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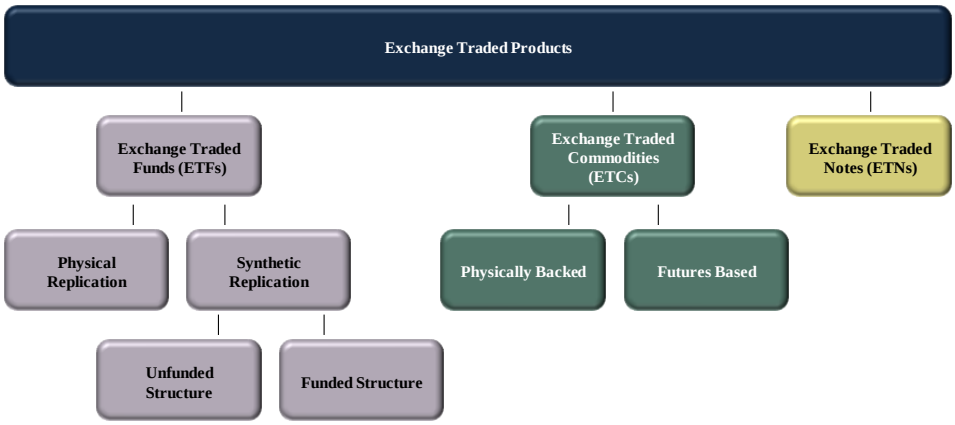
Exchange Traded Funds

-An Assessment of Investment Alternatives



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Executive Summary

Exchange traded products (ETPs) have seen tremendous growth internationally, but in a Danish context they are still relatively unknown. Exchange traded funds (ETFs) are the most popular subgroup of ETPs, and equity-based ETFs make up the largest share of global ETP asset under management (AUM). Equity-based ETFs are often described as a low-cost alternative to investing in traditional mutual funds (MFs). The purpose of this thesis is to investigate whether this is true for the Danish private investor. The investigation is performed based on an empirical performance analysis, an analysis of the surrounding environment in terms of regulation, tax and competition, and on thorough discussion of the literature on ETF structures and potential risks associated therewith.

Based on a set of criteria, nine ETFs and 19 MFs are chosen to be applied in an empirical performance test. Over a time period of 3-5 years (depending on the starting date of ETFs) 12 MFs shows negative performance, with two of these significant. One fund shows significantly positive performance. By synthetically replicating the ETFs the analysis is extended to an 11-year period. In this analysis 14 MFs is found to have negative performance, with four of these significant. One still exhibits positive significant performance. Introducing timing into the models reveals 13 MFs performed negatively, while only one is significant. No fund shows significantly positive performance. When extending the horizon to 11 years, 14 funds shows negative performance, but now seven of these are significant. Overall, based on performance for these specific funds equity-based ETFs is found to be a viable alternative to MFs.

Despite equity-based ETFs performing well compared to MFs, a review of the Danish tax system, along with regulation as distribution, is found to hinder the adoption of ETFs for private investors.

To address the confusion this thesis analyses the financial structures of 4 different ETPs. The equity-based ETFs used in performance testing, leveraged ETFs, exchange traded commodities (ETCs), and exchange traded notes (ETNs). It is found that even though these four all belong to the ETP family, the financial structure, the complexity, and the risk levels differ considerably. Analysis of equity-based ETFs shows no difference between ETFs using physical replication and engaging in securities lending and those using swaps to replicate a benchmark. Overall, both these types of equity-based ETFs are found to be reasonably safe investment vehicles for Danish private investors. Analysis of the three other types of ETPs reveals that these products are more complex. The Danish private investor will therefore have to understand the difference between equity-based ETFs, and the other types of ETPs.

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1. Introduction

Mutual funds (MFs) have a long history within the Danish financial sector, with the concept dating back to the 1920's and the industry has experienced success in the past decade (Investeringsforeningsrådet, 2012c). With more than 286DKKbn invested in MFs, Danes have more capital invested in MFs than in individual stocks and bonds combined (Investeringsforeningsrådet, 2012b). Their influence on the general investment landscape of Danish private investors is therefore indisputable.

Despite the popularity of MFs, the industry has in recent years been subject to criticism. Studies such as *"Recommendations on stock investments"* (Engsted, Larsen, and Møller, 2011) and *"Agency Commission of MF certificates"* (Bechmann and Wendt, 2012), has increased the focus on the costs associated with investing in MFs. A considerable part of academic literature on performance of MFs furthermore concludes that actively managed funds do not outperform their benchmark indices over longer periods of time (see e.g. Christensen, 2005). This has started a debate on alternatives to MF investing.

An alternative to MF investing is Exchange Traded Products (ETPs). ETPs are one of the most successful financial innovations in the last 20 years. Exchange Traded Funds (ETFs) is a very popular subgroup of ETPs and ETFs account for the majority of the invested capital in ETPs (Blackrock, 2011b). Since the creation of the first ETF in 1993, the SPDR S&P 500 ETF (Carrel, 2008), the global market for ETFs has grown rapidly. To spur interest among investors the first ETFs were passively managed and tracked well-known equity or fixed income indices. Today different types of ETPs provide exposure to a wide array of regions and sectors, as well as a broad selection of asset classes. In the beginning, ETFs were mainly adopted by institutional investors as hedging instruments. Instead of buying a large basket of securities to hedge macroeconomic exposure, a single ETF could be bought to constitute the same effect. While institutional investors still account for the large majority of ETF Assets Under Management (AUM), private investors now constitute 10-15% of the European market (Deutsche Bank, 2008).

Today most ETFs passively track a benchmark index and the largest share of these is equity-based (Blackrock, 2011b). These equity-based ETFs are often described as providing the diversification effect of a MF, combined with the trading flexibility of a stock (Dengsøe, 2011). Furthermore, ETFs are often described as being a low-cost index-tracking alternative to MFs.

1.1 Problem Statement

Historically there has been almost no alternative to MFs for the Danish private investor looking for broad diversification with limited funds, but with the rise of the ETFs this has changed. However, despite the general popularity, growth and use by private investors of ETFs in other European countries, ETFs are still relatively unknown in the Danish investment market. This is evident in the fact that only 1.5% of the total assets under management (AUM) are invested in passive funds such as e.g. ETFs (Mikkelsen, 2011c). This leads to the following problem statement:

Are equity-based ETFs a viable alternative to investing in traditional actively managed MFs for the Danish private investor?

The Danish private investor is defined as a private Danish citizen investing either free funds or pension funds. Actively managed MFs are defined as MFs in which a fund manager seeks to obtain a higher return than the benchmark index through stock picking.

Viability is understood in four ways:

1. Are ETFs able to deliver a reasonable return compared to actively managed MFs?

2. If reasonable performance is concluded, are there any other surrounding factors, which may hinder the adoption of ETFs for the Danish private investor?

3. Do the structure and underlying mechanisms of ETFs lead to any inherent risks, which could affect the Danish private investor in a negative way?

4. As ETFs are commonly mistaken for ETPs, it is found central to understand potential differences between ETFs and other ETPs to be able to conclude firmly on the viability of ETFs.

1.2 Methodology

This thesis is seen from the point of view of the Danish private investor. Private investors will in general have fewer options to act on financial markets than institutional investors, and this is also the case when analyzing ETFs. When ETF (and other) structures are presented, it will be with the opportunities and perspectives of the private investor in mind.

In order to assess whether these ETFs are in fact a viable alternative to Danish MF investing, an empirical analysis of MF performance versus ETF performance is conducted. The ETFs used in this thesis have only

been available for a relatively limited period of time; therefore a simulated historical ETF return series is generated to supplement the findings.

The empirical analysis is based on primary data which has been collected from IFR, Bloomberg, and the websites of the ETF providers. The data from IFR is only available on a monthly basis. Thus in order to obtain sufficient data for statistical inference a time horizon of 11 years is found sufficient. A further explanation of the reasons for choosing this will be given in chapter three.

The first part of the viability concept is investigated by means of a model which outlines performance. There are several ways to measure and evaluate performance of investments. In this paper a quantitative approach is applied, as it is believed to enhance the understanding of performance by providing measurable conclusions. A contribution to performance measurement is presented by Jensen (1968). Another model by Treynor and Mazuy (1966) applies a similar framework, but includes a measure of market timing performance. These frameworks estimate the excess performance of an investment over the market related performance, at a pre-specified confidence level and over a specific time horizon. The models provide an explicit performance measure, which enables decision-makers to see the measureable differences in performance.

In choosing these two performance measurement frameworks, weight was put on communicability, applicability and general use in other literature. Based on these factors the Jensen measure and the Treynor and Mazuy model were found to provide a good combination. A more detailed argumentation is provided in chapter four, in which the method is applied.

The frameworks are statistical models in which it is believed that reliability, validity and objectivity can be accomplished. The underlying statistical criteria, for applying the model are acknowledged and taken into consideration in the working process. Evaluation of model quality and of the data used is also relevant and is considered in the assessment of the results reached.

The second part of the viability term is to investigate whether any surrounding factors influence the viability of ETFs as an investment alternative. These aspects are analyzed by reviewing the current legislative framework and competitive environment. A considerable part of Danish legislation is dictated by EU law, therefore the analysis covers legislation from both a Danish perspective as well as in a broader European context.

The third part is investigated to understand the viability of the underlying mechanism of ETFs. The financial structure of ETFs is investigated to see if potential positive attributes of these products are offset by negative

aspects. This is done by a critical review of the financial literature available on the subject and graphical representation and analysis of each structure. The analysis of economic structure is supplemented by considerations on regulation and systemic risks. As described in the problem statement an analysis of ETPs is found central, to confirm whether other types of ETPs pose the investor with risks that are not present for equity-based ETFs. Three other types of ETPs are presented and analyzed, these are leveraged ETFs, exchange traded commodities (ETCs), and exchange traded notes (ETNs). This analysis is performed by means of literature review, analysis of financial structure, as well as case studies.

The literature supporting this thesis is for performance, statistics and regulations based on the general literature available on these subjects. However, as ETFs are relatively new financial products in Europe the empirical data on these has been somewhat limited, although not completely unobtainable. Therefore an inclusion of ETF experts in Denmark has been done through actively contacting and doing interviews with both the ETF provider iShares and the chief analyst at Morningstar Denmark. These interviews inspired and helped to find further literature, which is also included.

1.3 Delimitation

The central focus of this thesis is the viability of ETFs as investment vehicles for the Danish private investor. Only equity-based ETFs will form the basis for the performance tests, as the largest share of ETFs are equity-based (Blackrock, 2011b). This delimitation is done out of data considerations, as it has been assumed that since equity-based ETFs form the largest share of ETFs, these will also provide the broadest and fullest dataset. Therefore the MFs included for comparison are also equity-based MFs.

The ETFs seem to be a popular way of investing on a global scale and an analysis of the limited use in Denmark is therefore found very relevant. This constitutes the reason for choosing ETFs as the investment alternative instead of passively managed MFs.

Several different investor segments could have been chosen. For example the analysis could have been seen from the perspective of institutional investors or European private investors. The Danish private investors were chosen due to the very limited use of ETFs of this specific segment.

No comparison is made between direct investment in the underlying assets, and investing in ETFs. The debate regarding collective investment schemes in general was sparked last year by Engsted, Larsen, and Møller (2011), but the direct investment alternative is not included here.

To make the findings in this thesis relevant for the Danish private investor a set of clear and consistent criteria is set up for the ETFs and MFs to be included. The ETF providers included must have ETFs benchmarked to all three benchmark indices presented in chapter three. Furthermore, the ETFs must be available through the online bank Nordnet, and be listed on Xetra, which is the electronic trading system run by Deutsche Boerse. As with the ETFs, Danish MFs benchmarked to either one of the three indices is included. No restrictions are imposed on MFs in terms of tax status, listing, or accessibility. These criteria are set up to ensure that the data used for performance testing is in fact comparable. It is important that the funds compared are benchmarked against the same index, as their performance will be dependent upon this.

No attempt will be made to reach a conclusion regarding the suitability of investing in Danish MFs in general. The purpose is to compare performance of the MFs against their ETF counterpart and the strict criteria set up for this comparison results in a relatively limited amount of funds. Therefore general conclusions are not obtainable as the dataset in this thesis is not sufficiently large. Conclusions on performance will only be relevant for the specific MFs included in the statistical tests, however, these finding are supplemented with conclusions from other performance studies.

Data is collected up to 09.05.2012 and the legislation and market information applied are as of this date. Throughout the paper the applied system of notation will be British English. In this thesis a series of abbreviations will be introduced and used. These are summarized in appendix 11.1, for the reader to have as a reference guide. In the presented tables and figures numbers are in some cases reduced to billion in order to provide a better overview. This leaves out some effects which are considered irrelevant for the overall picture. For detailed information refer to enclosed CD-ROM with all data and excel spreadsheets.

1.4 Thesis Structure

In order to provide an overview of how this thesis tries to answer the problem, figure 1.1 presents the procedure and the overall structure used to arrive at a conclusion. To the right of figure 1.1, the content of the chapters is outlined.

The thesis consists of two parts. After a brief presentation of traditional Danish MFs and the different types of ETFs, Part I focuses on the quantitative aspects of ETF investing, as well as the investment environment surrounding these in Denmark. Part II is dedicated to the in-depth analysis of the financial structure of ETFs, and seeks to uncover the dynamics governing these products and an analysis of the mechanisms and risks of the three ETP types analysed in this thesis.

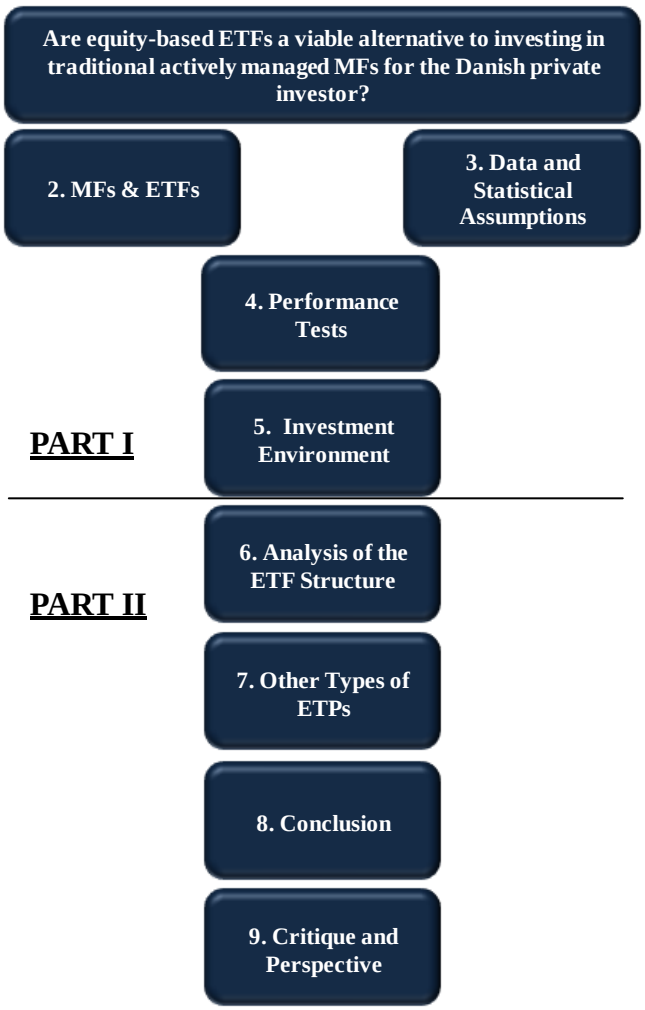


Figure 1.1: Thesis Structure. Source: Own Figure

Chapter 2 presents the concept of MFs and ETPs along with the financial structure of both traditional MFs and the different ETP structures. This will form the basis for further investigation in the rest of the thesis.

Chapter 3 introduces the data used for performance tests, and lays out the statistical assumptions used in these.

Chapter 4 presents the central performance test of the thesis. The procedures applied in the empirical tests are presented, and the results are analyzed and interpreted.

Chapter 5 applies a broader scope by reviewing and discussing the environment surrounding fund investments in a Danish context.

Chapter 6 presents the central analyses of the different financial structures for ETFs and a comparison between these. Recent regulatory critique will be addressed, as will the ongoing discussion regarding the risks associated with ETF investing.

Chapter 7 concludes the thesis by providing examples of other types of ETPs. Special focus is on the possible risks of these, and this point is communicated via three separate case studies

Chapter 8 provides a conclusion on the thesis as a whole

Chapter 9 puts the finding of the thesis into a broader overall perspective

2. MFs & ETPs

In this chapter the fundamental idea behind collective investment schemes is presented, and the structure of the traditional MF is presented. Secondly the term ETP is presented and the most common financial structures are presented.

As described in the introduction, collective investments are not a new phenomenon to the Danish private investor. Historically, collective investments in Denmark have been done through MFs, but with the invention of ETPs, a relatively new alternative has emerged. While being largely unknown in a Danish context, these products have experienced large success in both the US and much of Europe. For the private investor, ETPs might look like complicated products at first, since they do not form a homogenous group like MFs. Understanding the difference between these different types of ETPs is therefore crucial to the private investor, who wishes to understand the nature of this apparent low-cost alternative. Therefore both the most important attributes of MFs and ETPs will be presented in this chapter.

2.1 Idea Behind Collective Investments

One of the main reasons why MFs are popular today is that they provide easy access to diversification for the private investor with limited funds. By purchasing a single product the private investor is able to obtain a diversification effect, otherwise only available to institutional investors with larger holdings. Too see why diversification is desirable, consider that an investor is faced with two distinct sources of risk: Systematic risk, and non-systematic risk. Further assume that there are only two assets called A and B. If the portfolio consists of only these two assets, the total expected return and variance will be (Bodie, Kane, and Marcus, 2009):

$$E(r_p) = w_A E(r_A) + w_B E(r_B) \quad \textbf{(2.1)}$$

$$\sigma_p^2 = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_A w_B \sigma_A \sigma_B \rho_{AB} \quad \textbf{(2.2)}$$

$E(r_x) = Expected\ return\ of\ security\ x$

$w_x = Weight\ of\ security\ x$

$\sigma_x^2 = Variance\ of\ security\ x$

$\rho_{xy} = Correlation\ coefficient\ between\ security\ x\ and\ security\ y$

Expected return for a portfolio is the weighted average of the expected returns of its components, and is a linear function. However, the variance of the portfolio is not a linear function of its components unless the correlation coefficient is 1 (meaning that the assets are perfectly positively correlated). Looking at the special case where ρ=1 this is a perfect square:

$$\sigma_p^2 = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_A w_B\sigma_A\sigma_B = (w_A\sigma_A + w_B\sigma_B)^2 \quad \textbf{(2.3)}$$

$$<=> \sigma_p = w_A\sigma_A + w_B\sigma_B$$

This shows that when assets are perfectly positively correlated there is no diversification effect, and the portfolio variance is simply the weighted variance of the securities. As the expected return of a portfolio is the weighted average of the expected returns of its components, and portfolio standard deviation is less than the weighted average of its components for all ρ<1, diversified portfolios offer better risk-return than individual securities. This answers the central question of why diversification is attractive. These diversification effects are hard to obtain with limited funds and the private investor therefore has the choice of engaging in collective investments. Historically this option has been supplied by MFs in the Danish market. Among the most important factors for MFs are their cost structures, which are also of interest to the results of this paper. Therefore these will be presented first in the following.

2.2 Distribution and Costs of MFs

Several costs should be considered by the private investor, before investing in MFs. These will be covered in this paragraph.

2.2.1 Administrative Costs

Administrative costs are the costs incurred by the fund, in its daily operations. It is a fixed proportional cost, and it is easy to understand. Administrative costs include salary to the MF managers, property rental, custodian costs, marketing expenses, as well as agency commissions. The administrative cost is given as a percentage of the investment, creating the term "total expense ratio" (TER).

$$TER = \frac{Administrative\ Costs}{Investment} \quad \textbf{(2.4)}$$

TER is not to be confused with the Danish "ÅOP" often informed by MFs. ÅOP is based on not only administrative costs, but also cost associated with issuing and redeeming MF shares, trading costs, etc., over an investment horizon of seven years (Bechmann and Wendt, 2012).

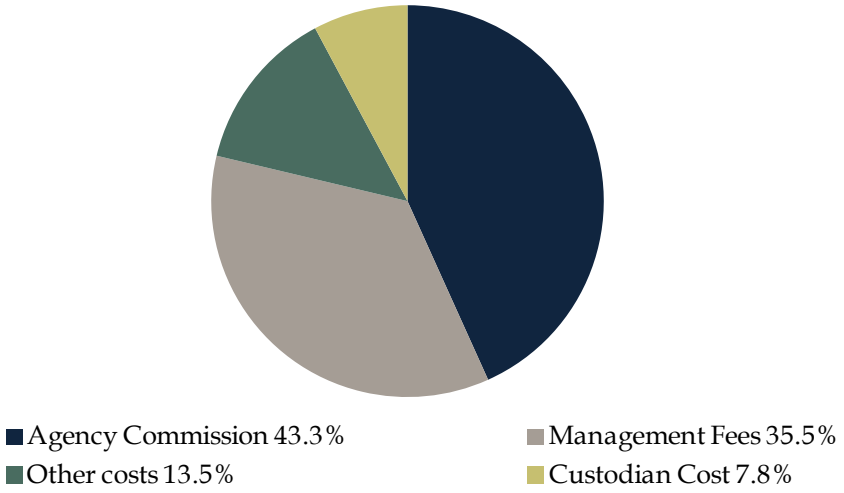


Figure 2.1: Components of administrative costs in Danish MFs in 2010. Source: IFR, 2010

As can be seen from figure 2.1, costs associated with agency commission constitutes the largest component of total costs, even larger than the actual management fees charged by the portfolio managers. This has been the focus of much attention in the Danish media in the spring of 2012[1], due to the publication of a report by Bechmann and Wendt which highlights some critical issues on the Danish investment market (Bechmann and Wendt, 2012). This report will be discussed in further detail in chapter five.

Administrative costs are embedded in the return of the MF, and are continuously deducted from the net asset value (NAV)[2] of the fund. Over time this will naturally reduce the overall return owned by the investor. When conducting performance tests of MFs (such as the ones in chapter four) it is important to remember that the return is net of administrative expenses.

2.2.2 Trading Costs

Two types of trading costs should be considered in MF investing: The trading costs faced by the investor when buying or selling the MF shares, and the trading costs incurred by the fund itself when trading the underlying securities. As is the case with any traded security, the private investor is faced with trading costs when buying or selling in the open market. This cost can either take the form of direct commission to the broker, or alternatively the bid-ask spread offered. The size of the cost associated with trading depends on several factors including the broker, the exchange the securities are listed on, and the type of security traded. When the fund trades securities in the open market, it is faced with commission costs and/or a spread to the last quoted price. As is the case with administrative costs, trading costs in the fund will be subtracted from the

[1] See e.g. "Skarp kritik af bankernes skjulte guldæg", http://www.dr.dk/DR1/penge/2012/03/21143638.htm.
[2] Net asset value is the value of the assets of the fund, less its liabilities (Blackrock, 2012d)

NAV on a continuous basis, reducing the performance of the fund over time. However, in contrast to administrative costs, the fund's trading costs are not known ex ante, thereby making it hard for the investor to make an informed decision (Bechmann and Wendt, 2012).

The size of the trading costs in the fund depends on several factors, including how often the fund is trading in the market (the turnover rate), and the nature of the securities being traded.

$$Turnover\ Rate = \frac{NAV\ of\ securities\ traded}{NAV\ of\ fund} \quad \textbf{(2.5)}$$

MFs with an investment universe where securities are more expensive to trade will *ceteris paribus* incur higher trading costs, than MFs trading in larger and more liquid markets (Bechmann and Wendt, 2012).

2.2.3 Emission Allowance

Besides administrative costs, investors might also face additional costs associated with the emission of MF certificates. Whenever an investor buys a MF certificate the MF has costs associated with this. These costs include a commission to the fund for issuing the certificate and trading costs for buying additional securities to the fund (including buying foreign currency to make the trade). The buyer is to pay these costs, so that the existing investors do not pay the "entry costs" for new investors (Bechmann and Wendt, 2012). However, the new investor has to consider these costs in their investment decision.

2.2.4 Redemptions Charge

In much the same way that a MF has costs whenever new certificates are issued, costs are incurred whenever investors wish to redeem certificates. As with the issue of new certificates, the fund has to trade securities in the market, hence has administrative expenses related to the emission, etc. Following the same logic as with the emission allowance, a redemption charge is asked of the investor wishing to redeem MF shares, in order for the remaining investors not to have to cover these expenses.

2.2.5 Total Cost

In summary, the investor in MFs needs to consider a variety of costs. By only focusing on the administrative costs expressed in TER, far from every cost incurred, will be included in the overall assessment of the fund.

Fund	Administration Costs	Trading Costs	Emmision Allowance	Redemption Charge	Turnover Rate	Holding Cost
Handelsinvest Verden	2.01%	0.48%	1.50%	0.50%	0.36	2.49%
Sydinvest Verden	1.12%	0.65%	1.83%	0.55%	1.20	1.77%
Lån og Spar Invest Verden	1.73%	1.00%	1.40%	0.65%	0.81	2.73%
Nielsen Global Value	1.84%	0.02%	2.13%	0.63%	0.08	1.86%
Nordea Invest Verden	1.26%	0.34%	2.00%	0.50%	0.35	1.60%
Nykredit Invest Globale aktier	1.14%	0.13%	2.00%	0.40%	0.07	1.27%
Jyske Invest Aktier Pension Acc	1.39%	0.42%	2.40%	0.50%	0.54	1.81%
Maximum	2.01%	1.00%	2.40%	0.65%	1.20	2.73%
Minimum	1.12%	0.02%	1.40%	0.40%	0.07	1.27%
Median	1.39%	0.42%	2.00%	0.50%	0.36	1.81%

Table 2.1: 2010 costs for MFs benchmarked to MSCI World. Source: IFR, 2012d

The table above provides average 2010 cost figures for the MFs benchmarked to MSCI World, which will be tested later in this thesis[34]. All figures are taken directly from the source, except holding cost, which is the sum of the administration costs and trading costs and is the yearly cost incurred by the MF investor.

As can be seen, even within the same investment universe costs can vary significantly from fund to fund. Consider Nielsen Global Value as an example. By only focusing on administration costs it would seem to be the second-most expensive fund. However, by having a very low turnover rate of only 0.08 the fund is able to keep trading costs at just 0.02%. In doing so, Nielsen Global Value is considerably cheaper than Lån og Spar Invest Verden, a fund that looked cheaper measured on administration costs.

2.3 MF Structure

As presented in the introduction, the MFs investigated in this thesis are equity-based MFs. This paragraph will consider the structure of equity-based MFs.

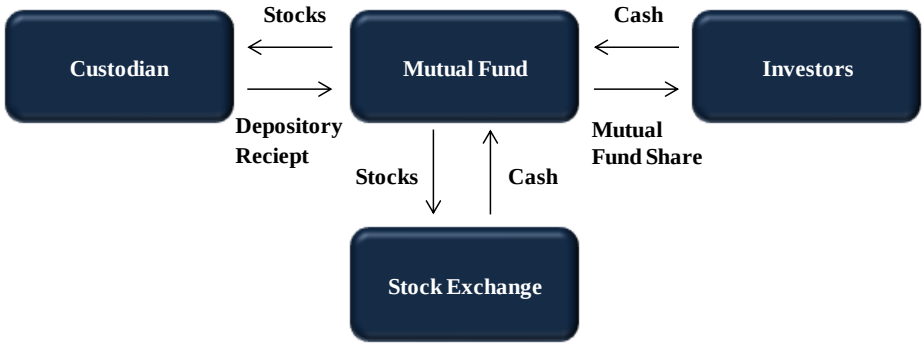


Figure 2.2: Simplified flow chart of an investment in a MF. Source: Own figure

[3] For in depth selection criteria of funds, please refer to chapter three.
[4] The same overview is provided for Europe and Emerging Markets MFs in appendix 11.2.

Figure 2.2 shows the structure of a Danish equity-based MF. The investor starts the process by buying a MF certificate from the MF, in exchange for cash. The certificate is usually bought through a retail bank. Each MF certificate grants the investor ownership of a portion of the fund. The cash acquired by the fund from the investor is used for purchasing stock on one or more stock exchanges, depending on the goal and benchmark of the fund (Morningstar, 2009).

Upon acquiring these certificates, the fund transfers them to a custodian bank, which will safeguard the assets. According to Danish legislation[5], all MFs are required to deposit their assets with a custodian that has been approved by the Danish FSA[6] (Retsinformation, 2011). The role of the custodian is only to safeguard the assets, as all investment decisions are still done at the fund level. The custodian handles settlements of sales and purchases of certificates, collects dividends when paid and administers corporate events such as stock splits, mergers and the like (Sparinvest, 2012). While the MF makes the decision regarding the timing and size of dividend payments, the actual transfer is also handled by the custodian.

The popularity of Danish MFs cannot be denied, and the industry has achieved impressive growth rates. However, critique has emerged concerning the cost of actively managed MFs and the fact that this cost structure might not always be easily recognized by the consumer. Furthermore, sparked by the article by Bechmann and Wendt in March 2012 (Bechmann and Wendt, 2012), the relationship between MFs and the retail banks distributing the MF certificates has been scrutinized. This recent debate might have prompted the private investor to consider alternatives to investing in classic Danish actively managed MFs. In the following such an alternative is presented.

2.4 ETPs

As described in the introduction, ETPs have experienced high growth since their invention. The wide umbrella term of ETPs captures all types of ETFs, but also the other types of products such as ETCs and ETNs. The overview is presented in the following figure 2.3.

[5] Lov om Investeringsforeninger mv, §8.
[6] The Danish FSA is the governing body of the Danish state to ensure compliance with financial regulation.

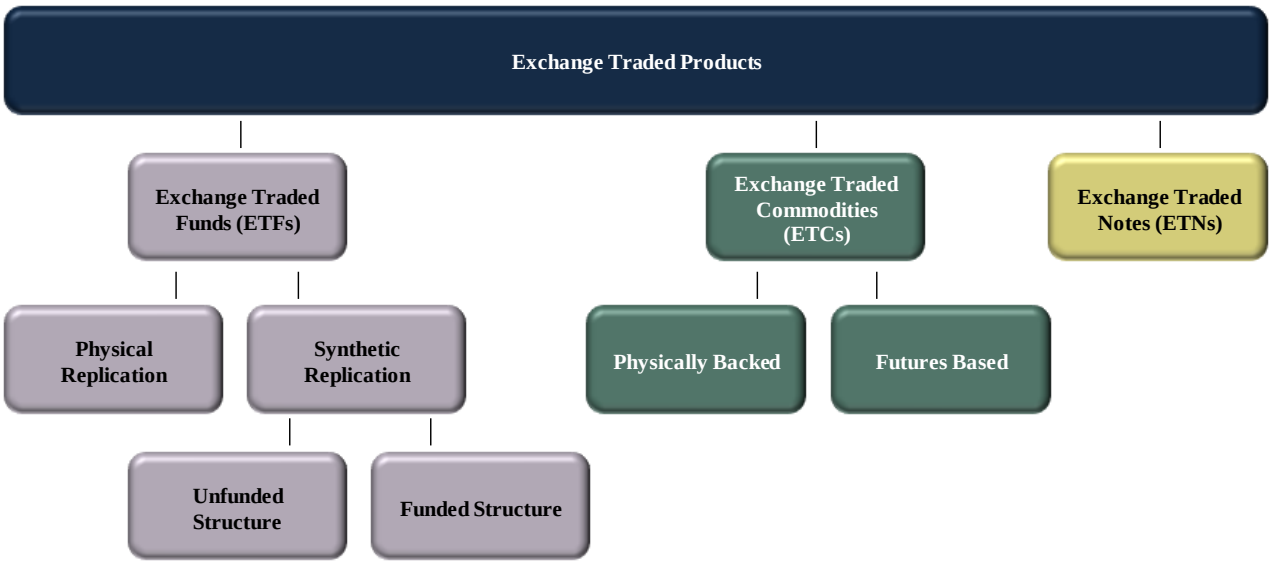


Figure 2.3: Overview of ETPs. Source: Own Figure

As will become evident throughout this thesis, ETPs are not a homogenous group. While the main focus of this thesis is equity-based ETFs, one cannot cover these instruments without also covering the other types of ETPs. This is mainly due to the apparent confusion that exists regarding the difference between these products. By reading through the media coverage of ETPs both in Denmark and abroad, it seems the press has already adopted the "ETF" term as an umbrella term for the entire range of ETPs. As can be seen from figure 2.3 this is not correct. By understanding the structure of other types of ETPs, the understanding of equity-based ETFs is further reinforced.

Should the conception take hold that ETFs are similar to other types of ETPs, there is a risk that private investors might not fully understand the risk associated with each product. Many of these other ETPs are not funds, making the ETF acronym (Exchange Traded *Funds*) misinforming. As opposed to the ETFs considered in chapter six, other types of ETPs differ in the means used for replication, diversification rules, collateral management, and overall counterparty risk. The market for commodity ETFs as well as other types of ETFs has become an increasingly larger share of the total ETP market in Europe, making them the subject of both interest and concern for regulators (see appendix 11.3). It should be noted that the discussion of risks associated with ETPs such as ETC and ETNs, should not be confused with the discussion on the risks of synthetic ETFs. Certain regulatory bodies tend to blend these two issues together, further contributing to the apparent confusion of these terms. Consider e.g. the following quote from the US Financial Stability Board (FSB):

"Product innovation has recently flourished in the ETF market, as well as in the market for close substitutes of ETFs such as ETNs or ETVs, which are essentially debt products (while ETFs are funds), extending the asset class beyond its initial plain-vanilla standardised nature." – (FSB, 2011).

Therefore it is found central to investigate the mechanisms and risks of ETPs along with the equity-based ETFs which will remain the main focus of this thesis. The ETPs which will be discussed are leveraged and inverse ETFs, ETCs and ETNs. Equity-based ETFs is thoroughly analyzed in chapter six, and the three other ETPs are covered in chapter seven.

2.4.1 Equity-based ETFs

As described in the introduction ETFs account for the largest majority of ETP investing and it is also the most directly comparable alternative to MF investing. ETFs are open-ended funds listed on an exchange, which provides the diversification effect offered by traditional MFs, as well as the flexibility of stocks[7]. This flexibility includes the possibility of short selling, and writing options on the ETF, although the options market on ETF is relatively limited outside the US (Ramaswamy, 2011). In Europe equity-based ETFs are generally UCITS[8] regulated.

Physical ETFs

In the following, the creation process for physically replicating ETFs is presented along with the different marketplayers participating in it.

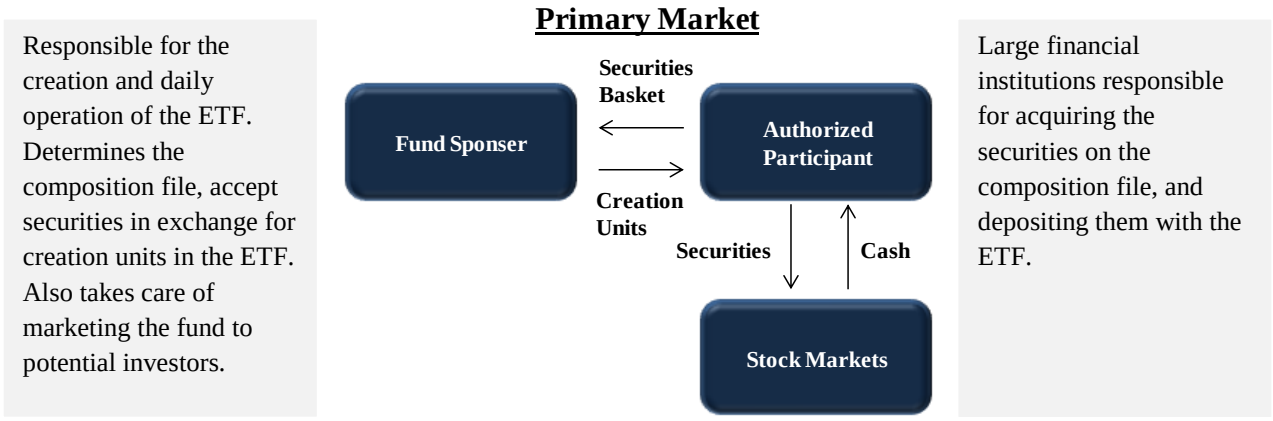


Figure 2.4: Primary market for ETF creation. Source: Own figure

[7] For a complete overview of the global and European ETF landscape, please refer to appendix 11.3.
[8] Undertakings for Collective Investment in Transferable Securitites (2009).

Figure 2.4 shows the primary market for ETF creation. An important part of this initial phase is determining the list of securities that can be delivered to the fund in exchange for the so-called creation units. This list is called the composition file, and it spells out the components and their weights in the index, which the ETF is tracking (Deloitte, 2009). When the administrative decisions have been made, the fund sponsor will contact institutional investors, typically pension funds and large asset management companies, to act as Authorized Participants (APs) for the ETF.

After forming participation agreements, the APs are responsible for creating and redeeming creation units in exchange for the securities basket specified in the composition file. In the creation process the APs deliver the basket of securities specified in the composition file (e.g. a basket of stocks matching the MSCI Europe index) to the custodian, and the ETF will issue creation units to the AP in return, typically in multiples of 50.000 (Ramaswamy, 2011). When the creation units are received in exchange for physical assets, this is called the "in kind" creation model. Creation units can be thought of as deposit receipts or warehouse receipts, as they represent a claim on the assets stored with the custodian. The creation units are not the actual ETFs, but are instead broken into smaller parts which constitute the ETFs. As such, the ETFs represent a fraction of the creation unit owned by the AP, which again represents a direct claim on the basket of securities held by the custodian. The number of ETF shares created by each creation unit is a direct function of the NAV of the creation unit, and therefore on the NAV of the securities basket. This concludes the primary creation process.

Once the ETF shares have been created, the AP can sell them in the open market by listing them on an exchange, just like a stock. Just as a stock represents ownership of the company issuing them, the ETF shares represent equity ownership of the creation unit. However, a fundamental difference is that the underlying value of the ETF (the NAV per share) is very well defined for an ETF, whereas the value of a normal stock is not. The difference between the pricing mechanism of a stock and ETF is described in detail in chapter six. Once the ETF is listed it can be traded with anyone with access to the exchange, and the APs often also act as market makers in the ETFs.

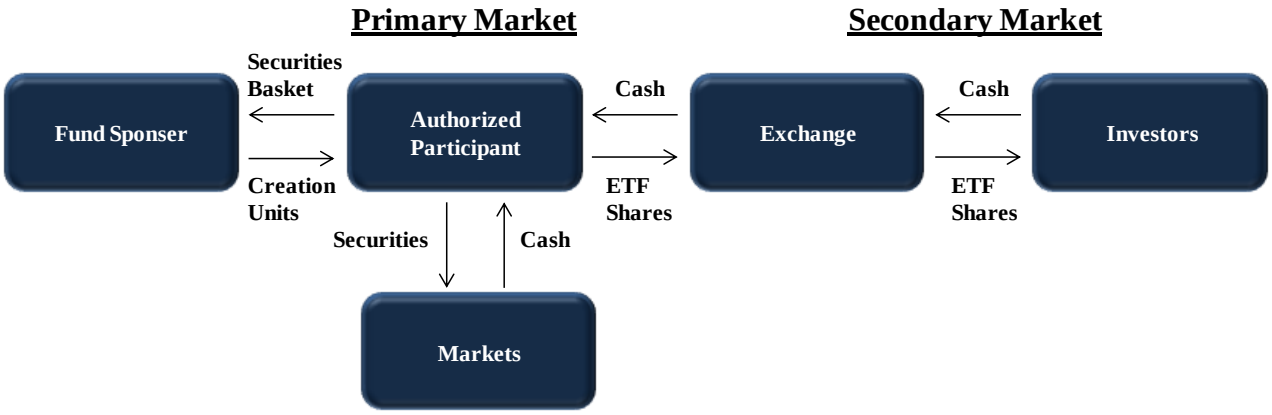


Figure 2.5: Physical ETF creation process. Source: Own figure

The creation of ETFs thus takes place in both the primary and secondary market. The process where the APs create and redeem ETFs is the primary market for ETFs, and the secondary market is the free trade of the ETF shares. This is quite different from the classic MF, where it is the MF itself that issues and redeems MF certificates through retail banks.

This structure should ensure that the ETF shares trade at, or alternatively very close to, the NAV. As an example, consider an ETF share that trades below its NAV. In this case the AP can buy the ETF shares in sufficient numbers, and redeem the creation units with the fund sponsor in exchange for the deposited securities, leaving the AP with an arbitrage gain. The creation process described so far relates to ETFs using physical replication, i.e. the funds is physically in possession of the securities that make up the underlying index that is being tracked. Another type of equity-based ETF is synthetic ETFs, which will be presented in the following.

Synthetic ETFs (unfunded structure)

Synthetic ETFs make use of financial derivates to replicate the return of a benchmark. There are, generally speaking, two types of synthetic ETFs where the first is presented here. In a synthetic ETF the APs receive creation units in return for cash instead of the basket of securities specified in the composition file for the physical ETF. This is called the cash creation model. Instead of holding physical securities, the fund sponsor enters into a total return swap, typically with a parent institution. As an example Deutsche Bank's x-trackers[9] have entered into total return swaps with the London branch of Deutsche Bank (Deutsche Bank, 2011). A total return swap is a financial contract where one party (here the swap counterparty) promises to pay the total

[9] ETF providers will be presented later in this thesis.

return on a specific security or index, in exchange for some other return (here the return on the collateral basket[10]), or the return on an alternative basket (Ramaswamy, 2011).

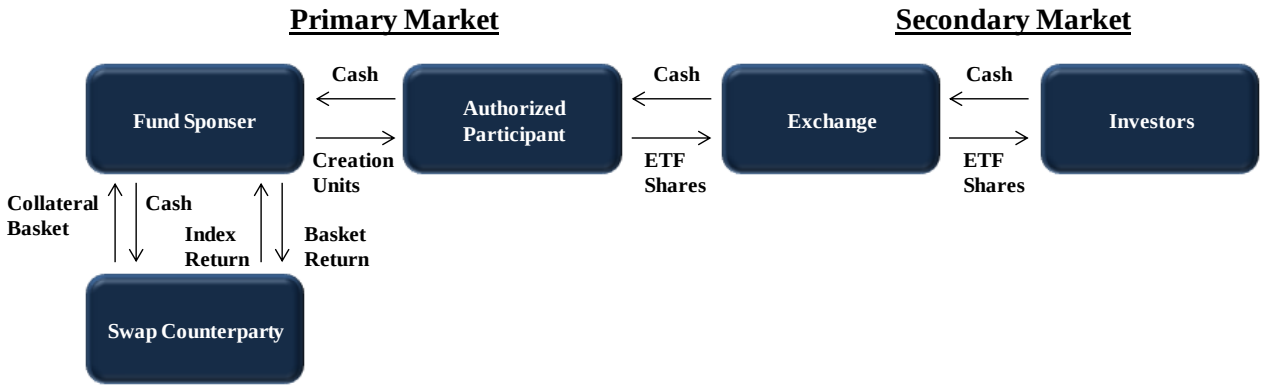


Figure 2.6: The unfunded swap synthetic ETF creation process. Source: Own figure

Figure 2.6 shows the unfunded synthetic structure. The fund sponsor transfers cash to the swap counterparty, and this cash transfer determines the notional value of the swap contract. The counterparty uses this cash to buy a collateral basket, which is transferred to the fund sponsor. The swap counterparty pays the fund sponsor the index return in exchange for the return on the collateral basket. A swap fee might also be added. The synthetic ETF creation process is otherwise identical to the process adopted by physical ETFs. Similar to the physical ETF structure, the APs also split up the creation units and sell the ETF shares on an exchange in the synthetic structure, as well as act as market makers.

Synthetic ETFs (funded structure)

A less used alternative to the unfunded swap synthetic structure is the funded swap structure. As in the unfunded swap structure, cash is transferred from fund sponsor to the counterparty, in exchange for the return on a specific index. However, in the unfunded swap structure the counterparty posts collateral to a third-party custodian. The account with the third-party can be opened by both the fund sponsor as well as the counterparty, and how this collateral is treated depends on the agreement struck between the fund and the counterparty. Generally speaking, two different structures can be adopted. With a transfer of title the collateral is legally the property of the fund and in the event of a default of the counterparty, the fund should in theory be able to immediately claim and liquidate the assets in case the counterparty defaults. The second option is to treat the collateral as pledged assets (Amanc et al, 2012). With pledged assets, the counterparty remains in legal possession of the assets and only in case of a default, will the ETF be able to access it. If this is the case, the fund would have to claim the collateral legally should the counterparty default. Potentially this could delay

[10] LIBOR: London Inter Bank Offered Rate.

the liquidation of the assets, in case the bankruptcy administrator decided to freeze the assets (Johnson, Bioy, and Rose, 2011). This issue will be covered in detail in chapter six.

The fact that fund sponsors call the structure depicted in figure 2.7 a funded swap structure is technically misleading. A swap is characterized by two legs of regular cash flows, but in the funded swap structure there is only one, namely the index return paid by the counterparty to the fund sponsor. Furthermore, the principal is due when the agreement is terminated. This is not the characteristics of a swap, but rather an equity-linked note, where the counterparty risk is collateralized. So what figure 2.7 really show is an equity-linked note secured by a collateral pledge (Ramaswamy, 2011).

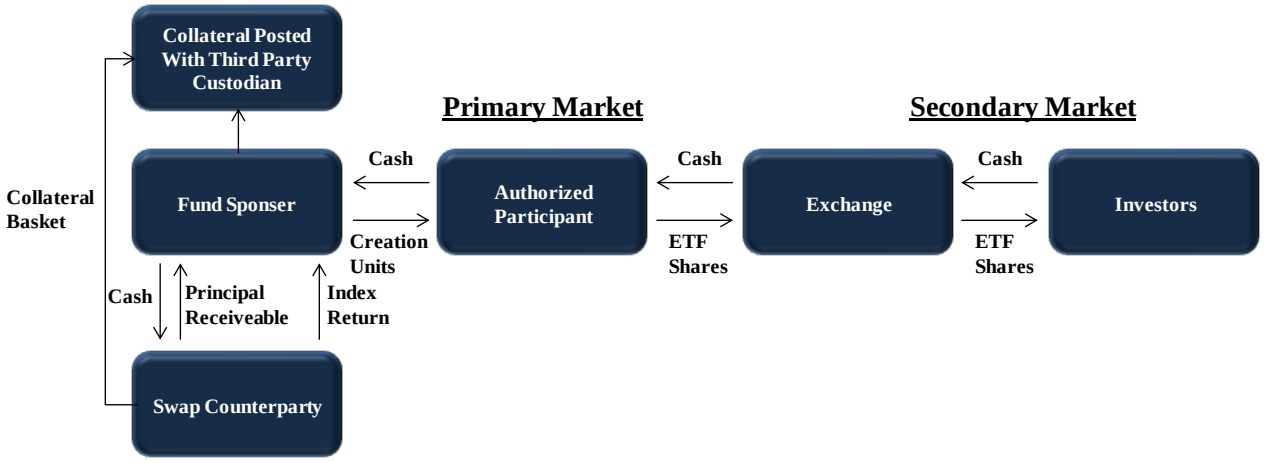


Figure 2.7: The funded swap synthetic ETF creation process. Source: Own figure

This concludes the introduction of standard equity-based ETFs, and in the following the three other types of ETPs are presented.

2.4.2 Leveraged & Inverse ETFs

Leveraged ETFs provide the investor with a multiple of the return of an index over a certain period of time. In the same way inverse ETFs and inverse levered ETFs theoretically deliver a return equal to the opposite of the daily index return or multiples hereof. Leveraged ETFs have gained popularity in past years. By mid 2011, 261 leveraged ETFs were listed on one or more European exchanges, totalling 11USDbn or the equivalent of approximately 3% of the total ETP market at the time (Amanc et. al, 2012). The growing popularity of these ETFs has contributed to academics raising warnings regarding potential destabilizing effects of leveraged ETFs (Cheng, Madhavan, 2009). Furthermore, regulators have questioned whether the nature of leveraged ETFs is fully understood by private investors (see e.g. FSB, 2011). In a Danish context, the most well-known

leveraged ETFs are the XACT BULL and XACT BEAR ETFs provided by the Swedish bank Handelsbanken, which are regularly among the most traded securities on Nordnet (Gandrup, 2010)

As opposed to other types of ETPs, providing a financial structure for leveraged ETFs is difficult, since the return of leveraged ETFs can be obtained in numerous ways. Some use options, others use futures or forwards, and others again use swaps or other derivatives (Amanc et al, 2012).

2.4.3 ETCs

An asset class which has become increasingly popular over the last years is commodities. Commodities have commonly been associated with high returns and are considered to provide diversification to the more common assets classes of e.g. stocks and bonds. In the past decade a search for higher returns led to a strong demand for commodities, which at this point were still fairly new investment assets (Gorton and Rouwenhorst, 2004). In the wake of the financial crisis, however, investment in commodities and in particular gold has been seen as a method of obtaining exposure to a broader array of asset returns. This trend has to some extent been reinforced by a flight to safety following steep declines in stock prices and negative real interest rates on bonds, as commodities historically has exhibited negative correlation to equity and bond returns (Gorton and Rouwenhorst, 2004).

Historically, investors seeking commodity exposure had the option to purchase the commodity physically, invest in futures or forwards on the commodity or invest in a company exposed to the commodity price development (such as a mining company). Therefore commodity investing has not always been easy or even possible for the private investor. This has now changed with the introduction of ETCs which track the performance of commodities markets. The first ETCs the SPDR Gold ETC was launched in 2004 (SPDR Gold Trust, 2012), and the growth in ETCs has been strong. As of 2011 there were over $80 billion invested in ETCs (Guedj, Li, and McCann, 2011).

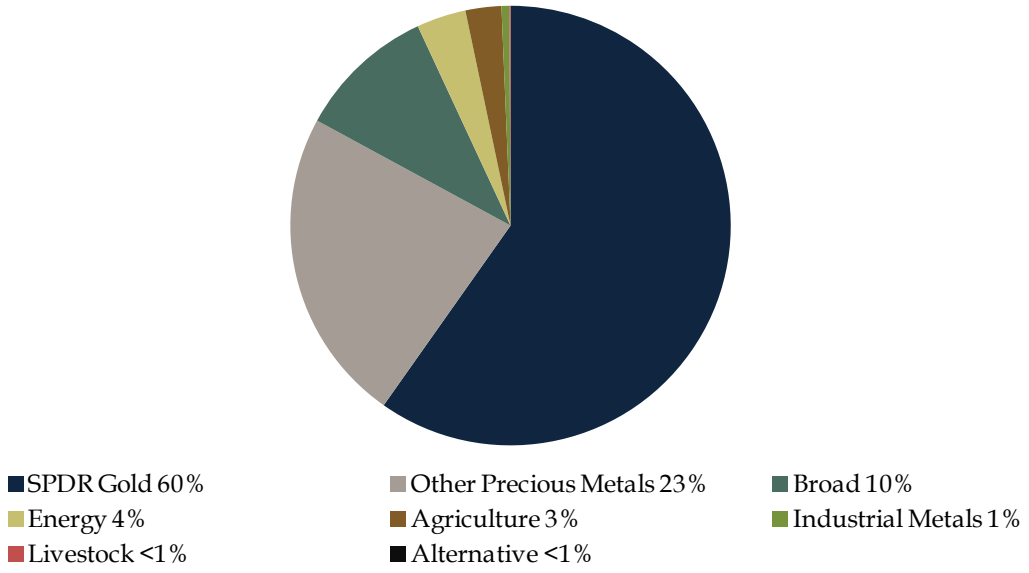


Figure 2.8: Share of global ETC AUM. Source: Blackrock (a), 2012, Breakdown of Global ETC assets

As can be seen from figure 2.8, the SPDR Gold ETC is more than 60% of the total ETC market, however this categorization only considers physically backed ETCs[11]. It is in particular the SPDR Gold ETC that has driven the growth in ETCs. According to the Economist (2011), apart from America, France, Germany and Italy, this SPDR Gold ETC holds more bullion than all the world's central banks. As the SPDR Gold is such a large part of the ETC universe, this specific structure will be presented in the following.

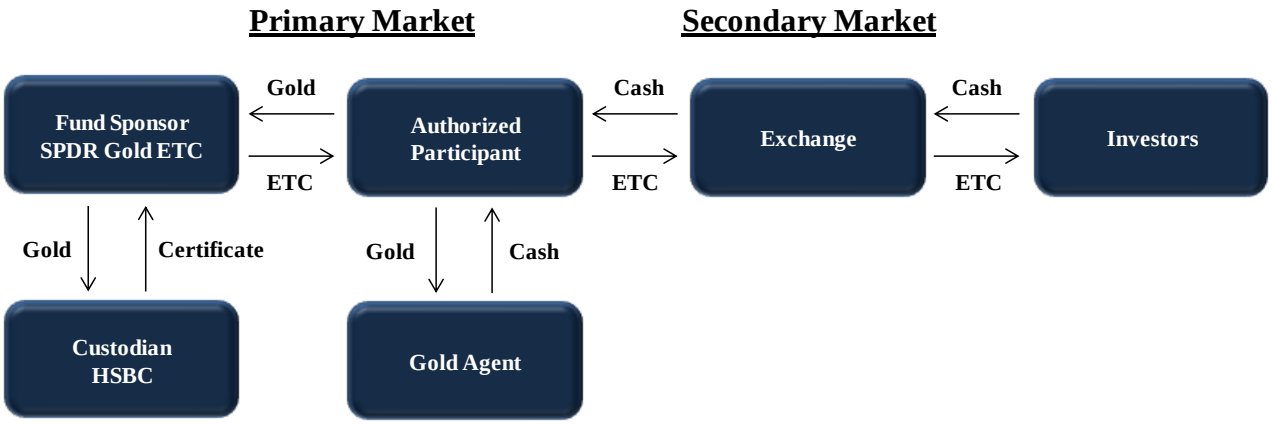


Figure 2.9: SPDR Gold Physical ETC Creation Process. Source: SPDR Gold Prospectus information

[11] Blackrock Definition of ETC: iShares defines ETCs as debt securities that are backed by fully-allocated physical holdings of precious metals kept in secured vaults.

As can be seen this structure is very similar to that for physical ETFs, the difference from these is that instead of transferring securities the transfer involves gold. The addition of a custodian is presented as the gold is secured at a vault at HSBC, thus ensuring that the ETF is asset backed. The difference also arises based on the fact that the ETC certificate is a debt security and not a fund certificate as for the ETF. This implies that the owner (investor) of the certificate has claim on the ETC trust (in practice the fund sponsor of this picture), and this trust is backed by the physical assets in the form of gold. Whereas for the physical ETF the owner of the fund certificate directly owns a part of the ETF fund and thereby a part of the securities.

As described above Blackrock only considers physically backed ETCs as actual ETCs – in this paper the categorization of Rose (2011) is used. By Rose's definition a general trade of ETCs is that they are fully collateralized and can be backed by physical assets, futures or similar instruments. Furthermore ETCs are debt securities and not funds (Morningstar, 2012 (b)). Any ETC which does not live up to these requirements should, according to Rose (2011), be categorized as an ETN. ETNs will be described in the following paragraph. There is some confusion on this point, as there are examples of ETCs which are UCITS regulated and thereby in fact funds – this is the case for the ETCs marketed by db x-trackers (Deutsche Bank, 2009).

For the futures based ETCs there is no market leader as prominent as SDPR is for the physically based ETCs. Therefore a general industry standard is presented in the following figure 2.10.

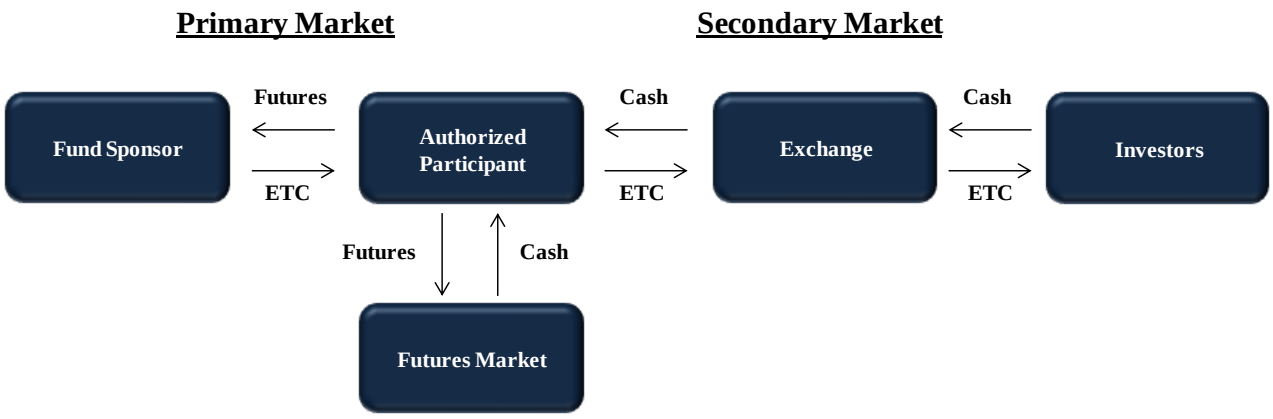


Figure 2.10: Futures Backed ETC Structure. Source: London Stock Exchange, 2009

Figure 2.10 shows the structure of a futures backed ETC. This structure is very similar to that shown for the physically backed ETC. The difference occurs in that it is futures being transferred between participants and in this structure these futures are not secured with a custodian. In order to obtain status as an ETC, the ETC certificates need to be backed by futures contracts, just like the certificates in the physical ETC structure needs

to be backed by physical gold holdings. If not, as described, they will be classified as ETNs, which are presented in the following paragraph.

2.4.3 ETNs

As mentioned there seems to be confusion in the media and even among regulators about the differences between various types of ETPs. Perhaps the most striking mistake and possibly the most dangerous, is the confusion surrounding the difference between ETFs and ETNs. The financial structure of an ETN is shown in figure 2.11 below.

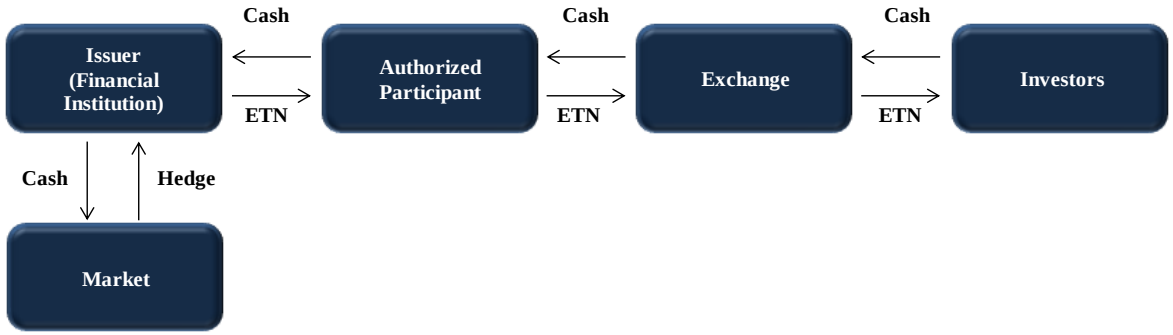


Figure 2.11: ETN structure. Source: Blackrock (c), 2012

ETNs are essentially non-UCITS, senior unsecured debt obligations issued by a single entity (typically an investment bank), and traded on an exchange. These ETPs are not asset-backed and the level of transparency can differ greatly from product to product (Rose, 2011). As ETNs are basically just a promise to deliver the return on something, this "something" can be practically anything; equity indices, bond indices, real estate, volatility indices, etc. Being non-UCITS products, ETNs are not subject to the rules concerning asset eligibility and diversification, which is the reason why they are able to provide exposure to a single asset class. Furthermore, ETNs can provide leverage much like leveraged ETFs, the effects of this will be presented in chapter seven.

The risks associated with equity-based ETFs will be analyzed extensively in chapter six. Leveraged ETFs, ETCs, and ETNs will be analyzed in chapter seven. Having provided the background knowledge of the financial structure of MFs, ETFs, and the other ETPs, the next chapter describes the data methodology and statistical assumptions applied in the thesis.

3. Data and Statistical Assumptions

This chapter covers the basis for empirical performance tests applied in this paper. The data foundation will be presented, and data handling and statistical assumptions will be covered.

This thesis cannot cover the entire investment universe, but the aim is for the ETFs included to represent a considerable share hereof. This will make the performance test in chapter four more relevant for private investors. According to Blackrock (Blackrock, 2011a), MSCI (Morgan Stanley Capital International) is the leading supplier of benchmarks used by ETFs. At the end of October 2011, more than 475 ETFs were benchmarked to an MSCI index, constituting a market share of 23.2% in terms of AUM (Blackrock, 2011a). Therefore, MSCI was chosen as the benchmark provider in this thesis. From MSCI, three benchmarks were selected due to their scope of investment, and geographical reach: MSCI World, MSCI Europe, and MSCI Emerging Markets. Together these three indices cover approximately 73% of global market cap (MSCI, 2012a) (Wigglesworth, 2011).

Like many academic papers researching fund performance (see e.g. Christensen, 2005), returns in this thesis will be based on NAV data. The NAV of a fund is a direct consequence of the underlying holdings, and reflects the "true" value of a fund at any given time. This is opposed to fund price quotes, as these can be influenced by a given supply-demand situation in the fund security. Since the short term supply-demand situation in the fund is not an indication of fund performance, using price quotes only adds artificial volatility to the observations. Furthermore, to assess the skills of an asset manager, only performance the manager has control of should be measured. This argument too favours the use of NAV data over price data.

3.1 ETF Selection Process

A set of clear and consistent criteria is set up for the ETFs to be included in the performance tests.

1. **Benchmark fit**

   Based on the selection of benchmark, ETFs are screened to find those benchmarked to one of the three indices. For a better overview and to ensure consistency only ETF providers with products relating to all three benchmarks are included.

2. **Accessibility**

   ETFs are limited to those accessible via the online bank Nordnet. This is done to make the findings in this thesis relevant for the Danish private investor. Nordnet is chosen due to its deposit fee of zero for both ETFs and MFs[12]. It is also free of charge to start a deposit at Nordnet. Furthermore, Nordnet has access to the German exchange Xetra, which leads to the final criterion.

3. **Exchange of Listing**

   Choosing ETFs listed on a single exchange provides consistency in the reporting required by the ETFs. Only ETFs listed on the Xetra (an electronic trading system operated by Deutsche Boerse), are included in this thesis. By selecting Xetra, the broadest possible selection of ETFs is aimed for since, as can be seen in appendix 11.3, Deutsche Boerse is the largest ETF exchange in Europe based on AUM.

When screening the European ETF universe, three ETF providers live up to the criteria outlined, making the total number of included ETFs nine. These are presented in table 3.1, and briefly introduced.

MSCI World	MSCI Europe	MSCI Emerging Markets
iShares MSCI World Inc	iShares MSCI Europe Inc	iShares MSCI Emerging Markets Inc
db x-trackers MSCI World TRN	db x-trackers MSCI Europe TRN	db x-trackers MSCI Emerging Market TRN
Lyxor ETF MSCI World A	Lyxor ETF MSCI Europe	Lyxor ETF MSCI Emerging Markets

Table 3.1: ETFs selected for tests. Source: Company Websites, Nordnet

iShares

iShares is by far the world's largest provider of ETFs with a worldwide market share of 39%[13], more than double the market share of its closest competitor (Blackrock, 2012a). The iShares brand is owned by Blackrock, which with approximately 3,500USDbn in AUM and more than 100 investment teams, in 27 different countries, is one of the largest asset management companies in the world (Blackrock, 2012b). Of the five central ETF regions globally, iShares is market leader in the US, Europe and Latin America. The majority of iShares ETFs use the physical replication technique described in chapter two, although a few funds use the swap-based synthetic replication structure. All three iShares ETFs used in this thesis use physical replication.

db x-trackers

db x-trackers is the second largest ETF provider in the European market, but unlike iShares db x-trackers acts primarily in the European market and is not among the top 10 providers in any other region. Since the launch in 2007, db x-trackers has been at the forefront of the push to introduce ETFs to the European market

[12] Deposit fees will therefore not have to be taken into consideration when evaluating results.
[13] Global ETP market share. This figure includes ETNs and ETCs as well as ETFs.

(Blackrock, 2011a). db x-trackers is a proponent of swap-based structures and most of its ETFs, including those examined in this thesis, use this structure. The swap-counterparty for the db x-trackers ETFs is the London Branch of Deutsche Bank (Deutsche bank, 2011).

Lyxor

Société Générale's ETF brand is the third largest ETF provider in Europe and provides a range of swap-based ETFs to both institutional and private investors. Like db x-trackers, Lyxor is only active in Europe (Blackrock, 2011), and the total-return swap counterparty for Lyxor ETFs is Société Générale (Lyxor, 2012).

3.2 MFs Selected

As was the case with the ETFs, the MFs selected for this thesis was done by applying a set of clear and consistent criteria. Firstly, the MFs included must be benchmarked to one of the three benchmark indices chosen for ETFs. Secondly, a minimum of 100 observations should be available for the MF to be included. Finally, where large gaps in the data were observed, the MF was excluded.

Based on these criteria, seven MFs benchmarked to MSCI World, nine MFs benchmarked to MSCI Europe, and three MFs benchmarked to MSCI Emerging Markets are chosen for further analysis.

MSCI World	MSCI Europe	MSCI Emerging Markets
Handelsinvest Verden	Alm. Brand Europæiske Aktier	Danske Invest Nye Markeder Inc
ISI Global Equities A Inc	BankInvest Europæiske Aktier	Jyske Invest Nye Aktiemarkeder
Jyske Invest Global Equities Acc*	BankInvest Europæiske Aktier Acc	Nykredit Engros Vækstlande
Lån og Spar Invest Verden	Carnegie Worldwide Europa	
Nielsen Global Value*	Danske Invest Europa	
Nordea Invest Verden	HandelsInvest Europa	
Nykredit Invest Globale Aktier*	Jyske Invest Europæiske Aktier	
	Nordea Europa	
	Sydinvest Europa	

Table 3.2: MFs included in performance tests. Source: IFR, 2012

Note that MFs denoted with a star (*) has an inception date later than 31.01.2000. For Jyske Invest Global Equities Acc the first return is observed 31.07.2001 (126 data points), Nielsen Global Value on 31.08.2002 (113 data points), and Nykredit Invest Globale Aktier on 31.07.2000 (138 data points). These funds are still included in the analysis as there are more than 100 observations, and no gaps in data after inception.

Although a thorough analysis of investment strategy for each MF included in the performance tests is outside the scope of this thesis, it is assumed that these MFs represent different investment strategies, and therefore accurately reflect the MF alternative to ETF investing. E.g. Nielsen Global Value has adopted the investment

philosophy of Benjamin Graham laid out in his 1934 book "Security Analysis". The focus of this particular investment style is to find undervalued companies with long term growth perspectives, without trying to "time" the general market (Nielsen Capital Management, 2012). Other funds might follow different and more beta oriented strategies. Also, when it comes to the number of stocks owned the MFs differ considerably. For example Handelsinvest Verden has a relatively focused investment strategy with no more than around 30 stocks in its portfolio (Handelsinvest, 2012), whereas Nordea Invest Verden has well over 200 (Nordea Invest, (2012).

3.3 Data

For MFs, NAV data is obtained from the Federation of Danish Investment Associations, and ETF NAV data is collected from the website of iShares, db x-trackers, and Lyxor respectively. Benchmark and currency data is collected from Bloomberg.

3.3.1 Accounting for Currency Differences

The NAV of Danish MFs are quoted in DKK, and the NAV of ETFs are quoted in either USD or EUR depending on their benchmark (see table 3.6 for ETF benchmarks). Benchmark indices used in this thesis are also quoted in either USD or EUR. To make cross-currency comparison possible, ETF NAV has been converted into DKK by means of historical exchange rates. The NAV quote is multiplied by the exchange rate before returns are calculated. Benchmark indices were downloaded in DKK via Bloomberg, making further currency adjustments unnecessary.

3.3.2 Accounting for Dividends

To reflect the full return to the investor, a total return approach is chosen. The total return of a fund includes capital gains as well as dividend payments. Dividends are added back to NAV the day after the payment date. In the data for IFR, iShares, and db x-trackers this is already done. For Lyxor, the only available data from the website is the NAV excluding dividend payments. Therefore, historical dividend payments are retrieved using Bloomberg, and added back to the NAV obtained from Lyxor. This should ensure consistency in the performance measurement across all MFs and ETFs.

3.3.3 Accounting for Missing Data Points

The last day of each month is chosen for data points, and the "VLOOKUP" excel function is used to return NAV values for each security and index. To account for missing data points e.g. relating to weekends, holidays or data glitches, the following methodology applies:

1. If there is data for the last day of the month, then the NAV from that day is used.

2. If there is no data for the last day of the month, the NAV from the day before is returned.
3. If there is neither data for the last day of the month or the day before, the day after is returned.
4. If none of the three previous options return any data, the cell is left blank.

By using this methodology, data can be obtained even if the last day of the month is a Saturday or Sunday, or any other circumstance where there are two successive days of missing data around the end of the month. More than two successive days of missing data will leave a blank data point. This methodology leaves almost no missing data points.

3.3.4 Risk Free Rates

As proxies for risk free rates, the yield on foreign 10-year government bonds has been used. The following is a short presentation of what risk free rate has been applied to each of the different investment universes.

MSCI World: US securities weigh 52% in the MSCI World index (see appendix 11.4, and for this reason the 10-year US Treasury bond yield has been used as risk free rate.

MSCI Europe: A Bloomberg index of the 10-year generic yield on euro zone government bonds has been used as risk free rate for the MSCI Europe. The index consists of yields from Germany, France, and Spain[14]. Measured by GDP, Germany is the largest European economy, France is third, and Spain is fifth (CIA World Factbook, 2012a). Choosing this index as the risk free rate for Europe excludes both the UK and Italy even though they are the second and fourth largest economies in Europe respectively (CIA World Factbook, 2012a). However, the benefit of having an easily accessible and reliable benchmark risk free rate is deemed to outweigh this fact.

MSCI Emerging Markets: The member countries of the MSCI Emerging Markets Index are more dispersed both in terms of geography and economic performance (CIA World Factbook, 2012b) than for World and Europe. To account for this the risk free rate has been based on an average of the 10-year government bond yields for four selected countries: China, South Korea, Taiwan, and South Africa. These four countries have been chosen based on their size in the benchmark as well as the availability of data. In the period from 2000 to 2006, reliable data can only be obtained for South Korea, Taiwan, and South Africa. In 2006 government bond yields for China is added. One could argue that the risk free is too dominated by Asian countries and in particular Latin America is not represented. However, due to missing data being an issue in the beginning of the period, a choice has been made to emphasize consistency across time.

[14] Bloomberg Ticker: GECU10YR INDEX.

3.3.5 Returns

Throughout this thesis, returns are calculated using the continuous convention.

$$r = LN\frac{NAV_t}{NAV_{t-1}} \quad \textbf{(3.1)}$$

$r = Total\ return$

$NAV_t = NAV\ at\ time\ t$

Continuously compounded returns scale proportionately to time, making them easy to work with.

$$r = e^{r_{cc}T} \quad \textbf{(3.2)}$$

$r = Total\ return$

$r_{cc} = Continuously\ compounded\ return$

$T = Time\ period$

3.3.6 Excess Returns

As described earlier, the risk free rate is based on the yield of various combinations of government bonds. The yield downloaded from Bloomberg is the effective annual rate (EAR)[15] (Bodie, Kane, and Marcus, 2009), whereas this thesis uses the continuous convention. Therefore, the risk free rates have been converted to continuously compounded rates, as well as converted to a monthly basis to match the returns of the ETFs and MFs.

$$r_{f_{cc}} = \frac{LN(1+r_{f_{EAR}})}{12} \quad \textbf{(3.3)}$$

$r_{f_{cc}} = Monthly\ effective\ yield\ using\ continuous\ compounding$

$r_{f_{EAR}} = Yearly\ effective\ yield\ using\ EAR$

Excess monthly returns are calculated by subtracting the monthly risk free returns from the monthly returns of each security and index:

$$R_x = r_x - r_{f_{cc}} \quad \textbf{(3.4)}$$

$R = Excess\ return\ of\ security\ or\ index$

$r_x = Return\ of\ security\ or\ index$

$r_{f_{cc}} = Monthly\ effective\ yield\ using\ continuous\ compounding$

[15] The official definition of EAR: "*..the percentage increase in funds invested over a 1-year horizon" (*Bodie, Kane, Marcus, 2009, pp. 118).

3.4 Data Considerations

Having shown the data requisition process as well as the methodology applied, a few considerations concerning the data should be made.

3.4.1 Survivorship Bias

Generally in analysing MF and ETF performance in an attempt to uncover the performance of an entire sector in a specific region, the possible presence of survivorship bias is important to consider. Malkiel (1995) argues that a systemic ignorance of non-surviving funds will lead to a significant overstatement of returns for an entire sector. As argued by e.g. Brown et al. (1992) and Carhart, Capenter, Lynch and Musto (2002) a sample containing survivorship bias may indicate an apparent persistence in performance, even if this persistence is not present. Therefore the presence of survivorship bias is critical in assessing the overall performance of a certain MF sector. Overgaard (2003) has conducted an analysis of the Danish MF market in which he found survivorship bias to be very small; therefore the universe in which this paper takes place seems to be a strong starting point.

Furthermore, the objective of this thesis is not to uncover the performance of the complete Danish MF sector but to test the performance of the comparable funds to the ETFs available. Therefore the number of MFs is as presented quite limited and the generalization of the results will therefore also be limited. Besides survivorship bias also index timing could impact the conclusions reached in chapter four.

3.4.2 Index Timing Considerations

All three benchmark indices follow US trading hours (as does the currency price quotes), whereas MFs and ETFs analyzed in this thesis follow European trading hours. This creates a small error term, which will be addressed in the following.

Consider a single ETF and its benchmark index. In European time the ETF will start trading in the morning and end trade in the afternoon. The benchmark which is following US trading hours will start trading during European afternoon, and end trading sometime later in the evening. Between the end of trading for the ETF and the end of trading for the benchmark, the benchmark value will most likely change. This will cause a small variation between the daily return of the ETF and the daily return of the index, even if the return of the ETF was identical to the return of the index at the closing time for the ETF. When the ETF starts trading the following morning, this difference will in theory be annulled due to arbitrage opportunities. The opening NAV price will thereby reflect the change in the benchmark after the ETF closed the previous day. This indicates

that this timing difference plays only a small role over longer periods of time, but can potentially distort daily return figures.

One indication of this is to look at the TE. Indeed, if yearly TEs for the ETFs are calculated based on daily returns, these results are many times greater than when based on monthly returns. This is due to the way yearly TEs are calculated. It must be assumed that the timing difference between the index and ETF returns is annulled at the beginning of each trading day. If this is the case the absolute difference due to time discrepancy is the same whether returns are calculated on a monthly or on a daily basis. When yearly TEs are based on monthly returns, the error due to timing difference is multiplied by a factor of $\sqrt{12}$. However, when based on daily returns the error is multiplied by a factor of $\sqrt{260}$ (assuming 260 trading days during a year). Therefore, based on the timing difference alone TEs based on daily observations are expected to be approximately 4,65 times larger than TEs based on the same data but on a monthly basis:

$$\frac{\sqrt{260}}{\sqrt{12}} = 4{,}65 \qquad \textbf{(3.5)}$$

By using monthly data this source of error is minimized, while still providing sufficient data for conclusions. This concludes the data presentation, and in the following the statistical diagnostics will be presented.

3.5 Statistical Diagnostics

The data just presented will be applied in statistical tests in the following chapter. To form a basis for statistical modelling the data must fulfil a certain criteria (Keller, 2005). These criteria are often assumed fulfilled, when performing statistical tests. This paragraph will present and analyse the data with respect to these criteria, in order to form a basis for the performance test conducted in the following chapter. In case the data does not fulfil these criteria, the implications for the results will be considered. By discussing these assumptions it will be evident that a theoretical model never will be able to fully embrace all aspects in the real world.

3.5.1 The Error Terms are Normally Distributed

The attribute of normally distributed error terms should be met in order to apply standard distributional theory to the data in question. In dealing with a sample of more 100 observations there is rarely a problem according to the Central Limit Theorem (CLT), see Keller (2005), however for equity market returns, normally distributed data is not often observed. In order to confirm or reject whether the errors terms of the data in the regression analysis are normally distributed the Jarque-Bera test for normality, is applied (Wooldridge, 2009).

Jarque-Bera Test for Normality

$H_0: \varepsilon \sim Normal\ Distribution$

$$JB = \frac{n}{6}\left(S^2 + \frac{1}{4} K^2 \right) \quad \textbf{(3.6)}$$

$n = Number\ of\ observations$

$S = Sample\ skewness$

$K = Sample\ kurtosis$

The test for normality of the error terms of the pure selection test for World is presented in table 3.3 below.

	World Pure Selection					
	iShares Backtracked			iShares		
Fund	Jarque Bera	P-value	Normality	Jarque Bera	P-value	Normality
Handelsinvest Verden	575.027	0.000	No	228.716	0.000	No
ISI Global Equities	1005.706	0.000	No	248.970	0.000	No
Jyske Invest Global Equities Acc	32.162	0.000	No	11.104	0.004	No
Lån og Spar Invest -Verden	216.437	0.000	No	78.812	0.000	No
Nielsen Global Value	4.756	0.093	Yes	8.496	0.014	No
Nordea Invest Verden	427.407	0.000	No	168.193	0.000	No
Nykredit Invest Globale Aktier	498.199	0.000	No	1074.583	0.000	No

Table 3.3 Normality Tests MFs World. Source: Own production based on data in Excel and SPSS

As can be seen from table 3.3, there are issues of non-normality for all error components at the 5% alpha level, except for Nielsen Global Value versus iShares backtracked for the World MFs. The same applies for a considerable part of the error terms of the other tests, see appendix 11.10. Therefore the criterion of normality in the error components is clearly violated. This implies that the distribution fitted to the data does not constitute a good fit. Thus the significance testing applied is not properly matched to the distribution and must be interpreted with great care.

In recent years there has been an increasing number of the so called "Tail – Risk" events, which implies that the custom of applying a standard normal distribution this type of data is increasingly questionable. Empirical return data are in fact infamous for having a tendency for "Fat Tails" – which arises when extreme returns is observed with a higher frequency than for the normal distribution. This implies that if the normal distribution is in fact not applicable to the data the actual risk of negative returns is underestimated.

When Markowitz in 1952 instated the foundation for portfolio theory, it was built upon the work of Bacheliers' widely accepted assumption of normally distributed returns. This assumption was later questioned by Mandelbrot (1963) and Fama (1965) which claimed that this was too simple of an assumption based on the

empirics. They found that empirical return series data was commonly centred around the mean and with a larger tendency for "fat-tails" than the normal distribution. The distributional attributes of return series data has since this been studied extensively and the general conclusion is that the normal distribution is not a good fit for return series data. In a study of daily, weekly and monthly data log return series for S&P500 and FTSE All Shares, respectively, Harris and Kücüközmen (2001) also concludes a breach of the normality assumption.

Therefore, as evidenced, non-normality is often the case for return series data. This was also acknowledged by e.g. Jensen (1968). Jensen (1968) however emphasized the fact that presence of normality is only necessary to rely *strictly* on tests of significance, therefore Jensen (1968) posts a warning to the reader to interpret the respective tests as simply indicative. In this paper the same approach is applied, acknowledging that there is presence of non- normality in a considerable part of the error terms of the tests performed, but advising the reader to keep this in mind in applying and interpreting the results.

3.5.2 The Error Terms Displays a Constant Variance

The second criterion for statistical inference implies that the variation in the error component must be constant and independent of the explanatory variables (homoscedascity). In order to evaluate this attribute of the error components the White test for heteroscedasticity is applied (Wooldridge, 2009).

Whites Test for Heteroscedasticity

$H_0: \varepsilon = Homoscedastic$

$$\hat{u} = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + \delta_3 x_1^2 + \delta_4 x_2^2 + \delta_5 x_1 x_2 + v \quad \textbf{(3.7)}$$

$\hat{u} = Estimated\ residuals\ from\ regression$

$\delta = Sensitivity\ to\ the\ independent\ variables$

$v = Residual$

	World Pure Selection					
	iShares Backtracked			iShares		
Fund	White	P-value	Heteroscedasticity	White	P-value	Heteroscedasticity
Handelsinvest Verden	0.316	0.729	No	0.015	0.985	No
ISI Global Equities	17.825	0.000	Yes	27.118	0.000	Yes
Jyske Invest Global Equities Acc	10.668	0.000	Yes	16.789	0.000	Yes
Lån og Spar Invest -Verden	12.940	0.000	Yes	13.690	0.000	Yes
Nielsen Global Value	14.892	0.000	Yes	26.043	0.000	Yes
Nordea Invest Verden	8.337	0.000	Yes	11.948	0.000	Yes
Nykredit Invest Globale Aktier	6.396	0.002	Yes	4.175	0.019	Yes

Table 3.4 Own production based on data in Excel and Eviews, Source: IFR, Company Websites and Bloomberg

As can be seen at the 5% alpha level there is evidence of significant heteroscedasticity for all World MFs except for Handelsinvest Verden. Referring to appendix 11.11, the same general picture applies for the Europe, while the opposite scenario is present for Emerging Markets. For the Emerging Markets tests only Nykredit Engros Vækstlande appears to results in heteroscedastic error terms. Thus for a considerable part of the tests, there is evidence of heteroscedasticity. The variance of the estimated error components, which do not satisfy the criteria of homoscedastiticy, is biased. While the coefficients should remain unbiased, the resulting F- and t-statistics of the regression analysis are unreliable. This has an adverse effect on the test.

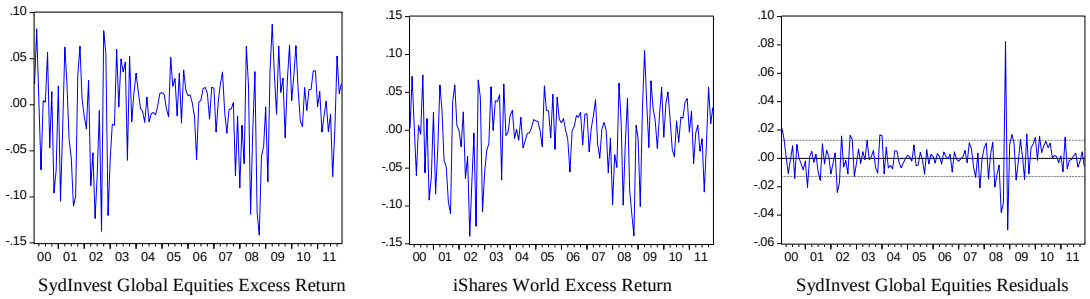


Figure 3.1: Plot of the Excess Return of SydInvest Global Equities, iShares World and residuals of the Pure Selection test of these, Source: IFR, Company Websites and Bloomberg

In order to illustrate the issue of heteroscedasticity, observe figure 3.1, in which the excess returns of SydInvest Global Equities, iShares World and their heteroscedastic residuals are presented. In applying standard distributional theory a constant variance is assumed. As can be seen from figure 3.1, the variance does not exhibit a constant pattern, but rather clusters of variance over different time periods. In September 2008 and onwards into the beginning of 2009, it is evident that increased fluctuations appear. This period represents a time of turbulence on the global financial markets. It includes the bankruptcy of Lehman Brothers on the 15.09.2008, which put enormous pressure on global capital markets, when they were already distressed (Krugman, 2009). Economic events such as the financial crisis will have a strong effect on market values and equities are among the first to react, thus exhibiting a large increase in volatility as can be observed.

As can be seen, the patterns of SydInvest and iShares are very similar, and one could expect the difference between the two returns series to exhibit the same spikes, but this is not the case.

In order to apply standard F of t- tests, certain criteria must be met, as discussed above. Homoscedasticity is a central criteria, and when the variance is heteroscedastic as that presented in figure 3.1, the F and t tests are not reliable. This issue can however be mitigated by the use of Newey- West Standard Errors (NWSE), refer to Wooldridge (2009). Heteroscedasticity implies more statistical noise which results in larger standard errors

than that for the normal regression analysis. Therefore the NWSEs apply larger standard errors to the parameters. This renders NWSE robust to homoscedasticity and autocorrelation. However there are also issues with this correction and it especially important not to apply NWSE to residuals which are not heteroscedastic or autocorrelated. Therefore the tests applied here will be presented using both Normal Standard Errors (NSE) and NWSEs.

3.7.3 Correlation Between the Error Terms is Zero

This assumption implies that the error components must not form any pattern, i.e. must be identically and independently distributed. Th1 assumption is critical in modelling time series data, as in this case. If there is positive correlation in the residuals, the test (t or F test), of a linear regression may appear significant even if it is insignificant. If there is negative correlation in the residuals the results may appear insignificant even if they are significant. This assumption is now investigated by examining the error terms of the regressions, applying the Breush Godfrey Test, see Wooldridge (2009). For the test of autocorrelation in the error terms 12 is defined as the maximum lag as the data in question is monthly return series data it is reasonable to infer that the data at hand should not be affected by data points over one year ago. In many cases the presence of autocorrelation can be aided by using the first difference of the data – as in this case, were excess returns are applied, however the test for autocorrelation is performed to see if this is indeed the case .

Breush Godfrey Test for Autocorrelation

$H_0: Autocorrelation = 0$

$$\hat{u}_t = x_t + x_{t-1} \dots + x_{tk} + \hat{u}_t + \hat{u}_{t-1} \dots . \hat{u}_{t-q} \; for \; all \; t = (q+1) \qquad \textbf{(3.8)}$$

$\hat{u}_t = Estimated \; error \; term \; at \; time \; t$

$n = Sample \; size$

$q = Lag$

	World Pure Selection					
	iShares Backtracked			iShares		
Fund	Breush Godfrey	P-value	Autocorrelation	Breush Godfrey	P-value	Autocorrelation
Handelsinvest Verden	0.730	0.720	No	0.797	0.651	No
ISI Global Equities	2.820	0.002	Yes	2.661	0.006	Yes
Jyske Invest Global Equities Acc	1.059	0.402	No	0.758	0.690	No
Lån og Spar Invest -Verden	0.742	0.708	No	0.881	0.570	No
Nielsen Global Value	1.020	0.437	No	1.494	0.152	No
Nordea Invest Verden	2.440	0.007	Yes	2.621	0.007	Yes
Nykredit Invest Globale Aktier	1.243	0.262	No	2.481	0.010	Yes

Table 3.5 Own production based on data in Excel and Eviews, Source: IFR, Company Websites and Bloomberg

As can be seen in table 3.5, there is a considerable part of the error terms, which are non-autocorrelative for the tests performed on the World MFs. The same applies for Europe and Emerging Markets, refer to appendix 11.12. This is a positive attribute of the data at hand. The presence of autocorrelation may, as described, bias the t and F tests of the regressions so that the results may indicate a different result than the correct one. Therefore the use of NWSE is also relevant in order to correct for autocorrelation and to substantiate the results found using NSE terms. Having presented the data and confirmed statistical criteria, the thesis now moves into the first tests, which will provide basis for performance testing in chapter four.

3.6 ETFs Tracking Performance

When investors buy index tracking ETFs, the expectation is for the ETF to deliver a return similar to the index it is tracking. To determine the tracking capabilities for ETFs and other index funds, the Tracking Error (TE) is the most widely used measure (Costandinides et al, 2010). The TE is defined as the standard deviation of the difference between the return of the fund and the return of its benchmark. In other words it is the standard deviation of the excess returns.

$$TE = \sqrt{\frac{\sum(r_t - r_m)^2}{n-1}} * \sqrt{12} \qquad \textbf{(3.9)}$$

$r_t = Return\ of\ fund$

$r_m = Return\ of\ benchmark$

$n = Number\ of\ observations$

Equation (3.10) is the yearly tracking error based on monthly data. TEs are normally based on either monthly or quarterly data (Costandinides et al, 2010), and in this thesis all TEs are based on monthly data. It is important to note that TE can only provide information about the tracking abilities of the fund. The TE does not say anything about relative performance, as a large TE can stem from large positive deviations, large negative deviations, or a mix of the two. Passively managed ETFs are expected to have smaller TEs than their actively managed MF counterparts. However, even index tracking funds such as ETFs are not expected to have a TE of 0, due to the administration costs. In theory, a fund perfectly tracking the index will still have a TE equivalent to its TER[16] (Costandinides et al, 2010).

[16] Not considering such factors as cash drag, securities lending, dividend reinvestment assumptions etc. These will be covered later in the thesis.

Fund	Benchmark	Bloomberg Ticker	TER
World			
iShares MSCI World Inc	MSCI World Total Return (USD)	NDDUWI INDEX	0.50%
db x-trackers MSCI World TRN Index ETF 1C	MSCI World Total Return (USD)	NDDUWI INDEX	0.45%
Lyxor ETF MSCI World A	MSCI World Total Return (EUR)	MSDEWIN INDEX	0.45%
Europe			
iShares MSCI Europe Inc	MSCI Europe Total Return (EUR)	MSDEE15N INDEX	0.35%
db x-trackers MSCI Europe TRN Index ETF	MSCI Europe Total Return (USD)	NDDUE15 INEDX	0.30%
Lyxor ETF MSCI Europe	MSCI Europe Total Return (EUR)	MSDEE15N INDEX	0.35%
Emerging Markets			
iShares MSCI Emerging Markets Inc	MSCI Emerging Markets Total Return (USD)	NDUEEGF INDEX	0.75%
db x-trackers MSCI Emerging Market TRN Index ETF	MSCI Emerging Markets Total Return (EUR)	NDUEEGF INDEX	0.65%
Lyxor ETF MSCI Emerging Markets	MSCI Emerging Markets Total Return (USD)	MSDEEEMN INDEX	0.65%

Table 3.6: Overview of ETF expenses. Source: Company websites

Table 3.6 shows the benchmark for all nine ETFs, as well as the TER for each. Based on the higher TER for the three ETFs tracking the MSCI Emerging Markets index, one should expect the TE to be higher for these ETFs after costs.

	World			Europe			Emerging Markets		
Year	iShares	db x-trackers	Lyxor	iShares	db x-trackers	Lyxor	iShares	db x-trackers	Lyxor
2006	0.46%		3.06%			3.35%	1.11%		
2007	0.65%	0.21%	2.08%	0.25%	0.67%	2.61%	0.98%	0.07%	4.96%
2008	1.26%	0.04%	16.81%	0.31%	0.07%	17.95%	2.33%	0.14%	8.91%
2009	0.69%	0.54%	6.82%	0.24%	0.55%	7.41%	1.03%	0.45%	5.13%
2010	0.48%	0.34%	0.75%	0.22%	0.47%	1.55%	0.82%	0.27%	0.30%
2011	0.81%	0.70%	1.19%	0.26%	0.71%	2.86%	1.22%	0.59%	0.69%

Table 3.7: ETF tracking errors. Source: Company websites, Bloomberg

The table above shows the yearly TEs for the 9 different ETFs based on monthly data. The TEs for the individual ETF has been measured on its own respective index as presented in table 3.6. As shown by the above table the TE can vary significantly from year to year, as well as from fund to fund.

iShares: As explained earlier in this thesis, of the three ETF providers used for performance tests, iShares is the only one to use physical assets to replicate the index. Often it is not economically feasible to replicate the index in full for example due to illiquidity in the underlying securities or if some of the stocks are unobtainable because of trade restrictions. Instead, iShares uses optimized sampling as a means of replication. Optimized sampling uses econometric and mathematical models to select a representative selection of securities that will mimic the characteristics of the full index as closely as possible (Blackrock, 2012c). Optimized sampling introduces a TE component, which is not present in synthetic replication. At any given point in time there will be a difference between the securities included in the benchmark index, and the securities held by the ETF. This difference is a source of TE, since exact replication of the benchmark is only possible using full replication or a swap-based structure. According to Picard et al (2012) increased market

volatility will further increase the TE as a result of not holding the full basket of securities. Specific sources of TE are covered in detail in chapter six.

A higher TE is observed for the iShares tracking performance in Emerging Markets in relation to that for World and Europe. Following the argumentation that higher volatility leads to higher TE for funds using optimized sampling, this is most likely due to the higher volatility in Emerging Markets. Brous, Ince, and Popova (2009) show that there is a relation between market cap and volatility. Referring to appendix 11.4 it can be seen that the average market cap of securities included in the MSCI Emerging Markets index is less than a third of those included in both MSCI World and MSCI Europe. This likely leads to increased volatility for the Emerging Market index securities, which again leads to higher TE for the iShares MSCI Emerging Markets ETF. For both iShares MSCI World and iShares MSCI Emerging Markets the TE spikes in 2008, which may be connected to the financial crisis.

db x-trackers: Overall, the ETFs provided by Deutsche Bank seems to be the best overall performing in terms of low TE, with the lowest TE in both World and Emerging Markets. The difference to iShares is especially pronounced in Emerging Markets, where the synthetic replication utilized by db x-trackers seems to provide a closer match to the underlying index, referring to the previous discussion on optimized sampling and tracking error.

Lyxor: For the years 2008 and 2009 the ETFs provided by Lyxor exhibits very large TEs when compared to its two competitors, but in 2010 and 2011 it moves toward more reasonable levels. As Lyxor and db x-trackers both use the same swap-based replication method, this large difference in TE is odd.[17]

3.7 ETFs Selected for Performance Tests

In order to avoid tests which do not add information, this paragraph will use a set of criteria to determine the specific ETFs to be used for performance testing in chapter four. The selection will be based on two separate criteria and this is done to ensure the maximum amount of consistency. Firstly, the data quality for all ETFs is examined, to determine where the longest and fullest data set can be obtained. Secondly, statistical tests are applied to see whether the ETFs are good at tracking the index to which they are benchmarked and if one single ETF provider can represent all of the ETF provider returns. ETFs that mimic the index as closely as possible, are preferred. This is done by using a single factor regression. To begin with, the data quality is considered.

[17] After making sure that methodology in treating the data has been consistent, Lyxor ETF Asset Management was contacted regarding the higher TEs, but at the time of handing in the thesis, no clear answer has been provided.

3.7.1 Selection Based On Data Quality

When conducting performance tests, a large data sample is desirable to add credibility to the results reached. For this reason, one of the selection criteria is inception date of the ETF.

ETF Provider	MSCI World	MSCI Europe	MSCI Emerging Markets
iShares	30-11-2005	31-08-2007	31-12-2005
db x-trackers	30-06-2006	28-02-2007	31-07-2007
Lyxor	28-02-2007	28-02-2006	31-07-2007

Table 3.8: First data point for ETFs. Source: Company Websites, Bloomberg

As can be seen from table 3.8, choosing ETFs from iShares will provide the most data for both world and Emerging Markets. In Europe, iShares is the fund with fewest data points, starting approximately six months after db x-trackers, and 18 months after Lyxor. Considering all three investment universes as a whole, seems to favour iShares. Add to this that iShares shows the least amount of missing data points. Both db x-trackers and Lyxor has missing values across all three investment universes[18] after inception, whereas iShares has a full dataset for all dates following the first data point. Based on data quality iShares seems preferable.

3.7.2 Goodness of Fit Tests

As discussed in chapter two, there are many different structures of ETFs, and as described, this paper looks at the ETFs of three ETF providers. This section will consider their fit with their respective benchmark indices.

Before implementing any statistical test, a confidence level must be specified. According to Keller (2005) the most commonly used confidence level is 95%, and this will also be applied for all tests in this paper. The underlying assumptions are tested and presented in appendix 11.10 through 11.12 and for the discussion of these assumptions, refer to paragraph 3.5.

First off, these are all regressed on their benchmark index, using a single-factor regression model as presented in equation (3.10) (Bodie, Kane and Marcus, 2009).

$$R_y = \alpha + \beta_x + \varepsilon_i \quad \textbf{(3.10)}$$

$R_y = Excess\ return\ of\ dependent\ variable$

$\alpha = Excess\ return, when\ the\ independent\ variable\ excess\ return\ is\ zero$

$\beta_x = Sensitivity\ of\ the\ dependent\ variable\ (y)\ to\ the\ independent\ variable\ (x)$

$\varepsilon = Zero\ mean\ error\ specific\ in\ the\ return(residual)$

[18] This is after missing data points are tried corrected. More on this in the section on methodology.

World ETF versus Index											
							Index				
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI World	0.999	0.000	0.000	-1.199	0.236	No	0.992	0.003	304.721	0.000	Yes
iShares MSCI World	0.998	0.000	0.000	-0.802	0.425	No	0.983	0.006	174.034	0.000	Yes
Lyxor ETF MSCI World	0.786	-0.001	0.003	-0.485	0.630	No	0.832	0.059	14.102	0.000	Yes

Table 3.9, Presentation of results for World from regression of ETFs versus Index: MSCI World, Source: Company Websites and Bloomberg

As can be seen from table 3.9[19] the adjusted R squared all indicate that this single index model has a high degree of explanatory power on the ETF excess returns. Furthermore, the beta coefficients indicate that the degree of explanation embedded in the index is very high as they are all above 0.786, with iShares MSCI World and db x-trackers MSCI World very close to 1. For an explanation of why the Lyxor ETF displays a much lower adjusted R squared and beta coefficient than the other two ETFs refer to the discussion of TE in paragraph 3.6. For the European and Emerging Market ETFs, the same scenario applies, refer to appendix 11.6. Generally, the iShares and db x-tracker ETFs follow their indices closely and the best performing ETF provider overall seems to be iShares. Adding to that (as presented earlier in this chapter), iShares was the first of the three, to launch ETFs obtainable through Xetra for the World and Emerging Markets universes, where db x-trackers was first in the European universe. As a result the iShares ETFs generally contain the longest history and a reasonably good fit to the indices they are attempting to replicate.

Thus iShares seems to be a good presentation of the ETFs to be used in the performance testing. However, in order to apply only iShares, a confirmation that iShares returns are similar to the other ETFs is needed, to make sure the exclusion of the other two ETFs does not eliminate knowledge creation. This is done by applying the single factor model presented in equation (3.10).

World ETF versus ETF											
							iShares				
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI World	0.998	0.000	0.000	-0.070	0.944	No	1.007	0.006	164.422	0.000	Yes
Lyxor ETF MSCI World	0.763	-0.001	0.003	-0.390	0.698	No	0.829	0.063	13.234	0.000	Yes

Table 3.10, Presentation of results for World from regression of ETFs versus Index: MSCI World, Source: Company Websites and Bloomberg

It can be seen that there is a high degree of correlation between the excess returns of iShares and the other two ETFs. Referring to appendix 11.7, this can also be confirmed for the European and Emerging Market funds. Based on the single factor model, the iShares ETFs also seem preferable.

[19] To see a detailed explanation and theoretical background of the measures; adjusted R squared, t-statistics and p-values refer to appendix 11.5

Based on both the quality of data as well as tracking errors, the iShares ETFs were chosen as the basis for performance tests of MFs. Even though db x-trackers exhibits better tracking abilities, this does not outweigh the fact that by choosing ETFs by iShares a more complete dataset will be gained.

3.10 Backtracking

The iShares ETFs used for performance tests in chapter four have only been available for a maximum of six years (see table 3.9 later in this chapter). The total number of return observations for each investment universe is 73 for World, 53 for Europe and 73 for Emerging Markets. As a basis for statistical tests this is not sufficient (a minimum of 100 observations are required as a rule of thumb), therefore a proxy for historical ETF performance is needed.

Based on the TEs presented earlier in this chapter, as well as the results in chapter four showing that ETFs track indices closely, it has been decided that the benchmark index provides a fair approximation of ETF performance when administrative costs are accounted for.

Backtracking the ETFs is done by subtracting the monthly TER from the monthly returns of the index. Yearly TER is converted to continuously compounded monthly TERs using the same methodology as previously presented.

$$TER_{m_{cc}} = \frac{LN(1+TER_{y_{EAR}})}{12} \quad \textbf{(3.11)}$$

$TER_{m_{cc}} = Countinuously\ compounded\ monthly\ TERs$

$TER_{y_{EAR}} = Year\ effective\ TER\ as\ informed\ by\ ETF\ provider$

This methodology has been applied to iShares ETFs in all three investment universes from the period starting 31.01.2000 to the first ETF return.

Having presented the data foundation, analysed statistical criteria and chosen the specific funds for performance testing, the following chapter will move into the theory and statistical tests for the performance evaluation.

4. Performance Tests

The following chapter presents the theoretical framework of performance testing and presents the procedures applied in this empirical test, in steps. Secondly the results are presented and lastly these results are analysed and interpreted upon.

As advocated by Eugene Fama (1970), th**e** EMH[20] asserts that financial markets are "informationally efficient", meaning that prices in the market reflect all available public and private information. It also implies that in any free market, competition among participants should drive prices to their correct levels. In this way Fama (1970) argues that superior forecasting skills must depend on forecasting movements based on data not already reflected in security prices. In the same manner Henriksson and Merton (1981) argue that if such information is available, the market in question, will not be efficient. If it is believed that superior forecasting skills can be obtained there is a basis for engaging in active portfolio management. The role of active portfolio management is in its essence providing a superior return net of costs, given a certain level of risk, to the market return.

Whether MF managers have indeed been able to achieve superior performance has been studied thoroughly. Among the studies for the US MF market the general picture is that MFs net of expenses did not perform superior to their passive benchmark – see e.g. Jensen (1968), Malkiel (1995) and Detzler (1999). According to Elton et al. (1993) and Detzler (1999) however, when applying gross returns, the MF funds have been able to deliver excess returns, but very close to the expenses. These studies give evidence to the Fama's theory of informationally efficient markets, where informed investors are compensated for their information gathering. Another take on this is provided by Sharpe (1991), who argues:

"If "active" and "passive" management styles are defined in sensible ways, it must be the case that: (1) before costs, the return on the average actively managed dollar will equal the return on the average passively managed dollar and (2) after costs, the return on the average actively managed dollar will be less than the return on the average passively managed dollar"(Sharpe, 1999, p. 1)

[20] Efficient Market Hypothesis

Within this average there will be superior performers and inferior performers. Studies for the US MF market suggest that the superior performers from one period, will be likely to outperform in the following short-term period, see e.g. Hendriks et al. (1993) and Elton et al. (1993). The same studies also emphasize that this performance persistence is only short-term. Another study by Gupta, Prajori and Stubbs (1999) find that performance for US large-cap and small-cap MFs generally is non-persistent. For the European market the study by Otten and Bams (2002) concludes that there is strong persistence in UK MF outperformance, but that this is not the case for French, German or Italian MFs. However, the general picture is that, on average, the MF managers will not be able to outperform the market over time. Furthermore most private investors have little knowledge about which MFs to choose and as outperformance will shift from period to period, keeping track can be difficult.

The alternative to active portfolio managements is passive investing in funds, such as ETFs, which is the focal interest in this paper. As discussed, passive index tracking ETFs do not attempt to ”beat” the market, but merely provide a return similar to the market return after costs.

The objective of this chapter is to compare and analyse the performance of active Danish MFs to their ETF counterparts. The general framework of performance testing is usually to test MFs against their respective benchmark indices. The performance test applied in this thesis is quite similar to the general approach for performance testing, however, the explanatory variable of the model applied here is the ETF tracking the index, and not the benchmark index itself. Therefore, the literature and theoretical framework used in performance testing also applies here, as there, to the author’s knowledge, is no available literature that investigates the performance on MFs versus ETFs for the Danish MF market. It must be noted that this paper does not attempt to uncover the performance of the entire Danish MF universe, but rather measure the performance of the ETFs selected against their Danish MF counterparts. For an analysis of the Danish MF market in general, refer to Christensen (2005). It should also be noted that when testing against pure indices, as is the norm for performance studies, there is a certain bias. The passive index cannot be obtained for an investor without incurring costs. Furthermore, indices are not subject to any regulatory demands, which may also imply additional costs for the management of any investable security or fund. Thus to some extent the comparison of MF and ETF performance is more realistic as the ETF are also investable securities, obtainable to the investor. Costs and regulation are also a part of the returns of the ETFs and the data used is available in the market.

To begin with, performance is compared by simple graphical and numerical representation. As discussed in chapter three ETFs have only been available for a relatively short period of time, thus in order to obtain a

sufficient amount of data, this is supplemented by a backtracked series of the ETFs. In the following paragraph the longer, backtracked, data will first be presented graphically, while the shorter horizon will be presented numerically, for all three universes.

4.1 Performance Presentation

In figure 4.1 below the returns for the MFs, iShares World ETF and the MSCI world index are graphed[21], with a base value of 100 on 31.07.2002. The date is chosen due to this being the first date where return data could be obtained for all MFs, as discussed in chapter three. The iShares ETF has been backtracked using the methodology presented in chapter three.

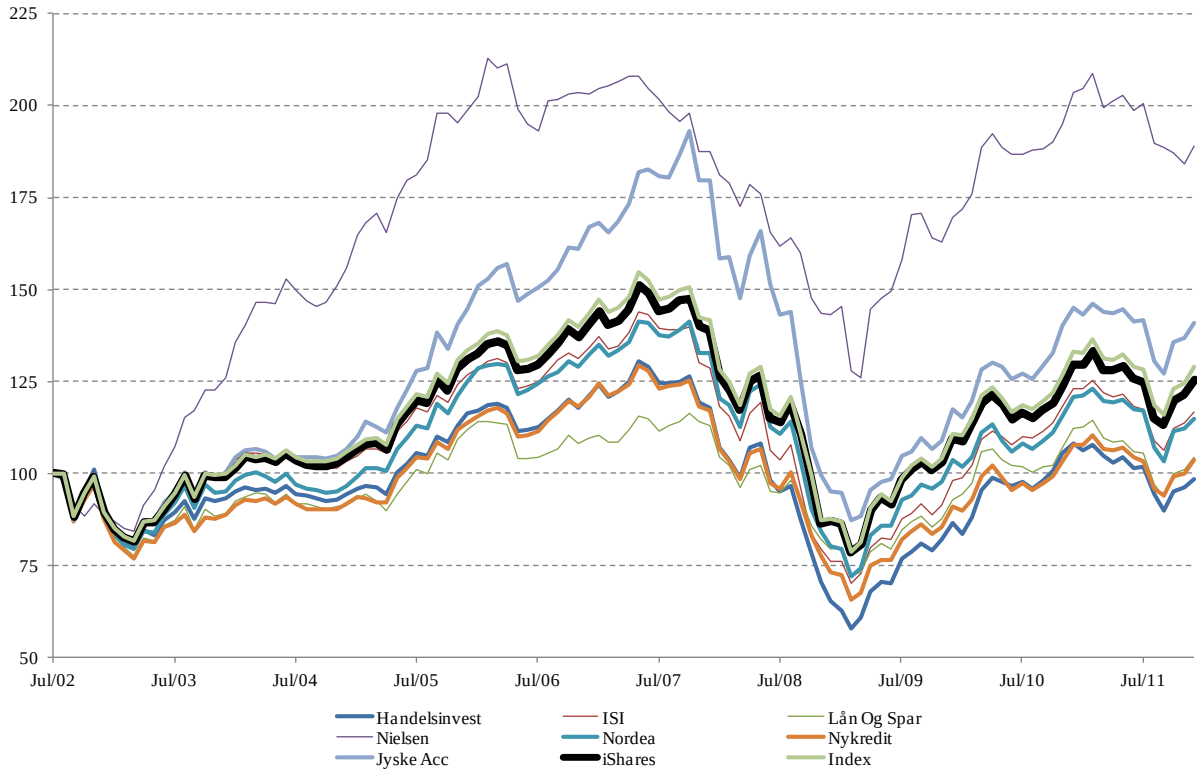


Figure 4.1: Performance of Funds Benchmarked to MSCI World. Base value = 100 on 31.07.2002. Source: IFR, Company Websites, Bloomberg

While it should be noted that all conclusions based on graphical representations should not be taken as final conclusions, a few things stand out from the graph.

[21] In order to provide a clear overview, ETFs from db x-trackers and Lyxor have been left out. Like the iShares ETF, these track the index very closely.

1. The return of the iShares ETF seems to follow the MSCI index quite well. Due to the fact the ETF is being replicated up until November 2005 this is no surprise, but the picture does not change after the replication ends and the graph is based on ETF NAV data. Due to the yearly administrative cost of the ETF, the slight underperformance over longer periods of time is to be expected.

2. Only two MFs end the period with a higher overall return than the iShares ETF, namely Nielsen Global Value and Jyske Invest Aktier Pension.

Table 4.1 in the following is a representation of the results from 2007 and onwards when the ETF has been available. As can be seen from the table, the performance varies greatly from fund to fund. However, the worst performing MF (Handelsinvest) had a return more than four times worse than that of the best performer (Lån og Spar).

	Returns										
Year	Handels invest	ISI	Lån Og Spar	Nielsen	Nordea	Nykredit	Jyske Acc	iShares	db x-trackers	Lyxor	Index
2007	-2.8%	-4.2%	2.9%	-7.9%	0.5%	-3.3%	7.4%	-1.1%	-1.6%	-2.3%	-1.4%
2008	-59.0%	-52.8%	-35.2%	-27.0%	-50.4%	-47.1%	-63.6%	-46.5%	-48.1%	-49.1%	-48.0%
2009	28.0%	25.4%	15.6%	16.9%	25.6%	21.9%	21.2%	22.8%	23.3%	25.0%	23.5%
2010	22.4%	22.6%	18.9%	18.3%	15.2%	16.9%	20.9%	16.9%	17.9%	16.3%	18.3%
2011	-9.5%	-5.0%	-7.3%	-7.3%	-5.0%	-3.7%	-2.7%	-3.2%	-3.0%	-2.8%	-2.9%
Full Period	-20.8%	-13.9%	-5.1%	-7.1%	-13.9%	-15.3%	-16.8%	-11.1%	-11.4%	-12.9%	-10.5%

Table 4.1: Yearly returns of ETFs and MFs benchmarked to MSCI World. Source: IFR, Company Websites, Bloomberg

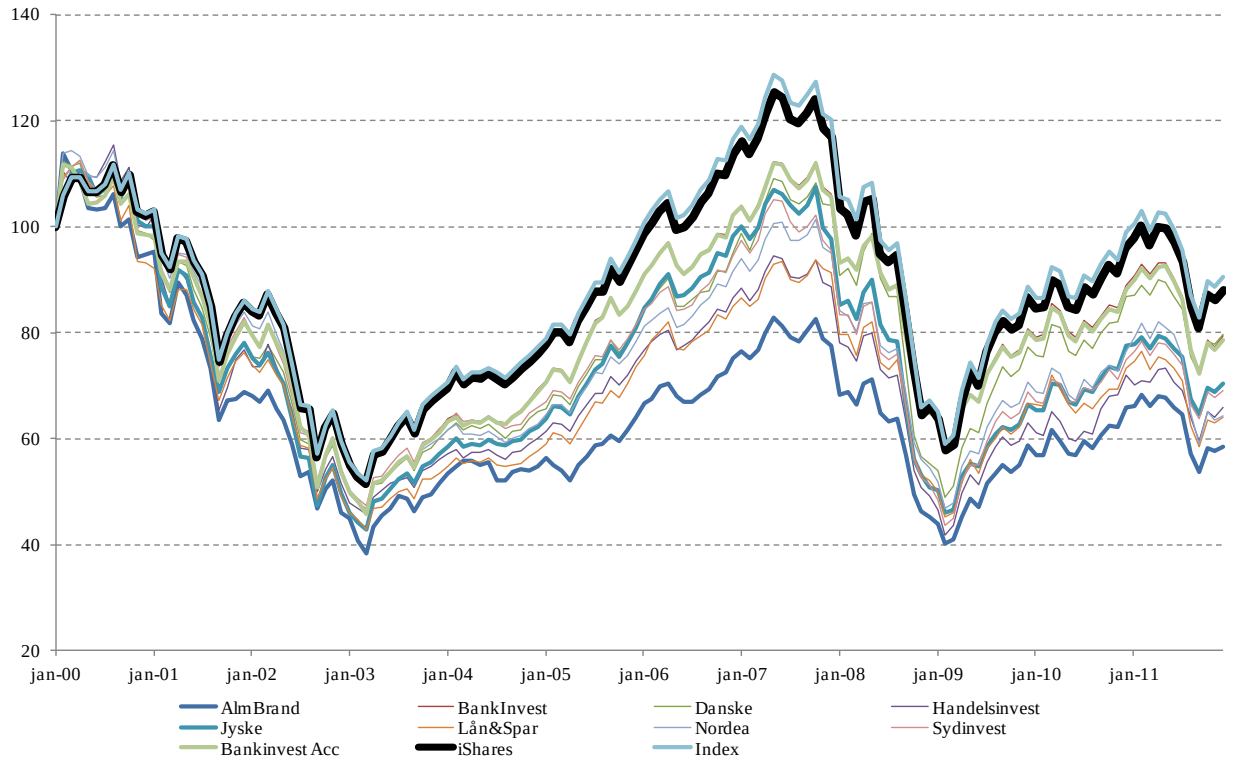


Figure 4.2: Performance of Funds Benchmarked to MSCI Europe. Base value = 100 on 31.01.2000. Source: IFR, Company Websites, Bloomberg

Judging from figure 4.2, none of the Danish MFs with a European focus has outperformed the benchmark index or the backtracked iShares ETF. Again, the ETF seems to closely trail the index, and the MFs performance varies across funds.

	Returns												
Year	Alm Brand	Bank Invest	Danske Invest	Handels Invest	Jyske Invest	Lån Og Spar	Nordea Invest	Syd Invest	Bank Invest Acc	iShares	db x-trackers	Lyxor	Index
2008	-53.7%	-49.3%	-63.0%	-58.5%	-65.5%	-55.8%	-55.8%	-62.0%	-48.7%	-57.0%	-58.0%	-51.9%	-58.1%
2009	26.3%	22.1%	33.6%	24.3%	27.1%	24.4%	26.3%	29.4%	21.1%	27.1%	27.9%	25.9%	27.9%
2010	11.1%	9.5%	11.5%	13.6%	15.2%	9.5%	7.9%	8.2%	9.5%	10.3%	10.9%	9.1%	11.0%
2011	-11.6%	-11.4%	-8.6%	-9.0%	-9.7%	-13.7%	-17.3%	-8.0%	-11.3%	-8.6%	-8.8%	-7.4%	-8.9%
Full Period	-27.9%	-29.1%	-26.5%	-29.6%	-33.0%	-35.6%	-38.9%	-32.5%	-29.4%	-28.3%	-28.1%	-24.2%	-28.2%

Table 4.2: Yearly returns of ETFs and MFs benchmarked to MSCI Europe. Source: IFR, Company Websites, Bloomberg

Interestingly, according to table 4.2 both db x-trackers and Lyxor actually outperformed the benchmark index in the period from 2008 to 2011, albeit only very slightly for db x-trackers[22]. When considering the yearly TER of 0,35% for the iShares MSCI Europe ETF (see chapter three) the fact that this ETF underperforms by

[22] As discussed in chapter three, the data for Lyxor should be interpreted with great care.

just 6 bps[23] over a 4-year period is quite impressive. Reasons for ETF over- and underperformance is discussed and analyzed in chapter six.

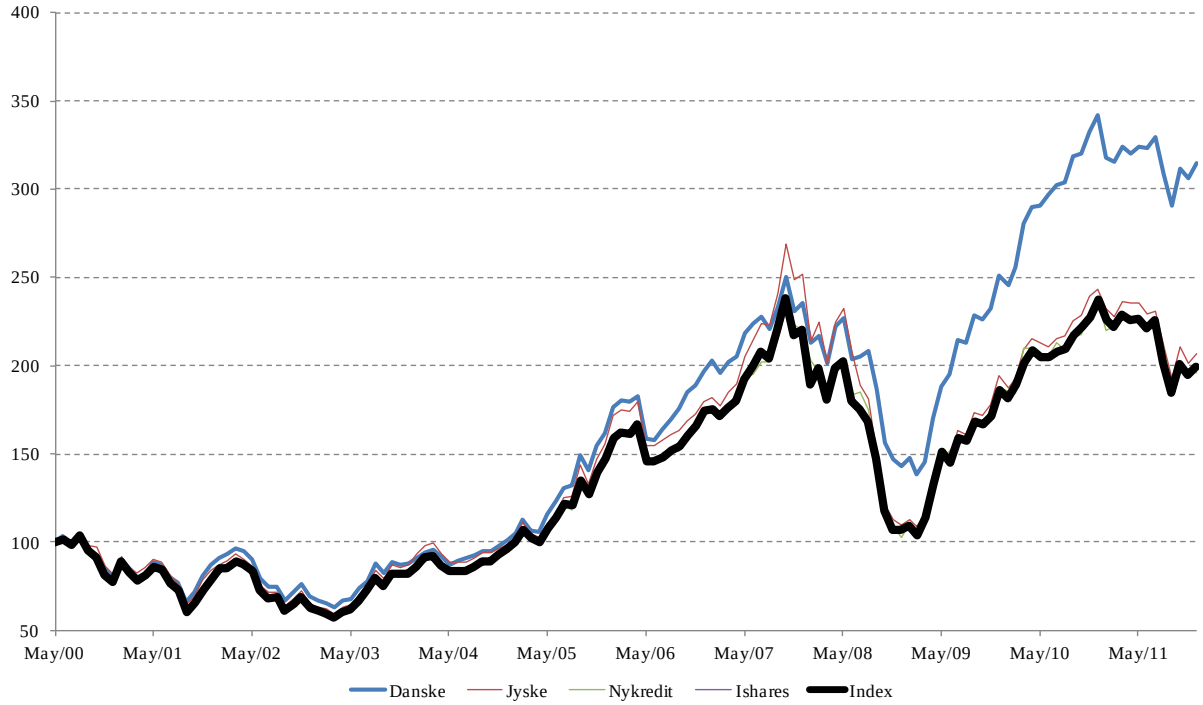


Figure 4.3: Performance of Funds Benchmarked to MSCI Emerging Markets. Base value = 100 on 31.07.2002. Source: IFR, Company Websites, Bloomberg

As presented earlier in this thesis, only three MFs live up to the criteria specified in chapter four for Emerging Markets. Of these three MFs, Danske Invest Nye Markeder and Jyske Invest Nye Aktiemarkeder end the period with a higher return than the index and the iShares ETF. Especially the MF from Danske Invest Nye Aktiemarkeder seems to outperform its benchmark quite considerably in the period following the financial crisis. As can also be seen Nykredit Engros Vækstlande underperforms its benchmark, but only slightly.

	Returns							
Year	Danske Invest	Jyske Invest	Nordea Invest	Nykredit Invest	Ishares	db x-trackers	Lyxor	Index
2008	-49.9%	-82.9%	-74.2%	-63.2%	-68.6%	-72.6%	-74.9%	-72.0%
2009	56.4%	57.2%	51.9%	52.8%	53.5%	54.6%	55.9%	55.2%
2010	30.8%	22.4%	24.6%	27.5%	24.3%	23.6%	22.0%	24.4%
2011	-8.2%	-16.2%	-17.7%	-17.1%	-18.4%	-18.3%	-17.9%	-17.5%
Full Period	29.1%	-19.5%	-15.4%	-0.1%	-9.2%	-12.7%	-14.9%	-9.8%

Table 4.3: Yearly returns of ETFs and MFs benchmarked to MSCI Emerging Markets. Source: IFR, Company Websites, Bloomberg

[23] bps = basispoints. 1 bps = 1/100%.

The factors discussed for the graphical presentation are also seen from table 4.3. While the benchmark had a return of -9,84% in the four year period, Danske Invest Nye Aktiemarkeder delivered almost 30% in return. In contrast Jyske underperformed in the period following the financial crisis, but due to good performance in the period leading up to 2008, the performance for the entire period is still slightly ahead of the benchmark and ETFs. Having considered the raw numbers it is time to further investigate the performance of ETFs and MFs, using statistical models.

4.2 Performance Tests

When evaluating performance the risk level of the investment must be considered. It is generally assumed that investors are rational, and will prefer a lower level of risk for the same level of expected return. Therefore, in theory, obtaining a higher expected return should be more likely for a higher level of risk. Thus creating a superior return is dependent on the level of risk that is taken in the different investment alternatives. There are several measures, which take the risk into consideration with Sharpe (1966) and Jensen (1968) among the most applied and acknowledged. In this paper we have chosen to follow the conventional methodology in the literature using the Jensen measure (Jensen's alpha) to measure MF performance.

Jensen (1968) investigates the performance of securities via the alpha generation, which is not explained by the general market movements (beta) by applying a single index model. A positive and significant alpha indicates superior performance against the specified market. There are, however, several issues with the Jensen measure, which should be noted. As argued by e.g. Dybvig and Ross (1985), the Jensen measure does not isolate stock picking ability of a MF manager, as other factors may also influence alpha. This could be the ability of the manager to time the market, as the Jensen measure does not specify where the performance is created. Another central issue with the Jensen measure is that it relies on the asset pricing model chosen. Applying the standard CAPM framework, the Roll critique states that the chosen benchmark has important consequences for the performance evaluation and this has been confirmed by newer research, refer to Lehmann and Modest (1987) and Kon and Jen (1978). The Jensen measure is easily understandable, communicable and simple, all qualities which increase the appeal of the Jensen measure, which is shy it is chosen despite its drawbacks.

In order to uncover whether the active MF management has led to superior performance, a single-index regression model, applying the excess return on the fund over the period in question, on the excess return of the ETF over the period, i.e. an analysis based on Jensen's alpha, in the following, form is applied.

Pure Selection

$$R_y = \alpha + \beta R_x + \varepsilon_i \quad \textbf{(4.1)}$$

$R_y = Excess\ return\ of\ dependent\ variable$

$\alpha = Excess\ return, when\ the\ independent\ variable\ excess\ return\ is\ zero$

$\beta_x = Sensitivity\ of\ the\ dependent\ variable\ (y)\ to\ the\ independent\ variable\ (x)$

$\varepsilon = Zero\ mean\ error\ specific\ in\ the\ return(residual)$

The Jensen measure analysis in this paper will be supplemented, in order to increase robustness of the results. As advocated by Fama in 1972, there are two levels for forecasting – the microeconomic level in the form of specific securities, and the macroeconomic level in the form of general market trends. The Jensen measure does not, among other things, account for the timing ability of the MF manager. Thus it is important to test for timing ability to isolate the security selection ability (micro forecasting ability) in the form of alpha.

Therefore the Danish MF manager has the tools to time the market through adjusting the beta according to his forecast for the macro trend. Among the first to present the model for such a performance evaluation were Treynor and Mauzy (1966). They argued that a manager would hold a greater proportion of high beta securities or a smaller proportion depending on the macro forecast for the period and thereby one should be able to isolate whether the manager successfully timed the market, by including a quadratic term into the regression equation as presented in equation (4.2).

Selection and Timing

$$R_y = \alpha + \beta_1 R_x + \beta_2 {R_x}^2 + \varepsilon_i \quad \textbf{(4.2)}$$

$R_y = Excess\ return\ of\ dependent\ variable$

$\alpha = Excess\ return, when\ the\ independent\ variable\ excess\ return\ is\ zero$

$\beta_x = Sensitivity\ of\ the\ dependent\ variable\ (y)\ to\ the\ independent\ variable\ (x)$

$\varepsilon = Zero\ mean\ error\ specific\ in\ the\ return(residual)$

The inclusion of a quadratic of the excess return of the ETF into the regression equation provides an indication of the timing ability of the manager, where the coefficient will indicate whether the manager is able to time the market by over or under-weighting high beta stocks depending on forecasts for bear or bull markets. A positive coefficient indicates that the manager has successfully timed the market and vice versa. The size of the coefficient does not hold any economic informational value, i.e. a larger coefficient does not indicate a better timing ability.

A side effect of including the quadratic term into the regression equation is the introduction of multicollinearity, as the squared term of the excess return of the ETF will be highly correlated with the excess return of the ETF. Multicollinearity is the presence of high collinearity between the independent variables of a regression model. This multicollinearity affects the magnitude of the coefficients, but does not bias the statistical tests (Wooldridge, 2009). The issue of multicollinearity introduces a heteroscedasticity type of problem, as discussed in chapter three, this must be considered when applying the results in any decision making process, see Christensen (2005). However, as described in chapter three the tests are robustness-checked by applying the NWSE and this should also account for the issue of multicollinearity.

Having discussed the theoretical background and data considerations the paper will now move into the results found from applying the theoretical test presented in this chapter on the data presented in chapter three. A short introduction of the parameters presented in tables in the following paragraphs is provided in appendix 11.5 as a reference tool.

4.3 Pure Selection Results

World Pure Selection iShares													
		NSE						NWSE					
Fund	R^2 adj.	Alpha	p	Sig.	Beta	p	Sig.	Alpha	p	Sig.	Beta	p	Sig.
Handelsinvest Verden	0.874	-0.002	0.386	No	0.985	0.000	Yes	-0.002	0.401	No	0.985	0.000	Yes
ISI Global Equities	0.879	-0.001	0.662	No	0.935	0.000	Yes	-0.001	0.560	No	0.935	0.000	Yes
Jyske Invest Global Equities Acc	0.809	0.000	0.886	No	0.988	0.000	Yes	0.000	0.885	No	0.988	0.000	Yes
Lån og Spar Invest -Verden	0.834	-0.001	0.671	No	0.804	0.000	Yes	-0.001	0.646	No	0.804	0.000	Yes
Nielsen Global Value	0.606	-0.002	0.464	No	0.638	0.000	Yes	-0.002	0.420	No	0.638	0.000	Yes
Nordea Invest Verden	0.895	-0.001	0.750	No	0.978	0.000	Yes	-0.001	0.625	No	0.978	0.000	Yes
Nykredit Invest Globale Aktier	0.919	-0.001	0.531	No	0.929	0.000	Yes	-0.001	0.305	No	0.929	0.000	Yes

Table 4.4: Performance test results for World Pure Selection with pure iShares data using NSE and NWSE Source: IFR, Company Websites and Bloomberg

These tests are based on the data, on a monthly basis, starting in November 2005, when the iShares World ETF was launched, this results in 74 observations for comparison. For all funds, except Nielsen Global Value[24], there is a relatively high degree of explanatory power, by means of an adjusted R squared above 80.9 and beta coefficients which are close to one and very significant. This indicates that the ETF excess return has a strong explanatory power (high correlation) on the excess return of these funds. It should be noted that these test do not imply causation, only correlation. It is highly unlikely that the ETF excess return is what causes the MF excess return, but the high correlation between the two is a result of both being influenced by the market movements to a stronger or lesser degree, as a part of the stock holdings are identical for the MFs and ETFs.

[24] Nielsen Global Value will be analysed further in paragraph 4.5.

When the ETF (market) movements are accounted for, the MFs do not show evidence of significant outperformance in the form of positive alpha values. This is indicated by negative, but insignificant alpha values for all funds, except Jyske Invest Global Equities, which shows neutral performance.

As presented in paragraph 4.1, the simple returns indicated outperformance for some MFs in some years, but as can be seen, this has not been sufficient to yield statistically significant outperformance on a monthly basis. It is reasonable to doubt whether these results are simply not significant, or whether the lack of a sufficient amount of data points results in the insignificance. Thus the test is, as explained in chapter four, supplemented by a similar test using a backtracked iShares series, in order to obtain more data and possibly stronger conclusions. These results are presented for World in the following section.

World Pure Selection iShares Backtracked													
		NSE						NWSE					
Fund	R^2 adj.	α	p	Sig.	Beta	p	Sig.	α	p	Sig.	Beta	p	Sig.
Handelsinvest Verden	0.879	-0.003	0.062	No	1.015	0.000	Yes	-0.003	0.047	Yes	1.015	0.000	Yes
ISI Global Equities	0.928	-0.001	0.299	No	0.986	0.000	Yes	-0.001	0.166	No	0.986	0.000	Yes
Jyske Invest Global Equities Acc*	0.874	0.001	0.670	No	1.027	0.000	Yes	0.001	0.657	No	1.027	0.000	Yes
Lån og Spar Invest -Verden	0.876	-0.003	0.049	Yes	0.912	0.000	Yes	-0.003	0.024	Yes	0.912	0.000	Yes
Nielsen Global Value*	0.548	0.003	0.170	No	0.634	0.000	Yes	0.003	0.232	No	0.634	0.000	Yes
Nordea Invest Verden	0.929	-0.001	0.323	No	1.022	0.000	Yes	-0.001	0.144	No	1.022	0.000	Yes
Nykredit Invest Globale Aktier*	0.927	-0.002	0.032	Yes	0.955	0.000	Yes	-0.002	0.007	Yes	0.955	0.000	Yes

Table 4.5: Performance test results for World Pure Selection with iShares data backtracked, using NSE and NWSE, Source: IFR, Company Websites and Bloomberg[25]

These tests are based on backtracked iShares series, starting in February 2000, and resulting in 143 data points for comparison. As described in chapter three, three funds were only available for a shorter period. It is noted, that it is not optimal to have slightly different time periods for comparison, but these funds were included, as they still contain sufficient data, in order to analyse as many funds as possible. As described, the MFs are tested for outperformance and the hypothesis must be that the goal for the MFs is to outperform the passive alternative during all time periods, that being from February 2000 to December 2011 or from August 2002 to December 2012. It must however be remembered, that the funds are not directly comparable due to the slightly different time horizons.

The results presented in table 4.5 are similar to those using the pure iShares data series. There is still a high degree of explanatory power and very significant beta values, but the alpha values are now different. Five of the MF alpha values are still negative, while two of these are significant using NSE, and three are significant using NWSE. Jyske Invest Global Equities and Nielsen Global Value show positive alpha values, which corresponds to the graphical presentation in paragraph 4.1. However, this performance has not been

[25] As described in chapter three, the star indicates a shorter time period.

sufficiently positive to reward statistical significance. The results for Nielsen Global Value are quite different from those of the pure iShares test, indicating that in the first period from August 2002 to November 2005, Nielsen Global Value achieved strong outperformance, while the second period from November 2005 to December 2012 resulted in the opposite.

As described in chapter three, the presence of homoscedasticity and/or autocorrelation in the error terms justifies the use of NWSE. Therefore the three funds are investigated according to the approach in figure 4.4 to see if homoscedasticity and/or autocorrelation is detected.

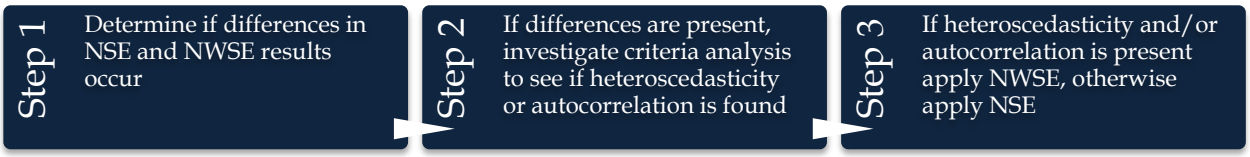


Figure 4.4: Approach to determining if NSE or NWSE results should be applied

Step 1: Differences in the results of NSE and NWSE justify a further investigation of the statistical attributes for Handelsinvest Verden, Lån og Spar Invest and Nykredit Invest Verden.

Step 2: The criteria analysis is investigated (refer to appendix 11.11 and 11.12 for these statistical criteria tests). Handelsinvest Verden suffers neither from heteroscedasticity nor from autocorrelation. Lån og Spar Invest – Verden and Nykredit Invest Verden suffer from heteroscedasticity.

Step 3: For Handelsinvest Verden the results from the NSE should be applied. For Lån og Spar Invest – Verden the results from the NWSE should be applied. For these to funds the NWSE based p-values are more significant, indicating that the NSE results are biased.

As a result there are two MFs which exhibit significantly negative alpha values, Lån og Spar Invest – Verden and Nykredit Invest Verden, indicating inferior performance.

Having presented the results for the short and long time horizon for World, the presentation now continues with the results for Europe.

Europe Pure Selection iShares													
		NSE						NWSE					
Fund	R^2 adj.	Alpha	p	Sig.	Beta	p	Sig.	Alpha	p	Sig.	Beta	p	Sig.
Alm. Brand Europæiske Aktier	0.934	0.000	0.859	No	0.932	0.000	Yes	0.000	0.822	No	0.932	0.000	Yes
BankInvest Europæiske Aktier	0.892	-0.002	0.489	No	0.830	0.000	Yes	-0.002	0.453	No	0.830	0.000	Yes
BankInvest Europæiske Pension Acc	0.892	-0.002	0.438	No	0.821	0.000	Yes	-0.002	0.419	No	0.821	0.000	Yes
Danske Invest Europa	0.903	0.001	0.731	No	1.027	0.000	Yes	0.001	0.231	No	1.027	0.000	Yes
HandelsInvest Europa	0.900	0.000	0.870	No	0.965	0.000	Yes	0.000	0.525	No	0.965	0.000	Yes
Jyske Invest Europæiske Aktier	0.863	-0.002	0.506	No	0.945	0.000	Yes	-0.002	0.738	No	0.945	0.000	Yes
Lån og Spar Invest - Europa	0.914	-0.001	0.759	No	0.976	0.000	Yes	-0.001	0.804	No	0.976	0.000	Yes
Nordea Invest Europa	0.899	-0.002	0.452	No	0.989	0.000	Yes	-0.002	0.166	No	0.989	0.000	Yes
Sydinvest Europa	0.930	-0.001	0.576	No	1.003	0.000	Yes	-0.001	0.543	No	1.003	0.000	Yes

Table 4.6: Performance test results for Europe Pure Selection with pure iShares data using NSE and NWSE, Source: IFR, Company Websites and Bloomberg

The data applied for the tests presented in table 4.6 are based on the iShares Europe ETF, which starts in August 2007, resulting in only 53 data points for comparison.

As can be seen from the results in table 4.6 the ETF has a high degree of explanatory power. Most of the alpha values are negative and they are all insignificant. Therefore the backtracked series is even more relevant for the European analysis and this is presented in the following.

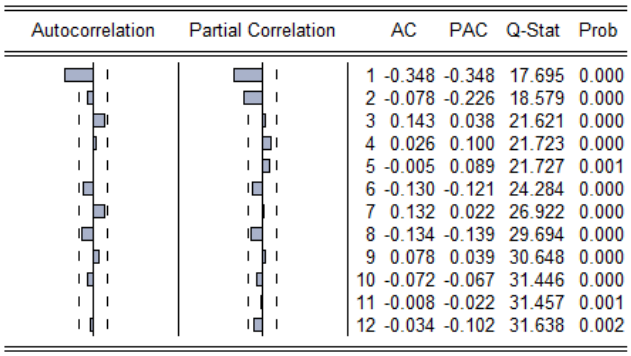
Europe Pure Selection iShares Backtracked													
		NSE						NWSE					
Fund	R^2 adj.	Alpha	p	Sig.	Beta	p	Sig.	Alpha	p	Sig.	Beta	p	Sig.
Alm. Brand Europæiske Aktier	0.860	-0.003	0.070	No	0.965	0.000	Yes	-0.003	0.022	Yes	0.965	0.000	Yes
BankInvest Europæiske Aktier	0.909	-0.001	0.452	No	0.945	0.000	Yes	-0.001	0.296	No	0.945	0.000	Yes
BankInvest Europæiske Pension Acc	0.907	-0.001	0.429	No	0.944	0.000	Yes	-0.001	0.280	No	0.944	0.000	Yes
Danske Invest Europa	0.915	-0.001	0.587	No	0.998	0.000	Yes	-0.001	0.508	No	0.998	0.000	Yes
HandelsInvest Europa	0.907	-0.002	0.122	No	0.987	0.000	Yes	-0.002	0.033	Yes	0.987	0.000	Yes
Jyske Invest Europæiske Aktier	0.911	-0.002	0.237	No	1.002	0.000	Yes	-0.002	0.092	No	1.002	0.000	Yes
Lån og Spar Invest - Europa	0.919	-0.002	0.058	No	0.976	0.000	Yes	-0.002	0.029	Yes	0.976	0.000	Yes
Nordea Invest Europa	0.921	-0.002	0.073	No	0.994	0.000	Yes	-0.002	0.015	Yes	0.994	0.000	Yes
Sydinvest Europa	0.947	-0.002	0.078	No	0.988	0.000	Yes	-0.002	0.010	Yes	0.988	0.000	Yes

Table 4.7: Performance test results for Europe Pure Selection with iShares data backtracked, using NSE and NWSE, Source: IFR, Company Websites and Bloomberg

The results presented in table 4.7 are for the test using backtracked iShares data, starting in February 2000 and resulting in 143 data points for comparison. None of the funds covering Europe were incepted at a later date. The general results are quite similar to the shorter period with high explanatory power and significant beta values. The alpha values are now all negative and when NSE are applied none are significant, but Alm. Brand Europæiske Aktier would be, if a 90% confidence level was applied (less strict). When the NWSE are applied five MFs exhibit significant alpha values. The approach presented in figure 4.4 is thus applied. The underlying assumptions are investigated, to see which of the tests to conclude upon. The residuals for Alm. Brand Europæiske Aktier exhibit neither Heteroscedasticity nor Autocorrelation, and thus the NSE test should be

relied upon, indicating that at a 95% confidence level Alm. Brand Europæiske Aktier does not perform significantly inferior to iShares MSCI Europe. The other four funds in question all show evidence of significant heteroscedasticity and thus the NWSE results should be applied, indicating that these are all significant.

Another important factor is that Sydinvest Europa also shows evidence of significant autocorrelation. As can be seen there is a quite significant change from the coefficients using NSE and NWSE for Sydinvest Europa and thus the affect of the autocorrelation is interesting to investigate. The Breush Pagan test presented in chapter three does not indicate the direction of the autocorrelation, only whether autocorrelation is detected. The order of the autocorrelation can however be investigated by applying the Box-Ljung test, which is presented in appendix 11.14. The results of the tests are displayed in figure 4.5 below.



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.348	-0.348	17.695	0.000
		2	-0.078	-0.226	18.579	0.000
		3	0.143	0.038	21.621	0.000
		4	0.026	0.100	21.723	0.000
		5	-0.005	0.089	21.727	0.001
		6	-0.130	-0.121	24.284	0.000
		7	0.132	0.022	26.922	0.000
		8	-0.134	-0.139	29.694	0.000
		9	0.078	0.039	30.648	0.000
		10	-0.072	-0.067	31.446	0.000
		11	-0.008	-0.022	31.457	0.001
		12	-0.034	-0.102	31.638	0.002

Figure 4.5: Presentation of Box-Ljung test, performed in Eviews (output from Eviews), using residuals from Europe Pure Selection test on Sydinvest Europa with 12 lags. AC: Autocorrelation Function, PAC: Partial Autocorrelation function, Q-stat: Box-Ljung tests statistic, Prob: P-value, Source: IFR, Company Websites and Bloomberg

As can be seen for AC, there are more negative than positive occurrences. This results in significantly negative autocorrelation, which will influence t-statistics to look insignificant, even when they are in fact significant (Wooldridge, 2009). Thus tests for Sydinvest Europa using NSE suffers from this statistical criteria and NWSE is used to determine significance. As a final test for the Pure Selection models the Emerging Markets funds are presented in the following paragraph.

Emerging Markets Pure Selection iShares													
		NSE						NWSE					
Fund	R^2 adj.	Alpha	p	Sig.	Beta	p	Sig.	Alpha	p	Sig.	Beta	p	Sig.
Danske Invest Nye Markeder	0.893	0.005	0.030	Yes	0.851	0.000	Yes	0.005	0.037	Yes	0.851	0.000	Yes
Jyske Invest Nye Aktiemarkeder	0.934	0.000	0.931	No	1.037	0.000	Yes	0.000	0.921	No	1.037	0.000	Yes
Nykredit Engros Vækstlande	0.892	0.000	0.995	No	0.904	0.000	Yes	0.000	0.995	No	0.904	0.000	Yes

Table 4.8: Performance test results for Emerging Markets Pure Selection with pure iShares data using NSE and NWSE, Source: IFR, Company Websites and Bloomberg

The tests presented in table 4.8 apply the pure iShares data, starting in December 2005 and thus result in 73 observations. The explanatory power for the Emerging Markets universe is high and the beta coefficients are very significant. The table presented in paragraph 4.1 indicated that Danske Invest Nye Aktiemarkeder had a high return compared to its passive counterpart. This excess performance is, as can be seen, significant and thus this performance was strong enough to reward significance in the statistical testing. The two other funds for the Emerging Market universe perform neutrally.

Emerging Markets Pure Selection iShares Backtracked													
		NSE						NWSE					
Fund	R^2 adj.	Alpha	p	Sig.	Beta	p	Sig.	Alpha	p	Sig.	Beta	p	Sig.
Danske Invest Nye Markeder	0.923	0.004	0.008	Yes	0.889	0.000	Yes	0.003	0.077	No	0.895	0.000	Yes
Jyske Invest Nye Aktiemarkeder	0.946	0.001	0.510	No	1.001	0.000	Yes	0.001	0.460	No	1.001	0.000	Yes
Nykredit Engros Vækstlande	0.929	-0.001	0.545	No	0.952	0.000	Yes	-0.001	0.485	No	0.952	0.000	Yes

Table 4.9: Performance test results for Emerging Markets Pure Selection with iShares data backtracked, using NSE and NWSE, Source: IFR, Company Websites and Bloomberg

These results are based on the iShares data backtracked, starting in February 2000 and resulting in 143 observations. The results are quite similar to the shorter period presented above. The Danske Invest Nye Aktiemarkeder fund is however insignificant, when applying NWSE, and this is thus investigated, using the approach from figure 4.4. As can be seen in appendix 11.11 and 11.12 the underlying assumptions of homoscedasticity and no autocorrelation in the residuals are fulfilled for Danske Invest Nye Aktiemarkeder. Therefore the NSE results should be applied, indicating that Danske Invest Nye Aktiemarkeder has also outperformed the iShares MSCI Emerging Markets ETF over the longer time horizon.

The overall conclusion of the Pure Selection model is that a considerable part of the MFs show inferior performance, with a considerable part of this being significant. There is only one of the 19 MFs, which exhibits significant outperformance. This fund outperforms in both periods in a very strong and significant manner. The results found for the Pure Selection model will now be supplemented by the Selection and Timing model.

4.4 Selection and Timing Results

As discussed, the use of a quadratic term of the independent variable, introduces multicollinearity, which poses a heteroscedasticity issue in the models. Therefore the use of NWSE is the theoretically correct approach, which is why only NWSE will be applied to the Selection and Timing model. When interpreting these results, it is should be remembered that the magnitude of the $beta_2$ coefficient does not provide an economically sensible estimate. The direction and significance of the $beta_2$ coefficient on the other hand is interesting.

World Selection and Timing iShares NWSE										
Fund	R^2 adj.	Alpha	p	Sig.	Beta1	p	Sig.	Beta2	p	Sig.
Handelsinvest Verden	0.881	-0.004	0.140	No	1.041	0.000	Yes	1.417	0.022	Yes
ISI Global Equities	0.880	-0.002	0.384	No	0.968	0.000	Yes	0.814	0.486	No
Jyske Invest Global Equities Acc	0.807	0.001	0.710	No	0.968	0.000	Yes	-0.496	0.695	No
Lån og Spar Invest -Verden	0.849	-0.004	0.085	No	0.872	0.000	Yes	1.691	0.170	No
Nielsen Global Value	0.628	-0.005	0.019	Yes	0.717	0.000	Yes	1.969	0.038	Yes
Nordea Invest Verden	0.901	-0.003	0.232	No	1.030	0.000	Yes	1.279	0.154	No
Nykredit Invest Globale Aktier	0.928	-0.003	0.094	No	0.987	0.000	Yes	1.438	0.099	No

Table 4.10: Performance test results for World Selection and Timing with iShares data, using NWSE, Source: IFR, Company Websites and Bloomberg

The results are based the iShares data, starting in November 2005, and rendering 74 data points. The general results are very similar to those of the pure selection model presented in table 4.4. The knowledge creation of this model stems from the $beta_2$ coefficients, which are mostly positive, and two of these are also significant. This indicates that the funds have been able to successfully time the market and some funds have been able to do this to a significant extent. The alpha values are, similar to the Pure Selection model, mostly negative one is significant. The fund Nielsen Global Value exhibits an interesting combination of timing and selection abilities. This is a situation where the Selection and Timing model does in fact create insight beyond that of the Pure Selection model. For Nielsen Global Value the overall neutral performance detected in the Pure Selection model is a combination of positive timing abilities and negative selection abilities. These results will be further discussed in paragraph 4.5.

Jyske Invest Global Equities, exhibits a negative timing ability along with a positive alpha, indicating that it showed the opposite abilities of Nielsen Global Value, but not to a significant extent.

World Selection and Timing iShares Backtracked NWSE										
Fund	R^2 adj.	Alpha	p	Sig.	Beta1	p	Sig.	Beta2	p	Sig.
Handelsinvest Verden	0.881	-0.005	0.036	Yes	1.055	0.000	Yes	0.922	0.150	No
ISI Global Equities	0.928	-0.002	0.228	No	1.006	0.000	Yes	0.451	0.524	No
Jyske Invest Global Equities Acc*	0.873	0.001	0.785	No	1.029	0.000	Yes	0.036	0.964	No
Lån og Spar Invest -Verden	0.878	-0.004	0.011	Yes	0.950	0.000	Yes	0.866	0.334	No
Nielsen Global Value*	0.555	0.001	0.767	No	0.687	0.000	Yes	1.347	0.105	No
Nordea Invest Verden	0.933	-0.003	0.048	Yes	1.071	0.000	Yes	1.109	0.052	No
Nykredit Invest Globale Aktier*	0.931	-0.004	0.006	Yes	1.000	0.000	Yes	0.986	0.107	No

Table 4.11: Performance test results for World Selection and Timing with iShares data backtracked, using NWSE, Source: IFR, Company Websites and Bloomberg

The results presented in table 4.11 are based on the iShares data backtracked, starting in February 2000, and resulting in 143 data points. The general results are quite similar to those of the Pure Selection model presented in table 4.5. The $beta_2$ coefficients are all positive, while none are significant. Even though none are significant, the inclusion of this timing factor influences the alpha values. Compared to the Pure Selection model these are still negative, but to a larger magnitude and now four are significant, versus three for the Pure Selection model. This indicates that these four funds make up for poor selection skills with successful timing abilities, but when isolating this timing ability, the poor selection factor is stronger and for Nordea Invest Verden now also significantly inferior.

Europe Selection and Timing iShares NWSE										
Fund	R^2 adj.	Alpha	p	Sig.	Beta1	p	Sig.	Beta2	p	Sig.
Alm. Brand Europæiske Aktier	0.933	0.000	0.822	No	0.933	0.000	Yes	0.039	0.952	No
BankInvest Europæiske Aktier	0.890	-0.002	0.453	No	0.833	0.000	Yes	0.077	0.907	No
BankInvest Europæiske Pension Acc	0.890	-0.002	0.419	No	0.823	0.000	Yes	0.070	0.914	No
Danske Invest Europa	0.904	0.003	0.231	No	1.004	0.000	Yes	-0.600	0.280	No
HandelsInvest Europa	0.899	-0.002	0.525	No	0.983	0.000	Yes	0.485	0.366	No
Jyske Invest Europæiske Aktier	0.862	-0.001	0.738	No	0.930	0.000	Yes	-0.385	0.546	No
Lån og Spar Invest - Europa	0.912	-0.001	0.804	No	0.976	0.000	Yes	-0.011	0.986	No
Nordea Invest Europa	0.901	-0.004	0.166	No	1.019	0.000	Yes	0.768	0.305	No
Sydinvest Europa	0.929	-0.001	0.543	No	1.006	0.000	Yes	0.086	0.883	No

Table 4.12: Performance test results for Europe Selection and Timing with iShares data, using NWSE, Source: IFR, Company Websites and Bloomberg

The results in table 4.12 are based on the pure iShares data, starting in July 2007, resulting in 53 observations. The results are similar to those of the Pure Selection model and overall no additional information is evident from this timing model.

Europe Selection and Timing iShares Backtracked NWSE										
Fund	R^2 adj.	Alpha	p	Sig.	$Beta_1$	p	Sig.	$Beta_2$	p	Sig.
Alm. Brand Europæiske Aktier	0.860	-0.004	0.028	Yes	0.978	0.000	Yes	0.315	0.547	No
BankInvest Europæiske Aktier	0.015	-0.001	0.371	No	0.951	0.000	Yes	0.121	0.851	No
BankInvest Europæiske Pension Acc	0.906	-0.001	0.362	No	0.949	0.000	Yes	0.120	0.858	No
Danske Invest Europa	0.914	-0.001	0.565	No	0.998	0.000	Yes	-0.007	0.984	No
HandelsInvest Europa	0.906	-0.002	0.087	No	0.991	0.000	Yes	0.096	0.803	No
Jyske Invest Europæiske Aktier	0.911	-0.001	0.339	No	0.998	0.000	Yes	-0.109	0.815	No
Lån og Spar Invest - Europa	0.918	-0.002	0.107	No	0.977	0.000	Yes	0.016	0.973	No
Nordea Invest Europa	0.922	-0.003	0.009	Yes	1.017	0.000	Yes	0.544	0.229	No
Sydinvest Europa	0.947	-0.003	0.019	Yes	1.003	0.000	Yes	0.337	0.294	No

Table 4.13: Performance test results for Europe Selection and Timing with iShares data backtracked, using NWSE, Source: IFR, Company Websites and Bloomberg

The results, presented in table 4.13 are based on iShares data backtracked, starting in February 2000 and resulting in 143 observations. The general results are similar to those of the Pure Selection model. The $beta_2$ coefficients are generally positive while none are significant. However, the alpha values are once again influenced by the inclusion of a timing factor. These effects are quite extensive for the European MFs over this longer horizon. The Pure Selection model results showed that four of the nine funds had significant alpha values. These were Handelsinvest Europa, Lån og Spar Invest - Europa, Nordea Invest Europa and Sydinvest Europa. As can be seen in table 4.13, this still applies for Nordea Invest Europa and Sydinvest Europa. The matching $beta_2$ coefficients are positive, indicating that the negative stock selection of the Pure Selection model was to some extent mitigated by positive timing abilities. When the timing ability is isolated, this results in larger coefficients and stronger significance, as can be seen in table 4.13. Handelsinvest and Lån og Spar Invest on the other hand are still negative, but now insignificant. Both funds have small, but positive $beta_2$ coefficients, and their respective alpha value would nearly remain significant at a 90% confidence level. Intuitively this should still result in a similar significance as that for the Pure Selection model, but there will sometimes be glitches in the data, which are important to be aware of. As mentioned in chapter three, sometimes data attributes cannot be fully reflected in statistical models. Alm. Brand is the third fund with a significant alpha value in the timing model. This was not the case for the Pure Selection model, in which NSE results were used as no autocorrelation and heteroscedasticity was observed. When isolating the positive timing abilities the negative stock selection ability is stronger and more significant.

The supplementary information provided by including a timing factor was very strong for the European funds. In the following the same will be applied to Emerging Markets.

Emerging Markets Selection and Timing iShares										
		NWSE								
Fund	R^2 adj.	Alpha	p	Sig.	Beta1	p	Sig.	Beta2	p	Sig.
Danske Invest Nye Markeder	0.891	0.005	0.076	No	0.849	0.000	Yes	-0.041	0.857	No
Jyske Invest Nye Aktiemarkeder	0.934	0.001	0.570	No	1.021	0.000	Yes	-0.334	0.322	No
Nykredit Engros Vækstlande	0.893	0.002	0.523	No	0.882	0.000	Yes	-0.463	0.420	No

Table 4.14 Performance test results for Emerging Markets Selection and Timing with iShares, and NWSE, Source: IFR, Company Websites and Bloomberg

The results presented in table 4.14 are based on the Pure iShares data, starting in December 2005 and resulting in 73 observations. The general results are similar to those of the Pure Selection model. The $beta_2$ coefficients are all negative and not significant. The alpha values are all positive and Danske Invest Nye Aktiemarkeder is no longer significant at the 95% confidence level, but would be at a (less strict) 90% confidence level. These results are interesting since it might be expected that isolating the negative timing abilities would show even stronger stock selection abilities. As discussed introducing a quadratic term into the regression equation, introduces multicollinearity and this can lead to increased statistical "noise", which can be the reason for the results reached.

Emerging Markets Selection and Timing iShares Backtracked										
		NWSE								
Fund	R^2 adj.	Alpha	p	Sig.	Beta1	p	Sig.	Beta2	p	Sig.
Danske Invest Nye Markeder	0.923	0.005	0.077	No	0.895	0.000	Yes	0.155	0.361	No
Jyske Invest Nye Aktiemarkeder	0.946	0.001	0.283	No	0.995	0.000	Yes	-0.151	0.521	No
Nykredit Engros Vækstlande	0.928	0.002	0.977	No	0.944	0.000	Yes	-0.219	0.523	No

Table 4.15 Performance test results for Emerging Markets Selection and Timing with iShares data backtracked, using NWSE, Source: IFR, Company Websites and Bloomberg

The same scenario applies for the longer horizon, the $beta_2$ coefficient for Danske Invest Nye Aktiemarkeder is now positive. This would suggest that the overall positive "Selection" ability found in the Pure Selection model is a result of both positive selection and timing abilities. When the timing ability is isolated, the stock selection is, however, not significant at the 95% confidence level, but would be at a 90% level. This connection is more intuitive than that for the shorter time horizon. The combination of the two forces was shown to be significant in the Pure Selection model, but both are insignificant at the 95% level when isolated in the Selection and Timing model.

This paragraph has presented the performance test results of the Pure Selection and Selection and Timing models applied to the MFs in comparison to ETF returns. These results and other relevant studies will now be interpreted and analysed to evaluate the general evidence.

4.5 Interpretation of the Empirical Results

The performance test generated interesting results, and two very central topics arose from the interpretation of these results. First off, the degree of active management the active MFs in fact engage in. Secondly the link between the investment objectives presented by the MFs and their actual performance results. These topics will be covered and debated in the following paragraph.

The general results from these performance tests indicate that many funds are highly correlated to the respective index they follow, and thus to the relevant ETF tracking that index. As presented in paragraph 4.3, there is the exception of Nielsen Global Value. MFs can manage their active bets both by stock selection and factor timing as discussed in this chapter, and as a results the adjusted R squared measure does not fully justify conclusions concerning the amount of active management of a MF. Cremers and Petaijisto (2009) suggest an approach to uncover the amount of active management MFs, in fact take on. As they argue:

"Active management is not a one-dimensional measure and thus cannot be completely characterized by a one-dimensional measure." (Cremers and Petaijisto, 2009, p. 7)

They divide active betting into active stock picking and factor timing measured by "Active Share" and TE, respectively. The mathematical representation is seen in equation (4.3) below.

$$Active\ Share = \frac{1}{n}\sum_{i=1}^{n}(w_{fund,i} - w_{index,i}) \quad \textbf{(4.3)}$$

$w_{fund,i} = Weight\ of\ security\ i\ in\ fund$
$w_{index,i} = Weight\ of\ security\ i\ in\ index$
$n = Number\ of\ securities\ in\ index$

The "Active Share" is a measure of how much of the current stock holdings in the MF diverge from the index, the MF is benchmarked to. The Active Share measure is found by comparing the portfolio holdings of a MF to the holdings of its benchmark index. As Danish MFs are never take short positions the "Active Share" will only be based on the active positions taken. The "Active Share" measure in effect compares the MF holdings of stock x to the benchmark index holding, and any stock that has a higher proportion in the MF than the index adds to the "Active Share" measure. This includes any holding that are not in the benchmark index. The overall interpretation of Active Share is thus the fraction of the MFs that is different from the benchmark index (Cremers and Petaijisto, 2009). The authors pose a threshold of an "Active Share" of 60% for actual active fund management. By their definition, any fund that has an "Active Share" below this figure is a "Closet Indexer". As argued by Cremers and Petaijisto (2009), the only possibility for active fund managers to

beat the index is to take bets that differ from these indices, otherwise the funds will automatically produce the same return, but at a higher costs and thus lower net return.

This issue has recently been discussed in the Danish media. Nikolaj Holdt Mikkelsen, the chief analyst at Morningstar Denmark, has performed "Active Share" analysis for the Danish MF universe, which was published in January this year (Morningstar Research, 2012). This analysis was also presented in the article "Active Funds are Passive" (Nielsen, 2012). The analysis was performed for 177 Danish MFs and the results show, that 37 MFs have an "Active Share" below 60%. This corresponds to nearly 20% of the "active" Danish MFs falling in the category of "Closets Indexers" if the Cremers and Petaijisto approach is to be followed. The average administrative costs for these funds are 1.59% whereas, as presented in chapter three, the passive alternative of ETF index trackers can be obtained for as little as 0.35%. Other ETFs not included in this thesis even have administrative costs of 0%. The other alternative of passive index MFs, which are available to the Danish investor, have yearly administrative costs between 0.5% and 1.1% (Nielsen, 2012).

The Danish MFs analysed in this paper for World, Europe and Emerging Markets are also mentioned in this "Active Share" analysis. These figures are presented in the following table for World and in appendix 11.13 for Europe and Emerging Markets. The adjusted R squared from the Pure Selection model in this paper are presented along with the Active Share measure to facilitate comparison.

World Pure Selection iShares		
Fund	Adj. R Sq.	Active Share
Handelsinvest Verden	87%	94%
ISI Global Equities	88%	74%
Jyske Invest Global Equities Acc*	81%	74%
Lån og Spar Invest -Verden	83%	72%
Nielsen Global Value*	61%	99%
Nordea Invest Verden	90%	64%
Nykredit Invest Globale Aktier*	92%	19%

Table 4.16 Presentation of Active Share from Morningstar analysis and adjusted R squared from tests in this paper. Source: Morningstar Research (2012), IFR, Company Websites and Bloomberg.

Observing table 4.16 the "Active Share" seems to be inversely correlated with the adjusted R squared from this paper. Nielsen Global Value has the absolute lowest adjusted R squared coupled with the highest "Active Share" of 99% while Nykredit Invest Globale Aktier has the highest adjusted R squared of 92% along with a low "Active Share" of 19%. It must be noted that these are not directly comparable for several reasons. First off, whereas the adjusted R squared represents a period from November 2005 to December 2012, the "Active

Share" is a snapshot of the current status of the fund. Secondly the adjusted R squared is calculated against the iShares MSCI Europe ETF, and the "Active Share" is based on the MSCI World index. While the difference in the basket held should be minimal, there might be a small discrepancy due to iShares using optimized sampling.

Drawing on these conclusions and the analysis performed by Nikolaj Holdt Mikkelsen, the reasoning behind active management becomes very controversial in cases, where the active funds are borderline passive. The management fees charged by these funds can in this case be very hard to justify and, as argued by Nikolaj Holdt Mikkelsen (Nielsen, 2012), the investor should perhaps consider a passive alternative.

Another interesting observation concerns the stated investment objectives of the funds, and their actual performance. Especially Nielsen Global Value is quite interesting in this regard. The Pure Selection test indicated neutral performance for Nielsen Global Value. This is in fact a combination of positive timing skills ($beta_2$) and negative stock selection skills (alpha). These finding are intriguing due to the presentation of the investment philosophy of Nielsen Asset Management in chapter three, which is basically finding undervalued stocks and thus, creating value based on stock selection. Quite the opposite scenario turns out to be the case, when observing this historical performance, in which the fund has performed negatively on stock selection but made up for it to a neutral position by strong timing abilities.

4.5.1 Summarizing the Empirical Results

This chapter has dealt with the concept of performance testing, starting with the theoretical framework of the EMH and academic studies, which generally concluded that no significant outperformance has been achieved by active MF management on the US market. These were supplemented by studies for a few European markets and Christensen (2005) for the Danish market. Generally, these studies also provided little evidence of significant outperformance. In this chapter the theoretical framework of these studies is applied to compare the Danish MFs to iShares ETFs. Using graphical and numerical presentation this comparison suggested outperformance for a few funds for World and Emerging Markets while the European returns all looked very similar. The performance tests consisted of statistical models, using the theoretical framework of Jensens alpha and Treynor and Mazuy market timing. Despite some drawbacks of these models, they were (as discussed earlier) considered the best alternative. The drawbacks from using these models will be discussed further in the critical review in chapter nine.

Before generalizing from these findings it is important to remember that these tests are performed for 19 Danish MFs due to the criteria set up of for investment alternative test. However, the three MSCI indices cover a great amount of the global stock market capitalisation, as presented in chapter three. Additionally

many of the MFs applied, are supplied by very central asset managers on the Danish MF market, as presented in chapter three. Thus the results are indeed relevant, but may not be generalised to the entire Danish MF market without further investigation. Table 4.17 summarizes the results obtained from the Pure Selection model.

Pure Selection Model					
		iShares		iShares Backtracked	
	Funds	Negative α	Signficant	Negative α	Significant
World	7	6	2	5	0
Europe	9	6	0	9	4
Emerging Markets	3	0	+1	0	+1
General	19	12	+1 and -2	14	+1 and -4

Table 4.17 Presentation of Pure Selection model results, summarized.

Table 4.17 presents; the number of negative alpha values in the tests and the number of significant alpha values. The table summarizes that there is one significantly positive alpha value among the Emerging Markets MFs and two and four significantly negative alpha values for the other MFs.

The model based on pure iShares data uncovers inferior performance in 12 of 19 funds, while two of these are significant. One fund shows significant outperformance. The model based on iShares data backtracked uncovers inferior performance in 14 of 19 funds, while four of these are significant. One fund shows significant outperformance. The same overview is presented for the Selection and Timing model in figure 4.18.

Selection and Timing Model					
		iShares		iShares Backtracked	
	Funds	Negative α	Significant	Negative α	Signficant
World	7	6	1	5	4
Europe	9	7	0	9	3
Emerging Markets	3	0	0	0	0
General	19	13	1	14	7

Figure 4.18 Presentation of Selection and Timing model results, summarized.

The model based on pure iShares data uncovers inferior performance in 13 of 19 funds, while one of these is significant. The model based on iShares data backtracked uncovers inferior performance in 14 of 19 funds, with seven of these significant.

In general, the MFs presented in this thesis exhibit inferior performance and a considerable part does so to a statistically significant extent. The application of the Treynor and Mazuy Timing model indicates positive

timing abilities for some, but only significantly for two funds. The inclusion of a timing factor altered a quite a few of the alpha coefficients and gave evidence of how a considerable part of the MFs have positive timing abilities, along with negative stock selection abilities. In some cases these positive timing abilities made up for poor stock selection abilities, as is evident in table 4.18.

For the Emerging Markets only three funds could be included. One of these three funds shows significant outperformance, which is to some extent a combination of positive stock selection along with positive timing abilities. The other two funds perform neutrally.

As discussed in paragraph 4.1 the numerical and graphical presentation could indicate some degree of outperformance of a few funds for World and Emerging Markets. The statistical performance tests presented in 4.3, however confirm that this evident outperformance, was not sufficient to confirm statistical significance for any MFs, except for Danske Invest Nye Aktiemarkeder, which is also the only significant outperformer among the 19 fund sample.

The results support the theoretical framework of EMH that active management will not result in outperformance compared to the passive alternative when costs are considered. The argumentation of Sharpe that active management will on average perform worse than the passive alternative due to costs could also be supported based on this data, even though the passive alternative in this paper also covers costs.

The evidence thus suggests that these specific ETFs perform well as an investment alternative for Danish private investors. Even though no general conclusions can be drawn based in this limited sample the evidence for these particular funds is quite strong. Thus based on pure performance these ETFs offer a viable alternative.

When interpreting these results it must be remembered that while the method accounted for heteroscedasticity and autocorrelation to some extent, the issues of non-normality was not corrected for. This implies that these results cannot be relied upon strictly. The implications of this will be discussed further in the critique of chapter nine.

When evaluating the suitability of ETFs as an investment vehicle, only considering performance is not enough. To supplement the findings on performance found in this chapter, the following chapter will address the other important factors the private investor has to take into consideration, and investigate the general environment for Danish investments.

5. Investment Environment

In this chapter the surrounding investment environment of the MFs and ETFs is presented, by means of the most important tax and regulation rules and a discussion of the competitive environment on the Danish market for investments.

The findings of chapter four suggest that ETFs provide a viable alternative to the active Danish MFs. However, the surrounding investment environment, with regulations, tax and the competitive level play a large role in the investment returns for Danish private investors. Therefore it is important to understand if any discrepancies exist in this investment environment that can alter the conclusions of chapter four. The purpose of this chapter is to enhance the understanding of whether and to which extend these factors may play a role in the final return for the Danish private investor.

5.1 Regulation

In Europe investments funds are governed by the UCITS directive (Collective Investments in Transferable Securities), and thus these apply for both ETFs and MFs.

A UCITS-certified fund registered in any country within the EU, can be marketed in every other EU country. UCITS IV, the fourth version of the directive was adopted in 2009, but the UCITS framework dates back to 1985 (Investeringsforeningsrådet, 2011), and today three quarters of AUM in Europe are held in UCITS funds (Amanc et al, 2012). Due to the high degree of investor protection offered by UCITS, it is currently being implemented worldwide in an effort to streamline regulation of investment funds. This is particularly the case in some Emerging Markets and especially in Asia, where more than 70% of authorized investment funds in Hong Kong and Singapore now in compliance with UCITS (Ramaswamy, 2011).

The entire regulation and tax regime governing Danish investments is quite extensive, and a complete review is outside the scope of this thesis. However the most central parts related to ETFs and MFs will be highlighted here.

An important rule for actively managed MFs, is set out in Article 52 (this is implemented through LIS §128 for Danish funds[26]). Article 52 concerns the dispersion rules for investment funds, securities and money market instruments governed by UCITS. It states that a UCITS fund may not invest more than five percent of fund assets in securities and money market instruments issued by one issuer or issuers in the same group. This limit may be increased to 10 percent if the total value of investments exceeding five percent does not exceed 40 percent of total fund assets. Furthermore, a UCITS may not create any combination that would result in a net position of more than 20% of its assets in a single body of transferable securities such as money markets instruments, deposits or exposures based on OTC derivative transactions. This results in a limit of 16 funds if the opportunity to extend to 10% is followed, and 20 if not, given that the fund is fully invested.

This regulation might be restrictive for the investment possibilities of an active portfolio manager, especially in smaller markets, such as the Danish equity market where a few companies with large market capitalizations constitute a large part of the benchmark index. As an example, the Novo Nordisk stock can be mentioned, as it weighs 44%[27] in OMX C20. No MFs benchmarked to this index limited under the UCITS and LIS can have a larger weight than the index of this stock and will thereby underperform in this regard if this stock has a positive return.

An important exception to article 52 is found in article 53. Article 53 applies to funds whose purpose it is to replicate the composition of an index. The index must be recognised by the authorities and live up to certain requirements of diversification and publications. If these requirements are fulfilled, the fund may hold positions of up to 20% in a single security. This would apply for index tracking ETFs, like the ones investigated in this thesis. The 20% rule, however, is not important for the specific ETFs considered in this thesis, as all three benchmarks used are very broad with no single security coming close to the 20% limit[28]. On the other hand there could have been issues for smaller index tracking funds with large single positions in the index, if the regulation did not allow for this caveat. Thus active UCITS funds may find it difficult to outperform passive funds under the same requirements, if the large positions in the benchmark index experience price increases. This is something to remember when interpreting performance tests of actively managed MFs. In some cases they may be restricted to a greater extent than what they are compared to. These regulatory requirements can thus have an influence on the performance of MFs and ETFs. Most importantly, however, the rules are set up for the protection of the investor, as the need for diversification for the private

[26]The UCITs regulation set out certain regulations which the member countries must implement in their own regulations. For investment funds in the Danish regulation this is done through the LIS – (Lov om investeringsforeninger, 2011).
[27] Per 09.05.2012; Sources: Nasdaq OMX.
[28] Refer to appendix 11.4 for the distributions of the indices.

investors is deemed most important. The rules are there to ensure that no single security is too dominant in the portfolio and that risk is not too centralized as a result thereof.

Another interesting part of the UCITS framework is the fund's status as a pool of assets separate from the sponsor. This means that in the case of a default or insolvency by the ETF- or MF provider, the assets in the fund will be protected (this is in stark contrast to ETNs, which will be covered later in the thesis). Practically, this is accomplished under article 22 (1) which states:

"The assets of a common fund shall be entrusted to a depositary for safe-keeping." (European Union, 2009).

Should the ETF provider file for bankruptcy the assets would still be in the possession of the custodian and available to the investor, thereby effectively removing issuer risk.

Having discussed the most important regulations the next paragraph deals with the tax rules implemented for any investment fund that wishes to operate on the Danish market. The tax rules can be particularly important for the Danish private investor as Denmark has the highest tax burden in the World (OECD, 2011) and thus the influence of taxation can be quite substantial for the net disposable income from investments.

5.2 Tax

The tax rules investigated here are seen from the Danish private investor's perspective, to understand if these rules may have any implications on the performance results of chapter four and to support the performance analysis with tax considerations. There is a strong line to be drawn between the rules and regulations for free savings funds and pension funds. These will be investigated, starting with the free funds rules.

The focus of this paragraph is the rules governing dividend paying funds catering to free fund investing. MFs operating on the Danish market are governed by the ABL[29] §19. There are certain requirements set out in this section, which the MFs must comply with. The MFs can furthermore choose to meet rules set out in ABL §21(2) which contains certain criteria for fund holdings and reporting to the Danish authorities. ABL §21 also refers to LL[30] §16C, which contains requirements for minimum dividend payments and reporting thereof. In practice, it requires extensive system implementation and effort to comply with LL §16C. The criteria of both ABL §21 and thereby also LL §16C must be followed strictly otherwise the funds will be reclassified, as stated in LL §16C (11).

[29] Capital Gains Tax Act (Aktieavancebeskatningsloven) (2011).
[30] Tax Assessment Act (Ligningsloven) (2011).

If the MFs are able to live up the rules set out in ABL§21 and LL§16C, the MF certificates become legally equivalent to shares, and any capital gains are therefore taxed according to share tax rules. The tax levels for shares for the Danish private investor are defined in PSL[31] §8a.

"Tax on share income does not exceed a basic amount of 48,300 DKK (2010-level), calculated as a final tax for income years 2010 and 2011 is 28% and subsequent income years is 27%...", (2) tax on income exceeding a basic amount of 48,300 kr (2010 level), calculated at 42%.." (PSL §8a).

This implies that any income, either in the form of dividends or capital gains, from MFs classified under ABL §21, will be taxed at 27% to 42%, depending on the amount.

If the regulations of ABL§21 are not followed the MF will instead fall under ABL §22. This implies that income from the MF shall be included in taxable income for the private investor. Taxable income is governed by the rules set out in PSL, §1 to 4b. Positive net capital gains are taxed according to rules set out in §5 in the PSL, general for all taxable income. The levels of taxation are set out in §6-9. The taxable amount of capital gains is calculated based on the person's total income from capital. If the person's total capital income is positive, this is taxed depending on the person's other income at a rate between 37% and 47.5% (2011 levels) (Dengsøe 2011). This is in contrast to the 27% to 42% for share based MF capital gains and implies a significant tax advantage for the private investor, investing free funds in any MF that lives up to the rules set out in ABL §21. Even though the exact difference is dependent on the taxable income of the investor, in most cases the advantage will be considerable.

As presented the tax rules which apply to pension savings are quite different from those for free funds. Pension savings, which comply with the rules set out in the PAL[32] §19, are exempted from taxable income when incurred, with the general exception being PAL §20. The pension funds are instead taxed at an annual rate of 15% of realised and unrealised gains (PAL §2[33]) and when the funds are cashed at retirement they are taxed as part of taxable income. Taxation is the same for all funds.

The ETFs presented in this thesis are all registered in foreign countries, but since no ETFs are registered in Denmark these are the only ones available to the Danish investor. This poses the question of whether Danish and foreign MFs are taxed at the same level or if there are any discrepancies, which will alter the results found in chapter four on an after tax basis. This will be further investigated in the following.

[31] Personal Gains Tax (Personskatteloven) (2011).
[32] Law on Pension Funds (Pensionsbeskatningsloven) (2010).
[33] Pension Investment Return Tax Act (Pensionsafkastbeskatningsloven) (2011).

5.2.1 Implications

According to an article by business.dk published in 2008 (Bentow, 2008), at the end of 2008, MFs operating in the Danish market had approximately 676 bn. DKK under management, out of the 676 bn. DKK, foreign MFs had 30.3DKKbn, corresponding to less than five percent of the total AUM[34]. These facts creates basis for questioning whether the rules and regulations governing Danish investments are skewed. Denmark has ratified the Maastricht Treaty, which means that the Danish authorities are obliged to ensure that certain rules are followed.

Relevant to this thesis is article 58EF of the Maastricht treaty as it governs investments and thereby MF certificates and ETF shares. By article 58EF member countries are allowed to instate their own tax rules, but these must comply with the rules set out in Article 58EF. This means that local tax rules must not constitute a means of arbitrary discrimination or a disguised restriction on the free movement of capital, payments and services. Only under special conditions, where it can be justified by overriding reasons that cannot be met otherwise, and where the restriction is proportional to the target, deviation is allowed (Maastrict Treaty, 1992).

The general regulation and tax rules discussed in this chapter, governs all investment funds that operate on the Danish market, both Danish and foreign. As described these rules are extensive, require strict compliance, and the use of special reporting to the Danish authorities, but they apply equally to all funds operating on the Danish market. Thus there does not seem to be evidence of discriminatory regulation in place favouring Danish funds over foreign funds. Seen in this light, the distribution of AUM with only approximately five percent held in foreign funds, seems peculiar. Part of the explanation may be found in the following statements:

"... the Danish market is in itself too small to justify a separate report by the Danish rules. As an international player you do not get the advantage of economies of scale..." (Henriksen, 2009, p.1)

As described by Peter Preisler, Director for Europe, Middle East and Africa at T. Rowe Price (Henriksen, 2009). This attitude is supported by with the following finding of the report from the Danish Competition and Consumer Authority (Konkurrencestyrelsen) from 2006:

"Especially for foreign funds - who are not familiar with the Danish system – this (the reporting and systems required, red.) is impractical and expensive in light of the fact that Denmark is a relatively small market. A foreign MF has indicated that the cost of living up to the requirements for dividend-paying MFs in

[34] These numbers were the most recent ones found.

Denmark, will amount to approximately half a million annually even if only a few funds were to be supplied..." (Konkurrencestyrelsen, 2006, p. 37)

This implies that foreign funds as well as Danish MFs operating on the Danish market have many demanding and costly requirements to comply with, if the status as share-based MF is to be achieved. It seems that the real reason why foreign MFs only constitute 5% of the market AUM may lie in the fact that foreign funds does not have enough of an economic incentive to target the Danish market, due to the relatively small size and high costs associated therewith.

Today only very few foreign funds are available as share-based funds to the Danish private investor[35]. Most foreign funds are only supplied as capital gain based, including all of the ETFs investigated in this thesis. This implies that these funds are all taxed as taxable income of 37% to 47.5% level as opposed to the Danish MFs investigated which all abide by the rules and result in share based capital income, which is taxed at 27% to 42%.

The performance test in chapter four showed that the ETFs performed well compared to their actively managed MF counterparts. However, for free funds the different tax treatment of capital income from MF and ETF investing, might potentially alter these conclusions. Despite the performance of ETFs, the rather large difference in taxation levels, leads the authors to believe that free fund investing in ETFs is currently not favourable. The specific tax treatment of capital income depends on other income of the investor. This makes it difficult to offer strict and measurable conclusions on the extent to which tax considerations will alter the conclusions found in chapter four.

Seen in this light ETFs appear to be most relevant for pension funds, which as discussed, are all taxed at the same level. However, according to an article by Penge og Privatøkonomi from 2011 (Verup, 2011), 40% of the Danish population leaves the investment decisions of their pensions saving entirely up to their pension company. The remaining 60% still leave many decisions to the pension company. Pension savings are therefore to a great extent collectively managed and the large pension companies have a strong role in the pension funds investment distributions. As a result the Danish private investor may not see the full benefits of the low cost alternative that ETFs provide. An example of this is provided by the Optimal Pension funds.

Optimal Pension is a Danish pension fund. The investment strategy of Optimal Pension is to invest in a world market portfolio through ETFs. The only active management done by Optimal Pension is the asset allocation decision. The underlying securities in the fund are only ETFs. The estimated yearly holding cost of this fund

[35] The Norwegian Skagen Funds are famously known as the general exception that makes the rule (Bentow, 2008).

is 0.53% whereas the underlying ETF funds have yearly costs of 0.13% (Mikkelsen, 2012). In effect, the costs for the private investor in Optimal Pension is four times higher than they would have been by investing directly in the underlying ETFs.

5.2.2 Illustration of Cost Differences

Generally ETFs are low cost alternatives, as we have seen in chapter two and three. To illustrate what implication these costs differences have for the savings of the private investor, the following figure is presented.

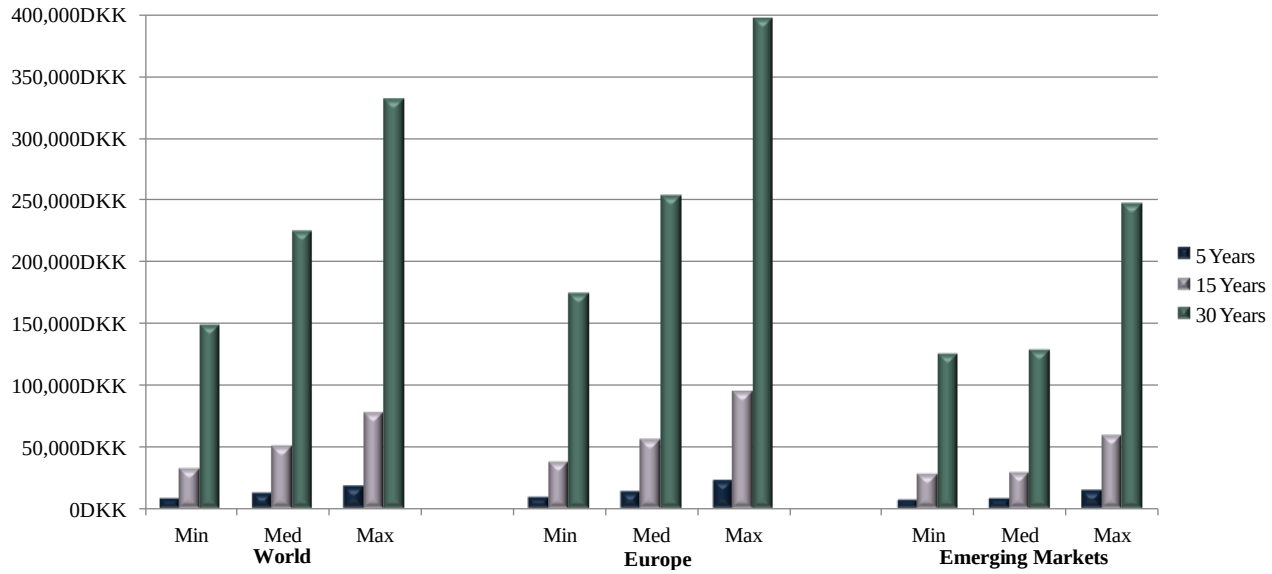


Figure 5.1: Additional Return from ETF Investing. Source: IFR, Company Websites

Figure 5.1 shows the difference in value of a 100,000DKK investment after 5, 15, and 30 years in the median ETF in terms of TER from one of the three ETF providers used in this thesis and in corresponding MFs. In accordance with the outlines worked out by The Danish Bankers Association (Finansrådet) and the Danish insurance and pension trade organization (Forsikring og Pension) a 7% yearly return has been assumed (Finansrådet, 2012). For the ETFs the TER is used as the holding cost. Even though this is not the full cost picture for an ETF (as it will be shown in chapter six) it is the best guess for holding costs going forward. For MFs the holding cost is defined as in table 2.1. i.e. administration cost plus trading costs for 2010. Furthermore emission allowance and redemption charges are included, also based on 2010 numbers. For each of the 3 holding periods the difference is shown for the cheapest, median, and most expensive MF alternative. It must be noted that these three scenarios is created by combining traits from different MFs. This means that e.g. the minimum scenario is created by combining the minimum holding cost found in MF "X", with the minimum emission allowance in MF "Y" and minimum redemptions charge in MF "Z". Trading costs are not

included as these are incurred when trading both ETFs and MFs[36]. Nordnet is assumed to be the bank used, thereby making deposit costs zero for holding both ETFs and MFs.

It would seem that from a cost perspective the greatest benefit to be had from ETF investing is found in European investments, where the difference in value after 30 years is almost 400,000DKK in the most extreme case. On the other hand, the benefits seem to be most limited in Emerging Markets, primarily due to higher ETF costs. These results are interesting when combined with the findings in chapter four, where European MFs were among the worst performers, and the only MF which showed significantly positive outperformance was an Emerging Market MF. As with all results being compounded over longer time horizons, the significance of low costs becomes more and more apparent. The difference in savings between the cheapest and most expensive World MF is only about 10,000DKK on a five year horizon, while this difference is more than 180,000DKK over 30 years. With a holding period of 30 years the minimum saving to be gained from investing in the ETF alternative is approximately 150,000DKK for World, 175,000 for Europe, and 125,000DKK for Emerging Markets under this framework.

Thus the Danish investor should find ETFs interesting, however, from a regulatory and tax standpoint the Danish market looks like a difficult market for the ETF providers. Another important thing to consider is that even if the foreign MFs decided to target the Danish market and to live up to the rules and regulations described in this chapter there are other important restrictions, which will be discussed in the following paragraph.

5.3 The Competitive Environment on the Danish Market for Investments

According to a report published by the Danish Competition and Consumer Authorities in 2006,

"You could say that a customer chooses a bank and mutual fund simultaneously. Additionally you can also say that each fund has a monopoly on the market the related financial institution has in terms of its customer list. This reduces competition substantially. Although the MFs are independent legal units, they cannot really act independently of the associated banks." (Konkurrencestyrelsen 2006, p. 27/28)

Furthermore, the Danish system for MF certificates is created so that customers have no means of buying the certificates directly from the MFs. Therefore the purchase of MF certificates must happen through a "Custodian" – in this case the banks (Bechmann and Wendt, 2012). These factors imply that the opportunity for MFs to market themselves to potential customers is very dependent upon the banks as the banks

[36] Were trading costs to be included this might slightly favour MFs as these are listed in Denmark, whereas the ETFs included in this thesis are listed on Xetra.

effectively have a monopoly on the distribution of the MF certificates. The following figures reflect this; 87% of total Danish AUM invested in MFs are placed in MFs which by name are connected to a Bank (such as Danske Invest and Sydinvest), and this share rises to 99% if those MFs are included who are independent but indirectly connected to the banks (such as BankInvest and Sparinvest) (Bechmann and Wendt, 2012).

5.3.1 Agency Commission

In order to gain access to distribution channels, i.e. be marketed by the banks, most MFs pay an ongoing agency commission[37] to the banks. The agency commission amounts to 2.3DKKbn on a yearly basis, (2010 numbers), which corresponds to approximately 0.5% of the total AUM. These costs are continuously deducted from the return that the MFs deliver (Bechmann and Wendt, 2012).

Furthermore the agency costs stand for approximately half the total costs, associated with MF investing and are therefore the biggest individual item of the costs, as shown in figure 2.1 in chapter two. The banks define the agency cost as:

"...the costs associated with being at the disposal for the investors, with advice on their investment certificates" (Konkurrencestyrelsen, 2006)

However, as argued by the Danish Competition and Consumer Authority (Konkurrencestyrelsen, 2006), it would be more reasonable if this advice only incurred costs, when it actually resulted in the purchase or disposal of certificates. An intriguing fact is that investors, who invest directly in stocks or bonds through a bank, do not pay an ongoing agency fee, as they do for MF certificates (Konkurrencestyrelsen, 2006). Another important factor is found by Bechmann and Wendt (2012), which show that agency costs are generally higher for active MFs, and for portfolios with higher risk.

According to §5 in BGS[38] banks are obliged to provide advice on their own initiative or upon request from the customer and this advice must put the interest of the customer first. Furthermore, if the bank has a special interest in the outcome of the advisory services, the customer must be informed thereof, according to BGS §9. These regulations are in place to ensure that the best interest of the investors is maintained and that transparency is achieved, so that customers are able to make an informed choice. According to a study by the Danish Financial Supervisory Authority (Finanstilsynet), which investigated the behaviour of 10 banks[39] in advising customers on MF certificates, these banks failed to provide a specification of the agency costs in the

[37] In Danish: Formidlingsprovision.
[38] Bekendtgørelse om god skik (2011).
[39] The Banks were: Danske Bank, Nordea, Jyske Bank, Sydbank, Nykredit, Ringkjøbing Landbobank, Nørresundby Bank, Østjydsk Bank, Nordfyns Bank and Sparlolland. (Finanstilsynet, 2012).

yearly overview of fee payments (Finanstilsynet, 2012). The Danish Financial Supervisory Authority argues that this entails that the true costs associated with investing in MF certificates are hidden. This could imply a lack of transparency and that the banks are not in compliance with the BGS. As a result the customers are not fully able to take informed decisions.

5.3.2 Economic Incentive Structure

As mentioned the agency commissions are typically higher for actively managed funds and riskier portfolios. Thus recommending active MFs with higher risk profiles will typically imply higher income for the banks, as opposed to recommending the passive alternative. According to a report on the Danish MFs performed by the Danish National Bank, the way in which the distributional system of MF certificates is set up in Denmark leaves the banks with an incentive to recommend active MFs (Karlsson and Ristrop-Thomsen, 2008). This argument is supported by Bechmann and Wendt (2012), who further argue that the fee structure also leaves incentive for recommending more specialised and risky products. This supports the hypothesis that banks have an economic incentive structure which favours active and risky investment recommendations. While this should not result in anything less than the best advisory services for the customers, there is some evidence which indicate it is not the case. If so, it would be in violation of BGS.

As discussed in chapter four, there is little evidence to support the outperformance of active MFs over passive alternatives. It is therefore peculiar that of the 440 Danish MFs marketed to retail investors, only 33 are passive funds (2010 numbers) (Finanstilsynet, 2012). According to Morningstar the market share of passive MFs in Denmark was only 1.5% in 2011. The average number for Europe was 8.5%, while some countries, such as Ireland and Switzerland, had levels of 15% (Morningstar, 2011). The empirical evidence found in this thesis (and supported by many studies) does not justify this distribution. The net return from passively managed funds may in many cases be better than the active alternative. Specifically for the Danish market, a study by Bechmann and Rangvid from 2007 on Danish MF performance, finds that MFs with lower costs generally provide a better return than MFs with higher costs over a longer horizon. This implies that the higher the costs associated with MF certificates the lower the return for the investor. The agency costs do therefore not have a positive effect on the overall returns.

A specific example, mentioned in a Morningstar (2011) study illustrates these issues quite well. Originally LD Invest (today Maj Invest) had a strategy based on low costs and therefore did not want to pay agency commissions. While maintaining this strategy the LD portfolios delivered reasonable returns, but despite the low costs and good return history LD invest had difficulty attracting new customers. LD Invest changed their strategy in December 2009 and started to pay agency commissions. After this the fund saw a steep increase in

new customers and thereby new capital started to flow into the portfolios. As presented by Morningstar this development was quite controversial since the portfolios since 2009 have become more expensive and have also generally provided lower returns (Morningstar research, 2011).

This example illustrates the way in which the economic incentive structure for banks advising private investor may not be optimal (Morningstar Research, 2011). Along with the fact that only 1.5% of the Danish AUM invested in MFs is invested passively, this could point towards the hypothesis that the customer's interest is not always being put at the forefront, as required by BGS.

Another potential reason why the distribution of wealth is heavily skewed towards actively managed funds, despite poor historic performance is presented by Karlsson and Ristorp-Thomsen (2008). They speculate that customers are not interested in buying a product, where they are certain to be beaten by the index. The investors are therefore more likely to prefer the opportunity of beating the index by means of an actively managed portfolio. An additional reason could be that investors believe they are able to pick the winners. As discussed in chapter four, there is some evidence supporting performance persistence in outperforming funds, but only in the short term. Over longer time period this ability has proven very difficult to maintain for the investors.

As argued by Bechmann and Wendt (2012) a real effect will only be evident if customers start to engage in the investment decision and are critical towards the costs and information provided by the financial advisors at their banks. This statement implies that to a wide extent the real issue starts and ends with the customers. All the information applied in this chapter is readily available to any Danish private investor, who engages in some active research. But if the private investors are fundamentally not interested in their investments and the related costs, the current market structure is unlikely to change. At the moment this does not seem to be at the forefront to the private investor's decision making. Why this is stands to question, since there is a lot to be saved from choosing a cheaper alternative, as has been shown in this thesis.

5.3.3 Going Forward

So how would this situation change? Generally in foreign markets, by law, the purchase of MF certificates must not be done through a custodian, but is instead traded directly between the fund and the investor. The MFs in these countries are therefore not forced to market their products through the banks. If regulations are changed so that this is no longer the case in Denmark, it would open up to a different market structure that could possibly be more favourable for the investors (Bechmann and Wendt, 2012). Another more current proposal is set out by The Danish Financial Authorities. They instated an investigation of whether the MF boards are concerned with running their businesses in a cost efficient manner and independently from the

banks. The objective of the investigation was to uncover whether investors were duly informed of agency costs (Finanstilsynet, 2012). The results from this investigation led to an agreement between The Danish Shareholders Association (Dansk Aktionærforening), The Danish Consumer Council (Forbrugerrådet) and The Danish Bankers Association (Finansrådet) to ensure better information about costs. This agreement will be implemented starting in 2012.

The new agreement sets out certain informational requirements for the banks in the investment advising situation. The banks are obliged to inform retail customers of the ÅOP of any MF certificate investing. This ÅOP has to be supplied with information on any distribution agreements the banks may have, and the exact percentage cost associated therewith (Finanstilsynet, 2012). The information must be given in writing in the advisory service and in the online banking system – for the customer to see before the investment decision (Finanstilsynet, 2012). Furthermore, the agreement entails that the yearly fee overview, which is already given to the retail customers, must be supplemented with an ÅOP measure and an indication of the funds with which the banks have a distribution agreement and the exact size of the agency commission in percentage (Finanstilsynet, 2012). By these initiatives the councils believe the incentive structure will become clear and thereby enhance the decision making tools for the private investor (Finanstilsynet, 2012). When these measures are put in place, it will be interesting to see the effects. If they are successful foreign funds might find it easier to access the Danish market and Danish investors.

5.4 Summarizing

This chapter has discussed the surrounding factors which influence investments of Danish private investors. The tax rules for investment income were discussed. Due to the requirements set in place for free funds, income from foreign funds are generally taxed as capital income i.e. at 37% to 47.5% while Danish funds are taxed at 27% to 42%. This does not apply for pension funds. However, most pension funds are managed by large pension companies and not the private investors themselves. A possible reason for a limited supply of foreign funds in the Danish investment market was found to be the small economic incentive for foreign fund providers to target the Danish market and not a violation of the Maastricht treaty. This can imply that Danish investors do not obtain the full cost and performance benefits that ETFs provide. An example of these cost differences was provided to illustrate the magnitude these cost differences can have on the nominal value of the private investors' savings.

If the ETF providers, however, did decide to target the Danish market, there are other factors to consider. Danish private investors make their investments primarily through their banks. This implies that banks effectively have a monopoly of the MF distribution and that MFs are dependent on the banks to sell their

product. It is therefore speculated by several studies that the ongoing agency commission paid by MFs creates an unfavourable economic incentive structure for the banks. The structure favours active and risky investments, as these provide higher agency commissions. This also supports the argument that the best interest of the customer is not always put first, in spite of the fact that banks are obliged to do so according to BGS. Based on the performance tests in chapter four it was found that passive investments are generally a viable alternative to active management. In spite of these findings, passive investment still constitute only 1.5% of total Danish AUM and this supports the finding that the economic incentive structure of banks can be unfavourable for the best interest of the Danish investor.

The relation between banks and MFs has recently been scrutinized by the Danish Financial Authorities, which found that the transparency concerning the agency commissions was not satisfactory. Therefore a new agreement concerning cost information has been made to ensure that the private investor is duly informed of any agreements between the banks and MFs and the exact costs of agency provisions. The increased level of information will hopefully increase the investors' awareness and thereby enhance their decision making abilities.

However, the information provided throughout this thesis is easily accessible for the Danish investor and as argued by Beckman and Wendt (2012) the real problem lies in the fact that the Danish private investors are not more proactive in the investment decisions and choose to rely on the advice provided by their banks. Unless this changes they speculate that the current conditions will continue. The Danish investors will thereby miss out on the benefits in terms of costs and performance that ETFs provide.

This chapter concludes part I of this thesis. In part I the analysis of the ETF performance versus actively managed MFs as well as the supporting analysis of the investment environment is presented.

Part II of this thesis, includes chapters six and seven. Chapter six will analyse whether the ETF structures are inherently risky and thereby viable investment alternatives. The concluding chapter seven will highlight the differences between ETFs and other types of ETPs and analyse these products supplemented by three case studies.

6. Analysis of the ETF structure

This chapter will present an analysis of the most important risks of ETFs to the individual investor, as well as the structural dangers they might pose to the financial system as a whole.

As ETFs have continued to rise in popularity in Europe, closer scrutiny of the risks and benefits associated with ETF investing has followed. Researchers, regulators, and the ETF providers themselves have all pitched in to this discussion recently. The main point of discussion at this time is to what extend ETF investing expose investors to counterparty risk and whether or not the growing importance of ETFs is a threat to overall financial stability. Most research and debate has focused on whether one replication method should be preferred to another, and the extent to which the use of over the counter (OTC) derivatives used in index replication is a source of risk. In a reply to the European regulators (ESMA[40]) on 22.09.2011, Blackrock argues in favour of classifying ETFs based on the replication method. To the question:

"Do you agree with the proposed approach for UCITS ETFs to use an identifier in their names, fund rules, prospectus and marketing material? If not, please give reasons." (Blackrock, 2011b, p. 5)

Blackrock replies:

"…it would be appropriate in our view for the ETF-identifier to clearly identify whether it is a synthetic or physical ETF, which can easily be established through the principal investment policy of the fund." (Blackrock, 2011b, p. 5)

ETF providers using synthetic replication have argued against this method of classification and no decision has yet been made on the subject. Since both sides have economic interest in convincing regulators that their particular product is superior in terms of performance and risks, getting a clear picture has proven difficult. In this chapter the authors will analyse the risks and benefits of the ETF structure. This will be done by critical analysis of the ETF structures presented in chapter two, both in economic and regulatory terms. To the knowledge of the authors, no ETF credit event has yet occurred, yielding any case studies impossible. The issue will therefore be analysed through rational analysis and discussion based on the literature available. As

[40] European Securities and Markets Authority.

the discussion concerning risks in ETFs is ongoing in Europe at the moment, arguments made by both regulators, ETF providers and academics will be included to provide the fullest possible understanding of ETFs. A key cause of concern for regulators has been the pricing mechanisms and the liquidity of ETFs which invest in illiquid assets. This issue will be addressed as the first point in this chapter.

6.1 Pricing Mechanism of ETFs

Even though ETFs trade on an exchange like stocks, the price formation between the two differs considerably, and before investing in ETFs, the pricing mechanism of these funds should be properly understood. The price of a stock is the market clearing price resulting from supply and demand, given the aggregate opinion in the market of the future prospects of the company. This price discovery process is what is known as an "outright market" (Daley, Dorencz, and Bargerstock, 2010). Thereby there is no "correct" price for stocks as the price simply reflects the given supply and demand for the stock at any given time. Furthermore, new shares in a company cannot be created by anyone but the company itself, which is only done rarely. In contrast, there is a theoretically correct price for ETFs, namely the NAV derived from the underlying securities. Like stock prices, ETF prices are subject to supply and demand in the listed security but this market is not an outright market. Rather it is an arbitrage market where APs can create and redeem shares whenever the ETF price quote differs from the NAV (Indicative NAV or INAV is published throughout the day by the ETF provider (Daley, Dorencz, and Bargerstock, 2010). This arbitrage process is crucial to the understanding of the difference between stock trading and ETF trading. Due to the creation and redemption process, the liquidity of ETFs depend both on the primary and secondary market. In the secondary market, liquidity is based on supply and demand similar to a stock. Liquidity is also provided from the arbitrage process undertaken by the APs, and this process ultimately dictates the number of ETFs outstanding. Therefore the liquidity of an ETF really depends on the liquidity of the underlying. As such, the average daily traded volume, which is a good indicator of stock liquidity, holds less information for ETFs. There are two main reasons why the pricing mechanism and liquidity is important to the private investor. First off, the higher the liquidity, the easier it will be to either buy or sell the ETF when a decision has been made. Secondly, liquidity has an impact on the spread.

Like liquidity, spread should be an important part of any investment decision. The spread is the difference between what the market makers are willing to pay for the security and what they are willing to sell it for. Combined with the commission charged, is the direct cost associated with trading ETFs[41]. The spread in ETFs is dependent on the trading in the secondary market, as described above. Furthermore, ETF spreads are

[41] Ignoring potential tax implications and the difference between the price and NAV.

influenced by the liquidity and volatility of the underlying portfolio. For this reason ETFs can have narrow spreads even with limited volume in trading, if the arbitrage process is sufficiently predictable. In the same way, ETFs with high trading volumes in the secondary market might still experience high spreads if the arbitrage process cannot be properly relied upon (Amanc et al, 2012). This is opposed to stocks where the inverse relationship between the liquidity of the stock and the spread has been proven many times (Daley, Dorencz, and Bargerstock, 2010).

The type of liquidity provided by the APs is only seen in ETFs. Thinking that ETFs provide an additional source of liquidity to the investor in an otherwise illiquid asset is irrational as the arbitrage process undertaken by the APs is dependent on them acquiring the underlying assets in the market (see figure 2.5). While there might be many arguments in favour of ETF investing for the private investor, increased liquidity compared to the underlying should not be is not one of them.

Understanding the underlying price formation is important for the investor when trading ETFs. However, when the ETF has been bought, understanding the internal returns and costs of these products is central. This will therefore be the focus of the next paragraph

6.2 Internal Returns and Costs - Sources of TE

When evaluating the costs and returns associated with ETF investing, considering only the stated TER is not sufficient. As was shown in chapter four, the TE of the ETFs was not exactly equal to the TER. In this section of the thesis other sources of costs and income for ETFs will be covered.

6.2.1 Securities Lending

An important source of income for physical ETFs stems from lending the securities deposited in the fund to a third party, typically hedge funds seeking short positions (Amanc et al, 2012). Due to the "warehouse" structure of physical ETFs where large amounts of securities are held (technically the securities are held by the custodian), the ETFs are well suited to engage in securities lending. The lending of these securities is secured, meaning that collateral is posted in return, and the fund is paid a fee in return for the lending (Ramaswamy, 2011). The collateral posted can be in the form of equities, bonds, or liquid instruments. As such, there could be US treasury bonds in the collateral basket to collateralize the lending of e.g. Emerging Market equities (more on collateral composition later). iShares, the largest provider of physical ETFs in Europe, also engage in the lending of securities. The revenue from this activity is split between the fund provider and the customer with 60% of the proceeds going to iShares, and 40% to the investor (iShares.dk, 2012). However, this split varies significantly from ETF to ETF, as does the share of securities on loan.

ETF Provider	Net Fees Returned to Fund	Acceptable Collateral Types (Margins)	Additional risk Mitigants
Amundi	60%	Undisclosed (110%)	None
ComStage	100%	Equities, Gov Bonds, CDs, Cash (100%-105%)	None
Credit Suisse	100%	Undisclosed (102%-115%)	None
EasyETF	50%	Equities, Gov Bonds, Cash (102%-115%)	None
ETFLab	100%	Equities, Gov Bonds, Cash (103%-110%)	None
HSBC	60%	Gov Bonds (105%)	Borrower Default Indemnisation
iShares	60%	Equities, Gov Bonds, CDs, Cash (102,5%-112%)	None
PowerShares	70%	Gov Bonds (102%)	Borrower Default Indemnisation
SPDR	50%	Equities, Gov Bonds (102%-105%)	Borrower Default Indemnisation
UBS	Undiscloed	Equities, Gov Bonds (102%-115%)	Borrower Default Indemnisation
XACT	100%	Equities, Gov Bonds, CDs, Cash (105%-110%)	None

Table 6.1: Securities lending practices for European ETF providers. Source: Bioy, 2011

The information in table 6.1 is based on a survey among 11 European ETF providers, and it highlights the very different approaches, that each of these have to securities lending and collateralization. The share of the net fees that goes towards the return of the fund varies from just 50% to 100%, where the remaining share goes to the ETF provider. This shows that the investor should keep a careful eye on the lending return policies of the individual ETF provider before making an investment decision. Another point of difference is the fact that some funds offer borrower default indemnification. Using HSBCs ETFs as an example, HSBC guarantees that the stock will be delivered to the fund, should the counterparty prove unable to do so, thereby further ensuring that the fund will receive the securities that has been on loan (Bioy, 2011).

In an article by Bioy (2011) the question is raised whether the proceeds from securities lending should not be returned to the fund in full. In the opinion of the authors, the answer to this question is yes. The risk associated with the lending practice is born in full by the fund, and for this reason the proceeds should also be returned to the fund in full. By returning anything but the full amount to the fund, the ETF provider is effectively exposing the ETF investors to a counterparty risk for which they do not earn the full return.

Lending practices also vary significantly when it comes to the proportion of the fund's AUM that is on loan, and even for the same ETF provider. The following figure provides a brief overview of the share of AUM on loan, as well as the return earned on securities lending in relation to the Total Expense Ratio (TER), for a few randomly selected European ETFs.

Fund Name	Average on Loan	Net Return to Fund	Total Expense Ratio (TER)
Comstage ETF EURO STOXX 50 FR	99.3%	8.9 bps	15.0 bps
iShares FTSE 250	92.0%	14.7 bps	40.0 bps
iShares MSCI Japan Smallcap	73.0%	17.6 bps	59.0 bps
ETFlab MSCI USA MC	62.8%	16.9 bps	30.0 bps
ETFlab DAX	55.5%	14.3 bps	15.0 bps
SPDR MSCI EUROPE Info Tech	35.0%	11.2 bps	30.0 bps
SPDR MSCI Europe Energy	24.0%	5.3 bps	30.0 bps
iShares MSCI Turkey	18.0%	38.5 bps	74.0 bps
HSBC EURO STOXX 50 ETF	7.8%	43.0 bps	15.0 bps

Table 6.2: ETF securities lending returns. Source: Bioy, 2011[42]

The share of AUM on loan varies greatly from fund to fund, as does the return earned from securities lending. The HSBC EURO STOXX 50 ETF is an example of an ETF where the net return earned on securities lending, is greater than the TER of the fund, implying that the internal returns are greater than the internal costs of the ETF. Even though this is somewhat rare, it does occur (Bioy, 2011). Naturally, the investor would have to take a holistic approach to the net return on securities lending while taking into account the collateral posted. Bear in mind that the table does not provide any information regarding the collateral levels for the funds, and does therefore not hold any information regarding the Net Counterparty Exposure[43] (NCE). This is covered later in the chapter.

Bioy (2011) argues that the amount of additional return an ETF can obtain by engaging in securities lending depends on a few key factors. Firsly, small, less liquid securities will warrant a higher fee to the ETF. Based on this, it could be speculated that e.g. Emerging Markets ETFs using physical replication would be in a strong position to collect a high fee from securities lending. Secondly, the extent to which the securities on loan have been over-collateralized, as well as the type of collateral posted, must have an effect on the fee required. From 6.2 based on iShares collateral levels, it can be seen that the deposit certificates and cash are considered less risky than equities and bonds, and the thereby require less collateral. Finally**,** whenever counterparty risk is an issue, the credit worthiness plays a crucial role in determining the required return. This is also the case in ETF securities lending.

Securities lending is almost exclusively done in ETFs using physical replication. In a 2011 study by Johnson, Bioy, and Rose (2011) it was found that none of the synthetic ETF providers in Europe engaged in securities lending, with only one exception[44]. The opposite is true for physical ETFs. In a survey among 11 providers of

[42] The "Average on Loan" is the average share of the fund AUM that has been on loan over a 1-year period.
[43] The NCE is the value of the counterparty exposure minus the value of the collateral basket.
[44] Comstage, the ETF brand of Commerzbank "…may on loan up to 100% securities held by its ETFs" (Johnson, Bioy, Rose, 2011).

physical ETFs, Bioy (2011) finds that only one does not engage in securities lending[45]. The most logical explanation for this is probably that the securities posted as collateral in synthetically replicating funds, is less attractive to borrow. Securities lending will always generate a positive return for the ETF, with the cost being additional counterparty risk.

6.2.2 Cash Drag

Cash drag occurs when the ETF generates cash that cannot be immediately invested. The TE resulting from cash drag will be greater the larger the difference between the index return and cash return. Since most ETFs do not hold cash in money market accounts, the return earned on cash held is zero. While the underlying securities in the ETF might depreciate in value, causing the zero return earned on cash to be preferable, investors in ETFs expect their money to be invested. Should the investor prefer the cash position, a cash position should be held outside the ETF. In ETFs, mainly two corporate events will generate cash holdings.

Whenever there is a rebalancing in the index benchmark an ETF, which uses physical replication will also need to rebalance the holdings. Index rebalancing can be planned (See appendix 11.3 for MSCI rebalancing schedules), or they can be a consequence of M&A activity. Between buying and selling securities, cash will have to be held in the fund. Cash drag could also be the consequence of dividend payments, if the dividend reinvestment conventions differ between the ETF and the benchmark. Alternatively, if the ETF is dividend-paying the cash will also be held by the fund from the time of the underlying dividend payments to the time where the ETF pays dividend (Carrel, 2008).

6.2.3 Sampling Differences

As described in chapter three, ETFs from iShares use optimized sampling, whereas the ETFs from db x-trackers and Lyxor use synthetic replication. Each of these methods introduces different sources of TE. As can be seen in appendix 11.3 all three benchmarks included in this thesis have hundreds of constituents. iShares hold an optimized sampling portfolio and, as explained in chapter three, this introduces an additional TE component. The return on the optimized basket may be larger or smaller than the return of the index benchmark depending on the relative performance, and may therefore be a source of outperformance or underperformance.

While synthetic swaps do not experience the same issue with optimized sampling, the swap rate negotiated in the total return swap might be a source of over- or underperformance. For the ETFs from Lyxor and db x-trackers in this thesis the swap rate is zero. An additional source of TE comes from the fact that the cash flow

[45] A small Dutch provider named ”Think Capital”.

convention used in the swap, might sometimes differ from the index. An example provided by Costandinides (2010), is that dividend reinvestment assumptions might not be the same for the swap and index.

Finally, regulation might impose sampling differences. As described in chapter five, ETFs in Europe are governed by UCITS regulation which imposes the 20% rule for index replicating funds[46]. Since the benchmark index is not hindered by these rules, the difference in holdings between the ETF and index might potentially lead to TE. As with the holding difference resulting from optimized sampling, this can lead to both outperformance and underperformance.

6.2.4 Total ETF Cost

To see the effect of the internal returns and costs presented in this paragraph for the ETFs considered in this thesis, administrative costs are added back to the returns of each ETF. This is done to isolate the effect of internal returns and costs. The return of the ETF "before TER" is then compared to the return of the benchmark index. This is done in the table below, where the return for each ETF is subtracted by the return of their individual benchmarks[47].

	World			Europe			Emerging Markets		
Year	iShares	db x-trackers	Lyxor	iShares	db x-trackers	Lyxor	iShares	db x-trackers	Lyxor
2006	0.19%								
2007	0.78%	0.23%	-0.12%						
2008	2.02%	0.40%	-1.26%	1.51%	0.44%	5.82%	4.10%	0.00%	-2.98%
2009	-0.24%	0.22%	2.41%	-0.49%	0.27%	-1.20%	-1.00%	0.05%	1.80%
2010	-0.91%	0.07%	-1.31%	-0.31%	0.24%	-1.04%	0.58%	-0.20%	-1.52%
2011	0.22%	0.37%	0.35%	0.63%	0.40%	1.42%	-0.05%	-0.15%	0.14%
Full Period	**2.06%**	**1.30%**	**0.07%**	**1.34%**	**1.34%**	**5.00%**	**3.63%**	**-0.29%**	**-2.57%**

Table 6.3: Yearly performance before administrative cost. Source: Bloomberg, IFR, Company Websites

Almost all ETFs benchmarked to MSCI World and MSCI Europe show outperformance, when correcting for administrative expenses. This would indicate that the internal returns of the ETFs outweigh the costs.

Of the three ETF providers, db x-trackers show the most consistent performance, whereas both Lyxor and iShares exhibit more volatility. In this context it should be remembered that the goal of an ETF is not to outperform the index (although outperformance is certainly to be preferred to underperformance). Investors in ETFs expect to receive the market return, and in that respect the best ETFs are the ones which come closest to that.

[46] The 5/10/40 rule applies to actively managed funds. See chapter five for rules and regulations.
[47] See chapter 4 for the benchmark of each ETF.

In conclusion to this part about ETF costs, a short reminder that the total cost to the end user is a combination of the internal costs presented above and external costs outside the ETF itself. The focus in this paragraph has been on internal costs, since they are the most interesting from a financial structure perspective. Figure 6.1 sums up the total cost faced by ETF investors.

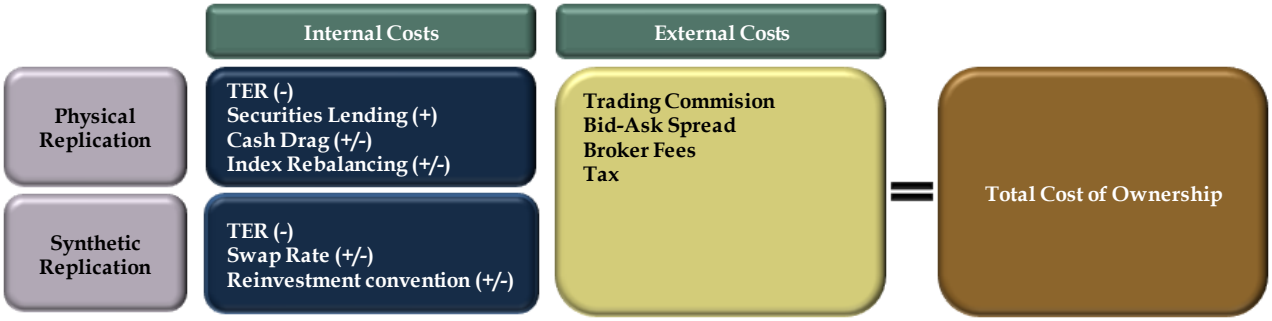


Figure 6.1: Total cost of owning an ETF. Source: Blackrock, 2012d, Costandinides (2010)

Considering the overview laid out in figure 6.1, it is interesting to note that most of the external costs are related to trading. These costs will become less and less of a drag on performance as the investment horizon increases, and can be minimized by limiting trading frequency. The internal costs in an ETF on the other hand are costs always incurred over time, and should therefore be the main source of interest for investors.

6.3 Risk in Synthetic ETFs

Of all themes related to the ETF structure, potential counterparty risk has without a doubt been the focus of most regulatory scrutiny. The most prominent example of this was when the Bank of International Settlements (BIS) published "Market structures and systemic risks of exchange traded funds" in the spring of 2011 (Ramaswamy, 2011)[48]. The content of this report focused primarily on liquidity concerns and systemic risks posed by swap-based ETFs, but later reports have broadened this focus to other types of ETFs as well, see e.g. Bioy (2011). In this paragraph the systemic risks highlighted in the article will be examined and discussed.

6.3.1 Transparency

The first argument raised by BIS concerns the lack of transparency in synthetic ETFs. Parallels are drawn to the recent history of structured finance (the subprime crisis is not mentioned specifically but is implied), where plain-vanilla products composed of physical assets are gradually replaced by more complex structures. It is argued that the lack of transparency in synthetic ETFs makes it difficult to assess the real risk related to these.

[48] This paper repeats many points brought fourth earlier by the Financial Stability Board (FSB), but will form the basis for these arguments in this thesis (FSB, 2011).

As stated earlier, two of the ETF providers used for performance tests, db x-trackers and Lyxor, use synthetic replication, and based on the critique by BIS, it was investigated whether there is indeed a lack of transparency in these specific ETFs. This was done through the website of each provider, with no further aids than those available to the average private investor.

For db x-trackers the collateral basket could easily be found on the subpage for each of the three ETFs[49]. Pie-charts show the allocation to region, sector, security type, and currency exposures. The top 20 weights in the collateral basket is listed on the website, with the option to download the complete collateral basket in an excel file. The NCE is readily available at the top of the page along with the replication technique used. The information is dated to the current date, and is updated daily. On the website of Lyxor the NCE is also readily available, along with a completely list of holdings in the collateral basket as well as their weights[50]. However, no information is given regarding the country, sector, or currency exposure in the collateral basket. Furthermore, the replication method is not given under the information for each ETF, but is instead under a Q&A section on a different section of the website. The information for the Lyxor ETFs is also updated on a daily basis.

It would seem that information regarding the collateral basket and the NCE is available on a daily basis for both of the two synthetic ETF providers considered in this thesis. The presentation of the information provides the investor with a much better overview at the db x-trackers website, but core information needed to make an informed decision, such as the NCE and the collateral basket holdings, is there for both.

In their article Johnson, Bioy, and Rose (2011) find that up until the end of 2010 providers of synthetic ETFs only released information about the collateral basket on a quarterly basis. Since then, however, increasing investor demand for information has ensured that transparency is much better than it used to be, and most providers are now releasing information of the collateral basket for each ETF on a daily basis. That being said, some points of critique are still raised concerning how well this information is presented. This fits well with what was found for db x-trackers and Lyxor in this thesis, where both presented the holdings, but db x-trackers came out much better in terms of accessibility. Other points of critique in Johnson, Bioy, and Rose (2011) in terms of transparency include the fact that most ETF providers do not inform of the swap-costs (usually not included in the TER and credit rating of counterparties. Again this fits well with the findings in this thesis, as swap costs or counterparty credit ratings could not be found for Lyxor or db x-trackers.

[49] http://www.etf.db.com/DE/EN/showpage.asp?pageid=29&stinvestortyp=privinv&strdisclaimerleverage=&strdisclaimereonia=&stinvtyp=&blauswahl=1.
[50] http://www.Lyxoretf.dk.

In conclusion the critique presented by BIS regarding lacking transparency of synthetic ETFs seem misplaced to the authors of this thesis. The study by Johnson, Bioy, and Rose (2011) show that for the majority of European ETF providers the collateral basket is available online and is updated daily, along with the NCE. This is also found to be the case for the two synthetic ETF providers examined in this thesis. To the private investor, the NCE as well as the composition of the collateral basket must be the most important points of interest.

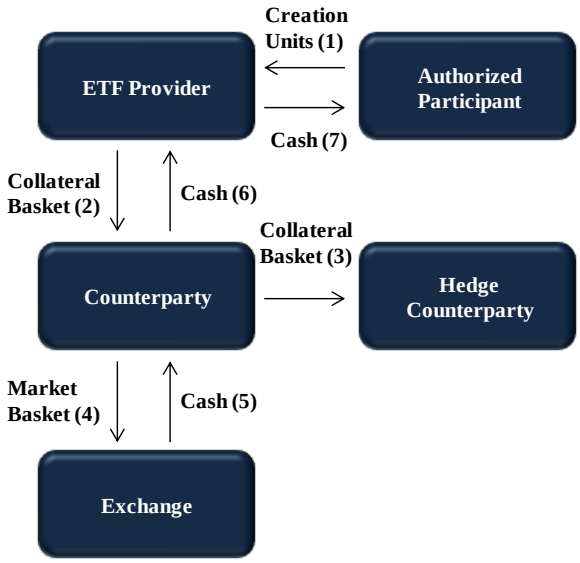
6.3.2 Quality & Liquidity of Collateral

The second issue raised by BIS concerns the quality and liquidity of the collateral. The article speculates that there are industry-wide incentives to post illiquid hard-to-fund securities as collateral. A large sudden investor withdrawal could cause a funding squeeze, as illiquid collateral would have to be sold by the swap counterparty to back large redemptions. The worst case scenario under this argument is that the counterparty is not able to sell the illiquid collateral and transfer cash back to the ETF provider. In that case the ETF provider would have to stop redemptions in the fund.

The argument has lately been subject to critique, both from within the ETF industry as well as from academic circles. In a reply to the ESMA in September 2011, Lyxor challenges the idea that the liquidity of the collateral basket is a danger to financial stability (Lyxor, 2011), and also Amanc et al (2011) argues against this. Both ETF providers and academics argue that the liquidity of the collateral basket is irrelevant, and this will be shown in this thesis as well. There are three different scenarios under which the bank will not be able to transfer cash back to the ETF provider, when there are (large) redemptions in the fund (Lyxor, 2011). First off, the counterparty might not have the needed liquidity at hand. Secondly, when the benchmark portfolio is illiquid, the underlying securities cannot easily be sold in stressed markets. Finally, the illiquid collateral cannot be sold without taking large losses.

To the point whether synthetic replication increases liquidity risk in large redemptions, a scenario is presented. Please refer to figure 2.6 for the unfunded synthetic swap-structure, and consider the position of the swap counterparty before the redemption. The counterparty has a long position in the collateral basket and a short position in the benchmark index of the ETF. Generally speaking, investment banks will make sure to hedge each of these exposures. In practice the investment bank will use the cash from the ETF provider to buy the market basket (or some share hereof). Furthermore, the basket of securities used to collateralize the swap agreement will usually be borrowed by the counterparty. In the redemption process the swap is terminated and both positions are unwound. In order to keep its position unchanged, the swap counterparty buys the collateral from the ETF provider, and sells the benchmark portfolio to fund this. If the “in kind” model is used by the

ETF, the counterparty sells the benchmark portfolio directly to the ETF (the "in kind" model is, however, mostly used with physical ETFs). In the cash creation model primarily used by synthetic ETFs and shown in figure 6.2, the benchmark portfolio is sold in the market which has the same effect on the counterparty.



1. Following the redemption, the AP delivers creation units to the ETF provider.
2. The ETF provider transfers the collateral basket to the swap counterparty, to unwind the swap.
3. The swap counterparty delivers the collateral basket to the original owner to annul its hedge.
4/5. The market basket is sold to fund the repayment to the ETF provider.
6. The cash from selling the market basket is transferred to the ETF provider.
7. The cash is ultimately transferred to the APs who can then pay the investors who originally redeemed the ETFs.

Figure 6.2: Synthetic Unfunded ETF Redemption Process. Source: Own Figure

Based on this scenario, the three points of critique will be addressed here.

1. As indicated by figure 6.2 the counterparty does not need to have the needed liquidity at hand. The liquidity position of the bank is only affected to the extent that there is a difference between the value of the collateral basket and the value of the market basket sold. This difference is per definition the counterparty risk, and is closely monitored on a daily basis and subject to regulation under UCITS.

2. The second point of critique seems to be true; there is a danger that the benchmark portfolio might be illiquid and not easily sold in stressed market conditions, and that this would make the counterparty unable to repay the ETF provider. However, the authors fail to see the difference between synthetic and physical ETFs in this regard. For an ETF using physical replication the illiquidity of the benchmark portfolio will also affect the redemption process. The APs will have to sell the index portfolio in the market to fund redemptions in much the same way that the counterparty has to in synthetic ETFs.

3. The liquidity of the collateral basket is irrelevant, since the counterparty is in fact not selling it at any point in the process, as shown by figure 6.2. In the redemption process the bank is buying the collateral from the ETF provider and in this exchange the liquidity in the market for these securities is irrelevant. The same is true when the collateral basket is delivered back to the owner.

In conclusion, the concerns regarding collateral liquidity seems overstated by BIS and others. The liquidity risk in a synthetic ETF is determined by the liquidity of the underlying index, and this is no different than the risk run by physical ETFs. What the BIS paper is not considering is the fact that the collateral basket *is not* sold in the market and therefore the liquidity is irrelevant. Furthermore, the counterparty will usually be hedged. Amanc et al (2011) concludes that:

"…the liquidity of the bank is impacted only at the level of the difference in values i.e. the counterparty risk…" (Amanc et al, 2011)

The liquidity of the collateral does have an effect in the event of a default of the counterparty, and this is where attention should be directed. As described in chapter two, the ETF will take possession of the collateral and liquidate it if the counterparty defaults. Two things will matter in this scenario, namely the marketability of the collateral funds, and the NCE. A study of the collateral holdings in European synthetic ETFs finds that they generally contain highly liquid assets, meaning that in case of default these should be marketable (Amanc et al, 2012).

6.3.3 Collateral Management

A point not raised by BIS, but interesting nonetheless, is collateral management practices. Even when the collateral posted is of high quality, prudent collateral management must be applied in ETFs to ensure maximum investor protection. The primary goal of collateral management in synthetic ETFs should be to keep counterparty exposure within reasonable limits at all times. From the point of view of the investor a few key issues should be considered when evaluating the reset policy of a synthetic ETF. Special attention should be paid to the frequency with which the swap is reset, and the level of counterparty exposure it is reset to. Under UCITS regulation article 52 the NCE of a fund cannot exceed 10%. At the latest, additional collateral will have to be called from the counterparty whenever the counterparty exposure reaches this limit of 10%. Reset policies amongst European synthetic ETF providers vary greatly as shown by Johnson, Bioy, and Rose (2011), but generally the ETFs set trigger-points well above the UCITS legal limit. As shown in chapter two, two types of synthetic ETF structures exist, and the primary difference between them is the way collateral is handled. It therefore makes sense to consider collateral management in the unfunded structure and in the funded structure separately.

For ETFs using the unfunded structure three different events might trigger a swap reset. First off, the counterparty exposure might reach the trigger-point set by the ETF. Secondly, swap resets might be caused by the issuance of new ETFs or redemptions in the fund. Finally, swaps might be reset on a regular basis, most often daily. The exposure trigger-point for European ETFs for ranges from the full 10% allowed by UCITS to

0% as a consequence of daily swap resets. None of the ETF providers considered by Johnson, Bioy, and Rose (2011) that used the unfunded structure over-collateralized the swap agreement.

As a small case study, the collateral management policy of Lyxor was investigated, since it is the only ETF provider included in the performance tests which use the unfunded synthetic structure. Lyxor has adopted a policy of daily swap resets:

> *"...in an effort to keep it (counterparty exposure) as close to zero as possible" (*Lyxor, 2012).

Each night, cash is transferred from the counterparty to the ETF equal to the marked-to-market difference between the benchmark index and the collateral basket. This cash is invested into additional collateral at the market opening the following day, thereby bringing the NCE back to zero.

In the opinion of the authors, daily swap resets provide the investor with the maximum amount of security. At the most the investor is only ever subject to the risk related to one day market movements. The downside of this is costs associated with the many transfers of funds, as well as trading costs related to buying and selling collateral securities.

From the presentation of the two synthetic ETF structures (unfunded and funded) in chapter two, it can be seen that the fundamental difference between the two structures is how collateral is treated. In the funded structure collateral is not transferred from the counterparty to the ETF, but is instead posted in a separate account. The collateral can either be posted in the name of the ETF or the counterparty, in which case it is pledged to the ETF. The difference between these two approaches becomes significant in the event of a counterparty default. When the collateral account is owned by the counterparty and pledged to the ETF, the ETF would have to file for ownership in case of a default, in order to access the collateral. Compared to the unfunded model where legal ownership of the collateral is transferred directly from counterparty to the ETF provider, having the collateral pledged seems riskier (this will be analyzed further later in this chapter). As a consequence collateralization levels should be expected to be larger too.

A look at the European market reveals that most synthetic ETFs using the funded approach over-collateralize the equity linked note[51], resulting in a NCE ranging between 0 and -25%. Typically, collateralization levels vary depending on the type of collateral, with higher collateralization levels required for equities than for bonds (Gordon, Bioy, and Rose, 2011). One of the synthetic ETF providers used for performance tests in

[51] As described in chapter two, referring to the funded synthetic approach as a swap is technically incorrect, although used extensively in marketing materials.

chapter four, namely db x-trackers, uses the funded synthetic structure[52]. No haircuts are imposed on bonds posted as collateral, but equity posted as collateral are take a haircut of 7,5% (meaning that to collateralize a value of 100, equity worth 107,5 will have to posted). The collateral is adjusted daily to maintain a negative NCE (Gorden, Bioy, and Rose, 2011). What is not clear from the article is how often the equity-linked note is reset. Daily adjustments to maintain overcollateralization does not necessarily mean that the counterparty exposure is always minimized. Consider the situation where all of the collateral is equity, this would indicate a required NCE of -7,5%. Making daily adjustments to keep the NCE from going positive (i.e. NCE below zero) is not the same as keeping the NCE at -7,5% which would happen with a complete reset. UBS is another ETF provider using the funded approach and like db x-trackers they employ daily adjustments to maintain negative NCE, and resets the equity-linked note agreement every quarter. The Swedish provider XACT only resets once a year (Gordon, Bioy, and Rose, 2011).

6.3.4 Unfunded Vs. Funded Synthetic ETFs

Following the discussion on collateral management, a broader discussion on the difference between the two synthetic structures and whether the investor should prefer one over the other is appropriate. Gordon Bioy, and Rose (2011) find that the unfunded structure is the most widely used in Europe with nine out of the 12 ETF providers using this for at least some of their ETFs. Given that most funded ETFs are overcollateralized this indicates that they are considered riskier than unfunded ETFs, as these are normally not overcollateralized. The authors agree with this point of view. When considering the difference between the two synthetic structures the central question must be how easily the collateral is accessed in case of a counterparty default. In the unfunded structure, the ETF already has legal possession of the collateral, which is physically being kept with the collateral custodian. In the funded structure where the collateral has been posted in the name of the ETF, legal ownership is also transferred, and in theory there should be no issues with gaining access to the collateral. The only difference between this and the unfunded structure is which one of the two parties initially posted the collateral. The access in the event of a default should be the same.

When the collateral is pledged to the ETF under the funded structure, there might potentially be trouble in accessing the collateral. In case of a default, the ETF would have to file for claim of the collateral before it could be sold. There are a couple of dangers related to this. First off when the counterparty defaults the pledged collateral might be frozen by the bankruptcy administrator. The most recent and noteworthy example of this (to the knowledge of the authors) happened during the bankruptcy of Lehman Brothers. In a high court ruling in London on 22.09.2008, a hedge fund was denied access to the collateral pledged to it by Lehman

[52] db x-trackers uses the unfunded structure for fixed-income ETFs, and the funded structure for equity and commodity ETFs (Deutsche Bank, 2010).

Brothers. The collateral had been rehypothecated[53] despite the fact that the contract between the two parties specifically prohibited this. In the bankruptcy process the hedge fund, along with others in the same situation, ranked among the unsecured creditors[54] (Aitken and Singh, 2009). This is an example of a situation where all of the collateral is not accessible. Even if the ETF is able to obtain the collateral, there might be delays associated with this, due to administrative procedures. It is reasonable to assume that should an ETF counterparty default this will most likely coincide with considerable market turmoil (remember that most ETF counterparties are larger European investment banks). In the time period between the default, and when the collateral can be accessed and liquidated by the ETF, large market movements might have occurred, potentially reducing the market value of the collateral.

Whether or not the funded synthetic structure with pledged collateral is really riskier remains to be seen, but from a theoretical point of view, the unfunded structure or the funded structure with a transfer of ownership should be preferred. The increased security of the unfunded structure comes, as always, with an additional cost. As has already been seen, the NCE under the unfunded structure is typically larger than in the funded structure. Furthermore, the funded structure is arguably more efficient in practice. Instead of posting the collateral with the ETF, which then transfers it to the collateral custodian, the counterparty can transfer it directly to the custodian. Among others, Manooj Mistry, the head of db x-trackers in the UK, uses this argument of operational efficiency as the primary argument in favour of the funded structure with pledged assets. It is difficult for the authors to conclude too strictly on the strength of this argument, but it does seem logical that the increased risk of the pledged funded structure is balanced by increased operational efficiency.

6.4 Risk in Physical ETFs

While synthetic ETFs has been the object of far most research and regulatory scrutiny, lately focus has also shifted to the risks in physical ETFs. This shift has been led by both researchers (see e.g. Amanc et al (2012) and Bioy (2011)) and (perhaps not surprising) providers of synthetic ETFs. In this paragraph the risk structure of physical ETFs is discussed and compared to the risks inherent in synthetic replication.

6.4.1 Counterparty Risk

The research on risk in physical ETFs has largely been concentrated on counterparty risk. The primary argument made by proponents of physical replication is the lack of counterparty exposure as no swap counterparty exists. However, when securities lending is taken into consideration this argument is no longer

[53] Rehypothecated means that the assets has been pledged to another party as well.
[54] Whether the hedge fund retrieved any of the collateral value during the following bankruptcy process is unknown.

valid. Consider the following figure showing the structure of a physical ETF using the "in kind" model and engaging in securities lending.

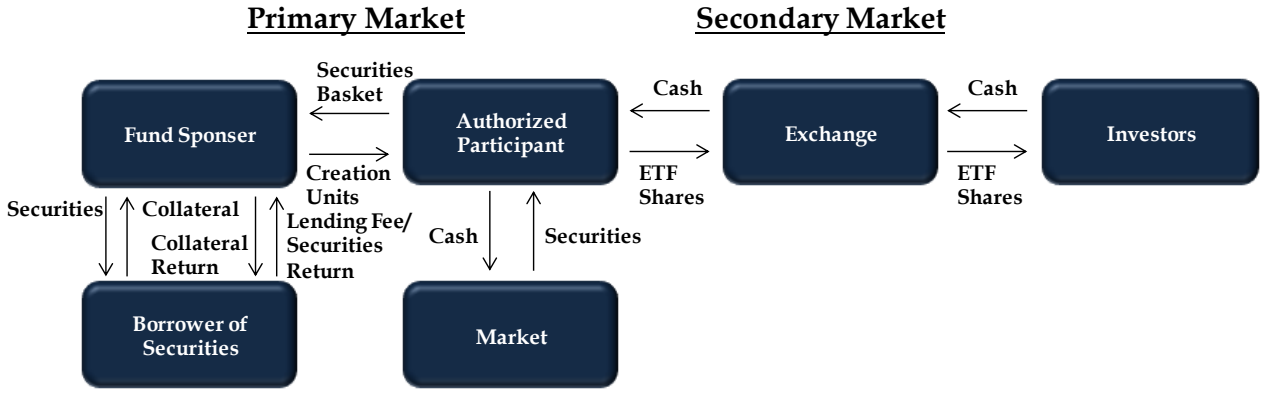


Figure 6.3: Physical ETF engaged in Securities Lending. Source: Own Figure

As can be seen from the figure 6.3, the structure of a physical ETF engaging in securities lending is the same as for synthetic ETFs. The only difference between figure 6.3 and figure 2.6 is that the figure above uses "in kind" redemption where figure 2.6 uses the cash creation model. Had figure 6.3 used the cash creation model, the two figures would have been identical. The ETF engages in what is in effect a total return swap with the borrower counterparty, with one leg constituting the lending fee and the other the collateral return. The securities are transferred to the counterparty in exchange for the collateral basket, which can be cash or non-cash (typically non-cash) (Amanc et al, 2012). This is the same process undertaken by synthetic ETFs, in that both lead to holding a basket of securities that is different from the benchmark index and exposing the investors to counterparty risk. Based on this, researchers have started to question whether physical replication is indeed less risky than swap-based replication.

Special attention should be paid to the regulation governing derivatives and securities lending in Europe. As described in chapter two European ETFs are almost unanimously UCITS regulated, which means that a maximum of 10% NCE related to over-the-counter (OTC) derivatives is allowed and furthermore:

"The OTC derivatives are subject to reliable and verifiable valuation on a daily basis and can be sold, liquidated or closed by an offsetting transaction at any time at their fair value at the UCITS' initiative" (European Union, 2009)[55]

[55] UCITS Article 50 1.-g.

Since it has been shown that the counterparty exposure taken on by securities lending is equal to that of synthetic ETFs in economic terms, the same set of rules should also apply. This is, however, not the case. The wording in UCITS article 52 on counterparty exposure is specifically related to OTC derivatives, and securities lending is not considered an OTC transaction. In theory, this means that the counterparty risk of an ETF engaging in securities lending is not subject to limits under UCITS. The most relevant restriction on counterparty risk from securities lending comes from the Committee of European Securities Regulators (CESR). CESR has clarified that the issuer concentration limit[56] of 20% laid out in UCITS article 52(2) includes securities lending and repurchase agreements (CESR, 2010). Besides that, the authors have been unable to locate any other restrictions to counterparty exposure resulting from securities lending. The conclusion of this must be that physical ETF could potentially accumulate a much larger counterparty exposure through securities lending, than synthetic ETFs can through OTC derivatives. Whether this is in fact done in practice is an entirely different matter, but it seems that there is a regulatory gap.

While securities lending regulation might lack behind that for OTC derivatives, the collateral management policies in physical ETFs might still protect investors from counterparty exposure. This is investigated in the following.

6.4.2 Collateral Management in Securities Lending

Lending practices for a broad selection of European physical ETFs was covered earlier and now an in-depth look at counterparty exposure and collateral management is conducted. iShares is the only ETF provider included in this thesis that uses the physical ETF structure for equity-based ETFs. Due to this, and the fact that iShares is the world leading ETF provider, the investigation of collateral management will be based on this provider.

General guidelines for securities lending is readily available on the iShares website[57]. iShares require haircuts (margins) on all securities posted as collateral to protect against the potential default of a borrower. Government bonds, certificate of deposits (CDs), and cash are all viable as collateral when borrowing securities from iShares funds. According to Bioy (2011) the most common forms of collateral in securities lending in Europe is equity and government bonds. In order to borrow equities (the focus of this thesis) the overcollateralization required by iShares is 110 - 112% for equities and 108% for the other three types of collateral (iShares.dk, 2012). Furthermore, the collateral accepted cannot exceed 40% of the average daily traded volume in each security and the collateral basket is marked-to-market on a daily basis (Blackrock,

[56] The amount of exposure a fund can have to a single counterparty.
[57] http://dk.ishares.com/ as of 26.04.2012.

2012d). Specific requirements apply to each security type. For example, only equities from one of 19 developed indices[58] is accepted as collateral, and government bonds must be from one of 10 developed high grade countries[59] (iShares.dk, 2012). The following figure shows the securities lending process in iShares.

Figure 6.4: Securities Lending Flow Chart. Source: Blackrock, 2012d

Figure 6.4 shows the chain of events when iShares engages in securities lending. Most often legal ownership of both the collateral as well as the securities on loan changes in the process illustrated in figure 6.4, but as can be seen, the economic benefits is still attributed to the original owner. As such, distributions from the borrowed basket are transferred back to the ETF, and distributions from the collateral are transferred back to the counterparty (Amanc et al, 2012). It would seem that iShares does not hold a naked position at any time during the securities lending process. Collateral is received before the loan is delivered, and the loan is returned to iShares before the collateral is returned to the counterparty. From a risk standpoint this seems prudent.

6.5 Comparison of Risk Structure between Physical and Synthetic ETFs

Having analysed the structure of both physical and synthetic ETFs, a brief discussion on the comparative strengths and weaknesses of each model is appropriate. It is concluded that there is no economic difference between synthetic funds using OTC derivatives, and physical funds engaging in securities lending. The counterparty exposure and the cash flows of these two models are identical. Given this the fears expressed by BIS and others that synthetic ETFs is riskier than physical ETFs by design seems misguided, at least when securities lending is considered.

Blaming European synthetic ETFs for a lack of transparency is unjustified based on what has been observed on the websites of the providers and other studies done. In general the NCE, the composition of the collateral basket, as well as the index replication is available, but much could be gained by improving the accessibility

[58] FTSE All Share; Russell 1000; CAC 40; FTSE MIB; Netherlands AEX; SPI Swiss Performance; Topix; OMX; CDAX; Russell 2000; TSX; ASX 50; OMX Copenhagen 20; The Madrid Stock Exchange General Index (IGBM); HEX 25; PSI20; BEL 20; OBX; ATX.
[59] UK; USA; Germany; France; Belgium; Netherlands; Switzerland; Canada; Sweden; Austria; and Japan.

of this information. The presentation provided by db x-trackers could potentially serve as a guide for other synthetic ETF providers, in this regard.

Liquidity considerations should be a part of the investment decision in ETFs, but this is the case in any investment decision. Understanding what drives liquidity and spread in ETFs is crucial, and there is a danger that investors might think ETFs provide a "shortcut" to investing in otherwise illiquid assets. Referring to the discussion earlier in this chapter, as well as the figures showing ETF structures in chapter two, ETF liquidity is driven by the liquidity in the underlying securities. This is the case regardless of replication strategy.

In terms of regulation it seems odd that the maximum NCE of 10% outlined in UCITS only applies to OTC derivatives (for synthetically replicating funds), when securities lending is in effect the same thing. This opens the door for providers of physical ETFs to have much larger NCE than synthetic ETFs. This is, however, not the case for iShares which seems to have a very clear and consistent approach to securities lending. Information regarding securities lending is available on the website, and the NCE for the three iShares ETFs considered in this thesis is comparable to the levels seen for funded synthetic ETFs, i.e. typically -10% or lower. While iShares has adopted a prudent securities lending policy, the authors of this thesis do not see any reason why regulation should not be changed to reflect economic exposure, rather than investment vehicles used.

The number of counterparties might differ between synthetic and physical ETFs engaged in securities lending. Most often synthetic ETFs will only have a single counterparty (the parent investment bank), whereas physical ETFs might have many. It has not been possible to find information on the number of counterparties iShares has for each fund. The diversification effect of having more than one counterparty limits the operational risk of having to liquidate the collateral basket in case of a counterparty default. The multiple counterparty model was first introduced in 2009, and a heated debate has since taken place on whether this is preferable to the single counterparty model adopted by most (Gordon, Bioy, and Rose, 2011). As so often before it comes down to balancing risks with costs. Having more counterparties would require additional organizational resources to negotiate swap agreements, monitor more than one collateral basket, etc.

The authors have not come across any major reason to prefer one type of ETF replication over the other, when securities lending is taken into account. The possible exception to this is the case where collateral is pledged under the funded structure, which might expose investors to execution risk as seen in connection with the Lehman Brothers' bankruptcy. Overall, comparing synthetic ETFs to CDOs or other exotic derivates seems farfetched. Instead of replication method, investors should pay attention to economic exposure, the collateral management employed by the ETF, the transparency of available information, and ultimately the NCE.

6.6 ETF's as Investment Vehicles

The final part of this chapter presents a comparison between ETFs and MFs. In chapter four the performance for selected ETFs and MFs were compared. Chapter five has dealt with regulatory as well as tax considerations. Here follows the final step, where the fundamental structure of the two investment vehicles is compared.

6.6.1 Internal/External Trading Costs

Referring to the structure for MFs and ETFs in chapter two, it shows that there is a fundamental difference in the way internal trading costs are handled. In table 2.1 the trading costs for selected Danish MFs benchmarked to MSCI World were found to be between 0.02% to 1.00% of AUM. Even though passive ETFs are expected to have a much lower turnover rate than actively managed MFs, ETFs still needs to rebalance its holding sometimes, e.g. when the index rebalances. Furthermore ETFs never trade securities themselves, this task is handled by the APs (figure 2.5, 2.6 and 2.7). It would seem that the ETF structure effectively cut costs for the investor by moving trading costs outside the fund. However, there is no free lunch on Wall Street, so this raises the question: Why are the APs willing to bear these costs? After conferring with the Morningstar ETF research team in Chicago the conclusion, is that trading costs are ultimately the same, they are merely externalized in ETFs[60].

First consider the role of the AP in the creation and redemption process of the ETF. In the creation and redemption process the APs keep the ETF price close to the NAV by means of arbitrage between the ETF price and the index basket. In this process, the APs are continuously earning small profits, which are in fact paid by the end investor by buying an ETF at a premium or selling it at a discount. Secondly, when APs also act as market makers in the ETFs, they have access to another source of profits, namely the bid-ask spread charged on the ETF. Again, this is paid by the end investor by not paying the "correct" price for the ETF. Both the arbitrage process and the market making activities represent the high frequency, small profit trades that are at the core of the investment bank business model.

6.6.2 Internal Costs Differences

The internal "hidden" costs of ETFs have already been covered in this chapter and they all apply, in theory, to MFs as well. As such, cash drag and securities lending is also potential sources for additional return or loss in MFs. Differences in the holding basket between an actively managed MF and the benchmark index is also a source of TE, but as opposed to ETFs this is what the MFs are meant to do (in fact, many Danish MFs could be blamed for not having sufficiently high "Active Shares". See chapter four). To uncover securities lending

[60] Mail correspondence with Morningstar Chicago 17.04.2012

practices in Danish MFs, mails were sent to eight of the largest Danish MFs[61]. In total five MFs had answered at the time of handing in this thesis. To the question on whether securities lending were allowed in their statutes, four MFs allowed securities lending in one or more of their funds.

Of these four, only Danske Invest actively engages in securities lending and only in a single fund, namely Danske Invest Danmark Akkumulerende. In this fund, up to 80% of the holdings of a single security may be on loan at any given time. No specific information on the daily securities on loan is available from the website of Danske Invest. However, it is stated in the prospectus that the fund may engage in securities lending[62]. Furthermore, the annual report states the market value of securities on loan, as well as the collateral posted. As has been shown, the ETFs considered in this thesis update a complete list of securities on loan as well as the collateral basket daily on their website. When Danske Invest provides this information in the annual report, the exact numbers are in effect only updated once a year. This could potentially lead to outdated information.

It seems that Danish MFs generally do not engage in securities lending. Interestingly, a couple of MFs expressed interest in pursuing securities lending going forward, and cited such concerns as IT limitations, the loss of voting rights etc. as the reason why they did not currently engage in it. However, it does not seem that the private investor needs to consider securities lending when investing in MFs.

6.6.3 Tax Efficiency of ETF Structure

The fact that all transactions between the fund and the AP are done in kind (meaning that no cash changes hands) has some interesting tax implications, briefly touched upon earlier. Under both US and European tax law, in kind trades are not subject to capital gains tax, the main point being that capital gains tax can only be triggered by a *sale*, whereas the exchange between the ETF and the AP is considered a *trade*. The capital gains tax is only realized when the AP trades the underlying assets in the open market, but since this cost is outside the framework of the ETF, the ETF investors do not have to cover it. Due to this, the ETF construction is often described as being more tax efficient than the traditional MF structure, where capital gains taxes are possibly incurred with every trade in the open market. However, it is important to note that the capital gains tax has not disappeared; it has merely been transferred from the fund to the APs, much like the trading costs. APs might arguably be in a better position to offset the capital gains by capital losses due to the size and scope of the institutions, thereby making them a better bearer of the capital gains.

[61] Danske Invest, BankInvest, Nordea Invest, Nykredit Invest, Handelsinvest, Jyske Invest, Lån og Spar Invest, and Nielsen Invest.
[62] Information provided by Frands Baastrup Nielsen from Danske Invest.

6.6.4 Transparency

The ETFs analyzed in this thesis, synthetic and physical, all publish their fund holdings daily on their website. A look at the websites of some of the largest Danish MFs[63] at the end of April 2012 revealed that the fund holding has all been updated ultimo March/primo April i.e. they were over one month old. Based on this it would seem that the transparency in fund holdings is considerable better for ETFs than their MF counterparts. The reason that MFs do not update their holdings daily is unclear but the authors speculate it might be due to competitive or technical reasons.

A more important question regarding transparency is whether or not the increased complexity of ETFs over MFs should be a cause of concern for the private investor. Amanc et al (2012) discuss this issue in their article, and the following quote is one of the main conclusions:

"The advanced nature of the tools employed to deliver a payoff should not be confused with the complexity of the payoff itself; it is relevant to contrast UCITS tracking financial indices with other UCITS when considering restrictions on retail distribution; when drawing distinctions between products, a focus on the tools and techniques may create a false sense of security and exacerbate adverse selection and moral hazard phenomena" (Amanc et al, 2012)

When the entire structure of ETFs, with all its risks, internal costs, liquidity questions etc., are considered in depth (as done in this thesis), ETFs might look frightening. In reality the return of the ETF itself is not very complicated. As was shown in chapter four, the return of an ETF is indeed quite close to the return of the benchmark. Mixing the complexity of the payoff with the complexity of the method with which the payoff is reached is a mistake. This ties into the recent discussion of whether certain ETFs should be named "complex" due to replication method (as promoted by Blackrock in the beginning of this chapter). Besides, both the Danish MFs and the ETFs considered in this thesis are governed by the same set of regulation, namely UCITS (as discussed in chapter five).

6.7 Final Remarks

In summation, the dangers of ETF investing seem exaggerated. In the opinion of the authors synthetic funds, in particular, are misunderstood, as they do in fact not have larger counterparty risk embedded, than a physical ETF engaging in securities lending. The argument might even be turned on itself, as UCITS lays out a maximum NCE for synthetic ETFs, whereas physical ETFs are allowed to assume larger NCE. The authors find that due to the relatively new nature of these products they might not be fully understood by regulators, as

[63] Danske Invest, BankInvest, ISI, Nordea Invest.

exemplified by the critique by BIS and the FSB. In Denmark the most recent example of this was seen in April 2011 when the financial regulator published a broad risk assessment of various investment vehicles. Three categories were introduced; green, yellow, and red, with green being the safest and red being the riskiest. In this risk assessment MFs were placed in the yellow category, whereas ETFs where place in the red category with the riskiest investments (Finanstilsynet, 2011). This means that at the time of writing this thesis, ETFs are being classified in the same category as CDOs, CDSs, swap-options, etc. Following the previous argumentation that the risk assessment of products should be based on the complexity of returns, the authors find it hard to see ETFs being as risky as any of these. Instead there is little argument for ETFs not to be classified in the same category as MFs. However, other types of ETPs are also found in this red category, and might deserve the classification more than ETF. These other ETPs are the focus of the following and final chapter.

7. Other Types of ETPs

This chapter concludes the thesis by critical assessment and analysis of the ETP structures presented in chapter two. Special focus is on the possible risks of these, and this point is communicated via three separate case studies

Similar to the analysis of the mechanisms and potential risks discussed for ETFs in the previous chapter, this chapter will analyse the ETPs presented in chapter two. As presented in chapter two the distinction between ETP and ETF is not always well communicated by the media, and an understanding of the ways in which ETFs and other types of ETPs differ and in which ways they are similar is found central. Confusion concerning the distinction between ETFs and ETPs could potentially lead investors to disregard differences, and thereby believe that the inherent risks in one type of ETP also apply to others. Whether and to which extend these products differ will be analysed in this chapter to add to the understanding of whether ETFs, if they mistakenly are seen as ETPs, are viable investment alternatives. As presented in chapter two leveraged ETFs, ETCs and ETNs will be analysed in the following.

7. 1 Leveraged ETFs

As described in chapter two leveraged ETF provide return that is a multiple of the benchmark. While this does provide the private investor with some possibilities, the following paragraph will analyze the risks associated with investing in leveraged ETFs.

7.1.1 Mechanics of Leveraged ETFs

Leveraged ETFs can use multiple methods to provide gearing to an index return. This includes short selling, swaps, futures, options, and other techniques (Kennedy, 2012). All of this still takes place in a fund setting, which is what sets leveraged apart from products such as ETNs and some ETCs. As opposed to normal equity-based ETFs which can be split into categories such as physical ETFs, synthetic ETFs, funded - or unfunded synthetic ETFs etc., leveraged ETFs are altogether a less homogenous group due to the many different ways of leveraging. Common for financial derivatives such as futures and options, is that they only require a

relatively small cash output, making it relatively easy for the ETF manager to borrow against the stocks in the fund and gain leverage.

The fact that leveraged ETFs is a more diversified group increases the demand for useful information from the individual provider. To investigate the level of information provided for a specific product, the XACT BULL 2 ETF from Handelsbanken was studied. This product provides 200% the daily return on the Swedish stock index OMXS30. The prospectus was searched for guidelines regarding the means of replication, and the following is what was found:

"The fund aims for positive exposure to the OMXS30™ Index equivalent to 200% of the fund's value. This exposure is generated by holdings in the abovementioned assets, primarily in derivative instruments and investments in accounts" (Handelsbanken, 2012)

While the prospectus does inform the investor that the return is obtained through the use of derivatives, the type of derivatives used is not specified. However, the holdings are available under the "tools" section of the website, where it can be seen that the entire holdings of this ETF is in futures contracts on the OMXS30 index (XACT.se, 2012). In the marketing material on the website, it is also explained that the exposure is gained through the use of futures.

As described in chapter two leveraged ETFs have been speculated to have a destabilizing effect on financial markets. This is closely connected to the fact that they promise the return over a pre-specified period of time. Most often the leveraged ETFs will promise to deliver X times the daily return of a benchmark[64]. For this reason leveraged ETFs need to be rebalanced daily to maintain the promised exposure to the underlying. Some academics and researchers have theorized that this increases the end of day volatility in the underlying, as the rebalances usually happen as close to the end of day as possible (Cheng and Madhavan, 2009). Furthermore, an interesting market dynamic adds to the scenario: Whenever the market increases both leveraged and inverse leveraged ETFs will be net buyers in the security and the opposite is true for when the market falls. This means that rebalancing us always in the same direction as the daily performance. To see this consider the following equation (Cheng and Madhavan, 2010):

[64] See e.g. XACT ETFs or leveraged ETFs from db X-trackers.

$$\Delta_{t_{n+1}} = A_{t_n}(x_i^2 - x_i) r_{t_n, tn+1} \quad \textbf{(7.1)}$$

$\Delta_{t_{n+1}} = Adjustment\ in\ Exposure$

$A_{t_n} = Fund\ NAV\ at\ time\ t_n$

$x_i = Leverage\ of\ ETF$

$r_{t_n, tn+1} = Return\ of\ underlying\ from\ time\ t_n\ to\ t_{n+1}$

Equation 7.1 shows that the adjustment to exposure needed (which is the same as hedging demand) is a non-linear function of the gearing of the ETF. Larger leverage requires increasingly large daily adjustments.

Consider the following scenario: An index and two ETFs both start with a NAV of 100. One ETF is 3x the daily market movement, and the other is -3x the daily market movement. This means 300 in market exposure for the 3x ETF and -300 in market exposure for the -3x ETF. The next day there is a 5% increase in the market, making the new index NAV 105. The NAV for the 3x ETF will have increased to 115 (15%), making the new required exposure 345. Thus, the 3x ETF will have to buy futures, swaps or other instruments worth 45 (345-300) to maintain its exposure to the index. So when the market increases leveraged ETFs buy in the same direction. Now consider the -3x ETF. The NAV will fall from 100 to 85 (-15%), making the new required exposure -255. To maintain its exposure the -3x ETF will also have to buy derivatives worth 45 (300-255=45) to maintain its exposure. This means that no matter what direction the market moves, both leveraged ETFs and leveraged inverse ETFs will in theory add to that gain/loss.

So how large might this effect be? In their 2009 article Cheng and Madhavan find that even small changes in index return, have large implications for the hedging demand of leveraged ETFs. Furthermore, the relationship is non-linear meaning that larger changes in index return will have a relatively larger effect on hedging demand. In the analysis based on US market data from February 2009, it is shown that a 1% uniform change in the US Equity market would result in an additional 16,8% of hedging demanded. A 5% change would result in just over 50% additional hedging demand. Even with these large numbers in mind it should be stressed that these theoretical results have not been proven to have any effect in practice. Trainor (2010) approaches the issue by considering the volatility of the S&P500 from 1980 to 2010, and finds that the volatility of the index has not changed after the introduction of leveraged ETFs. To further isolate the effect of rebalancing leveraged ETFs the volatility of the last 30 minutes of trading is isolated (since this is where most ETFs rebalance). Again the conclusion is that the volatility of the S&P500 has not changed since the introduction of leveraged ETFs. To the knowledge of the authors, a similar test has not been done on leveraged ETFs in the European market.

7.1.2 Holding Period and Path Dependence

A second point of critique regarding leveraged ETFs is the fact that their use and function might be misunderstood by the average investor. Holding leveraged ETFs over longer periods of time will likely not provide the investor with the leveraged return of the index, due to the path dependent nature of leveraged returns. Cheng and Madhavan (2009) derive the mathematical explanation for this problem and reach the following expression[65]:

$$\frac{A_{t_N}}{A_0} = \left(\frac{S_{t_N}}{S_0}\right)^x \exp\left(\frac{(x-x^2)\sigma^2 t_N}{2}\right) \quad \textbf{(7.2)}$$

$A_{t_n} = Fund\ NAV\ at\ maturity$

$A_0 = Fund\ NAV\ at\ time\ 0$

$S_{t_N} = Index\ value\ at\ time\ t_N$

$S_0 = Index\ value\ at\ time\ 0$

$x = Leverage\ of\ ETF$

$\sigma = Volatility$

It can be seen from equitation (7.2) that the return of a leveraged ETF over an N-day period is equal to the return of the underlying index to the power of the level of leverage, times a scalar equal to $\exp\left(\frac{(x-x^2)\sigma^2 t_N}{2}\right)$. Since the term $(x - x^2)$ will always be negative, the scalar will always assume a value of less than 1. Furthermore, it can be seen why leveraged ETFs are short term investment vehicles: the scalar term will decline with an increasing holding period as well as with volatility. Table 7.1 shows the scalar term for different combinations of holding period and gearing with an assumed volatility of 30%.

Days	1	2	3	4	5	10	15	50
2X	91.393%	83.527%	76.338%	69.768%	63.763%	40.657%	25.924%	1.111%
3X	76.338%	58.275%	44.486%	33.960%	25.924%	6.721%	1.742%	0.000%

Table 7.1: Value Destruction in Leveraged ETFs for different combinations of holding period and leverage. Source: Own table

As can be seen from table 7.1 the value of a buy and hold strategy with leveraged ETFs is bound to destroy value at an alarming rate, independent of market development. The first term in equation (7.2) could mean that the investor earns a return many times greater than the underlying index, offsetting the value destructing

[65] The derivation rests on the index level S_t following a Brownian motion, with a Weiner process with mean 0 and variance t, and using continuous compounding.

effect of the scalar. However, the negative drift from the scalar term makes leveraged ETFs a very poor choice for buy and hold strategies.

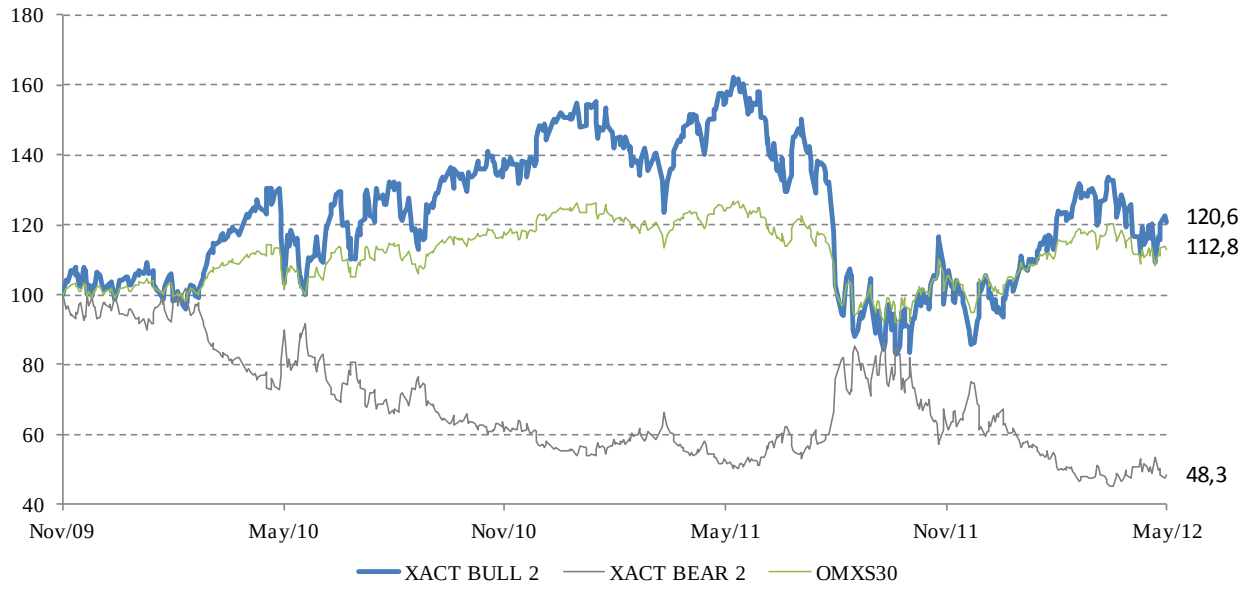


Figure 7.1: XACT leveraged ETFs Long Term Performance. Source: Euroinvestor.dk

Figure 7.1 illustrates this point for two leveraged ETFs both benchmarked to the Swedish OMXS30 index. The figure shows performance from inception of the ETFs until the start of May 2012. Considering the fact that the index has had a return of approximately 12.8% during the period the return of 20.6% for the BULL 2 ETF is reasonably close to the daily stated goal of double the index performance. This is, however, not at all the case for the BEAR 2. The index return of 12.8% could (to the unknowing investor) imply an expected loss of 25.6% on the ETF. Instead the ETF lost approximately 51.7% of its value over the period, a full 26.1% more than might be expected. This small example clearly shows the dangers of a buy-and-hold strategy using leveraged ETFs.

7.1.3 Regulation & Investor Use

In Europe many leveraged ETFs are UCITS regulated the same way the standard equity-based ETFs are. Under UCITS leveraged ETFs cannot leverage above 100% (AFG, 2011) meaning that a maximum of 2 times the market index can be provided. ETFs providing 3X or -3X an index return cannot be UCITS certified. Even then, the investor cannot assume that leveraged ETFs are UCITS certified. Returning to the ETFs from XACT, it is clear from the prospectus that all of the BULL or BEAR ETFs are non-UCITS funds. Investing in non-UCITS funds naturally does not provide the investor with the same level of regulatory security as investing in UCITS funds.

Interestingly, recent events in the US suggest that regulators are aware of the dangers leveraged ETFs might pose to unknowing private investors. On May 1st four American investment banks (Wells Fargo, Citigroup, Morgan Stanley, and UBS) were fined a total of 9.1USDmm for selling leveraged ETFs to retail investors without adequately explaining the risk. The banks sold these products to retirees (some of whom were in their 90's) who held on to the products for months, thereby greatly increasing their risk. None of the banks admitted to the charges (Braithwaite, and Alloway, 2012).

In conclusion, it is found that leveraged ETFs should only be used by investors with in depth knowledge of the product. Due to the heterogeneous nature of this category of funds with respect to replication, leveraged ETFs are considerable harder to evaluate than standard equity-based ETFs. US studies have not been able to prove any connection between the emergence of leveraged ETFs and increased end-of-day market volatility, and there is no reason to assume that this should be the case in a European context, even though this has not yet been researched. Leveraged ETFs are the tools of the very short term trader, and a buy-and-hold investor should stay far away due to the value destructing nature over time. The analysis of leveraged ETFs indicates that these are not viable investment alternatives for the long-term private investor.

7.2 ETCs

As presented in chapter two, ETCs are easily investable products catering to investors seeking commodity exposure. Most commonly ETCs obtain commodity exposure through either investing directly in the physical assets which will then have to be stored with a custodian, or though futures contracts. ETCs using futures can either track commodity indices – which invest in futures or directly invest in futures of certain commodities (Morningstar, 2012b).

ETCs can be bought in amounts as low as very few dollars, trade like stocks, have low costs, and thus result in easy availability for smaller investors, which were earlier not able to obtain this exposure through either physical or futures investing (Morningstar, 2012 (b)). This is a without a doubt positive for the private investor. However, in the following some of the risks associated with ETC investing will be covered.

7.2.1 Futures Investing

In order to understand the difference ETCs holding the physical commodities and those using futures contracts, a short summary of the mechanism of the futures market is deemed in place. Commodity prices are fundamentally determined by supply and demand, which in turn is derived from expectations of macroeconomic factors such as increased GDP growth, inflation, structural trends, geopolitics, etc. The suppliers and the market for the commodity in question determine the supply side. Take oil for example – for this commodity particularly OPEC is a significant factor, as they control approximately 81.33% of world

reserves as of 2010, and as a consequence have substantial pricing power (OPEC, 2011). For the private investor looking to invest in commodities, the difference between futures prices and spot prices should be understood.

Futures prices are an indicator of the "expected" future spot price and the purchase of a commodity future is not the same as direct purchase of an actual commodity (the spot price). However in some cases investing directly in the commodity is not possible or feasible and the best option is to obtain this exposure through futures investment. In order to avoid physical delivery of the commodity at expiration of the futures contract, however, the investor must continuously "roll" the contract. This is done by selling the shorter dated contracts held and at the same time buying longer dated contracts keeping the long position in the commodity (Hull, 2011).

According to Hicks (Hicks, 1939), the producer is more vulnerable than the consumer, as the consumer is better able to choose how he places his consumption, which should, in theory, create a weakness on the demand side of the commodity market. The argument supports Keynes in his theory of normal backwardation (Geman, 2005), where spot prices generally must be above the futures prices, as individual producers of commodities are willing to sacrifice returns to hedge themselves against future price drops and inventory costs. The difference represents the risk premium that the individual investor gets to assume risk, also called "roll yield". Unlike this classical theory, which has been predominant up to the millennium, spot prices today are generally lower than the future futures prices, which is called contango.

The methodology presented by Fama and French (1987), Gorton and Rouwenhorst (2004) and Gorton, Hayashi and Rouwenhorst (2007) will be introduced here to see how the returns from futures investing is composed.

The expected return from holding futures contracts from time t to maturity time T:

$$\ln \frac{E_t[S(t)]}{F(t,T)} = \ln \frac{E_t[S(t)]}{S(t)} + \ln \frac{S(t)}{F(t,T)} \qquad \textbf{(7.3)}$$

$S(t) = Spot\ price\ at\ time\ t$
$E_t[S(t)] = Expected\ futures\ spot\ price\ at\ time\ t$
$F(t,T) = Price\ of\ futures\ contract\ purchased\ at\ time\ t\ to\ delivery\ at\ time\ T$

Futures contracts are marked-to-market and therefore any change on price is settled daily.

At time t, the futures contract expires and the price of this contract converges to the realized spot price. As can be seen from equation 7.3 the expected return from holding futures contracts from time t to maturity time T, is a combination of the return from the expected change in spot price from time t to time T plus the difference between the current spot price and current futures price. The second term of this equation is the term structure of the yield curve. When the yield curve is in contango (when futures prices are higher than spot prices) the roll over from shorter dated contracts (which is expiring) to longer dated contracts, results in a negative term here and implies an overall loss. Oppositely when the market is in backwardation, the roll over from shorter dated contracts to longer dated contracts results in a gain (Hull, 2011). Therefore when the spot and futures price diverge the roll-over return from futures investing will be different from the return from directly investing the in physical commodity (spot price).

7.2.2 ETC Strategies

The ETC has several active decisions to make when the strategy of the ETC investment is to be determined and written into the prospectus. The decisions include what to track, the rebalancing scheme applied, and the approach to futures investing. This will be discussed in the following.

As for the choice on what to track ETCs can have one of two objectives; either to reflect the performance of a single commodity less expenses or to reflect the performance of a commodity index. This will determine whether the futures that are transferred are futures on one single commodity or a basket of futures which compose the index tracked.

Another active choice taken by the ETC is the rebalancing scheme – determined by how often the ETC chooses to rebalance the futures holding. This can in reality be anything from every day to about one year (most liquid futures contracts do not run beyond one year depending on the commodity) (Alquist and Killian, 2008). The choice taken here will have an influence on risk profile of the ETC – the more frequent the rebalancing is done the smaller the risk – but the higher the costs of actively trading these contracts – thus this is in effect a balancing act on risk versus costs of ensuring less risk.

This leads to a final active choice in strategy for the ETC, which will be discussed here. The choices between using a full replication of the index or utilizing an optimum yield strategy.

For the ETCs tracking an index, the ETCs can choose to directly replicate the holding of the index or to take a dynamic approach to the futures investing in order to mitigating losses from contango and to maximize gains from backwardation (Morningstar, 2012b). This strategy is for example used by db x-trackers for special ETCs which they label Optimum Yield Rolling Technology Strategy ETCs. These ETCs can only go long in

contracts and use an active approach to finding the optimal futures contract in which to invest. In practice this is done by looking at all contracts up to 14 months. If the futures curve is in contango the futures with the smallest annualised loss is chosen. If the futures curve is in backwardation the futures with the largest annualized gain is chosen. (Deutsche Bank, 2009).

All in all, the introduction of ETCs, both physical and futures based, seems to have introduced a relatively simple, cost effective and accessible, way for the private investor to obtain exposure to commodity performance. For the Danish private investor several ETCs are available through Nordnet, facilitating the use of such exposure in a investment composition. However, as presented, there are several things to be aware of when investing in ETCs. This is in effect investing in commodities, either through the physical structure or the futures structure. As discussed, the physical structure is only feasible for certain commodities and therefore many ETC obtain their exposure through futures investing. An example to illustrate the difference between spot and futures investing will be presented to illustrate how the private investor needs to conduct proper due diligence on whether the ETC is physically or futures replicating and to understand this difference.

7.2.3 Case study: US Oil Fund

The point will be illustrated through the case of the US Oil Fund ETC. The US Oil Fund was incepted on April 10th 2006 with the objective to reflect the performance of the price of WTI Crushing Crude Spot, less expenses. The US Oil Fund invests in the oil futures contracts traded on the NYMEX. Practically it invests in the contract with the shortest maturity available and rolls-over to the next near-month contracts when there are two-weeks to expiration (United States Oil Fund, 2011). The US Oil Fund is benchmarked to the USCRWTIC index, which trades at parity to the front month NYMEX Oil futures contract to reflect the WTI Crushing Crude Spot (Bloomberg.com, 2012). Figure 7.2 shows the US Oil Fund ETC performance.

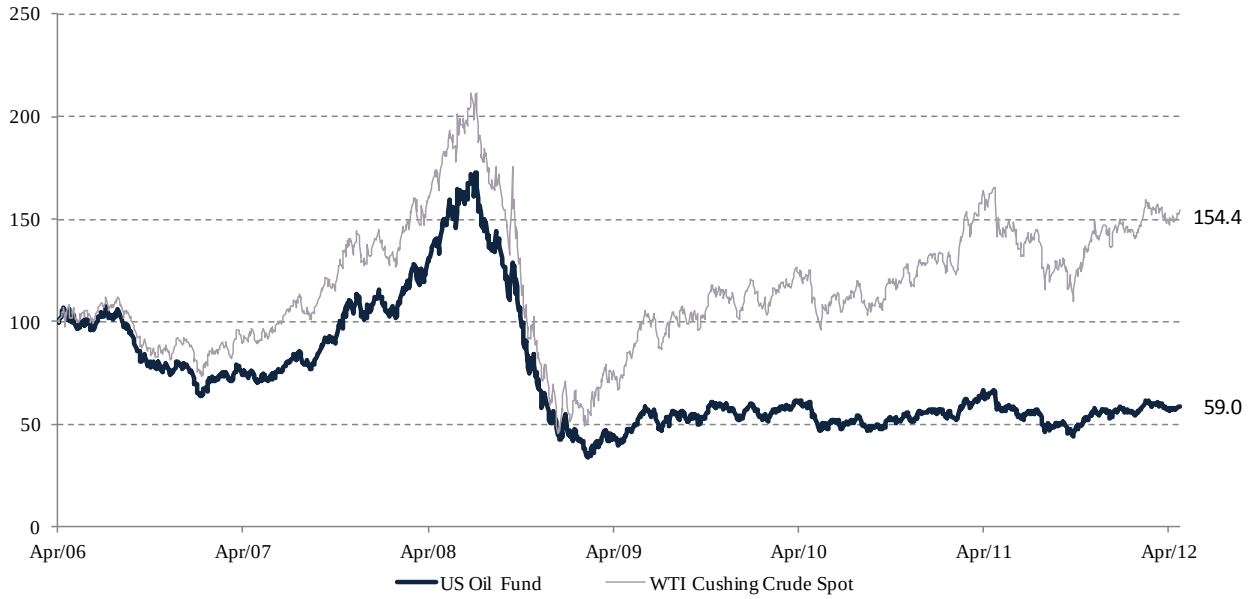


Figure 7.2: ETC US Oil Fund performance versus the WTI Crushing Crude Spot (represented by the USCRWTIC index)

As can be seen from figure 7.2, since the inception of the fund in 2006 the US Oil Fund has exhibited significant underperformance with a loss of 41% over the period, while the spot price has provided a return of 54%. In the first period from 2006 to the beginning of 2009 the ETC underperformed, but not heavily. From the beginning of 2009 and onwards the ETC has underperformed heavily, while the spot price has been increasing. The underperformance is a result of roll-over losses as the futures curve has been in contango – meaning that when rolling the futures every month the ETC incurs a loss and as the futures curve has been particularly steep the first near-month futures roll-over strategy has been especially unsuccessful.

This example clearly illustrates the differences between investing in the physical commodity and investing indirectly through futures. The private investor should understand the difference before investing and ETCs, if not used properly, can be very risky alternatives.

7.3 ETNs

In the ETN structure presented in chapter two, the issuer uses the cash from the APs to hedge the short position it obtains from selling the ETNs. Comparing this to the structure of equity-based ETFs, the most obvious comparison would be to synthetic ETFs. However, there are a couple of important distinctions between the two. First of all, as mentioned earlier, ETNs do not employ a fund structure. In a synthetic ETF the investor is the owner of a share of the fund, i.e. each share constitutes equity ownership of the underlying. An ETN is a promise by the issuer to provide a certain exposure, no equity ownership is implied. In fact the

investor is a lender to the issuer, where the cost of capital for the issuer is the return promised by the ETN. Secondly, there is the question of counterparty risk. This will be covered in the next paragraph.

7.3.1 Counterparty Exposure

Compared to equity-based ETFs the credit worthiness of the issuer is considerably more important when investing in ETNs. Since the investor is fully exposed to the balance sheet of the issuer (100% counterparty risk), the credit worthiness of the ETN is completely dependent on the credit worthiness of the issuer (Amanc et al, 2012). This counterparty risk does not exist in the ETFs analyzed in chapter six, as they were all UCITS regulated with assets posted with a custodian in a ring-fenced account. It is possible for ETNs to be collateralized, but this is completely dependent on the ETN issuer, and no standardization applies.

Lee (2012) argues that ETNs are almost guaranteed to be profitable for the issuing investment bank, for a couple of reasons. Structuring products is part of the core business of many investment banks, and therefore the fixed costs related to the infrastructure needed to market ETNs will already be in place, thereby making the products *"dirt-cheap to run"*(Lee, 2012, p.1). Furthermore, by selling ETNs the investment bank has access to a very cheap source of funding, depending on the cost structure embedded in the ETN. This may or may not be even more important after the financial crisis where the funding has become increasingly important for banks (Lee, 2012). Add to this that as banks find it harder and harder to get external funding due to a weaker balance sheet, the cheap funding from marketing ETNs becomes more and more valuable. If this is the case, potentially only banks unable to obtain funds from other channels, would market ETNs. This is exactly the type of bank who the investor should avoid counterparty exposure to (Lee, 2011).

By buying an ETN, the investor is entering into an adversarial relationship with the issuing investment bank. This should raise serious concerns among investors, as it is a zero-sum game; one party's loss is the other party's gain. All things equal it must be assumed that the investment bank is considerably more sophisticated than the investor, making this an undesirable situation for the latter.

7.3.2 Case study: VelocityShares 2x VIX Short-Term ETN

The creation and redemption process of an ETN is completely dependent on the investment bank issuing new shares. Should this process ever come to a stop, the ETN would essentially stop trading as an open ended instrument, and instead trade like a closed-end instrument. This could cause an ETN to trade at a significant premium or discount to the underlying. For the investor buying an instrument where he expects the price to reflect the NAV, these large deviations from the underlying value could potentially undermine the trustworthiness of the security. A recent event provides an example of this.

The VelocityShares 2x Vix Short-Term ETN promises double the daily return of the S&P500 VIX Short-Term Futures Index, and is issued by Credit Suisse (Credit Suisse, 2012b). As indicated by the name, it is a leveraged ETN offering exposure to an index built on futures. A daily return of 5%-7% (both positive and negative) is not uncommon for the security which was listed in November 2010 (Credit Suisse, 2012b). The VelocityShares 2x Vix Short-Term ETN trades over 30% of its value on an average daily basis (Bloomberg, 2012), which is not surprising since the value destruction of holding leveraged products over longer time periods has already been covered in section 7.1. Figure 7.3 below shows the daily tracking error of the ETN against twice the daily return of the S&P500 VIX Short-Term Futures Index from inception to May 2012. What can be seen from the figure is that the tracking error has been relatively stable, before it suddenly explodes in the spring of 2012.

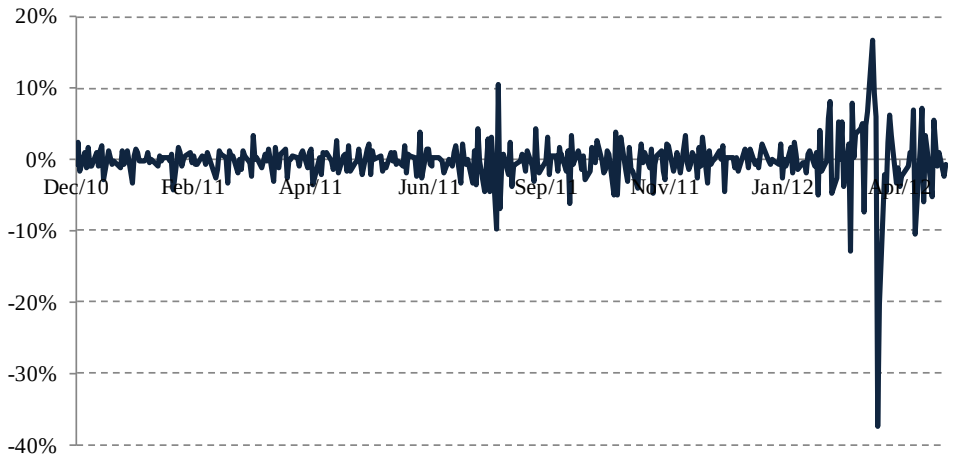


Figure 7.3: VelocityShares 2x Vix Short-Term ETN Tracking Error Since Inception. Source: Bloomberg

On February 21st 2012 Credit Suisse suspended the ETN from further issuance due to an internal limit on the size of the ETN (Conton and Robinson, 2012). Referring to the ETN structure in chapter two, it is clear that when it is no longer possible, or alternatively no longer profitable, to hedge the exposure from the ETN the issuing bank will have to stop issuing new ETNs. Alternatively the bank would assume larger and larger exposure. The figure below shows the daily tracking error of the ETN against twice the daily return of the S&P500 VIX Short-Term Futures Index.

Figure 7.4: VelocityShares 2x Vix Short-Term ETN Tracking Error 2012. Source: Bloomberg

As can be seen be seen from the figure, the tracking error is relatively stable in January and most of February, but pick up dramatically after Credit Suisse stops issuing new ETNs. By mid March the ETN starts outperforming its benchmark dramatically, pushing the price of the ETN far above its NAV. By March 21st the ETN was trading at an 89% premium to its NAV. Then on March 22nd Credit Suisse again opened for issuing new ETN, causing the ETN to drop dramatically the following two days. 34.7% was lost on March 22nd and on March 23rd an additional 35.4% was lost, thereby losing more than half its value in two days. To add to the confusion of the investors, the benchmark index had a positive return of 1.4% the 22nd and a negative return of 7.5% on the 23rd.

A couple of lessons should be learned from the case study. First off, the investor should be aware of the embedded option in ETNs that issuers could suddenly stop creation in the security. This option has a negative value and is hard for investors to properly understand it. Looking at figure 7.4 it is interesting to observe that the TE does not descend to pre-crisis levels in the period after Credit Suisse again started to issue ETNs. It might indicate that investors have become aware of this option, but are unable to determine the correct value of it. Secondly, Credit Suisse didn't do anything illegal in the process and they even included a warning in the prospect of the product:

" we are under no obligation to sell additional ETNs of any series at any time, and if we do sell additional ETNs of any series, we may limit or restrict such sales, and we may stop selling additional ETNs of such series at any time. If we stop selling additional ETNs, the price and liquidity in the secondary market could be materially and adversely affected" (Credit Suisse, 2012b)

It is doubtful whether private investors read the prospect of the ETN, and if they read it, whether they understood the implications. When the ETN is a short-term instrument such as this one, there is even less reason to believe investors will spend time reading through the prospect.

7.3.3 Discussion of confusion between ETFs and ETNs

To put ETFs and ETNs in the same group of investment vehicles cannot be justified from a risk perspective. The suitability of ETNs as an investment tool for the private investor is highly doubtful due to the unregulated nature, the possibly complex structure of returns, and the fact that the investor enters into an adversarial relationship with a counterparty, which is considerably more sophisticated. The case study presented shows a scenario where the private investor could potentially lose a lot, and unfortunately this is not an isolated incident. Another example of an ETN where the issuer stopped issuing new securities is the Path Dow Jones-UBS Natural Gas Total Return Sub-Index ETN issued by Barclays. Barclays stopped issuing back in 2009, and the ETN is still trading at a premium of 86% to its NAV (Condon, Robinson, 2012).

The lack of understanding in the media concerning the difference between ETFs and ETNs[66] is potentially a source of risk to both the investor, and the ETF industry as a whole. Should stories such as the one above reach the private investor, without clear distinction between ETF and ETNs, the investor might reach the conclusion that the products are unsafe altogether, and avoid investing in all ETPs.

This chapter has analysed and discussed ETPs other than the equity-based ETFs that is the main focus of this thesis. It is shown that leveraged ETFs, ETCs, and ETNs all present the investor with risks that is not present in equity-based ETFs. Based on the analysis of the three ETPs presented here, it is clear that the source of risk differs between each product. Equity-based ETFs seem to be considerably less risky than any of the three types of ETPs presented in this chapter. Therefore the conclusion that ETFs offer viable investment alternative to MFs, cannot be directly conveyed for these other ETPs. The payoff structure from the ETPs presented here is far more complicated than what was found for equity-based ETFs in chapter six, which is why the private investor should pay careful attention to whether the product he/she is buying is an equity-based ETF, or some of these other ETPs. The line between equity-based ETFs and ETPs should therefore be drawn firmly between these investment alternatives.

[66] See e.g. Berlingske Business, 19.03.2011, ”Sådan kommer du igang” (Dengsøe, 2011).

8. Conclusion

The purpose of this thesis was to investigate whether ETPs are viable alternatives to traditional MF investing. For equity-based ETFs the investigation was performed based on an empirical performance analysis, an analysis of the surrounding environment in terms of regulation, tax and competition, and on thorough discussion of the literature on ETF structures and potential risks associated therewith.

Based on a set of criteria, nine ETFs and 19 MFs were chosen to be applied in an empirical performance test. Applying the Pure Selection model with pure iShares data showed negative performance of 12 MFs, with two of these significant. One fund showed significantly positive performance. When the time period was extended to 11 years, 14 MFs was found to have negative performance, with four of these significant. The fund, which exhibited significant outperformance for the pure iShares data still did so for the extended period. When introducing timing to the model with pure iShares data, the results revealed 13 negatively performing MFs, while only one was significant. No fund showed significantly positive performance. When extending the horizon 14 funds showed negative performance, but now seven of these were significant. Thus overall good performance for these specific ETFs was found, leaving ETFs a viable investment alternative, in this regard.

Funds, catering to free savings, can choose to comply with an extensive system of reporting to the Danish authorities, to obtain status as a share based funds. This seems to result in very few foreign funds being available as share based funds to the Danish private investor. Therefore most foreign funds are only supplied as capital gain based, and this includes all the ETFs which are analysed in this thesis. As a result, the capital income from ETFs is taxed at a level between 37% and 47.5%, while the Danish capital income from MFs analysed are taxed at 27% to 42%. The ETFs showed strong performance, but when this tax discrepancy is considered, the full benefit does not reach the end investor. Therefore foreign funds, ETFs included, are primarily relevant for pension savings where there is no difference in tax treatment. These taxation differences were not found to be a result of discrimination but instead due to limited economic incentive for international funds to target the Danish market. This, coupled with the heavily concentrated distributional system of MF certificates trough banks, leaves the Danish market for investments difficult to access for the foreign competitors such as ETFs.

Based on a thorough analysis of ETF structures it was found that in economic terms, no difference exists between a synthetic ETF using OTC derivatives and a physically replicating ETF engaging in securities lending. When analyzing the structure of both it was found that the cash flows were the same, and that the counterparty exposure was also equal. For both types of ETFs the primary focus for the investor should be the

NCE, as well as the collateral management policies employed by the ETF. For all three ETF providers, the collateral management policies were found to be prudent, both for iShares using physical replication, and for db x-trackers and Lyxor using synthetic structures.

The risks flagged by regulators concerning liquidity and transparency were found to be unjustified. Visits to the websites of the three ETF providers revealed a high level of information, although the presentation of this was far better for iShares and db x-trackers. This information was updated daily and included the replication model used, the composition of the collateral basket, as well as the NCE. Via an analysis of the structure of unfunded synthetic ETFs, it was found that the liquidity of the collateral basket did not pose a risk to investors or overall financial stability in the event of a large redemption in the fund. In the redemption process, it is the benchmark portfolio which will have to be sold by the counterparty to live up to its obligations to the ETF. In this respect there is no difference between the liquidity risk run by an unfunded synthetic ETF and a physical ETF. The liquidity of the collateral basket is only important in the event of a counterparty default, and this is why attention should be paid to reset policies and NCE.

The primary cause of worry in the analysis of ETFs was the funded synthetic structure with pledged collateral. In this structure the ETF does not have legal ownership of the collateral basket, which might hinder the ETF from gaining access to assets if the counterparty defaults. The Lehman Brothers bankruptcy process have provided a recent example of the dangers of pledged collateral. However, at this point the potential dangers of pledged collateral in funded synthetic ETFs can only be speculated upon, as no credit event has yet taken place.

ETPs other than standard equity-based ETFs are a much less homogenous group, and in this thesis three other types of ETPs were analysed. Leveraged and inverse leveraged ETFs was shown to exhibit value destructing tendencies if held for longer periods of time. Empirically, this was illustrated by a case study on the XACT BULL 2 and XACT BEAR 2 ETFs, which showed that especially the inverse leveraged ETF underperformed quite significantly.

The most prominent ETC structures were analysed and the difference between physically backed and futures backed ETCs was discussed. The mechanism behind futures investing is quite different from an investment in the physical asset. Aspects such as roll – yield, backwardation and contango play a large role in the return from futures based ETCs. These aspects were discussed and illustrated by a case study of the US Oil Fund, which showed that over time this futures based ETC has severely underperformed the spot price, due to a steep contango curve.

Of all the ETPs analyzed in this thesis, ETNs were found to pose the largest potential risk to the private investor. With ETNs being non-asset backed debt obligations, the buyer of these securities enters into an adversarial relationship with the issuing investment bank. Should the issuer suddenly stop issuing or redeeming ETNs, large deviations from underlying value might take place. This was shown for the VelocityShares 2x Vix Short-Term ETN Tracking, where a sudden stop in ETN issuance resulted in the security trading far from its NAV.

Overall, equity-based ETFs are found to be a cost effective, and well performing addition to the private investor´s portfolio. When compared to 19 Danish MF alternatives, the equity-based ETFs included in this thesis were found to outperform the Danish funds more often than the MFs outperformed the ETFs. With the exception of funded synthetic ETFs with pledged collateral, no major cause of concern has been uncovered with respect to the financial structure of equity-based ETFs. However, as always the research burden ultimately lies with the investor. Funds should be evaluated based on the level of transparency, and the simplicity of returns, not the complexity with which the returns are reached.

As for the performance tests due to the limited selection of ETFs and MFs included, further research is needed to generalize the findings of this thesis to the broader Danish market for investment. However for the specific funds included in this thesis, there is an indication that ETFs offer a viable alternative for the private investor. The regulatory, tax and distributional framework of the Danish market for investment was, however, found to hinder their adoption by the Danish private investor.

It was found that the confusion of ETPs and ETFs could potentially pose a danger to Danish private investors. Whereas equity-based ETFs were found to be a viable alternative, investing in other ETPs might expose the investor to more complicated payoff structures and risks not fully comprehended. The line between equity-based ETFs and ETPs should therefore be drawn firmly.

9. Critique and Perspective

The results reached in this thesis will be critically assessed in this chapter. Furthermore the findings will be discussed in a broader perspective and points for further analysis will be presented.

As discussed throughout the thesis there were limitations in our analysis and data, which has resulted in potential issues. The results reached are only as good as the data used, this is an important point to consider, and therefore it is critical to assess the attributes of the data and their potential impact and bias on the results.

Historical Data

The performance tests carried out in chapter four showed good performance of the ETFs. However, it must be noted that historic performance does not necessarily equal future performance. It can be questioned whether historical performance is ever a good predictor of future performance, yet the lack of a better alternative means that historical data is often applied in economic studies. An idea for future studies could be to use a simulation of future performance to supplement the analysis. The data period in question runs from February 2000 to December 2011. This period of time involves some periods of great market turbulence, and there is a risk that this period is not representative of a "normal" time period. Therefore, a longer time horizon could also be included in future studies.

Limitations of Performance Models Applied

The results based on the Jensen and Treynor and Mazuy models depend on the underlying economic theory applied. As a result the findings could have been different if e.g. the asset pricing model (APM) theory was applied instead of the standard CAPM theory applied in this thesis. A further investigation could involve the same models based on different economic theory such as the APM to see if the similar results were reached.

Statistical Criteria Discussion

Complications arise due to the nature of the data input used, as these must fulfil certain statistical properties. As is found there is evidence of non-normality, heteroscedasticity and autocorrelation. Heteroscedasticity and autocorrelation are both to some extend accounted for by applying NWSE, but due to the NWSE methodology there can still be issues with these results. A further investigation of these attributes could be a point for future investigation. Non-normality is an issue, but the breach of this assumption is disregarded in order to carry out

the tests and conclude on the results. However, as the most of the data inputted in the model is not normally distributed it is strictly speaking incorrect to conclude that with 95% confidence the results found are certain. As the distributions of most of the data is non-normal, the actual certainty about this result will be lower than 95%. This is an important point to stress in applying the results found in a decision making process.

Other Investment Regions

The conclusion reached for the specific funds investigated in this thesis are for the World, Europe and Emerging Market regions. The literary studies included to supplement these findings are mostly for the developed markets in the US, and Europe and therefore it is highlighted that the findings concerning a limited outperformance in active stock-picking for the regions analysed in this thesis cannot be generalised across other regions. It is in fact believed that active stock-picking may be a good alternative in less developed or more specialised markets or industries[67].

Active versus Passive Management

If all capital was allocated towards passively managed funds such as ETFs, the possibility to outguess the market might be altered versus the current market settings.

Current Market Debate

The current discussion in Europe regarding ETPs in general and ETFs in particular is influenced by competing interests of the fund providers. Physical ETF providers have an obvious economic interest in branding the synthetic ETFs of their competitors as being riskier, in much the same way that providers of synthetic ETFs try to do the same for physical ETFs. This has to be considered in the context that the European market for ETFs is still relatively young. Naturally, each provider will try to convince customers as well as regulators that their particular products are of better quality. Much of the literature used in this thesis stems from parties with incentives to promote particular perceptions, and when using these sources the approach has been more analytical and strict than with academic sources. There is a danger that ETF providers might further add to the confusion regarding the classification of ETPs, and the different sources of risks associated with each.

Considering the relatively limited share of the total investment universe in Europe (less than 3% (Amanc et al, 2012)), a great deal of regulatory scrutiny is directed at ETFs, and particular synthetic ETFs. As has been shown in this thesis, these products are not necessarily any riskier than physical ETFs but are often singled out due to them using OTC swaps to replicate the benchmark. With the financial crisis still fresh in the memory of many, it looks as if anything using derivatives is considered dangerous.

[67] This argument is supported by Nikolaj Holdt Mikkelsen, as discussed in interview 16.04.2012

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11. Appendix

11.1 Abbreviation Overview

AP: Authorized Participant

AUM: Assets under Management

CDO: Collateralised Debt Obligations

CDS: Credit Default Swaps

ETF: Exchange Traded Fund

ETP: Exchange Traded Product

ETC: Exchange Traded Commodities

ETN: Exchange Traded Notes

MF: Mutual Fund

NAV: Net Asset Value

NCE: Net Counterparty Exposure

NSE: Normal Standard Error

NWSE: Newey-West Standard Errors

PAC: Partial Autocorrelation

TE: Tracking Error

TER: Total Expense Ratio

Q-stat: Box-Ljung test statistic

11.2 MF Cost Overview

Fund	Administration Costs	Trading Costs	Emmision Allowance	Redemption Charge	Turnover Rate	Holding Cost
Handelsinvest Verden	2.01%	0.48%	1.50%	0.50%	0.36	2.49%
Sydinvest Verden	1.12%	0.65%	1.83%	0.55%	1.20	1.77%
Laan & Spar Invest Verden	1.73%	1.00%	1.40%	0.65%	0.81	2.73%
Nielsen Global Value	1.84%	0.02%	2.13%	0.63%	0.08	1.86%
Nordea Invest Verden	1.26%	0.34%	2.00%	0.50%	0.35	1.60%
Nykredit Invest Globale aktier	1.14%	0.13%	2.00%	0.40%	0.07	1.27%
Jyske Invest Aktier Pension*	1.39%	0.42%	2.40%	0.50%	0.54	1.81%
Maximum	2.01%	1.00%	2.40%	0.65%	1.20	2.73%
Minimum	1.12%	0.02%	1.40%	0.40%	0.07	1.27%
Median	1.39%	0.42%	2.00%	0.50%	0.36	1.81%

2010 costs for MFs benchmarked to MSCI World. Source: Investeringsforeningsrådet, 2012d

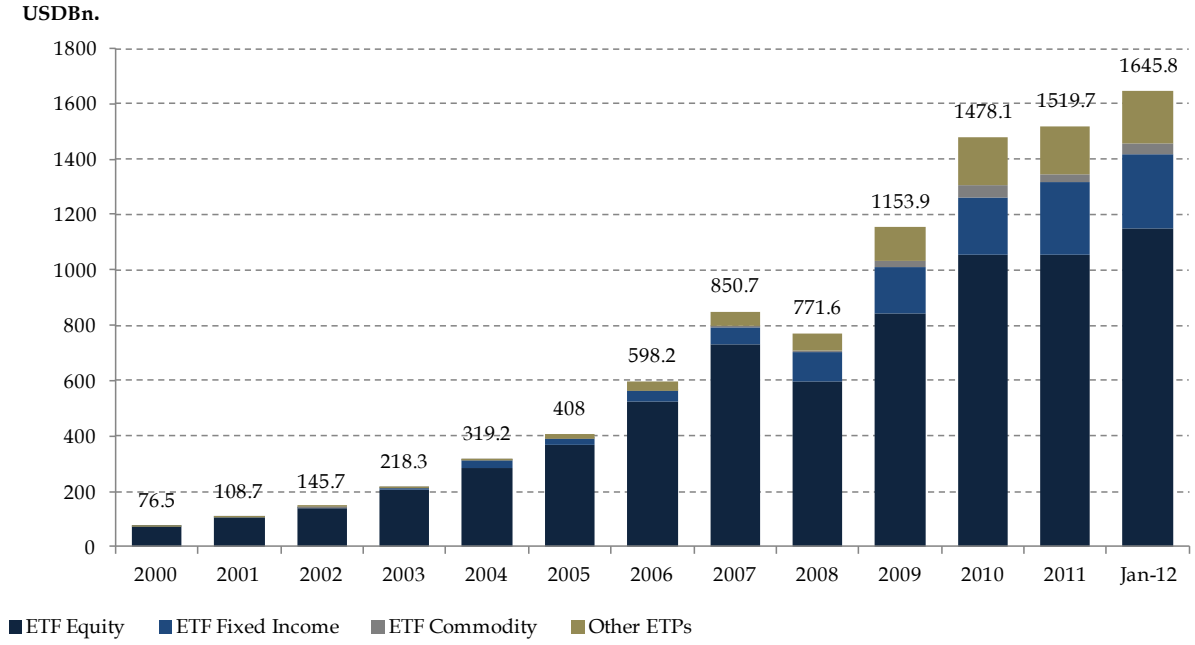
Fund	Administration Costs	Trading Costs	Emmision Allowance	Redemption Charge	Turnover Rate	Holding Cost
Alm. Brand Europæiske Aktier	1.76%	0.22%	1.45%	0.45%	0.18	1.98%
BankInvest Europæiske Aktier	1.68%	0.19%	1.90%	0.49%	0.27	1.87%
Danske Invest Europa	1.41%	0.10%	1.70%	0.25%	0.21	1.51%
Handelsinvest Europa	2.21%	1.02%	1.50%	0.50%	1.34	3.23%
Jyske Invest Europæiske Aktier	1.41%	0.29%	2.30%	0.30%	0.37	1.70%
Lån & Spar Invest Europa	1.69%	1.01%	1.40%	0.65%	0.85	2.70%
Nordea Invest Europa	1.23%	1.28%	2.00%	0.50%	1.35	2.51%
Sydinvest Europa	1.24%	0.08%	1.92%	0.50%	0.15	1.32%
BankInvest Pension Europæiske A	1.72%	0.16%	1.90%	0.49%	0.23	1.88%
Maximum	2.21%	1.28%	2.30%	0.65%	1.35	3.23%
Minimum	1.23%	0.08%	1.40%	0.25%	0.15	1.32%
Median	1.68%	0.22%	1.90%	0.49%	0.27	1.88%

Source: Investeringsforeningsrådet, 2012d

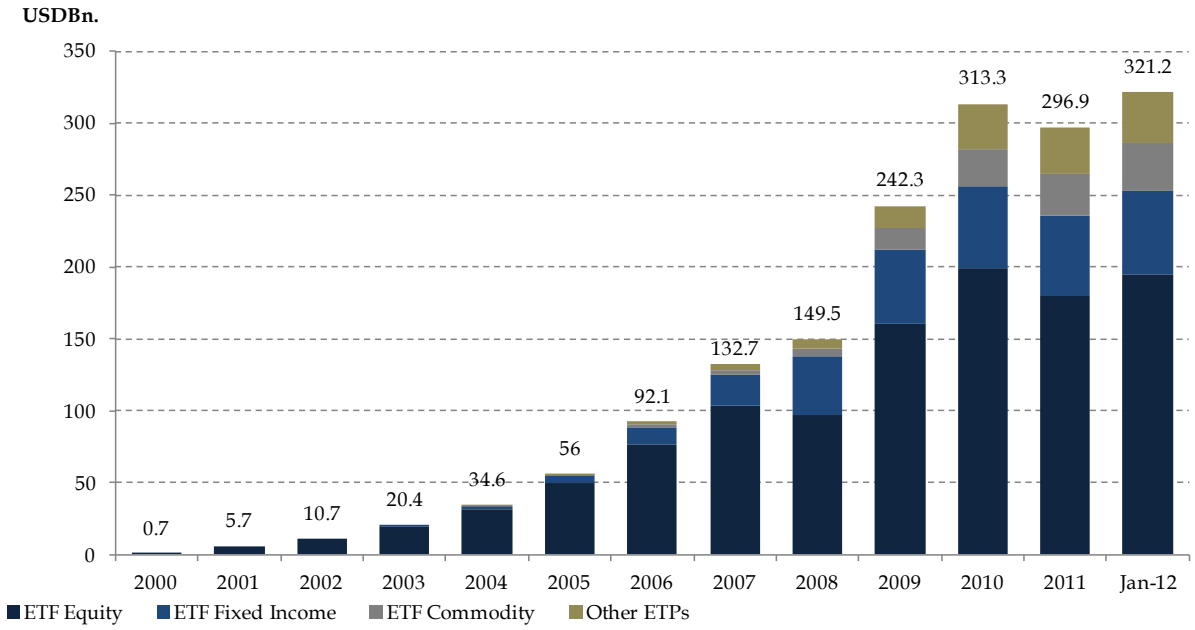
Fund	Administration Costs	Trading Costs	Emmision Allowance	Redemption Charge	Turnover Rate	Holding Cost
Danske Invest Nye Markeder	1.36%	0.00%	1.80%	0.45%	0.00	1.36%
Jyske Invest Nye Aktiemarkeder	1.38%	0.87%	2.80%	0.80%	0.79	2.25%
Nykredit Invest Engros Vækstlan	1.17%	0.19%	1.50%	0.60%	0.24	1.36%
Maximum	1.38%	0.87%	2.80%	0.80%	0.79	2.25%
Minimum	1.17%	0.00%	1.50%	0.45%	0.00	1.36%
Median	1.36%	0.19%	1.80%	0.60%	0.24	1.36%

Table Source: Investeringsforeningsrådet, 2012d

11.3 Global and European ETF Market



Global AUM for ETPs. Source: Blackrock, 2012d



European AUM for ETPs. Source: Blackrock, 2012b

Jan 2012, USDmn	Market Share
Ishares	35.1%
db x-trackers/db ETC	14.6%
Lyxor Asset Management/Soc Gen	12.6%
ETF Securities	7.1%
Credit Suisse Asset Management	5.1%
Zurich Cantonal Bank	5.0%
UBS Global Asset Management/UBS AG	4.3%
Amundi ETF	2.7%
Source Markets	2.6%
Commerzbank	2.2%
Others (36 total)	8.8%

European ETF Providers, Source. Blackrock, 2012b

Jan 2012, USDmn	AUM
SPDR S&P500	99,046
SPDR Gold Trust	71,161
Vanguard MSCI Emerging Markets ETF	49,818
Ishares MSCI EAFE Index Fund	38,542
Ishares MSCI Emerging Markets Fund	37,463
Powershares QQQ Trust	31,031
Ishares S&P 500 Index Fund	28,087
Ishares Barclays TIPS Bond Fund	23,168
Vanguard Total Stock Market ETF	20,652
Ishares iBoxx $ Investment Grade Corp Bond	18,638

Top 10 global ETFs by AUM. Source: Blackrock, 2012b

Top 5 European Exchanges			
Country	Exchange	ETF Listings	AUM USDbn.
Germany	Deutsche Bourse	440	116.3
UK	London Stock Exchange	255	68.8
France	NYSE Euronext Paris	272	49.8
Switzerland	SIX Swiss Exchange	130	49.4
Sweden	NASDAQ OMX Stockholm	24	2.9
Combined ETFs		**1121**	
Share of European Total ETFs		**92.0%**	
Combined AUM			**287.2**
Share of European AUM			**98.2%**

Top 5 European exchanges. Source: Blackrock, 2011a

11.4 Indices

	MSCI World	MSCI Europe	MSCI Emerging Markets
Countries	24	16	21
Securities	1,613	450	820
Inception	31-12-1969	31-12-1969	31-12-1987
Base Value	100	100	100
Total Market Cap (USDbn)	23,615	6,417	3,604
Avg. Market Cap (USDbn)	14.6	14.3	4.4
One-year forward P/E	11.3	10.23	9.98
P/B	1.65	1.44	1.7

Source: MSCI 2012a

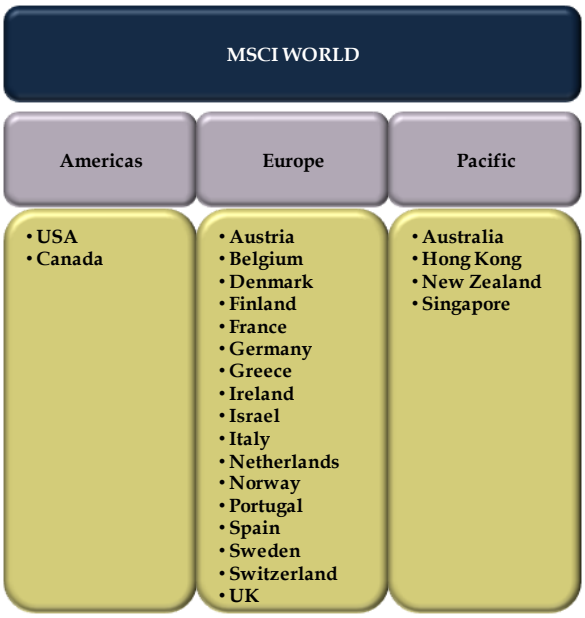
All mutual funds and ETFs are hugely dependent on benchmark indices, and MSCI have a large impact on international investment, through their power to define the equity universe. In other words they determine which countries and securities to include in which indices and thereby dictate the investment options for fund managers. Moreover, the way returns are accounted for, how securities are weighted, and how to treat dividends, all have a very real impact on the investment strategy the investor will have to adopt in order to beat the benchmark. It could be argued that for ETFs these factors are even more important, as they promise to deliver the return of the benchmark (minus expenses).

MSCI indices are reviewed in quarterly reviews every February, May, August, and November to ensure that the indices continue to be a relevant reflection of the market place (MSCI, 2012). Things up for revision include the following four points.

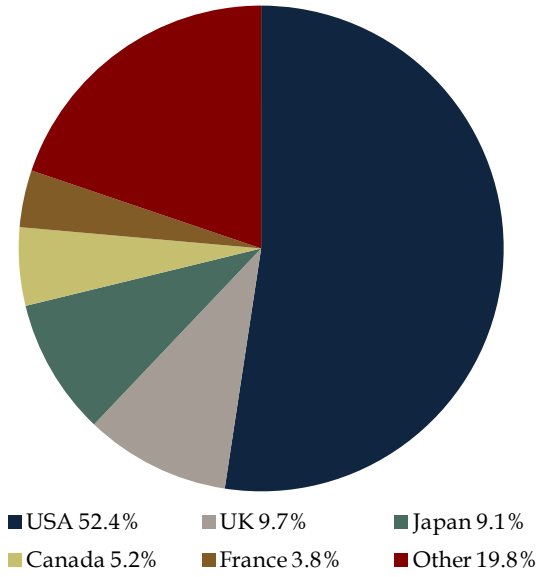
1. Updating size references, e.g. the threshold for the large cap categorization might be moved upwards (most common) or downwards (only in times of crises)
2. Small changes in the number of shares outstanding, (typically less than 5%) are only updated at the quarterly review, while larger ones are included immediately
3. Including new securities, that were not part of the benchmark previously (e.g. due to an IPO)
4. Transferring countries and securities from one classification to another, e.g. the Qatar and UAE equity markets have been up for review 3 times, to consider a transfer from the MSCI Frontier Markets index to the MSCI Emerging Markets Index, and Israel was transferred from the Emerging Market classification to the developed market classification in 2009 (MSCI, 2012).

MSCI World

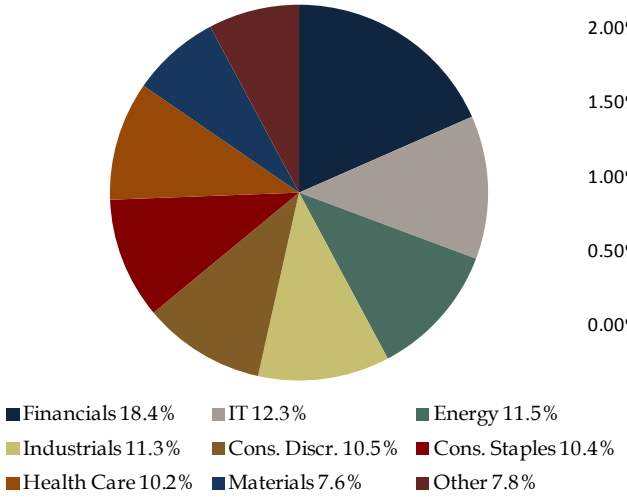
The MSCI world index is a free-float market-cap weighted index covering a selection of developed markets, and was first launched 31/12/1969 (MSCI(b), 2012). It includes 24 countries, 1613 securities, and is one of the oldest indices as well as one of the most widely used as benchmark (MSCI (c), 2012).

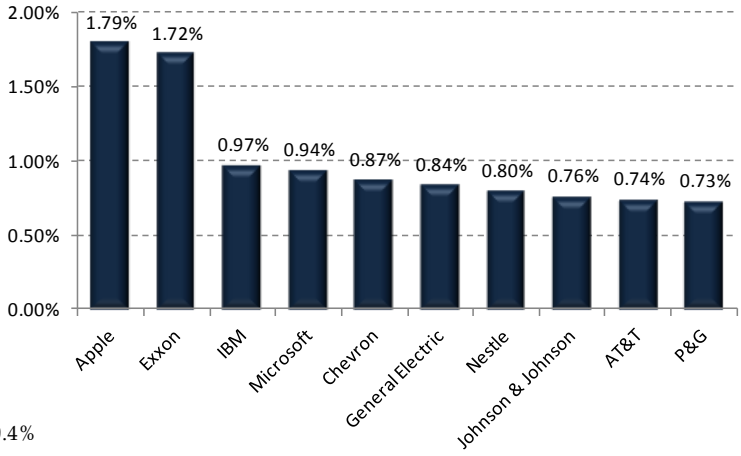


Source : MSCI World Factsheet, January 2012



Source: MSCI World Factsheet, January 2012

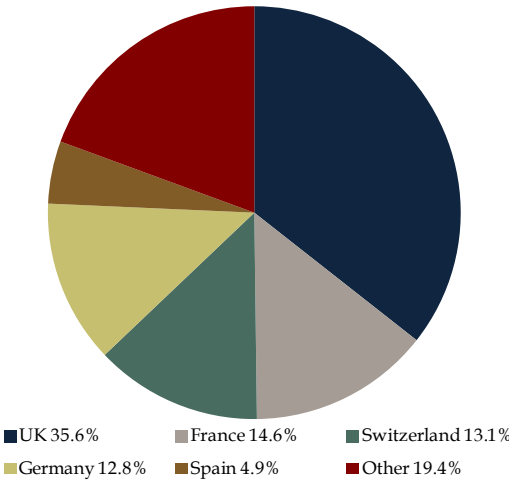




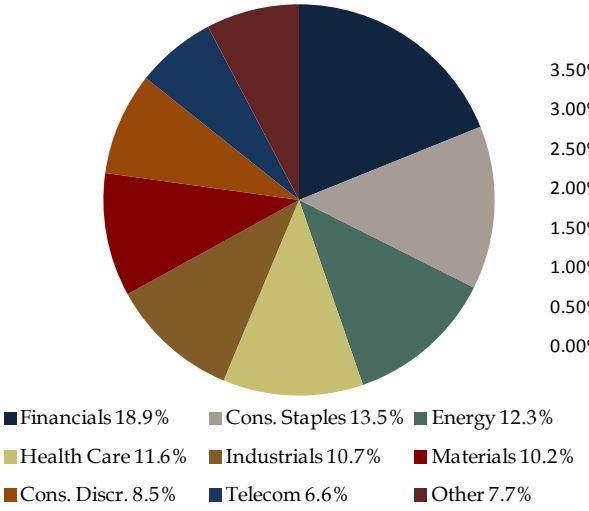
MSCI Europe

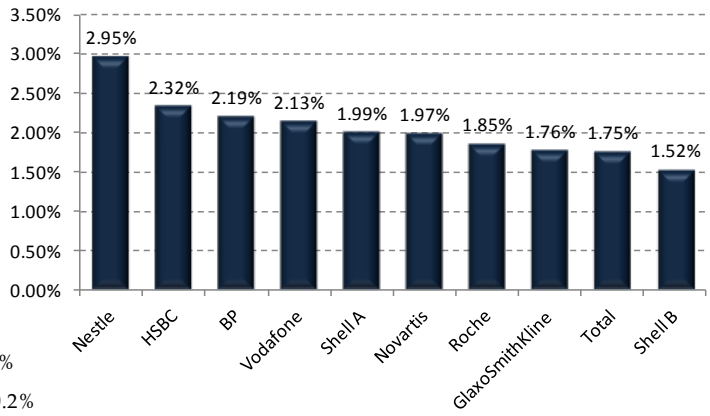
The MSCI Europe index is a combination of 450 securities from 16 European developed markets. The index is free-float market-cap weighted and covers approximately 84% of the developed equities market cap in Europe (MSCI (d), 2012).

Source: MSCI (d), 2012



Source: MSCI (d), 2012





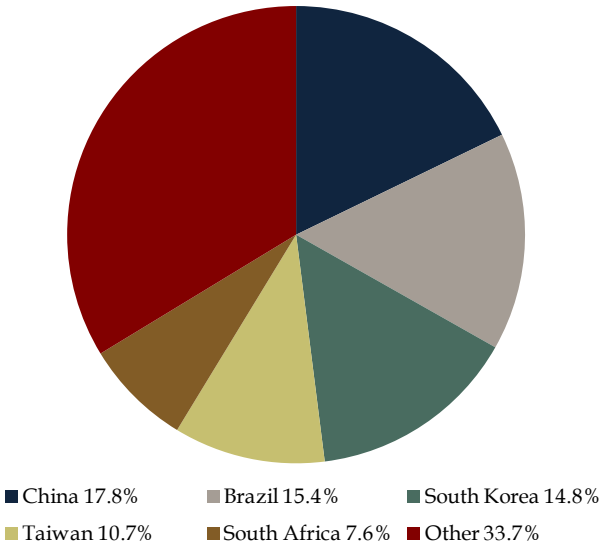
The country weights presented in the figure, should be interpreted with great care. As can be seen Switzerland and the UK seems to have a disproportionately large share of AUM. Switzerland has the same share as Germany. When seen in relation to the size and economical influence in Europe, this AUM distribution does not comply very well. An explanation for this could be that both the UK and Switzerland are global financial centres, with many large companies listed. Since the country weights presented in the figure are based on the country of listing, and not on the exposure of the listed securities to each country, this will inflate the weight, and thereby importance, of a country such as Switzerland.

MSCI Emerging Markets

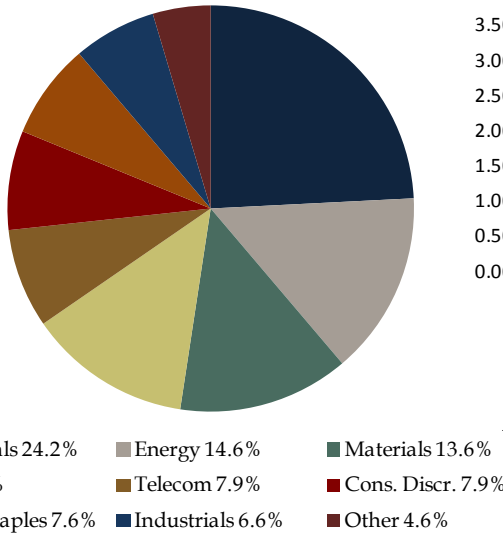
The final index we will be referring to in this thesis is the MSCI Emerging Markets Index. This index is also free-float market-cap weighted, and covers 820 securities in 21 countries. Like the European index, the

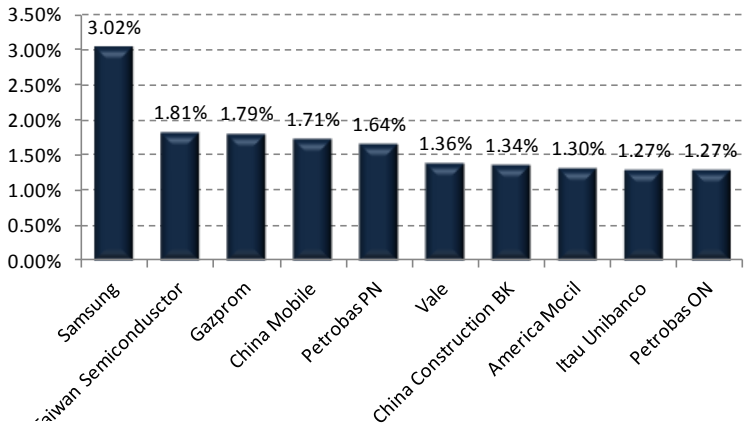
Emerging Markets index covers approximately 84% of the market-cap in each country (MSCI (e), 2012). The index was launched 31/12/1987 (MSCI (b),2012).

Markets, Source: MSCI (e), 2012



Country Weights, Source: MSCI (e), 2012)





Compared to the two developed market indices some factors are notably different with the Emerging Markets index. E.g. the average market cap of the constituents is considerably lower at ca. 4,4bn. USD compared to 14,3bn. USD, and 14,6bn. USD for MSCI Europe and MSCI World respectively.

11.5 Statistical measures

Adjusted R^2

$$\bar{R}^2 = \frac{\frac{SSR}{(n-k-1)}}{\frac{SST}{(n-1)}}$$

$SSR = Unexplained\ sum\ of\ squares$

$SST = Total\ sum\ of\ squares$

$n = sample\ size$

$k = number\ of\ parameters$

The adjusted R^2 measures the amount of explanation of the explanatory variables on the dependent variable adjusted for the degrees of freedom. Thus a high adjusted R^2 indicates a high degree of explanation.

F-statistic

$H_0: x_1, x_2 \ldots, x_k\ do\ not\ help\ to\ explain\ y$

$$F = \frac{R^2/k}{(1-R^2)/(n-k-1)}$$

This is applied to determine the overall significance of the regression. The critical F value for a two sided test with a 95% confidence level, as specified, is 1.96.

T-statistic

$H_0: \beta_j = 0$

$$T = \frac{\hat{\beta}_j}{se(\hat{\beta}_j)}$$

$j = any\ of\ the\ k\ variables$

The t-statistic is applied to determine the significance of the independent variables on the independent variable. The critical t value for a 95% confidence level is, as specified, is 1.960.

P-value

For testing against the two sided alternative applied in both the F- and t-statistic

$$P(|T| > |t|) or\ P(|F| > |f|)$$

The p-value is the probability of observing a t statistic as extreme as we did is the null hypothesis is true. The p-value is a probability so its value is always between zero and one.

11.6 Goodness of Fit - Regression of ETFs versus Index

World ETF versus Index											
							Index				
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI World	0.999	0.000	0.000	-1.199	0.236	No	0.992	0.003	304.721	0.000	Yes
iShares MSCI World	0.998	0.000	0.000	-0.802	0.425	No	0.983	0.006	174.034	0.000	Yes
Lyxor ETF MSCI World	0.786	-0.001	0.003	-0.485	0.630	No	0.832	0.059	14.102	0.000	Yes

World ETF versus Index Newey West Standard Errors											
							Index				
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
iShares MSCI World	0.999	0.000	0.000	-2.329	0.024	Yes	0.992	0.004	272.173	0.000	Yes
db x-trackers MSCI World	0.998	0.000	0.000	-1.109	0.271	No	0.983	0.006	157.156	0.000	Yes
Lyxor ETF MSCI World	0.786	-0.001	0.001	-0.918	0.363	No	0.832	0.060	13.886	0.000	Yes

Europe ETF versus Index											
							Index				
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
iShares MSCI Europe	0.999	0.000	0.000	-0.062	0.951	No	0.994	0.004	283.271	0.000	Yes
db x-trackers MSCI Europe	0.998	0.000	0.000	-0.384	0.702	No	0.990	0.006	157.164	0.000	Yes
Lyxor ETF MSCI Europe	0.834	-0.001	0.003	-0.294	0.770	No	0.855	0.051	16.784	0.000	Yes

Europe ETF versus Index Newey West Standard Errors											
							Index				
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
iShares MSCI Europe	0.999	0.000	0.000	-0.105	0.917	No	0.994	0.004	272.667	0.000	Yes
db x-trackers MSCI Europe	0.998	0.000	0.000	-0.541	0.591	No	0.990	0.006	160.203	0.000	Yes
Lyxor ETF MSCI Europe	0.834	-0.001	0.001	-0.517	0.607	No	0.855	0.065	13.197	0.000	Yes

Emerging Markets ETF versus Index											
							Index				
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
iShares MSCI Emerging Markets	1.000	-0.001	0.000	-3.494	0.001	Yes	0.996	0.002	432.280	0.000	Yes
db x-trackers MSCI Emerging Marke	0.996	0.000	0.000	-0.088	0.930	No	0.976	0.008	129.757	0.000	Yes
Lyxor ETF MSCI Emerging Markets	0.834	-0.001	0.003	-0.294	0.770	No	0.855	0.051	16.784	0.000	Yes

Emerging Markets ETF versus Index Newey West Standard Errors											
							Index				
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
iShares MSCI Emerging Markets	1.000	-0.001	0.000	-5.258	0.000	Yes	0.996	0.003	301.189	0.000	Yes
db x-trackers MSCI Emerging Marke	0.996	0.000	0.000	-0.147	0.883	No	0.976	0.009	112.709	0.000	No
Lyxor ETF MSCI Emerging Markets	0.949	-0.002	0.001	-1.518	0.136	No	0.971	0.035	27.790	0.000	No

11.7 Goodness of Fit – Regression of ETF versus ETF

World ETF versus ETF											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI World	0.998	0.000	0.000	-0.070	0.944	No	1.007	0.006	164.422	0.000	Yes
Lyxor ETF MSCI World	0.763	-0.001	0.003	-0.390	0.698	No	0.829	0.063	13.234	0.000	Yes

World ETF versus ETF Newey West Standard Errors											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI World	0.998	0.000	0.000	-0.093	0.926	No	1.007	0.007	135.950	0.000	Yes
Lyxor ETF MSCI World	0.763	-0.001	0.002	-0.720	0.475	No	0.829	0.071	11.657	0.000	Yes

Europe ETF versus ETF											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI Europe	0.998	0.000	0.000	0.458	0.649	No	1.003	0.006	159.920	0.000	Yes
Lyxor ETF MSCI Europe	0.827	-0.001	0.003	-0.357	0.722	No	0.843	0.058	14.516	0.000	Yes

Europe ETF versus ETF Newey West Standard Errors											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI Europe	0.998	0.000	0.000	0.640	0.525	No	1.003	0.007	140.616	0.000	Yes
Lyxor ETF MSCI Europe	0.827	-0.001	0.002	-0.639	0.526	No	0.843	0.071	11.935	0.000	Yes

Emerging Markets ETF versus ETF											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI Emerging Marke	0.996	0.000	0.001	-0.696	0.490	No	1.016	0.009	110.414	0.000	Yes
Lyxor ETF MSCI Emerging Markets	0.927	-0.001	0.003	-0.541	0.591	No	0.976	0.040	24.435	0.000	Yes

Emerging Markets ETF versus ETF Newey West Standard Errors											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
db x-trackers MSCI Emerging Marke	0.996	0.000	0.000	-1.225	0.226	No	1.016	0.011	88.948	0.000	Yes
Lyxor ETF MSCI Emerging Markets	0.927	-0.001	0.001	-1.055	0.297	No	0.976	0.043	22.768	0.000	Yes

Source: IFR, Company Websites and Bloomberg

11.8 Performance Test Pure Selection

World Pure Selection iShares											
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Handelsinvest Verden	0.874	-0.002	0.002	-0.871	0.386	No	0.985	0.044	22.558	0.000	Yes
ISI Global Equities	0.879	-0.001	0.002	-0.440	0.662	No	0.935	0.041	23.025	0.000	Yes
Jyske Invest Global Equities Acc	0.809	0.000	0.002	0.144	0.886	No	0.988	0.056	17.587	0.000	Yes
Lån og Spar Invest -Verden	0.834	-0.001	0.002	-0.426	0.671	No	0.804	0.042	19.169	0.000	Yes
Nielsen Global Value	0.606	-0.002	0.003	-0.736	0.464	No	0.638	0.060	10.647	0.000	Yes
Nordea Invest Verden	0.895	-0.001	0.002	-0.320	0.750	No	0.978	0.039	24.945	0.000	Yes
Nykredit Invest Globale Aktier	0.919	-0.001	0.001	-0.629	0.531	No	0.929	0.032	28.816	0.000	Yes

World Pure Selection with Newey-West Standard Errors iShares											
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Handelsinvest Verden	0.874	-0.002	0.002	-0.845	0.401	No	0.985	0.042	23.313	0.000	Yes
ISI Global Equities	0.879	-0.001	0.001	-0.585	0.560	No	0.935	0.068	13.714	0.000	Yes
Jyske Invest Global Equities Acc	0.809	0.000	0.002	0.145	0.885	No	0.988	0.074	13.321	0.000	Yes
Lån og Spar Invest -Verden	0.834	-0.001	0.002	-0.461	0.646	No	0.804	0.077	10.382	0.000	Yes
Nielsen Global Value	0.606	-0.002	0.002	-0.811	0.420	No	0.638	0.102	6.228	0.000	Yes
Nordea Invest Verden	0.895	-0.001	0.001	-0.491	0.625	No	0.978	0.056	17.609	0.000	Yes
Nykredit Invest Globale Aktier	0.919	-0.001	0.001	-1.032	0.305	No	0.929	0.056	16.701	0.000	Yes

World Pure Selection iShares Backtracked											
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Handelsinvest Verden	0.879	-0.003	0.001	-1.879	0.062	No	1.015	0.032	32.092	0.000	Yes
ISI Global Equities	0.928	-0.001	0.001	-1.042	0.299	No	0.986	0.023	42.796	0.000	Yes
Jyske Invest Global Equities Acc*	0.874	0.001	0.002	0.428	0.670	No	1.027	0.035	29.527	0.000	Yes
Lån og Spar Invest -Verden	0.876	-0.003	0.001	-1.986	0.049	Yes	0.912	0.029	31.653	0.000	Yes
Nielsen Global Value*	0.548	0.003	0.002	1.382	0.170	No	0.634	0.054	11.698	0.000	Yes
Nordea Invest Verden	0.929	-0.001	0.001	-0.992	0.323	No	1.022	0.024	43.038	0.000	Yes
Nykredit Invest Globale Aktier*	0.927	-0.002	0.001	-2.160	0.032	Yes	0.955	0.023	41.756	0.000	Yes

World Pure Selection with Newey-West Standard Errors iShares Backtracked											
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Handelsinvest Verden	0.879	-0.003	0.001	-2.008	0.047	Yes	1.015	0.036	28.573	0.000	Yes
ISI Global Equities	0.928	-0.001	0.001	-1.393	0.166	No	0.986	0.038	26.215	0.000	Yes
Jyske Invest Global Equities Acc*	0.874	0.001	0.002	0.445	0.657	No	1.027	0.046	22.558	0.000	Yes
Lån og Spar Invest -Verden	0.876	-0.003	0.001	-2.274	0.024	Yes	0.912	0.054	16.889	0.000	Yes
Nielsen Global Value*	0.548	0.003	0.003	1.203	0.232	No	0.634	0.079	8.021	0.000	Yes
Nordea Invest Verden	0.929	-0.001	0.001	-1.469	0.144	No	1.022	0.031	32.869	0.000	Yes
Nykredit Invest Globale Aktier*	0.927	-0.002	0.001	-2.746	0.007	Yes	0.955	0.033	28.576	0.000	Yes

Europe Pure Selection iShares											
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Alm. Brand Europæiske Aktier	0.934	0.000	0.002	-0.178	0.859	No	0.932	0.034	27.123	0.000	Yes
BankInvest Europæiske Aktier	0.892	-0.002	0.002	-0.696	0.489	No	0.830	0.040	20.756	0.000	Yes
BankInvest Europæiske Pension Acc	0.892	-0.002	0.002	-0.781	0.438	No	0.821	0.040	20.752	0.000	Yes
Danske Invest Europa	0.903	0.001	0.003	0.346	0.731	No	1.027	0.047	22.074	0.000	Yes
HandelsInvest Europa	0.900	0.000	0.003	-0.165	0.870	No	0.965	0.045	21.632	0.000	Yes
Jyske Invest Europæiske Aktier	0.863	-0.002	0.003	-0.669	0.506	No	0.945	0.052	18.154	0.000	Yes
Lån og Spar Invest - Europa	0.914	-0.001	0.002	-0.308	0.759	No	0.976	0.042	23.509	0.000	Yes
Nordea Invest Europa	0.899	-0.002	0.003	-0.757	0.452	No	0.989	0.046	21.520	0.000	Yes
Sydinvest Europa	0.930	-0.001	0.002	-0.563	0.576	No	1.003	0.038	26.386	0.000	Yes

Europe Pure Selection with Newey-West Standard Errors											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Alm. Brand Europæiske Aktier	0.934	0.000	0.001	-0.291	0.772	No	0.932	0.052	17.848	0.000	Yes
BankInvest Europæiske Aktier	0.892	-0.002	0.002	-0.945	0.349	No	0.830	0.066	12.561	0.000	Yes
BankInvest Europæiske Pension Acc	0.892	-0.002	0.002	-1.042	0.302	No	0.821	0.065	12.573	0.000	Yes
Danske Invest Europa	0.903	0.001	0.002	0.469	0.641	No	1.027	0.057	18.133	0.000	Yes
HandelsInvest Europa	0.900	0.000	0.002	-0.221	0.826	No	0.965	0.044	21.994	0.000	Yes
Jyske Invest Europæiske Aktier	0.863	-0.002	0.002	-0.951	0.346	No	0.945	0.070	13.469	0.000	Yes
Lån og Spar Invest - Europa	0.914	-0.001	0.002	-0.398	0.693	No	0.976	0.053	18.551	0.000	Yes
Nordea Invest Europa	0.899	-0.002	0.002	-1.121	0.267	No	0.989	0.078	12.750	0.000	Yes
Sydinvest Europa	0.930	-0.001	0.001	-0.998	0.323	No	1.003	0.046	21.893	0.000	Yes

Europe Pure Selection											
						iShares Backtracked					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Alm. Brand Europæiske Aktier	0.860	-0.003	0.002	-1.824	0.070	No	0.965	0.033	29.573	0.000	Yes
BankInvest Europæiske Aktier	0.909	-0.001	0.001	-0.754	0.452	No	0.945	0.025	37.776	0.000	Yes
BankInvest Europæiske Pension Acc	0.907	-0.001	0.001	-0.793	0.429	No	0.944	0.025	37.224	0.000	Yes
Danske Invest Europa	0.915	-0.001	0.001	-0.545	0.587	No	0.998	0.026	39.059	0.000	Yes
HandelsInvest Europa	0.907	-0.002	0.001	-1.554	0.122	No	0.987	0.027	37.153	0.000	Yes
Jyske Invest Europæiske Aktier	0.911	-0.002	0.001	-1.186	0.237	No	1.002	0.026	38.197	0.000	Yes
Lån og Spar Invest - Europa	0.919	-0.002	0.001	-1.907	0.058	No	0.976	0.024	40.153	0.000	Yes
Nordea Invest Europa	0.921	-0.002	0.001	-1.805	0.073	No	0.994	0.024	40.753	0.000	Yes
Sydinvest Europa	0.947	-0.002	0.001	-1.773	0.078	No	0.988	0.020	50.390	0.000	Yes

Europe Pure Selection with Newey-West Standard Errors											
						iShares Backtracked					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Alm. Brand Europæiske Aktier	0.860	-0.003	0.001	-2.314	0.022	Yes	0.965	0.041	23.576	0.000	Yes
BankInvest Europæiske Aktier	0.909	-0.001	0.001	-1.049	0.296	No	0.945	0.054	17.501	0.000	Yes
BankInvest Europæiske Pension Acc	0.907	-0.001	0.001	-1.085	0.280	No	0.944	0.056	16.800	0.000	Yes
Danske Invest Europa	0.915	-0.001	0.001	-0.663	0.508	No	0.998	0.031	32.282	0.000	Yes
HandelsInvest Europa	0.907	-0.002	0.001	-2.154	0.033	Yes	0.987	0.034	29.429	0.000	Yes
Jyske Invest Europæiske Aktier	0.911	-0.002	0.001	-1.697	0.092	No	1.002	0.043	23.226	0.000	Yes
Lån og Spar Invest - Europa	0.919	-0.002	0.001	-2.201	0.029	Yes	0.976	0.031	31.751	0.000	Yes
Nordea Invest Europa	0.921	-0.002	0.001	-2.473	0.015	Yes	0.994	0.043	23.104	0.000	Yes
Sydinvest Europa	0.947	-0.002	0.001	-2.620	0.010	Yes	0.988	0.026	38.251	0.000	Yes

Emerging Markets Pure Selection											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Danske Invest Nye Markeder	0.893	0.005	0.002	2.210	0.030	Yes	0.851	0.035	24.498	0.000	Yes
Jyske Invest Nye Aktiemarkeder	0.934	0.000	0.002	-0.087	0.931	No	1.037	0.032	31.991	0.000	Yes
Nykredit Engros Vækstlande	0.892	0.000	0.002	-0.006	0.995	No	0.904	0.037	24.403	0.000	Yes

Emerging Markets Pure Selection with Newey-West Standard Errors											
						iShares					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Danske Invest Nye Markeder	0.893	0.005	0.002	2.122	0.037	Yes	0.851	0.028	30.059	0.000	Yes
Jyske Invest Nye Aktiemarkeder	0.934	0.000	0.002	-0.099	0.921	No	1.037	0.047	21.883	0.000	Yes
Nykredit Engros Vækstlande	0.892	0.000	0.002	-0.007	0.995	No	0.904	0.055	16.423	0.000	Yes

Emerging Markets Pure Selection											
						iShares Backtracked					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Danske Invest Nye Markeder	0.923	0.004	0.001	2.685	0.008	Yes	0.889	0.022	41.041	0.000	Yes
Jyske Invest Nye Aktiemarkeder	0.946	0.001	0.001	0.660	0.510	No	1.001	0.020	49.392	0.000	Yes
Nykredit Engros Vækstlande	0.929	-0.001	0.001	-0.607	0.545	No	0.952	0.022	42.664	0.000	Yes

Emerging Markets Pure Selection with Newey-West Standard Errors											
						iShares Backtracked					
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	p-value	Significance	Beta	Std. Error	t-statistic	p-value	Significance
Danske Invest Nye Markeder	0.924	0.003	0.002	1.784	0.077	No	0.895	0.023	39.236	0.000	Yes
Jyske Invest Nye Aktiemarkeder	0.946	0.001	0.001	0.741	0.460	No	1.001	0.029	34.866	0.000	Yes
Nykredit Engros Vækstlande	0.929	-0.001	0.001	-0.700	0.485	No	0.952	0.029	32.295	0.000	Yes

Source: IFR, Company Websites and Bloomberg

11.9 Performance Test Selection and Timing

World with Timing
iShares

Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	p-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Handelsinvest Verden	0.881	-0.004	0.002	-1.937	0.057	No	1.041	0.049	21.103	0.000	Yes	1.417	0.627	2.259	0.027	Yes
ISI Global Equities	0.880	-0.002	0.002	-1.085	0.282	No	0.968	0.047	20.621	0.000	Yes	0.814	0.597	1.363	0.177	No
Jyske Invest Global Equities Acc	0.807	0.001	0.003	0.430	0.668	No	0.968	0.066	14.759	0.000	Yes	-0.496	0.834	-0.594	0.554	No
Lån og Spar Invest -Verden	0.849	-0.004	0.002	-1.866	0.066	No	0.872	0.046	18.753	0.000	Yes	1.691	0.591	2.861	0.006	Yes
Nielsen Global Value	0.628	-0.005	0.003	-1.835	0.071	No	0.717	0.068	10.592	0.000	Yes	1.969	0.860	2.289	0.025	Yes
Nordea Invest Verden	0.901	-0.003	0.002	-1.458	0.149	No	1.030	0.044	23.227	0.000	Yes	1.279	0.564	2.269	0.026	Yes
Nykredit Invest Globale Aktier	0.928	-0.003	0.002	-2.234	0.029	Yes	0.987	0.035	27.973	0.000	Yes	1.438	0.449	3.205	0.002	Yes

World with Timing with Newey-West Standard Errors
iShares

Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	p-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Handelsinvest Verden	0.881	-0.004	0.003	-1.493	0.140	No	1.041	0.035	29.642	0.000	Yes	1.417	0.603	2.348	0.022	Yes
ISI Global Equities	0.880	-0.002	0.003	-0.876	0.384	No	0.968	0.055	17.552	0.000	Yes	0.814	1.162	0.700	0.486	No
Jyske Invest Global Equities Acc	0.807	0.001	0.003	0.374	0.710	No	0.968	0.073	13.313	0.000	Yes	-0.496	1.258	-0.394	0.695	No
Lån og Spar Invest -Verden	0.849	-0.004	0.002	-1.745	0.085	No	0.872	0.068	12.869	0.000	Yes	1.691	1.220	1.387	0.170	No
Nielsen Global Value	0.628	-0.005	0.002	-2.406	0.019	Yes	0.717	0.095	7.522	0.000	Yes	1.969	0.933	2.111	0.038	Yes
Nordea Invest Verden	0.901	-0.003	0.002	-1.206	0.232	No	1.030	0.035	29.338	0.000	Yes	1.279	0.887	1.443	0.154	No
Nykredit Invest Globale Aktier	0.928	-0.003	0.002	-1.696	0.094	No	0.987	0.034	28.905	0.000	Yes	1.438	0.859	1.673	0.099	No

World with Timing
iShares Backtracked

Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	P-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Handelsinvest Verden	0.881	-0.005	0.002	-2.625	0.010	Yes	1.055	0.038	27.889	0.000	Yes	0.922	0.484	1.904	0.059	No
ISI Global Equities	0.928	-0.002	0.001	-1.565	0.120	No	1.006	0.028	36.230	0.000	Yes	0.451	0.355	1.270	0.206	No
Jyske Invest Global Equities Acc*	0.873	0.001	0.002	0.326	0.745	No	1.029	0.043	23.795	0.000	Yes	0.036	0.530	0.068	0.946	No
Lån og Spar Invest -Verden	0.878	-0.004	0.002	-2.751	0.007	Yes	0.950	0.034	27.579	0.000	Yes	0.866	0.441	1.965	0.051	No
Nielsen Global Value*	0.555	0.001	0.003	0.297	0.767	No	0.687	0.062	11.003	0.000	Yes	1.347	0.800	1.683	0.095	No
Nordea Invest Verden	0.933	-0.003	0.001	-2.547	0.012	Yes	1.071	0.028	38.469	0.000	Yes	1.109	0.356	3.114	0.002	Yes
Nykredit Invest Globale Aktier*	0.931	-0.004	0.001	-3.404	0.001	Yes	1.000	0.027	36.654	0.000	Yes	0.986	0.346	2.849	0.005	Yes

World with Timing with Newey-West Standard Errors
iShares Backtracked

Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	P-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Handelsinvest Verden	0.881	-0.005	0.002	-2.112	0.036	Yes	1.055	0.039	26.923	0.000	Yes	0.922	0.637	1.448	0.150	No
ISI Global Equities	0.928	-0.002	0.002	-1.210	0.228	No	1.006	0.034	29.629	0.000	Yes	0.451	0.706	0.639	0.524	No
Jyske Invest Global Equities Acc*	0.873	0.001	0.002	0.274	0.785	No	1.029	0.060	17.020	0.000	Yes	0.036	0.801	0.045	0.964	No
Lån og Spar Invest -Verden	0.878	-0.004	0.002	-2.575	0.011	Yes	0.950	0.047	20.410	0.000	Yes	0.866	0.892	0.970	0.334	No
Nielsen Global Value*	0.555	0.001	0.003	0.297	0.767	No	0.687	0.090	7.672	0.000	Yes	1.347	0.825	1.632	0.105	No
Nordea Invest Verden	0.933	-0.003	0.002	-1.993	0.048	Yes	1.071	0.023	47.350	0.000	Yes	1.109	0.565	1.963	0.052	No
Nykredit Invest Globale Aktier*	0.931	-0.004	0.001	-2.815	0.006	Yes	1.000	0.031	32.462	0.000	Yes	0.986	0.607	1.624	0.107	No

Europe with Timing
iShares

Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	p-value	Indicates	Beta2	Std. Error	t-statistic	P-value	Significance
Alm. Brand Europæiske Aktier	0.933	0.000	0.002	-0.198	0.844	No	0.933	0.038	24.280	0.000	Yes	0.039	0.427	0.091	0.928	No
BankInvest Europæiske Aktier	0.890	-0.002	0.003	-0.665	0.509	No	0.833	0.045	18.621	0.000	Yes	0.077	0.497	0.156	0.877	No
BankInvest Europæiske Pension Acc	0.890	-0.002	0.003	-0.730	0.469	No	0.823	0.044	18.611	0.000	Yes	0.070	0.492	0.143	0.887	No
Danske Invest Europa	0.904	0.003	0.003	0.855	0.397	No	1.004	0.052	19.492	0.000	Yes	-0.600	0.572	-1.048	0.300	No
HandelsInvest Europa	0.899	-0.002	0.003	-0.612	0.543	No	0.983	0.050	19.862	0.000	Yes	0.485	0.550	0.882	0.382	No
Jyske Invest Europæiske Aktier	0.862	-0.001	0.004	-0.240	0.811	No	0.930	0.058	16.025	0.000	Yes	-0.385	0.645	-0.597	0.553	No
Lån og Spar Invest - Europa	0.912	-0.001	0.003	-0.245	0.807	No	0.976	0.046	21.000	0.000	Yes	-0.011	0.516	-0.022	0.983	No
Nordea Invest Europa	0.901	-0.004	0.003	-1.380	0.174	No	1.019	0.050	20.179	0.000	Yes	0.768	0.561	1.369	0.177	No
Sydinvest Europa	0.929	-0.001	0.003	-0.567	0.573	No	1.006	0.043	23.667	0.000	Yes	0.086	0.473	0.181	0.857	No

Europe with Timing and Newey-West Standard Errors
iShares

Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	p-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Alm. Brand Europæiske Aktier	0.933	0.000	0.002	-0.226	0.822	No	0.933	0.051	18.244	0.000	Yes	0.039	0.641	0.061	0.952	No
BankInvest Europæiske Aktier	0.890	-0.002	0.002	-0.756	0.453	No	0.833	0.060	13.945	0.000	Yes	0.077	0.661	0.117	0.907	No
BankInvest Europæiske Pension Acc	0.890	-0.002	0.002	-0.815	0.419	No	0.823	0.060	13.763	0.000	Yes	0.070	0.651	0.108	0.914	No
Danske Invest Europa	0.904	0.003	0.002	1.212	0.231	No	1.004	0.036	27.508	0.000	Yes	-0.600	0.550	-1.091	0.280	No
HandelsInvest Europa	0.899	-0.002	0.003	-0.640	0.525	No	0.983	0.030	32.592	0.000	Yes	0.485	0.532	0.913	0.366	No
Jyske Invest Europæiske Aktier	0.862	-0.001	0.003	-0.336	0.738	No	0.930	0.053	17.521	0.000	Yes	-0.385	0.634	-0.608	0.546	No
Lån og Spar Invest - Europa	0.912	-0.001	0.003	-0.250	0.804	No	0.976	0.040	24.207	0.000	Yes	-0.011	0.644	-0.018	0.986	No
Nordea Invest Europa	0.901	-0.004	0.003	-1.405	0.166	No	1.019	0.068	15.022	0.000	Yes	0.768	0.741	1.036	0.305	No
Sydinvest Europa	0.929	-0.001	0.002	-0.613	0.543	No	1.006	0.033	30.930	0.000	Yes	0.086	0.579	0.148	0.883	No

Europe with Timing
iShares Backtracked

Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	P-value	Indicates	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Alm. Brand Europæiske Aktier	0.860	-0.004	0.002	-1.930	0.056	No	0.978	0.037	26.102	0.000	Yes	0.315	0.433	0.727	0.469	No
BankInvest Europæiske Aktier	0.909	-0.001	0.001	-0.831	0.408	No	0.951	0.029	33.019	0.000	Yes	0.121	0.333	0.364	0.717	No
BankInvest Europæiske Pension Acc	0.906	-0.001	0.002	-0.860	0.391	No	0.949	0.029	32.536	0.000	Yes	0.120	0.337	0.357	0.722	No
Danske Invest Europa	0.914	-0.001	0.002	-0.451	0.653	No	0.998	0.029	33.931	0.000	Yes	-0.007	0.340	-0.020	0.984	No
HandelsInvest Europa	0.906	-0.002	0.002	-1.460	0.147	No	0.991	0.031	32.427	0.000	Yes	0.096	0.353	0.273	0.785	No
Jyske Invest Europæiske Aktier	0.911	-0.001	0.002	-0.840	0.402	No	0.998	0.030	33.050	0.000	Yes	-0.109	0.349	-0.312	0.755	No
Lån og Spar Invest - Europa	0.918	-0.002	0.001	-1.640	0.103	No	0.977	0.028	34.915	0.000	Yes	0.016	0.323	0.048	0.962	No
Nordea Invest Europa	0.922	-0.003	0.001	-2.437	0.016	Yes	1.017	0.028	36.604	0.000	Yes	0.544	0.321	1.695	0.092	No
Sydinvest Europa	0.947	-0.003	0.001	-2.196	0.030	Yes	1.003	0.022	44.688	0.000	Yes	0.337	0.259	1.301	0.195	No

Europe with Timing and Newey-West Standard Errors iShares Backtracked																
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	P-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Alm. Brand Europæiske Aktier	0.860	-0.004	0.002	-2.218	0.028	Yes	0.978	0.048	20.584	0.000	Yes	0.315	0.521	0.604	0.547	No
BankInvest Europæiske Aktier	0.015	-0.001	0.001	-0.897	0.371	No	0.951	0.054	17.457	0.000	Yes	0.121	0.642	0.188	0.851	No
BankInvest Europæiske Pension Acc	0.906	-0.001	0.001	-0.915	0.362	No	0.949	0.057	16.581	0.000	Yes	0.120	0.671	0.179	0.858	No
Danske Invest Europa	0.914	-0.001	0.001	-0.576	0.565	No	0.998	0.025	40.001	0.000	Yes	-0.007	0.342	-0.020	0.984	No
HandelsInvest Europa	0.906	-0.002	0.001	-1.723	0.087	No	0.991	0.036	27.317	0.000	Yes	0.096	0.385	0.251	0.803	No
Jyske Invest Europæiske Aktier	0.911	-0.001	0.001	-0.959	0.339	No	0.998	0.040	24.907	0.000	Yes	-0.109	0.465	-0.234	0.815	No
Lån og Spar Invest - Europa	0.918	-0.002	0.001	-1.623	0.107	No	0.977	0.025	39.364	0.000	Yes	0.016	0.459	0.034	0.973	No
Nordea Invest Europa	0.922	-0.003	0.001	-2.645	0.009	Yes	1.017	0.038	26.504	0.000	Yes	0.544	0.451	1.207	0.229	No
Sydinvest Europa	0.947	-0.003	0.001	-2.379	0.019	Yes	1.003	0.019	52.987	0.000	Yes	0.337	0.321	1.052	0.294	No

Emerging Markets with Timing iShares																
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	p-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Danske Invest Nye Markeder	0.891	0.005	0.003	1.910	0.060	No	0.849	0.039	21.993	0.000	Yes	-0.041	0.345	-0.118	0.906	No
Jyske Invest Nye Aktiemarkeder	0.934	0.001	0.002	0.491	0.625	No	1.021	0.036	28.563	0.000	Yes	-0.334	0.320	-1.045	0.300	No
Nykredit Engros Vækstlande	0.893	0.002	0.003	0.681	0.498	No	0.882	0.041	21.669	0.000	Yes	-0.463	0.364	-1.271	0.208	No

Emerging Markets with Timing with Newey-West Standard Errors iShares																
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	p-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Danske Invest Nye Markeder	0.891	0.005	0.003	1.800	0.076	No	0.849	0.029	28.907	0.000	Yes	-0.041	0.225	-0.181	0.857	No
Jyske Invest Nye Aktiemarkeder	0.934	0.001	0.002	0.571	0.570	No	1.021	0.051	19.935	0.000	Yes	-0.334	0.335	-0.996	0.322	No
Nykredit Engros Vækstlande	0.893	0.002	0.003	0.642	0.523	No	0.882	0.041	21.647	0.000	Yes	-0.463	0.570	-0.811	0.420	No

Emerging Markets with Timing iShares Backtracked																
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	P-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Danske Invest Nye Markeder	0.923	0.003	0.002	1.810	0.073	No	0.895	0.023	38.144	0.000	Yes	0.155	0.233	0.666	0.507	No
Jyske Invest Nye Aktiemarkeder	0.946	0.002	0.002	0.939	0.349	No	0.995	0.022	45.344	0.000	Yes	-0.151	0.217	-0.696	0.488	No
Nykredit Engros Vækstlande	0.928	0.000	0.002	0.032	0.975	No	0.944	0.024	39.098	0.000	Yes	-0.219	0.239	-0.917	0.361	No

Emerging Markets with Timing with Newey-West Standard Errors iShares Backtracked																
Fund	Adj. R Sq.	Alpha	Std. Error	t-statistic	P-value	Significance	$Beta_1$	Std. Error	t-statistic	P-value	Significance	$Beta_2$	Std. Error	t-statistic	P-value	Significance
Danske Invest Nye Markeder	0.923	0.003	0.002	1.784	0.077	No	0.895	0.023	39.236	0.000	Yes	0.155	0.169	0.916	0.361	No
Jyske Invest Nye Aktiemarkeder	0.946	0.002	0.001	1.079	0.283	No	0.995	0.030	32.664	0.000	Yes	-0.151	0.235	-0.644	0.521	No
Nykredit Engros Vækstlande	0.928	0.000	0.002	0.029	0.977	No	0.944	0.026	35.693	0.000	Yes	-0.219	0.343	-0.640	0.523	No

Source: IFR, Company Websites and Bloomberg

11.10 Test for Normality

World ETF versus Index Index			
Fund	Jarque Bera	P-value	Normality
db x-trackers MSCI World	51.964	0.000	No
iShares MSCI World	7.194	0.027	No
Lyxor ETF MSCI World	363.176	0.000	No

Europe ETF versus Index Index			
Fund	Jarque Bera	P-value	Normality
iShares MSCI Europe	51.964	0.000	No
db x-trackers MSCI Europe	7.194	0.027	No
Lyxor ETF MSCI Europe	363.176	0.000	No

Emerging Markets ETF versus Index Index			
Fund	Jarque Bera	P-value	Normality
iShares MSCI Emerging Markets	26.096	0.000	No
db x-trackers MSCI Emerging Marke	6.482	0.039	No
Lyxor ETF MSCI Emerging Markets	159.161	0.000	No

World ETF versus ETF iShares			
Fund	Jarque Bera	P-value	Normality
db x-trackers MSCI World	4.325	0.115	Yes
Lyxor ETF MSCI World	350.940	0.000	No

Europe ETF versus ETF iShares			
Fund	Jarque Bera	P-value	Normality
db x-trackers MSCI Europe	1.405	0.495	Yes
Lyxor ETF MSCI Europe	98.009	0.000	No

Emerging Markets ETF versus ETF iShares			
Fund	Jarque Bera	P-value	Normality
db x-trackers MSCI Emerging Marke	2.229	0.328	Yes
Lyxor ETF MSCI Emerging Markets	216.377	0.000	No

World Pure Selection						
	iShares Backtracked			iShares		
Fund	Jarque Bera	P-value	Normality	Jarque Bera	P-value	Normality
Handelsinvest Verden	575.027	0.000	No	228.716	0.000	No
ISI Global Equities	1005.706	0.000	No	248.970	0.000	No
Jyske Invest Global Equities Acc	32.162	0.000	No	11.104	0.004	No
Lån og Spar Invest -Verden	216.437	0.000	No	78.812	0.000	No
Nielsen Global Value	4.756	0.093	Yes	8.496	0.014	No
Nordea Invest Verden	427.407	0.000	No	168.193	0.000	No
Nykredit Invest Globale Aktier	498.199	0.000	No	1074.583	0.000	No

World with Timing						
	iShares Backtracked			iShares		
Fund	Jarque Bera	P-value	Normality	Jarque Bera	P-value	Normality
Handelsinvest Verden	655.372	0.000	No	241.166	0.000	No
ISI Global Equities	652.669	0.000	No	116.371	0.000	No
Jyske Invest Global Equities Acc	31.724	0.000	No	12.792	0.002	No
Lån og Spar Invest -Verden	109.452	0.000	No	11.787	0.003	No
Nielsen Global Value	13.671	0.001	No	5.603	0.061	Yes
Nordea Invest Verden	187.800	0.000	No	62.148	0.000	No
Nykredit Invest Globale Aktier	322.870	0.000	No	804.215	0.000	No

Europe Pure Selection						
	iShares Backtracked			iShares		
Fund	Jarque Bera	P-value	Normality	Jarque Bera	P-value	Normality
Alm. Brand Europæiske Aktier	57.960	0.000	No	46.860	0.000	No
BankInvest Europæiske Aktier	193.034	0.000	No	22.427	0.000	No
BankInvest Europæiske Pension Acc	154.528	0.000	No	19.443	0.000	No
Danske Invest Europa	195.028	0.000	No	37.612	0.000	No
HandelsInvest Europa	93.067	0.000	No	27.988	0.000	No
Jyske Invest Europæiske Aktier	451.320	0.000	No	46.978	0.000	No
Lån og Spar Invest - Europa	121.535	0.000	No	63.707	0.000	No
Nordea Invest Europa	1085.208	0.000	No	108.553	0.000	No
Sydinvest Europa	602.722	0.000	No	154.416	0.000	No

Europe with Timing						
	iShares Backtracked			iShares		
Fund	Jarque Bera	P-value	Normality	Jarque Bera	P-value	Normality
Alm. Brand Europæiske Aktier	51.609	0.000	No	241.166	0.000	No
BankInvest Europæiske Aktier	175.286	0.000	No	116.371	0.000	No
BankInvest Europæiske Pension Acc	140.827	0.000	No	12.792	0.002	No
Danske Invest Europa	195.068	0.000	No	11.787	0.003	No
HandelsInvest Europa	85.986	0.000	No	5.603	0.061	Yes
Jyske Invest Europæiske Aktier	485.239	0.000	No	62.148	0.000	No
Lån og Spar Invest - Europa	119.201	0.000	No	804.215	0.000	No
Nordea Invest Europa	850.900	0.000	No	63.880	0.000	No
Sydinvest Europa	452.545	0.000	No	141.046	0.000	No

Emerging Markets Pure Selection						
	iShares Backtracked			iShares		
Fund	Jarque Bera	P-value	Normality	Jarque Bera	P-value	Normality
Danske Invest Nye Markeder	30.800	0.000	No	9.536	0.008	No
Jyske Invest Nye Aktiemarkeder	32.893	0.000	No	15.359	0.000	No
Nykredit Engros Vækstlande	19.428	0.000	No	4.018	0.134	Yes

	Emerging Markets with Timing					
	iShares Backtracked			iShares		
Fund	Jarque Bera	P-value	Normality	Jarque Bera	P-value	Normality
Danske Invest Nye Markeder	34.161	0.000	No	9.257	0.010	No
Jyske Invest Nye Aktiemarkeder	31.087	0.000	No	15.350	0.000	No
Nykredit Engros Vækstlande	20.264	0.000	No	4.899	0.086	Yes

Source: IFR, Company Websites and Bloomberg

11.11 Test for Heteroscedasticity

World ETF versus Index Index			
Fund	White	P-value	Heteroscedasticity
db x-trackers MSCI World	0.399	0.673	No
iShares MSCI World	16.309	0.000	Yes
Lyxor ETF MSCI World	1.690	0.195	No

Europe ETF versus Index Index			
Fund	White	P-value	Heteroscedasticity
iShares MSCI Europe	0.545	0.583	No
db x-trackers MSCI Europe	1.421	0.251	No
Lyxor ETF MSCI Europe	9.788	0.000	Yes

Emerging Markets ETF versus Index Index			
Fund	White	P-value	Heteroscedasticity
iShares MSCI Emerging Markets	0.935	0.400	No
db x-trackers MSCI Emerging Marke	2.914	0.061	No
Lyxor ETF MSCI Emerging Markets	9.788	0.000	Yes

World ETF versus ETF iShares			
Fund	White	P-value	Heteroscedasticity
db x-trackers MSCI World	15.353	0.000	Yes
Lyxor ETF MSCI World	2.066	0.137	No

Europe ETF versus ETF iShares			
Fund	White	P-value	Heteroscedasticity
db x-trackers MSCI Europe	0.649	0.527	No
Lyxor ETF MSCI Europe	7.829	0.001	Yes

Emerging Markets ETF versus ETF iShares			
Fund	White	P-value	Heteroscedasticity
db x-trackers MSCI Emerging Marke	7.149	0.002	Yes
Lyxor ETF MSCI Emerging Markets	2.920	0.064	No

World Pure Selection						
	iShares Backtracked			iShares		
Fund	White	P-value	Heteroscedasticity	White	P-value	Heteroscedasticity
Handelsinvest Verden	0.316	0.729	No	0.015	0.985	No
ISI Global Equities	17.825	0.000	Yes	27.118	0.000	Yes
Jyske Invest Global Equities Acc	10.668	0.000	Yes	16.789	0.000	Yes
Lån og Spar Invest -Verden	12.940	0.000	Yes	13.690	0.000	Yes
Nielsen Global Value	14.892	0.000	Yes	26.043	0.000	Yes
Nordea Invest Verden	8.337	0.000	Yes	11.948	0.000	Yes
Nykredit Invest Globale Aktier	6.396	0.002	Yes	4.175	0.019	Yes

World with Timing						
	iShares Backtracked			iShares		
Fund	White	P-value	Heteroscedasticity	White	P-value	Heteroscedasticity
Handelsinvest Verden	0.237	0.917	No	0.095	0.984	No
ISI Global Equities	16.350	0.000	Yes	31.312	0.000	Yes
Jyske Invest Global Equities Acc	6.452	0.000	Yes	13.027	0.000	Yes
Lån og Spar Invest -Verden	10.993	0.000	Yes	9.317	0.000	Yes
Nielsen Global Value	4.164	0.004	Yes	3.374	0.014	Yes
Nordea Invest Verden	7.991	0.000	Yes	10.438	0.000	Yes
Nykredit Invest Globale Aktier	3.420	0.011	Yes	2.717	0.037	Yes

Europe Pure Selection						
	iShares Backtracked			iShares		
Fund	White	P-value	Heteroscedasticity	White	P-value	Heteroscedasticity
Alm. Brand Europæiske Aktier	1.143	0.322	No	4.637	0.014	Yes
BankInvest Europæiske Aktier	9.740	0.000	Yes	5.155	0.009	Yes
BankInvest Europæiske Pension Acc	11.222	0.000	Yes	4.577	0.015	Yes
Danske Invest Europa	13.580	0.000	Yes	16.882	0.000	Yes
HandelsInvest Europa	3.905	0.022	Yes	2.764	0.073	No
Jyske Invest Europæiske Aktier	12.959	0.000	Yes	7.105	0.002	Yes
Lån og Spar Invest - Europa	18.183	0.000	Yes	7.328	0.002	Yes
Nordea Invest Europa	4.892	0.009	Yes	4.989	0.011	Yes
Sydinvest Europa	14.670	0.000	Yes	7.627	0.001	Yes

Europe with Timing						
	iShares Backtracked			iShares		
Fund	White	P-value	Heteroscedasticity	White	P-value	Heteroscedasticity
Alm. Brand Europæiske Aktier	0.748	0.561	No	3.405	0.016	Yes
BankInvest Europæiske Aktier	6.115	0.000	Yes	3.140	0.023	Yes
BankInvest Europæiske Pension Acc	6.981	0.000	Yes	2.719	0.040	Yes
Danske Invest Europa	10.130	0.000	Yes	17.606	0.000	Yes
HandelsInvest Europa	2.464	0.048	Yes	4.544	0.003	Yes
Jyske Invest Europæiske Aktier	7.282	0.000	Yes	4.656	0.003	Yes
Lån og Spar Invest - Europa	11.086	0.000	Yes	5.961	0.001	Yes
Nordea Invest Europa	3.204	0.015	Yes	2.869	0.033	Yes
Sydinvest Europa	10.621	0.000	Yes	6.976	0.000	Yes

Emerging Markets Pure Selection						
	iShares Backtracked			iShares		
Fund	White	P-value	Heteroscedasticity	White	P-value	Heteroscedasticity
Danske Invest Nye Markeder	0.808	0.448	No	1.440	0.244	No
Jyske Invest Nye Aktiemarkeder	2.142	0.121	No	1.787	0.175	No
Nykredit Engros Vækstlande	4.823	0.009	Yes	8.199	0.001	Yes

Emerging Markets with Timing						
	iShares Backtracked			iShares		
Fund	White	P-value	Heteroscedasticity	White	P-value	Heteroscedasticity
Danske Invest Nye Markeder	0.757	0.555	No	1.311	0.275	No
Jyske Invest Nye Aktiemarkeder	2.133	0.080	No	2.294	0.068	No
Nykredit Engros Vækstlande	1.886	0.116	No	2.579	0.045	Yes

Table

Source: IFR, Company Websites and Bloomberg

11.12 Test for Autocorrelation

World ETF versus Index Index			
Fund	Breush Godfrey	P-value	Autocorrelation
db x-trackers MSCI World	2.884	0.005	Yes
iShares MSCI World	1.321	0.231	no
Lyxor ETF MSCI World	2.319	0.023	Yes

Europe ETF versus Index Index			
Fund	Breush Godfrey	P-value	Autocorrelation
iShares MSCI Europe	1.765	0.086	No
db x-trackers MSCI Europe	2.630	0.011	Yes
Lyxor ETF MSCI Europe	4.872	0.000	Yes

Emerging Markets ETF versus Index Index			
Fund	Breush Godfrey	P-value	Autocorrelation
iShares MSCI Emerging Markets	1.363	0.226	No
db x-trackers MSCI Emerging Marke	2.794	0.004	Yes
Lyxor ETF MSCI Emerging Markets	4.872	0.000	Yes

World ETF versus ETF iShares			
Fund	Breush Godfrey	P-value	Autocorrelation
db x-trackers MSCI World	0.624	0.810	No
Lyxor ETF MSCI World	2.597	0.011	Yes

Europe ETF versus ETF iShares			
Fund	Breush Godfrey	P-value	Autocorrelation
db x-trackers MSCI Europe	1.015	0.456	No
Lyxor ETF MSCI Europe	3.391	0.003	Yes

Emerging Markets ETF versus ETF iShares			
Fund	Breush Godfrey	P-value	Autocorrelation
db x-trackers MSCI Emerging Marke	2.330	0.024	Yes
Lyxor ETF MSCI Emerging Markets	1.275	0.277	No

	World Pure Selection					
	iShares Backtracked			iShares		
Fund	Breush Godfrey	P-value	Autocorrelation	Breush Godfrey	P-value	Autocorrelation
Handelsinvest Verden	0.730	0.720	No	0.797	0.651	No
ISI Global Equities	2.820	0.002	Yes	2.661	0.006	Yes
Jyske Invest Global Equities Acc	1.059	0.402	No	0.758	0.690	No
Lån og Spar Invest -Verden	0.742	0.708	No	0.881	0.570	No
Nielsen Global Value	1.020	0.437	No	1.494	0.152	No
Nordea Invest Verden	2.440	0.007	Yes	2.621	0.007	Yes
Nykredit Invest Globale Aktier	1.243	0.262	No	2.481	0.010	Yes

World with Timing						
	iShares Backtracked			iShares		
Fund	Breush Godfrey	P-value	Autocorrelation	Breush Godfrey	P-value	Autocorrelation
Handelsinvest Verden	0.806	0.644	No	1.477	0.159	No
ISI Global Equities	3.094	0.001	Yes	3.336	0.001	Yes
Jyske Invest Global Equities Acc	1.074	0.389	No	0.738	0.709	No
Lån og Spar Invest -Verden	0.914	0.535	No	1.511	0.146	No
Nielsen Global Value	1.023	0.435	No	1.544	0.134	No
Nordea Invest Verden	1.961	0.033	Yes	1.612	0.113	No
Nykredit Invest Globale Aktier	1.266	0.247	No	3.009	0.002	Yes

Europe Pure Selection						
	iShares Backtracked			iShares		
Fund	Breush Godfrey	P-value	Autocorrelation	Breush Godfrey	P-value	Autocorrelation
Alm. Brand Europæiske Aktier	0.930	0.520	No	2.024	0.048	Yes
BankInvest Europæiske Aktier	1.354	0.197	No	1.936	0.060	No
BankInvest Europæiske Pension Acc	1.339	0.204	No	1.683	0.109	No
Danske Invest Europa	1.389	0.179	No	0.748	0.697	No
HandelsInvest Europa	1.665	0.082	No	0.488	0.909	No
Jyske Invest Europæiske Aktier	3.091	0.001	Yes	1.447	0.187	No
Lån og Spar Invest - Europa	0.970	0.481	No	0.955	0.506	No
Nordea Invest Europa	1.093	0.371	No	1.334	0.239	No
Sydinvest Europa	3.667	0.000	Yes	2.563	0.013	Yes

Europe with Timing						
	iShares Backtracked			iShares		
Fund	Breush Godfrey	P-value	Autocorrelation	Breush Godfrey	P-value	Autocorrelation
Alm. Brand Europæiske Aktier	0.896	0.553	No	2.132	0.038	Yes
BankInvest Europæiske Aktier	1.335	0.207	No	1.891	0.068	No
BankInvest Europæiske Pension Acc	1.320	0.215	No	1.626	0.125	No
Danske Invest Europa	1.378	0.184	No	0.670	0.769	No
HandelsInvest Europa	1.659	0.084	No	0.360	0.970	No
Jyske Invest Europæiske Aktier	3.058	0.001	Yes	1.547	0.150	No
Lån og Spar Invest - Europa	0.966	0.484	No	0.928	0.530	No
Nordea Invest Europa	1.100	0.366	No	1.111	0.380	No
Sydinvest Europa	4.117	0.000	Yes	2.616	0.012	Yes

Emerging Markets Pure Selection						
	iShares Backtracked			iShares		
Fund	Breush Godfrey	P-value	Autocorrelation	Breush Godfrey	P-value	Autocorrelation
Danske Invest Nye Markeder	0.695	0.754	No	0.692	0.752	No
Jyske Invest Nye Aktiemarkeder	1.312	0.219	No	1.109	0.370	No
Nykredit Engros Vækstlande	1.040	0.417	No	0.803	0.646	No

Emerging Markets with Timing						
	iShares Backtracked			iShares		
Fund	Breush Godfrey	P-value	Autocorrelation	Breush Godfrey	P-value	Autocorrelation
Danske Invest Nye Markeder	0.647	0.799	No	0.756	0.692	No
Jyske Invest Nye Aktiemarkeder	1.475	0.142	No	1.419	0.184	No
Nykredit Engros Vækstlande	0.989	0.463	No	0.808	0.641	No

Source: IFR, Company Websites and Bloomberg

11.13 Active Share

World Pure Selection iShares		
Fund	Adj. R Sq.	Active Share
Handelsinvest Verden	87%	94%
ISI Global Equities	88%	74%
Jyske Invest Global Equities Acc*	81%	74%
Lån og Spar Invest -Verden	83%	72%
Nielsen Global Value*	61%	99%
Nordea Invest Verden	90%	64%
Nykredit Invest Globale Aktier*	92%	19%

Europe Pure Selection iShares		
Fund	Adj. R Sq.	Active Share
Alm. Brand Europæiske Aktier	0.934	62%
BankInvest Europæiske Aktier	0.892	73%
BankInvest Europæiske Pension Acc	0.892	73%
Danske Invest Europa	0.903	92%
HandelsInvest Europa	0.900	96%
Jyske Invest Europæiske Aktier	0.863	46%
Lån og Spar Invest - Europa	0.914	63%
Nordea Invest Europa	0.899	60%
Sydinvest Europa	0.930	50%

Emerging Markets Pure Selection iShares		
Fund	Adj. R Sq.	Active Share
Danske Invest Nye Markeder	0.892	90%
Jyske Invest Nye Aktiemarkeder	0.934	77%
Nykredit Engros Vækstlande	0.892	86%

Source: IFR, Company Websites and Bloomberg and Morningstar Research 2011.

11.14 Box-Ljung Test for Autocorrelation

H_0: $Autocorrelation = 0$

Box-Ljung Q Test Statistic

$$Q_{BL} = n(n+2)\sum_{k=1}^{h}\frac{\hat{\rho}_k^2}{n-k}$$

$n = sample\ size$

$\hat{\rho} = sample\ autocorrelation\ at\ lag\ k$

$h = number\ of\ lags\ being\ tested$