

Sustainable Investment: A Win-Win Situation?

An Evaluation of Mutual Ethical Equity Funds on the Global Market Using a Five Factor Model

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Abstract

This study investigates the performance and investment styles of mutual ethical equity funds on the global market. To examine this, the Fama French Five Factor model is applied by adding the new variables to Fama French Three Factor Model step by step, discovering new results about performance and investment style. This study finds support for mutual ethical equity funds on developed markets to be outperformed by the equity market between 2006 and 2016. Between 2011 and 2016, however, these funds performed similar to the market when accounting for investment style. Regarding investment style, mutual ethical equity funds on developed markets appears to be exposed to aggressive companies, i.e. companies that makes substantial investments. Mutual ethical equity funds that invests on emerging markets, however, are outperformed by both the global equity market and the funds on developed markets between 2011 and 2016. This study's results indicate that these funds perform similar to profitable, small companies with high book-to-market values. It does not appear to have occurred any win-win situations, but between 2011 and 2016 an investor would not had lost money when held an ethical fund instead of a global index fund.

JEL Classification: G11, G12

Key Words

Portfolio Evaluation, Investment Style, SRI, ESG, Ethical Funds, Sustainability, Global, Emerging Markets, Equity Fund, Mutual Funds, CAPM, Fama French Five Factor Model

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Table of Content

1. Introduction	4
1.1. Purpose and Contribution	4
1.2 Background	4
1.3 Research Question	5
1.4 Delimitations	6
1.5 Section Description	6
2. Literature Review	7
2.1 Ethical Investment Performance	7
2.2 Emerging Markets Mutual Fund Performance	8
3. Theory	9
3.1 Original CAPM	9
3.2 Fama & French Five Factor Model.....	9
3.3 Jensen’s Alpha	12
3.4 Sharpe Ratio	13
3.5 Treynor Ratio.....	13
3.6 M2 Measure	14
4. Data	14
5. Methodology	16
5.1 Definition of Ethical Investments	16
5.2 Portfolio Construction	16
5.3 Benchmark	18
5.4 Econometric Model	18
5.5 Factor Portfolio Construction	19
5.6 Statistical Hypotheses	22
6. Empirical Results	23
6.1 Ethical Fund Portfolio Results.....	23
6.2 Emerging Markets Ethical Fund Portfolio Results	27
6.3 Difference Portfolio Results	30
7. Conclusions	32
8. Proposals for Future Research	34
9. References	35
10. Appendix	38
10.1 Specification of Equations	38
10.2 Tables	39
10.3 Key Terms.....	42

1. Introduction

1.1. Purpose and Contribution

This thesis seeks to evaluate risk-adjusted performance and investment style of mutual ethical equity funds on the global market offered by nordic financial institutions and asset managers. It also seeks to evaluate differences between emerging markets mutual ethical equity funds and developed markets mutual ethical equity funds. The emerging markets mutual ethical equity fund category is relatively new, and therefore comparisons with the global equity market and emerging markets funds will be done on a five-year horizon, between 2011 and 2016. The developed markets category consists of funds investing predominantly in developed markets¹, both Global and in Europe. This fund category is somewhat older, and a comparison between it and the global equity market is performed on a ten-year and a five-year horizon, between 2006 and 2016, and 2011 and 2016.

There is substantial literature about performance of ethical funds, but to our knowledge no paper applies the Fama & French Five Factor Model used in this study. This study reveals results regarding investment style and performance that are difficult to detect when applying the other models used in prior research papers, due to inclusion of new variables. Moreover, little research exist on emerging markets ethical funds, thus motivates research within the research question of this essay.

1.2 Background

Eurosif (2012) states that over time investors have become increasingly aware about extra-financial aspects when investing their money, such as environmental and social aspects. The responsible investments sector is an established sector today, and offers a broad range of financial products to both institutional and retail investors (Eurosif, 2012). What should be considered ethical is subjective and various definitions exist. Hamilton, Jo and Statman (1993) conclude that there is no general agreement of criteria within ethical investing, something that Eurosif (2012) also points out almost 20 years later. The Environmental, Social and Governance (ESG) is a criterion for investors to follow when investing responsible. The criterion refers to three major areas; climate change, greenhouse gas emission and working conditions. (Eurosif, 2016a). SRI, often referred to as Socially Responsible Investment, is an investing principle that is based on the ESG criteria (Financial

¹ For definition of what markets considered developed, see appendix figure 10.2.1.

Times, 2016), and during the 2000s SRI has expanded its notation to Sustainable and Responsible Investments (Eurosif, 2012). Fund managers and investors work to incorporate these principles in different ways, some simply refrains from investing in controversial sectors, whereas others use a more proactive approach. Common to all is the consideration of ESG (Eurosif, 2012). Any fund manager can appoint themselves “ethical”, and for an investor choosing an, allegedly, ethical fund this can be troublesome. One tool available is the Morningstar Sustainability Ratings’ system that evaluates funds by the ESG criterion (Justice & Hale, 2016). When indentifying ethical funds in this study, the ESG criterion and the Morningstar Sustainability Ratings will be used.

1.3 Research Question

This thesis seeks to evaluate if there is a difference in performance between mutual ethical equity funds and the global market, and if there is a difference in performance between such funds investing in emerging markets and developed markets (referred to as ‘global’). This essay also seeks to evaluate the investment style of these ethical funds. The global mutual ethical funds hypotheses will be tested on both ten- and five-year horizons, 2006-2016 and 2011-2016 respectively. The emerging markets mutual ethical equity funds hypotheses will be tested on a five-year horizon, 2011-2016. The differences between these two categories will be tested on a five-year horizon, 2011-2016. This study evaluates the following hypotheses:

Figure 1.3.1, Hypotheses

1	<i>H₀</i> There is no difference in performance between global mutual ethical equity funds and the equity market.
	<i>H_a</i> There is a difference in performance between global mutual ethical equity funds and the equity market.

2	<i>H₀</i> There is no difference in performance between the emerging markets mutual ethical equity funds and the equity market.
	<i>H_a</i> There is a difference in performance between the emerging markets mutual ethical equity funds and the equity market.

3	<i>H₀</i> There is no difference in performance and investment style between global mutual ethical equity funds and emerging markets mutual ethical equity funds.
	<i>H_a</i> There is a difference in performance between global mutual ethical equity funds and emerging markets mutual ethical equity funds.

The investment style is evaluated by the funds sensitivity towards the factors size, value, profitability and investments.² The investment styles investigated in this study are therefore based on these four dimensions.

The global mutual ethical equity funds in no. 1 are included in the Ethical Fund Portfolio and the emerging markets mutual ethical equity funds in no. 2 are included in the Emerging

² For more information on investment styles, see section 3.2 and 5.5.

Markets Ethical Fund Portfolio. No. 3 will be tested with a Difference Portfolio. The hypotheses will be tested by applying the Fama & French five factor model. The portfolios will also be analyzed with other portfolio performance measurements, such as Sharpe Ratio, Treynor Ratio, M2-measure and within an original CAPM. The statistical hypotheses for testing these hypotheses are specified in section 5.6.

1.4 Delimitations

For delimitation reasons, only the ethical mutual equity funds offered by nordic asset managers are investigated. This essay assumes that the Fama & French market index and factor portfolios are representative of a conventional index; the broader global equity market. For delimitation purposes, no sensitivity analysis or comparison using different indices for the broader market is performed. The global benchmark data is measured in developed countries and this essay uses it to benchmark the emerging market funds. This is because of absence of easily accessible factor portfolio data for emerging markets. There is a limited amount of ethical funds investing in emerging markets, and when choosing funds to include in this portfolio some modification to the criteria for inclusion in this study had to be made (see methodology section 5.2).

This study assumes the fund portfolios constructed as representative to ethical funds in general, which is not necessarily the case. The results in this study are also limited to the time periods evaluated. The annual fee of the ethical funds is assumed to be constant over the research period which might bias the result. Funds that generated low returns might be discontinued or merged into other funds causing the final result of the funds performance test to be upward biased. To avoid this survivorship bias problem, both active funds and inactive funds must be included in the dataset (Brown, Goetzmann, Ibbotson, & Ross 1992). These two problems require time that we did not have to solve when performing the study, and for delimitation reasons no actions are taken to prevent these.

1.5 Section Description

Succeeding this section, relevant literature and prior research are presented in the literature review section, followed by a theory review. Thereafter, data collection and methodology are described, followed by an empirical results section. In the conclusions section the most important findings for all hypotheses are brought up. Throughout the thesis abbreviations is used; see appendix section 10.3 for key term definitions.

2. Literature Review

2.1 Ethical Investment Performance

Financial models often assume that investors seek to minimize risk for a given level of return, i.e. that they are mean variance efficient. This objective requires a fully diversified portfolio, and the argument against socially responsible (SRI) funds is therefore: Since they have a more limited investment opportunity set, these funds should underperform the broader market (Humphrey & Lee, 2011). Prior research suggests that this is not the case, ethical funds do not significantly underperform the market or conventional funds. In a survey from 2012, Fondbolagens Förening (2012) concludes that many researchers do not seem to find significant differences in ethical funds risk-adjusted performance. On the other hand, Sjöström's (2011) survey of 21 research studies on ethical fund performance find that only a third of these conclude that ethical funds performance does not differ from the average.

Hamilton et al. (1993) were among the first to evaluate socially responsible fund performance, and they analyse data over the years 1981-1990. They find no significant difference in performance between ethical mutual funds and conventional funds when applying a single index capital allocation pricing model (CAPM). Bauer, Koedijk and Otten (2005) compare returns on ethical funds in Germany, UK and US over the years 1990-2001 by using multi factor models. Similar to other research that compares performance of ethical mutual funds to the performance of conventional mutual funds, they do not find any significant differences in performance. On the other hand, they do find differences in investment style. They find that ethical funds tend to be more exposed to small, growth companies, a fact that is mentioned in other research as well, for example Guerard (1997). Moreover, they conclude that conventional indices tend to explain the performance of ethical mutual funds better than ethical indices.

When researching the European market, Cortez, Silva and Areal (2009) conclude, similar to Bauer et. al (2005), that conventional indices tend to explain ethical funds performance better than ethical indices. They find no support for under- or outperformance by ethical funds over ethical or conventional benchmark portfolios. Cortez, Silva and Areal (2012) use data between 1996 and 2008, and applies both a single index CAPM model and multi index models. They find support for US and Austrian ethical funds to underperform conventional benchmarks. Regarding investment style, consistent with prior research, they find strong evidence for ethical funds to be exposed to small, growth companies.

Negative screening refers to the practice of screening out companies that participate in unethical activities, while positive screening is a proactive approach (Kempf & Osthoff, 2007). One of the main objective in Guerard's (1997) research is to investigate whether socially screened investing universes significantly differs from unscreened universes. He shows that between 1987-1994 there were no difference in returns between screened and unscreened universes.

Humphrey & Lee (2011) research screening effect on performance, and unlike Guerard (1997) they find that funds that impose a large amount of different negative screening suffer from lack of diversification. However, they do not find differences between socially responsible funds and conventional funds. Kempf & Osthoff (2007) use a Carhart Four Factor Model, over the years 1992-2004, to evaluate a trading strategy where an investor buys company stocks with high socially responsible ratings, and sells stocks of low socially responsible ratings³. They find that this strategy actually results in higher returns when using a positive screening approach, and the highest alphas are accomplished by using a best in category stock-picking method. However, they do not find a negative screening approach to lead to higher returns.

2.2 Emerging Markets Mutual Fund Performance

There are research suggesting that mutual funds do not outperform their benchmark indices, see for example Cumby and Glen (1990) and Carhart (1997). More recent research by Barras, Scalliet and Wermers (2010) suggests the same. Due to efficient markets, fund managers have problems finding mispriced stocks; and therefore problems earning excess returns on developed markets. Emerging markets, however, are often considered to offer fund managers opportunities to exploit asymmetric information and mispricing to generate excess returns (Basu & Huang-Jones, 2015). Despite this, Basu and Huang-Jones (2015) find no evidence for emerging market funds to outperform their benchmark. Abel and Fletcher (2004) find no significant differences in performance between emerging markets mutual funds and the global index when evaluating those in a Fama & French Three Factor Model. Huji and Post (2011) find the size variable to be insignificant when researching emerging markets funds, and they find evidence for these funds to be exposed to growth companies.

³ Ratings from KLD Ratings & Analytics

3. Theory

3.1 Original CAPM

The capital allocation pricing model (CAPM) introduced by Sharpe (1964), Lintner (1965) and Mossin (1966) is one of the cornerstones in modern finance and is still widely used in various forms when valuing assets. Predicted returns within CAPM for an asset or portfolio is calculated as a risk premium over the risk free rate (Bodie, Kane & Marcus, 2014):

$$E[r_i] = r_f + \beta_i(E[r_m] - r_f) \quad (3.1.1)$$

Where

$E[r_i]$ = Expected return of an asset or portfolio

$E[r_m]$ = Expected return of market

r_f = risk free rate

Definitions of beta, variance and covariance can be found in section 10.1. Bodie et al. (2014) lists the assumptions made within the capital allocation pricing model; for example, identical investors, efficient markets and no transaction costs. It also implies that there is only one systematic risk; market risk (beta risk). This is a simplification of reality and it has caused researchers to search for ways to eliminate problems with the original CAPM; publishing extended versions of the CAPM. (Bodie et al. 2014). Prior research on ethical funds used extended, stock-specialized versions of the CAPM, for example the Carhart four factor model and the Fama and French three factor model. Another example of a stock-specialized version of the CAPM is the Fama & French Five Factor Model (Fama & French, 2015), an extension to the famous Three Factor Model. (Fama & French, 1992; Fama & French 1993).

3.2 Fama & French Five Factor Model

In articles from 1992 and 1993 Fama and French publish their three factor model. Fama and French (1992; 1993) provide evidence for, contradictory to the original CAPM, that there is more than one systematic risk for stocks. They find that size and book-to-market are good proxys for common risk factors in stock returns. Fama and French (2015) use a discounted dividends model to interpret the predictors of stock returns, and argue that expected profitability and investments are also important determinants for stock returns. There are substantial evidence for a three factor model's shortcoming with respect to investment and profitability factors (Fama & French 2015); which research by Fama and French (2015) supports. Fama and French (2015) provide evidence for a five factor model that includes

profitability and investments to explain more variations in returns than a three factor model. It is a linear model and specifies as follows for all assets or portfolios i (Fama & French, 2015)⁴:

$$E[r_i] - r_f = \alpha_i + \beta_{1i}(E[r_m] - r_f) + \beta_{2i}SMB + \beta_{3i}HML + \beta_{4i}RMW + \beta_{5i}CMA + \varepsilon \quad (3.2.1)$$

Where

$E[r_i]$ = Expected return of a portfolio

r_f = Return of Risk Free Rate

$E[r_m] - r_f$ = Expected market risk premium

α_i = Five factor alpha

$\beta_{1,2,\dots,5}$ = Sensitivity factors

SMB = Size factor portfolio

HML = Value factor portfolio

RMW = Profitability factor portfolio

CMA = Investment factor portfolio

ε = Error term

The market variable (expected market risk premium) measures market excess return over the risk free rate and is the variable included in the original CAPM. This variable captures systematic market risk and the coefficient is interpreted as the portfolio sensitivity towards market returns (beta-value) (Bodie et al. 2014).

SMB

Fama and French (1992) argue that since small companies have periods of poor earnings performance not shared by large firms, there should be a risk related to size. They find that small company stocks generally have higher betas than large company stocks, i.e. more sensitive to market risks. They also find a relationship between size and average returns, and in articles from 1992 and 1993 Fama and French (1992; 1993) show that a size variable indeed has large explanatory power over stock returns. The SMB variable measures differences in performance between a small company portfolio and a big company portfolio and is a proxy for risk factors related to size. Positive/ higher coefficients to this variable are interpreted as higher sensitivity against small cap stock return versus large cap returns; and therefore such portfolio logically holds more small company stock. Negative coefficients

⁴ Fama and French (2015) use different letter notations for the coefficients.

suggest that the portfolio is exposed to large companies. As mentioned in the literature review, Bauer et al. (2005) and Cortez et al. (2012) find evidence for ethical funds holdings to be exposed to small company stock; i.e. significantly positive sensitivity to the SMB variable.

HML

Fama and French (1992) argue that earnings prospects are priced by the market and companies with good earnings prospects are valued higher, i.e. low book-to-market values. Therefore, companies with low book-to-market values tend to deliver higher earnings than companies with high book-to-market values. They provide evidence for a relationship between book-to-market values and returns (Fama & French 1992; Fama & French 1993), and there is substantial research suggesting the same (Fama & French, 2015). The HML variable measures differences in performance between a high value (high book-to-market) portfolio and a growth (low book-to-market) portfolio and is a proxy for risk factors related to book-to-market values. High positive sensitivity for this variable indicates high exposure to value companies, and negative sensitivity indicates exposure to growth companies. As mentioned in the literature review, Bauer et al. (2005) and Cortez et al. (2012) find that ethical funds investment style tends to be more growth-oriented; i.e. significantly negative sensitivity to the HML variable.

RMW

Fama and French (2015) use a discounted dividend model to argue that higher expected profitability (higher expected earnings) indicates higher expected returns. Prior research by Novy-Marx (2013) supports this conclusion and provides evidence for a positive relationship between stock returns and profitability. One explanation to this is that earnings, free cash flow and dividends has proven to be determinants of future stock prices and profitability can predict these (Novy-Marx, 2013). The RMW variable captures difference in returns between a portfolio of companies with robust profitability and a portfolio of companies with weak profitability and is used as a proxy for risk factors related to profitability and future earnings. High positive coefficients to this factor would suggest that the portfolio has high exposure to companies with high profitability, and negative coefficients suggest that the portfolio is exposed to companies with weak profitability. (Fama & French, 2015)

CMA

Fama and French (2015) use a discounted dividend model to argue that higher expected investments result in lower expected returns. This theoretical conclusion is also supported by

research; e.g Titman, Wei & Xie (2004) show that stocks of companies that make substantial increases in capital investments (aggressive companies) tend to underperform companies that makes very small investments (conservative companies) over a subsequent five-year period (Titman et al. 2004). The CMA variable captures the difference in performance between a portfolio of conservative companies and a portfolio of aggressive companies and is used as a proxy for expected investments. High positive values of the coefficient for this variable would suggest that the portfolio has high exposure to conservative companies and negative values suggest exposure to aggressive companies. (Fama & French, 2015)

Putting all five factors together into a five factor model, Fama and French (2015) show that the value factor (HML) appears redundant in the presence of the new profitability and investment factors for US data. The redundancy of the value factor can be explained by the tendency of value companies to do very little investments. Value companies should therefore behave like conservative companies and generate higher returns (Fama & French, 2015). The intuitive explanation for how the profitability factor would absorb the high returns of value companies is contradictory, since it suggests that value companies behave like profitable companies, and value companies do not tend to be rather profitable (Fama & French, 2015). On the contrary, Chiah, Chai, Zhong & Li (2016) find the HML variable significant in the presence of profitability and investment variables.

International evidence by Fama and French (2016) shows that the significance of SMB, HML, RMW and CMA varies for different countries, although a five factor model is almost always outperforming a four factor model in Europe, North America and Asia Pacific. Chiah et al. (2016) also find the five factor model to be superior to a Fama & French three factor model and Carhart four factor model when evaluating it on the Australian market. However, even though the five factor model is improving a three factor model, it is not perfect. As Chiah et al. (2016) points out, the five factor model manages to explain some variation in time-series returns, but definitely not all of it.

3.3 Jensen's Alpha

The difference between one asset's return and the CAPM predicted return is called the alpha, often referred to as Jensen's Alpha. When the alpha is positive, an asset's risk (beta value) is too low given its expected return, and is therefore undervalued. When the alpha is negative, the asset risk (beta value) is too high given its expected return, and is therefore overvalued. (Bodie et al.)

Jensen's Alpha is calculated as follows (Bodie et al. 2014):

$$a_i = E[r_i] - (r_f + \beta_i(E[r_m] - r_f)) \quad (3.3.1)$$

Use equation 3.3.1 to think of the alpha as

$$\alpha_i = E[r_i] - \text{Benchmark model} \quad (3.3.2)$$

Where the benchmark model is the original CAPM in equation 3.3.1, but could be any eligible model (Bodie et al. 2014), for example the Fama & French Five Factor Model. Note that equation 3.3.1 equals:

$$E[r_i] - r_f = a_i + \beta_i(E[r_m] - r_f) \quad (3.3.3)$$

Therefore, in an econometric model where the dependent variable is an asset's excess return over the risk free rate, the intercept is interpreted as the asset's alpha. (Jensen, 1967)

3.4 Sharpe Ratio

There is a trade-off between risk and reward, and Sharpe Ratio is a measurement of that. The Sharpe ratio (SR) is the excess return the asset manager can earn by replacing a T-bill with a risky portfolio, per unit of risk. (Bodie et al. 2014). There are two versions of the sharpe ratio (Sharpe, 1994): "Ex ante sharpe ratio" and "ex post sharpe ratio". When calculating the ex ante sharpe ratio the expected return is used, unlike when calculating the ex post sharpe ratio when the historical return is used. This paper will use the ex ante version of the sharpe ratio and it is calculated by dividing the risk premium by the standard deviation (the risk) of the portfolio. \bar{r}_i is average return. (Bodie et al. 2014)

$$SR = \frac{\bar{r}_i - r_f}{\sigma_i} \quad (3.4.1)$$

3.5 Treynor Ratio

Risk can be divided into two parts; systematic risk and nonsystematic risk. Sharpe Ratio measures excess return by unit of total risk, while Treynor Ratio use systematic risk, i.e. nondiversifiable risk. It divides excess return by beta; which is a portfolio's sensitivity towards the market. Treynor Ratio therefore measures the excess return per unit of risk that can not be eliminated through diversification; a risk that is shared by all assets on the market. (Bodie et al. 2014)

$$TR = \frac{\bar{r}_i - r_f}{\beta_i} = \frac{\bar{r}_i - r_f}{\frac{\sigma_{i,m}}{\sigma_m}} \quad (3.5.1)$$

3.6 M2 Measure

M2 is a measure of risk adjusted return, and the idea is to measure portfolio return if it had the same risk as a certain market index. This risk adjusted return is then compared to that same market index return. This is done by weighing portfolio return with market risk share of portfolio risk and subtracting market return (Bodie et al. 2014):

$$M2 = \frac{\sigma_m}{\sigma_i} \bar{r}_i - \bar{r}_m \quad (3.6.1)$$

If the measure is negative, the portfolio is outperformed by the market on a risk adjusted basis, and vice versa. (Bodie et al. 2014)

4. Data

The data of the Ethical Fund Portfolio consists of 120 monthly observations; returns for November 2006 until October 2016. The data of the Emerging Markets (EM) Ethical Funds Portfolio consists of 60 observations, i.e. five years. The return and dividend data was downloaded from Bloomberg in USD, and figure 4.1.1 and 4.1.2 shows the monthly properties of the data set. The properties of the factor portfolio data are found in appendix 10.2.6-7. The fees of the funds were collected from Morningstar and respectively fund managers' webpage. The returns of SEB Etisk Europa and Handelsbanken Europa Tema and Handelsbanken Tillväxtmarknad Tema were downloaded from respective webpage. The factor portfolio data was downloaded from the Kenneth R. French data library, which is reported in USD every month. The Kenneth R. French data library use Bloomberg data when constructing the portfolios, and exactly how these portfolios are constructed is presented in section 5.5. Both the monthly fund data and the benchmark index data is converted to USD every month for comparability reasons since currencies depreciates/appreciates over time.

Figure 4.1.1, Ten-Year Monthly Data

10 Years						
<i>Portfolios</i>	<i>Obs.</i>	<i>Avg. Return</i>	<i>Std. Dev</i>	<i>Min</i>	<i>Max</i>	<i># funds</i>
Ethical Fund Portfolio	120	0.23%	5.23%	-21.41%	15.54%	10
Weighted Equity Market	120	0.51%	5.00%	-19.99%	11.93%	

2006-10-2016-09 Monthly data. Arithmetic averages. Return based on prices in USD

Figure 4.1.2, Five-Year Monthly Data

5 Years						
<i>Portfolios</i>	<i>Obs.</i>	<i>Avg. Return</i>	<i>Std. Dev</i>	<i>Min</i>	<i>Max</i>	<i># funds</i>
Ethical Fund Portfolio	60	0.50%	3.51%	-10.62%	6.83%	10
EM Ethical Fund Portfolio	60	0.32%	4.92%	-11.86%	12.87%	4
Global Equity Market	60	1.00%	3.45%	-8.87%	10.03%	
Weighted Equity Market	60	0.96%	3.59%	-9.56%	10.23%	

Notes: 2011-10-2016-09 Monthly data. Arithmetic averages. Return based on prices in USD.

Multicollinearity

Multicollinearity arises when two or more of the independent variables in a regression correlates on high levels, and causes bias in the OLS estimated coefficients. Testing for multicollinearity is done by the VIF-test. If a variable gets a value greater than 10 there is multicollinearity (Field, 2014). The data used in this study does not show signs of multicollinearity, according to figure 4.1.3.

Heteroscedasticity

Heteroscedasticity is when the variance of the residuals is not constant, and there is a relationship between the independent variables and the residuals. If there is heteroscedasticity, the abnormal residuals will bias the estimated model (Field, 2014). Testing for heteroscedasticity is done by performing both a Breusch Pagan test and White test, for linear and general heteroscedasticity respectively (Gujarati & Porter, 2009), within a five factor model. For the five-year period data, no heteroscedasticity is found. The ten-year data tests positive for heteroscedasticity according to both the Breusch Pagan and the White test; which can be concluded from figure 4.1.3 where these tests are significant. To correct for this problem, the regressions are performed with robust standard errors, White standard errors, which is a technique that correct for the problems that occur when regressing data with heteroscedastic residuals. (Gujarati & Porter, 2009)

Figure 4.1.3, Data Tests

	Five Factor Model		
	<i>Mean VIF</i>	<i>Breusch Pagan (Prob >F)</i>	<i>White (Prob >F)</i>
10 Year			
Ethical Fund Portfolio	1.73	0.020**	0.001***
5 Year			
Ethical Fund Portfolio	2.05	0.664	0.567
Emerging Markets Ethical Fund Portfolio	1.98	0.448	0.536

*Notes: *Significant on 10% level, **Significant on 5% level, ***Significant on 1% level. All tests calculated within a five factor model.*

5. Methodology

5.1 Definition of Ethical Investments

Hamilton et. al. (1993) conclude that there is no general agreement of criteria within ethical investing, which Eurosif (2012) also points out. The ESG addresses three major areas; Environmental, Social and Governance (Eurosif, 2016b). The environmental area recognizes a company's impact on the environment, for example greenhouse gas emissions and energy efficiency. The social area recognizes a range of issues, from social aspects of company's workplace environment, to human rights aspects. The governance area recognizes a company's management, cultures and risk profile. Example of this is strategic management of social and environmental performance, transparent reporting, and corruption. (Eurosif, 2016b). The ESG criterias is frequently mentioned when reading about ethical and sustainable investments, it is also used by research firms when rating companies, for example by Morningstar (Justice & Hale, 2016). ESG is therefore a central piece when identifying ethical investments in this study.

The Morningstar Sustainability Rating system is based on the ESG criteria for sustainable investments. This tool facilitated the process of identifying ethical funds in this study. The holdings of funds are analysed and the funds are thereafter given a Morningstar Sustainability Score between 0 and 100 based on ESG criterias and controversy (unethical or environmental risk factors). The funds are divided into peer groups, and within these groups the funds are ranked based on their Morningstar Sustainability Score. They are thereafter given a Morningstar Sustainability Rating between 1 and 5, where 1 is low, 2 is below average, 3 is average, 4 is above average and 5 is high (Justice & Hale, 2016). For purposes of evaluating ethical funds, there is no point in including funds that scores below average on the Morningstar Sustainability Rating. For that reason, the limit is set to a rating of 3 (average) in this study. The Morningstar Sustainability Score is used as a double check, since the peer groups in which the funds are ranked are unknown. The limit score was set to 50, which is half of the score a fund can get.

5.2 Portfolio Construction

The global mutual ethical equity funds form the Ethical Fund Portfolio and the emerging markets mutual ethical equity funds are included in the Emerging Markets Ethical Fund Portfolio. Which funds to include in the study was determined by first researching the market

with the help of different screening tools such as Morningstar, actively picking the funds with ethical profiles and thereafter eliminating the ones that did not fit the Sustainability Score and Rating and time period requirements. The requirements for a fund to be included are the following:

Figure 5.2.1 Fund Criteria

Criteria	Limits	
	Ethical Fund Portfolio	EM Ethical Fund Portfolio
Mutual Fund	Eliminate index funds	Eliminate index funds
Evident Ethical Profile	Subjective	Subjective
Morningstar Sustainability Rating*	≥ 3	≥ 3
Morningstar Sustainability Score*	≥ 50	-
Time period	≥ 10 Years	≥ 5 Years
Market	Global, Developed	Emerging

* At the time of data collection, 16/11/16

The funds in the Ethical Fund Portfolio are mutual ethical equity funds managed by Nordic finance institutes, investing predominantly in global developed markets. Even if they are allowed to invest in emerging markets does not mean that they do not reflect developed markets in nature, and this gets clear in the empirical results section. There were ten funds that matched the criteria discussed above. Two of them are investing on European markets, and how to treat this while benchmarking is discussed in section 5.3. Other area-specific funds were evaluated as well, for example North American funds, but they did not meet the requirements. The reason for not including Nordic funds in this portfolio is the absence of factor portfolio data that is needed.

The funds in the Emerging Markets Ethical Fund Portfolio are mutual ethical equity funds investing predominantly in emerging markets. There were four emerging market ethical funds that fit the requirements of at least five years old with a distinct ethical profile, and three or higher Sustainability Rating on Morningstar. No regard to the Morningstar Sustainability Score was taken when choosing the emerging markets funds. The criteria for the global ethical funds were stricter and this was not possible for the emerging markets funds since there were very few funds on the market matching the time frame criteria of five years.

The two portfolios are constructed by first collecting the monthly return, dividend and fee data, adding dividend and subtracting the fees from return of every fund. Then, an equally weighted return for the funds in the two groups was calculated, creating the Ethical Fund Portfolio and the EM Ethical Fund Portfolio. A specification of which funds that are included can be found in appendix figure 10.2.1.

$$r_{i,t} = \frac{P_t + \text{dividend}_t}{P_{t-1}} - \text{fee}\% - 1 \quad (5.2.1)$$

$$r_{p,t} = \frac{1}{n} \sum_{i=1}^n r_{i,t} \quad (5.2.2)$$

The difference between the Ethical Fund Portfolio and the EM Ethical Fund Portfolio returns forms a difference portfolio:

$$r_{\text{Difference Portfolio}, t} = r_{\text{Ethical Fund Portfolio}, t} - r_{\text{EM Ethical Fund Portfolio}, t} \quad (5.2.3)$$

5.3 Benchmark

The Ethical Fund Portfolio consist of ten funds. Since two of them are European funds and eight are global funds a weighted average of the Global and European data is used in the benchmark technique to match the Ethical Fund Portfolio as good as possible. All five factor portfolios and the risk free rate from the Kenneth R. French data library are weighted with this technique.

$$\text{Weighted data} = \frac{8}{10} \text{Global data} + \frac{2}{10} \text{Europe data} \quad (5.3.1)$$

For the EM Ethical Fund Portfolio, the unweighted, global benchmark data is used. The global data is measured on developed markets, but is expected to partly explain variance in returns of emerging market ethical funds. Another part of the variance will be explained by emerging markets development. When comparing EM Ethical Fund Portfolio to Ethical Fund Portfolio five-year return data is used for both portfolios.

The difference portfolio is benchmarked with both global data and the weighted data calculated for the Ethical Fund Portfolio. In the empirical results part, two results for the difference portfolio are presented.

5.4 Econometric Model

In research papers similar to this one, Fama & French Three Factor, and Carhart Four Factor Models are frequently used. Therefore, it is interesting to evaluate ethical funds with a new model; possibly detecting new interesting results about performance and investment style. The five factor model is a product of research and are supported by theories within finance, for example Fama and French (2015), Fama and French (1992), Fama and French (1993), Novy-Marx (2013) and Titman et al. (2004). The new variables in the model, profitability and investment, are added step by step to expose how the extension of the Fama & French three factor model changes the results. Specification of these models are found in appendix equations 10.1. 9-11. Besides from the Fama & French Five Factor Model the portfolios will

also be evaluated with other portfolio performance measurements, such as Sharpe Ratio, Treynor Ratio, M2-measure and within an original CAPM model.

The theoretical model in equation 3.2.1 differ from the econometric model in equation 5.4.2 in the sense that the econometric model is an estimation of the theoretical model, where the coefficients are OLS estimators⁵. OLS estimation is a widely used technique for estimating coefficients in regression models (Gujarati & Porter, 2009); and Bauer et al. (2005) are also using this technique. The coefficients $\alpha_i, \beta_{1i}, \dots, \beta_{5i}$ in the theoretical model in equation 3.2.1 are estimated by OLS estimators b_{0i}, \dots, b_{5i} in the model below. The five factor model in equation 3.2.1 is estimated through the following model:

$$r_{it} - r_{ft} = b_{0i} + b_{1i}(r_{mt} - r_{ft}) + b_{2i}SMB_t + b_{3i}HML_t + b_{4i}RMW_t + b_{5i}CMA_t + U_t \quad (5.4.2)$$

Where

b_{0i} = Estimation of intercept of regression

$b_{1i,2i,\dots,5i}$ = Estimation of coefficients for independent regression variables

U_t = Unexplained variance at time t

Instead of the expected returns in equation 3.2.1, historical returns are used in the estimated model. When estimating this model the intercept (b_0) is interpreted as the alpha, and the coefficients b_{1i}, \dots, b_{5i} for the different factor portfolios are interpreted as the portfolio sensitivity to that factor. The theoretical meaning of this is discussed in the theory review.

5.5 Factor Portfolio Construction

The equity market portfolio is a value weighted portfolio created from all stocks listed on developed markets stock exchanges. What countries that are included can be found in appendix figure 10.2.1. The treasury bill (one-month) collected from the Kenneth R. French data library is used as a proxy for the risk free rate within the econometric models. Bodie et al. (2014) mean that the treasury bill rate is close to the risk free rate, and it is also the same proxy used by Bauer et al. (2005). The treasury bill rate is therefore a reasonable measure of the risk-free rate for purposes of this study.

The factor portfolios are created by dividing companies of the major stock exchange markets in the world into different groups; these groups can be found in figures 5.5.1, 5.5.2, 5.5.3. These portfolios are, as mentioned, downloaded from the Kenneth R. French data library, and

⁵ With White standard errors, see section 4.

are constructed as follows (Kenneth R. French Data Library, 2016): The big/ small dimension is determined by market capitalization, the value dimension by book-to-market value, the profitability dimension by operating profitability and the investment dimension by capital investments made by the company. The companies are first divided into two size groups based on median market cap; “big” and “small” where the breakpoints are 10th and 90th percentile (where the 50th percentile is the median of the sample). The companies are then ranked within the big and small groups based on the three other dimensions: value, profitability and investments. The breakpoint for these three dimensions is 30th percentile and 70th percentile (Kenneth R. French database 2016). To be considered a “Big Value” company, a company would first be divided into the big company subgroup (rank 90th percentile or higher based on market capitalization), and then ranked 70th percentile or higher (top 30th percentile) based on book-to-market value. To be considered a “Small Growth” company, a company would at first end up in the “Small” group and then rank 30th percentile or lower based on book-to-market value. Graphical interpretations of these portfolios are given below.

Figure 5.5.1, Six Portfolios Formed on Size and Value

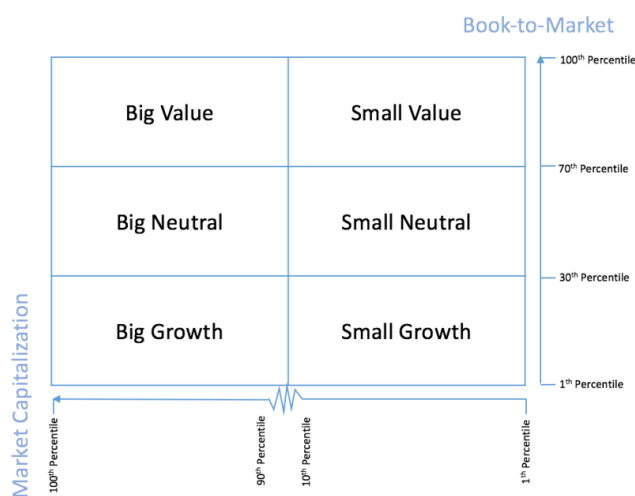


Figure 5.5.2, Six Portfolios Formed on Size and Profitability

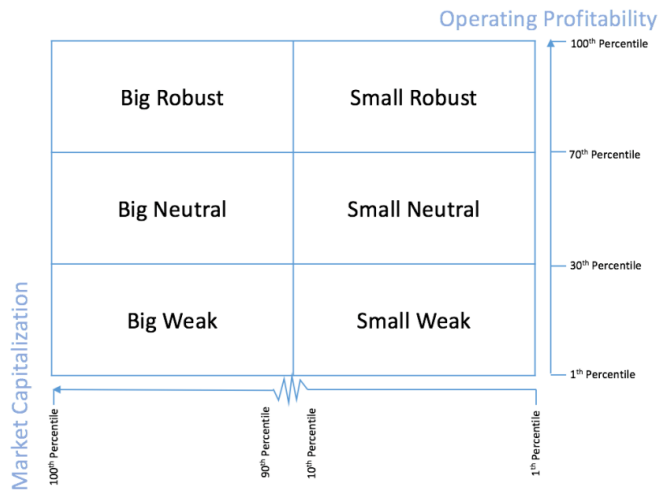
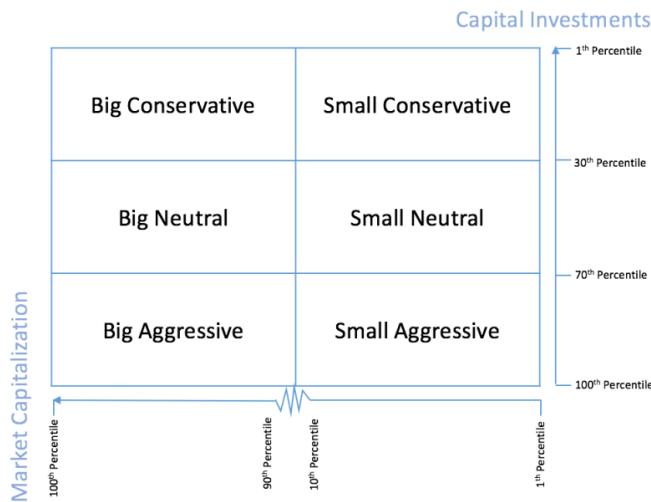


Figure 5.5.3, Six Portfolios Formed on Size and Investments



The SMB (Small Minus Big) portfolio is created by averaging the big-company portfolio return and subtracting the average return of small-company portfolios, an illustration of how to divide companies in these groups is given in figure 5.5.1 (Kenneth R. French Data Library, 2016).

$$SMB = \frac{r_{Big\ Value} + r_{Big\ Neutral} + r_{Big\ Growth}}{3} - \frac{r_{Big\ Growth} + r_{Small\ Neutral} + r_{Small\ Growth}}{3} \quad (5.5.4)$$

The HML (High Minus Low) portfolio is created by subtracting the average return of the small and big growth portfolios from the average of the small and big value portfolios, an illustration of how to divide companies in these groups is given in figure 5.5.1. (Kenneth R. French Data Library, 2016)

$$HML = \frac{r_{Big\ Value} + r_{Small\ Value}}{2} - \frac{r_{Big\ Growth} + r_{Small\ Growth}}{2} \quad (5.5.5)$$

The RMW (Robust Minus Weak) portfolio is created by averaging the small and big robust profitability companies return and subtracting the average of the big and small weak companies return. An illustration of how to divide companies in these groups is given in figure 5.5.2. (Kenneth R. French Data Library, 2016)

$$RMW = \frac{r_{Big\ Robust} + r_{Small\ Robust}}{2} - \frac{r_{Big\ Weak} + r_{Small\ Weak}}{2} \quad (5.5.6)$$

The CMA (Conservative Minus Aggressive) portfolio is created by subtracting the average of big and small aggressive companies returns from the average of big and small conservative companies returns. An illustration of how to divide companies in these groups is given in figure 5.5.3. (Kenneth R. French Data Library, 2016)

$$CMA = \frac{r_{Big\ Conservative} + r_{Small\ Conservative}}{2} - \frac{r_{Big\ Aggressive} + r_{Small\ Aggressive}}{2} \quad (5.5.7)$$

5.6 Statistical Hypotheses

Following figures states the statistical hypotheses for testing hypotheses 1, 2 and 3 in section 1.3 and for evaluating investment styles on ten- and five-year horizons. This section is provided for explanation on how to interpret the output in the empirical results section 6.

Figure 5.6.1, Statistical Hypotheses, Ten-Year

	<i>Alpha</i>	<i>Market</i>	<i>SMB</i>	<i>HML</i>	<i>RMW</i>	<i>CMA</i>
H₀	$\alpha_i = 0$	$\beta_{1i} = 0$	$\beta_{2i} = 0$	$\beta_{3i} = 0$	$\beta_{4i} = 0$	$\beta_{5i} = 0$
H_a	$\alpha_i \neq 0$	$\beta_{1i} \neq 0$	$\beta_{2i} \neq 0$	$\beta_{3i} \neq 0$	$\beta_{4i} \neq 0$	$\beta_{5i} \neq 0$

Where i = Ethical Fund Portfolio

Figure 5.6.2, Statistical Hypotheses, Five-Year

	<i>Alpha</i>	<i>Market</i>	<i>SMB</i>	<i>HML</i>	<i>RMW</i>	<i>CMA</i>
H₀	$\alpha_j = 0$	$\beta_{1j} = 0$	$\beta_{2j} = 0$	$\beta_{3j} = 0$	$\beta_{4j} = 0$	$\beta_{5j} = 0$
H_a	$\alpha_j \neq 0$	$\beta_{1j} \neq 0$	$\beta_{2j} \neq 0$	$\beta_{3j} \neq 0$	$\beta_{4j} \neq 0$	$\beta_{5j} \neq 0$

Where j = Ethical Fund Portfolio, EM Ethical Fund Portfolio, Difference Portfolio.

The hypotheses are individual tests for all variables and are tested with a t-test. The coefficients are estimated and tested within a single CAPM model, a three factor model, two four factor models (I & II) and a five factor model, see equations 10.1.8-12 in appendix for specifications. Hypotheses 1, 2 & 3 in the research question section 1.3 is tested by α_i , α_i is the regression intercept and is interpreted as the portfolio alpha (cf sections 3.3, 5.4), these hypotheses test the portfolio under- or outperformance over the market. If the null hypothesis is rejected for α_i this would mean that the portfolio is performing significantly different from the market. β_{1i} is the portfolios sensitivity towards the market, and is interpreted as the

portfolio beta. For evaluating investment style $\beta_{2i}, \dots, \beta_{5i}$ is tested. $\beta_{2i}, \dots, \beta_{5i}$ are interpreted as sensitivity towards the factors. If the null hypothesis is rejected for any of $\beta_{2i}, \dots, \beta_{5i}$ that would mean that factor significantly affects the portfolio return (cf variables in 3.2). Where the test results are presented, significant coefficients where the null hypothesis is rejected are notated with *, ** and *** (for significance levels 10 %, 5 % and 1 % respectively).

6. Empirical Results

In this section the empirical results are presented and analysed. The section is organized after the hypotheses in section 1.3. Within each section there are two sub titles: "Portfolio Performance Measures" and "Fama & French Models". The first refers to e.g. the Sharpe Ratio and the original CAPM output. The second refers to results from the Fama & French models, including the five factor model.

6.1 Ethical Fund Portfolio Results

In this section hypothesis 1 from section 1.3 is tested, and the Ethical Fund Portfolio's investment style is evaluated.

Portfolio Performance Measures

Figure 6.1.1 shows that the Ethical Fund Portfolio average yearly return between 2006-2016 is 2.8 % with a standard deviation of 18.1 %, compared to market average yearly return of 6.1 % and standard deviation of 17.3 %. Between 2011 and 2016 the Ethical Fund Portfolio return was higher, and standard deviation was lower: 6.0 % and 12.2 % respectively. Market average yearly return was also higher for the five-year period, 11.5 % and with standard deviation of 12.4%. The Sharpe Ratio for the Ethical Fund Portfolio was 0.111 and 0.431 for the ten-year and the five-year horizon respectively. The market Sharpe Ratios were higher: 0.305 and 0.859 for the two horizons. This suggests that the market outperformed the Ethical Fund Portfolio on both the ten- and five-year horizon. The higher risk, lower Sharpe Ratio and average yearly return over ten years might be affected by the financial crisis in 2008-2009.

The negative M2 measure also suggest that if the ethical fund portfolio had the same risk as the market, the Ethical Fund Portfolio would perform an average of 3.4 % and 5.3 % lower returns on a yearly basis on the ten- and five-year horizon respectively. The M2-measure is closer to zero for the ten-year period than for the five-year period, suggesting that despite lower risk and higher returns for the five-year period the market performed even better. If the

five- and ten-year portfolio had the same risk as the market, the five-year Ethical Fund Portfolio performance would be inferior to the ten-year portfolio performance relative to market performance.

Figure 6.1.1, Ethical Fund Portfolio Performance Data

	Ten-Year			Five-Year		
	Ethical Fund Portfolio	Weighted Equity Market	Risk Free Rate	Ethical Fund Portfolio	Weighted Equity Market	Risk Free Rate
Average return Y	2.8%	6.1%	0.8%	6.0%	11.5%	0.8%
Standard deviation Y	18.1%	17.3%		12.2%	12.4%	
Sharpe Ratio	0.111	0.305		0.431	0.859	
Treynor Ratio	0.020			0.051		
M2	-3.4%			-5.3%		
Beta	1.026***			1.035***		
Jensen's Alpha	-0.002**			-0.003**		

Notes: Arithmetic averages. Yearly data. OLS Estimators with robust standard errors. *Significant on 10% level, **Significant on 5% level, ***Significant on 1% level. For model specification, see equation 10.1.8

The ten-year Ethical Fund Portfolio beta is 1.026, and the five-year beta is 1.035. This suggests that during the five-year period, the Ethical Fund Portfolio was more sensitive to market movements than during the ten-year period. The alpha calculated within an original CAPM is significantly negative in both time periods, suggesting that the Ethical Fund Portfolio returns are significantly lower than those that can be predicted within an original CAPM model. Based on the original CAPM model, the null hypothesis 1 in section 1.3 is rejected for both periods 2006-2016 and 2011-2016; there is a difference in performance between global mutual ethical equity funds and the equity market. Hamilton et al. (1993) find no significant differences in performance between SRI funds and conventional funds when applying single CAPM on the US market, and is therefore not consistent with this results. Hamilton et al. (1993) evaluates the performance over the years 1981-1990, and this could be a contributory factor to differences in results; by this time there were fewer ethical mutual funds. Cortez et al. (2012) find no differences in performance on the overall global market, but they do find support for ethical funds in the US and in Austria to underperform the market when applying an original CAPM.

Fama & French Models

Figure 6.1.2 shows results from regressions performed within a three factor model, two four factor models (I & II) adding one of the new Fama & French variables each, and one final five factor model. Interpreting model R^2 , the five factor model explains a larger amount of variation in returns than a three factor model on both the ten- and five-year horizon which indicates that the new variables improves the model. This result is consistent with prior

research on the five factor model (Fama & French; 2015; Chiah et al. 2016). Observing the five factor model, this model explains 97.5 % and 97.4% of variation in returns on the ten- and five-year horizons respectively. This means that only 2.5 % and 2.6 % of variation is unexplained variation. This result is consistent with prior research by Bauer et al. (2005) and Cortez et al. (2009), both studies find that conventional indices has very large explanatory power over ethical funds.

Figure 6.1.2, Fama & French Models Regression Output, Ethical Fund Portfolio

Ethical Fund Portfolio	Ten-Year Coefficients	Five-Year Coefficients
<i>Three Factor</i>		
Model R ²	0.971***	0.963***
Three Factor Alpha	-0.003***	-0.003***
Market	1.036***	1.042***
SMB	0.159***	0.069
HML	-0.105*	-0.028
<i>Four Factor I</i>		
Model R ²	0.972***	0.965***
Four Factor Alpha I	-0.003***	-0.002*
Market	1.044***	1.016***
SMB	0.182***	0.002
HML	-0.053	-0.087
RMW	0.162	-0.215
<i>Four Factor II</i>		
Model R ²	0.974***	0.974***
Four Factor Alpha II	-0.002**	-0.001
Market	0.991***	0.966***
SMB	0.111**	-0.042
HML	0.0147	0.169**
CMA	-0.280***	-0.581***
<i>Five Factor</i>		
Model R ²	0.975***	0.974***
Five Factor Alpha	-0.002**	-0.001
Market	0.999***	0.962***
SMB	0.130**	-0.054
HML	0.049	0.151*
RMW	0.124	-0.049
CMA	-0.268**	-0.566***

Notes: OLS estimators with robust standard errors. *Significant on a 10% level, **Significant on a 5% level, ***Significant on a 1% level. Alpha is regression intercept. Significance level for R² is for F-test of model. For model specification, see equation 10.1.9-11.

Observing results in figure 6.1.2, the three, four and five factor alphas (intercept of regression) are significantly negative in all models for the ten-year horizon. This is interpreted as that ethical funds within this sample performed worse than can be predicted within a three factor, the two four factor models I & II and a five factor model over the years 2006 and 2016; and the null hypothesis 1 in section 1.3 is therefore rejected for this time period. When applying multi factor models Bauer et al. (2005) and Cortez et al. (2009) find no evidence of ethical funds to underperform conventional indices, which is inconsistent with this study's results over ten years. Reasons for this could be difference in time periods and geography. They also approach the benchmark issue somewhat different from this study, and uses different market indices to evaluate performance. Due to delimitations, this study approaches the problem somewhat simplified. Cortez et al. (2012) find evidence for ethical funds in Austria and US to underperform conventional indices when applying multi factor models, but not the overall global market. This conclusion is partly consistent with the results in this study.

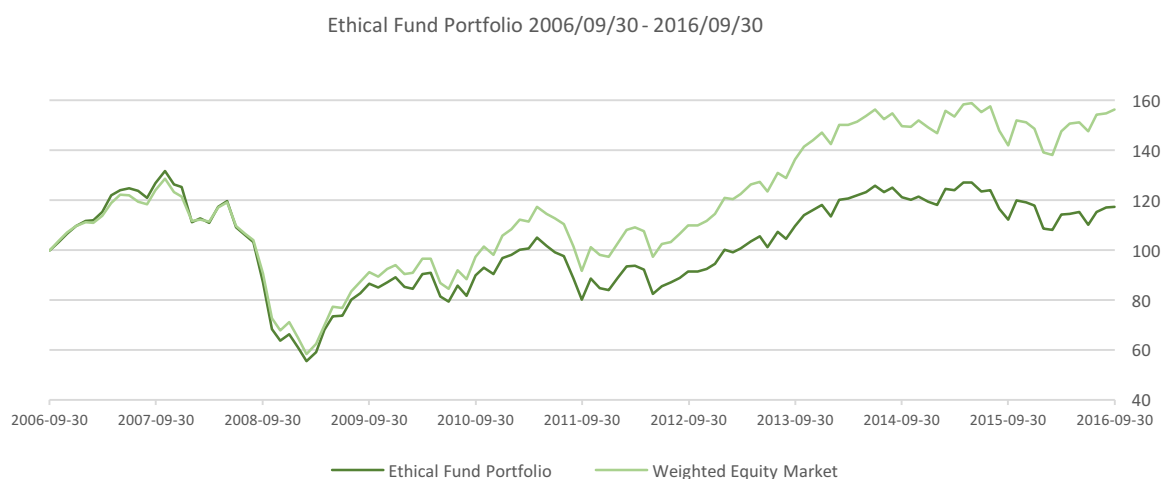
Observing the five-year output in figure 6.1.2, the results are different from the ten-year horizon. Within the three factor model and four factor model I the alphas are significantly negative for the Ethical Fund Portfolio. Inclusion of the investment variable to absorb the significantly negative alpha; four factor model II and the five factor model do not have significant alphas. Interpreting the significantly negative coefficient for CMA in the four factor model II and the five factor model it seems that the negative performance of ethical funds is due to the poor performance of aggressive companies compared to conservative companies. The null hypothesis 1 in section 1.3 is therefore not rejected for the five-year time period within a five factor model. The three factor model is performing misleading results, if the investment variable was not included in this study, we would have, incorrectly, drawn the conclusion that ethical funds underperformed the market between 2011-2016. This is consistent with prior research: Fama and French (2015) also find that the three factor model fail to explain returns in aggressive or conservative portfolios. On the ten-year horizon when including the investment variable, the alpha shrinks from -0.003 to -0.002 and the beta shrinks from 1.026 to 0.999. Even though the alpha is still significant, the three factor model is performing misleading results on the ten-year horizon as well.

Regarding investment style, as mentioned the Ethical Fund Portfolio seems to be exposed to aggressive companies when evaluating on both the ten- and five-year horizon. On the ten-year horizon, the significantly positive coefficient for SMB show that the Ethical Fund Portfolio is

exposed to small companies. Cortez et al. (2012) and Bauer et al. (2005) find support for ethical funds to be exposed to small, growth companies, and in this study a three factor model on the ten-year data supports this finding. Cortez et al. (2012) and Bauer et al. (2005) findings is also consistent with the five factor model output regarding the aggressive investment style, since growth companies tend to invest more than value companies and are therefore more aggressive (Fama & French, 2015).

On the five-year horizon, the result in this study is for reasons mentioned above contradictory to research by Bauer et al. (2005) and Cortez et al. (2012). Unlike on the ten-year horizon, the five-year horizon does not have a significant coefficient to SMB, but the significantly positive coefficient to HML suggests exposure towards companies with high book-to-market values. The fact that Ethical Fund Portfolio is exposed to both aggressive and value companies seems to be intuitively illogical, since value companies tend to be more conservative (Fama & French, 2015). The differences in investment style and performance on the ten- and five-year horizons discussed in this section demonstrate the importance of evaluating different time periods before drawing conclusions.

6.1.3, Ethical Fund Portfolio Performance



6.2 Emerging Markets Ethical Fund Portfolio Results

In this section hypothesis 2 from section 1.3 is tested, and investment style of emerging markets mutual ethical equity funds is evaluated.

Portfolio Performance Measurements

The EM Ethical Fund Portfolio has an average yearly return of 3.8 % with a standard deviation of 17.0 %, compared to the global market return of 12.0 % with standard deviation

of 12.0 %. The EM Ethical Fund Portfolio's Sharpe Ratio of 0,178 is also lower than the global market Sharpe Ratio of 0.939 and suggests that the EM Ethical Fund Portfolio is outperformed by the global equity market. The M2 measure suggests that if the EM Ethical Fund Portfolio would have the same risk as the market, the emerging market ethical portfolio would perform an average of 9.3 % lower returns on a yearly basis.

Figure 6.2.1, EM Ethical Fund Portfolio Performance Data

Five- Year	EM Ethical Fund Portfolio	Global Equity Market	Risk Free Rate
Average return Y	3.8%	12.0%	0.8%
Standard deviation Y	17.0%	12.0%	
Sharpe Ratio	0.177	0.938	
Treynor Ratio	0.026		
M2	-9.3%		
Beta	1.179***		
Jensen's Alpha	-0.008**		

*Notes: OLS estimators with robust standard errors. Arithmetic averages. *Significant on 10% level, **Significant on 5% level, ***Significant on 1% level. For model specification, see equations 10.1.8*

The beta of the EM Ethical Fund Portfolio is 1.179, suggesting relatively high sensitivity towards the market (see for example Ethical Fund Portfolio figure 6.1.1). The alpha calculated within an original CAPM is -0.008, which is significantly negative. This is interpreted as the emerging markets ethical funds in this sample performed worse than can be predicted within an original CAPM. This means that based on the original CAPM, the null hypothesis 2 is rejected, the emerging markets ethical fund performance seems to be different from those of the equity market.

Fama & French Models

As for the Ethical Fund Portfolio, a five factor model describes more variation in EM Ethical Fund Portfolio returns than a three factor model. However, the CMA variable appears redundant and is not improving the model. The global developed markets data used to benchmark the EM Ethical Fund Portfolio can describe 73.6% of the variation, the remaining 26.4% is described by other factors, most likely emerging markets and associated factor portfolio returns since these funds are heavily invested in emerging markets. The amount of variance can be argued to be enough to draw some conclusions, but for reasons of the unexplained variance, conclusions should still be drawn with circumspect.

Figure 6.2.2, Fama & French Models Regression Output, EM Ethical Fund Portfolio

<i>EM Ethical Fund Portfolio</i>	<i>Five-Year</i>
Coefficients	
Three Factor	
Model R ²	0.698***
Three Factor Alpha	-0.008**
Market	1.182***
SMB	0.314
HML	0.202
Four Factor I	
Model R ²	0.730***
Four Factor Alpha I	-0.012***
Market	1.333***
SMB	0.728**
HML	0.464*
RMW	1.225***
Four Factor II	
Model R ²	0.698***
Four Factor Alpha II	-0.008**
Market	1.170***
SMB	0.297
HML	0.234
CMA	-0.096
Five Factor	
Model R ²	0.736***
Five Factor Alpha	-0.011***
Market	1.289***
SMB	0.692**
HML	0.686*
RMW	1.407***
CMA	-0.557

Notes: OLS estimators with robust standard errors.

**Significant on 10% level, **Significant on 5% level,*

****Significant on 1% level. Alpha is regression intercept.*

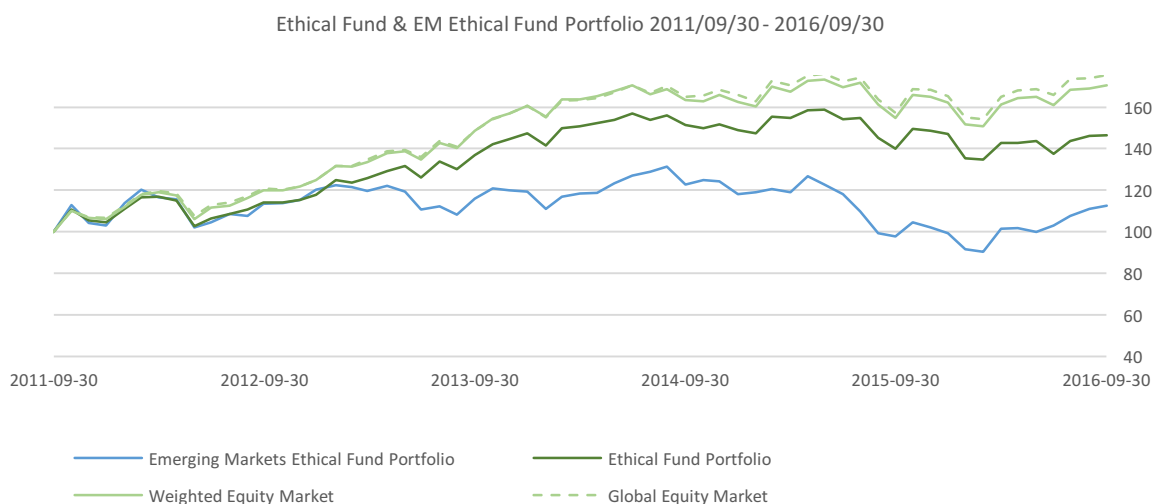
Significance level for R² is for F-test of model. For model specification, see equations 10.1.9-11.

Observing the EM Ethical Portfolio results in figure 6.2.2; the alpha is significantly negative in all four models. In the five factor model it is -0.011 and this significantly negative intercept of regression is interpreted as the emerging markets ethical funds in this sample is significantly underperforming the market; performing worse returns that can be predicted within a five factor model. The hypothesis 2 in section 1.3 is therefore rejected; the emerging markets ethical funds seems to perform significantly different from the equity market. There are a very limited amount of research on emerging markets ethical funds. However, when

researching emerging markets mutual funds, Abel and Fletcher (2004) find, unlike the results in this study, no support for emerging markets mutual funds to underperform a global market index when applying a Fama & French Three Factor Model. The deviant results in this study could be due to the fact that the funds in this study are ethical funds, but due to small sample problems, conclusions should be drawn carefully.

In a five factor model, the significantly positive coefficient for SML suggests that the emerging markets ethical funds in this sample are holding a large amount of small cap stock. The value variable, HML, is also significantly positive, suggesting that the holdings of these funds have high book-to-market values. Unlike for the developed markets/ global ethical funds, the profitability variable, RMW, is significantly positive. This suggests that the EM Ethical Fund Portfolio is exposed to companies with robust profitability. Minding the benchmarking issue, this is interpreted as that EM ethical funds invests heavily in companies that behaves like profitable, small, value companies on developed markets. Huji and Post (2011) find the size variable to be insignificant when researching emerging markets funds, and they find these funds to be exposed to growth companies. This result is inconsistent with our results, but this could be attributable to the differences between different emerging markets. It is hard to draw general conclusions for these markets.

Figure 6.3.2, Ethical & EM Ethical Fund Portfolio Performance, Five-Year



6.3 Difference Portfolio Results

In this section the difference between global ethical funds and emerging markets ethical funds is discussed. Hypothesis 3 in section 1.3 is tested. Due to the irrelevance of a step-by-step

method for the Difference Portfolio, the three and four factor models (I & II) outputs are excluded.

Portfolio Performance Measures

Observing five-year results in figures 6.1.1 and 6.2.1 the Ethical Fund Portfolio seems to have both higher returns and lower risk (standard deviation) than the EM Ethical Fund Portfolio. This is also clear through the fact that the Ethical Fund Portfolio has higher Sharpe Ratio than the EM Ethical Fund Portfolio, 0.431 and 0.177 respectively. This suggests that ethical funds on developed markets is outperforming ethical funds on emerging markets on a risk adjusted basis. This conclusion is also supported by the higher Treynor Ratio (0.051 to 0.026) and the closer-to-zero M2 value (-5.3 % to -9.3 %). The statistical significance of these differences is tested below.

Fama & French Models

The Difference Portfolio (figure 6.3.1) is, as mentioned in section 5, benchmarked with two different data sets (Global and Weighted), and are presented as “G” and “W” in figure 6.3.1. The five factor model describes a significant part of the difference in performance between the two portfolio, though only 17.7% and 19.5% respectively.

Figure 6.3.1, Fama & French Model Regression Output, Difference Portfolio

Five Factor Model	Five-Year	
	Difference Portfolio W	Difference Portfolio G
	Coefficients	Coefficients
Model R ²	0.177**	0.195**
Five Factor Alpha	0.009**	0.009**
Market	-0.264**	-0.293**
SMB	-0.693**	-0.799***
HML	-0.539	-0.478
RMW	-1.544***	-1.466***
CMA	0.096	-0.015

*Notes: OLS estimators with robust standard errors. *Significant on 10% level, **Significant on 5% level, ***Significant on 1% level. Alpha is regression intercept. Significance level for R² is for F-test of model. For model specification, see equations 10.1.11. W= Weighted data, G= Global data.*

The significantly positive five factor alphas in these models are interpreted as that ethical funds are significantly outperforming the emerging markets ethical funds. The significantly negative coefficients for the market variables are interpreted as Ethical Fund Portfolio to have a significantly lower sensitivity towards the market; when the market is performing well, the

spread between Ethical Fund Portfolio and EM Ethical Fund Portfolio shrinks, and when it performs bad, the spread widens.

The significantly negative coefficients for the SMB variable suggest that the difference portfolio significantly depends on the performance of small companies over big companies. EM Ethical Fund Portfolio is significantly more exposed to small companies, when they are performing well, the spread between Ethical Fund Portfolio and EM Ethical Fund Portfolio shrinks, and when it performs bad, the spread widens. The significantly negative RMW coefficients also suggest that the funds in the EM Ethical Fund Portfolio is significantly more exposed to profitable companies.

The significance of the intercept (alpha), market, SMB and RMW coefficients indicates that the null hypothesis 3 in section 1.3 is rejected; there is a significant difference in performance and investment style between the Ethical Fund Portfolio and the EM Ethical Fund Portfolio. Trying to intuitively explain some of the differences in investment style, one could imagine that since emerging markets are riskier than developed markets, fund managers probably search for more stable companies. Profitable companies can be assumed to be more stable than companies with low profitability, and that could explain the emerging markets ethical funds exposure to profitable companies to which the developed markets ethical funds are not.

7. Conclusions

This study seeks to evaluate risk-adjusted performance and investment style of mutual ethical equity funds on the global market, that invests on both developed and emerging markets. It also seeks to evaluate differences between emerging markets mutual ethical equity funds and developed markets mutual ethical equity funds. Below, the most important findings related to this purpose is described.

On a ten-year horizon, the results from a five factor model in this study suggest that developed markets ethical funds underperformed the equity market. Cortez et al. (2012) find similar results when researching the Austrian and US market individually, but not on the global market. Humphrey and Lee (2011) find that a (Australian) investing universe with a large amount of negative screening suffers from lack of diversification, but despite this most researcher find no significant differences when evaluating ethical funds which is inconsistent with our ten-year results. The five-year results find, similar to prior studies, no significant difference in risk adjusted performance within a five factor model. The five-year data

suggests that an investor would not lose money when investing in an ethical fund, but if an investor held such a fund over the years 2006-2016, this investor would have earned less money than it would holding a global index fund.

Evaluating investment style of the global mutual ethical equity funds, the inclusion of the investment variable reveals interesting results. In the three factor model on both ten and five year horizons, the negative three factor alpha is suggesting that developed markets ethical funds are outperformed by the market. When including the investment variable, it seems that a part of the poor performance of ethical funds is actually attributable to the fact that ethical funds tend to be exposed to aggressive companies. The results on a five-year horizon suggest that ethical funds are performing similar to the market when accounting for investment style in a five factor model. Prior research (Bauer et al. 2005), (Cortez et al. 2012) find support for ethical funds to be exposed to small growth companies, which is consistent with findings in this study; small growth companies tend to be more aggressive than opposite investment style big value companies. However, they do not include an investment variable in their models. If the investment variable were to be excluded from this study, other conclusions would be drawn. Also, the difference in performance and investment style over the ten- and five-year horizon demonstrates the importance of evaluating different time periods before drawing conclusions.

From the results of this study, it seems that EM ethical funds of this sample is underperforming the global equity market. Evaluating the investment style of emerging markets mutual ethical equity funds, they seem to behave like small, profitable value companies. This suggests that these funds are exposed to such companies, or, when minding the benchmark issue (i.e the unexplained variation), that emerging markets mutual ethical equity funds are exposed to companies that behaves like small, profitable, value companies in developed markets. Seeking to explain this finding it is possible that since emerging markets are riskier than developed markets, fund managers probably search for more stable companies. This would explain the differences in investment style between ethical and emerging markets ethical funds; a profitable value company would be more stable than an aggressive company. Have in mind that in this study, 26.4% of the variation is left unexplained, and one would therefore be careful drawing conclusions about the emerging markets mutual ethical equity funds.

The EM Ethical Fund Portfolio has significantly lower returns and higher risk than the Ethical Fund Portfolio. It is also significantly more sensitive to the market, i.e. have higher beta than

the Ethical Fund Portfolio. This suggests that an investor would expect lower returns and higher volatility when choosing an emerging markets mutual ethical equity fund over an ethical mutual equity fund investing in developed markets.

8. Proposals for Future Research

This essay has investigated mutual ethical fund versus a conventional index; the global equity market. There are three other dimensions that could be researched in the future, both global and country specific:

1. Mutual ethical funds versus mutual conventional funds
2. Mutual ethical fund versus index ethical funds, or sustainability index
3. Ethical index funds versus conventional index funds or index

There were four emerging market ethical funds fit the requirements to be included in the EM Ethical Fund Portfolio. This fund category is still young, and therefore there are not many funds that existed for as long as needed for this kind of experiments. To be able to draw robust conclusions about the ethical emerging markets funds more funds would have to be included in the experiments. Better tests on emerging markets ethical funds can be performed in the future when these funds have existed for long enough. This essay uses global benchmark data to benchmark this portfolio, for purposes of future research it would be interesting to benchmark with data from emerging markets for comparability reasons. Performing this study with access to emerging markets factor portfolios, one could draw more accurate conclusions about emerging markets performance and investment style. In this study, a fairly large amount of variation is left unexplained, and one would therefore be careful drawing conclusions.

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10. Appendix

10.1 Specification of Equations

Arithmetic Average

$$\bar{X} = \frac{1}{n} \sum_{t=1}^n X_t \quad (10.1.1)$$

Variance

$$\sigma_i^2 = \frac{1}{n} \sum_{t=1}^n (X_t - \bar{X})^2 \quad (10.1.2)$$

Standard Deviation

$$\sigma_i = \sqrt{\sigma_i^2} \quad (10.1.3)$$

Covariance

$$\sigma_{X,Y} = \frac{1}{n} \sum_{t=1}^n (X_t - \bar{X})(Y_t - \bar{Y}) \quad (10.1.4)$$

Beta Value

$$\beta_i = \frac{\sigma_{im}}{\sigma_m} \quad (10.1.5)$$

Monthly Data to Yearly Data

$$\bar{X}_Y = 12 * \bar{X}_M \quad (10.1.6)$$

$$\sigma_Y = \sqrt{12} * \sigma_M \quad (10.1.7)$$

Capital Allocation Pricing Model

$$E[r_i] - r_f = \alpha_i + \beta_{1i}(E[r_m] - r_f) \quad (10.1.8)$$

Three Factor Model

$$E[r_i] - r_f = \alpha_i + \beta_{1i}(E[r_m] - r_f) + \beta_{2i}SMB + \beta_{3i}HML + \varepsilon \quad (10.1.9)$$

Four Factor Model I

$$E[r_i] - r_f = \alpha_i + \beta_{1i}(E[r_m] - r_f) + \beta_{2i}SMB + \beta_{3i}HML + \beta_{4i}RMW + \varepsilon \quad (10.1.10)$$

Four Factor Model II

$$E[r_i] - r_f = \alpha_i + \beta_{1i}(E[r_m] - r_f) + \beta_{2i}SMB + \beta_{3i}HML + \beta_{5i}CMA + \varepsilon \quad (10.1.11)$$

Five Factor Model

$$E[r_i] - r_f = \alpha_i + \beta_{1i}(E[r_m] - r_f) + \beta_{2i}SMB + \beta_{3i}HML + \beta_{4i}RMW + \beta_{5i}CMA + \varepsilon \quad (10.1.12)$$

10.2 Tables

Figure 10.2.1, Countries

Country	Global	Europe
Australia	x	
Austria	x	x
Belgium	x	x
Canada	x	
Switzerland	x	x
Germany	x	x
Denmark	x	x
Spain	x	x
Finland	x	x
France	x	x
Great Britain	x	x
Greece	x	x
Hong Kong	x	
Ireland	x	x
Italy	x	x
Japan	x	
Netherlands	x	x
Norway	x	x
New Zealand	x	
Portugal	x	x
Sweden	x	x
Singapore	x	
United States	x	

Source: Kenneth R. French Data Library (2016)

Figure 10.2.2, Monthly Ethical & Emerging Markets Ethical Funds Data

Fund name	Average return	Std. dev.	Sharpe	Markets	Morningstar Sustainability Rating*	Morningstar Sustainability Score*
SEB Hållbarhetsfond Global	0.22%	4.80%	0.11	Global	5	50
SEB Utland Stiftelsefond	0.14%	5.18%	0.05	Global	5	61
Swedbank Ethica Global MEGA	0.36%	4.84%	0.21	Global	4	53
Swedbank Ethica Global	0.50%	4.19%	0.36	Global	4	53
DNB Miljöinvest	0.46%	8.31%	0.16	Global	4	51
Delphi Global	0.50%	5.64%	0.27	Global	4	53
Danske Invest SRI Global	0.39%	4.64%	0.24	Global	3	50
SEB Etisk Europafond	0.00%	6.22%	-0.03	Europe	4	58
Handelsbanken Europa Etiskt Tema	-0.07%	6.17%	-0.08	Europe	4	58
Öhman Global Sustainable Brands	0.40%	4.91%	0.23	Global	5	57
<i>Notes: Monthly Data 10/2006-09/2016</i>						
Nordea 1 Emerging Stars Equity Fund	0.27%	5.26%	0.13	Emerging	5	51
DNB Global Emerging Markets SRI	-0.09%	5.19%	-0.11	Emerging	3	47
SPP Emerging Markets SRI	-0.05%	4.97%	-0.08	Emerging	3	46
Handelsbanken Tillväxtmarknader (Criteria)	0.13%	4.87%	0.05	Emerging	4	49

Notes: *At the time of data collection. Monthly Data 10/2011-09/2016. Arithmetic averages. Return based on prices in USD. Morningstar Sustainability Data was collected 2016-11-16.

Figure 10.2.3, Ten-Year Correlation Matrix

Correlation Matrix 10y						
	Ethical	Market	SMB	HML	RMW	CMA
Ethical	1.000	0.983	0.076	0.307	-0.368	-0.472
Market	0.983	1.000	0.035	0.341	-0.401	-0.415
SMB	0.076	0.035	1.000	0.016	-0.205	-0.194
HML	0.307	0.341	0.016	1.000	-0.585	0.326
RMW	-0.368	-0.401	-0.205	-0.585	1.000	-0.101
CMA	-0.472	-0.415	-0.194	0.326	-0.101	1.000

*Europe-Global Weighted Data**Figure 10.2.4, Five-Year Correlation Matrix. Ethical Funds*

Correlation Matrix 5y						
	Ethical	Market	SMB	HML	RMW	CMA
Ethical	1.000	0.981	-0.110	0.208	-0.457	-0.432
Market	0.981	1.000	-0.136	0.219	-0.432	-0.349
SMB	-0.110	-0.136	1.000	0.134	-0.407	-0.138
HML	0.208	0.219	0.134	1.000	-0.534	0.404
RMW	-0.457	-0.432	-0.407	-0.534	1.000	0.190
CMA	-0.432	-0.349	-0.138	0.404	0.190	1.000

*Europe-Global Weighted Data**Figure 10.2.5, Five-Year Correlation Matrix, EM Ethical Funds*

Correlation Matrix 5y						
	EM Ethical	Market	SMB	HML	RMW	CMA
EM Ethical	1.000	0.828	0.017	0.153	-0.275	-0.301
Market	0.828	1.000	-0.093	0.100	-0.041	-0.365
SMB	0.017	-0.093	1.000	0.131	-0.451	-0.144
HML	0.153	0.100	0.131	1.000	-0.405	0.430
RMW	-0.275	-0.041	-0.451	-0.405	1.000	0.265
CMA	-0.301	-0.365	-0.144	0.430	0.265	1.000

*Global Data**Figure 10.2.6, Factor Portfolio Returns, Ten-Year*

Factor Portfolios (Weighted)	Obs.	Avg. Return	Std. Dev	Min	Max
Mkt-RF	120	0.44%	5.00%	-20.07%	11.92%
SMB	120	0.08%	1.45%	-3.59%	3.88%
HML	120	-0.11%	1.70%	-4.59%	5.51%
RMW	120	0.34%	1.09%	-2.66%	3.31%
CMA	120	0.13%	1.38%	-4.00%	5.55%
RF	120	0.07%	0.13%	0.00%	0.44%

2006-10-2016-09 Monthly data. Arithmetic averages. Return based on prices in USD

Figure 10.2.7, Factor Portfolio Returns, Five-Year

Factor Portfolios (Weighted)	Obs.	Avg. Return	Std. Dev	Min	Max
Mkt-RF	60	0.95%	3.59%	-9.57%	10.23%
SMB	60	0.04%	1.36%	-2.83%	2.73%
HML	60	-0.11%	1.50%	-3.12%	3.34%
RMW	60	0.21%	1.05%	-2.12%	2.47%
CMA	60	0.11%	0.92%	-1.60%	2.87%
RF	60	0.00%	0.01%	0.00%	0.02%

Factor Portfolios (Global)	Obs.	Avg. Return	Std. Dev	Min	Max
Mkt-RF	60	1.00%	3.45%	-8.88%	10.03%
SMB	60	-0.01%	1.35%	-3.30%	2.50%
HML	60	-0.07%	1.44%	-3.24%	3.45%
RMW	60	0.16%	1.01%	-2.34%	2.44%
CMA	60	0.12%	0.94%	-1.56%	2.91%
RF	60	0.00%	0.01%	0.00%	0.02%

Notes: 2011-10-2016-09 Monthly data. Arithmetic averages. Return based on prices in USD.

Figure 10.2.8, Weighted Factor Portfolio Performance, Ten-Year

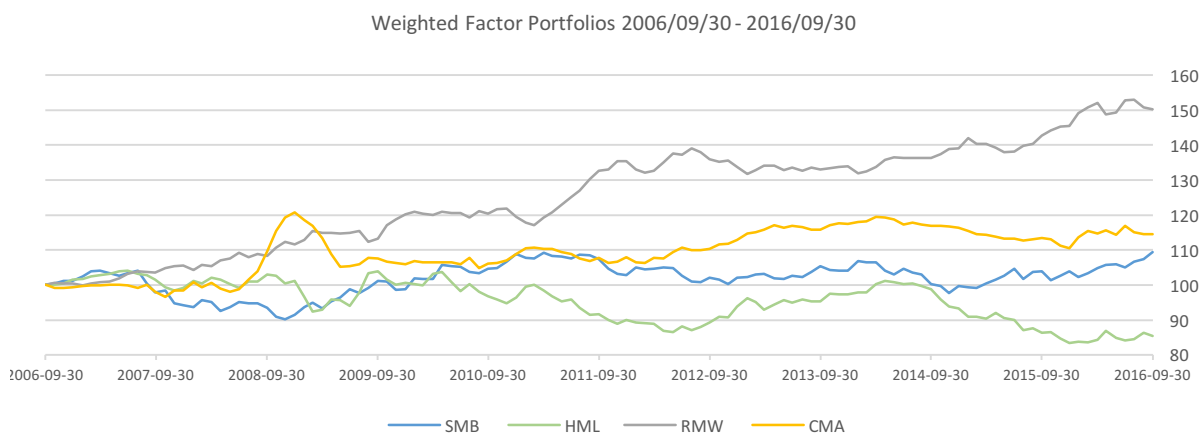
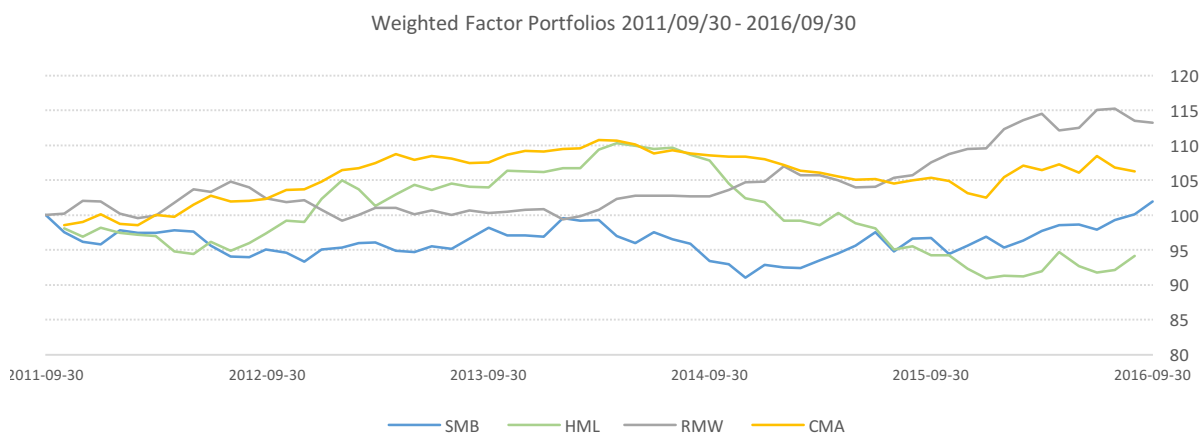


Figure 10.2.9, Weighted Factor Portfolio Performance, Five-Year



10.3 Key Terms

<i>CAPM</i>	Capital Allocation Pricing Model
<i>CMA</i>	Conservative minus aggressive. The investment variable's factor portfolio.
<i>Difference Portfolio</i>	Portfolio of the difference in return between the Ethical Fund Portfolio and the EM Ethical Fund Portfolio.
<i>EM Ethical Fund Portfolio</i>	Portfolio consisting of ethical funds investing on emerging markets.
<i>ESG Criterion</i>	Environmental, Social and Governance criterion.
<i>Ethical Fund Portfolio</i>	Portfolio consisting of ethical funds investing in developed markets.
<i>HML</i>	High minus low. The value variable's factor portfolio.
<i>PRI</i>	Principles for Responsible Investments
<i>RMW</i>	Robust minus weak. The profitability variable's factor portfolio.
<i>SMB</i>	Small minus big. The size variable's factor portfolio.
<i>SRI</i>	Socially Responsible Investments/ Sustainable and Responsible Investments
<i>Weighted Equity Market</i>	Weighted average of global and europe equity markets, 8/10 and 2/10 respectively.