definition of ESG scores. Refinitiv defines ESG as three pillars of environment, social and corporate governance that combined cover 10 main categories. On company level, Refinitiv collects over 500 ESG data points based on publicly available information and groups these into the 10 categories. These then make up for the three individual pillar scores, which then gives the final ESG score. The result reflects the company's ESG performance, commitment and effectiveness. Regarding funds, Refinitiv Lipper ESG fund scoring is built on the securities in the portfolio. To receive an ESG score, a portfolio must consist of at least 10 securities and an ESG score must be available for at least 70% of the securities. The scoring model has two grading systems, percentile scores that range from 0-100 and letter grades, D- to A+ (Refinitiv 2022).

4.1.2 Asset pricing model factors

Moreover, the Fama-French factors as well as the momentum variable for Carhart's four factor model is downloaded from the AQR-Capital online data library where monthly historical data for all factors is collected. The data that AQR uses is collected and merged from the sources CRSP, Compustat, Moody and Xpressfeed Global. Since we look at Swedish funds active on the Swedish market, only relevant factors for the Swedish market are retrieved.

4.2 Creating the sample

To create the sample we use the Screener feature in Refinitiv Eikon in order to obtain a list of funds that were of interest. Initially we obtain a list of 109 active mutual equity funds while screening for Sweden as domicile and the Lipper Global Classification set to Equity Sweden and Sm & Mid Cap. This provides us with Swedish funds investing at least 75% in Sweden and 75% in equities. (Refinitiv 2019). We then removed funds with less than 12 months of reported data which left us with 105 funds. From here, we further screen for funds that have received an ESG score of 66 or greater to create our sample of 42 ESG funds. Funds with an ESG score above the 66th percentile represent a letter grade of at least B+ which is translated into “good relative ESG performance and above average degree of disclosure transparency”. This is where we choose to delimit the study with regards to the sample selection and definition of ESG. Our method for selecting conventional funds as our control group for the analysis is further explained in section 5.2.

4.3 Data and variables

4.3.1 Fund data

We retrieve each fund’s monthly return during the period 2012-01-01 to 2021-12-31 from Refinitiv Lipper. The return is calculated as the percentage monthly change in Net Asset Value (NAV) which is the per share value of the fund calculated net of annual management fees. Data for each fund’s TNA is retrieved from Refinitiv Lipper to categorize the funds by size.

4.3.2 Risk free return

The risk free return represents the alternative investment available for an investor which in theory implies zero risk. Commonly this is defined as the monthly U.S. treasury bill, and since this study aims to study the Swedish market, we make use of the Swedish 1-month bond rate.

4.3.3 Market return

In the dataset from AQR the market return for the Swedish market is calculated as the value weighted return of all available stocks listed on the Swedish exchanges minus the risk free rate (AQR 2022). The data is given in excess return form and the risk free rate used by AQR is defined as the historical rate of the U.S. 1-month treasury bill. Therefore, in accordance with the aims of this study, the data is converted by adding the U.S. T-bill rate and subtracting the corresponding Swedish 1-month bond rate for all observations.

4.4 Data issues

The thesis being highly revolving around the Refinitiv Lipper fund database may give rise to some potential problems with the data set. The ESG scores are from 2021 which means that funds that have been liquidated or merged during the time period of our study have not been given an ESG score. Consequently, our sample group of ESG funds suffer from survivorship bias, meaning that performance may have been overestimated since closed funds that potentially have performed worse than the active funds are not included. We have access to fund data for dead funds in the control group but choose to remove them in order to give the different groups the same bias. It is believed that the amount of closed funds would be equally distributed between the groups and should therefore not distort the analysis. Another problem arising from the ESG scoring from Refinitiv is the absence of historical ESG scores. The screening performed when creating the sample is based on ESG scores from 2021 and therefore an assumption to the data set is applied; ESG scoring today defines the funds ESG performance for the entire time period[2]. This also means that we disregard the fact that funds can change their ESG performance over time.

[2] Since we are not regressing to predict returns with ESG score as an independent variable; we are using the ESG score to screen the funds, we do not consider this to distort our analysis.

5 Method

This section presents our methodology behind the study and explains the models used. We study the performance of ESG- and conventional funds by using the monthly time-series returns of an equally weighted portfolio of funds. In order to make an evaluation on performance, an excess risk-adjusted return is calculated using three different models, in line with previous studies. To further compare the funds, we use a dummy model to capture the group-specific difference between the two portfolios. These models will be further explained in 5.1. To eliminate possible bias between the portfolios, a matching procedure is used, which will be explained in section 5.2.

5.1 Asset pricing models

5.1.1 Capital Asset Pricing Model

The general method for calculating a portfolio's excess risk-adjusted returns is by using CAPM and Jensen's alpha, as found by Jensen (1968). CAPM is modeled with expected returns less the risk free rate and adjusts for systematic risk towards the market. Jensen's alpha then explains all excess returns in the model, which will be central to the study.

$$r - rf = a + \beta^{rM}(rM - rf) + \varepsilon \tag{4.1}$$

Definition of variables

r = Return

a = Risk-adjusted excess return

β = Sensitivity to market

rM = Market return

rf = Risk free rate

5.1.2 Fama-French three-factor model

The Fama-French Three Factor Model is an asset pricing model that expands on CAPM with additional explanatory variables related to size risk and value risk. In Eugene (1992), the model is presented and describes that it considers the fact that small-cap and value-securities regularly outperforms markets and adjusts the valuation accordingly by adjusting the performance of small-cap and value-securities. The small-minus-big (SMB) factor is attained by creating three equally weighted portfolios of small cap securities and three similar portfolios of large cap securities. The small cap- and large cap portfolio's average monthly returns are separately calculated. By subtracting the average return of the large cap portfolios from the average returns of the small cap portfolios the factor is generated for each month. This is done since small cap securities tend to outperform their large cap counterparts. The risk factor SMB will adjust the excess return of portfolios differently, depending on their exposure to small- or large-cap securities. Portfolios with heavily weighted small cap holdings will be benefited for their risk-taking every month that small cap companies outperform the large cap ones and vice versa. The high-minus-low (HML) factor is produced from a similar method, but instead considers the value-risk aspect of the portfolio holdings. This is since value companies regularly outperform growth companies. The factor upwards adjusts portfolios with larger value-stock holdings, and downward adjusts portfolios with growth-stock holdings the same way as the SMB factor. By including the two additional variables for size- and value risk, the model is considered to give more realistic asset valuations, according to Fama and French (1992).

$$r - rf = a + \beta^{rM}(rM - rf) + \beta^{SMB}(SMB) + \beta^{HML}(HML) + \varepsilon \qquad (4.2)$$

Definition of variables

β^{SMB} = SMB factors effect on return

β^{HML} = HML factors effect on return

5.1.3 Carhart's four-factor model

The Carhart Four-Factor model is a refinement of the Fama-French in that it additionally includes a variable for momentum (MOM). In this case, MOM is the tendency of rising prices of securities to continue rising, and vice versa for falling prices. Carhart (1997) shows that the inclusion of the momentum variable increases the accuracy when estimating mutual funds portfolio returns. This variable is attained by calculating the average monthly return of two

portfolios, one with high performing securities and one with low performing securities. The performance is measured on a 12-month rolling basis. The return of a low performing portfolio is subtracted from the high performing portfolio and the factor will thereby reward portfolios with exposure towards the recent high performing securities.

$$r - rf = a + \beta^{rM}(rM - rf) + \beta^{SMB}(SMB) + \beta^{HML}(HML) + \beta^{MOM}(MOM) + \varepsilon \quad (4.3)$$

Definition of variables

β^{MOM} = MOM factors effect on return

5.1.4 Dummy model

In order to further examine the difference in risk-adjusted returns between ESG- and conventional funds, another model is used. In this model, a dummy-variable labeled "ESG" is added to Carhart's four factor model to determine whether ESG funds have better financial performance than conventional funds. This variable takes a value of 1 if the fund has an ESG rating above 66,66 and the value 0 if it does not. This is done to capture the group-specific data effects, which in this instance is ESG or conventional funds. This regression captures the cross-sectional difference between the two fund groups' financial performance.

$$r - rf = a + \beta^{rM}(rM - rf) + \beta^{SMB}(SMB) + \beta^{HML}(HML) + \beta^{MOM}(MOM) + \beta^{ESG}(ESG) + \varepsilon \quad (4.4)$$

Definition of variables

β^{ESG} = Difference in risk-adjusted return between ESG- and conventional funds

ESG = Dummy variable; 1 if from test group and 0 if from control group.

5.2 Matching the sample

After creating the sample in 4.2, we have 63 potential conventional funds. However, as stated by several authors of the reviewed articles, it is difficult to ensure that the funds in our control group can serve as an appropriate benchmark for a performance comparison. Mallin et al. (1995) suggests the use of a matched pair approach to help eliminate the effect of fund characteristics which may be endemic for the ESG funds. The concept of selecting a control group to match attributes found in the sample group is extensively used and developed in several studies produced following Mallin's publication, as done by Kreander et al. (2005), Bollen (2007) and Renneboog et al. (2008). These studies find common ground in controlling for age, size and risk. We use a matching procedure along the lines of their discussions where risk is used as a proxy for portfolio characteristics, size since larger funds tend to have performed well, and age to control for extraneous time-dependent macroeconomic effects.

To control for age, size and risk, we follow the methodology by Bollen (2007) and his presented algorithm. This is done by applying an exclusionary criterion where the difference in age between the ESG fund and its conventional candidate is not allowed to be more than three years. For a given ESG fund, all eligible conventional funds are scored based on the distance given by the algorithm to find the best match. The conventional fund with the lowest distance score from a given ESG fund (i) is then selected as the matched conventional pair (j).

$$Distance_{i,j} = \left(\frac{\beta_i - \beta_j}{\sigma_\beta}\right)^2 + \left(\frac{TNA_i - TNA_j}{\sigma_{TNA}}\right)^2 \quad (4.5)$$

Definition of Variables

$Distance_{i,j}$ = The matching score value given to a conventional fund "j" compared to the ESG fund "i".

$\beta_{i,j}$ = The covariance of the monthly return between fund "i" and the market, divided by the variance of monthly market return.

σ_β = the cross-sectional standard deviation between all observed fund's average β.

$TNA_{i,j}$ = the largest measured TNA value for fund "i" during the observed period.

σ_{TNA} = the cross-sectional standard deviation between all observed fund's largest measured TNA.

5.3 Additional issues

5.3.1 Model selection

When performing a regression with a panel data set, there are three possible models to use: fixed effect (FE), random effect (RE) and pooled OLS. Deciding between FE and RE is done by conducting a Hausman test (Torres-Reyna 2007). The Hausman test checks if there is correlation between error terms and the independent variables. If this is true, then FE is preferred. Otherwise, both RE and pooled OLS are both viable options. Deciding then between RE and pooled OLS is done by another test, the Breusch-Pagan Lagrange Multiplier test. We run both tests and find that pooled OLS would be the appropriate model using our panel data set. The results are presented in Appendix B.

5.3.2 Heteroskedasticity

If a sample suffers from heteroskedasticity, the variance in the error terms is not constant. More specifically, there is systematic change in the spread of error terms that is measured. An OLS regression assumes that all error terms have constant variance (homoscedasticity), and if this is not true, the sample suffers from heteroskedasticity. Then the standard errors for the estimated coefficients will be bigger and the significance test will be incorrect. Testing for heteroskedasticity is done with a Breusch-Pagan test, and if heteroskedasticity is present, the OLS should be computed with robust standard errors. Our test shows some signs of heteroskedasticity, and robust standard errors are used. The result of the test is presented in Appendix B.

5.6.3 Multicollinearity

Multicollinearity is when any two or more independent variables in an OLS are highly correlated with each other. This is undesired since it is then difficult to separate the effects the independent variables have on the dependent variable. The Variance Inflation Factor (VIF) is studied when looking for multicollinearity in a sample. Our test shows no signs of multicollinearity. The result of the test is presented in Appendix B.

6 Summary statistics

This section presents summary statistics for our funds. It is divided by the two different portfolios ESG and conventional. It describes different characteristics of the portfolios year by year from 2012 to 2021 by age, size and returns.

Table 1. Summary statistics
Table 1 shows the number, average and median age (years) of the funds at the beginning of every year since 2012.

	Conventional			ESG		
	No. Funds	Avg. age	Med. Age	No. Funds	Avg. age	Med. Age
2012	27	13,4	13,2	27	15,6	13,7
2013	29	13,5	14,0	30	15,1	13,9
2014	30	14,0	15,0	30	16,1	14,9
2015	30	15,0	16,0	32	16,1	15,8
2016	32	15,0	16,5	35	15,7	16,2
2017	35	14,7	16,3	38	15,5	16,7
2018	38	14,5	15,5	38	16,5	17,7
2019	38	15,5	16,5	39	17,0	18,3
2020	40	15,7	15,3	40	17,6	18,1
2021	42	15,9	14,5	42	17,7	16,6

Table 2. Summary statistics
Table 2 shows the number, average and median size (100 million SEK) of the funds at the beginning of every year since 2012.

	Conventional			ESG		
	No. funds	Avg. size	Med size	No. funds	Avg. size	Med. Size
2012	27	27,25	15,34	27	43,54	21,21
2013	29	29,86	15,18	30	51,69	23,84
2014	30	38,39	23,82	30	59,62	29,62
2015	30	44,92	28,46	32	74,61	39,28
2016	32	46,12	25,20	35	67,81	41,82
2017	35	50,35	24,86	38	79,01	44,55
2018	38	51,63	19,98	38	82,87	44,33
2019	38	48,32	17,90	39	75,92	36,14
2020	40	68,84	30,21	40	88,66	41,35
2021	42	75,60	25,49	42	93,30	43,33

Table 3. Equally weighted percentage returns
Table 3 shows the equally weighted yearly percentage returns for the different portfolios for every year since 2012.

	Conventional	ESG	Difference
2012	3,3	6,8	-3,4
2013	25,2	22,7	2,5
2014	21,1	17,3	3,8
2015	23,2	17,5	5,8
2016	7,3	0,0	7,3
2017	14,8	18,6	-3,7
2018	7,9	4,0	3,9
2019	10,2	8,2	2,0
2020	17,0	8,3	8,7
2021	42,4	32,7	9,7

7 Results

The regression outputs for the CAPM, Fama-French and Carhart model are presented in table 4. The first column, alpha, displays the intercept constant which represents the excess risk-adjusted return, for the ESG- and Conventional portfolios separately, relative to the market factor benchmark. Table 5 presents the regression output for the dummy model. Here, the coefficient for the dummy-variable will indicate the group specific differences in return between the ESG- and conventional funds.

Table 4. Regression analysis

This table summarizes the results of the OLS regression analysis for the equally weighted ESG- and conventional portfolios using the CAPM, Fama-French three-factor and Carhart four-factor models.

	α	ß(rM – rF)	ßSMB	ßHML	ßMOM	R-squared
CAPM						
Sustainable	0.00451**	0.657***				0.675
	(0.00227)	(0.0450)				
Conventional	0.00695***	0.673***				0.691
	(0.00224)	(0.0469)				
FAMA-FRENCH						
Sustainable	0.00496**	0.651***	-0.138*	0.104		0.689
	(0.00222)	(0.0449)	(0.0771)	(0.0996)		
Conventional	0.00691***	0.672***	0.0209	0.0160		0.691
	(0.00228)	(0.0467)	(0.0768)	(0.0989)		
CARHART						
Sustainable	0.00690***	0.642***	-0.142**	0.0874	-0.142**	0.700
	(0.00246)	(0.0445)	(0.0733)	(0.0976)	(0.0625)	
Conventional	0.00659***	0.673***	0.0215	0.0189	0.0241	0.692
	(0.00247)	(0.0468)	(0.0776)	(0.100)	(0.0658)	

Significance level: *** p<0.01, ** p<0.05, * p<0.1

Robust standard errors in parentheses

From the CAPM model regressions, both portfolios outperform the market benchmark. The ESG funds outperform the market with 0.452%** and the conventional with 0.695%***. The portfolios displayed market betas of 0.657*** and 0.673*** respectively, indicating that both portfolios are less volatile than the market benchmark. When observing the R-squared, we can see that the data from the ESG- and conventional portfolios similarly fits the model, with a slightly better fit for the conventional portfolio.

When the results from the Fama-French model are analyzed, the excess returns increase to 0.496%** for the ESG portfolio and a decrease to 0.691%*** for the conventional portfolio. The beta values for the ESG- and conventional portfolios indicate that the portfolios are less volatile than the market, with values of 0.651*** for the ESG portfolio and 0.672*** for the conventional portfolio. The negative SMB coefficient of -0.138* suggests that the ESG portfolio is more exposed to large cap companies. Further, the positive HML coefficient of 0.104 indicates that the ESG portfolio has exposure to a high value portfolio, although without statistical significance. Our conventional portfolio shows less dependence on both factors with coefficients at 0.0209 for SMB and 0.016 for HML. These values hint towards the conventional portfolio being more exposed to both small cap and high value companies, although without statistical significance. Furthermore, the Fama-French model produces a slightly higher R-squared for the ESG portfolio compared to the CAPM model, indicating a better fit. The conventional portfolio's R-squared remains unchanged between the models.

With the inclusion of the momentum factor, the result from the Carhart model deviates from the previous results. The results show that the excess returns for our ESG portfolio are 0.690%*** and 0.659%*** for our conventional portfolio. These results indicate that the ESG portfolio has a higher excess return than the conventional portfolio. The market betas show similar values of 0.642*** and 0.673*** respectively, indicating a lower volatility than the market benchmark. The momentum factor seems to have a significant role in explaining the excess returns for our ESG portfolio. Its negative value of -0.142** translates into the ESG portfolio behaving more like the low yielding portfolio in the momentum factor calculations. The MOM variable, also without statistical significance, shows that the conventional portfolio generally benefits from the factor implying a larger portion of its placings benefitted from the winner portfolio.

Furthermore, when observing the R-squared, we see that it increases as we use more independent variables. The Carhart regression is showing the highest R-squared which means that this model has the highest explanatory power between the asset pricing models.

Table 5. Panel regression analysis
The table shows the pooled OLS panel regression results for cross-sectional time series for the entire sample using the dummy model.

α	ß*(rM – rF)*	ß*SMB*	ß*HML*	ß*MOM*	ß*ESG*	*Observations*
0.00804***	0.668***	-0.0692***	0.0612***	-0.0690***	-0.00269***	8 530
(0.000369)	(0.00583)	(0.0174)	(0.00960)	(0.0154)	(0.000490)	

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

Looking at the regression output from the dummy model in table 5, the cross-sectional difference in returns between ESG- and conventional funds is shown to be negative for the ESG funds. The coefficient for the dummy variable of -0.027% is significant at 1%, indicating that ESG funds perform worse than its matched conventional peers. Therefore, it is concluded that there is a difference in risk-adjusted returns; the ESG portfolio performs worse than the conventional portfolio.

8 Discussion

Observing the results from the regressions we can see that all models show that both the ESG- and conventional funds outperform their market benchmark. Furthermore, the CAPM and Fama-French model indicate that conventional funds perform better than ESG funds with statistical significance. This is also true for the dummy model which shows a negative relationship between ESG and excess return. The Carhart model indicates that compared to the market benchmark the ESG portfolio yields a slightly higher excess return compared to the conventional portfolio. However, the difference between the performance for the portfolios shown in the Carhart model is only 3 basis points, making it difficult to state that ESG funds outperformed their conventional peers. Considering these results, we make a general conclusion that ESG funds perform worse than conventional funds.

As observed from the results, we can see that all the models indicate that both ESG- and conventional funds outperformed their benchmark with statistical significance. This result is different from Gonçalves et al. (2021), Climent et al. (2011), Renneboog et al. (2008) and Bollen (2007) where evidence shows that ESG funds underperform against the benchmark. Since our data set suffers from survivorship bias, the returns of our observed funds might be overestimated in relation to the benchmark. As previous studies include data of dead funds, this could explain the difference in results regarding performance in relation to the market.

The stated conclusion regarding our results that ESG funds perform worse than conventional funds is in line with our hypothesis. This conclusion is also supported by previous studies Gonçalves et al. (2021), Ibikunle et al. (2017), Climent et al. (2011) Renneboog et al. (2008). Common ground for these studies are their discussions about the limitations in diversification options for ESG funds. The argument behind this is derived from the modern portfolio theory which argues that rational investors should allocate capital to securities with optimal return given a certain level of risk. The constraints fund managers are forced to apply when investing with ESG strategies could lead to a deviation of optimal risk management that, in theory, results in suboptimal returns. In Climent et al. (2011) the concept is explained as: "*...restricting the investment set may reduce the ability to reduce risk through diversification*." (Climent et al. 2011, p.276)

When comparing our results to previous studies done with a global or European index benchmark, one can observe higher excess returns for ESG funds than what our analysis shows. This could potentially be contributed by the limitation of diversification options on the Swedish market, where our funds are active. This differs from funds on the bigger European and global markets where a wider range of ESG investments are available. This argument is also in line with the results of Rennebog et al. (2008) where they look at sustainable and conventional funds across different markets. Their analysis shows that sustainable funds show a significant underperformance compared to conventional funds on the Swedish market, while finding no significant difference in other larger markets outside of Sweden. Friede et al. (2015) also observe differences between the proportion of positive ESG results from over 2000 studies where they present that a lower percentage of assets in developed Europe showed positive ESG results, versus a high majority of assets in emerging markets. This might explain our lower excess return for ESG funds, since our selection of funds are not exposed to any significant emerging market holdings. These arguments therefore conclude that a fund's geographical investment universe affects its diversification possibilities. Thus, the limited diversification options on the Swedish market could explain the lower performance of ESG funds indicated by our analysis.

Another factor considered is the concept of ESG investments' gradual improvement in return over the last decades as discussed by Friede et al. (2015). The results of this analysis suggest that ESG funds have improved their performance during the last decades and gone from significantly underperforming the market to being a solid contender to the conventional fund peers. They state in their study that it is caused by the increase in the number of suitable investment options for ESG funds, giving the funds a wider range of companies to choose from to achieve a desirable level of diversification for their respective portfolios. The same point is brought up by Climent et al. (2011) where they discuss that lower returns as shown by their study could be caused by a limitation in diversification options. The authors write: "*This is probably the reason why green funds seem to show lower returns than their conventional peers during their early years (1987-2001 sub-period) and, as a result of that, in the full time period considered.*". (Climent et al. 2011, p.285)

Another factor that further supports the theory of limited diversification options on the Swedish market can be found when observing the characteristics of the funds' portfolio holdings. Our selected ESG funds seem to have a high exposure towards large cap and value companies, which can be seen from the negative SMB factor. This is different from Ibikunle et al. (2017) and Climent et al. (2011), where the corresponding funds, active on the US and European markets, seem to be more exposed to small cap and growth companies. This therefore affects our results by downward adjusting the returns of the ESG funds compared to previous studies through the SMB factor of the Fama-French and Carhart factors. If Swedish ESG holdings had more similar properties in terms of size, then our results might have indicated higher excess returns for the ESG portfolio.

In addition, something else to note is that the study includes an abnormal year. The Covid-19 pandemic had a paramount impact on the financial markets, and in 2021 we can observe abnormally high returns. We find it highly interesting to further investigate how market sentiments affect the performance for ESG and conventional funds. Although, since that is outside the purpose of this thesis, we leave that discussion for future research.

9 Conclusion

The purpose of this study is to examine the difference in performance between 42 ESG funds and 42 conventional funds active on the Swedish market. For the analysis a matched pair approach is used to limit extraneous factors' impact on the comparison. The results show that the ESG- and conventional funds outperform the market benchmark, although noted that survivorship bias could account for some of this overperformance. Further, this study produces the result that ESG funds perform worse than their conventional counterparts, which is in line with the hypothesis. This result is similar to Gonçalves et. al (2021), Ibikunle et. al (2017), Climent et al. (2011) and Renneboog et al. (2008) who also find evidence of ESG funds performing worse than conventional counterparts. Several possibilities as to why this result is achieved is discussed, where a general conclusion is made regarding limited diversification possibilities for the ESG funds. Attention is given to abnormal returns for the year of 2021 but left to be investigated further in future research.

Finally, although this study suggests that ESG funds perform worse than conventional funds, we as authors still believe that sustainable investments are of paramount importance regarding the future of our planet. The growth of sustainable investing will undoubtedly continue and will show to be principal in the work towards a sustainable future for our planet. We believe that in the future, one will not be able to distinguish between sustainable and conventional, since sustainability will without a doubt be heavily incorporated in, and an obligatory aspect to consider, when investing.

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Appendix A

Table A1. ESG Funds
This table presents all funds defined as ESG in our study

ISIN Code	Fund name	Launch Date	ESG Score
SE0000735789	Aktie-Ansvar Sverige A	1992-01-01	76,14
SE0008321780	Aktiespararna Direktavkastning A	2016-10-03	78,59
SE0000924649	Aktiespararna Topp Sverige Hallbar	1999-11-25	78,88
SE0007704804	Carnegie All Cap A	2016-02-10	67,79
SE0013222858	Carnegie Spin-Off C	2019-11-04	67,36
SE0000429789	Carnegie Sverigefond A	1987-01-08	72,89
SE0000577322	Catella Sverige Aktiv Sustainability	1998-02-16	68,36
SE0000428336	Didner & Gerge Aktiefond	1994-10-21	70,80
SE0000540593	Folksam LO Sverige	1999-03-18	70,71
SE0000540619	Folksam LO Vastfonden	1999-03-18	68,40
SE0003788587	Handelsbanken Sverige 100 Index Criteria	2011-08-30	69,99
SE0005965639	Handelsbanken Sverige Selektiv (A1)	2014-09-26	68,12
SE0005933421	Indecap Guide Sverige C	2014-04-11	75,41
SE0000740680	Lannebo Sverige	2000-08-04	74,56
SE0002686584	Lannebo Sverige Plus	2008-12-11	74,33
SE0002656611	Lansforsakringar Sverige Indexnara	2008-11-17	69,60
SE0000837221	Lansforsakringar Sverige Vision A	1990-12-10	73,85
SE0000427874	Nordea Alfa	1984-04-02	73,37
SE0004330181	Nordea Inst Aktief Sverige icke-utd	1998-04-20	68,76
SE0000427882	Nordea Olympiafond	1988-01-05	73,29
SE0002591016	Nordea Sverige Passiv icke-utd	2008-09-01	70,36
SE0000625238	Nordea Swedish Stars icke-utd	1999-10-26	72,71
SE0002469353	Nordic Equities Sweden	2009-06-01	71,68
SE0002756973	Nordnet Indexfond Sverige	2009-03-10	70,69
SE0001463449	Ohman Etisk Index Sverige A	2005-08-24	74,41
SE0010049213	Ohman Marknad Sverige A	2017-06-20	74,07
SE0004636447	PriorNilsson Sverige Aktiv A	2012-10-01	73,01
SE0000775298	SEB Sverigefond	1984-12-31	69,21
SE0001838004	SEB Swedish Value Fund	2006-11-10	73,01
SE0006453536	Simplicity Sverige	2015-12-16	68,98
SE0005065521	Skandia Sverige Exponering	2013-03-12	67,31
SE0014554838	Skandia Varlden Sverige	2020-07-09	69,98
SE0000529992	SPP Aktiefond Sverige A SEK	1998-12-30	70,84
SE0013121522	SR Access Edge Sweden A	2020-02-25	70,67
SE0000708950	Swedbank Humanfond	1990-06-01	70,44
SE0007074075	Swedbank Robur Access Sverige	2015-09-10	71,63
SE0000602294	Swedbank Robur Exportfond	1993-02-01	72,43

SE0000996233	Swedbank Robur Sverigefond	1967-06-01	67,86
SE0000537771	Swedbank Robur Sverigefond MEGA	1995-11-30	67,88
SE0000709016	Swedbank Robur Transition Sweden	1987-10-09	70,37
SE0000987216	Swedbank Robur Transition Sweden MEGA	2003-01-23	70,52
SE0005849833	Swedish Sustainable Leaders A	2014-10-15	72,23

Table A2. Conventional Funds
This table presents all funds defined as conventional in our study.

ISIN Code	Fund name	Launch Date	ESG Score
SE0001953647	Agenta Svenska Aktier	2006-05-31	
SE0001185000	AMF Aktiefond Smabolag	2004-05-17	55,26
SE0000739195	AMF Aktiefond Sverige	1998-12-30	63,89
SE0001718388	Avanza Zero	2006-05-22	
SE0009495633	Carnegie Micro Cap	2017-01-31	
SE0004392025	Carnegie Smabolagsfond A	2012-01-31	
SE0010134288	Case All Star	2017-10-31	
SE0000577330	Catella Smabolagsfond	1998-02-16	52,58
SE0000577272	Catella Sverige Hallbart Beta A	1998-10-02	66,62
SE0012853828	Cicero Sverige A	2019-09-13	64,51
SE0014829545	Cliens Micro Cap A	2020-09-30	
SE0008992069	Cliens Smabolag A	2016-09-30	47,11
SE0001338799	Cliens Sverige A	2004-12-31	64,35
SE0003910314	Cliens Sverige Fokus A	2011-03-31	65,05
SE0011750967	Consensus Sverige Select A	2018-10-17	
SE0002096545	Enter Select A	2007-08-14	66,06
SE0001172362	Enter Select Pro	2004-02-06	66,09
SE0007413398	Enter Smabolagsfond A	2015-09-01	
SE0000813917	Enter Sverige A	1999-11-30	63,94
SE0000813925	Enter Sverige Pro	1999-11-30	64,27
SE0001714676	Ethos Aktiefond Utd	2006-06-14	63,62
SE0014958187	FE Smabolag Sverige A	2020-11-16	
SE0008431803	Handelsbanken MicroCap Sverige	2016-11-30	
SE0000356065	Handelsbanken Svenska Smabolag (A1 SEK)	1994-11-21	58,03
SE0001466368	Handelsbanken Sverige Index Criteria	2005-06-28	65,39
SE0000582033	Handelsbanken Sverige Tema (A1 SEK)	1988-04-01	65,92
SE0002229658	Humle Smabolagsfond A	2008-01-01	
SE0002229641	Humle Sverigefond	2008-01-01	
SE0010441352	Indecap Guide Q30 C	2017-10-04	56,95
SE0013121456	Kvartil Investmentbolag + Calc A	2019-11-08	
SE0004841195	Lancelot Avalon A	2012-11-01	
SE0000740698	Lannebo Smabolag SEK	2000-08-04	56,53

SE0003462126	Lannebo Sverige Hallbar B	2010-10-01	65,68
SE0013109329	Lansforsakringar Balanserad Rantefond	2019-09-25	
SE0000837239	Lansforsakringar Smabolag Sverige Vision A	1997-09-01	62,04
SE0001376880	Max Mitteregger Gladiator	2005-02-01	
SE0003653302	Nordea Smabolagsfond Sverige	2011-02-14	
SE0000432775	Ohman Smabolagsfond A	1991-09-20	56,15
SE0005281953	Ohman Sverige A	2013-08-19	57,19
SE0009997109	Ohman Sverige Fokus D	2017-05-31	55,08
SE0000432809	Ohman Sweden Micro Cap A	1997-05-29	55,20
SE0014991535	PLUS Allabolag Sverige Index	2020-10-26	
SE0010323634	PLUS Mikrobolag Sverige Index	2017-09-25	
SE0010323642	PLUS Smbolag Sverige Index	2017-09-27	
SE0000893307	Quesada Sverige	2001-12-17	
SE0002593673	SEB Hallbar Sverige Indexnara A	2008-10-22	65,29
SE0009773716	SEB Hallbarhetsfond Sverige Index B	2017-04-04	65,29
SE0000433278	SEB Stiftelsefond Sverige	1998-01-14	62,22
SE0000984197	SEB Sverige Expanderad	1973-11-11	65,33
SE0000577389	SEB Sverigefond Smabolag A	1987-09-21	47,11
SE0000434201	SEB Sverigefond Smabolag Chans/Risk	1995-04-18	48,33
SE0006852232	She Invest Sweden	2015-08-26	
SE0009161540	Simplicity Smabolag Sverige A	2016-10-31	59,40
SE0000432759	Skandia Cancerfonden	1988-06-01	58,13
SE0000810814	Skandia Smabolag Sverige	1998-12-09	55,73
SE0010547943	Skandia Sverige Hallbar	2017-12-14	63,64
SE0000432742	Skandia Varldsnaturfonden	1988-06-01	58,13
SE0004297927	Spiltan Aktiefond Investmentbolag	2011-11-30	52,35
SE0002566349	Spiltan Aktiefond Smaland	2008-06-25	56,21
SE0001015348	Spiltan Aktiefond Stabil	2002-12-02	55,98
SE0008964407	SPP Sverige Plus A SEK	2016-09-26	65,57
SE0014808382	SPP Sverige Smabolag Plus A	2020-10-08	56,59
SE0000602302	Swedbank Robur Smabolagsfond Sverige A	1995-11-13	50,43

Appendix B

Table B1. Hausman test
Table B1 presents the results from the Hausman test

```
                 ---- Coefficients ----
              |      (b)          (B)            (b-B)    sqrt(diag(V_b-V_B))
              |       fe           re         Difference          S.E.
--------------+----------------------------------------------------------------
       R_MKT  |     .667827     .6677683        .0000587        .0003613
         SMB  |   -.0692985    -.0691323       -.0001662        .0005454
         HML  |    .0603433     .0611185       -.0007752        .0006982
         UMD  |   -.0692082    -.0689454       -.0002628        .0004837
------------------------------------------------------------------------------
                     b = consistent under Ho and Ha; obtained from xtreg
      B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        1.39
                Prob>chi2 =      0.8461
```

Table B2. Breusch and Pagan Lagrange Multiplier Test
Table B2 present the results from the Breusch and Pagan Lagrange Multiplier Test

```
Breusch and Pagan Lagrangian multiplier test for random effects

        R_RF[ID,t] = Xb + u[ID] + e[ID,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                    R_RF |   .0018813       .0433737
                       e |   .0006911       .0262893
                       u |          0              0

        Test:   Var(u) = 0
                              chibar2(01) =     0.00
                           Prob > chibar2 =   1.0000
```

Table B3. Test for heteroskedasticity
Table B3 presents the results from the Breusch-Pagan test for heteroskedasticity.

```
Breusch-Pagan / Cook-Weisberg test for
heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of R_RF

         chi2(1)      =    87.08
         Prob > chi2  =   0.0000
```

Table B4. Test for Multicollinearity
Table B4 presents the results from the VIF test for multicollinearity.

Variable	VIF	1/VIF
HML	1.02	0.978683
UMD	1.02	0.981869
R_MKT	1.01	0.986606
SMB	1.00	0.995574
ESG	1.00	0.999983
Mean VIF	1.01	