Copenhagen
Business School
HANDELSHØJSKOLEN

Fund costs as a predictor of fund performance

A theoretical and empirical investigation of the costs and performance of Danish retail equity funds from 2008-2014

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Master thesis

MSc Applied Economics and Finance,

Copenhagen Business School

June 2015

Number of characters: 169.525/77 pages

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Abstract

This paper investigates the correlation between fund costs and fund performance in Danish retail equity funds from 2008-2014. Based on a theoretical discussion of the expected correlation between fund cost items and fund performance, five hypotheses are proposed. A majority of these suggest an expected negative correlation between the cost item in question and the performance of the fund given the expected negative impact of distribution costs, and the risk of agency problems in high cost funds.

The hypotheses are tested empirically by the use of OLS multivariate cross-sectional dummy variable regressions for three different investment horizons with the use of two different performance measures, Sharpe ratio and Jensen's Alpha. The empirical evidence provides some degree of support for the hypothesis that fund costs in general are negatively correlated to fund performance in Danish retail equity funds. However, the findings are sensitive to the choice of performance measure and to the period of investigation, and are only statistically significant for the short and medium investment horizon when applying the Sharpe ratio as the performance measure.

Acknowledgements

I thank Carsten Mahler, FundCollect, Søren Meyer, FundCollect and Nikolaj Holdt Mikkelsen, Morningstar for providing data for this study and for giving valuable insights. I further thank Jesper Ihlemann, Optimal Invest, Kenn Bechmann, Copenhagen Business School and Ole Risager, Copenhagen Business School, for providing academic guidance and feedback.

Introduction

Over the past two decades, Danish mutual funds have grown increasingly more popular, and have grown significantly in size as a result. Whereas in 1995, the total assets under management (AUM) of Danish mutual funds amounted to DKK 36 billion, by 2013 this number had increased to DKK 1.385 billion (IFB 2009b p. 20, 2014). From a theoretical perspective, the popularity of mutual funds is hardly surprising considering the great benefits that come with pooling multiple investors' funds into a mutual fund: Mutual fund investment has the potential to lead to economies of scale, diversification of assets at a lower cost and enable more qualified security selection.

However, Danish public institutions have on several occasions criticized Danish mutual funds for having excessive costs that are not in the interest of the funds' investors. In 2006, the Danish Competition Authority raised concerns that economies of scale in Danish mutual funds did not materialize into smaller costs for fund investors due to other excessive fund costs (Konkurrencestyrelsen 2006). In 2011 and 2014, the Danish FSA strongly criticized the current cost-structure in Danish mutual funds and in the same year, the Danish Ministry of Business and Growth established a commission that was to consider reforming the current law on mutual funds in respect to fund costs (Finanstilsynet 2011, 2014a; Erhvervs & Vækstministeriet 2014). Similar criticism has been published in Danish newspapers during the same period of time.

The above criticism emphasizes the need for investors to critically assess the costs of individual Danish mutual funds. Does this mean that investors at all times would benefit from choosing the fund with the lowest cost? Not necessarily. To answer this question, one would need to consider a much more fundamental discussion: How fund costs correlates with fund performance in Danish mutual funds.

Bechmann & Rangvid (2004, 2005, 2007) previously investigated this topic based on data of Danish mutual fund costs and performance from 1994-2004 and found a statistically significant negative correlation between fund costs and long-term fund performance. These findings seems to suggest that, on average, investors would benefit from choosing low cost funds over high cost funds. However, the study was conducted more than a decade ago based on data of 10-20 years of age. The Danish mutual fund industry has been developing rapidly since then, and the characteristics of the costs in Danish mutual funds have changed, too. As such, the findings of Bechmann & Rangvid (ibid) hardly seem to be evidence of a similar current correlation in Danish mutual funds.

This paper seeks to add to the existing literature on this topic by investigating the current correlation between fund costs and fund performance in Danish equity funds from a theoretical and empirical perspective. The paper considers Danish retail equity funds only seeing as these funds have had a relatively larger range of fund costs, hence better capable of magnifying any underlying correlation between fund costs and fund performance. The study seeks to address the following research question: *What is the correlation between fund costs and fund performance in Danish retail equity funds?*

The paper is structured as follows:

Section 1 introduces the theoretical framework and limitations of this paper, and further provides a brief historical account of the current Danish mutual fund industry with an emphasis on events of relevance to this study.

Section 2 analyses the costs in Danish equity funds by considering the characteristics of the all-in one cost-indicator, ÅOP, and its key sub cost components. The section will further consider the extent to which fund costs varies depending on the type of fund and its style. Finally, the section will analyze the potential effect of agency problems on the size of fund costs in Danish equity funds.

Se*ction 3* discusses how fund costs in theory should be expected to be correlated to fund performance in Danish equity funds. The findings of this discussion are used to form five different hypotheses about the expected correlation between fund costs and fund performance for both the ÅOP and its sub cost items.

Section 4 empirically tests the hypotheses proposed in section 3 and thereby provides empirical evidence on the correlation between fund costs and fund performance in Danish equity funds. The hypotheses are tested based on the performance of Danish equity funds measured by the funds' Sharpe ratio and Jensen's alpha. The test considers an investment horizon of 3 years (2012-2014), 5 years (2010-2014) and 7 years (2008-2014).

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1 Introduction

1.1 Theoretical framework

This section provides a brief review of theories within capital markets and corporate governance that is considered of relevance to this study. The theories will be applied in more detail in later discussions and will for now only be accounted for in their most general terms.

1.1.1 Random walk and efficient markets

The random walk (RW) hypothesis and the efficient market hypothesis both question the predictability of asset prices and state that changes in these prices are often driven by factors which cannot be foreseen. Though having existed for decades, these two theories are still being discussed vividly in academia and on Wall Street and their validity is of great relevance to scholars and professionals within portfolio management.

The random walk hypothesis says that asset prices are unpredictable and evolve as a random walk. As presented in Equation 1.1, if the RW hypothesis is to be accepted then the current asset price (p_t) should be equal to its previous price (p_{t-1}), a constant drift term (μ) and an error term (ε) (Campbell & Mackinlay 1997).

$$p_t = \mu + p_{t-1} + \varepsilon_t$$

Equation 1.1

Source: Campbell & Mackinlay 1997

Over the years, several different version of the RW model have been presented in academia with varying requirements. Following Campbell & Mackinlay (1997), the strongest version requires that the error terms presented in Equation 1.1 are both independent and identically distributed. In other words, all error terms are required to be completely uncorrelated, and their distribution is not supposed to change over time. If empirical evidence from the financial markets suggests that any of these criteria have been violated, the RW hypothesis should not be accepted. In a weaker version of the RW model, the error terms are required to be uncorrelated, but are not required to be identical over time. This allows for the RW hypothesis to be accepted even if the volatility in the empirical data shows signs of volatility clustering. Finally, if all conditions are met, and the drift term $\mu \neq 0$ then one may say that asset prices follow a RW with a drift. Similarly, if all conditions are met, but the drift term $\mu = 0$ then this suggests a RW with no drift (Levich 2001).

The efficient market hypothesis (EMH), as initially proposed by Fama (1970), says that the price of a stock already reflect all available information of relevance and as a result, changes in its price at t+1 is caused by

new information, which by definition is unknown at t. In other words, a stock is never mispriced seeing as its price already reflects all available information. Consequently, an investor investing in stocks should expect a long-run return that resembles the riskiness of the stock. Fama (1991) later allowed for a slight modification of EMH in which the hypothesis allows for some temporary mispricing of stocks for short periods of time until inefficiencies are eliminated.

A vast amount of empirical research exists on the validity of the RW hypothesis and the EMH and it is beyond the scope of this paper to review all of these findings. In a literature review, Campbell & Mackinlay (1997) concludes that recent studies pose evidence of the rejection of the RW hypothesis. However, this finding does not necessarily provide evidence that the EMH is rejected. As an example, if there is a consistent change in the return of a stock due to changes in its underlying risk, this would lead the RW hypothesis to be rejected, but would not result in a rejection of the EMH.

Any empirical test of the EMH suffer from what Fama (1991) considers a joint-hypothesis problem. The only way to know whether a stock is mispriced is to know its true value. Seeing as no universal definition of a stock's true value exists, any rejection of the EMH would risk suffering from inaccurate estimates of the true value of the stock (Levich 2001). For this reason, the EMH can in theory not be rejected nor confirmed empirically. However, the EMH has been challenged by scholars adhering to the semi-efficient or inefficient-market view. Scholars of behavioral finance have argued that it is wrong to assume that investors always act rationally and say that theory within psychology could help explain stock price changes (Barberis & Thaler 2002; Bodie, Kane & Markus 2011). Furthermore, scholars have found low P/E stocks to consistently outperform high P/E stocks which is considered inconsistent with the EMH (Basu 1977; Bird and Whitaker 2003; Risager 2012). This line of reasoning was supported by the acclaimed portfolio manager, Warren Buffet (1984), arguing that the EMH has several flaws. In response to this last point, Davis, Fama, and French (2000) argue that this can be explained by risks associated with high P/E that have traditionally not been accounted for.

1.1.2 The Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) predicts the expected return of risky assets by considering three different risk factors: The risk-free rate, the market risk and the firm-specific risk. As presented in Equation 1.2, the firm specific risk is decided by the fund's return's correlation to the market return, denoted beta.

$$E(r_i) = r_f + \beta[E(r_M) - r_f]$$

Equation 1.2

Source: Bodie, Kane & Markus 2011, p. 320

The CAPM is based on a number of simplifying assumptions of which the most significant ones are those relating to perfect market efficiency, and to how investors are assumed to be price-takers.

1.1.3 Portfolio performance measures

The arithmetic and geometric average return

The arithmetic and geometric average return are two different ways of measuring the average return of a portfolio. As presented in Equation 1.3, the arithmetic return simply expresses the average of all individual returns. This method does not consider any compounding that may occur following previous chances in the return of the portfolio.

$$E(r) = \frac{1}{n}\sum_{s=1}^{n} r(s)$$

Equation 1.3

Source: Bodie, Kane & Markus 2011

The geometric average return is different in how it considers the effect of compounding in estimate of average return. For this reason, this estimate is sometimes referred to as the compounded annual growth rate in estimates of annualized data. See Equation 1.4 for details on the geometric average return

$$r_g = Terminal\ value^{\frac{1}{n}} - 1, where\ terminal\ value = (1 + r_1) * (1 + r_2) * \ldots.$$

Equation 1.4

Source: Bodie, Kane & Markus 2011

The Sharpe ratio

The Sharpe ratio, sometimes referred to as the reward to volatility ratio, was first proposed by William Sharpe (1966) and is to this day widely used to evaluate the performance of investment managers. As presented in Equation 1.5, the Sharpe ratio expresses the excess return of a portfolio relative to the standard deviation of the portfolio.

$$Sharpe\ ratio = \frac{t_p - r_f}{\sigma_p}$$

Equation 1.5

Source: Bodie, Kane & Markus 2011

The ratio expresses the excess return that the portfolio achieves for one unit of risk expressed as the standard deviation of the portfolio. The portfolio return is typically estimated as the arithmetic average return, but one may apply the geometric average return to obtain the geometric value of the Sharpe ratio.

Sharpe (1994) later made a slight adjustment to the formula by arguing that the standard deviation should be estimated based on the excess return of the fund (and not just the fund return).

Jensen's alpha

Jensen's alpha (also called Jensen's measure) is strongly inspired by the CAPM in how it considers beta to be the best indicator of risk. However, unlike the CAPM, Jensen's alpha does not assume efficient markets, but rather accepts that some funds are capable of providing a risk-adjusted return in excess of the market return, and that some funds provide a risk-adjusted return below the market return. In other words, Jensen's alpha seeks to quantify the proportion of fund return that is not explained by its correlation to the market portfolio. In practice, 'the market' is often defined as an index of stocks/bonds that carries many of the same characteristics as the fund's underlying assets.

$$\alpha_i = R_p - \beta R_m$$

Equation 1.6

Note: R_p is defined as r_p-r_f, R_m is defined as r_M-r_f.
Source: Bodie, Kane & Markus 2011

1.1.4 Corporate Governance

The corporate governance literature analyses settings in which ownership and control of a company is divided between several different actors with different interests. Often this would be the case when the owners of a company are not a part of its executive management. In this kind of a setting the company risks facing an agency problem in which the incentives of the executive management and the company's owners are not aligned (Tirole 2001). The corporate governance literature analyzes ways of which to reduce the agency problem by aligning the incentives of owners and management. In other words, following Schleifer & Wishny (1997, p.1) corporate governance theory considers "the ways in which the suppliers of finance to corporations assure themselves of getting a return on their investment". [1]

In theory, an optimal corporate governance policy would be one in which every action of management was agreed upon in advance with the company's shareholders. In this way, management would simply act as a neutral agent for its principal, the shareholders. However, for practical reasons, these kinds of contracts are not feasible. This leaves incomplete contracts in companies where management often possesses more expertise than shareholders. If the resulting agency problem is not governed by well-functioning corporate governance practices, management will be left with residual rights of control that could result in self-interested behavior (Schleifer & Wishny 1997). Furthermore, empirical evidence suggests that poor corporate governance practices could reduce a company's chances of obtaining financing (Tirole 2001).

[1] Tirole (2001) argues that corporate governance should be even more broadly defined to take the interest of all stakeholders into account and not just consider the shareholders of the company. However, traditionally the shareholder has been at the center of most corporate governance theory.

Most Western countries have laws within corporate governance, guarding the rights of shareholders, which significantly reduce the agency problem (McKinsey & Company 2004). Additional firm-specific corporate governance practices in the Western world should therefore be considered supplements to the already existing national corporate governance regulations.

The corporate governance literature proposes several different ways to reduce the agency problem at a corporate level. Long-term management incentive contracts ensure that the long-term performance of the company and management's remuneration is closely linked (Core et al. 2003). This helps align the incentives of management and shareholders. Furthermore, consistent monitoring of management would ensure that management act in the interest of shareholders. This can be facilitated by well-functioning boards and/or block shareholders (Holderness 2003; Coles et al. 2008). Finally, management may naturally be inclined to act in the interest of shareholders as a result of reputation building concerns and career concerns (Schleifer & Wishny 1997). The reputation of the management is of great importance for their long-term ability to attract financing for their company hence the incentive to act in the interest of shareholders in the short-term. Furthermore, each individual in the management team will in most cases face better long-term career opportunities if they have improved shareholder value.

1.1.5 The value premium puzzle

The term 'value premium' applies to cases in which value stocks on average outperform growth stocks in the long-run. It is sometimes referred to as a puzzle seeing as the academic literature does not entirely agree on the reason for the existence of this premium.

Those scholars that have studied the value premium do not entire agree on one universally-accepted definition of value stocks. Some categorize value stocks according to a single key financial ratio (e.g. the highest book-to-market value (B/M), the lowest price to earnings (p/e) or the highest cash-flow yields (FCF/Market cap) (Basu 1977; Davis, Fama & French 2000; Lakonishok 1994). Others rely on several different key financial ratios for defining value stocks. As an example, the Morningstar Stylebox considers five different financial ratios, including B/M and cash-flow yields, for its categorization of value stocks (Morningstar 2008).

A vast amount of empirical research on the value premium in American stock-markets confirms that value stocks on average outperform growth-stocks (Basu 1977; Cooper et al. 2008; Davis et al. 2000). As an example, Davis, Fama & French (2000) studied US average monthly stock-return data for 1929-1997 and found that value stocks on an average beat growth stocks by 0,46 percentage points per month, corresponding to an annual value premium of 5,7 %. Though less research exists on this topic in Europe, a

majority of the studies that covered this topic finds similar existence of a value premium in European stock markets (Bird and Whitaker 2003; Risager 2013). Noticeably, a majority of these studies find that the value premium is statistically significant even when adjusting for risk.

Whereas academia seems to be in a fairly large agreement of the historical existence of a value premium in the stock markets of several developed countries, there is less agreement on the reason for the existence of this premium. Those adhering to the EMH argue that value stocks carry greater risk and that this explains the excess return of such stocks. Even if traditional measures of risk such standard deviation and beta are incapable of explaining the premium, this does not mean that the EMH has been violated, it is argued. As an example, Davis, Fama and French (2000) introduce a three-factor model (incl. B/M) that is said to be a better measure of risk that is capable of explaining a large part of the value premium. The behavioral finance school, on the other hand, argues that the value premium is clear evidence that the EMH can be rejected, and securities are not correctly priced at all times. Rather, according to this line of reasoning, investors often get too excited about the prospects of growth companies, leading to stock prices to increase well beyond the intrinsic value of the stock. As an example, Chan et al. (2000) refers to the IT-bubble in the late 1990s as a strong example of a hype in the market in which the market was clearly inefficient.

1.2 Delimitations

In later sections of the study, the performance of Danish equity funds is estimated using the Sharpe ratio and Jensen's Alpha. Whereas the Sharpe ratio measures the risk of the fund by the standard deviation of its return, Jensen's alpha builds on CAPM, and argues that beta is the best measure of fund risk. Both of these measures of risk have been criticized by scholars of finance. The standard deviation as a risk-measure assumes normally distributed returns which is an assumption that is often violated in financial markets (Bernado & Ledoit 2000). Furthermore, the Sharpe ratio could be criticized for favoring high risk if the fund return is negative. Similarly, strong criticism of beta exists: In a test of the predictability of CAPM, Fama & French (2004) strongly questions the use of beta as an appropriate risk-measure.

The alternative to these kinds of performance measures would be to use a three factor model so as proposed by Fama & French (1992) or the Carhart (1997) four-factor model. However, these models have theoretical limitations, too, that could limit their applicability. Furthermore, according to Bodie, Kane & Markus (2011), Jensen's alpha continues to be among the most commonly used performance measures in academia, which to some extent seems to justify its application in this paper.

The data of this study is based on Danish equity funds that have existed throughout the entire period of investigation (2008-2014). Any funds that closed down or merged with other equity funds during this period of time were not included in the dataset. As such, the data used suffers from a survivorship bias in how it only considers 'successful' funds that did not close down during the period of investigation. However, in a recent study of Danish mutual funds, Christensen (2012) estimated that the effect of the survivorship bias was very limited. Furthermore, in an analysis of the expected correlation between fund costs and fund performance, the survivorship bias should not be expected to favor low cost groups of funds over high cost groups of funds or the other way around. As such, the survivorship bias is expected to be of minor relevance to the results of this paper.

The benchmarks used in Jensen's alpha-estimates are based on the indexes that the funds' choose to compare themselves to. Some funds may favor choosing lower-risk indexes that are easier to beat, which would favor these funds in this study. However, for ethical reasons, such practices should be assumed to be avoided by most funds, and are therefore assumed to be only of small influence on the performance analysis.

The fund's style is determined based on Morningstar's categorization that is described in further detail in section 4.1. Academia has not agreed on one universally-accepted definition of value and growth stocks,

and so Morningstar's definition could be subject to criticism. As an example, one may question the extent to which large book value to price ratios truly pick out value stocks considering how a stock like IBM – that would typically be considered a value stock – has a low book value to price. An alternative to the Morningstar methodology could be to only focus on one key ratio such as the earnings to price. However, this would leave the study vulnerable to temporary declines in the earnings of the underlying assets of the fund. This problem would be of particular large effect in this study seeing as the 7 year period of investigation of the study starts in 2008. If one were to categorize funds according to style in 2008 entirely based on the earnings to price of the fund's underlying assets, the categorization would be strongly affected by the sensitivity of the companies' earnings to the financial crisis. For this reason, the study has relied on the Morningstar methodology for its categorization of active equity funds by style.

1.3 Brief account of the Danish mutual fund industry

The AUM of Danish mutual funds grew rapidly in the 1990s and early 2000, but declined in 2008 following the global financial crisis. Weak financial markets caused the value of the Danish mutual funds' assets to decrease significantly. Simultaneously, institutional and retail investors were reducing its investments in

Change in AUM in DK funds and MSCI index, 2005-2013

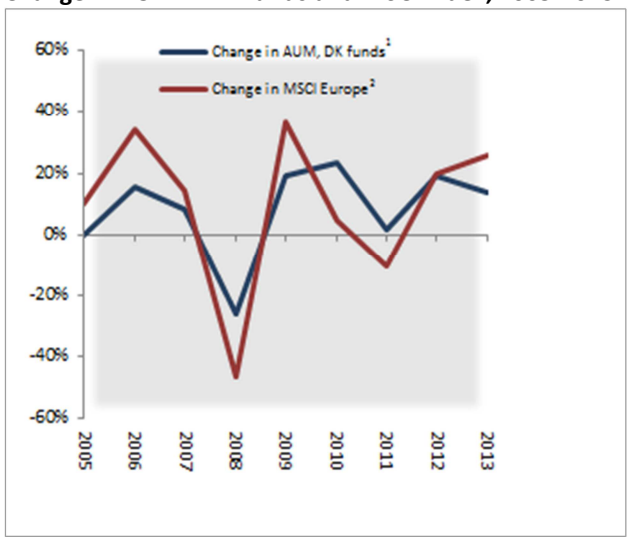


Figure 1.1

Net issue of certificates in DK funds, 2008-2013

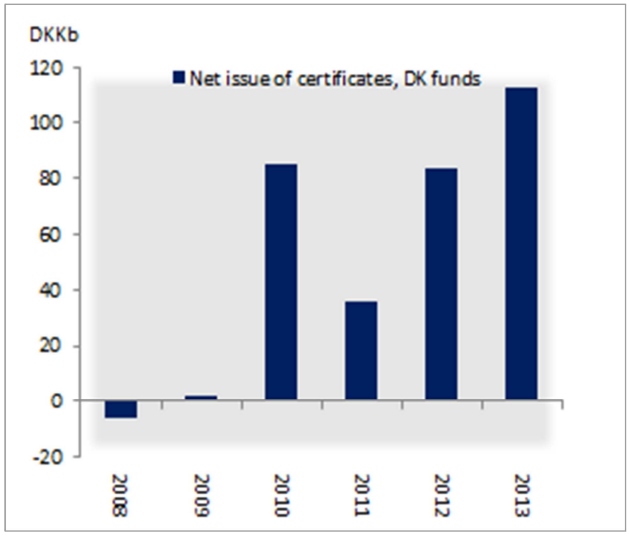


Figure 1.2

Notes: The MSCI Europe Index captures large and mid-cap stocks across 15 Developed countries in Europe.
Source: Own contribution; IFB 2015 ; Bloomberg 2015

mutual funds, leading to a negative net issue of new certificates in 2008 (IFB 2015). As a result, the AUM of the Danish mutual fund industry declined by DKKm 242 in 2008 reducing the industry's size by 25 % in one year (ibid.). As the global equity markets improved in 2009 and 2010, the Danish mutual funds were quick to recover. By 2010, the funds had regained all of its strength, and were having more AUM than before the crisis hit in 2008 (IFR 2011). The growth in AUM was slowed temporarily in 2011, largely due to the Eurozone sovereign debt crisis, but quickly recovered in the years that followed.

Supranational regulation following the financial crisis

On a supranational level, Danish mutual funds and Danish banks have been regulated by the UCITs directives and the MiFID of the EU. These regulations led to the introduction of Key Investor Information (in Danish: "Central Investorinformation, CI") in 2011 (Investeringsforeningsrådet 2010). This was a standardized EU reporting format that required Danish mutual funds to account for its historical return, risk, costs and investment strategy. In 2012 the ÅOP was refined to include some of the same components as the CI (Investeringsforeningsrådet 2013).

In 2014 the EU agreed to amend MiFID (I) and introduce MiFID II. MiFID II will not be implemented in Danish law until 2017, however, the legal changes could have a substantial effect on the Danish financial sector. Of relevance to Danish mutual funds, the Danish ministry of Business and Growth has stated that the current distribution cost-model in Denmark needs to be changed in accordance with MiFID II requirements (Erhvervs & Vækstministeret 2014). Furthermore, it is expected that the Danish law needs to be amended to ensure more transparency in the mutual fund industry in general.

1.3.1 Current characteristics of the Danish mutual fund industry

Currently, most Danish mutual funds can be split into groups of retail and institutional mutual funds. The two groups account for an almost even share of total AUM (DKKb 1.385 as per 2013) (IFB 2014). The funds are largely composed of either bonds, stocks or a mix of the two. As presented in Figure 1.4, 53 % of all Danish retail funds are bond funds whereas 38 % are focused entirely on equity. Retail equity funds, that are the focus of this study, therefore accounts for a bit less than 20 % of total AUM in Danish mutual funds.

The industry is dominated by a few very large players that have large retail and institutional funds. The competitive environment carries similarities to an oligopoly in which the three largest Danish mutual funds Nykredit Portefølje Administration, Danske Invest and Nordea Invest account for almost 75 % of total AUM (IFB 2014). However, much of this large market share is due to Nykredit's and Danske Bank's large share of institutional mutual funds. The market for retail mutual funds is less concentrated, and several smaller players are playing a relatively larger role. The three largest *retail* mutual funds Danske Invest, Nordea Invest and Bank Invest make up approximately half of total AUM (IFB 2014).

Share of AUM of Danish retail funds by asset class, 2013

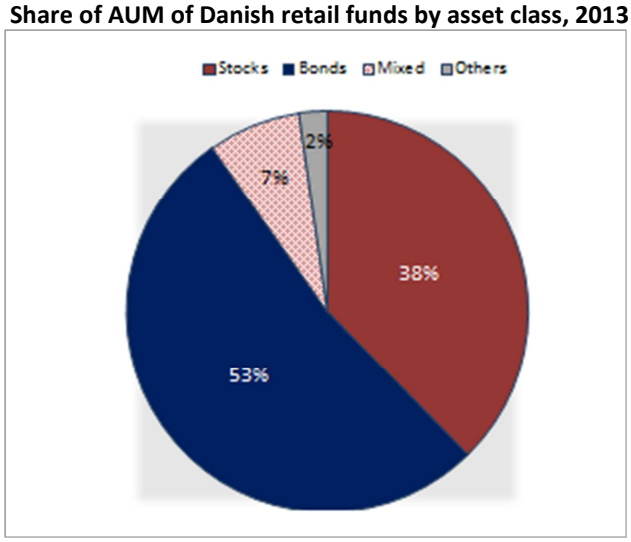


Figure 1.4

Source: Own contribution based on data from IFB (2014)

Total AUM by Danish mutual fund, 2013

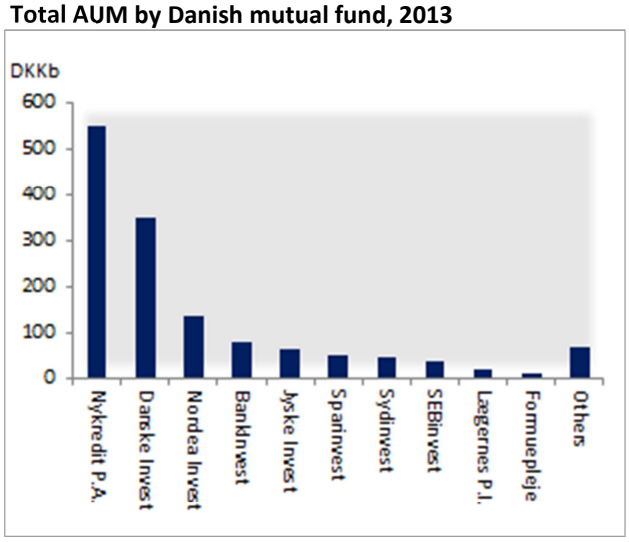


Figure 1.4

Source: Own contribution based on data from IFB (2014)

2 Analysis of the costs in Danish equity funds

2.1 Individual cost items in Danish equity funds

The strong emphasis on costs in Danish mutual funds by public institutions and the public press combined with an increased national and supranational legislative focus on fund costs for the past decade has arguably led to more transparency in the industry (Grosen 2008; Konkurrencestyrelsen 2008). Danish investors can now easily access and compare key cost measures of any Danish retail equity funds simply by accessing the websites of IFB or Morningstar. However, it could be argued that cost information available online does not cover the entire spectrum of costs, and that the cost-side of the industry is still far from transparent. Furthermore, the extent to which mutual fund costs correlate with mutual fund performance could have a lot to do with the characteristics of the costs. For this reason, this section serves to do an in-depth analysis of the costs in Danish mutual funds so as to provide a clear analysis of the costs' characteristics, size and correlation.

The costs in Danish equity funds can largely be characterized by six different types of costs, four of which can be considered 'visible'-costs and two of which are 'less visible'. Each type of cost is presented in Table 2.1. The visible costs are by law all to be reported in the mutual fund's general investor declaration ("Central Investorinformation" (CI)) and in its annual report (Lov nr. 597 2013). Furthermore, Fundcollect and Morningstar have collected all of this information in publicly available online databases enabling easy access. Spread costs, on the other hand, are not reported.[2] To address these costs, Danish scholars have had to use other available data as proxies (Loeb 1983; Konkurrencestyrelsen (2006); Rangvid 2008). As a result, any attempt to quantify these kinds of costs is strongly limited by data constraints. Finally, important to note, Danish equity fund may exhibit some degree of cost-bundling in how management could have a stronger focus on the size of total costs of the fund, and be less concerned with the size of sub costs.

Types of costs in Danish equity funds

'Visible' costs	'Less visible' costs
Front-end load costs	Spread costs
Back-end load costs	(Fund of fund costs)
Direct trade costs	
Administrative costs	

Table 2.1

Source: Own contribution based on Bechmann & Wendt 2012; Konkurrencestyrelsen (2006); Rangvid 2008

The following section will consider each individual cost item in turn and then turn to the overall cost indicator, ÅOP.

[2] This is true for all Danish mutual funds apart from those 4 administrated by Tiedemann Independent A/S. For details, see sub-section on spread-costs.

2.1.1 Load costs

The term load costs is used to describe the sum of the two cost components; front-end load costs ("*Emissionsgebyr*") and back-end load costs ("*Indløsningsfradrag"*) (see Equation 2.1)

$$\text{Load costs} = \text{Front end load costs} + \text{back end load costs}$$

Equation 2.1

Source: Own contribution

Front-end load costs are formally defined as the maximum amount that an investor can be required to pay for the costs that come with issuing new mutual fund certificates (Finanstilsynet 2005). Similarly, back-end load are the maximum amount that a mutual fund investor can be required to pay for the costs that occur when the investor request to have its certificates redeemed (Finanstilsynet 2005). The two cost measures are both denoted in percent of total AUM. Combined, the front-end and back-end load costs have accounted for an estimated 14 % of average annual total visible costs of Danish equity funds from 2008-2014.[3]

When issuing new certificates the mutual fund needs to make new investments to ensure that the asset allocation of its portfolio is unchanged. This leads to trade costs that would otherwise not have incurred. These kind of trade costs are part of the front-end load costs. Adding to this, often, the mutual fund pays a one-time sales commission/distribution cost to the bank that has facilitated the trade (Bechmann & Rangvid 2007; Struwe 2014).[4] This expense is as well considered part of the front-end load costs (IFR 2015). The formula for front-end load costs is presented below.

$$\text{Front end load costs} = \text{trade costs from purchase of assets} + \text{distribution costs}$$

Equation 2.2

Source: Own contribution; IFB 2015

The front-end load costs are paid up-front by the buyer of the new certificate as a one-time fee. In other words, any costs from issuing new certificates is not covered by the mutual fund, but is paid in full by the investor requesting the issue of new certificates. For this reason, front-end load costs are formally not reported as costs but rather as revenue in the mutual fund's income statement (for examples, see Danske Invest 2014, Nordea Invest 2014). Therefore, whereas this cost is not a direct cost to the mutual fund, its size and characteristics is of relevance to the mutual fund investor.

[3] The estimate assumes that the investor has a holding period of 7 years so as proposed by Finanstilsynet (2007a).
[4] Distribution costs will be discussed in greater depth when addressing the administrative costs of the mutual fund.

It should be noted that an investor looking to acquire certificates in a Danish mutual fund may not have to pay the full front-end load costs. Often, Danish mutual funds have a market maker that buys and sells the mutual fund's certificates on the Copenhagen Stock Exchange (NASDAQ OMX Nordic) (Rangvid 2008; Struwe 2014). By law, the market maker can never offer a larger bid-ask spread than NAV +/- front-end or back-end load fee (Finanstilsynet 2005)[5]. However, the market maker is free to trade at a smaller spread. Furthermore, other investors looking to buy or sell those same certificates may be active on the NASDAQ OMX Nordic as well, which could further lower the spread. Thus, whereas theoretically there is a risk that the investor will pay the full front-end load cost upon investing in a Danish mutual fund (max spread), often the actual spread faced by the investor is significantly smaller (Bechmann & Rangvid 2007; Rangvid 2008). In a case study Rangvid (2008) found that retail investors faced a significantly more attractive spread on the Copenhagen stock exchange than the max spread.

Back-end load costs are the costs that occur when a mutual fund member requests to have its certificates redeemed. To pay-out the mutual fund member's investment, the mutual fund will have to sell some of its underlying assets. This leads to trade costs that are considered back-end load costs (see Equation 2.3).

$$\text{Back end load costs} = \text{trade costs from sale of assets}$$

Equation 2.3

Source: Own contribution; IFB 2015

As with front-end load costs back-end load costs are financed by the investor requesting to have his certificate redeemed. However, following the same line of argumentation as above, the investor rarely actually pays the full back-end load costs due to market trading (Bechmann & Rangvid 2007; Rangvid 2008).

Average load costs in Danish equity funds in % of AUM, 2008-2014

	2008	2009	2010	2011	2012	2013	2014	Avg. 2008-2014
Front-end load costs	1,90%	1,80%	1,74%	1,64%	1,56%	1,50%	1,50%	**1,66%**
Back-end load costs	0,56%	0,51%	0,48%	0,44%	0,43%	0,39%	0,38%	**0,46%**
Load costs total	2,47%	2,31%	2,22%	2,08%	1,98%	1,88%	1,88%	**2,12%**
Load costs total adj.	0,35%	0,33%	0,32%	0,30%	0,28%	0,27%	0,27%	**0,30%**

Table 2.2

Note: Load costs total adj. is adjusted to reflect an assumed holding period of 7 years.
Source: Own contribution based on data from FundCollect (2015)

Equation 2.2 presents the average load costs in Danish equity funds in & of AUM from 2008-2014. Both front-end load costs and back-end load costs seems to have decreased significantly since 2008 with total load costs decreasing from 2,47 % of AUM to 2,12 % of AUM. Front-end costs have on average been

[5] NAV is the value of a fund's assets less the value of its liabilities per unit. In other words, NAV is the book value of the mutual fund.

significantly larger than back-end costs in Danish mutual funds. In 2014, front-end load costs were almost 4 times higher than back-end load costs. In other words, the costs from issuing new certificates in a fund were on average 4 times higher than the costs of redeeming certificates. Bechmann & Rangvid (2007) and Struwer (2014) came to a similar conclusion when considering data from 1994-2004 and argued that the distribution costs associated with the front-end load costs were the prime reason for the difference in size between front-end load costs and back-end load costs.

2.1.2 Direct trade costs

By law, the term direct trade costs should cover all costs associated with the mutual fund's direct trade with financial instruments except those trade costs covered by the front-end and back-end load costs (lov nr. 597, 2013). Danish mutual funds were not required to report its direct trade costs until 2007 and for this reason, research on Danish mutual funds pre 2007 (incl. Bechmann & Rangvid (2004)) does not consider direct trade costs (Finanstilsynet 2007a). On average, direct trade costs have accounted for 19 % of all annual visible costs of mutual funds from 2008-2014 (FundCollect 2015). Direct trade costs can both be denoted in absolute value and in percent of total AUM.

Most Danish mutual funds exercise some degree of rebalancing and re-optimization of its portfolio even at times where there has not been a change in its number of mutual fund certificates. Each buy or sell order by the mutual fund is executed by a Danish bank acting on behalf of the mutual fund on the exchange. In exchange the bank is paid a brokerage fee often expressed in percentage of total trade volume. The sum of each of these brokerage fees are what account for the majority of the direct trade costs of Danish mutual funds. For this reason, the key determinants of direct trade costs in a Danish mutual fund are the brokerage fee it pays pr. trade volume and its volume of trade (turnover rate).

Table 2.3 presents the average direct trade costs of Danish equity funds in % of AUM from 2008-2014. The funds are split into groups according to the geography of their underlying assets, which show that funds

Average annual direct trade costs in Danish equity funds in % of AUM, 2008-2014

	2008	2009	2010	2011	2012	2013	2014	Avg. 2008-2014
Developed markets	0,35%	0,43%	0,43%	0,46%	0,38%	0,35%	0,34%	0,39%
Emerging markets	0,52%	0,56%	0,55%	0,57%	0,44%	0,42%	0,41%	0,50%
Mix	0,49%	0,45%	0,35%	0,39%	0,36%	0,37%	0,36%	0,39%
Average direct trade costs	**0,41%**	**0,45%**	**0,43%**	**0,45%**	**0,38%**	**0,37%**	**0,35%**	**0,40%**

Table 2.3

Note: Geographical investment strategy based on IFB fund group categorization methodology
Source: Own contribution based on data from FundCollect (2015)

that invest in emerging markets on average have higher trade costs than those that invest in developed markets. The table further shows a strong general decrease in the average direct trade costs of equity

funds from 2009 to 2014: Whereas average direct trade costs in 2009 amounted to 0,45 % of AUM it now only makes up 0,35 % of AUM. The strong decrease in average direct trade costs could be partly explained by a generally more competitive market for brokerage services, given the growing number of online brokers that offer brokerage services at very competitive prices.

One may question the extent to which direct trade costs of mutual funds truly only cover expenses related to the mutual fund's direct trade with financial instruments. Morningstar found that the reported direct trade costs of Danish mutual funds trading Danish stocks on average was 0.167 % of the mutual fund's total trade volume in 2013 (Mikkelsen 2014, p. 1). In comparison, a private customer could in the same year buy Danish stocks through the Danish bank, Nordnet, at a brokerage fee of 0,1 % of trade volume (Mikkelsen 2014, p. 14). In other words, the mutual fund seems to have paid a higher price for its brokerage services than what a private consumer would have to. As argued by Nationalbanken (2008) one should expect for mutual funds to pay a lower brokerage fee than what a private individual would have to pay due to their great size and power in negotiating commissions. However, there may be several explanations for this. In a study of American mutual funds, Haslem (2003) finds the existence of a 'soft-dollar practice' in which American mutual funds pays a premium for its brokerage agreements in exchange for research products/services. Whereas no research or documentation confirms this kind of practice in Danish mutual funds, this may still be the case. Another explanation may be that mutual funds are doing far larger trades ("block trades") than private investors which could be more cumbersome and expensive for brokers to execute. Finally, a - somewhat more controversial - explanation could be related to the governance structure and the Danish mutual fund's relationship to its bank relations. This aspect will be discussed in further detail in section 2.3 which considers fund governance aspects.

2.1.3 Administrative costs and CI administrative costs

Administrative costs have historically been the largest cost item of Danish mutual funds. On average, administrative costs have accounted for 67 % of all annual visible costs of mutual funds from 2008-2014 (FundCollect 2015). Administrative costs are the sum of the following sub cost components: Salaries, consultancy fees, rent, IT-costs, accountant costs, bank administrative fees, market maker fees, distribution costs, performance fees and other operating items (Finanstilsynet 2013). Its definition largely resembles the international mutual fund cost-measure Total Expense Ratio (TER) (Finanstilsynet 2007a). Administrative costs are denoted in percent of total AUM.

Figure 2.1 presents the key subcomponents of administrative costs and illustrates their average share of total administrative costs in Danish mutual funds from 2007-2013. All expenses paid to the mutual fund's administrative company are considered administrative costs. These costs include employee costs for administrative staff, rent, IT-costs and accountant costs that are all fairly common operating costs of any company or fund. Combined, on average, these costs accounted for 18 % of total administrative costs in Danish mutual funds from 2007-2013 (Finanstilsynet 2007b; 2008; 2009; 2010; 2011; 2012; 2013).[6] Another fairly large administrative cost component is the costs paid to the fund's portfolio management company that amounted to an average of 31,5 % of total administrative costs (ibid.).[7] The portfolio management company is the one providing the actual service of portfolio construction and security analysis, and as such, it is hardly surprising that they take up a large proportion of total mutual fund administrative costs. However, the significantly largest single sub-component of administrative costs in Danish mutual funds is distribution costs. Distribution costs made up 37,7 % of administrative costs in Danish mutual funds, and includes all costs associated with the marketing efforts of the fund's distribution channels that are not covered by the front-end load costs (ibid.).

Administrative costs, avg. 2007-2013

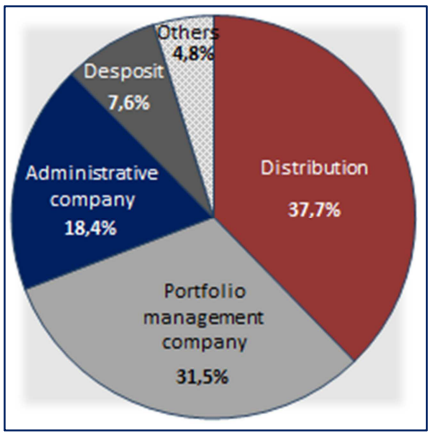


Figure 2.1

Note: Data considers retail equity and bond funds
Source: Own contribution, Finanstilsynet (2007b; 2008; 2009; 2010; 2011; 2012; 2013)

Distribution costs are paid annually by the mutual fund to its distribution channels so as to compensate the distribution channel for its efforts in promoting and distributing the mutual fund's certificates (Tanggaard 2012). As an example, most of Danske Invest's distribution costs are paid to its key distribution channel, Danske Bank, that in exchange promotes and distributes Danske Invest's funds (Danske Invest 2014). Furthermore, Danske Bank is to advice potential investors on investment decisions and tax policies that may be of relevance before investing in Danske Invest's funds (Bechmann & Wendt 2012). Importantly, this cost should not be confused with the distribution costs already covered by the front-end load costs. The distribution costs covered by the front-end load costs are variable and are only paid when the bank facilitates a purchase of the mutual funds' certificates. The distribution costs that are a part of the administrative costs, on the other hand, are a one-time fixed annual fee. In cases where a customer

[6] This estimate and those presented in Figure 2.1 are based on data for both Danish retail equity and bond funds.
[7] Market making costs are included in this estimate, but only made up 0,5 % of the portfolio management costs in 2013, and are for this reason not considered of relevance for further analysis.

receives counseling, but does not purchase more mutual fund certificates as a result, the distribution costs that are a part of the administrative costs would cover this expense.

Often, the Danish mutual funds do not keep detailed records of the exact amount of hours that its bank relations spent on counseling on its behalf (Bechmann & Wendt 2012). Rather, the mutual funds see the distribution cost as an estimate of the total value of all the distribution channels' efforts.

The large size of distribution costs in Danish mutual funds have caused several public institutions and academics to question the extent to which Danish mutual funds are paying a 'fair price' for the distributional service. This will be addressed further in section 3

Table 2.4 presents average annual administrative costs in Danish equity funds from 2008-2014. The cost item has slightly increased over this period of time. In general, as was true for the direct trade costs, too, administrative costs are, on average, higher for equity funds that invest in emerging markets relative to funds that invest in developed markets. Part of the explanation for this could be that funds are spending

Average annual administrative costs in Danish equity funds in % of AUM, 2008-2014

	2008	2009	2010	2011	2012	2013	2014	Avg. 2008-2014
Developed markets	1,39%	1,40%	1,42%	1,43%	1,40%	1,40%	1,41%	1,41%
Emerging markets	1,57%	1,59%	1,60%	1,53%	1,61%	1,59%	1,67%	1,59%
Mix	1,43%	1,44%	1,51%	1,46%	1,53%	1,52%	1,52%	1,49%
Average administrative costs	**1,41%**	**1,43%**	**1,47%**	**1,45%**	**1,47%**	**1,46%**	**1,48%**	**1,45%**

Table 2.4

Note: Geographical investment strategy based on IFB fund group categorization methodology
Source: Own contribution based on data from FundCollect (2015)

more resources on external consultancy services when investing in Emerging markets. Furthermore, the distribution costs associated with emerging market funds should be expected to be higher, too, given the larger need for investor consultancy on emerging markets.

In 2011, with the introduction of Central Investorinformation (CI), a new modified administrative cost-indicator was introduced. The administrative cost indicator in CI (referred to as 'CI administrative costs') resembles the traditional definition of administrative costs, but adds one component and subtracts another: Fund of fund costs are added to the equation and performance fees are subtracted (IFR 2013b). Currently, both types of administrative cost-indicators are published annually (ibid).

$$\text{CI administrative costs} = \text{Administrative costs} + \text{Fund of fund costs} - \text{Performance fees}$$

Equation 2.4

Source: IFR 2013b

2.1.4 Spread costs

When a mutual fund buys and sells its underlying assets it pays a brokerage fee so as described in section 2.1.2 on direct trade costs. However, brokerage fees alone do not account for all transaction costs associated with these trades. Truly, as presented in Equation 2.5, bid-ask spreads could account for a significant amount of the actual direct trade costs of mutual funds (Chalmers 1999; Haslem 2003).

$$Actual\ direct\ trade\ costs = \frac{Brokereage\ fee + Spread\ costs}{trade\ volume} * turnover\ rate$$

Equation 2.5

Source: Own contribution; Chalmers et. al 1999

Spread costs refer to the costs that arise as a result of the bid-ask spreads of the underlying assets of the mutual fund. Almost all assets (stocks, bonds, etc.) trade at a bid-ask spread. As a result, whenever a mutual fund *buys* underlying assets it buys at a price which is higher than what it would be able to sell those same assets for at that exact time. Similarly, whenever a mutual fund *sells* some of its underlying assets it sells at a price which is lower than what it would be able to buy those same assets for at that exact time. The larger the spread, the lower the liquidity of the underlying asset and the larger the resulting spread costs. Due to the close correlation between bid-ask spreads and the liquidity of the underlying assets, spread costs are sometimes referred to as liquidity costs (Chen et. al 2004; Hodrick & Moulton 2009).

As is clear from Danish mutual funds' annual reports, spread costs are almost never included in the Danish mutual funds' estimate of direct trade costs, hence spread costs is best defined as a 'less visible' costs. [8] However, this does not mean that spread costs do not have an effect on the performance of Danish equity funds. Rather, spread costs have a direct effect on the capital gains/losses listed in the mutual funds' income statement, which affects the gross return and thereby the net return of the fund.

In Danish literature, The Danish competition authority published approximate spread cost estimates for Danish retail mutual funds in 2006 by using the turnover rate as a proxy (Konkurrencestyrelsen 2006). They found that on average in 2006, spread costs in Danish retail mutual funds had amounted to 0,18 % of AUM. They further found that spread costs were larger for bond funds than equity funds due to the higher turnover rate of bond funds. Noticeably, these findings led the Danish competition authority to conclude that spread costs were larger in size than the direct trade costs of mutual funds. In comparison, the four

[8] This is true for all funds except for four Tiedemann Independent mutual funds. These four funds will be addressed later in this section.

Danish funds that reported their estimated spread costs in 2013, had spread costs in the range of 0,2 % - 0,55 % of AUM (Tiedemann Independent 2014, p. 13).[9] Truly, the size of this cost should not be underestimated. As an example, If average spread costs of Danish mutual funds proved somewhere in the range of 0,3 % of total AUM as estimated by Tiedemann Independent (2014), this would suggest that spread costs amounts to an equally large share of costs as those direct trade costs that are already reported.

2.1.5 Fund of funds costs

In Denmark, a fund of funds is defined as a mutual fund that invests more than 20 % of its AUM in other mutual funds (Investeringsforeningsrådet 2013). On top of fund of funds' own fund costs, these funds pay the same kinds of costs that any other investor would for holding other mutual funds. The costs that come with holding other funds are called fund of funds costs. Danish mutual funds are not required to report its fund of fund costs in its annual report, and so these costs are only indirectly presented in the annual report through its impact on the capital losses/gains of the mutual fund. However, as of 2012 Danish funds of funds are to report their fund of funds costs as part of their CI administrative costs ("Løbende omkostninger") and as a result short-term data of this is now available. However, in datasets of a wider timespan, this cost is not taken into account. Furthermore, Danish mutual funds that invests less than 20 % of its AUM in other funds are not obligated to report these costs, and so these will not be accounted for in short-term nor long-term data.

2.1.6 ÅOP

ÅOP ("Årlige Omkostninger i Procent" – directly translated: "Annual costs in percent") was introduced in 2007 with the intention of combining all relevant cost-indicator into one overall cost-indicator that would express the investor's annual costs of investing in a mutual fund. This would enable investors to easily list and compare the costs of Danish mutual funds. As presented in Equation 2.6, ÅOP included all before mentioned cost-indicators that this paper has considered to be 'visible' costs. It did initially not include spread costs or fund of fund costs. The front-end load costs and back-end load costs are divided by 7 seeing as the ÅOP is an annual cost indicator and assumes an investor holding period of 7 years.

$$\text{ÅOP}_{prev} = Direct\ trade\ costs + Administrative\ costs + \frac{Front{-}end\ load\ costs + Back{-}end\ load\ costs}{7}$$

Equation 2.6

Source: Finanstilsynet 2007a

[9] Tiedemann Independent refers to these costs as 'costs that cannot be calculated accurately". Tiedemann Independent has confirmed in writing that this cost measure covers spread costs, but the cost-measure may include other costs on top of this that are not considered spread costs.The mutual funds' actual spread costs may therefore be smaller than what is listed above.

ÅOP was refined in 2012 with in interest of aligning ÅOP with CI. ÅOP was no longer to be calculated based on the book-value of administrative costs, but rather to be based on the CI administrative costs (see Equation 2.7). In practice, this would ensure that ÅOP now also included fund of fund costs that had previously not been included in ÅOP.

$$\text{ÅOP}_{current} = \text{Direct trade costs} + \text{CI Administrative costs} + \text{performance fees} + \frac{\text{Front-end load costs} + \text{Back-end load costs}}{7}$$

Equation 2.7

Source: IFB 2014

Table 2.5 presents the average ÅOP in Danish equity funds from 2008-2014. ÅOP has decreased quite significantly from 2008 to 201, which seems primarily driven by a decrease in Danish equity funds' average direct trade costs and average load costs. Further, important to note, the average ÅOP for emerging market equity funds is significantly larger than the average ÅOP for developed markets funds.

Average ÅOP in Danish equity funds in % of AUM, 2008-2014

	2008	2009	2010	2011	2012	2013	2014	Avg. 2008-2014
Developed markets	1,99%	2,00%	2,01%	1,97%	1,84%	1,85%	1,84%	1,93%
Emerging markets	2,46%	2,48%	2,48%	2,39%	2,26%	2,27%	2,25%	2,37%
Mix	2,21%	2,23%	2,08%	2,10%	2,03%	2,01%	1,95%	2,09%
Average ÅOP	**2,11%**	**2,12%**	**2,10%**	**2,07%**	**1,96%**	**1,95%**	**1,92%**	**2,03%**

Table 2.5

Note: Geographical investment strategy based on IFB fund group categorization methodology
Source: Own contribution based on data from FundCollect (2015)

ÅOP has been criticized by Danish scholars for assuming a holding period of 7 years (Rangvid 2008; Grosen 2008). It is argued that holding periods are typically significantly longer than 7 years for institutional pension funds and significantly shorter for private investors (Rangvid 2008). By only using the assumed average holding period of 7 years, the ÅOP risks overestimating the front-end and back-end load costs faced by pension funds, and underestimating those same costs faced by private investors. Furthermore, one could question the extent to which 7 years truly represents the average holding period of Danish investors. In a study published in the leading Danish financial newspaper, Børsen, the average holding period of Danish investors was estimated to be 3 years (Bach & Martini 2013, p. 1). Along the same lines, American research indicated that the average investor holding period in the USA for the past 20 years had been approximately 3,5 years (Dalbar 2014). Both of these estimates are significantly lower than what is assumed in the ÅOP.

To the inexperienced investor ÅOP is a good all-in-one cost-indicator. However, ÅOP does not *per se* provide any information about the costs of Danish mutual funds that are not already expressed by one of the cost components described earlier. Furthermore, ÅOP has several flaws that may impair its accuracy.

2.1.7 Costs overview and comparison

Figure 2.2 illustrates the share of each cost component of total ÅOP. Clearly, administrative costs, is by far the largest single cost-item on average accounting for 67 % of fund ÅOP. Direct trade costs are approximately the same size as front-end and back-end load costs combined if one assumes a holding period of 7 years. If one were to further subdivide administrative costs into categories of distribution costs, portfolio management costs and administrative costs, each of these cost-items would make up approximately the same share of ÅOP as load costs and direct trade costs.

Cost items share of ÅOP, avg. 2008-2014

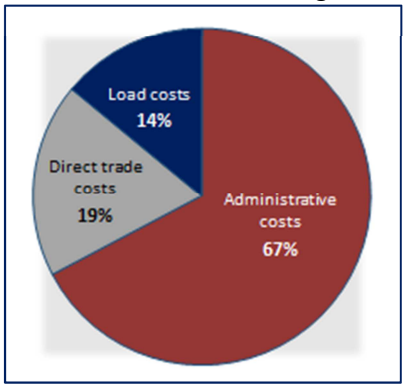


Figure 2.2

Note: Data based on Danish retail equity funds only. Assuming a holding period of 7 years.
Source: Own contribution based on data from FundCollect (2015)

As presented in Table 2.6, the Danish equity funds with the highest ÅOP are typically relatively smaller in size (by AUM), have an active investment strategy, and invests in emerging markets. The lowest cost Danish equity funds are typically index funds with a passive investment strategy that follows an index of risky assets in a developed market.

Selected high and low cost equity funds by ÅOP, 2014

Ranking	Top 5 by ÅOP		Bottom 5 by ÅOP	
#	Name	ÅOP	Name	ÅOP
1	BankInvest New Emerging Markets Aktier	3,56%	Danske Invest Engros Online Global Indeks	0,41%
2	Strategi Invest Aktier	3,46%	Nykredit Invest Globale Aktier Basis	0,50%
3	Absalon Invest, Rusland	3,34%	Maj Invest Europa Aktier	0,57%
4	SEBinvest Japan Hybrid (DIAM)	2,96%	Sparinvest INDEX USA Growth	0,58%
5	Handelsinvest Latinamerika	2,93%	Sparinvest INDEX OMX C2 Capped	0,58%

Table 2.6

Source: Own contribution based on data from FundCollect (2015)

Typically, funds with large administrative costs have larger load costs and direct trade costs, too. To formally consider this relationship, Table 2.7 presents a correlation matrix for all visible cost-items. Furthermore, the matrix includes fund turnover rate that to some extent could be considered a proxy for spread costs. Clearly, administrative costs and load costs seem fairly closely related. In other words, if the investor pays large costs for entering and exiting the fund, the operating costs of the fund are typically large, too. Another fairly strong correlation exists between direct trade costs and the turnover rate. This is hardly surprising as a relatively larger turnover rate suggests that the fund is actively buying and selling assets relatively more than other equity funds, which should be expected to increase the fund's transaction costs, and thereby the fund's direct trade costs.

Correlation of costs in Danish equity funds, 2013

	Administrative costs	Direct trade costs	Load costs	*Turnover rate*
Administrative costs	1,000	0,183	0,425	*0,181*
Direct trade costs	0,183	1,000	0,222	*0,332*
Load costs	0,425	0,222	1,000	*0,226*
Turnover rate	0,181	0,332	0,226	*1,000*

Table 2.7

Source: Own contribution based on data from FundCollect (2015)

2.2 Costs by fund investment strategy

A Danish equity fund's portfolio manager is free to pursue any investment strategy in the construction of the fund's portfolios as long as this strategy has been approved by the board of the mutual fund. The investment strategy of an equity fund has a strong say on the characteristics of the underlying assets in the mutual fund's portfolio, i.e. large-cap/small-cap, business area, geography. Needless to say, the choice of investment strategy has great influence on the gross return and risk of mutual funds. Furthermore, the choice of investment strategy could be considered a fundamental determinant of the costs of a fund, thereby further affecting the overall performance of the fund.

Though several other investment strategies exist, this section considers two strategies that have received great attention in academia: Value investing and index investing. The two represents very different investment philosophies – one adhering to active portfolio management, the other representing passive portfolio management. Below section will analyze the expected gross and net return of the two types of funds in Denmark by referring to findings in the academic literature and by providing new evidence on the costs associated with each type of strategy in Danish equity funds.

2.2.1 Value investing

Most research on the value premium puzzle categorizes stocks into groups of value and growth stocks and find that value stocks in the long-run provide better risk-adjusted returns than growth stocks (Basu 1977; Cooper et al. 2008; Davis et al. 2000). Of particular interest to Danish investors, Risager (2013) confirms the existence of a long-run premium on the returns of Danish value stocks. This suggests that Danish value stocks on average have had positive alpha-values and that these stocks have provided a return in excess of the market return on average. If one considers the findings on the value premium universal to the entire equity market, portfolios consisting of value stocks should be expected to provide superior long-term performance compared to portfolios of growth stocks. Similarly, well-diversified value portfolios should on average be expected to outperform portfolios that replicate an index.

Following Morningstar's style box methodology, a value mutual fund is defined as one that has a majority of its underlying assets in value stocks (Morningstar 2008).[10] Morningstar's definition of value stocks combines several different key variables that have been considered key determinants of value stocks in academic research on the topic (Basu 1977; Davis et al. 2000; Lakonishok 1994). As such, proponents of the value premium may argue that value mutual funds are more likely to outperform the market in the long-run than growth mutual funds or index mutual funds. However, important to note, a majority of the

[10] For a detailed account of Morningstar's definition of value mutual funds, see appendix 8.1.1.

academic research on the value premium does not consider mutual fund data, but composes its own stock portfolios and assumes investment costs to be 0. By investing in value stocks through mutual funds, investors face significant mutual fund costs that may reduce the overall performance of the portfolio. Thus, whereas the empirical findings on the value premium puzzle may hint to the existence of a similar positive effect on the *gross* return of value mutual funds, the *net* return of value mutual funds could be strongly affected by mutual fund costs.

Combined, Danish value funds accounted for 25 % of total AUM in Danish equity funds in 2013, and were a bit smaller in size than the group of growth equity funds that accounted for 35 % (Morningstar 2015). Passively held index funds accounted for just 6 % of AUM in Danish equity funds (ibid). Finally, 41 % of Danish equity funds were best categorized as being a mixture of a value and a growth fund (ibid).

Table 2.8 presents the average costs of each type of Danish equity fund. The table considers each specific cost component of the all-in-one cost-measure, ÅOP, and further presents evidence on the turnover rate. As evident in Table 2.8, average load costs and performance fees in value funds and growth funds were almost of similar size for all types of funds, and do therefore not seem to relate to the type of fund. On the contrary, the average administrative costs proved to differ significantly between the different types of funds.

Average costs by type of equity fund, 2013

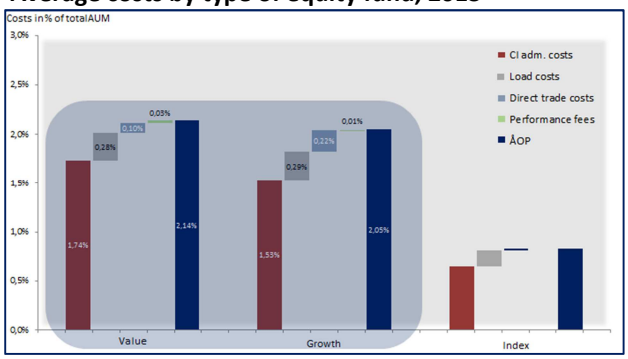


Figure 2.4

Average trade costs and turnover by type, 2013

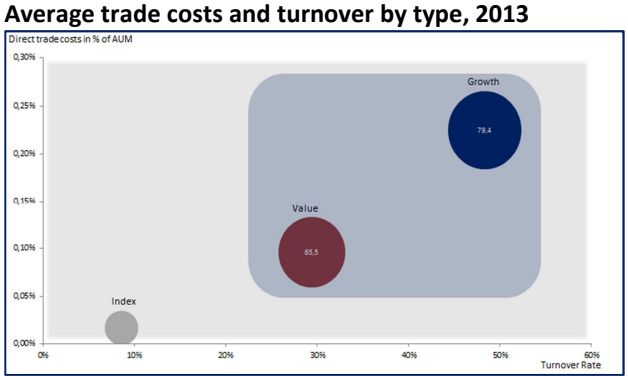


Figure 2.3

Average costs and turnover rate of Danish equity funds by type, 2013

Type	Total AUM, DKKb	CI adm. costs	Load costs	Direct trade costs	Performance fees	ÅOP	Turnover rate
Value	65,5	1,74%	1,97%	0,10%	0,03%	2,14%	29,41%
Growth	79,4	1,53%	2,03%	0,22%	0,01%	2,05%	48,31%
Mix	115,8	1,52%	2,02%	0,20%	0,04%	2,07%	41,82%
Index	15,7	0,65%	1,16%	0,02%	0,00%	0,83%	8,59%
All equity funds	**276,4**	**1,44%**	**1,89%**	**0,16%**	**0,02%**	**1,90%**	**37,08%**

Table 2.8

Note: All equity funds were categorized following Morningstar's Stylebox methodology (2008). For illustrative purposes, Mix mutual funds were not included in Figure 2.4 and Figure 2.3. Figure 2.4 assumes a holding period of 7 years. In Figure 2.3, bubble size and bubble labels represents total AUM of the group of funds.
Source: Own contribution, Fundcollect (2015), Morningstar (2015a)

Whereas Danish growth funds' average administrative costs amounted to 1,53 %, the average administrative costs in value funds were 1,74 % corresponding to a difference of 0,21 percentage points. As illustrated in Figure 2.4, administrative costs account for a significant share of a fund's ÅOP, and is therefore to be considered of great relevance in considering the overall costs of a fund. As previously presented, administrative costs in Danish mutual funds is the sum of several different sub cost components, and it could be that one of these are responsible for the difference in the average costs between growth and value funds. However, only high-level fund-specific data on administrative costs is available, and it has therefore not been possible to decompose which exact sub administrative cost components that explain the deviation in administrative costs between the two types of funds. That said, a plausible explanation for the deviation could be that the value investment strategy requires qualified in-depth analysis of the fundamental/intrinsic value of individual stocks which would require a relatively more expensive workforce and more work-hours spent, hence making value funds more costly to operate than growth funds. Furthermore, value funds may be more inclined to pay for external expertise in its efforts to locate value stocks, which would further increase the costs of these funds relatively to growth funds.

The direct trade costs were more than twice as large in growth funds compared to value funds, which seems closely related to how the turnover rate was significantly higher for growth funds than value funds. The correlation between the two is illustrated in Figure 2.3. As previously presented, the turnover rate and the direct trade costs of a fund are typically highly correlated seeing as both of them increases with the number of trades that are executed over a given year. The fact that value funds seem to have lower turnover-rates than growth funds goes well in line with how value investors often practice the buy and hold-strategy, in which investments are of a longer time horizon. As an example, one of the most acclaimed value-investors, Warren Buffet, and his investment company, Berkshire Hathaway, consider day-to-day movements in stock-markets as 'noice' and have more of a long-term investment horizon (Buffet 1984).

The higher turnover rate of growth funds compared to value funds could as well indicate that growth funds on average face higher spread costs than value funds. As previously noted, spread costs could be considered an 'invisible cost' in most Danish mutual funds seeing as it is not included in the all-in-one cost measure, ÅOP, and a majority of the Danish mutual funds do not include this as a cost-item in its publication. However, any incurred spread-costs will be reflected in a reduced return of the mutual fund. Thus, interestingly, the disproportionally larger spread-costs of growth funds should be expected to have a negative impact on the gross-return of this group of funds relative to value funds. In other words, this adds to the before mentioned hypothesis of the superior gross returns of value funds to growth funds.

The all-in-one cost measure, ÅOP, is, on average, slightly higher for value funds than growth funds, which could have a relatively negative effect on the performance of value mutual funds net of costs. However, the difference in total visible costs between the two groups only amounts to 0,09 percentage points, and therefore seems to be of only small effect on the differences in performance between the two types of funds.

As a final remark, it is worth commenting on the potential effect of the financial crisis. Research have found less empirical support of the value premium in the past decade in the developed country markets, mostly due to the underperformance of value stocks during the financial crisis (Risager 2013). Similarly, this underperformance of value stocks could be expected to have had a negative influence on the performance of value funds during that same period of time.

2.2.2 Index Investing

The first American index fund was introduced by Vanguard in 1975, and increased its AUM rapidly in the decades that followed. By 2012, Vanguard had grown to be the second largest mutual fund in the US, and index funds in general had a 15 % market share in the American market (Morningstar 2012; Damodaran 2012). In Denmark, index funds have not experienced the same popularity, and had a market share of just 2 % in 2012 (Morningstar 2012). Nevertheless, studies of the average underperformance of actively managed Danish mutual funds confirms the relevance of analyzing passive investment strategies, hence the relevance of studying Danish index funds.

The *gross* return and standard deviation of an index fund should be expected to be close to the index that the fund tracks with small deviations explained by tracking error. Similarly, the *net* return of the index fund should be expected to be close to the fund's *gross* return seeing as index funds typically have significantly lower costs than other types of funds.

Danish equity index funds are on average significantly cheaper than growth funds and value funds. The load costs of equity index funds are almost half of the load costs of other Danish equity funds, primarily driven by significantly lower front-end costs.

Distribution fees make up a significant share of the front-end load costs, and it seems likely that this subcomponent is smaller for index equity funds than other equity funds. Index funds are a simple investment product that are relatively easier to understand than other investment products, which reduces the time spent on counseling investors, effectively reducing distribution costs.

Furthermore, it could be argued that index funds provides a smaller profit-margin than other types of funds for the mutual fund's associated companies, thereby reducing the mutual fund management's interest in promoting these kind of funds.

The average administrative costs of index equity funds were just 0,65 %, which is significantly smaller than the average administrative costs of all equity funds of 1,44 %. The assumed lower marketing and distribution costs of index funds described above should be expected to explain part of the reason for the

Average costs by type of equity fund, 2013

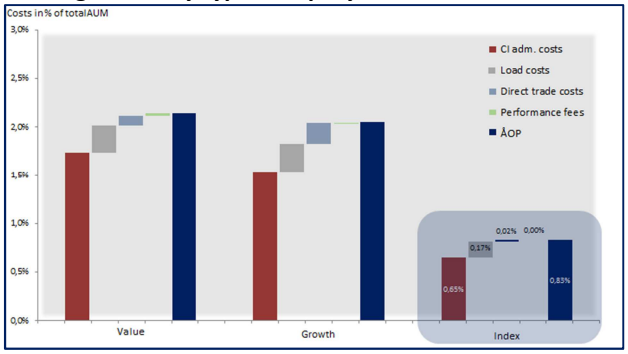


Figure 2.5

Average trade costs and turnover by type, 2013

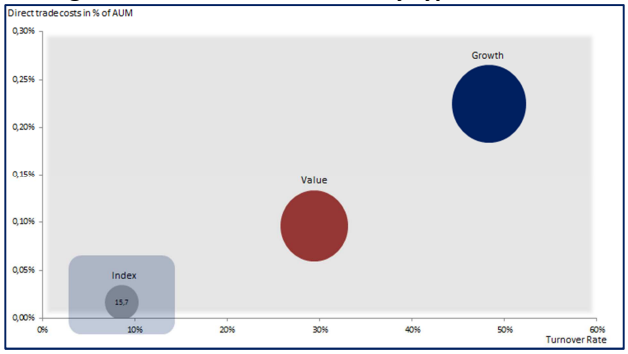


Figure 2.6

Average costs and turnover rate of Danish equity funds by type, 2013

Type	Total AUM, DKKb	CI adm. costs	Load costs	Direct trade costs	Performance fees	ÅOP	Turnover rate
Value	65,5	1,74%	1,97%	0,10%	0,03%	2,14%	29,41%
Growth	79,4	1,53%	2,03%	0,22%	0,01%	2,05%	48,31%
Mix	115,8	1,52%	2,02%	0,20%	0,04%	2,07%	41,82%
Index	15,7	0,65%	1,16%	0,02%	0,00%	0,83%	8,59%
All equity funds	**276,4**	**1,44%**	**1,89%**	**0,16%**	**0,02%**	**1,90%**	**37,08%**

Table 2.9

Note: All equity funds were categorized following Morningstar's Stylebox methodology (2008). For illustrative purposes, Mix mutual funds were not included in Figure 2.4 and Figure 2.3. Figure 2.4 assumes a holding period of 7 years. In Figure 2.3, bubble size and bubble labels represents total AUM of the group of funds..
Source: Own contribution, Fundcollect (2015), Morningstar (2015)

relatively smaller administrative costs of these funds. Furthermore, the index investment strategy does not require in-depth analysis of the stock-market, and is therefore less expensive to operate.

Finally, as presented in Figure 2.6, the turnover rate and the direct trade costs of index funds are on average much smaller than the average Danish equity funds'. This is hardly surprising seeing as the portfolio manager of an index only needs to adjust the portfolio if the index that is tracked is adjusted or if the portfolio manager is aware of ways in which a trade can reduce the tracking error of the index fund. Furthermore, some of these funds only carry a sample of the underlying stocks in the index that it tracks, and thereby reduces the need for rebalancing the portfolio.

2.3 Potential agency problems in Danish mutual funds

This section serves to analyze the extent to which Danish mutual funds face potential agency problems that could have an effect on the performance and costs of these funds. It is beyond the scope of this paper to do an in-depth empirical corporate governance analysis of each mutual fund, rather, the analysis will point to some characteristics that are common to most Danish mutual funds of relevance to a corporate governance analysis.

2.3.1 The ownership structure and cash-flow movements in Danish mutual funds

Danish mutual funds have a fairly unique ownership structure that is different from mutual funds in most other developed countries. All Danish mutual funds are owned by its investors, and as a result the group of investors have complete control rights and dividend rights. Following Bechmann & Rangvid (2007) you can divide Danish mutual funds into groups of dependent and independent mutual funds. The dependency categorization refers to the extent to which the mutual fund is strongly associated with one bank in particular defined as the mother-bank. Figure 2.8 illustrates the primary cash-flow movements in dependent and independent mutual funds respectively. In both types of mutual funds, much of their daily

Cash-flow movements in *dependent* mutual funds

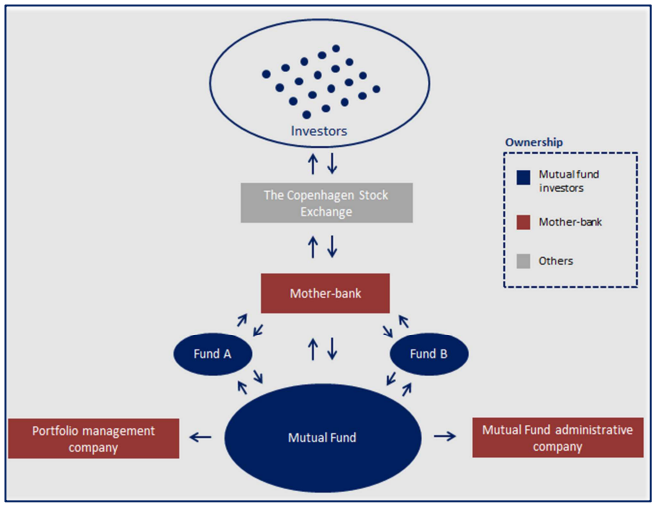


Figure 2.8

Cash-flow movements in *independent* mutual funds

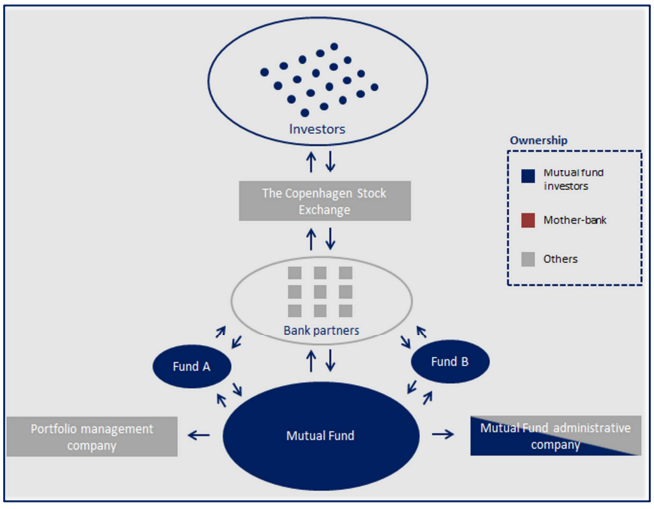


Figure 2.7

Source: Own contribution; Bechmann & Rangvid 2007; Danske Invest 2014; Nordea Invest 2014; Nykredit 2014; Sparinvest 2014; Carnegie Worldwide 2014; Maj Invest 2014

operations are outsourced to external partners. Financial reporting and controlling is managed by a mutual fund administrative company, and portfolio management and consultancy is provided by an external portfolio management company. Finally, market making, deposit administration, and distribution are

typically outsourced to the mutual funds' bank relations. As a result, the number of employees formally employed internally in Danish mutual funds is very limited.

The primary difference between the two types of mutual funds lies in the mutual funds' choice of external partners. As illustrated in Figure 2.8, most of the dependent mutual funds' external partners are either a business unit of the mother-bank, or a separate entity owned by the mother-bank. The three largest Danish mutual funds Danske Invest, Nordea Invest and Nykredit Invest could all be considered to be in this category. As an example, Nykredit Invest's mother-bank is Nykredit Bank A/S. The mutual fund's daily operations and financial reporting is managed by Nykredit Portefølje Administration A/S that is owned by Nykredit Bank A/S (Nykredit 2014). Nykredit Invest's market making, deposit administration and distribution is outsourced to Nykredit Bank A/S, and portfolio management consultancy is provided by Nykredit Asset Management, a business unit of the Nykredit group (Nykredit 2014). In other words, almost all mutual fund costs from the daily operations of Nykredit Invest accrue to its mother-bank, Nykredit Bank.

Independent mutual funds are not as closely associated with a single bank, and typically have outgoing cash flows to a more diverse group of entities. Furthermore, some independent mutual funds own its mutual fund administrative company thereby keeping these operations 'in house'. Danish mutual funds within this categorization are typically smaller in size and include Sparinvest, Maj invest and Carnegie Worldwide. As an example, Carnegie Worldwide outsources its administration, portfolio management and distribution to entities of the Carnegie group, its deposits are with J. P. Morgan Europe, and it has a market maker agreement with Nordea (Carnegie Worldwide 2014).

Finally, some Danish mutual funds are best categorized as being in between the two groups. Jyske Invest, SEBinvest and Sydinvest are all fairly large mutual funds with close relations to its mother-banks. However, these funds own their management company, and thereby differ from other dependent mutual funds.

2.3.2 Potential agency problems

Following the terminology of agency-theory, the associated companies responsible for the daily operations of the mutual fund, could be considered agents of their principal; the investors. These associated companies have service contracts obligating them to do work for the mutual fund. However, as with any agency-relationship, the relationship between the investors and the mutual fund's associated companies may be exposed to agency problems resulting from a conflict of interest. These potential conflicts of interest, often referred to as agency problems, could result in a loss of value for the mutual fund investors, and are therefore of great relevance to a study of mutual fund performance.

Dependent and independent mutual funds have different cash flow and ownership structures, and are consequently exposed differently to agency problems. A dependent mutual fund is owned by its investors, but the executive management handling the daily operations of the mutual fund are employed with the mutual fund's management company, which is owned by the mother-bank. In other words, the CEO of a dependent mutual fund is ultimately employed by the mother-bank, and should in theory first and foremost be expected to act in the interest of the mother-bank's shareholders. If not mitigated, this ownership structure could lead to agency problems in which the incentives of the owners and executive management are not aligned.

Furthermore, as argued by the FSA (2011), the mere fact that the mother-bank has a monopoly on almost all of the operational activities of the mutual fund, could lead to conflicts of interest. Dependent mutual funds often share the same name as its mother-bank and the same office-buildings. If the mutual fund was no longer to make use of its mother-bank's services, this would result in a complete change of personnel, offices and mutual fund name. Such strong consequences could limit the board's interest in making such changes – even if this was in the interest of its investors.

Finally, in theory, dependent mutual fund investors could face the risk of 'churning', in which dependent mutual funds execute excessive amounts of trades so as to generate broker-commissions to the mother-bank.

As in the case of dependent mutual funds, independent mutual funds formally outsources its investment management operations and financial reporting to external associated companies, typically (though not always) owned by a single corporate group. The executive management of the mutual fund is ultimately employed by this group, and so should first and foremost be expected to serve its interest, hence a potential agency problem. In more severe cases, the executive management may even own the associated companies. This is especially the case in small independent Danish mutual funds. In such cases, the executive management are sitting on both sides of the table when negotiating fund management service agreements. Though not in the interest of the mutual fund's investors, the executive management would personally benefit from excessive service fee-agreements with management-owned associated companies. If not mitigated, this would pose a serious agency problem.

However, in regards to the distribution-agreement of independent mutual funds, the potential agency problem seems less severe. Often, dependent mutual funds are not confined to just one distribution channel, but could have several banks compete for distribution rights (Bechmann & Rangvid 2007; Bank Invest 2014; Maj Invest 2014). In theory, this mechanism would bring the price of the distributional services

closer to market prices. Furthermore, seeing as the executive management of the mutual fund are not ultimately employed by the bank in charge of distribution, the executive management would be less concerned with the financial wellbeing of the distribution channel, and may in turn be more inclined to act in the interest of the mutual fund investors.

2.3.3 Agency problem mitigation: National and supranational fund governance legislation

MiFID, an EU directive implemented in Danish law in 2007, was primarily targeted towards European banks. However, considering the typically close relationship between Danish banks and Danish mutual funds, MIFID has had an effect on Danish mutual funds, too. Part of the objective of MiFID was that of "ensuring a high degree of harmonized protection for investors in financial instruments, such as shares, bonds, derivatives and various structured products" (European Commission 2015, p. 1). MiFID requires investment companies to classify clients as professionals or retail clients. Those classified as retail clients enjoy the highest level of protection available in the MiFID (Christiansen et al. 2011). A key pillar of importance to Danish mutual funds in MiFID from a corporate governance perspective is that of 'best execution'. The 'best execution' law obligates investment firms to "execute client orders on terms that are most favorable to the client. This obligation should apply to the firm which owes contractual or agency obligations to the client" (European Parliament & European Council 2004, §33). In other words, this limits a mother bank's distributional power by obligating the bank to only promote a particular mutual fund to the extent that this is beneficial to the investor in question – regardless of the distribution service agreement in place between the bank and the mutual fund.

In 2014 the EU agreed to amend MiFID (I) and enforce MiFID II, which is to be implemented in Danish law no later than 2017. MiFID II was introduced based on the belief in the EU that weakness in the corporate governance structure in a number of financial institutions has been part of the reason for the financial crisis (European Parliament & European Council 2014, §5). Hence, an important objective of the MiFID II is to further improve investor protection and the corporate governance structure of financial institutions. Of importance to mutual funds, MiFID II enacts even stronger regulation regarding the distribution agreements between mutual funds and its bank relation by saying that any distribution commission is against the law unless both of below requirements are met:

(a) *The distribution agreement is designed to enhance the quality of the relevant service to the client*
(b) *Does not impair compliance with the investment firm's duty to act honestly, fairly and professionally in accordance with the best interest of its clients.*

Source: European Parliament & European Council 2014, Article 24, 5

On a national level, this has led the Danish ministry of Business and Growth to start working on legal changes that is expected to change the current distribution model of most Danish mutual funds (Erhvervs og Vækstministeriet 2014). In other words, MiFID II is expected to help mitigate the potential agency problem that arises as a result of the current distribution model in Danish mutual funds. Arguably, one could expect this legal change to have a stronger impact on dependent mutual funds with strong relations to its mother-bank than independent mutual funds with less strong relations to its distributor(s).

In addition to the national implementation of supranational law, Danish mutual funds are regulated by country-specific legal regulations. The Danish law on mutual funds ("Lov om investeringsforsforeninger m.v.", lov nr. 597) covers the following areas related to fund-governance:

- Requirements in cases of delegation of the daily operations of the fund to associated companies (§22)
- The board's independence (§47, §59, §61)
- The board's monitoring responsibility (§47, §51, §64)
- Fund-specific governance policies (§51, §63)

Source: Own contribution, Law nr. 597 2013

The law allows a mutual fund to delegate its daily operations to a mutual fund management company and a portfolio company to the extent that the mutual fund's board can account for clear efficiency benefits from this action. In more general terms, the board is legally obligated to only act in the interest of the mutual fund investors.

To ensure the independence of the board, the law allows for only a minority of the board members to be employed or hold board positions with the mutual fund's portfolio management or mutual fund administrative company. Furthermore, board members of mutual funds can never be part of the executive management of such associated companies. However, in cases where the associated companies are owned by the mutual fund, the law is less strict.

The law further reads that an important task of the board is that of monitoring the daily operations of the mutual fund. The board is to continuously evaluate its current agreements with its associated companies, and should only enter into agreement with such companies if it is capable of monitoring all of its actions. It is the responsibility of the board to cancel any agreements with associated companies that are not in the interest of the mutual fund's investors.

Finally, the law requires that the mutual fund's operations are structured in a way that reduces the risk of conflicts of interest and that it is the responsibility of the board to have company-specific fund governance policies so as to mitigate any potential agency problems.

In sum, the law on Danish mutual funds has several different sections intended to legally mitigate potential agency problem in the Danish mutual fund industry. The law emphasizes the obligations of the board of the fund in mitigating the agency problem, and requires that the board continuously monitors the executive management of the mutual fund. If a mutual fund has entered into agreement with associated companies that causes agency problems and a resulting loss to the investors, it is the responsibility of the board to change or resolve this agreement.

To ensure that the above laws are met, the FSA continuously review the fund governance practices of Danish mutual funds. Bechmann & Wendt (2012) was requested to test for 'unintentional incentives' in the distribution model of Danish mutual funds. Furthermore, the FSA performed a test in 2013 and 2014 that were to address the efforts of the boards in the 10 largest mutual funds in Denmark towards acting in the interest of the mutual fund investors (Finanstilsynet 2014a). The results of the test were not satisfactory, and as a result, the FSA has increased its focus on the performance of the boards in Danish mutual funds.

It is very hard to empirically test the extent to which Danish law on fund governance mitigates potential agency problems in Danish mutual funds. In more general terms, a McKinsey and Company (2004) survey found that investors were willing to pay a significantly larger premium for well-governed companies in developing countries than in developed countries. This suggested that the more well-functioning corporate governance regulations in developed countries had on average helped mitigate the agency problem. However, investors still considered well-governed companies more valuable, and would be willing to pay a premium for such companies. Though this is hardly evidence of a similar pattern in the Danish mutual funds, it seems fair to assume some similarity in how Danish regulation on this area may mitigate potential agency problems, but do not completely eliminate such potential problems. Arguably, the agency problem is further mitigated by additional fund-specific fund governance-policies.

2.3.4 Agency problem mitigation: Fund-specific fund governance-policies

The corporate governance literature primarily points to three different way of which the agency problem can be mitigated at a corporate level: Well-functioning boards, block-holders and incentive-based remuneration (Schleifer & Wishny 1997; Coles et al. 2008; Holderness 2003).

The board of a mutual fund is elected by the investors of the mutual fund, and is solely to act in the interest of the investors. As such, a well-functioning board is to monitor the mutual fund's associated companies and enter into agreement/terminate old ones if this is in the interest of the mutual fund investors. In more formal terms, the board is to act as an agent for its principal; the investors. However, the corporate governance literature points to rare cases in which the board has not acted in the interest of its investors, and finds that this is often the case if boards are not independent (Hermalin & Weisbach 2003). The term 'independent boards' refers to boards that consist of board members that do not have a close personal or corporate relationship with the executive management of the company. Similarly, in Danish mutual funds, it could be argued that an independent board is one in which its board-members do not have a close relationship to the mutual fund's executive management or its associated companies. Hence, if the findings of the corporate governance-literature apply to the Danish mutual fund industry, too, one should expect for dependent boards in Danish mutual funds to be less capable of mitigating potential agency problems. It is beyond the scope of this paper to analyze the extent to which the board of each Danish mutual fund is best characterized as dependent or independent. Sufficient to say, those mutual funds that lack independent boards face a greater risk of agency problems, which affects its performance negatively.

In addition to the board's ability to monitor the executive management, corporate governance theory further points to block shareholders' monitoring incentives (Holderness 2003). In the world of mutual funds, block shareholder would typically be institutional investor that holds large investments in a single mutual fund. Such an institutional investor would have a stronger incentive to monitor the daily operations of the mutual fund and its board, and would thereby reduce potential agency problems. If the institutional investor as well is represented in the board of the mutual fund, potential agency problems between the investors and the board should be expected to be further reduced seeing as part of the investors are now directly represented in the board.

Incentive-based remuneration is another often-cited corporate governance tool that is said to help align the incentives of the executive management and its investors (Core et al. 2003). By directly linking the executive management's salary to the long-term performance of a company, the executive management will have a personal interest in the performance of the company. Similarly, if the executive management of a Danish mutual fund had some of their remuneration linked to the overall risk-adjusted performance of their mutual fund, this could help mitigate potential agency problems. However, as pointed to by Morningstar (2009, 2013), performance fees in Danish mutual fund have typically been asymmetric by nature: The executive management and its portfolio managers are being rewarded with bonuses for performing well, but are not punished financially if performing poorly. In general, as previously presented,

performance fees are not very common in the Danish mutual fund industry and the use of these contracts as a way to mitigate potential agency problem seems very limited.

Finally, reputation building concerns and career concerns of the executive management in a corporation are said to automatically mitigate agency problems seeing as these concerns are often aligned with the interest of shareholders (Schleifer & Wishny 1997). Clearly, the corporate CEO's chances of keeping his job are directly related to whether he acts in the interest of the company's shareholders. However, this line of reasoning seems less clear when applying such thinking to the Danish mutual fund industry. As already noted, in dependent mutual funds, the executive management are employed by a subsidiary of the mutual fund's mother-bank. An executive in a dependent mutual fund caring for his future career therefore seems more likely to act in the interest of the mother-bank than the mutual fund. As a matter of fact, often, the executive management of a dependent mutual fund seems to have very strong historical ties to the mother-bank. The CEOs of the three largest dependent Danish mutual funds, Danske Invest, Nykredit Invest and Nordea Invest, all have a long history of employment with the mother-bank before having been offered the job as CEO of the mutual fund (Danske Invest 2013, Nykredit Invest 2013; Nordea Invest 2013). This further confirms that a dependent mutual fund's CEO's career concerns are more aligned with the mother-bank than with the mutual fund investors.

2.3.5 Residual agency problems

The daily operations of dependent and independent Danish mutual funds are currently structured in a way that could cause agency problems if not mitigated. In efforts to reduce the risk of such problems, supranational and national regulation exists that is intended to reduce conflicts of interest. Similarly, at a fund-specific level, several corporate governance practices have been implemented so as to ensure that the Danish mutual funds are acting in the interest of their investors. However, arguably these laws and fund-specific corporate governance practices do not entirely rule out the risk of agency problems in Danish mutual funds.

The corporate governance literature typically finds evidence of agency problems in cases where shareholder value has been reduced as a consequence of the actions of the executive management (Harris 2012). Similarly, arguably, it could be considered evidence of an agency problem if a Danish mutual fund's executive management allows the mutual fund to pay excessive costs for services provided by its mother-bank. Excessive costs would in this case be defined as above market price costs. Several Danish public institutions and academics have pointed to the existence of such agreements that are said not to be in the interest of the mutual fund investor with a majority of the research focusing on the costs paid by Danish

mutual funds for distribution. In a research project ordered by the Danish FSA, Bechmann & Wendt (2012) find that the distribution costs paid by Danish mutual funds seems priced at a price different from market prices, and that the costs seem excessive. Similarly, Grosen (2008) and Tanggard (2012) argue that the mother-banks are using their distributional power to come to agreements that are favorable to the mother-bank, but not necessarily favorable to the investors. Morningstar (2011) hinted to unfavorable distribution agreements between mutual funds and their distribution channel, when estimating that the price paid for distribution by the mutual fund would allow each individual investor to have one full day of counseling if the money was spent this way. Finally, in a recent study, the Danish FSA (2014) found that any savings from economies of scale in Danish mutual funds were not directed to the investors of the mutual funds, but rather to the distribution channel (i.e. the mother-bank in most cases).

In addition to the studies on the mispricing of distribution services, Morningstar (2014) studied the direct trade costs of Danish mutual funds. Morningstar compared these costs to those faced by a private individual executing similar trades at a discount brokerage firm, and found that the mutual funds on average were paying more than what the private investor would. In other words, if the service provided by the discount brokerage firm was somewhat similar to that provided by the mutual fund broker, the mutual funds were on average paying an above market price for its brokerage services.

The CEO of IFB, Jens Jørgen Møller, later disputed much of the above research by saying that Danish mutual funds *do* pay market prices for the services it receives, and that cheaper is not always better (Bitsch 2014). He further argued that distribution through banks were a far better and cheaper alternative to mutual funds having to establish their own distribution networks (Møller 2014).

Much of the empirical evidence and argumentation presented above could be suggested to be evidence of an agency problem in some Danish mutual fund. Some of these funds are said to be paying excessive fees to their mother-bank/associated entities for its services, and this does not benefit the mutual fund investors. However, what is the fair market price for the services provided by the mother-banks and other associated companies? How do you empirically prove that mutual funds are paying excessive costs for the services it is provided? This is a very central question to an agency problem analysis of Danish mutual funds, and it is one that is very hard to answer. Truly, as an example, if Danske Bank is the only bank capable of offering a distribution channel with their exact amount of customers and with those exact characteristics then Danske Bank has a monopoly on this specific type of service and gains great negotiation power as a result. This would not necessarily mean that the agreed price for its distribution services is not the market price or the 'fair price'.

3 The expected correlation between costs and performance in Danish equity funds

3.1 The theoretically expected effect of costs on performance

The discussion of how mutual fund costs relate to mutual fund performance is closely-linked to a much more fundamental discussion in academia – the validity of the efficient market hypothesis. Those adhering to the strong-version of the EMH argue that all assets are correctly priced at all times, and that assets can never have a positive or negative alpha value. On the contrary, opponents of the EMH believe that markets are only semi-efficient or not efficient at all, suggesting that it is possible to locate mispriced assets. The validity of the EMH is central to a discussion of mutual fund performance and mutual fund costs, because it questions the benefits of mutual fund investing for anything other than mere diversification benefits. Unfortunately, empirical tests of the EMH ultimately suffer from the joint-hypothesis problem, which makes the EMH very hard to reject or confirm (Fama 1991). For this reason, this section will discuss the expected relationship between mutual fund costs and mutual fund performance by firstly assuming efficient markets, and later assuming inefficient markets. In doing so, the section will refer to findings in the analysis presented previously in this paper. The findings of this section will be summarized in section 0.

3.1.1 The efficient market view

Following the assumptions of the EMH and the CAPM, if all investors have the same knowledge of the current and future prospects of the market's securities, then all investors will use the same input list in their construction of the optimal risky portfolio. Furthermore, seeing as all assets are assumed to be correctly priced at all times, the optimal risky portfolio of all investors would simply be the market portfolio; a combination of all available securities in the market. This relationship is formally expressed in Equation 3.1 below, where it is assumed that the optimal risky portfolio is one that maximizes the Sharpe ratio. Following the CAPM, depending on the investor's risk appetite, the investor would optimally have a proportion of his portfolio in a risk-free asset (e.g. short-term government bonds) and a proportion in the market portfolio. The investor would not consider alternative risky portfolios with different sets of underlying assets seeing as these portfolios inevitably would be inferior to the market portfolio.

$$\text{Sharpe ratio} = \frac{\text{Gross } r_p - r_f}{\sigma_p}, \text{where } \max(\text{Sharpe ratio}) = \frac{\text{Gross } r_M - r_f}{\sigma_M}$$

Equation 3.1

Source: Own contribution; Bodie, Kane & Marcus 2011

Noticeably, a fundamental assumption in the EMH and the CAPM is that investors pay no transaction costs or investment costs associated with the operations of the portfolio. In reality, this assumption is violated seeing as an investor always faces investment costs when constructing a portfolio – whether the investor is constructing the portfolio on his own or investing in a mutual fund.

In the interest of providing a more accurate representation of reality, one may relax the assumption of zero costs, and rewrite the Sharpe ratio as follows:

$$\text{Sharpe ratio}_{\text{Mutual funds}} = \frac{\text{Net } r_p - r_f}{\sigma_p} = \frac{\text{Gross } r_p - \text{Costs} - r_f}{\sigma_p} = \frac{\text{Gross } r_p - r_f}{\sigma_p} - \frac{\text{Costs}}{\sigma_p}$$

Equation 3.2

Source: Own contribution

Equation 3.2 is different from the original Sharpe ratio in how it incorporates the costs that investors pay for the services of the mutual fund by subtracting these from the gross return of the fund to obtain the net return of the fund. Assuming that the remaining assumptions of the EMH and the CAPM still hold and that investment costs are the same for any available security, the Sharpe ratio net of costs can be maximized by once again constructing the market portfolio, while minimizing the costs of doing so, so as presented in Equation 3.3 below.[11]

$$\text{Max}(\text{Sharpe ratio}_{\text{Mutual funds}}) = \frac{\text{Gross } r_M - r_f}{\sigma_M} - \frac{\text{Min(costs)}}{\sigma_M}$$

Equation 3.3

Source: Own contribution

In other words, Equation 3.3 suggests that, the optimal risky portfolio would be one that contains all securities available in the global market, and one that has no operating costs or transaction costs. However, for obvious reasons, no mutual funds in Denmark (or any other place in the world) have these features. Rather, in reality, Danish proponents of the EMH would favor investing in passively managed Danish index funds that carry some similar features to the optimal risky portfolio presented in Equation 3.3. More specifically, those index funds that track the broadest global index of securities and have the lowest mutual fund costs would be favored over less diversified index funds of higher mutual fund costs.

Following the efficient market view, actively managed funds fail in two ways: (i) They would be expected to provide a relatively lower gross Sharpe ratio than passively held funds due to their suboptimal construction of risky portfolios, and (ii) they have higher costs than index funds reducing their Sharpe ratio net of costs.

[11] This line of reasoning further assumes investment costs to be the same for any available security.

In combination, these two factors make all actively managed mutual funds unattractive to the investor that adheres to the strong-version of the EMH.

The table below illustrates the potential negative effect of mutual fund costs on the net return of mutual funds assuming market efficiency. Though the table builds on very simplified assumptions of the performance of the portfolios, it brings out two important points: If the strong-version of the EMH holds,

Net return in DKKt by type of fund assuming constant risk and return, AUM_{t0}= DKK 1 million

Fund		Holding period					
Type	Costs	2 years	4 years	6 years	8 years	10 years	12 years
Passive	0,5%	92,0	192,5	302,3	422,1	553,0	695,9
Active	1,5%	71,2	147,5	229,3	316,8	410,6	511,1
Active	2,5%	50,6	103,8	159,7	218,4	280,1	344,9

Table 3.1

Note: For illustrative purposes only. It is assumed that the funds are accumulating, and that all provide a gross return of 8 % p.a. with a standard deviation of 0.
Source: Own contribution

the passively held low-cost fund will outperform the actively-held higher cost fund. Furthermore, the longer the holding period of the investor, the greater the relative gain will be from investing in a passive index fund early on than investing in an actively held mutual fund.

Another way to illustrate the impact of costs on the performance of mutual funds in efficient markets is by considering costs share of the equity premium. Traditionally, costs are subtracted from the gross return of a mutual fund to get its net return, however, as argued by Bogle (1999), this does not bring out the true costs of mutual fund investing. The return of a risk-free asset can easily be obtained by an individual investor by investing in short-term government bonds and if markets are efficient then alpha is equal to 0 at all times. As such, the only added value of the mutual fund is the equity premium, and therefore it could be argued that its costs should be compared to the equity premium only. As presented in Figure 3.1, whereas a low-cost index fund could be expected to have costs amounting to approximately 10 % of the equity premium, a high cost fund (of total costs=2,5 %) reduces the equity premium by 58 %, leaving just 42 % of the premium for the

Equity premium net of mutual fund costs

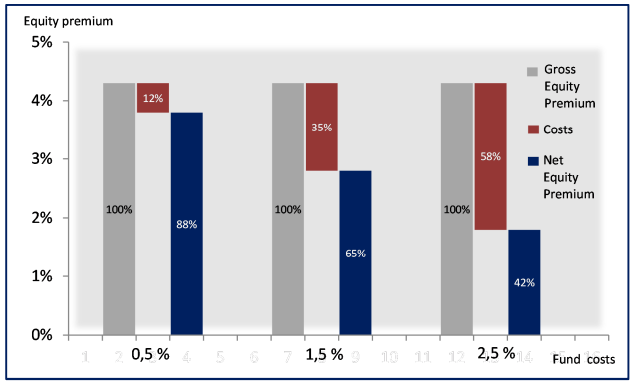


Figure 3.1

Note: Estimates based on an average global equity premium of 4,3 % in 1900-2014 so as presented in Credit Suisse Global Investment Returns Yearbook 2015.
Source: Own contribution; Dimson et al. (2015)

investor. An investor that wants to preserve as much of the equity premium as possible will benefit from choosing the cheaper fund.

In sum, if accepting the thinking of the EMH and the CAPM, Danish mutual fund costs are expected to be negatively related to mutual fund performance. Danish mutual funds that have large marketing costs, large research costs and large trade costs are expected to underperform relative to low cost funds seeing as they are expected to provide a relatively unattractive gross Sharpe ratio, and an unattractive Sharpe ratio net of costs. Truly, as argued by Bodie, Kane & Marcus (2011, p. 311), "if the passive strategy is efficient, then attempts to beat it simply generate trading and research costs with no offsetting benefit, and ultimately inferior results".

That said, a few exceptions exist in which a higher-cost fund could be expected to outperform a lower-cost fund. In cases where an index fund provides a higher expected gross Sharpe ratio than an active fund due to its optimal security selection, but have slightly higher costs, the index fund may still have a higher expected Sharpe ratio net of costs than the active fund. Oppositely, it could be that an index fund with a very strong cost focus performs less well than a higher cost fund, if the index has a large tracking error and fails to be well diversified. However, only a minority of the samples in an empirical investigation should be expected to carry these trades, and as such, the overall expected negative relation between mutual fund costs and performance should still hold.

3.1.2 The inefficient market view

If one no longer assumes markets to be efficient, but rather accepts the weak-version of the EMH or the hypothesis that markets are inefficient, the expected relationship between mutual fund costs and mutual fund performance is less clear-cut.

Once again considering Equation 3.4 of the Sharpe ratio net of mutual fund costs reprinted below, the optimal risky portfolio is still considered to be the portfolio of risky assets that provides the highest Sharpe ratio. However, in inefficient markets, the portfolio managers' input lists are not necessarily the same, but vary depending on the individual portfolio manager's knowledge of current and future characteristics of the securities. Portfolio managers can locate underpriced stocks with positive alpha-values, and risk investing in overpriced stocks with negative alpha-values. Consequently, the optimal portfolio of risky assets that maximizes the expected Sharpe ratio is no longer simply the market portfolio, but could be an entirely different set of securities.

$$\text{Sharpe ratio}_{\text{Mutual funds}} = \frac{\text{Net } r_p - r_f}{\sigma_p} = \frac{\text{Gross } r_p - \text{Costs} - r_f}{\sigma_p} = \frac{\text{Gross } r_p - r_f}{\sigma_p} - \frac{\text{Costs}}{\sigma_p}$$

Equation 3.4

Source: Own contribution

If the market portfolio is no longer to be considered the optimal risky portfolio then the maximization of Sharpe ratio net of costs presented in Equation 3.3 previously no longer holds, and a minimization of costs is no longer necessarily the way to obtain the highest Sharpe ratio. In other words, the low cost index funds favored by proponents of the EMH may not be capable of providing the highest Sharpe ratio if one considers markets to be inefficient.

To discuss the expected relationship between mutual fund costs and performance in an inefficient market, this section will refer to the findings of the analysis performed previously in this paper by discussing the characteristics of each cost component in Danish mutual funds, and how mutual fund investment strategies, and potential agency problems in Danish mutual funds may alter the initial conclusions. To simplify the discussion, this section will for most parts assume that Danish mutual funds pay the market price for the services that it acquires, and only question this assumption when discussing potential agency problems.

As previously presented, the term 'mutual fund costs' comprises a wide range of cost items with very different characteristics. To understand how costs should be expected to correlate with fund performance, it is of great importance to not just consider mutual fund costs as one uniform group, but rather to analyze its subcomponents so as to identify individual characteristics capable of affecting performance. This theoretical exercise improves any subsequent empirical investigation as it points the attention to specific cost component that are expected to be of high correlation to fund performance. However, as previously, it is important to be aware of potential cost-bundling in the industry that could blur the direct effect of any individual cost item.

Administrative costs

Administrative costs is the largest sub component of the ÅOP, and has on average accounted for 67 % of the average Danish equity fund's ÅOP (Fundcollect 2015). Judging by its size, one should expect for this cost parameter to have a significant influence on fund performance. Three cost-components have been identified as the key sub components of administrative costs in Danish mutual funds: Administrative company costs (18 %), Portfolio management company costs (32 %) and distribution costs (38 %).

Administrative company costs (ie. IT-costs, office rent, accountant services, etc.) are the kinds of costs that most organizations incur as part of their daily operations, and could be considered an unavoidable cost of

any Danish mutual fund whether a value fund, growth fund or an index fund. One could argue in favor of a positive correlation between administrative company costs and mutual fund performance to the extent that such expenditures improve the work-environment for those employed at the fund and thereby attracts more talented employees. However, relatively higher administrative costs of a fund could as well suggest that the fund is less capable of realizing economies of scale than other competing funds, which would suggest a negative correlation between administrative company costs and fund performance. In combination, these two aspects do not seem to suggest a strong negative or positive correlation between administrative company costs and fund performance.

Any potential agency problems in Danish mutual funds should not be expected to reflect in excess administrative company costs given that IT-costs, office rent, accountant services all are fairly standardized products of which any deviation from market prices would be fairly obvious to the mutual fund investors or to the Danish FSA.

In sum, administrative company costs could be considered a fairly standardized cost common to all mutual funds that should not be expected to be closely related to fund performance, and should be expected to less affected by any potential agency problems in Danish mutual funds.

Portfolio management company costs relate to the costs charged by the portfolio management company that in exchange constructs and oversees the portfolios of the mutual fund. In inefficient markets it seems fair to argue that those portfolio management companies that have relatively more qualified staff, and spent more time on analysis and research are more likely to locate securities with positive alpha values. Furthermore, that same group of portfolio management companies would be more likely to obtain exact measures of future expected correlation and volatility of a portfolios securities, and should be expected to better capable of constructing optimal Markowitz portfolios. In other words, this would suggest a positive correlation between portfolio company costs and fund performance to the extent that the excess return and reduced volatility from portfolio management company services exceeds the costs of these services. However, mutual funds do not receive any guarantees that portfolio management companies are capable of locating securities with positive alpha values. As such, the portfolio management company costs could be compared to the costs faced by an oil company that is drilling for oil in an unknown territory. If the oil company locates a significant amount of oil, the correlation between money spent on the drilling exercise and the company's value proved positive. However, if the company fails to locate oil, the correlation turns negative. Similarly, if the portfolio management company is consistently capable of locating positive alpha securities that would otherwise not have been located had the fund spent less money on research, then

these costs should be expected to be positively correlated to fund performance. However, the opposite could very well be the case, too.

Considering the growing strand of empirical research on mutual fund performance summarized previously in this paper, it is worth noting that several of these find that mutual funds underperform relative to the market – even before costs. Such research could lead one to expect that money spent on security analysis and research on average is a waste – even if markets are not completely efficient – which suggests an expected negative correlation between portfolio company costs and mutual fund performance. However, the literature on the value premium puzzle has been identifying a long-term superior performance of value portfolios over growth portfolios in developed countries. If these findings were to hold for Danish mutual funds, then one could expect portfolio company costs to be more positively related to performance if the mutual fund is a value fund. On the contrary, if the fund is a growth fund, the correlation between costs and performance should be negative. Interestingly, as presented previously, Danish value funds seem to have higher administrative costs than growth funds. As such, if one expects a superior performance of value funds to growth funds, the expected correlation between administrative costs and performance should be expected to be positive.

The price paid by a Danish mutual fund for the services provided by its portfolio management company fluctuates significantly and depends on the agreement in place between the mutual fund and its portfolio management company. It is very hard to define a specific market price for these services seeing as the services provided are often very fund-specific, and the skills of the portfolio management company's portfolio managers varies significantly. Consequently, Danish investors and the Danish FSA are less capable of telling whether a mutual fund is paying a 'fair price' for the services provided by the fund's portfolio management company. In such a setting, existing agency problems in a fund may lead to excess portfolio management company costs that do not benefit the fund. As an example, a dependent Danish mutual fund that has a portfolio management agreement with an entity of its mother-bank may be inclined to pay excess portfolio management fees if its governance structure is not working properly. This would be very hard to detect by investors or the Danish FSA, seeing as it is unclear what the fair value of the portfolio company's services truly is. Ultimately, this could result in a reduced performance of the fund.

In sum, portfolio consultancy costs could in theory be expected to be positively correlated to performance seeing as one should expect increased research efforts to result in better chances of obtaining positive alpha. However, the mutual fund is not guaranteed a better return as the result of increased portfolio consultancy expenditures, and faces the risk that money is wasted. Furthermore, empirical evidence in other studies studying a different dataset at a different time suggests that mutual funds are unable to beat

the market on average – even when controlling for mutual fund costs, which could lead one to expect somewhat similar findings in a broad study of all Danish mutual funds. Value funds may exhibit a slightly less negative correlation between portfolio company costs and performance due to the presumed value premium in Danish mutual funds. Finally, given the subjectivity involved in valuing portfolio company service contracts, the cost item may be of disproportionately larger size and decrease performance in funds with agency problems.

Distribution costs have, on average, been the significantly largest administrative cost item of Danish mutual funds. The primary effect of strong distribution and marketing efforts of mutual funds is to attract new investors and thereby increase the fund's AUM. The new AUM are typically invested in the existing underlying assets of the fund's portfolio, thereby increasing the total size of the portfolio, but keeping the weights of each asset constant. As an example of this, one may refer to the Danish active mutual fund, Maj Invest. Maj Invest had in its first years of operation not spent money on distribution or marketing. In December 2009, the fund changed this and increased its distribution expenses significantly, which resulted in a strong increase in the fund's AUM (see Figure 3.2). Noticeably, the fund did not change the underlying assets of its portfolio or its portfolio managers during this period of time, so the increased investments in the fund seem solely attributable to the effect of distribution costs (Morningstar 2011).

Adjusted change in AUM of LD Invest, 2008-2011

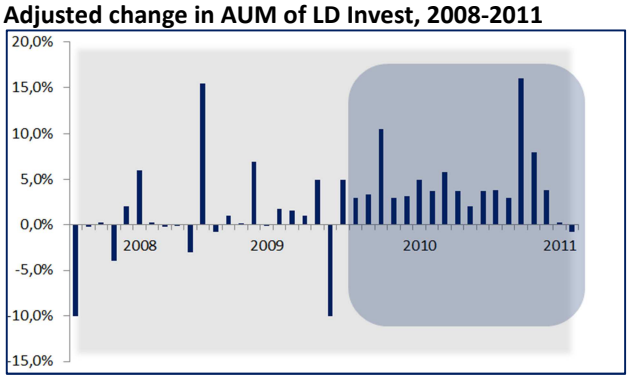


Figure 3.2

Note: The change in AUM is adjusted for changes in the value of the underying assets of Maj Invest's portfolio
Source: Own contribution, Morningstar (2011, p. 6)

Several Danish researchers have questioned the extent to which large spendings on fund marketing and distribution is in the interest of the fund's investors (Bechmann & Wendt 2012; Morningstar 2011; Tanggaard 2012). Truly, distribution services do not change the composition of the underlying assets of the mutual fund's portfolio, and should consequently not be expected to improve the gross return or lower the volatility of the fund's portfolio. In other words, the Sharpe ratio pre costs should not be expected to improve as a result of larger mutual fund distribution costs. Similarly, the fund's chances of providing alpha should not be expected to be improved as a result of an increase in distribution costs.

Distribution costs could have indirect benefits that come with its ability to increase AUM. In theory, larger mutual funds (by AUM) should be more capable of realizing economies of scale in portfolio optimization

and administrative tasks. As an example, a mutual fund's total portfolio of 50 well-assembled assets requires the same amount of security research whether the fund has AUM of DKK 200 million or DKK 500 million. Seeing as the expenses associated with constructing the portfolio (denoted portfolio company costs) are expressed in % of AUM, the fund with AUM of DKK 500 million, would have lower portfolio company costs than the fund with AUM of DKK 200 million, hence better capable of realizing economies of scale. Another indirect benefit from increased AUM in a fund is that it improves the fund's chances of attracting qualified portfolio managers. Portfolio managers reputational benefits should be expected to be higher if the portfolio manager manages a portfolio of great size (in terms of AUM) compared to a small portfolio. Furthermore, assuming economies of scale, portfolio management companies assisting larger mutual funds would be able to offer better remuneration schemes for its portfolio managers while keeping costs at the same size in percent of AUM as they would be for less qualified staff for a smaller fund.

Whereas the above mentioned indirect benefits certainly could be of importance to the performance of Danish mutual fund, it is important to recall that distribution costs on average made up 38 % of total administrative costs in Danish mutual funds which makes it the single largest cost item in Danish mutual funds. Such large costs can only be justified if the resulting economies of scale and improvements in personnel reduce the size of other mutual fund cost items and/or improve the gross return significantly and thereby improves the net Sharpe ratio of the fund. More specifically, these benefits would need to exceed the costs of distribution costs, which from a theoretical stand-point seems unlikely at best. Furthermore, considering the findings in Bechmann & Tangaard (2014), Finanstilsynet (2014a) and Morningstar (2011), the theoretical realization of economies of scale of large Danish funds could not be confirmed empirically. On the contrary, large funds did not seem to have lower costs than their competing smaller funds suggesting that increased AUM resulting from large distribution costs did not materialize in lower overall costs.

Much like the case of portfolio management service agreement, it is very hard to tell whether fund-specific distribution agreements are priced at market prices. According to a survey by Bechmann & Wendt (2012) on Danish mutual funds, even the boards of the Danish mutual funds do not keep exact account of the services that its distribution channel provides in return for distribution fees suggesting that the 'fair value' of these services are very subjective by nature. Furthermore, from an outside perspective it is very hard to tell whether the distribution agreement is priced at competitive levels. As an example, how do you compare the price paid for a distribution agreements with Danske Bank (the distribution channel of Danske Invest) to the price paid for a distribution agreement with Nykredit (the distribution channel of Nykredit Invest) if these banks have different customer bases, and no one is keeping track of the actual services they

provide? Truly, this is an almost impossible task that leaves the mutual fund vulnerable to agency problems that could ultimately reduce the performance of the fund. Said differently, Danish mutual funds that have higher distribution costs do not necessarily get their money's worth seeing as part of the explanation for its higher costs could simply be agency problems that does not add value.

However, returning to the example of Maj Invest in Figure 3.2 that rapidly increased its distribution costs in 2011: Currently, several of Maj Invest's funds have performed significantly better than its peers, and have contributed positively to the competition on the Danish equity funds market. These funds potentially would have closed down several years ago had Maj Invest not decided to increase its distribution costs. In this case, distribution costs therefore seem to have had a positive effect on fund performance. Unfortunately, given the survivorship bias described in section 1.2, funds that shut down during the period of investigation are typically not considered in empirical performance tests. As such, an empirical test of the effect of distribution costs on fund performance may undermine the negative effect associated with *low* distribution costs.

In sum, only minor theoretical support exists for the notion that distribution costs are positively related to fund performance. However, such positive effect should not be expected to be evident in empirical tests of the correlation between distribution costs and performance analysis given the potential survivorship bias. On the contrary, it is found that distribution costs are expected to be negatively correlated to performance in Danish mutual funds. This was further confirmed by how potential agency problems in Danish mutual funds could lead to increased distribution costs with no offsetting benefit to the fund. This expectation seems valid for all types of Danish mutual funds (value/growth/index).

Total trade costs

The direct trade costs of Danish mutual funds on average accounted for just 19 % of total ÅOP in Danish equity funds from 2008-2014, and given the small size of direct trade costs, its correlation to overall mutual fund performance should be expected to be limited. Furthermore, in theory, the implications of an increase in trade expenses on fund performance are ambiguous seeing as its effect is highly dependent on the characteristics of the trades that are executed. If increased portfolio trading leads to a more optimal risky portfolio then there is reason to belief that higher trade costs are positively correlated with performance, however, the opposite could be the case, too.

As previously argued, direct trade costs are not the only trade costs that mutual funds incur when buying and selling its underlying assets. The 'less visible' trade costs, spread costs, should be considered a part of the mutual fund's trade costs, too. As previously presented in Table 2.7, direct trade costs are strongly

correlated with the turnover rate of the fund, which in turn is argued to be closely related to the fund's spread costs. Increased direct trade costs should therefore be expected to load to an increase in spread costs. Though, spread costs are formally not considered a cost item in Danish mutual funds, it still has an effect on the gross return of the fund. As an example, if the direct trade costs of a fund increase by 0,1 %, then formally the costs of the fund increase by 0,1 %, but the gross return is further reduced by the spread costs that have not been accounted for elsewhere. If one considers increases in spread costs as a direct consequence of increases in direct trade costs, then the performance of a fund will only be positively affected by an increase in direct trade costs to the extent that the trading of underlying assets provide an excess return in excess of *all* trade costs.

Given the significantly lower direct trade costs and turnover rate of Danish value funds to growth funds it seems fair to assume that this group of funds on average have significantly lower total trade costs than growth funds. As such, assuming the superior performance of Danish value funds to growth funds, funds with lower trade costs may be expected to provide better performance.

The brokerage service that is paid for by the direct trade costs of Danish mutual funds is a fairly standardized service that is typically priced as a percentage of the size of the trade. As a result, the prices charged by banks and online brokers in Denmark do not vary significantly. This suggests that there is little room for maneuver in funds that faces the risk of profit extraction from associated companies due to agency problems in the fund. However, as presented previously, Morningstar (2014) found that Danish mutual funds on average were paying higher direct trade costs for its trades than a private individual would at an online broker. Though this is not clear-evidence of a mispricing, it could be that uncompetitive brokerage agreements between the funds and their bank relation are part of the explanation for this. Such arrangements would suggest a negative correlation between the size of the direct trade costs and fund performance.

In sum, theoretically, the expected correlation between trade costs and performance in Danish mutual funds seems ambiguous seeing as trade expenses may/may not lead to improved performance given the improvement/lack of improvement of the portfolio. However, it is worth noting that Danish value funds have had significantly lower trade costs than growth funds, and that this may imply a negative correlation between trade costs and fund performance. Furthermore, Morningstar (2014) presented evidence on Danish mutual fund that could be suggested to hint to the existence of uncompetitive brokerage agreements between Danish mutual funds and their bank relations, further hinting to a negative correlation between this cost item and fund performance.

Load costs

As previously described, load costs are technically not a mutual fund cost, but is the costs that is paid directly by the investor that requests the issue of new certificates or redeems his certificates in a Danish mutual fund. As such, this cost affects the performance of the investor's investment, but does not directly affect the mutual fund's performance measures (i.e. its return, its volatility or its Sharpe ratio) and should consequently not be expected to affect the mutual fund's performance. However, for reasons stated below, the load costs could still be indirectly correlated to fund performance, and may therefore still be of interest to an analysis of fund performance.

As previously presented in section 2.1.1, load costs consist of two components: (i) Trade costs as a result of new buy/sell orders of underlying assets following the issue of new certificates/redemption of certificates and (ii) distribution and marketing commissions/costs upon the issue of new certificates. The trade costs should hardly be expected to have an effect on fund performance seeing as these are all paid for by the investor, and do not change the composition of assets in the fund. However, it could be argued that fund's with large underlying distribution commissions as part of their load cost fees are more likely to have large spendings on distribution costs in general. If this proves to be the case then one should expect the part of load costs related to distribution costs to be negatively correlated with the performance of the fund. The sum of load costs should only be expected to have a minor negative impact on performance given the neutral characteristics of trade costs of load costs and the partial impact of distribution costs. However, if one were to solve for the distribution costs by simply subtracting front-end load costs from back-end load costs, the correlation should be expected to be stronger and more negative.[12]

ÅOP

ÅOP is the sum of administrative costs, direct trade costs and a minor share of load costs of the Danish mutual fund, and its expected correlation to fund performance should simply reflect the already presented theoretical findings of its underlying cost-components. Noticeably, administrative costs is the largest sub component of ÅOP, and carries greater weight on its influence on the effect of ÅOP on fund performance.

Given the slightly negative expected correlation between administrative costs and fund performance, and the negative expected effect of load costs, the expected correlation between ÅOP and fund performance should be expected to be somewhat negative.

[12] Following Equation 2.2 and Equation 2.3 presented previously, and assuming that the costs of buying assets on average falls close to the costs of selling those same assets, the distribution commission is simply expressed as the front-end load costs minus the back-end load costs.

3.2 Hypotheses

This section briefly summarizes the theoretical conclusions of section 3.1, and presents this paper's resulting hypotheses. The hypotheses will be tested empirically in section 4.

If one assumes efficient markets, the hypothetical market portfolio is considered the optimal portfolio. To maximize performance, mutual funds should seek to replicate the market portfolio while keeping costs at a minimum. Those funds that have large spendings on day-to-day trading, portfolio management and distribution are expected to perform less well seeing as these costs are not expected to result in improved performance. In other words, all cost items in Danish mutual funds - including the overall cost-indicator, ÅOP - are expected to be negatively correlated to fund performance.

Hypothesis 1.1:

All cost-items are negatively correlated to fund performance in Danish equity funds

If assuming semi-efficient or inefficient markets, the findings are expected to be more diverse. Mutual fund costs are not necessarily destroying value, but could contribute to improved fund performance due to an improvement in the fund's gross return, a reduction in the fund's risk, or a reduction in the fund's other mutual fund costs. The expected findings are summarized in Table 3.2.[13] The findings are based on the

Summary of findings in 3.1: The theoretically expected correlation between costs and performance in Danish mutual funds

	Direct effect	Agency problem effect	Value bias	Total
Administrative costs	Neutral	Negative	Positive	**Neutral**
- Administrative company costs	Neutral	Neutral	Positive	**Neutral**
- Portfolio Management costs	Positive	Negative	Positive	**Positive**
- Distribution costs	Negative	Negative	Positive	**Negative**
Trade costs	Neutral	Neutral	Negative	**Neutral**
- Trade costs as % of trade volume	Negative	Neutral	Data n/a	**Negative**
Load costs	Neutral	Negative	Neutral	**Negative**
- Front end - Back end load costs	Neutral	Negative	Neutral	**Negative**
ÅOP	**Negative**	**Negative**	**Positive**	**Negative**

Table 3.2

Source: Own contribution

[13] Table 3.2 is only intended to summarize already presented theoretical conclusions. For details on the reasoning behind Table 3.2, refer to section 3.1.

belief that each cost item's correlation to fund performance depends on three key aspects: (i) The cost item's direct effect on performance, (ii) the effect of agency problems on the size of the cost-item, (iii) the effect of a presumed value premium that may bias the results.

Firstly, considering the largest cost-item in Danish mutual funds, administrative costs expressed as % of AuM, its three sub cost items (administrative company costs, portfolio management costs and distribution costs), should be expected to be differently correlated to fund performance. In general one may note that Danish value equity funds on average have significantly higher administrative costs than other equity funds excluding index funds. If there is a value premium bias in the performance of Danish mutual funds, one may expect the higher administrative costs of Danish value equity funds to push for a positive correlation between administrative costs and performance. However, considering the theoretical direct effect of each administrative sub cost-item, and the potential influence of agency problems, the overall expected correlation between administrative costs and fund performance seems to be ambiguous. This is especially driven by the expected negative effect of distribution costs on fund performance, and a presumed more positive effect of portfolio management costs.

Hypothesis 2.1:

The correlation between Administrative costs in % of AUM and fund performance in Danish equity funds is ambiguous

Trade costs expressed in % of AuM could be positively correlated to fund performance to the extent that increased trading results in more optimal portfolios. However, the opposite could be true, too, suggesting an ambiguous direct effect of trade costs on fund performance. Furthermore, potential agency problems seem incapable of affecting trade costs due to strong transparency about the pricing of these services effectively reducing any negative effect from corporate governance issues. A minor aspect suggesting a somewhat negative correlation between trade costs and fund performance is that value funds have significantly lower trade costs than growth funds, which may bias the results. However, this is not believed to be of crucial importance to the effect of this cost-item on fund performance. As a result, trade costs should not be expected to be strongly correlated to fund performance

If one were to express trade costs in % of trade volume, the correlation between trade costs and fund performance should be expected to be stronger, and more negative. Large trade costs in % of trade

volume suggests poor negotiation skills of the mutual fund, or potential agency problems of which neither are of benefit to fund performance.

Hypothesis 2.2:

Direct trade costs in % of AUM are not strongly correlated to fund performance, however, direct trade costs in % of trade volume is negatively correlated to fund performance in Danish equity funds

Load costs do not have a direct effect on fund performance seeing as these are costs that are paid by the investor. However, large load costs are argued to be a strong sign of large distribution agreements in the mutual fund, which has been evaluated to be unfavorable for mutual fund performance. Furthermore, high distribution costs could be an indirect effect of agency problems in the mutual fund, which is expected to hurt performance. For these reasons, the expected correlation between load costs and fund performance is negative.

In section 3.1 it is found that one may isolate the distribution costs of load costs by subtracting the front-end load costs from the back-end load costs. Regressing fund performance on front end load costs minus back end load costs should be expected to yield an even stronger negative correlation.

Hypothesis 2.3:

Load costs are negatively correlated to fund performance in Danish equity funds. Furthermore, by considering front end load costs – back end load costs, the correlation to fund performance turns stronger and more negative.

Given the findings stated above, the all-in-one cost measure, ÅOP, should be expected to be slightly negatively correlated to fund performance.

Hypothesis 2.4:

ÅOP is negatively correlated to fund performance

4 Empirical test of the relationship between costs and performance in Danish equity funds

4.1 Methodology

This section presents the data used in the empirical analysis, and provides an overview of the underlying methodology of the study.

The funds under investigation were selected based on the following criteria:

- Danish mutual fund
- Publicly listed
- Retail fund
- Equity fund
- Active during the entire period of investigation (2008-2014)

By deselecting funds that did not match the above criteria, the initial dataset amounted to a total of 176 funds. As illustrated in figure Figure 4.1, the dataset was further reduced on three occasions; 18 funds severely changed their investment strategy during the period of investigation and were excluded from the sample. Another 23 and 18 funds, respectively, were excluded due to various data limitations, leaving total sample size at 117 funds.

Deselected samples and final sample size

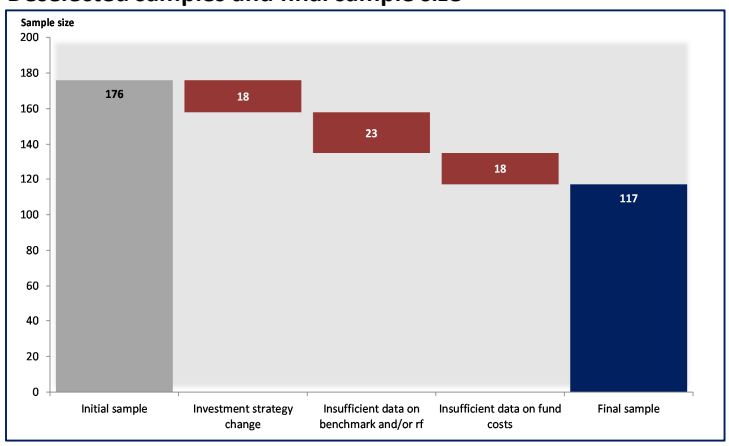


Figure 4.1

Source: Own contribution

4.1.1 Data

Data was provided by three different companies/databases as follows:

- Bloomberg (2015): Monthly returns on relevant indexes, monthly yields on relevant government bonds and monthly exchange rates on relevant currencies.
- Fundcollect (2015): Annual fund costs (direct trade costs, administrative costs, load costs, ÅOP), monthly returns and Sharpe ratio estimates of selected funds.
- Morningstar (2015): Categorization of selected funds by style and benchmark index for selected funds

Data on fund turnover rate, fund of fund costs and fund spread costs has not been available for the entire period of investigation, and has not been considered further in the study. However, fund of fund costs are indirectly included in small parts of the study seeing as ÅOP was adjusted for fund of fund costs in 2012.

4.1.2 Performance measures

To measure the performance of the funds in the sample, two different performance measures are applied: The Sharpe ratio and Jensen's alpha. Both are fairly conventional methods for evaluating the performance of a fund and are often used to by academics as well as practitioners within the field. The use of two different performance measures serves to test the sensitivity of the findings to the choice of performance measure.

The study considers three different investment horizons:

- 3 years (2012-2014)
- 5 years (2010-2014)
- 7 years (2008-2014)

This means that each fund in the sample ends up with six different measures of its performance: A measure of the fund's Sharpe ratio for three different investment horizons, and a measure of the fund's alpha for three different investment horizons.

4.1.3 Sharpe ratio

Estimates of the Sharpe ratio have been provided by FundCollect (2015) and are estimated based on Sharpe (1994) updated version of the Sharpe Ratio. This slightly different estimation method from the original Sharpe ratio should be expected to result in a higher Sharpe ratio than what would otherwise be the case if one were to use the original formula for the Sharpe ratio. As such, the estimates of Sharpe ratio are not directly comparable to estimates of Sharpe ratio based on the original Sharpe ratio formula.

$$Sharpe\ ratio_{adj.} = \frac{r_p - r_f}{\sigma_{rp-rf}}$$

Equation 4.1

Source: Own contribution

The excess portfolio return is the geometrical average return of the fund subtracted by the risk-free rate. All returns are net of costs and are adjusted for dividends and currency. Estimates have been provided for each fund in the sample for a 3 year, 5 year, and 7 year period.

For details on the Sharpe ratio as a performance measure, refer to section 1.1.3.

4.1.4 Jensen's Alpha

As presented in Equation 4.2, Jensen's alpha is equal to the excess return of the fund's portfolio minus the fund's beta to the market portfolio multiplied by the excess return of the market portfolio.

$$\alpha_i = R_p - \beta R_m$$

Equation 4.2

Note: R_p is defined as r_p-r_f, R_m is defined as r_M-r_f.
Source: Bodie, Kane & Markus 2011

Rewriting above formula by solving for the excess return of the fund, it is clear that Jensen's alpha can be found by regressing the excess return of the fund with the excess return of the market return. In other words, the excess return of the fund is the dependent variable, and the excess return of the market is the explanatory variable. The resulting intercept from this regression is the fund's alpha.

$$R_p = \alpha_i + \beta R_m$$

Equation 4.3

Note: R_p is defined as r_p-r_f, R_m is defined as r_M-r_f.
Source: Bodie, Kane & Markus 2011

In practice, the market portfolio does not exist. Rather, as a proxy for the market portfolio, one may use the fund's benchmark – often an index of risky assets. The benchmark used is fund-specific and varies depending on the characteristics of the fund. In this study, the benchmark chosen by the fund itself is used as the fund's benchmark index. Seven funds in the sample did not choose a benchmark. In those cases, the fund-specific benchmark index suggested by Morningstar was applied. In cases where the funds' benchmark index changed during the period of investigation, the estimates were adjusted for this. All combined, 37 different benchmarks were applied in the study.

The excess return of the fund and the excess return of the benchmark index are estimated based on monthly return data for the fund and the index in question. All fund returns are net of costs, adjusted for dividends and are converted to DKK. Similarly, index returns are adjusted for dividends and converted to DKK.

In theory, the risk-free rate applied should carry no risk. However, such an asset does not exist in reality. Rather, typically, one would use the yield of a short-term government bond as a proxy. Following Damodaran (2008), the risk-free rate applied should relate to where the cash flows of the underlying assets of the fund are located. As an example, the risk-free rate of a fund that only invests in Danish stocks is the yield on a short-term Danish government bond. Noticeably, several of the funds in the sample invest in multiple countries. In these cases, the risk-free rate of the largest country in question has been applied. As

an example, the risk-free rate of a fund that invests in countries within the BRIC-region (Brazil, Russia, India, China) is the yield on a short-term Chinese government bond.

Optimally, to reduce the risk associated with the risk-free asset, one would consider the yield of 3-month treasury bill. However, not all relevant countries offered 3-month treasury bills during the entire period of investigation. Rather, to ensure the comparability of the risk-free rates, the monthly yield on a 2-year government bond was applied for each country in question. All combined, the monthly yields of 2-year government bonds for 9 different countries have been applied.

All regressions are run using OLS, which seeks to minimize residuals. For OLS to provide the most precise estimates – that is for OLS to be the best linear unbiased estimator (BLUE) – the data has to comply with 10 assumptions (Gujarti & Porter, 2009). In reality, most data does not satisfy all of these assumptions, however, complying with all assumptions may serve as the ideal for exact regression results. Two of these assumptions are of particular relevance to a performance analysis of mutual funds with just one explanatory variable:

- No heteroscedasticity
- No autocorrelation

If any of these assumptions are violated, the OLS estimates remain unbiased and consistent, but the standard error estimates are biased. This could have implication for statistical significance of the coefficients, and it is therefore of great importance to test the extent to which these assumptions are violated.

Heteroscedasticity (as opposed to homoscedasticity) exists if the variance of the residuals of the regression is positively or negatively correlated to the explanatory variable of the regression. In the regression performed to obtain alpha estimates, the explanatory variable is the excess return of the benchmark index. If variance increases/decreases as the return of the benchmark index increases, this would suggest a risk of heteroscedasticity. To formally test for this, the Breusch-Pagan test is applied.

$$e^2 = \gamma_0 + \gamma_1 x + v$$

Equation 4.4

Source: Gujarti & Porter, 2009

As presented in Equation 4.4, the Breusch-Pagan test runs a regression on the squared residuals as a function of the explanatory variable. If the regression's F-test confirms that the variables are jointly

significant, the null-hypothesis of no homoscedasticity cannot be rejected, hence the severe risk of heteroscedasticity.

Autocorrelation characterizes regression outputs in which the residuals (at t) are correlated to lagged residuals (at t-1). In an alpha regression analysis, positive autocorrelation would suggest that a fund return in excess of the predicted return would have a large chance of being followed by another fund return in excess of the predicted return. Similarly, a fund return below the predicted return would be likely to be followed by another return below the predicted value. Oppositely, in an alpha regression with negative autocorrelation, a fund return in excess of the predicted return would be expected to be followed by a fund return below the predicted return. The tendency of autocorrelation in stock returns Is not uncommon, and investment strategies of technical analysis, including momentum strategies, are making strong efforts to predict expected autocorrelation. Seeing as equity fund returns are strongly driven by stock returns, equity fund return data should be expected to be at risk of exhibiting autocorrelation. However, the risk should be less severe for monthly returns (as studied here) compared to daily returns.

$$d = \frac{\sum_{t=2}^{T}(e_t - e_{t-1})^2}{\sum_{t=1}^{T} e_t^2}$$

Equation 4.5

Source: Gujarti & Porter, 2009

The study applies the Durbin Watson test capable of detecting both positive and negative autocorrelation (see Equation 4.5). In cases where the test is inconclusive, it has been assumed that autocorrelation does not exist.

Test of statistical significance and robustness of alpha regression

	3 years (2012-2014)	5 years (2010-2014)	7 years (2008-2014)
Statistical significance of intercept			
Sample size	117	117	117
Statistically significant alpha	17	19	15
Robustness check			
Autocorrelation	2	1	2
- Positive	2	0	1
- Negative	0	1	1
Heteroscedasticity	3	1	2
Robust statistical significance of intercept			
Sample size	117	117	117
Statistically significant alpha	15	18	13

Table 4.1

Source: Own contribution

Table 4.1 presents the statistical significance of this study's alpha-estimates, and summarizes the test results of the robustness tests. The tests suggest that the data was only plagued to a limited extent by heteroscedasticity and autocorrelation.

In data for which the Breusch-Pagan test suggested signs of heteroscedasticity, heteroscedasticity consistent standard errors were applied. These standard errors slightly changed the p-value of the alpha-estimates, but the alpha estimates stayed statistically significant.

Autocorrelation was not corrected for, and so it is noted that respectively 2,1 and 2 of the significant alpha estimates for the 3 years, 5 years and 7 years estimates may have biased standard errors causing incorrect statistical significance inferences.

4.1.5 Methodology of regression analysis of correlation between fund costs and fund performance

To test the correlation between fund costs and fund performance, the study follows the approach of Bechmann & Rangvid (2007) and runs multiple multivariate cross-sectional dummy-variable regressions. The funds are divided into three groups according to the size of their costs, and the dummy variables then acts as explanatory variables by picking out each of these groups. Fund performance is considered the dependent variable, and represents average Sharpe ratio or average alpha of the fund for the investment horizon of consideration. As an example, for a study of the correlation between fund Sharpe ratio and fund ÅOP for an investment horizon of 7 years (2008-2014), the funds are sorted into equally sized groups according to the size of the funds' ÅOP. The Sharpe ratio considered is the 7 years Sharpe ratio, and the ÅOP categorization is based on fund ÅOP as of 2008. Had the study considered the same variables for an investment horizon of 5 years (2010-2014), the Sharpe ratio used would be a 5-year Sharpe ratio, and ÅOP categorizations would be based on the ÅOP as of 2010.

$$Performance_i = \delta_{above\ average} + B_1\delta_{average} + B_2\delta_{below\ average}$$

Equation 4.6

Source: Own contribution

As presented in Equation 4.6, the 'above average' cost group is selected as the intercept, and the two other groups are picket out by dummy variables that take the form of 1 if the fund is in the given cost group and 0 if it is not. The corresponding coefficients, B_1 and B_2, express the added/reduced value of each dummy variable to the expected performance relative to the intercept. In other words, the two coefficients express the relatively smaller/larger expected performance of funds that have average and below average costs, respectively.

The corresponding p-values of the coefficients are of great importance to this study seeing as they define the extent to which the difference in performance between high costs and low costs funds is statistically significant at a chosen significance level of a=0,05. Furthermore, in cases where the coefficients have a p-value in the range of 0,05 to 0,15 it is noted that these would be statistically significant if one were to accept a significance level of a=0,15.

To consider the robustness of the dummy-variable estimators, the regressions is tested for heteroscedasticity.[14] It is found that that the three year regression of ÅOP on performance shows signs of heteroscedasticity for both regressions on alpha and the Sharpe ratio. However, by correcting for this, the standard errors and corresponding p-values did not change to a degree that made the conclusions on the analysis change.

To study the correlation between alpha and fund costs, the alpha estimates of the entire sample is used as data. The use of regressed estimates as variables in subsequent regressions may cause methodological concern seeing as the regressed estimators carry statistical uncertainty that is not directly reflected in the estimator. Said differently, the alpha estimates found in this study are exact estimates of the alpha of the funds in the period of investigation, but the *true* alpha could be very different given the large standard deviation of many of the estimates. As such, a regression that includes alpha estimates may be incapable of providing results for wider applicability. That said, any academic study that considers alpha estimates as a variable in its regression ultimately suffers from this unavoidable methodological breach. In sum, the regressions of fund costs on the alpha of the fund provide valid estimates of the correlation presented in the sample. However, the applicability of these results for predictions about larger samples lacks credibility due to methodological limitations.

4.1.6 Test of a value premium

To test the extent to which value funds have outperformed other types of funds in the sample, the study again makes use of a multivariate cross-sectional dummy regression in which each dummy variable picks out the style/type of fund. The funds are categorized as follows: Firstly, the overall investment strategy of the fund is evaluated to determine whether the fund follows an active or passive investment strategy. This information can be derived from the fund's CI. Funds with a passive investment strategy are categorized as index funds. Funds with an active investment strategy are further sub categorized according to the funds' style.

[14] The regressions are not tested for autocorrelation because the regressions are panel data dummy variable regressions.

The style of the fund is found by the use of Morningstar's (2008) stylebox methodology in which an equity fund can either take the form of a value fund, a growth fund or a mix of the two. The categorization is based on the weighted average of the funds underlying assets, which are categorized by style based on five key-ratios: Projected earnings-to-price (e/p), book value-to-price (b/p), revenue-to-price (r/p), cashflow-to-price (c/p) and dividend-to-price (d/p). The larger each of these are, the higher the value-score of the stocks.[15]

As presented in Equation 4.7, the dummy variable that picks out growth funds is used as the intercept and the value fund and index fund dummy variables are explanatory variables.

$$Performance_i = \delta_{Growth\ fund} + B_1\delta_{value\ fund} + B_2\delta_{index\ fund}$$

Equation 4.7

Source: Own contribution, Fundcollect (2015)

The coefficients B_1 and B_2 quantify the better/worse performance of value funds and index funds, respectively, relative to growth funds. The associated p-value provides an indication of the extent to which a superior/worse performance of one group of funds has been statistically significant.

[15] For a detailed summary of the Morningstar Stylebox methodology, refer to appendix 8.1.1

4.2 Regression analysis and results

This section presents an empirical test of the hypotheses proposed in section 3. All presented empirical analysis is based on data of 117 Danish equity mutual funds that have been active during the entire period of investigation. The analysis considers three different investment horizons:

- 3 years (2012-2014)
- 5 years (2010-2014)
- 7 years (2008-2014)

To test the correlation between fund costs and fund performance, two different performance measures are applied; Sharpe ratio and Jensen's alpha. Accordingly, the following regression analysis is divided in two sections – one considering the Sharpe ratio as the key performance measure, and one considering Jensen's alpha as the key performance measure.

For further details on the data used and underlying methodological considerations of this empirical test, refer to section 4.1.

4.2.1 Sharpe ratio as a function of fund costs

The Sharpe ratio is a performance measure that seeks to quantify the excess risk-adjusted fund return, in which risk is measured by the standard deviation of the excess fund return.

Table 4.2 summarizes the average Sharpe ratio of all Danish equity funds and the corresponding standard

Sharpe ratio estimates summary

	3 years (2012-2014)	5 years (2010-2014)	7 years (2008-2014)
Average Sharpe ratio	1,65	0,94	0,43
Standard deviation	0,77	0,45	0,24

Table 4.2

Source: Own contribution based on data from Fundcollect (2015)

deviation. One may note that the average Sharpe ratios decrease the longer the investment horizon. This is largely explained by how the 5 year and 7 year investment horizon includes the later periods of the global financial recession and its aftermath in Europe that caused low returns and resulting low Sharpe ratios in equity markets in almost all parts of the world. The standard deviation of the Sharpe ratios should be expected to decrease the longer the period of investigation as the data is less sensitive to short-term changes in fund return or volatility in the long-run.

For a fund-specific representation of the top-5 best performing funds for each investment period, refer to appendix 8.1.2.

4.2.2 The correlation between ÅOP and the Sharpe ratio

To consider the relationship between ÅOP and fund performance, the funds in the sample were divided into groups of three by ÅOP for each investment horizon with an even amount of funds in each group. As an example, the 39 funds with the largest ÅOP in 2008 were categorized as 'above average' in the categorization for the 7-year investment horizon. Similarly, to consider a 5 year investment horizon, a new categorization was formed based on the funds' costs in 2010.

Table 4.3 presents the characteristics of each group for each period considered. Not surprisingly, all index funds fall in the 'below average' category for all years considered. Furthermore, important to note, the characteristics of each group stayed fairly similar in 2008, 2010 and 2012.

Fund categorization by ÅOP

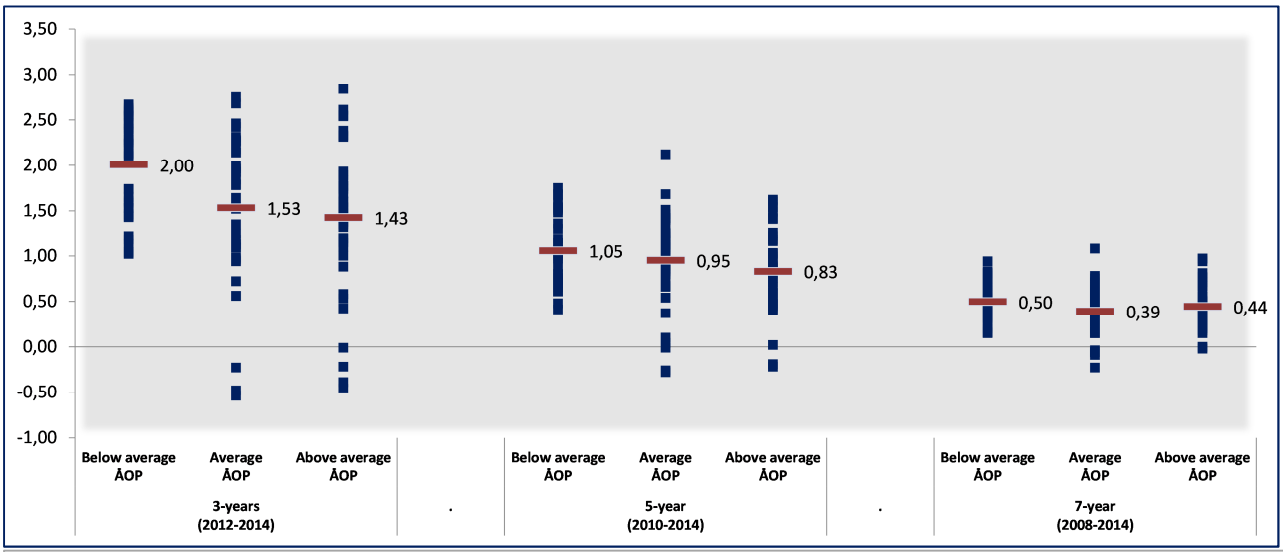
Categorization	ÅOP Range		Number of funds Active	Passive	Total
2008					
Above average	2,25% -	3,75%	39	0	39
Average	1,73% -	2,24%	39	0	39
Below average	0,56% -	1,72%	21	17	38
Total	**0,56%**	**3,75%**	**99**	**17**	**116**
2010					
Above average	2,22% -	3,52%	39	0	39
Average	1,77% -	2,22%	39	0	39
Below average	0,57% -	1,75%	21	17	38
Total	**0,57%**	**3,52%**	**99**	**17**	**116**
2012					
Above average	2,09% -	3,59%	39	0	39
Average	1,84% -	2,07%	39	0	39
Below average	0,58% -	1,84%	21	17	38
Total	**0,58%**	**3,59%**	**99**	**17**	**116**

Table 4.3

Source: Own contribution based on data from Fundcollect (2015)

Figure 4.2 and Table 4.4 plots fund Sharpe ratio against the fund's ÅOP cost-categorization for each

Sharpe ratios by ÅOP cost-group



Categorization	3 years		5 years		7 years	
	Average sharpe ratio	*Std. deviation*	Average sharpe ratio	*Std. deviation*	Average sharpe ratio	*Std. deviation*
Below average	2,00	*0,60*	1,05	*0,38*	0,50	*0,20*
Average	1,53	*0,81*	0,95	*0,51*	0,39	*0,27*
Above average	1,43	*0,81*	0,83	*0,44*	0,44	*0,25*

Figure 4.2 and Table 4.4

Note: Standard deviation represents the standard deviation of Sharpe ratios in each group
Source: Own contribution based on data from Fundcollect (2015)

investment horizon. For all three investment horizons, the average Sharpe ratio is considerably larger for the group of funds with below average ÅOP compared to those with above average ÅOP. Considering a 3 year investment horizon, low cost funds provided an average Sharpe ratio of 2,00 from 2012-2014 which is well in excess of the average Sharpe ratio of large costs funds of 1,43. In other words, the low cost funds' Sharpe ratio was 40 % higher than the large cost funds from 2012-2014. A Sharpe ratio of 2 suggests that the fund has generated a net return (net of the risk-free rate and net of costs) that is twice the size of the portfolio's standard deviation (net of the standard deviation of the risk-free rate). For the 5 year and 7 year investment horizon the same conclusion holds: The low costs funds did on average provide a better Sharpe ratio than the high cost funds. However, the difference in average performance of each cost group seems less strong, with the low cost funds outperforming the high costs funds with 27 % and 14 % larger Sharpe ratios for a 5 year and 7 year investment horizon respectively.

The standard deviations of the Sharpe ratios of each group are fairly large, which limits the statistical validity of the results. Thus, whereas these initial observations suggest a strong negative correlation between ÅOP and fund performance, the findings are subject to statistical uncertainty and are on their own incapable of providing confident conclusions.

A way to formally test the above findings, is to follow the approach of Bechmann & Rangvid (2007), and run multivariate cross-sectional regressions of fund Sharpe ratios on dummy variables that pick out each ÅOP cost group.

$$Sharpe\ ratio_i = \delta_{above\ average} + B_1\delta_{average} + B_2\delta_{below\ average}$$

Equation 4.8

Source: Own contribution

As presented in Equation 4.8, the 'above average' cost group is selected as the intercept, and the two other groups are dummy variables that take the form of 1 if the fund is in the given cost group and 0 if it is not. The corresponding coefficients, B_1 and B_2, express the added/reduced value of each dummy variable to the expected Sharpe ratio relative to the intercept. In other words, the coefficients express the relatively smaller/larger expected Sharpe ratio that comes with funds that have average or below average costs compared to the funds with above average costs.

Table 4.5 presents the results of the dummy variable regression for the three different investment horizons. The coefficient of the 'below average' dummy-variable is similar to the difference in average Sharpe ratio between the low cost and the high cost funds presented in Figure 4.2 and Table 4.4 above, and so these coefficient do not add anything new to the test. However, interestingly, the low p-value for the

'below average' coefficients in the 3 years and 5 years investment horizon suggests that these coefficient are statistically significantly different from 0 with a 95 % confidence level. Said differently, this provides empirical support for the notion that ÅOP was strongly negatively correlated with the Sharpe ratio of the fund in the 3 years and 5 years period of investigation.

Dummy variable regressions, ÅOP on the Sharpe ratio

			$\delta_{Below\ average}$		$\delta_{Average}$		$\delta_{Above\ average}$	
	Adj. R^2	F-value	Coefficient	p-value	Coefficient	p-value	Intercept	p-value
3 years (2012-2015)	0,091	6.74	0,58**	0%	0,11	53%	1,43**	0%
5 years (2010-2015)	0,025	2.5	0,23**	3%	0,12	23%	0,83**	0%
7 years (2008-2015)	0,014	1,81	0,05	34%	-0,05	35%	0,44**	0%

Table 4.5

Note: Two asterix (**) marks coefficient that are statistically significant at a significance level of a=0.05
Source: Own contribution, Fundcollect (2015)

As for the 7 year investment horizon, the positive coefficient of the 'below average' dummy variable shows that this group of funds in the sample on average have provided superior performance relative to the high cost funds. However, given the high p-value, this result was not statistically significant.

4.2.3 The correlation between sub cost items and fund performance

To test which of ÅOP's sub cost components that is driving the significantly negative correlation between ÅOP and fund performance, individual dummy variable regressions are run for each of the sub cost items following the same methodology as presented above. Administrative costs, direct trade costs and load costs are all included in the ÅOP and are regressed individually on the Sharpe ratio. On top of these sub cost items, a variant of the load costs – the load cost difference - is regressed separately. The load cost difference is defined as the difference between the front-end load costs and the back-end load costs.

The results of the individual regressions are summarized in Table 4.6. The positive coefficients related to almost all of the cost items for all three investment horizons suggest that smaller costs on average is associated with better fund performance in the sample of funds for all sub cost items. However, not all of these coefficients are statistical significant, and it is therefore important to consider the statistical significance of each cost-item in turn.

Administrative costs are strongly and significantly negatively correlated to fund performance for the investment horizons of 3 years given the positive coefficient of 0,47 for the low cost group of funds. However, for longer investment horizons the results were not significant. Direct trade costs seem slightly negatively correlated for longer investment horizons than 3 years, but were only statistically significant if one accepts a significance level of a=0.15. Finally, load costs carry the strongest explanatory effect among the considered sub cost items due to the large statistically significant coefficient of 0,78 of the low cost group of funds for a short investment horizon, and a smaller – but significant – coefficient for the 5 year investment horizon. However, the long-term results were not statistically significant for this cost item either. The variant of load costs, load cost difference, was insignificant for all three investment horizons.

Dummy variable regressions, sub cost items on the Sharpe ratio

			$\delta_{Below\ average}$		$\delta_{Average}$		$\delta_{Above\ average}$	
	Adj. R^2	F-value	Coefficient	p-value	Coefficient	p-value	Intercept	p-value
3 years (2012-2014)								
Adm. costs	0,048	3,87	0,47**	1%	0,19	25%	1,43**	0%
Direct trade costs	-0,010	0,44	0,07	69%	0,16	35%	1,57**	0%
Load costs	0,156	11,80	0,78**	0%	0,45**	1%	1,25**	0%
- Load cost difference	0,029	2,74	0,16	36%	-0,24	16%	1,68**	0%
5 years (2012-2014)								
Adm. costs	0,013	1,75	0,11	27%	-0,08	45%	0,93**	0%
Direct trade costs	0,004	1,24	0,16*	12%	0,06	56%	0,87**	0%
Load costs	0,053	4,24	0,28**	1%	0,21**	3%	0,78**	0%
- Load cost difference	-0,007	0,61	-0,01	96%	-0,10	33%	0,98**	0%
7 years (2012-2014)								
Adm. costs	0,029	2,72	0,03	54%	-0,09*	10%	0,46**	0%
Direct trade costs	0,045	3,71	0,09*	11%	-0,06	27%	0,43**	0%
Load costs	-0,001	0,94	0,07	20%	0,06	29%	0,40**	0%
- Load cost difference	-0,004	0,75	-0,03	59%	-0,07	23%	0,46**	0%

Table 4.6

Note: One asterix (*) and two asterix (**) mark coefficient that are statistically significant at significance levels of a=0.15 and a=0.05 respectively
Source: Own contribution, Fundcollect (2015)

4.2.4 Jensen's alpha as a function of fund costs

The alpha values of each fund were found by regressing the monthly excess return of the fund on the monthly excess return of the fund's benchmark. Table 4.7 presents the regression results for each investment horizon. Noticeably, on average, the funds in the sample did not provide a positive alpha in any of the three investment horizons. However, the alpha estimate for a majority of the funds are insignificant at a 5 % significance level suggesting that it cannot be rejected that the actual alpha of these funds is 0 %.

For a fund-specific representation of the top-5 best performing funds for each investment period, refer to appendix 8.1.2.

Jensen's alpha regression results

	3 years (2012-2014)	5 years (2010-2014)	7 years (2008-2014)
Regression results			
Average annualized alpha	-0,26%	-0,64%	-0,57%
Standard deviation	1,35%	1,37%	1,13%
Test of significance			
Sample size	117	117	117
Statistically significant alpha	17	19	15
Robust statistically significant alpha	15	18	13

Table 4.7

Source: Own contribution based on data from Fundcollect (2015) and Bloomberg (2015)

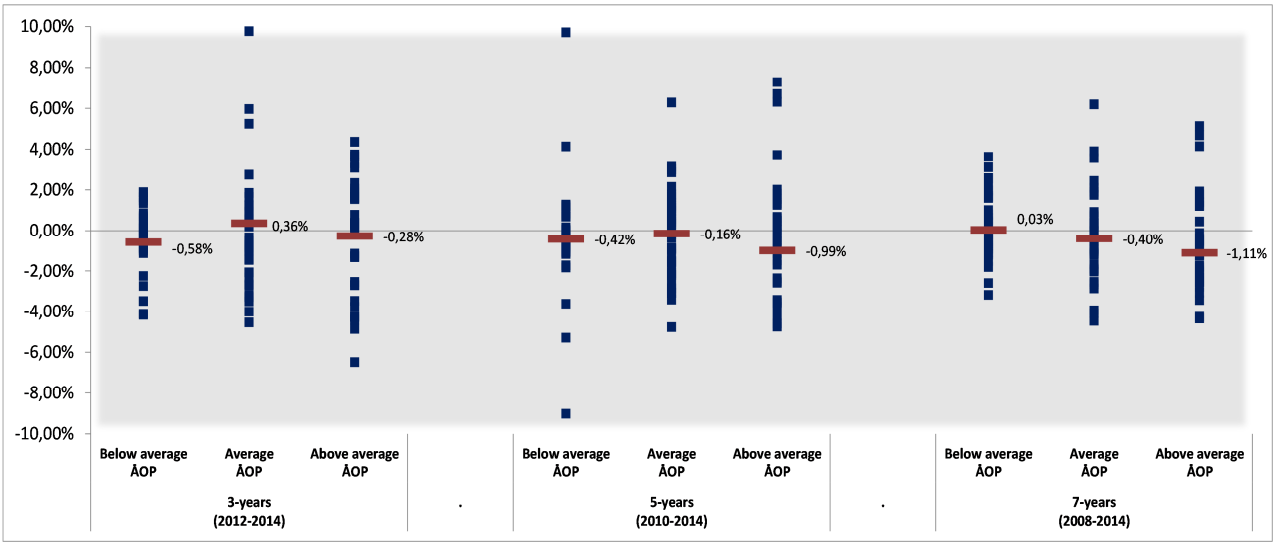
The correlation between ÅOP and alpha

Following the same approach as above, the correlation between ÅOP and alpha can first be illustrated by a data plot, which is later followed by a dummy variable regression.

The data plot in Figure 4.3 and Table 4.8 reveals that the relationship between ÅOP and fund alpha proves less clear than when comparing fund costs to the Sharpe ratio. In the 3 year investment horizon scenario, the plot indicates a slightly positive correlation between fund costs and its alpha in how the average alpha for the low cost group is 0,2 percentage points smaller. However, this relationship changes with the time horizon, and for the longer-term of 7 years the data suggests a negative relationship between fund costs and alpha in how the low cost group on average has provided an annualized alpha of 0,03 %, which is more than 1 percentage points better than the high costs funds.

Clearly, the large standard deviations again leave room for concern about the statistical significance of the results. However, one thing worth noting is that the standard deviation is significantly smaller for the low cost group of funds. This is hardly surprising seeing as index funds are widely represented in this group. These funds have a set goal of following their benchmark as tightly as possible with small deviations caused by fund costs. As such, it is an indirect goal of the index fund to have only small variations in its alpha

Annualized fund alpha by ÅOP cost group



Cost categorization by ÅOP	3 years		5 years		7 years	
	Average alpha	*Std. deviation*	Average alpha	*Std. deviation*	Average alpha	*Std. deviation*
	α	*σ*	α	*σ*	α	*σ*
Below average	-0,58%	*1,66%*	-0,42%	*2,54%*	0,03%	*1,54%*
Average	0,36%	*4,79%*	-0,16%	*2,23%*	-0,40%	*2,18%*
Above average	-0,28%	*5,99%*	-0,99%	*6,36%*	-1,11%	*5,49%*

Figure 4.3 and Table 4.8

Note: Standard deviation represents the standard deviation of alphas in each group
Source: Own contribution, Fundcollect (2015), Bloomberg (2015)

Running dummy regressions on above data reveals that a large part of the findings are not statistically significant (see Table 4.9). The previously presented positive correlation between ÅOP and alpha for a 3 year investment horizon is statistically insignificant and the 5 year investment horizon held insignificant results, too. For the 7 year investment horizon, the coefficient for the 'below average' costs group of funds is 0,108 %, and is statistically significant at a 0,15 significance level. The findings suggests that - with an 85 % confidence level - it could be suggested that out of sample data would provide a higher alpha for low cost funds than high cost funds in the7 year investment horizon. However, it should be noted that the p-value suggests some statistical risk that the actual alpha value of the low cost group funds is indifferent from the high cost group of funds. Furthermore, as noted in section 4.1, the validity of the p-value in these regressions may be limited given methodological breaches that come with using alpha values in subsequent regression analysis. Thus there only seems to be minor evidence of a negative correlation between fund alpha and ÅOP in the long-term.

Dummy variable regressions, ÅOP on alpha

			$\delta_{Below\ average}$		$\delta_{Average}$		$\delta_{Above\ average}$	
	Adj. R^2	*F-value*	Coefficient	*p-value*	Coefficient	*p-value*	Intercept	*p-value*
3 year (2012-2015)	-0,011	*0,39*	-0,00013	*88%*	0,00060	*50%*	-0,00038	*55%*
5 year (2010-2015)	-0,009	*0,47*	0,00064	*48%*	0,00084	*36%*	-0.00102*	*11%*
7 year (2008-2015)	0,001	*1,08*	0.00108*	*15%*	0,00069	*35%*	-0.00107**	*5%*

Table 4.9

Note: One asterix (*) and two asterix (**) mark coefficient that are statistically significant at significance levels of a=0.15 and a=0.05 respectively
Regression is based on nominal values of average monthly alpha.
Source: Own contribution, Fundcollect (2015), Bloomberg (2015)

The correlation between sub cost items and fund performance

For the 5 years and 7 years investment horizon, the sample of funds with low direct trade costs and low load costs, provided a better alpha on average than funds in the sample with large trade costs and load costs. On the other hand, funds in the sample with small administrative costs had lower alpha than funds with high administrative costs on average for all investment horizons. However, whereas these conclusion are valid for the sample of this study, none of them are statistically significant, and the validity of these findings is therefore limited.

Dummy variable regressions, sub cost items on alpha

			$\delta_{Below\ average}$		$\delta_{Average}$		$\delta_{Above\ average}$	
	Adj. R^2	F-value	Coefficient	p-value	Coefficient	p-value	Intercept	p-value
3 years (2012-2014)								
Adm. costs	0,014	1,84	-0,00041	64%	-0,00162	7%	0,00046	46%
Direct trade costs	-0,012	0,35	-0,00074	41%	-0,00032	72%	0,00013	83%
Load costs	-0,014	0,23	-0,00023	79%	-0,00060	50%	0,00006	92%
- Load cost difference	-0,017	0,06	0,00004	97%	0,00028	75%	-0,00033	60%
5 years (2010-2014)								
Adm. costs	-0,013	0,27	-0,00010	92%	-0,00062	50%	-0,00029	65%
Direct trade costs	-0,014	0,21	0,00042	65%	0,00056	53%	-0,00086	18%
Load costs	0,011	1,66	0,00085	35%	-0,00079	38%	-0,00055	39%
- Load cost difference	-0,006	0,64	0,00088	33%	-0,00002	98%	-0,00081	20%
7 years (2008-2014)								
Adm. costs	-0,009	0,46	-0,00065	39%	-0,00004	96%	-0,00025	63%
Direct trade costs	0,010	1,56	0,00094	21%	0,00126*	9%	-0,00121**	2%
Load costs	0,004	1,22	0,00094	21%	0,00107	15%	-0,00114**	3%
- Load cost difference	-0,008	0,52	0,00062	41%	0,00070	35%	-0,00091647*	9%

Table 4.10

Note: One asterix (*) and two asterix (**) mark coefficient that are statistically significant at significance levels of a=0.15 and a=0.05 respectively
Regression is based on nominal values of average monthly alpha.
Source: Own contribution, Fundcollect (2015), Bloomberg (2015)

4.2.5 Test of the existence of a value premium bias

To test for a value premium bias in the data, a dummy variable regression is constructed, so as presented in Equation 4.9 and Equation 4.10 below. Due to data limitation, the value premium bias is only tested for the 7 year horizon.

$$Sharpe\ ratio_i = \delta_{Growth\ fund} + B_1\delta_{value\ fund} + B_2\delta_{index\ fund}$$

Equation 4.9

Source: Own contribution, Fundcollect (2015)

$$Alpha_i = \delta_{Growth\ fund} + B_1\delta_{value\ fund} + B_2\delta_{index\ fund}$$

Equation 4.10

Source: Own contribution, Fundcollect (2015)

The regression results do not provide evidence of a value premium in Danish equity funds from 2008-2014. As presented in Table 4.11, the value coefficient is slightly negative for the alpha estimates, and slightly positive for the Sharpe ratio regression, however, none of these are statistically significant. A potential explanation for this could be that the period of consideration includes the financial crisis and its aftermath in which the value premium on stocks were negative in most developed countries.

Dummy variable regressions, type of fund on fund performance, 7 years (2008-2014)

	Index		Value		Growth	
	Coefficient	p-value	Coefficier	p-value	Intercept	p-value
Alpha estimates	0,00005	96%	-0,00034	63%	-0,00039	34%
Sharpe ratio	0,09	16%	0,02	65%	0,42**	0%

Table 4.11

Note: One asterix (*) and two asterix (**) mark coefficient that are statistically significant at significance levels of a=0.15 and a=0.05 respectively
Alpha regression is based on nominal values of average monthly alpha.
Source: Own contribution, Fundcollect (2015), Bloomberg (2015)

4.3 Summary of results

The objective of this section has been to empirically test the hypotheses proposed in section 0. Below is a summary of the findings.

Hypothesis 1,1

Hypothesis: All cost-items are negatively correlated to fund performance in Danish equity funds

Results of tests: **Hypothesis rejected**.

Detailed answer: Whereas the overall cost-indicator seemed to be strongly negatively correlated to the funds' Sharpe ratio, the same relationship did not hold true for its correlation to the funds' alpha. Furthermore, several sub cost items were not statistically significant for any of the performance measures,

suggesting that there is overarching chance that these cost items have only limited correlation to fund performance.

Hypothesis 2,1

Hypothesis: The correlation between Administrative costs in % of AUM and fund performance in Danish equity funds is ambiguous

Results of tests: **For a majority of the tests performed, the hypothesis could not be rejected**.

Detailed answer: The correlation between administrative costs and fund performance proved statistically insignificant for both performance measures for investment for the medium and long-term investment horizons. However, in the 3-year test of administrative costs correlation to Sharpe ratio it was evident that the funds with low administrative costs on average had performed significantly better than the group of funds with high administrative costs, achieving a Sharpe ratio which was 0,48 larger than the high cost group of funds. The difference was significant at a 5 % significance level.

Hypothesis 2,2

Hypothesis: Direct trade costs in % of AUM are not strongly correlated to fund performance, however, direct trade costs in % of trade volume is negatively correlated to fund performance in Danish equity funds

Results of tests: **The hypothesis could not be rejected.**

Detailed answer: Regressions on the correlation between direct trade costs as % of AUM and the Sharpe ratio for investment horizons of 5 years and 7 years hinted to the existence of a negative relationship between direct trade costs and fund performance. In the sample, the funds with low direct trade costs had, on average, performed better than those with high trade costs for both investment horizons. However, these findings were only statistically significant at a 15 % significance level, and so it could not be rejected that direct trade costs were only neutrally correlated.

Due to data limitations, it has not been possible to test the correlation between direct trade costs as a % of trade volume and fund performance.

Hypothesis 2,3

Hypothesis: *Load costs are negatively correlated to fund performance in Danish equity funds. Furthermore, by considering front end load costs – back end load costs, the correlation to fund performance turns stronger and more negative.*

Results of tests: **Hypothesis partly rejected**

Detailed answer: Load costs were strongly and statistically significantly negatively correlated to funds' Sharpe ratio for the 3 and 5 years investment horizon. For the 3 year investment horizon, funds with low load costs did on average have a Sharpe ratio that was 0,73 larger than the Sharpe ratio of funds with high load costs. This result suggests that the load costs is the single sub cost item with the strongest correlation to the Sharpe ratio. However, the evidence was not statistically significant for the 7 year investment horizon or for alpha estimates. In sum, this part of the hypothesis could not be rejected. The load cost difference was not a statistically significant variable in any of the regressions, and so the part of the hypothesis relating to this variable can be rejected.

Hypothesis 2,4

Hypothesis: *ÅOP is negatively correlated to fund performance*

Results of tests: **Hypothesis could not be rejected**

Detailed answer: The regressions of fund costs on Sharpe ratio suggested a strong negative correlation between ÅOP and Sharpe ratio for the 3 and 5 year investment horizon. For the 3 year investment horizon, the Sharpe ratio 0,58 larger for funds with low ÅOP compared to funds with high ÅOPs. However, the results were insignificantly different from zero for the 7 year investment horizon. Somewhat opposite, the regression of ÅOP on alpha only showed signs of a statistically significant negative correlation for the 7 year investment horizon. However, these results could only be accepted if accepting a significance level of 15 %. In sum, the validity of hypothesis 2,4 is highly sensitive to the choice of investment horizon and performance measure.

5 Conclusion

This study analyzed the correlation between fund costs and fund performance in Danish equity funds by firstly discussing the expected correlation between the two from a theoretical perspective, and subsequently testing this empirically.

In the discussion of the expected correlation between fund costs and fund performance it was argued that the validity of the efficient market hypothesis is of great importance to expectations about the correlation between fund costs and fund performance. If one accepts the strong version of the EMH, the correlation between fund costs and fund performance should be expected to be negative for all fund cost components. On the other hand, if one accepts the weak version of the EMH or argues that markets are inefficient, expected correlation depends on a number of characteristics such as the type of cost in question, the skill of the portfolio manager, the style of the fund and the extent to which the fund suffers from agency problems.

The findings of the discussion led to five hypotheses on the expected correlation between individual cost items and fund performance. A majority of the cost items were expected to be negatively correlated to fund performance, primarily driven by a negatively expected impact of distribution costs, and the risk of potential agency problems in high-cost funds. However, it was noted that *de facto* some degree of 'bundling of costs' exists in Danish mutual funds that may blur the direct effect of each sub cost item.

The five hypotheses were tested empirically by the use of two different performance measures, the Sharpe ratio and Jensen's alpha, for 3 different investment horizons. The empirical findings proved to be sensitive to the choice of performance measure and to the chosen investment horizon.

Regressing fund Sharpe ratio on fund cost items provided a statistically significant negative correlation between fund performance and fund ÅOP in the short-term and medium term. The negative correlation in the short investment horizon seemed strongly driven by a significantly better performance of funds with low administrative costs and low load costs relative to high cost funds. In the medium term, funds with low direct trade costs and low load costs outperformed higher cost funds. For the long-term investment horizon, the correlation between fund Sharpe ratio and fund costs was ambiguous.

Regressing fund alpha estimates on fund costs provided less conclusive results. In the short-term, low cost funds in the sample had performed worse than high cost funds. In the medium and long-term, the opposite was true: Low cost funds in the sample had performed better than high cost funds. However, none of the

statistics were statistically significant suggesting that these findings do not necessarily apply to out of sample data.

To sum up, this study has provided some degree of empirical support for the notion that fund costs are negatively correlated to fund performance in Danish equity funds. The reason for this negative correlation is believed to be a result of several different contributing factors such as the negative effect of distribution costs on fund performance, and potential agency problems that may be leading to excess costs in some Danish mutual funds. An alternative interpretation of the results could be that high cost funds on average are incapable of beating low cost funds because equity markets large are efficient, and so the high cost funds are wasting investors' money on active portfolio management of no use. Noticeably, the expected value premium bias in the data proved not to be present.

The above findings are based on estimates of the average performance of large groups of Danish equity funds. The performance of each individual Danish equity fund was not analyzed, and so it could be that some high cost funds have persistently outperformed the market, and will continue to do so in the future. In other words, the findings do not suggests that an investor looking to invest in Danish equity funds *always* should prefer the low cost fund over the high cost fund. If the investor is capable of picking individual funds that are expected to outperform other funds in the future, the relative cost of this fund should be of minor interest to the investor. However, the investor that accepts his limited capability of predicting future fund performance may strongly benefit from choosing funds of low costs. Truly, this conclusion goes well in line with the thinking of Warren Buffet (2014), one of the most successful active portfolio managers in the world:

"The goal of the non-professional should not be to pick winners – neither he or his "helpers" can do that – but should rather be to own a cross section of businesses that in aggregate are bound to do well. A low-cost S&P 500 index fund will achieve this goal"

6 Suggested future research

The regression analysis suggested that the results of this study were very sensitive to the choice of performance measure. It could be interesting to consider whether the results would change if one were to use the Fama & French 3-factor model or Carharts 4-factor model. Both of these have a different view of measuring risk, which could have a strong impact on the findings.

Due to data constraints, the correlation between fund performance and direct trade costs in % of total transaction size was not tested. However, it was hypothesized that such an estimate would be a strong indicator of fund performance. It would have been interesting to see if this hypothesis proved true if tested empirically. Furthermore, data on distribution costs have not been available. Again, it was hypothesized that this cost item is of great importance to fund performance, but the hypothesis remains to be confirmed/rejected empirically.

Finally, the analysis touches upon potential agency problems in Danish equity funds, but does not specifically test for the effect of such problems on fund performance. This would could potentially be a very interesting topic for future research.

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8 Appendix

8.1.1 Morningstar Style Box methodology – Value, core and growth.

Value-score for stocks

Categorization is based on the following five key-ratios: Projected earnings-to-price (e/p), bookvalue-to-price (b/p), revenue-to-price (r/p), cashflow-to-price (c/p) and dividend-to-price (d/p). The higher each of these values are, the higher the value-score of the stocks.

Finally, after having calculated all scores, a weighted average Overall Value score is calculated. The e/p is considered the most important ratio, and accounts for half of the score if available. The other ratios are weighted equally.

Growth-score for Stocks

A stock's growth orientation reflects the rates at which its earnings, book value, revenue, and cash flow are expected to grow. The higher the projected growth rate, the higher the growth-score.

Categorizing stocks – the stock's Net Vale-Core-Growth (VCG) score

If the stock's value-score is significantly higher than its growth-score, the stock is categorized as a value stock. The opposite applies if the growth-score is significantly higher. If there is no significant difference in score between the two for the stock in question, the stock is categorized as "core". Core, in other words, suggests that the stock is a mix of value and growth.

Categorizing mutual funds

Simply the weighted average of the VCG score of all stocks in the mutual fund's portfolio. Weights are based on how much of the fund's total assets that have been invested in the stock in question.

Source: Morningstar (2008)

8.1.2 Top 5 best-performing equity funds

Top 5 equity funds by Sharpe ratio

Ranking	3 years (2012-2014)		5 years (2010-2014)		7 years (2008-2014)	
	Fund	Sharpe ratio	Fund	Sharpe ratio	Fund	Sharpe ratio
1	Nykredit Invest Globale Aktier SRI	2,84	Nordea Invest Stabile Aktier	2,12	Nordea Invest Stabile Aktier	1,08
2	Nordea Invest Stabile Aktier	2,75	Sparinvest INDEX USA Growth	1,75	ValueInvest Danmark, Blue Chip	0,97
3	Nordea Invest DK aktier fokus	2,68	Danske Invest USA	1,68	ValueInvest Danmark, Global Akk.	0,97
4	Danske Invest USA	2,67	Jyske Invest USA Aktier	1,68	Sparinvest INDEX USA Growth	0,94
5	Sparinvest INDEX USA Value	2,63	SEBinvest Nordamerika Indeks	1,67	ValueInvest Danmark, Global	0,94

Table 8.1

Source: Own contribution based on data from Fundcollect (2015)

Top 5 equity funds by annualized alpha

Ranking	3 years (2012-2014)		5 years (2010-2014)		7 years (2008-2014)	
	Fund	Alpha	Fund	Alpha	Fund	Alpha
1	Maj Invest Value Aktier	17,84%	Maj Invest Value Aktier	9,71%	BIL Nordic Invest Danske Small Cap aktier	11,40%
2	Carnegie WorldWide/Globale Aktier	15,61%	BIL Nordic Invest Danske Small Cap aktier	7,28%	Nordea Invest DK aktier fokus	6,19%
3	Handelsinvest Verden	14,12%	SEBinvest Europa Small Cap	6,27%	Nordea Invest Stabile Aktier Akk	4,67%
4	SEBinvest Europa Small Cap	12,04%	Nordea Invest DK aktier fokus	3,80%	Carnegie WorldWide/Danske Aktier	3,56%
5	Nordea Invest DK aktier fokus	5,23%	Handelsinvest Norden	3,71%	Nordea Invest Danmark	2,56%

Table 8.2

Note: All alpha-estimates are annualized and are statistically significant at a significance level of a=0,05
Source: Own contribution based on data from Fundcollect (2015) and Bloomberg (2015)