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Performance of Sustainable Investments

A comparison of sustainable and conventional mutual funds in emerging markets

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Master thesis in Financial Economics

NORWEGIAN SCHOOL OF ECONOMICS

Abstract

This thesis compares the performance and risk factor exposure of sustainable and conventional mutual funds in emerging markets from January 2012 to July 2017. We use the latest sustainability ratings provided by Morningstar to define sustainable funds, and apply CAPM, Fama-French and Carhart models to control for the market, size, book-to-market and momentum factors. Additionally, we add a dummy to compare the risk-adjusted returns of the funds, and examine if the difference is statistically significant. To expand our understanding of the funds' performance and behavior we study them during three different economic cycles: Steady development, Recession and Recovery. The results imply there is no statistically significant difference in risk-adjusted returns between sustainable and conventional funds. However, conventional funds tend to outperform sustainable funds during recovery periods. Further, we discover sustainable funds being less exposed to the market and small companies, with difference in exposure to the market only present during the recession period. The difference in exposure towards small companies is consistent during both the steady and the recession period, but we reveal sustainable funds to exhibit a greater exposure to small companies than conventional funds in the recovery period. Our findings suggest there is no additional cost related to investing sustainable in emerging markets, except when the economy is recovering from a recession.

Preface

This Master thesis is written as part of the Finance master's program at the Norwegian School of Economics (NHH).

The paper intends to examine the relationship between sustainable investing and profitability. The choice of topic is partly explained by our increased interest for finance and asset management during four years at NHH. In addition, the growing media attention on the topic awakened our curiosity regarding the financial aspect of sustainable investing.

The process has been time consuming and challenging, but also highly stimulating and educational. The thesis provided valuable knowledge and experience concerning the use of economic theory in practice.

Norwegian School of Economics

Bergen, December 2017

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1. Introduction

Social Responsible Investing (SRI) is any investment strategy considering Environmental, Social and Governance (ESG) criteria, as well as financial return when deciding which investments to acquire. Some SRI strategies involve excluding companies or industries that do not meet the required ethical standards set by the investor (negative screening), while other strategies undertake a more active role by selecting sustainable firms to invest in (positive screening). Regardless of which SRI strategy one decides on, economic theory suggests it will reduce the investment universe, hence, result in a higher total risk (Humphrey & Tan, 2011). On the other hand, several studies conclude differently, revealing socially responsible funds to not alter from conventional funds in the degree of portfolio diversification (Bello, 2005). Nevertheless, SRI is growing fast and becoming an increasing part of international asset management. Globally, there were $22.89 trillion assets managed under responsible investment strategies at the beginning of 2016, an increase of 25% since 2014 (Global Sustainable Investment Alliance, 2016). The growth in size, media attention, and importance makes SRI an intriguing topic to cover.

In this thesis, we narrowed the investment universe down to emerging markets for three different reasons. Organizations classify different countries as emerging economies, and this thesis follows the definition by Morgan Stanley Capital International (MSCI), which includes 24 nations from four continents. A large portion of the MSCI index contains Asian countries, and China cover approximately 30% of the market capitalization (MSCI, 2017). After experiencing low economic growth up to 2016, emerging economies are now facing strengthening growth in 2017. The growth is projected to reach an average of 4.6% in 2018-19, compared to the expected global growth of 2.9% (World Bank Group, 2017). The recent development of emerging markets is displayed by the MSCI Emerging Markets Index in Figure 1.

The first reason for restricting this study to examine emerging markets is the fluctuations the market has experienced lately. From 2012 to 2017, the index faced three different economic periods; a steady economic development from January 2012 to July 2014, a recession from August 2014 to January 2016, and a recovery period from February 2016 to July 2017. This provides the opportunity to measure the funds' performance and investment style during all cyclical periods, making the findings in this paper more valuable for investors.

The second reason for examining sustainable funds in emerging markets is that we believe the gap between sustainable and conventional companies to be wider in underregulated markets, although we have not found any prior studies to validate this theory. A reason for not finding any studies confirming our suspicions might be the level of growth SRI has experienced in emerging markets. This growth may result in a general increase in sustainable consciousness, tightening the gap between sustainable and conventional companies. SRI in Asia (excluded Japan) grew by 16% between 2012 and 2016, resulting in $52.1 billion invested in assets using sustainable investment strategies (Global Sustainable Investment Alliance, 2016). Additionally, the number of sustainable funds grew by 15% each year between 2014 and 2016 (Global Sustainable Investment Alliance, 2016). Furthermore, China commits strongly to the green shift, as they launched their new 5-year plan with enhanced focus on sustainability in 2016 (Koleski, 2017).

The last reason for choosing to examine emerging markets is that, despite the growth and increased focus on sustainable investments, the literature on SRI in emerging markets is deficient. The majority of research covers developed markets, and we were only able to find one paper by Elaut et al. (2015) covering sustainable funds in emerging economies. They investigated SRI in the BRICS countries (Brazil, Russia, India, China and South Africa), and discovered sustainable investing not leading to an underperformance compared to benchmark. Other literature related to emerging markets mostly covers corporate social responsible behavior of businesses, whereas this study examines the performance and investment style of sustainable funds.

The main cause for the last recession in emerging markets was the oil price drop starting in July 2014. It is statistically proven that fluctuations in the oil price influence the stock returns of both developed and emerging markets (Driesprong et al., 2008), with emerging economies like China being even more affected by fluctuations than developed economies. The foremost reason behind this originates from the lack of fuel substitutions like nuclear, gas and renewable energy (Taghizadeh-Hesary F. et al., 2016). A support of this argument is shown in the graph below, where MSCI Emerging Market Index evidently correlates with the crude oil price. It reveals the index following the oil price drop, but with approximately one-month lag. Emerging markets being dependent of oil at this level creates an extra dimension to the thesis, enabling us to expand our understanding of the funds' behavior during different economic cycles.
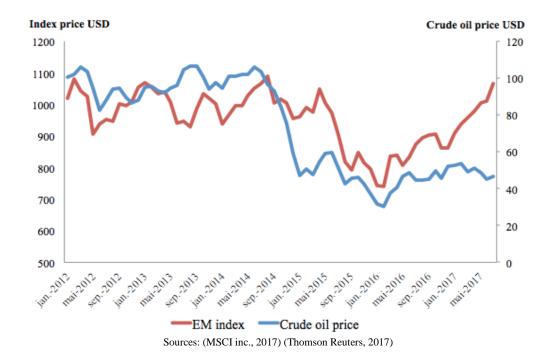
Figure 1 – Comparison of Emerging Markets index and Crude oil price

Sources: (MSCI inc., 2017) (Thomson Reuters, 2017)

The objective of this thesis is to combine research on SRI, in the form of sustainable funds, with the context of oil-dependent emerging markets. Additionally, we analyze three different periods, which capture all parts of an economic cycle. An SRI investor pursues maximized economic return given a certain level of risk, but at the same time, he or she wants to be within certain ESG constraints. With that in mind, this paper examines financial performance of sustainable investing compared to conventional investing, in order to discover whether investors have to pay an additional cost to invest sustainable. Furthermore, we investigate how the funds expose themselves to well-established risk factors introduced by Fama-French (1993) and Carhart (1997). This analysis contributes to the literature by further expanding the understanding of sustainable investing in emerging markets, and we define SRI in a new way by using the latest Morningstar Sustainability Rating. In addition, this thesis will to the best of our knowledge, be the first research paper examining both the performance and investment style of sustainable funds compared to conventional funds in emerging markets.

The research question of this study is divided into three parts:

1. Do sustainable funds experience a significant difference in financial performance compared to conventional funds in emerging markets?
2. How are sustainable funds exposed to the four systematic risk factors: Mkt-Rf, SMB, HML and Mom, compared to conventional funds in emerging markets?

3. Do sustainable funds exhibit a difference in financial performance and risk factor exposure compared to conventional funds during the three economic periods: Steady development, Recession and Recovery?

By mainly focusing on the Carhart four-factor model (1997), we find there to be no significant difference in performance between sustainable and conventional funds. Thus, investors do not have to incur an additional cost to invest sustainable in emerging markets. Moreover, we find sustainable funds to be underexposed to the market compared to conventional funds, mainly due to negative screening (Jegourel & Maveyraud, 2010). They are also less exposed to small companies than conventional funds, possibly because bigger companies can allow a higher focus on sustainability in their operations. During the different economic cycles, we find Recovery to be the only period there was a significance difference in return between the groups. Considering the oil price drop caused the recession, a possible explanation for conventional funds outperforming sustainable funds in this period, could be the surviving oil companies experiencing a growth above average during the recovery. We also discover sustainable funds exposing themselves towards smaller companies in a greater extent than conventional funds during the recovery period. It might indicate that the drop in oil price forced small oil-related companies to alternate their practices towards other industries than the non-sustainable oil sector. Thus, making small companies´ share of the sustainable investment universe larger.

We structure the remaining parts as follows: Part 2 provides an overview of related literature, while part 3 contain our hypotheses for this thesis. Part 4 elaborates on the data and assumptions used, whereas part 5 describes the methodology. Part 6 reveals the results, before part 7 and 8 respectively presents the discussion and a final conclusion.

2. Literature review

The following section reviews previous research on performance of Socially Responsible Investing (SRI) funds compared to conventional funds. We examine papers utilizing both single-factor and multi-factor models, as well as research with different matching approaches. We also review research revealing how SRI funds differ from conventional funds in investment style, and how SRI funds perform during various economic cycles. Lastly, we explore the small amount of work on Socially Responsible Investing in emerging markets.

2.1 Difference in performance

Early research applying single-factor models, suggests there is no statistically significant difference in performance between SRI funds and conventional funds. In the paper by Hamilton et al. (1993), the authors use CAPM (1964) and Jensens alpha (1968) to investigate if there is a difference in excess return between US socially responsible funds and US conventional funds in the period 1981-1990. The results show there is a statistically insignificant difference in excess return between the groups, hence, investors do not suffer financially for investing sustainable.

These findings are later confirmed by Mallin et al. (1995), who perform a matching pair analysis of UK ethical and non-ethical funds during the period 1986-1993. They match 29 ethical and non-ethical funds based on fund size and age, then examine whether the ethical funds generate a higher excess return using both the Sharpe (1966), Treynor (1965) and Jensens alpha measures. They conclude there is no statistical difference in risk-adjusted performance between the ethical and non-ethical funds. Furthermore, Kreander et al. (2005) extend the approach used by Mallin et al. (1995) to study the performance of 30 European ethical and conventional funds over the years of 1995-2001. The conclusions are similar, and they reveal no statistically significant difference in performance.

More recent literature applies multi-factor models like Fama-French (1993) and Carhart (1997), to investigate the difference in risk-adjusted performance between funds. These models consider several systematic risk factors in order to provide a better understanding of the funds performances. Bauer et al. (2005) were one of the first to study the performance and investment style of sustainable funds utilizing the Carhart model. They use a matching pair

approach on funds in UK, US and Germany over the period 1990-2001. The authors discover no statistically significant difference in returns between sustainable and conventional funds after controlling for the risk factors market, size, book-to-market and momentum.

Renneboog et al. (2008) expand the study of Bauer et al. (2005) to include all SRI funds across the world in the period 1991-2003. They find most of the SRI funds underperforming their domestic benchmarks with several percentage points annually. However, when adjusting for relevant risk, the majority of SRI funds perform statistically no different than conventional funds. These results are consistent throughout the world, except for some countries like France, Japan and Sweden where SRI funds experience lower risk-adjusted returns. The general result of no difference in performance between ethical and non-ethical funds is later confirmed by the research of Leite & Cortez (2014) performed on eight European markets.

Even though most studies find no evidence of SRI funds performing differently than conventional funds, there is still some research claiming otherwise. A paper by Chang et al. (2012) compare 131 green US funds to the average of conventional funds in their Morningstar category. The results show green funds exhibiting lower returns and similar risks compared to conventional funds, thus, experiencing lower risk-adjusted returns. This is in accordance with part of the findings by Renneboog et al. (2008) where SRI funds in some countries obtain lower risk-adjusted returns than their conventional counterparts. In contrast to these discoveries, Lean et al. (2014) find European and North American SRI funds outperforming the market benchmark in the period 2001-2011. This implies investors do not need to sacrifice financial performance in order to satisfy their sustainability concerns. In conclusion, there are convincing evidence suggesting there exist minimal, or no, difference in risk-adjusted performance between sustainable and conventional funds.

2.2 Difference in investment style

2.2.1 The Market factor

There are several research papers investigating the difference in investment style between SRI funds and conventional funds. The majority agrees that SRI funds in general are less exposed to the market factor. Bauer et al. (2005) find strong evidence of UK, US and German sustainable funds tending to have less exposure to the market portfolio compared to conventional funds. Traaseth & Framstad later confirm these findings in a Master thesis from

2016, where they learn US and UK sustainable funds experiencing less exposure to the market factor using the Carhart model. These findings are predictable considering the results by Jegourel & Maveyraud (2010). They discover the existence of a negative relationship between screening intensity, and exposure to the market. However, Leite and Cortez (2015) find French SRI funds being significantly more exposed to the market than conventional funds. Interestingly, they also discover SRI funds reducing their exposure to the market during economic crisis, making their exposure equal to that of the conventional funds.

2.2.2 The SMB factor

In the study by Bauer et al. (2005), they learn that sustainable funds in UK and Germany tend to be significantly more exposed to small capitalization firms than their conventional peers. However, this is not the case for US sustainable funds. Even though they are exposed to small-cap firms, they are relatively less exposed compared to conventional funds. A more recent paper written by Jin & Han (2018) on the Chinese fund market in the period 2010-2016, reveal Chinese green funds being significantly more exposed to the SMB factor, which is in accordance with the general findings by Bauer et al. (2005).

On the other hand, Leite & Cortez (2015) find contradicting evidence in the French fund market. Although both SRI and conventional funds are positively exposed to the SMB factor, they discover French SRI funds being significantly less exposed to small-cap firms compared to conventional funds. Further, they reveal that both groups increase their exposure to small-cap firms during economic crisis, and the significant difference between the groups disappears during recessions.

The findings of SRI funds being positively exposed to small-cap companies is curious considering the research by Mollet & Ziegler (2014). They examine the US and European stock market together with worldwide corporate sustainability performance data, to discover social responsible investing being associated with large-sized firms. Sustainability leading firms are often large-sized companies, as these have the required resources to devote to ESG projects. This has previously been uncovered by Boon et al. (2013) in the US market, and by Lourenco & Branco (2013) in the Brazilian market.

2.2.3 The HML factor

Further examination of the study by Bauer et al. (2005) show that UK and US sustainable funds tend to be more growth-oriented than conventional funds. In general, the SRI funds experience a negative exposure to the HML factor, which the authors explain by value firms being typically chemistry, energy, and industry-related. These firms are usually not associated with sustainability, and the findings are later confirmed by Leite & Cortez (2015) in the French market. They also reveal both SRI funds and conventional funds increasing their exposure to value companies during financial crisis, as these firms appear more stable. However, SRI funds continue to be significantly more exposed to growth firms. There is little evidence contradicting the findings by Bauer et al. (2005) and Leite & Cortez (2015), but Jin & Han (2018) discovers Chinese green funds to be more exposed to value stocks.

2.2.4 The Mom factor

As for the momentum factor, Bauer et al. (2005) find indications of SRI funds in the UK and US being positively exposed, and relatively more exposed to the momentum strategy than conventional funds. However, the opposite is true for German SRI funds. The results from the UK and US market are also challenged by Leite & Cortez's (2015) study of the French market. They discover French SRI funds being significantly less exposed to the momentum factor during both good and bad times compared to conventional funds. Additionally, both SRI and conventional funds reduce their exposure to the Mom factor during recessions. Further research contributed by Jin & Han (2018) lends support to the work by Bauer et al. (2005), and reveals Chinese green funds being more exposed to the momentum factor.

2.3 Performance in different economic cycles

Reviewing research on SRI funds' performance during different economic cycles shows a clear tendency of sustainable investing being more profitable compared to conventional investing during economic crisis. In a paper by Nofsinger & Varma (2014), the authors examine the performance of 240 US SRI and conventional funds during the period 2000-2011. Using the Carhart four-factor model they conclude that conventional funds perform slightly better than SRI funds during non-crisis, while in periods of crisis SRI funds achieve statistically higher alphas compared to conventional funds. Nofsinger & Varma explain these findings by sustainable firms exhibiting better corporate governance practices than other

companies, and they are better suited to perform well during periods of falling markets. They also discover increased performance during economic crisis, which is especially pronounced in SRI funds utilizing positive screening.

These results are later supported by the research of Leite & Cortez in 2015. While studying the performance of French SRI funds, they discover SRI funds underperforming conventional funds during good times, but matching their performance during economic crisis. They are also able to show that SRI funds using positive screening, perform just as good as conventional funds during the entire period, and thus confirm the findings by Nofsinger & Varma (2014). Further research by Silva & Cortez (2016) shows also US and European green funds increasing their performance during crisis periods compared to non-crisis.

Research investigating performance of sustainable investing during the financial crisis in 2007/2008 is substantial, and the majority of studies tend to agree on the same conclusion. Becchetti et al. (2015) examine 22 000 funds worldwide and conclude that on a general basis, SRI funds perform better compared to conventional funds in the period following the financial crisis. This is also the result when Nakai et al. (2016) use an event study methodology to measure the performance of Japanese SRI funds following the bankruptcy of Lehman Brothers in 2008. Further confirmation is provided by Soler-Dominguez & Matallin-Saez (2016), who explore how the performance of SRI funds compares to the performance of the VICEX fund. VICEX is a fund investing most of its assets in tobacco, gambling, alcohol and weapons. They discover the VICEX fund outperforming SRI funds in good times, while SRI funds outperform the VICEX fund by 13.3% during the recession period following the financial crisis in 2008.

In contradiction to most of these findings, Bredal & Negård (2015) propose in their Master thesis that because of extra idiosyncratic risk arising from negative screening, SRI indexes will experience inferior risk-adjusted returns in periods of falling markets. They confirm this hypothesis by applying the Fama-French model on five SRI indexes during the dot-com bubble in early 2000, and the financial crisis in 2008. The underperformance of SRI funds during the dot-com bubble is also discovered by Becchetti et al. (2015). They explain this outcome by SRI funds being heavily exposed to technological companies, thus, experiencing considerable negative returns in this period.

2.4 Sustainable investing in emerging markets

The small amount of research on sustainable investing in emerging markets mainly focus on examining what firms are associated with corporate social responsibility (CSR), and how shocks to the oil price influence the returns in stock markets. The only study we are able to find related to the performance of sustainable investments in emerging markets is the research paper by Elaut et al. (2015). This paper investigates the performance of SRI funds in the BRICS countries (Brazil, Russia, India, China and South Africa), compared to SRI funds in US and UK. Utilizing the Carhart four-factor model, they find evidence of SRI funds in the BRICS countries outperforming their domestic benchmarks. Additionally, they perform better than SRI funds in US and UK with their current holdings. This outperformance disappears when examining historical holdings, consequently, they conclude with a "no difference" hypothesis of SRI in emerging markets.

Lourenco & Branco (2013) investigate the factors driving high levels of corporate sustainability performance in Brazil. The findings suggest firms with highest scores on corporate sustainability performance being significantly larger than their counterparts. The same companies also experience a greater return on equity. Another study supporting this view, is the paper by Li et al. (2010) who examine the four BRIC countries (Brazil, Russia, India and China). They find the firm's size influencing the degree to which a company engages and communicates about corporate social responsibility.

Several research papers study the effect of an oil price shock on the stock market in an emerging economy. Basher & Sadorsky (2006) examine 21 emerging countries and find strong evidence of fluctuations in the oil price having an impact on the stock price return. This is later confirmed by Taghizadeh-Hesary et al. in (2016), who discover oil price fluctuations having a significant impact on emerging economies. They also learn oil price fluctuations exhibiting a much greater impact on emerging countries compared to developed countries, because of the shortage emerging countries experience in alternative energy sources.

This literature review lays the foundation for our research. By using the latest data available from Morningstar, and the research methodology from previous studies, we aim to contribute to further expand the understanding of sustainable investing in emerging markets. To the best of our knowledge, our thesis is the first research paper examining both the performance and investment style of sustainable funds compared to conventional funds in emerging markets.

3.   Hypotheses

This section introduces the three hypotheses we explore in the thesis. The first two hypotheses are related to the entire period, while the last hypothesis focuses on the three different sub-periods we examine. The hypotheses are mostly based on previous empirical results, but also on our own assessments.

3.1 Research question 1

Hypothesis 1: Sustainable funds achieve no statistically significant inferior risk-adjusted returns compared to conventional funds in emerging markets.

We expect sustainable funds to achieve no significant difference in risk-adjusted financial performance compared to conventional funds in emerging markets. Previous research by Bauer et al. (2005) shows sustainable funds in UK, US and Germany exhibiting no inferior risk-adjusted returns than their matching conventional funds. This is also the result for most countries in the paper by Renneboog et al. (2008), where they investigate sustainable funds on a global basis. More recent research by Leite & Cortez (2014) suggests this is still the situation for majority of European countries. Due to the lack of research on emerging markets, we have few empirical results from these countries to support our hypothesis. However, the findings by Elaut et al. (2015) suggests there exists no significant difference in risk-adjusted returns in the BRICS countries, thus, we find no reason to expect investors suffering financially by investing sustainable in emerging markets.

3.2 Research question 2

Hypothesis 2: Sustainable funds in emerging markets are less exposed to the market, small companies and high book-to-market firms, but exhibit a greater exposure to the momentum strategy compared to conventional funds.

We expect the risk factor exposure of sustainable funds to differ from conventional funds, partly because of a smaller investment universe due to the screening process. Consequently, we expect sustainable funds to be less exposed to the market, as several of the companies listed in the market index are excluded from their investment universe. This is also in accordance with previous research by Bauer et al. (2005). Further, we predict sustainable funds to be more

exposed to big companies, as these firms have the required resources to implement desirable ESG projects. The connection between large firms and sustainability has previously been discovered in the work by Mollet & Ziegler (2014) on the US and European market, and Lourenco & Branco (2013) on the Brazilian market. We also expect sustainable funds to be less exposed to high book-to-market firms. These firms are often chemistry, energy and industry-related (Bauer et al., 2005), accordingly, not associated with sustainability. Lastly, in coherence with empirical results on Chinese green funds (Jin & Han, 2018), we predict sustainable funds to be more exposed to the momentum strategy,

3.3 Research question 3

Hypothesis 3: Sustainable funds experience no significant difference in performance during steady economic development, while achieving greater risk-adjusted returns in the recession, and inferior returns during the recovery. Sustainable funds are less exposed to the market, small companies and high book-to-market firms, but exhibit a greater exposure to the momentum strategy compared to conventional funds in the steady period. The difference in exposure will be reduced during the recession, before increasing towards the initial position in the recovery period.

Performance

We expect there to be no significant difference in risk-adjusted performance between sustainable and conventional funds in the steady period. The general results from previous research on this subject, suggest there should not exist any significant difference during a period of steady economic development in the market (e.g. Bauer et al., 2005; Renneboog et al., 2008). Throughout the recession period, we expect sustainable funds to achieve greater risk-adjusted return compared to conventional funds. This view is supported by previous research showing sustainable funds tend to outperform conventional funds during economic crisis (Nofsinger & Varma, 2014). Additionally, we assume sustainable funds are less exposed to fluctuations in the oil price, thus, being better suited to perform well during this particular recession. In the recovery period, we expect conventional funds to perform significantly better than sustainable funds. The intuition behind is that increased oil price and better economic development will benefit the conventional funds. Furthermore, it has been shown that conventional funds tend to outperform sustainable funds during good times (e.g. Leite & Cortez, 2015; Soler-Dominguez & Matallin-Saez, 2016).

Factor Exposure

In the steady period, we expect the differences in factor exposure to be similar as to the ones predicted in Hypothesis 2. Concerning the factor exposure in the recession period, we predict the investment universe of conventional funds to be reduced during the crisis, as fewer companies would be regarded as potential investment objects. This effect would contribute to making the factor exposure between the two groups more equal. In the recovery period, we believe that the funds will move towards their initial factor exposure, implying sustainable funds being less exposed to the market, small companies and high book-to-market firms, while exhibiting a greater exposure to the momentum strategy compared to conventional funds.

4. Data

This section covers the collection, description and critics of the dataset used in this thesis. Firstly, it reveals the source and selection process of the data. Secondly, it describes the funds and how they are categorized as sustainable or conventional. Lastly, this section explains the construction of systematic risk factors, followed by general critics of the dataset.

4.1 Data sources

The main data source used in this thesis is the analysis platform, Morningstar Direct. Morningstar is an independent provider of investment research, and have created a tool to help investors, asset managers and financial advisors to make well-founded decisions regarding their investments (Morningstar, 2017a). With this platform, we were able to get hold of all the return series we needed, as well as information about each funds' sustainability rating.

Some of the other variables in our dataset were constructed using data for several indexes from the database of MSCI. We also used data from the library of Kenneth French and inflation data from the OECD website to complete the dataset.

4.2 Sample selection

To examine the performance and investment style of sustainable and conventional funds we began with Morningstar's database of 83 353 open-end mutual funds. This database included all offshore open-end funds in the world. The first screening criterion we used was to exclude all the funds not listed as equity funds. In order to be categorized as an equity fund, the fund must invest at least 80% of its capital in equities (Verdipapirfondenes Forening, 2017). As we were interested in examining how sustainable funds were performing in the emerging economies, we screened our dataset to consist only of funds investing in the area of "Global Emerging Markets". This reduced our sample significantly, and we were left with 3009 funds. The majority of the funds investing in Global Emerging Markets had two thirds of their assets invested in large Asian countries like China and South Korea, but also some in South America (17%), Europe (9%) and Africa (6%).

In order to get results of significance and relevance we chose to exclude all funds trying to replicate an index. This way our results would not be biased towards the funds' ability to

follow an index, or the return of the index, but rather focus on the performance of sustainable equities and funds. To eliminate potential currency differences, we removed funds not having US Dollar as their base currency. This left us with a dataset of 1237 funds.

To explore how the funds performed during different economic cycles, we decided to use the period from January 2012 until July 2017. Thus, we excluded all the funds without return data in this period and were left with 460 funds. This implies we only included funds that were active during the entire period, and excluded merged or terminated funds. That may cause the dataset to suffer from survivorship bias (Rohleder et al., 2007), and we will discuss the complications arising from this problem in the end of this section.

The rest of the sample contained several funds with the same FundID[1]. These funds were invested in the exact same portfolio, but one way to distinguish them from each other was using SecID[2]. The reason these funds had the same FundID, but different SecID, was because they represented different share classes of the same fund (e.g. "A", "B", "S", "Z"). These share classes may have different fees and expenses, or be marketed towards specific investors (Finra, 2008). In order to avoid the inclusion of multiple funds that were invested in the exact same portfolios, and yielded the same return before deducting expenses, we chose to remove these funds and only kept the most representable share class. An inclusion of these funds would contribute to making our results less economically reasonable as some returns would be calculated several times. Previous research encountering this issue chose the share class with the highest Total Net Assets (TNA) as the most representable (Gaspar et al., 2006), and we did the same in this thesis. This screening led to an elimination of 290 funds, and our sample now consisted of 170 funds.

4.3 Morningstar Sustainability Ranking

As the purpose of this thesis was to compare the performance and investment style of sustainable and conventional funds, we needed to screen our dataset accordingly. To determine which funds to categorize as sustainable we used the ratings provided by Morningstar. The Morningstar Sustainability Rating (MSR) was launched in 2016 and is an evaluation tool for investors wanting to include ESG factors to their investment decisions. Morningstar

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[1] Characteristic used by Morningstar to identify funds
[2] Characteristic used by Morningstar to identify different share classes

cooperates with the global leading research company Sustainalytics, which delivers information about each company's performance on the three ESG factors; Environmental, Social and Governance, as well as each company's level of involvement in major controversies (Hale, 2016). Based on this information, Sustainalytics provides both an "ESG score" and a "Controversy score" to each company.

To determine the ESG score, Sustainalytics evaluates the companies based on all public information and measure "*how well companies proactively manage the environmental, social and governance issues that are most material to their business*" (Sustainalytics, 2016a). They analyze the companies' performance on different ESG factors by reviewing an extensive list of core and sector-specific metrics, before scoring them based on the company's overall performance.

The Controversy score is based on an assessment of each company's involvement in incidents *"that have an impact on the environment or society, and the associated business risks companies face from such involvement".* Sustainalytics categorizes each incident into a category class from 1 to 5 based on the severity of the incident, before calculating a score to each company (Sustainalytics, 2016a).

Morningstar uses this data to calculate the Morningstar Sustainability Rating by subtracting the "Portfolio Controversy Score" from the "Portfolio ESG Score".

$$\textit{Portfolio Sustainability Score} = \textit{Portfolio ESG Score} - \textit{Portfolio Controversy Score} \quad (1)$$

The Portfolio ESG score is an asset-weighted average of the ESG scores from companies the fund is invested in. The company level ESG scores are calculated by an assessment of the company's performance on ESG issues relative to other firms in the same industry. Since the assessment criteria differ between the industry groups, one cannot compare the scores from two companies in two separate industries without normalizing the scores. Morningstar uses a z-score transformation to normalize the score on a 0-100 scale with a mean of 50.

$$Z_C = \frac{ESG_C - \mu_{PG}}{\sigma_{PG}} \quad (2)$$

$$ESGNorm_C = 50 + 10Z_C \quad (3)$$

ESG_C = The ESG score of company C
μ_{PG} = The mean of the ESG scores of the companies in the peer group
σ_{PG} = The standard deviation of the ESG scores of the companies in the peer group

The Portfolio Controversy Score is the asset-weighted average of the company level controversy scores. Morningstar has their own method of rescaling the score to decide how much to deduct from the Portfolio ESG Score, in order to create the Portfolio Sustainability Score. When the funds receive their score, they get a Morningstar Sustainability Rating based on which quintile they belong to in their fund category. The ratings are distributed as follows:

Figure 2 - Illustration of the distribution of Morningstar's Sustainability Rating

Source: (Sustainalytics, 2016b).

I order to compare funds with "Above Average" or "High" rating with funds exhibiting a "Below Average" or "Low" rating, we chose to exclude all funds without a Sustainability rating, or a rating of "Average". The funds with 4 or 5 globes were classified as "Sustainable", and the funds with 1 or 2 globes as "Conventional". This completed the screening of our dataset and we were left with 71 funds, distributed as follows:

Table 1 - Summary statistics

Fund	# Funds	OBS	Mean	Std. Dev.	Sharpe Ratio	Min	Max
Sustainable	**43**	**2881**	**0.29 %**	**4.38 %**	**6.62 %**	**-13.13%**	**17.58%**
5 Globes	12	804	0.27 %	4.38 %	6.16 %	-12.23 %	14.94 %
4 Globes	31	2077	0.30 %	4.38 %	6.76 %	-13.13 %	17.59 %
Conventional	**28**	**1876**	**0.34 %**	**4.57 %**	**7.38 %**	**-15.17 %**	**16.23 %**
2 Globes	22	1474	0.31 %	4.54 %	6.91 %	-15.17 %	16.23 %
1 Globe	6	402	0.42 %	4.67 %	8.98 %	-13.46 %	15.21 %

Consistent with the use of performance measures throughout this study, the risk-free rate is subtracted from the average return.

From the summary statistics, we notice conventional funds on average experiencing a greater return compared to sustainable funds. We also observe sustainable funds exhibiting a lower risk associated to their investments than conventional funds, and that conventional funds

achieve a higher Sharpe Ratio during the period. Both the returns and Sharpe Ratio reveal a negative relationship with the sustainability classification of the fund.

4.4 Variables

To generate our dependent variable, we used Morningstar Direct to download the return series for all funds in the period from January 2012 until July 2017. To get the best performance estimates in our models, we decided to use the variable called "Total Return" in Morningstar's database. This number is determined by "*taking the change in price, reinvesting, if applicable, all income and capital gains distributions during the period, and dividing by the starting price*" (Morningstar, 2017b). By doing this, and excluding all costs associated with the funds, we got a more precise measurement of the funds' performances.

When deciding what risk-free rate to use we had to consider which market we were examining. As we were studying funds investing in global emerging markets we needed to create a risk-free rate considering these market conditions. By using the US 3-month Treasury Bill, and then adding the monthly inflation spread between US and China, we were able to construct a representable risk-free rate (FinanceTrain, 2017). China was chosen to represent the emerging countries, as they exhibit approximately one third of the investments. With this method, we managed to take into account some of the extra risk associated with investing in emerging markets.

The market factor used in this thesis was the monthly return of the MSCI Emerging Markets Index. This index was closest to the investment area examined, and was assumed fit to represent the market in our models.

When estimating the Fama-French model on funds in the emerging markets, we encountered a problem when deciding on how to consider classic portfolio risk factors like "SMB" and "HML". The library of Kenneth French is an extensive database for developed countries, but do not provide any data for emerging countries. Thus, as previously done by Bauer et al. (2005), we circumvent this problem by constructing our own risk factor proxies using indexes. By doing this, we constructed the most accurate risk factor proxies as explanatory variables (Magnusson & Dyremyhr, 2011).

The "Small Minus Big" proxy was created by subtracting the return series of "MSCI Emerging Markets Large Cap Index" from "MSCI Emerging Markets Small Cap Index".

$$SMB\ proxy = MSCI\ Emerging\ Markets\ Small\ Cap\ Index \tag{4}$$
$$– MSCI\ Emerging\ Markets\ Large\ Cap\ Index$$

With the same reasoning, we constructed the "High Minus Low" proxy by subtracting the return series of "MSCI Emerging Markets Growth Index" from "MSCI Emerging Markets Value Index".

$$HML\ proxy = MSCI\ Emerging\ Markets\ Value\ Index \tag{5}$$
$$- MSCI\ Emerging\ Markets\ Growth\ Index$$

The momentum factor was extracted from the library of Kenneth French. Due to the heavy workload and large amount of data required to construct a proxy for the momentum factor in emerging markets, we decided to use the one provided for "Global excluding US". We chose to exclude the largest developed country, USA, as we considered this the most appropriate alternative. However, since the factor is not 100% representable we need to be careful when analyzing the results of the momentum factor.

4.5 Critics of the dataset

As mentioned earlier we decided to exclude all funds not active during the entire period of investigation. Funds performing poorly may be merged into other funds or get terminated, thus, they are not included in the sample. Consequently, our results may suffer from survivorship bias. This may lead to an overestimation of the average returns, and the conclusions might differ from a situation where all funds were included (Rohleder et al., 2007). However, since our research is dependent on static sustainability ratings from Morningstar, datasets containing "dead funds" without a rating would not be suitable for our purpose. Additionally, we find it reasonable to assume that the terminated funds are equally distributed between the "Sustainable" and "Conventional" groups. Accordingly, since our research question focus on comparing the two groups with each other, and not examining their absolute returns, we assume the exclusion of "dead funds" will not affect our results significantly.

We have not considered management fees when measuring financial performance between the groups. However, previous research shows there is no significant difference between SRI

funds and conventional funds regarding management fees (e.g. Renneboog et al., 2008; Gil-Bazo et al., 2010). Even though Bauer et al. (2005) found some evidence of difference in management fees, their conclusions on financial performance between the funds remained unaffected. Hence, we find it sensible not to include the management fees into our models.

When determining which funds to categorize as sustainable and conventional, we decided to only use the Morningstar Sustainability Rating as guidance. Some previous research has also used the "Socially Conscious" variable supplied by Morningstar to screen their sample (Brama & Nguyen, 2017). This is a qualitative variable constructed by identifying which funds categorizes themselves as sustainable in official documents, or that impose ESG screening criteria on their investments. *"This group includes any fund that invests according to noneconomic guidelines. Funds may make investments based on such issues as environmental responsibility, human rights, or religious views"* (Morningstar, 2017c). When consulting Morningstar about this variable, they replied that it was a controversial variable to use in a screening process because of the simplicity for fund managers to "greenwash" their funds. Even though Morningstar finds a weak correlation between the socially conscious variable and Morningstar Sustainability Rating, they recommend using the independent evaluation MSR offers.

When reviewing the dataset there was no clear relationship between a fund being listed as "Socially Conscious" and their Morningstar Sustainability Rating. The extra screening necessary in order to adjust for this criterion would reduce our sample significantly, and we did not find it appropriate. We believe this would lead to an excessive screening of our dataset, and that using MSR as guidance will be sufficient to capture the relevant sustainability effect.

Morningstar provides the most thorough data on how companies and funds perform on the different ESG factors at the present time. However, the score they receive is a static score and does not tell anything about their performance in previous years. Wimmer (2012) finds the persistency of ESG scores in socially responsible mutual funds to be approximately two years, and that the persistency of the scores are terminated after three years. This is a limitation all previous research on this subject has faced, and is a consequence of the required dataset not existing. Thus, we are confronted with the dilemma of either having a long time series with more observations and less relevance of the sustainability ratings, or a shorter time series with a more correct evaluation of the ESG scores. We chose a compromise between the two and decided to use period of 67 months. This way we got enough observations for our results to

be of significance, and for the sustainability ratings to be relevant. In conclusion, we chose to use the Morningstar Sustainability Rating for all funds as of July 2017, and assume this to be the correct rating for the entire period.

5. Methodology

To measure the funds' performance and factor exposure, we ran regressions for respectively CAPM, Fama-French three-factor and Carhart four-factor models. We used Ordinary Least Squares (OLS) for the time series and Pooled OLS for the panel data.

5.1 Models

To capture the performance of the funds, we initially used CAPM. Further, we added Fama-French and Carhart risk factors to achieve a more complete assessment of the risk-adjusted performance. We then structured the data as panel data, where we included a dummy variable and interaction terms to control for difference in factor exposure between sustainable and conventional funds.

5.1.1 CAPM

Capital Asset Pricing Model (CAPM) reveals the funds´ excess return considering the market only. The alpha indicates if the funds have out- or underperformed the benchmark on a monthly basis, resulting in the following model:

$$r = \alpha + \beta^{rM} * (rM_t - rf_t) + u_t \qquad (6)$$

Where:

$r \quad = r_t - rf_t = $ Return on time t minus risk free rate at time t

$\alpha \quad = $ Risk adjusted excess return

$\beta^{rM} = $ Sensitivity to market fluctuation

$rM_t = $ Market return at time t

$rf_t \quad = $ Risk free rate at time t

$u_t \quad = $ Error term at time t

5.1.2 Fama-French three-factor model

To get a better understanding of the returns, we included two more risk factors to the model: "Small Minus Big" (SMB) and "High Minus Low" (HML). In general, small capitalization firms outperform big capitalization firms, and high book-to-market (value) companies outperform low book-to-market (growth) companies (Fama & French, 1993). Hence, the risk factors are appropriate variables to include in our model. Using the Fama-French risk factors result in the following extended model:

$$r = \alpha + \beta^{rM} * (rM_t - rf_t) + \beta^{SMB} * SMB_t + \beta^{HML} * HML_t + u_t \qquad (7)$$

Where:

β^{SMB} = Exposure to the size factor

SMB_t = Size factor at time t

β^{HML} = Exposure to the value factor

HML_t = Value factor at time t

5.1.3 Carhart four-factor model

To further clarify the funds' behavior, we added "Momentum" (Mom) as the last risk factor. By being exposed to firms having experienced superior returns over the last period, one would in most cases achieve positive excess return (Carhart M. M., 1997). Model 8 provides results on how sustainable and conventional funds are exposed to all four risk factors:

$$r = \alpha + \beta^{rM} * (rM_t - rf_t) + \beta^{SMB} * SMB_t + \beta^{HML} * HML_t + \beta^{Mom} * Mom_t + u_t \quad (8)$$

Where:

β^{Mom} = Exposure to the momentum factor

Mom_t = Momentum factor at time t

5.1.4 Pooled OLS model

The risk factors mentioned above differ over time, but is equal for all funds. The sustainability rating of a fund is fixed over time, but vary between the funds. To reveal this effect, we aligned the data as panel data and created a dummy variable to separate sustainable funds apart from conventional funds. Consequently, we were able to compare the risk-adjusted performance of the two groups.

$$S_i = \begin{cases} 1 \ if \ fund \ i \ is \ sustainable \\ 0 \ if \ fund \ i \ is \ conventional \end{cases}$$

The dummy variable lead to Model 9:

$$r = \alpha + \beta^{rM} * (rM_t - rf_t) + \beta^{SMB} * SMB_t + \beta^{HML} * HML_t + \beta^{Mom} \qquad (9)$$
$$* Mom_t + \beta^{Sustainable} * S_i + u_{it}$$

In addition to the dummy variable, we created interaction terms between the dummy and all the risk factors. It provided the opportunity to study the difference in risk factor exposure between sustainable and conventional funds, leading to Model 10:

$$r = \alpha + \beta^{rM} * (rM_t - rf_t) + \beta^{SMB} * SMB_t + \beta^{HML} * HML_t + \beta^{Mom} \qquad (10)$$
$$* Mom_t + \beta^{Sustainable} * S_i + \beta^{rM*S_i} * (rM_t - rf_t) * S_i + \beta^{SMB*S_i}$$
$$* SMB_t * S_i + \beta^{HML*S_i} * HML_t * S_i + \beta^{Mom*S_i} * Mom_t * S_i + u_{it}$$

5.2 Model requirements

In order to make the results valid there are certain requirements for the error terms in an OLS model. If the requirements are not met, OLS will no longer be BLUE (Best Linear Unbiased Estimator), and we would have to choose another model. Below follows an overview of statistical tests that will prove whether the regressions are valid or not. The tests and corresponding results may be found in the appendix. Further, panel data will be used in the second part of the study. When managing panel data there are fixed and random effects to be taken into consideration, and it is necessary to perform certain tests to determine which model to run.

Test for multicollinearity

If the explanatory variables in OLS are highly correlated the model will suffer from multicollinearity. The consequence is that explanation between the variables would be inseparable. We tested the presence of multicollinearity by examining the Variance Inflation Factor (VIF) of the variables, covered in the appendix.

Test for heteroscedasticity

For OLS to be BLUE, the variance of the error term must be constant, implying *var (u_t) = σ^2*. A violation of this would cause heteroscedasticity, and can be tested with a Breuch-Pagan test. To solve the problem of heteroscedasticity one must run the regressions with robust standard deviations.

Test for autocorrelation

To get valid results in OLS, the error term of one variable has to be independent from the error term of another, implying *cov (u_t, u_s) = 0, t $\neq$ s.* A violation of this causes autocorrelation and can be tested by using a Breusch-Godfrey test, covered in the appendix.

Test for unit root

If the data series contains unit root the results may show incorrect significant effects, consequently, leading to false results. One would thus only accept stationary variables in the regression model. To test whether the panel data contain unit root, or if the series are stationary, we conducted the Levin-Lin-Chu test for unit root covered in the appendix.

5.3 Model selection

To get correct results when dealing with panel data, one must choose the right model. Depending on the data, either Fixed Effects (FE), Random Effects (RE) or POLS will be the most appropriate model (Torres-Reyna, 2007). First, we used a Hausman test to find the most suitable model between FE and RE, before using the Breusch-Pagan test to decide between POLS and RE. The results may be found in the appendix

Hausman test

The Hausman test examines whether the individual specific error terms are correlated with the regressors. Accordingly, we test this with an approach where we see which of the FE and RE estimators that are best suited. If RE is sufficiently equal to FE we will choose RE, as it is the most efficient estimator. In that case, the individual specific error term would be uncorrelated with the regressors, and POLS would also be consistent (Torres-Reyna, 2007).

Hypotheses:

H_0: Both estimators are consistent, thus, RE is the preferred model

H_1: RE estimators are not consistent, thus, FE is the preferred model

Test:

$$W = \frac{(\hat{\beta}^{FE} - \hat{\beta}^{RE})^2}{Var(\hat{\beta}^{RE}) - Var(\hat{\beta}^{FE})} \sim \chi^2 \tag{14}$$

Where:

$\hat{\beta}^{FE}$ = A consistent estimator (FE)

$\hat{\beta}^{RE}$ = A more efficient estimator (RE)

Breusch-Pagan test

If the Hausman test shows RE and POLS to be consistent, we must test which of the two models to use. It depends whether there are any unobserved effects for every individual, or group of individuals, over a given time. In that case, the panel data will suffer from serial correlation and RE is the most efficient model. In the opposite case, POLS would be the preferred model. We tested this with a Breusch-Pagan test (Torres-Reyna, 2007).

The error term in the data is given as follows:

$$v_{it} = \alpha_i + u_{it} \tag{15}$$

Further, it can be shown that:

$$corr\left(v_{it}^{OLS}, v_{i,t-s}^{OLS}\right) = \frac{\sigma_{\alpha_i}^2}{\sigma_{\alpha_i}^2 + \sigma_{u_{it}}^2} \tag{16}$$

We have serial correlation if there is a time fixed effect that wary between individuals, and cannot be observed or included in the model. Hence, we use the following hypotheses:

$H_0: \sigma_{\alpha_i}^2 = 0$
$H_1: \sigma_{\alpha_i}^2 \neq 0$

We can test this with the Lagrange Multiplier test:

$$\text{LM} = \frac{nT}{2(T-1)}\left(\frac{\sum_{i=1}^{n}\left(\sum_{t=1}^{T}\hat{v}_{it}\right)^2}{\sum_{i=1}^{n}\sum_{t=1}^{T}\hat{v}_{it}^2} - 1\right) \sim \chi^2 \tag{17}$$

If LM exceeds critical value, we reject H_0, resulting in RE being preferred over POLS.

6. Empirical results

This section covers the results from the analysis. The main purpose of the study is to test whether there is a significant difference in financial return between sustainable and conventional investing in emerging markets. Further, we explore if there is a difference in how the funds expose themselves towards systematic risk factors. Lastly, we examine if there is a change in performance and risk factor exposure between the groups in the following three periods: Steady development, Recession and Recovery. The section is divided into three research questions with corresponding hypotheses and results.

6.1 Research question 1

This part presents the results related to the first research question. We explore the financial performance of the funds using three different models, and through these analyses we aim to answer the following:

Do sustainable funds experience a significant difference in financial performance compared to conventional funds in emerging markets?

Hypothesis one

Sustainable funds achieve no statistically significant inferior risk-adjusted returns compared to conventional funds in emerging markets.

Table 2 below, contains the two groups "Sustainable" and "Conventional" funds. It reveals the results from the CAPM, Fama-French three-factor and Carhart four-factor models, where the alpha reflects the performance of the funds compared to their factor benchmark. If the alpha is not significant, it is considered to be zero, yielding no excess return. If the alpha is significant, the funds experience either a positive or a negative abnormal return on a monthly basis.

Table 2 – Comparison of sustainable and conventional funds

	α	βMkt-Rf	βSMB	βHML	βMom	R²	OBS
CAPM							
Sustainable	0.081***	0.916***				0.892	2881
Conventional	0.121***	0.952***				0.886	1876
Fama-French							
Sustainable	-0.003	0.946***	0.025	-0.221***		0.897	2881
Conventional	0.034	0.991***	0.097***	-0.208***		0.892	1876
Carhart							
Sustainable	-0.017	0.951***	0.024	-0.196***	0.033***	0.898	2881
Conventional	0.021	0.995***	0.096***	-0.185***	0.029*	0.893	1876

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The regressions are carried out with robust standard deviations

The CAPM reveals the funds´ excess return considering the market only. It displays sustainable funds experiencing a statistically significant alpha of 0.081%, while conventional funds have a significant alpha of 0.121%. Those results are surprising, as they uncover both sustainable and conventional funds outperforming the market. Later, we will add more risk factors to the model to further explain this excess return. However, this result cannot be considered with our hypothesis, as we are not able to conclude whether the difference in performance between the groups is statistically significant. Lastly, we also notice both sustainable and conventional funds being underexposed to the market portfolio with a beta below 1.

The Fama-French model includes the two risk factors: SMB and HML. We notice the inclusion of extra risk factors causing the alphas of both groups to lose their level of significance. Hence, the excess return from CAPM can be explained by both groups' significant exposure to growth companies, and conventional funds' tilt towards small firms. In this model, neither of the alphas are significantly different from zero with coefficients of -0.003% for sustainable funds, and 0.034% for conventional funds. This is in accordance with our hypothesis. We also discover both groups still being underexposed to the market, and positively exposed to growth companies. Conventional funds are significantly exposed to small capitalization firms, while sustainable funds do not overweight in either small or big companies. It is worth noticing the

SMB beta for sustainable funds being the only insignificant coefficient in the model, covered more closely in research question 2.

The Carhart four-factor model includes Momentum as the last risk factor. In agreement with our hypothesis, there is still no evidence of difference in performance between the groups. It is worth mentioning that sustainable funds have an alpha of -0.017%, while conventional funds have an alpha of 0.021%, although none of them are significantly different from zero. Regarding the risk factor exposure, we get the same results as in the Fama-French model. Additionally, we discover both groups being positively exposed to the momentum factor, with sustainable funds on a significance level of 1%, and conventional funds on a 10% level. However, as covered in the data section, the momentum factor is not 100% representable for emerging markets, and we need to be careful when analyzing the results.

The analysis related to Table 2 suggests sustainable and conventional funds not performing significantly different when adjusting for risk factor exposure. To further examine these findings, we divide the dataset into the respective four rating classes, and apply the same three models. We denote the most sustainable class as "5 Globes" and the least sustainable "1 Globe". To concretize the results in this study, we choose only to submit the Carhart four-factor model, while CAPM and Fama-French may be found in the appendix.

Table 3 – Comparison of different rating classes

	α	βMkt-Rf	βSMB	βHML	βMom	R^2	OBS
5 Globes	-0.002	0.934***	0.030	-0.099**	0.040*	0.879	804
4 Globes	-0.023	0.958***	0.022	-0.233***	0.030**	0.905	2077
2 Globes	-0.001	0.987***	0.081***	-0.173***	0.039**	0.890	1474
1 Globe	0.101	1.023***	0.152***	-0.231***	-0.010	0.902	402

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The regressions are carried out with robust standard deviations

We discover the same results regarding performance in Table 3 as we did in Table 2. None of the alphas are significantly different from zero, with respectively -0.002%, -0.023%, -0.001% and 0.101% from high to low sustainability class. Despite the alphas not being different from zero, it is worth noticing that all of them are negative except 1 Globe, the least sustainable class. We also uncover the existence of a negative relationship between sustainability and exposure to the market, where the least sustainable class is even more volatile than the market

portfolio. As in Table 2, the conventional group (1 and 2 Globes) is exposed to small capitalization firms, while neither of the two sustainable classes are significantly exposed to the SMB factor. In addition, all classes are significantly exposed to growth companies. Lastly, we see the trend of sustainable funds being positively exposed to the momentum risk factor, while the conventional group is split between the exposed 2 Globes and unexposed 1 Globe class. These outcomes are further analyzed in research question 2.

To capture the difference between the groups in terms of financial performance, we created a dummy variable. "βSustainable" is 1 if the fund is sustainable, and 0 if the fund is classified as conventional. This dummy represents the change from the conventional alpha for funds characterized as sustainable.

Table 4 – Dummy model

	α	βMkt-Rf	βSMB	βHML	βMom	βSustainable	R²	OBS
Dummy	0.027	0.969***	0.052***	0.192***	0.031***	-0.048	0.895	4757

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The regressions are carried out with robust standard deviations

Table 4 reveals an insignificant "βSustainable" of -0.048. This is interpreted as, although sustainable funds on average experience a lower risk-adjusted return than conventional funds, the difference is not significant. Hence, in agreement with hypothesis one, there is no statistical difference in risk-adjusted return between the groups. It is also worth noticing that the conventional alpha is insignificant, consequently, we are able to conclude there is no evidence of risk-adjusted excess return from funds in emerging markets. Table 4 also uncovers how the funds are exposed to systematic risk factors. In other words, it provides an overview of how funds generally behave in emerging markets. We notice all the funds being underexposed to the market. They are also significantly exposed to small companies, growth firms and companies recently experiencing high returns.

Sub conclusion

All the analyses provide the same result as predicted in hypothesis one. There is no significant difference in financial performance between sustainable and conventional funds in emerging markets. The dummy model tests the difference in return between the groups, and we discover that although sustainable funds experience a slightly lower risk-adjusted return, the difference

is insignificant. Consequently, we conclude there is no statistical evidence of conventional funds achieving higher risk-adjusted returns compared to sustainable funds.

There is also no positive or negative risk-adjusted excess return for the funds in general. Although CAPM reveals positive excess returns for both groups, this effect disappears when the return is adjusted for risk factors in the Fama-French and Carhart models. The results are further supported when all rating classes are tested separately.

6.2 Research question 2

The next part examines the results related to the second research question. By including several interaction terms to the Carhart four-factor model, we aim to answer the following:

How are sustainable funds exposed to the four systematic risk factors: Mkt-Rf, SMB, HML and Mom, compared to conventional funds in emerging markets?

Hypothesis two

Sustainable funds in emerging markets are less exposed to the market, small companies and high book-to-market firms, but exhibit a greater exposure to the momentum strategy compared to conventional funds.

Firstly, to get an indication of whether our hypothesis is correct or not, we look at the Carhart four-factor model in Table 2. Both sustainable and conventional funds are underexposed to the market portfolio on a 1% level of significance, with coefficient of respectively 0.951 and 0.995. Regarding the SMB factor, there exists a difference between the groups. Conventional funds are significantly exposed to small capitalization companies, with a coefficient of 0.096 on a 1% level, while sustainable funds do not overweight in either small or big companies. Hence, the Carhart model provides some sign of sustainable funds being less exposed to small firms compared to conventional funds. Both sustainable and conventional funds are significantly exposed to growth companies on a 1% level, with respective betas of -0.196 and -0.185. Finally, both groups are significantly exposed to the momentum factor, with coefficients of 0.033 and 0.029.

To better observe the difference in factor exposure between the groups, we created the sustainable dummy "βSustainable" as in Table 4. Additionally, we created interaction terms

by multiplying the dummy and the other risk factors. We notice the coefficients of the alpha and the four risk factors being equal to the conventional funds' coefficients in the Carhart model (Table 2). Thus, the interaction terms tell us the difference in factor exposure if the fund is regarded as sustainable.

Table 5 – Interaction terms

Coefficient	Interaction Terms
α	0.021
βMkt-Rf	0.995***
βSMB	0.096***
βHML	-0.185***
βMom	0.029**
βSustainable	-0.038
βMkt-Rf*S	-0.044***
βSMB*S	-0.072***
βHML*S	-0.010
βMom*S	0.004
R²	0.896
OBS	4757

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The regressions are carried out with robust standard deviations.

The market interaction term is significant with a beta of -0.044, implying sustainable funds being significantly less exposed to the market than conventional funds. This is in agreement with hypothesis two. The SMB interaction beta is equally significant with a coefficient of -0.072, hence, sustainable funds are less exposed to small companies compared to conventional funds. This is also in accordance with hypothesis two. The HML interaction term is not significant with a beta of -0.010. Consequently, we cannot conclude that sustainable funds are differently exposed to value/growth companies than conventional funds. This is not consistent with our hypothesis. Lastly, the Mom interaction term is insignificant with a beta of 0.004, and the exposure is therefore not significantly different between the groups. This is also in contrast with our hypothesis.

Sub-conclusion

The analyses of risk factor exposure reveal funds in emerging markets to generally expose themselves towards small companies, growth firms and momentum stocks, while exhibiting an underexposure to the market portfolio. Concerning hypothesis two, some results are consistent, and some are not. In accordance with the hypothesis, sustainable funds are significantly less exposed to the market and small companies compared to conventional funds. On the other hand, sustainable funds do not possess a significant difference in exposure to the HML and Mom factors than conventional funds.

6.3 Research question 3

In this section, we present the results related to the third research question. We explore the three periods separately, and begin by evaluating and comparing the financial performance between the funds. In the second part, we examine the differences in factor exposure, and how the funds' investment style changes dependent on the economic cycle. Through these analyses, we aim to answer the following:

Do sustainable funds exhibit a difference in financial performance and risk factor exposure compared to conventional funds during the three economic periods; Steady development, Recession and Recovery?

Performance

As elaborated in the hypotheses section, we expect to find no statistically significant difference in risk-adjusted performance between sustainable and conventional funds in the period of steady economic development. Table 6 below, reports the results obtained using a Carhart four-factor and dummy model for the period starting in January 2012, lasting until July 2014. As the output from the Carhart model shows, sustainable funds experience a negative and significant (5% level) alpha of -0.107 in the steady period. This indicates sustainable funds underperforming relative to their factor benchmark. As for the conventional funds, we discover a negative and insignificant alpha in this period, indicating that they perform no better or worse compared to their factor benchmark. This section only displays the results from the Carhart models, as it yields the highest explanatory power, but the results are consistent using the CAPM and Fama-French models as well.

Table 6 – Steady period

	α	βMkt-Rf	βSMB	βHML	βMom	βSustainable	R²	OBS
Sus.	-0.107**	1.004***	0.078***	-0.156***	0.080***		0.900	1333
Con.	-0.077	1.021***	0.157***	-0.168***	0.070***		0.883	868
Dum.	-0.059	1.011***	0.109***	-0.160***	0.076***	-0.060	0.891	2201

Significance level: * p < 0.10, ** p < 0.05, *** p < 0.01.
The regressions are carried out with robust standard deviations
Sus. = Sustainable, Con. = Conventional, Dum. = Dummy

To get a better understanding of difference in performance between the groups, we include a sustainable dummy in our model. We discover the sustainable dummy being negative, but insignificant. This indicates sustainable funds on average performing slightly worse than conventional funds in the steady period, but this difference is not statistically significant. However, this finding is consistent with what we learned from the Carhart model, where sustainable funds experienced a significant negative alpha. These results provide small evidence of some underperformance from sustainable funds compared to conventional funds.

In the recession period, we expect sustainable funds to outperform conventional funds, and achieve greater risk-adjusted returns. Table 7 displays output from the Carhart and dummy models in the period of August 2014, until January 2016. The results reveal sustainable funds experiencing a negative and significant alpha of -0.255, implying that the funds underperform their factor benchmark. The magnitude of the alpha is even more negative compared to the steady period, indicating the performance of sustainable funds deteriorating during the recession. The conventional funds' alpha is negative, but still insignificant. This suggests conventional funds performing slightly worse than their factor benchmark, but the difference is not statistically significant. The conventional alpha is lower compared to the steady period, providing small evidence of a weakening in performance.

Table 7 – Recession period

	α	βMkt-Rf	βSMB	βHML	βMom	βSustainable	R²	OBS
Sus.	-0.255***	0.907***	-0.058**	-0.322***	0.034		0.885	774
Con.	-0.136	0.959***	0.104***	-0.163**	-0.020		0.890	504
Dum.	-0.256***	0.927***	0.006	-0.259***	0.013	0.080	0.882	1278

Significance level: * p < 0.10, ** p < 0.05, *** p < 0.01.
The regressions are carried out with robust standard deviations
Sus. = Sustainable, Con. = Conventional, Dum. = Dummy

Further, we include the sustainable dummy to check for differences in risk-adjusted performance between the funds. The sustainable dummy is positive, but statistically insignificant, indicating sustainable funds on average may experience higher risk-adjusted returns than conventional funds. This contrasts with the results from the Carhart model, where sustainable funds had a greater negative alpha compared to conventional funds. However, the difference represented by the dummy is not statistically significant. Consequently, we are not able to conclude that there exists any statistical evidence of difference in performance between the funds during the recession.

During the recovery period, we expect conventional funds to outperform sustainable funds, and experience greater risk-adjusted returns. Table 9 shows output from the Carhart and dummy models in the period of February 2016, until July 2017. The results reveal sustainable funds achieving a positive and significant alpha, indicating sustainable funds outperforming their factor benchmark during this period. Compared to the recession, the performance of sustainable funds has improved substantially, taking advantage of better economic development. The same interpretation is suitable for the conventional alpha as well. Comparing the two alphas, we notice conventional funds on average experiencing a greater excess return than sustainable funds, but we are not able to conclude that this difference is statistically significant yet.

Table 8 – Recovery period

	α	βMkt-Rf	βSMB	βHML	βMom	βSustainable	R^2	OBS
Sus.	0.223***	0.976***	0.232***	-0.140***	0.044**		0.890	774
Con.	0.270***	0.986***	0.121**	-0.191***	0.020		0.881	504
Dum.	0.334***	0.980***	0.188***	-0.160***	0.035*	-0.154**	0.885	1278

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The regressions are carried out with robust standard deviations.
Sus. = Sustainable, Con. = Conventional, Dum. = Dummy

When including the sustainable dummy, we get compelling evidence of sustainable funds underperforming conventional funds during the recovery period. The sustainable dummy is negative and statistically significant on the 5% level, with a coefficient of -0.154. The result implies sustainable funds achieving lower risk-adjusted returns compared to conventional funds in the recovery period. This is in accordance with the Carhart model, which showed a greater alpha for conventional funds in the recovery period.

Sub conclusion

In coherence with our hypothesis, we find no statistically significant difference in risk-adjusted performance between the groups in the period of steady economic development. Nevertheless, there are some evidence of a minor underperformance from the sustainable funds. Further, we expected sustainable funds to achieve greater risk-adjusted returns compared to conventional funds during the recession, however, we find no evidence of this. In contrast, we discover small evidence of sustainable funds underperforming conventional funds in this period. Comparing results from the recovery period with our hypothesis, we uncover conventional funds performing, as expected, better than sustainable funds. Both the Carhart model and the sustainable dummy suggest conventional funds outperforming sustainable funds on risk-adjusted returns in this period.

Factor exposure

Table 9 – Interaction terms in sub-periods

	(1) Steady	(2) Recession	(3) Recovery
α	-0.077	-0.136	0.270***
βMkt-Rf	1.021***	0.959***	0.986***
βSMB	0.157***	0.104***	0.121**
βHML	-0.168***	-0.163*	-0.191***
βMom	0.070***	-0.020	0.020
βSustainable	-0.031	-0.118	-0.047
βMkt-Rf*S	-0.017	-0.053**	-0.010
βSMB*S	-0.080*	-0.162***	0.111*
βHML*S	0.012	-0.159	0.051
βMom*S	0.010	0.054	0.024
R²	0.891	0.885	0.886
OBS	2201	1278	1278

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The regressions are carried out with robust standard deviations.

As explained in the hypotheses section, we expect to discover sustainable funds being less exposed to the market, small companies and value firms, and exhibit a greater exposure to the momentum strategy during steady period. We learn from the Carhart models in Table 6 that both sustainable and conventional funds are significantly exposed to the market. The

magnitude of the coefficients is above 1 and almost equal, indicating greater risk than the market portfolio and minor differences in exposure between the groups. Both groups are also positively and significantly exposed to the SMB factor, suggesting both sustainable and conventional funds exposing themselves to small firms during the steady period. The coefficients of the HML factor are negative and significant for the two groups, implying both significantly tilt towards investing in growth companies. The last factor coefficients are positive and significant, indicating both sustainable and conventional funds to be exposed to the momentum strategy.

To capture the difference in factor exposure, we include interaction terms between the sustainable dummy and the four risk factors. In the steady period, displayed in column 1 of Table 9, the sustainable dummy has reduced its magnitude from Table 6, but the coefficient is still negative and insignificant. The interaction term between the market and the dummy is negative, indicating sustainable funds being less exposed to the market compared to conventional funds. However, this difference is not statistically significant. The interaction term between the SMB factor and the dummy is negative and significant on a 10% level, with a coefficient of -0.080. This implies sustainable funds in general to be less exposed to small capitalization firms than conventional funds in the period of steady economic development. Regarding the difference in exposure to value firms, we discover the interaction term between the HML factor and the dummy being positive and insignificant. This suggests that sustainable funds are more exposed to value companies compared to conventional funds, but this difference is not significant. The same interpretation can be used for the last coefficient, suggesting sustainable funds exposing themselves insignificantly more to past winners compared to conventional funds.

In the recession period, we expect the difference in factor exposure between the two groups to diminish, as a result of a reduced investment universe. By further examination of the Carhart models in Table 7, we learn that both groups are significantly exposed to the market portfolio. However, the coefficients are now below 1, indicating some reduction in the funds' exposure to the market portfolio during the recession. The magnitude of the coefficient is lower for the sustainable group, suggesting sustainable funds on average may be less exposed to the market compared to conventional funds. Regarding the SMB factor, we notice sustainable funds displaying a negative coefficient, suggesting these funds to be more tilted towards investing in large companies. This exposure is statistically significant, and represents a shift in investment style from the steady period. As for the conventional funds, the coefficient is

positive and significant. The results propose that the funds are still exposed to small companies, even though the magnitude of the coefficient is slightly lower during the recession. The coefficients of the HML factor are negative and significant for both groups, implying both sustainable and conventional funds being positively exposed to growth companies. The output also shows sustainable funds increasing their exposure to growth firms from the previous period. As for the momentum factor, none of the coefficients are statistically significant. The interpretation of this result is that neither sustainable nor conventional funds exhibit a strategy related to momentum.

When including the interaction terms for the recession in Table 9, we notice the coefficient of the sustainable dummy from Table 7 turning negative. This indicates that when we adjust for the difference in factor exposure, sustainable funds experience inferior risk-adjusted returns compared to conventional funds. This is in accordance with the Carhart models, although the difference in performance is not statistically significant. The interaction term between the market and the dummy is negative and significant on a 5% level, with a coefficient of -0.053. This implies sustainable funds being significantly less exposed to the market portfolio during economic crisis compared to conventional funds. With the same reasoning, we learn that sustainable funds are significantly less exposed to small companies during the recession than conventional funds. These results confirm the suspicions from the Carhart models. As for the difference in exposure to the HML factor, we discover sustainable funds being more growth-oriented than conventional funds, but this difference is not statistically significant. The interaction term between the momentum factor and the dummy is positive, but insignificant, which suggests there exists no statistically significant difference in exposure to the momentum strategy in the recession period.

During the recovery period, we expect to discover the funds moving towards their initial factor exposure, where sustainable funds are less exposed to the market, small companies and high book-to-market firms, and exhibit a greater exposure to the momentum strategy compared to conventional funds. Table 8 reveals both groups being significantly exposed to the market portfolio, but the coefficients are still below 1. Both sustainable and conventional funds have increased their exposure to the market compared to the recession period, indicating a greater belief in the market development. The sustainable funds have also increased their exposure to the SMB factor considerably, changing the sign of the coefficient from negative to positive. This implies sustainable funds to be more invested in small firms compared to previous periods. The exposure to the SMB factor is consistent for the conventional funds, remaining

positive and significant. Still, we discover both groups being negatively exposed to the HML factor, suggesting a tilt towards investing in growth companies. However, the sustainable funds have reduced their exposure to these companies from the recession period. The momentum coefficient is positive for both groups, but only significant for the sustainable funds. This indicates a development where sustainable funds expose themselves increasingly to past winners, compared to the recession period and conventional funds.

When including interaction terms in column 3 of Table 9, we discover that the significance level of the sustainable dummy from Table 8 is gone. The coefficient remains negative, but the magnitude is reduced, suggesting the difference in risk-adjusted performance indicated in Table 8 is explained by the funds being differently exposed to risk factors. Further, during the recovery period, there is no statistically significant difference between the groups in market exposure. The SMB interaction term is positive and significant on a 10% level, providing evidence of sustainable funds being more exposed to small firms during this period compared to conventional funds. Neither of the last two interaction terms are statistically significant, but they both suggest sustainable funds on average being more exposed to value firms and past winners, compared to conventional funds during the recovery period. Nevertheless, we are not able to conclude this difference in exposure to be statistically different from zero.

Sub-conclusion

As we expect, sustainable funds are less exposed to the market and the SMB factor, as well as more exposed to the momentum strategy during a period of steady economic development. Yet, the difference in exposure to the market and Mom factor are not statistically significant. However, we also expect sustainable funds to be more growth-oriented than conventional funds in this economic cycle, but the results imply the opposite. Nevertheless, this difference in exposure is also insignificant. Further, we expect the differences in factor exposure to be reduced during the recession. With increasingly different exposure in this period, especially related to the market and SMB factor, the results show the hypothesis to be wrong. The part of our hypothesis related to the recovery period also proves to be incorrect. Even though sustainable funds are less exposed to the market, and more invested in past winners, neither of these differences are statistically significant. Unexpectedly, sustainable funds also prove to be significantly more exposed to small companies in this period. Lastly, sustainable funds exhibit an insignificant larger exposure to value firms compared to conventional funds during the recovery period.

7.   Discussion

This section includes the discussions and explanations associated to the results discovered in the thesis. We validate the results by relating them to previous research and economic mechanisms. Firstly, we review the entire period with research question one and two, before examining the three different sub-periods relevant to research question three.

7.1 Research question 1

When analyzing the entire period as one, the results provide no evidence of significant difference in risk-adjusted return between sustainable and conventional funds. Thus, investors do not have to suffer financially for investing sustainable in emerging markets. The findings are in accordance with the majority of previous studies covering other markets, like the research by Renneboog et al. (2008) and Bauer et al. (2005). This is peculiar as one intuitively believes negative screening conducted by sustainable funds would lead to a smaller investment universe, hence, triggering a lower risk-adjusted return. One plausible reason could be, that despite the sustainable investment universe being smaller than the conventional, it is still large enough to avoid a considerable loss in diversification. Accordingly, sustainable funds do not expose themselves to a higher risk, and gain approximately equal risk-adjusted returns as conventional funds.

7.2 Research question 2

Sustainable funds are significantly less exposed to the market risk compared to conventional funds, as a result of the screening process excluding companies with a conventional practice (Jegorel & Maveyraud, 2010). This reasoning is further validated when we discover the existence of a negative relationship between sustainable investment class and exposure to the market portfolio. Sustainable funds are also less exposed to small companies compared to conventional funds in emerging markets. This intuitively makes sense, as one expects sustainability leading firms to be large-sized companies, as these have the required resources to devote to ESG projects. This argument has previously been proved by Boon et al. (2013).

Sustainable funds are not significantly different exposed to the HML factor. This is curious, as one would assume sustainable funds to be negatively exposed to value firms, considering

Bauer et al (2005) finds them to be typically chemistry, energy, and industry-related. These kinds of firms are usually not associated with sustainability. A possible explanation for the difference not being significant, may be conventional investors also seeking to growth firms in emerging markets, as growth is the foremost reason to choose this investment universe. Some previous research reveals sustainable funds being more exposed to the momentum factor compared to conventional funds, however, our results reveal no significant difference. We choose a careful interpretation of these results, considering the momentum factor is not 100% representable for emerging markets.

7.3 Research question 3

Performance

When examining the risk-adjusted performance of the funds during the steady period in emerging markets, we find no statistically significant difference. Even though we discover some minor indications of underperformance by sustainable funds, we cannot conclude with the difference being significant. These findings are supported by several previous research papers, suggesting there exists no difference in risk-adjusted performance between sustainable and conventional funds during a period of steady economic development (e.g. Bauer et al., 2005; and Renneboog et al., 2008). The slight indications of underperformance by sustainable funds is also present in the study by Renneboog et al., where some of the countries experience lower risk-adjusted returns compared to their conventional counterparts. As previously mentioned, a possible explanation for the existence of no significant difference in risk-adjusted performance, can be the size of the sustainable investment universe being sufficiently large enough for the funds not to suffer any loss of diversification.

The findings during the recession period are unexpected, as we discover no statistical difference in risk-adjusted returns between sustainable and conventional funds. Given our assumption of sustainable funds being less exposed to fluctuations in the oil price, we expect to reveal sustainable funds outperforming conventional funds in this recession period. Our belief is further underlined by the results attached in Table 20 in the appendix, showing sustainable funds experiencing lower exposure to the development in oil price. However, despite sustainable funds being less dependent of fluctuations in the oil price, we find small indications of sustainable funds experiencing lower risk-adjusted returns in the recession. This result is surprising, and in contrast with most of previous research. E.g., Nofsinger & Varma

(2014) learn that sustainable US funds outperform conventional funds during economic crisis, explaining this by better corporate governance in sustainable companies. Contrarily, Bredal & Negård (2015) discover the opposite, and argue that the extra idiosyncratic risk arising from the screening process cause sustainable funds to experience inferior risk-adjusted returns during falling markets. One likely explanation for the results from emerging markets not harmonizing with developed countries, might be the immaturity of the sustainable fund universe in emerging economies. This may cause the effects of sustainable investing to lag several years behind countries like US and UK, explaining the difference in results. Another explanation could be the companies focusing on sustainability in emerging markets being less advanced, thus, not exhibiting equally great corporate governance as in developed countries.

In the recovery period, we find compelling evidence of conventional funds experiencing significantly greater risk-adjusted returns compared to sustainable funds. This confirms the previous findings by Leite & Cortez (2015) in the French market, and Soler Dominguez & Matalliz-Saez (2016) on the performance of the VICEX fund compared to sustainable funds. An explanation for the conventional funds' outperformance could be the upswing in oil price during the recovery period. As conventional funds are more exposed to fluctuations in the oil price compared to sustainable funds, they intuitively perform better during a growth period in the oil sector. Another possible explanation for the superior risk-adjusted returns, might be the companies' focus on generating profits during the recovery period, compensating for losses incurred during the recession. This can result in deteriorating focus on sustainability compared to periods with steady economic development, which in turn might lead to fewer profitable investment opportunities for sustainable funds. A third explanation, proposed by Leite & Cortez (2015), is the negative screening conducted by sustainable funds contributing to the funds missing several profitable investments during recovery periods.

Factor exposure

Regarding the differences in factor exposure during the steady period, we only find exposure to the SMB factor significantly different. Both sustainable and conventional funds exhibit a tilt towards investing in small companies, but conventional funds are on average significantly more exposed. The fact that sustainable funds are positively exposed to small companies might be curious considering the findings by Mollet & Ziegler (2014), who discover sustainability being related to large companies. A possible explanation to this deviance, can be the existence of several small and sustainable technology companies in emerging economies like China and

South Korea. In addition, sustainable funds being positively exposed to the SMB factor during steady economic development is well documented in previous literature. However, most of the papers find sustainable funds to be more exposed compared to conventional funds (e.g. Bauer et al., 2005; Jin & Han, 2018). One possible explanation for our results contradicting previous research, is that sustainability is less developed in emerging markets, causing ESG practices to only be profitable for large companies.

During the recession, we discover sustainable funds being significantly less exposed to the market compared to conventional funds. This has previously been observed by Leite & Cortez (2015) in the French market. A feasible explanation can be the negative screening process being extra prominent during recessions, resulting in exclusion of several companies included in the market portfolio. Consequently, the sustainable funds' exposure to the market is reduced, as shown by Jegourel & Maveyraud (2010). We also reveal sustainable funds to be less exposed to small companies during the recession, with a negative exposure to the SMB factor, indicating a tilt towards investing in large companies. This might be explained by large companies' capacity to implement ESG practices even during economic crisis, thus making them relevant and attractive investments for sustainable funds.

In contrast to our hypothesis, we only find the difference in exposure to the SMB factor statistically significant during the recovery period. The results show that sustainable funds are significantly more exposed to small companies compared to conventional funds in this period. It is reasonable to expect both sustainable and conventional funds experiencing a tilt towards small companies during economic upturns, as the funds have the capacity to incur higher risk. However, based on previous literature and findings, we do not expect sustainable funds to be more exposed compared to conventional funds. A possible explanation for this controversial result can be the oil price drop forcing small oil related companies to alternate their practices towards other industries than the non-sustainable petroleum sector. Consequently, making small companies´ share of the sustainable investment universe larger. This might contribute to making the exposure of sustainable funds to small companies greater, and explain part of the findings.

8. Conclusion

The main purpose of this study is to compare sustainable and conventional investing in emerging markets. We examine whether there is a difference in financial performance, and explore potential differences in risk factor exposure between the two investment approaches. We analyze sustainable and conventional mutual funds in a period lasting from January 2012 until July 2017, providing us the opportunity to examine the funds' response to different economic cycles.

Based on our analyses, we conclude there to be no significant difference in performance between sustainable and conventional funds in emerging markets. The findings indicate that conventional funds might be performing slightly better, but the difference is not statistically significant. This result was expected considering previous research on other markets, but is nevertheless an argument against neglecting sustainable investing due to anticipated lower financial returns.

The study reveals several discoveries regarding the funds' risk factor exposure. Sustainable funds are significantly less exposed to the market portfolio and small companies compared to conventional funds. However, there is no significant difference in the exposure towards the HML and Mom risk factors. Sustainable funds being less exposed to small companies can be explained by bigger firms' ability to maintain a more sustainable operation. Furthermore, the underexposure to the market portfolio is a consequence of negative screening, and both findings correspond with previous research on the matter. The paradox arises when this underexposure does not lead to a lower financial performance, considering well-established economic theory argue that exposure to systematic risk factors should lead to higher financial returns.

Our analyses uncover several differences between the funds before, during and after the substantial oil price drop in 2014. However, we discover the recovery period being the only period there exists a significant difference in risk-adjusted return between the groups, as conventional funds outperform sustainable. This can imply surviving oil companies experiencing a growth above market average in the recovery period. Further, sustainable funds are less exposed to small companies in the steady period, and less exposed to the market and small firms in the recession than conventional funds. These findings are similar as in research question one and two. We also discover sustainable funds, in a greater extent, exposing

themselves towards small companies compared to conventional funds during the recovery period. It might indicate the oil crisis forcing small oil-related companies to alternate their practices towards other industries than the non-sustainable petroleum sector. Thus, making small companies´ share of the sustainable investment universe larger.

A limitation of this study is the lack of time series data on the sustainability ratings provided by Morningstar. Thus, we are forced to exclude funds that have been terminated during our research period, as these do not exhibit a rating. Consequently, our dataset suffers from survivorship bias, and this might lead to an overestimation of the funds' average performance. Additionally, the relevance of the sustainability ratings is limited over time, as the persistency of the ratings is restricted to approximately three years (Wimmer, 2012). Another limitation of the thesis is the absence of risk factor data for emerging markets, forcing us to create these variables ourselves using data from several indexes. Therefore, the risk factors work as proxies, and this should be considered when analyzing the results. Special carefulness is needed when interpreting the momentum factor, as this variable is not 100% representable for emerging markets.

Our results are relevant for anyone looking to invest in emerging markets, as they reveal no additional cost of investing sustainable. Equal risk-adjusted returns advocate for both sustainability concerned investors, as well as indifferent investors, to prefer sustainable funds instead of conventional. Based on our findings, the only period there exists a financial justification of choosing conventional funds in emerging markets is during a recovery cycle.

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Appendix

1. Statistical tests

Breusch-Godfrey test for autocorrelation

We use the Breusch-Godfrey test to control for autocorrelation in the model. We test with the order of 12, as the data contain monthly returns. To compute the test, one construct a regression containing the original model and add on the lagged residuals, giving us:

$$\hat{U}_t = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + \dots + \beta_k x_{Kt} + \rho_1 \hat{u}_{t-1} + \rho_2 \hat{u}_{t-2} \tag{18}$$
$$+ \dots + \rho_q \hat{u}_{t-q} + e_t$$

The null hypothesis states there being no autocorrelation:

$$H_0\colon \rho_1 = \rho_2 = \dots = \rho_q = 0$$

If the model is free from autocorrelation, R^2 from equation 18 will be low. The test is given by:

$$LM = (T - q) * R^2 \sim \chi^2 \tag{19}$$

The test is chi-squared distributed with q degrees of freedom. If LM exceeds critical value, we reject H_0 and assume autocorrelation. If there are signs of autocorrelation in any of the funds, we use a Cochrane-Orcutt test to circumvent it, which is explained more carefully later.

Variance Inflation Factor for multicollinearity

To analyze whether multicollinearity is present, we look at the Variance Inflation Factor (VIF), given by:

$$VIF = \frac{1}{(1 - R^2)} \tag{20}$$

R^2 is the coefficient of determination to the regression. Consequently, if a variable to a large extent can be explained by variation in the other variables, it will result in a high VIF. We decide 2.5 to be the critical value in this study, based on an article by Allison (2012).

Levin-Lin-Chu test for unit root

If the data series contains unit root, the results may show untrue significant effects, consequently leading to false results. Thus, one would only accept stationary variables in the regression model. A stochastic process (x_t: t = 1, 2, ...) is stationary if all time periods $1 \le t_1 \le t_2 \le \ldots \le t_m$ have the same distribution in (x_{t1}, x_{t2}, ..., x_{tm}) as in (x_{t1+h}, x_{t2+h}, ..., x_{tm+h}) for all h $\ge$ 1 (Wooldridge, 2013).

To test whether the panel data contain unit root, or the series being stationary, we conduct the Levin-Lin-Chu test for unit root in Stata. H_0 states that the panels contain unit roots, while H_1 declares the panels to be stationary. To choose the optimal number of lags for each variable, we use AIC (Akaike Information Criterion).

2. Test results

Table 10 – Results from the Breusch-Godfrey test for autocorrelation

Funds	χ^2	P-value
KBI Institutional	22.947	0.028**
Multipartner CEAMS	25.783	0.011**
Allianz Global	23.723	0.022**
Barclays	18.653	0.097*
Mirae Asset	19.200	0.084*

Significance level: * p < 0.10, ** p < 0.05, *** p < 0.01.
The Breusch-Godfrey test gave five significant results.

We learn from Table 10 that five funds get significant scores on the test, hence, suffering from autocorrelation. The presence of autocorrelation implies the time series may not be valid, and that OLS might not be efficient. We test the implication of the results by transforming the coefficients, using FGLS method (Cochrane-Orcutt estimates) to remove autocorrelation from the model.

Table 11 - Cochrane-Orcutt estimates

Funds	Method	α	βMkt-Rf	βSMB	βHML	βMom	R²	OBS
KBI	OLS	0.126	0.912***	-0.035	0.170**	0.008	0.964	67
	FGLS	0.130	0.920***	-0.024	0.138*	-0.015	0.969	66
Multipartner	OLS	-0.202	0.735***	-0.099	-0.106	0.009	0.876	67
	FGLS	-0.233	0.730***	-0.104	-0.133	0.015	0.868	66
Allianz	OLS	-0.259**	1.031***	0.027	-0.581***	0.001	0.961	67
	FGLS	-0.265**	1.029***	0.017	-0.585***	-0.006	0.964	66
Barclays	OLS	-0.035	0.950***	-0.053	-0.205**	0.109*	0.944	67
	FGLS	0.009	0.942***	-0.101	-0.210**	0.056	0.957	66
Mirae	OLS	0.091	1.008***	0.062	-0.726***	-0.071	0.911	67
	FGLS	0.098	0.996***	0.059	-0.719***	-0.080	0.913	66

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Comparing the regressions with OLS and FGLS

The yellow boxes mark the funds that changed level of significance when going from OLS to FGLS. We see this to be the case for 2 out of 20 factor coefficients. KBI's Book-to-Market beta change from 0.17 to 0.138, and Barclays' Momentum beta change from 0.109 to 0.056. When we keep in mind the momentum factor not being 100% accurate, we conclude that autocorrelation is probably not an issue for our analyses and conclusions.

Table 12 – Results from the Variance Inflation Factor for multicollinearity

Variables	VIF	1/VIF
MOM	1.49	0.670
HML	1.44	0.697
Mkt-Rf	1.34	0.747
SMB	1.13	0.884
Mean VIF	1.35	0.750

From Table 12 we notice none of the variables exhibiting VIF values close to the critical value of 2.5. Accordingly, a considerable variation in the variables cannot be explained by variation in other variables, hence, we have no problem with multicollinearity. Based on this result, we include all the four variables in our regressions.

Table 13 – Results from the Levin-Lin-Chu test for unit root

Variables	Unadjusted T	Adjusted T*	P-Value
Return	-63.2467	-57.8302	0.00
Mrkt-Rf	-63.3058	-57.9834	0.00
SMB	-69.6089	-68.5679	0.00
HML	-67.1713	-60.3541	0.00
Mom	-70.1086	-63.7725	0.00

The table reveals no problems of unit root in our data set. With all variables having a low p-value, we dismiss H_0 and conclude the series to be stationary.

Table 14 – Results from the Hausman test

We run the Hausman test to uncover whether RE and POLS produce consistent estimators. If there is individual specific variation in the error term, which is correlated with the explanatory variables, we will have inconsistent estimators.

	β^{FE}	β^{RE}	$\beta^{FE} - \beta^{RE}$	$\sqrt{Var\beta^{FE} - Var\beta^{RE}}$
MktRf	0.9660	0.9670	-0.0010	0.0014
SMB	0.0460	0.0465	-0.0006	0.0014
HML	-0.1924	-0.1946	0.0022	0.0031
Mom	0.0058	0.0076	-0.0076	0.0023
MktRf*S	-0.0436	-0.0436	0.0017	0.0021
SMB*S	-0.0723	-0.0723	-0.0009	0.0020
HML*S	0.0104	0.0104	-0.0036	0.0049
Mom*S	0.0036	0.0036	0.0028	0.0037

Table 14 reveals the results from the Hausman test. With 8 degrees of freedom, on 5% level of significance, we get a critical value of 15.51. With the corresponding test observer "W" of

0 and the equivalent p-value of 1.000, we keep H_0. Thus, we conclude that both RE and POLS are consistent.

Table 15 – Results from the Breusch-Pagan test

The Hausman test indicates both RE and POLS to be consistent. Consequently, we run a Breusch-Pagan test to decide whether we should use POLS or RE. If there are unobserved effects for every individual or group of individuals, POLS will not be efficient. We test this formally with the Breusch-Pagan test.

Parameter	Variance	Standard Error
Return	19.467	4.412
e	2.394	1.547
u	0	0

We learn from the results there being no individual specific variations in our model. Consequently, the test observer "LM" is 0 and the corresponding p-value is 1. Thus, we keep H_0 and conclude POLS to be the preferred model.

3. Complete tables

This section covers tables not included in empirical results (part 6), and the model revealing funds' exposure to oil price fluctuations. It contains CAPM and Fama-French models for 1-5 Globes, and the three economic periods, Steady development, Recession and Recovery.

Table 16 - 1-5 Globes during the entire period

	α	βMkt-Rf	βSMB	βHML	R²	OBS
CAPM						
5 Globes	0.066	0.908***			0.876	804
4 Globes	0.087***	0.919***			0.898	2077
2 Globes	0.100**	0.946***			0.885	1474
1 Globe	0.197***	0.977***			0.894	402
Fama-French						
5 Globes	0.015	0.929***	0.031	-0.131***	0.878	804
4 Globes	-0.010	0.953***	0.023	-0.256***	0.905	2077
2 Globes	0.016	0.981***	0.082***	-0.203***	0.890	1474
1 Globe	0.099	1.024***	0.152***	-0.226***	0.902	402

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The regressions are carried out with robust standard deviations

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Table 17 - Steady Period

	α	βMkt-Rf	βSMB	βHML	R²	OBS
CAPM						
Sustainable	0.053	0.941***			0.888	1333
Conventional	0.105**	0.953***			0.873	868
Fama-French						
Sustainable	-0.035	0.976***	0.055**	-0.231***	0.894	1333
Conventional	-0.014	0.996***	0.137***	-0.234***	0.882	868

Significance level: * p < 0.10, ** p < 0.05, *** p < 0.01.
The regressions are carried out with robust standard deviations

Table 18 - Recession Period

	α	βMkt-Rf	βSMB	βHML	R²	OBS
CAPM						
Sustainable	0.100	0.860***			0.877	
Conventional	-0.037	0.933***			0.882	
Fama-French						
Sustainable	-0.244***	0.903***	-0.044	-0.344***	0.885	
Conventional	-0.142	0.961***	0.096***	-0.150**	0.890	

Significance level: * p < 0.10, ** p < 0.05, *** p < 0.01.
The regressions are carried out with robust standard deviations

Table 19 - Recovery Period

	α	βMkt-Rf	βSMB	βHML	R²	OBS
CAPM						
Sustainable	0.147***	0.930***			0.880	
Conventional	0.266***	0.952***			0.870	
Fama-French						
Sustainable	0.203***	0.982***	0.230***	-0.172***	0.890	
Conventional	0.261***	0.990***	0.118**	-0.206***	0.881	

Significance level: * p < 0.10, ** p < 0.05, *** p < 0.01.
The regressions are carried out with robust standard deviations

Table 20 – The funds' exposure to the development in oil price

	Oil interaction
α	0.042
βMkt-Rf	0.961***
βSMB	0.048***
βHML	-0.198***
βMom	0.032***
βOilprice	0.019***
βSustainable	-0.060
βS*O	-0.015***
R²	0.896
OBS	4757

Significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
The regressions are carried out with robust standard deviations.

The yellow box reveals sustainable funds being less exposed to fluctuations in the oil price compared to conventional funds.