The older the fiddle, the sweeter the tune?

A study of the relationship between age and performance of actively managed Nordic equity mutual funds

By

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Abstract

This paper studies the relationship between the performance and the age of equity mutual funds in the Nordics. This is an important question because most institutional investors require funds to have existed for at least two to three years before investing in them. This requirement exists even though the performance of very young funds compared to older funds has not been extensively studied and lacks consensus. It could be that the requirement comes at a cost of worse performance. We show that the prerequisite is unwarranted as the risk-adjusted returns for funds younger than three years do not differ from the risk-adjusted returns of older funds. Nor do we find any evidence for lower standard deviation or higher cumulative returns among funds that are older than three years.

Despite the seeming lack of support for requiring funds to be three years or older before investing in them, the criterion still exists. Thus, we propose that qualitative factors, such as the principal-agent conflict between investors (want high risk-adjusted returns) and fund managers (want to keep their jobs) might have better success in explaining the prevalence of the criterion and that future research should approach the subject from this perspective.

Dedication and acknowledgements

We want to thank friends and family for lending us support throughout the thesis - no one mentioned, no one forgotten. We also want to thank our supervisor Assistant Professor Cristian Huse for helpful guidance and useful remarks.

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Chapter 1

Introduction

1.1 Introduction

1.1.1 Background

This study will examine the relationship between fund age and performance. While many studies have been conducted on fund performance in general, the relationship between fund age and performance is still a fairly novel area of study. Various types of investors demand several years of track record as a fundamental prerequisite before investing (this is supported by anecdotal evidence, and further strengthened by e.g. Morningstar not rating a fund until it has at least three years of performance history). Considering this, it is interesting to examine if the investment criteria has merit to it. Do funds that are older actually yield better risk-adjusted returns than new funds? If newer funds are found to outperform older funds, the investment criteria of solely investing in funds that have existed for several years would be ill-advised.

Deciding where to invest capital is a very important question both for individuals as well as society. Many studies have been conducted regarding funds' performance; on one side, there are studies that support the efficient market hypothesis which asserts that investors cannot outperform the market (and thus the fund age should not matter), on the other side there are studies that lend support to the notion that there are ways to consistently outperform the market. The topic has been of major interest to many academics and investors over last decades.

Given the recent discourses and debates in the Nordics regarding funds' performance, risk-levels, integrity and excessive management fees, funds' performance is a hot topic. As the integrity of many funds is scrutinised, investors are looking for objective metrics to make their investment decisions. One logical benchmarking measure is the track record of funds; the funds that have persisted for a longer time ought to be a safer bet than newly created funds with no track record, as they have stood the test of time. In this study, we will examine whether data supports this hypothesis.

1.1.2 Aim

The aim of this study is to evaluate whether there is a relationship between age and risk-adjusted returns in actively managed Nordic equity mutual funds to determine the soundness of having a minimum fund age as an investment criteria.

1.1.3 Research question

Do Swedish active funds that have existed for a longer time (i.e. have a longer track record) have a higher risk-adjusted return than younger funds? As risk-adjusted returns is related to absolute performance and risk (i.e. standard deviation), these two metrics will be examined as well.

1.1.4 Delimitations

The equity mutual funds used in the study are all domiciled in Sweden, Finland, Norway or Denmark. In this study this geographical area, i.e. Nordics excluding Iceland, will be referred to as the Nordics.

The focus of this study is the relationship between age and performance. Adjacent areas of study include performance persistence and the relationship between fund characteristics and performance. Although these topics will be discussed, it is only out of necessity, to set the appropriate framework surrounding the question of age and performance.

The question of pre- and post-expense performance of active managers compared to passive management will not be examined further than what is needed to set the theoretical framework.

1.1.5 Definitions

Market efficiency: The market efficiency hypothesis (EMH) asserts that securities' market prices reflect all the available and relevant information, thus stating that it is impossible for investors to outperform the market as all information already is reflected in the securities' prices.

Alpha: Alpha, also called overperformance and excess returns, is a measure of performance on a risk-adjusted basis. Alpha is the excess return over the predicted return according to an equilibrium model such as the capital asset pricing model on a security or portfolio.

CHAPTER 2

PREVIOUS LITERATURE

This literature review aims to describe and comment on the findings of fund characteristics that are of importance when studying fund age and performance. The existing literature is split into two main areas: performance persistence and the effect of various characteristics on fund performance.

2.1 Previous studies

2.1.1 Performance persistence

The relationship between performance and persistence is interesting to examine because it is possible that a correlation between performance and age is found. However, this correlation would not necessarily imply causality between performance and age because if performance persistence exists; the funds that have performed well are more likely to remain, while poor performing funds would be more likely to drop out. In this story, age would not be the driving performance factor due to survivorship bias. Thus, it is important to investigate if performance persistence exists, to make sure that results regarding fund age and performance are not actually the sole effect of performance persistence leading to survivorship bias among older funds.

Several previous studies have found that funds' prior performance cannot predict the funds' future performance. One of the earliest mutual funds studies was conducted by Treynor (1965) and found no support for performance persistence. Drawing on Treynor's results, Sharpe (1966) studied the risk-adjusted returns of 34 open-end mutual funds from 1954-63 and found that a fund's performance was positively correlated to volatility and that "there is no assurance that past performance is the best predictor of future performance" (p.127).

Jensen (1968) confirmed Sharpe's results by examining the performance of mutual funds in the period 1945-1964. The study, based on 115 open end mutual funds, both found that the funds on average were not able to earn higher risk-adjusted returns than index, and that there is little proof that any individual fund significantly could outperform a randomly selected fund. These studies lend support to the efficient market hypothesis, suggesting that a fund manager is not able to systematically outperform the market portfolio on a risk-adjusted basis. Thus, the conclusions of these studies formed the framework for a new paradigm which essentially all ensuing studies of mutual funds have been benchmarked against.

However, these studies have been disputed by several economists. McDonald (1974) studied the monthly performance of 123 American mutual funds between 1960-69 to evaluate their risks and returns. McDonald found that the mutual funds' performance implies "success in stock selectivity or market timing" (p.324).

Grinblatt and Titman (1989) compared abnormal returns of active and passive funds. In contrast to previous studies, Grinblatt and Titman used a sample of mutual funds not subject to survivorship bias from 1975-84. The funds' gross returns were estimated through the quarterly holdings and were used alongside with the funds' net returns. This enabled Grinblatt and Titman to measure whether abnormal performance existed. The study indicated that the gross returns of

some funds on a risk-adjusted basis were significantly positive and that "there is evidence that this measured performance is at least partly generated by active management of the funds" (p. 394-395).

However, the study did not provide information regarding whether a fund's past performance is an important factor when deciding which fund to invest in. Consequently, Grinblatt and Titman examined the relation between past and future performance in a study 1992 by examining a sample of 279 mutual funds' performance from 1974-84, by using an extension of Jensen's performance measure from 1968 (p.1979). Their results indicate "that there is a positive persistence in mutual fund performance" (p.1983).

A similar study by Hendricks, Patel and Zeckhauser (1992) supports that specifically the most recent past performance is the most important indicator for future performance. Hendricks, Patel and Zeckhauser (1993) reaffirmed these results by finding that funds' performance persistence is "predominantly a short-run phenomenon" (p.94). Moreover, Goetzmann and Ibbotson (1994) also found that a fund manager's track record could provide information regarding future performance.

Thus, the previously accepted paradigm of the efficient market hypothesis from the early 1970s clearly became disputed by the early 1980s.

However, several later studies have reaffirmed the original conclusions of the studies conducted in the 1960s. Elton et al. (1993) showed that Ippolito's earlier study from 1989, which found that "mutual funds earned a positive alpha before load charges" contained benchmarking errors. Thus, after adjusting for errors and biases, Elton et al. found that Ippolito's findings are reversed, consequently providing support to the market efficiency hypothesis.

Malkiel (1995) found, by studying mutual fund returns from 1971-1991, that there is no reason "to abandon a belief that securities markets are remarkably efficient." Similarly, Carhart (1997) when studying 1,892 American equity mutual funds from 1962-93, found evidence consistent with the market efficiency hypothesis (p.80).

Clearly, it is hard to draw an accurate conclusion of performance persistence based on previous studies as they have shown conflicting conclusions. There are many plausible reasons that might explain these contradictions. One explanatory variable might be survivorship bias as some studies do not take into account that well performing funds are the ones that prevail, thus mistaking that a track record per se can provide information about future performance.

Moreover, benchmarking errors and biases can explain why previous studies have shown opposing

conclusions. Using different benchmarks as market return proxies have effect on the results. For instance, using the Standard and Poor's 500 index as a benchmark will cause bias towards small cap funds as the Standard and Poor's 500 index is a large market-cap index. Ippolito (1989) found that active mutual funds performed better than index funds on a risk-adjusted basis. However, Elton et al. (1993) showed that Ippolito's result stemmed from an incorrect benchmark as well as data errors that led to bias. Further benchmarking errors include estimating alpha through a single benchmarking model since the funds that are analysed may be heterogeneous.

Benchmarking biases can be derived from several factors. For example, financial models such as the capital asset pricing model and the four-factor model might not consider all risk factors attributable to a fund, possibly engendering false risk-adjusted performance persistence as all risk factors are not adjusted for.

Furthermore, the number of fund specific factors used in the regressions can cause the contradictory conclusions. It is important to examine several factors simultaneously in the regression to fully determine the drivers behind a fund's performance. However, using too many variables in a regression also poses a problem as it leads to multicollinearity.

2.1.2 Size effect

The relationship between the size of investments and performance is of interest in this study. If there is a relationship, e.g. if funds that invest in large cap stocks perform worse on a risk-adjusted basis than other funds, this would have to be controlled for, as there is a positive correlation between fund age and size of investments. Otherwise, an ostensibly negative correlation between fund age and performance might in reality be caused by size differences.

Previous studies concerning the relationship between small-, mid- and large cap investing and performance are numerous. Stocks with larger market capitalisation have been shown to have lower average risk-adjusted returns than small- and mid-cap stocks by many studies (e.g. Banz (1981), Basu (1983), Fama and French (1992, 1996) and Daniel and Titman (1997). For example, Daniel and Titman (1997) found that the return premium for the smallest quintile of equities over the largest quintile is 30-50 basis points per month. Banz (1981) found that small NYSE firms have had significantly larger risk-adjusted returns than large NSYE firms over a forty-year period, and this effect is most pronounced for the smallest firms in the sample. The explanation for this effect is however not determined, and Banz is open for both the interpretation that size is a factor and that size is a proxy for one or more true but unknown factors correlated with size.

Dahlquist, Engstrom and Soderlind (2000), in a study of Swedish equity mutual funds' per-

formance during 1993-1997, found that mutual fund size has a strong and robust negative relation to the funds' performance. Implementing a trading strategy of buying all large Swedish equity mutual funds and selling the small ones generated an underperformance of 2.33% per year during the time period. The proposed explanation for this is that funds that are relatively large compared to their respective markets may simply be too large to adopt aggressive trading strategies. The theory of diseconomies of relative scale is validated by the observation that the underperformance is less pronounced/disappears when small and medium-sized equity funds are compared. Furthermore, for money market funds that in general are small compared to the relevant markets, larger funds instead have a weak positive correlation with performance - which is attributed to economies of scale in fund management. As smaller mutual funds on average invest in smaller companies, the results complement previous studies (Banz, Titman) that have shown underperformance of larger stocks.

In the debate about the size effect on performance, there are other results that oppose the previously described paradigm. Carhart (1997), Grinblatt and Titman (1994) and Prather, Bertin and Henker (2004) found that there is no correlation between fund performance and fund size. Grinblatt and Titman find that, when analysing the monthly returns of 279 mutual funds and 109 passive portfolios between 1974 and 1984, the size of the funds do not affect the risk-adjusted returns. Grinblatt and Titman (1992) suggest that studies of the size effect suffer from benchmark biases. For example, CAPM and ATP-based benchmarks favour small capitalisation and high dividend-yield stocks, leading to that small-firm funds and dividend-oriented funds may appear to outperform other funds due to the benchmark biases.

2.1.3 Manager tenure

If manager tenure has implications for fund performance, this would have implications for the study of fund performance and fund age as manager tenure and fund age are positively correlated, and thus should be controlled for.

In a study performed on 530 mutual funds' performance between 1988 and 1990, Golec (1996) found that tenure and alpha are strongly positively related, indicating that experience pays and perhaps that poor performers are quickly eliminated. The short time period studied mitigates the effect of survivorship bias. More specifically, Golec found that managers younger than 46 years old with tenure of more than 7 years and MBA degrees had the best risk-adjusted performance. Per the study, an additional year of tenure leads to a direct 0.165 increase in annual alpha. Different proposals are put forward as the explanation for the tenure's positive correlation with excess returns. For example, tenure is negatively related to expense ratio and negatively related to number of trades (keeping transaction costs low). Further, tenure measures the manager's survivorship at the job. Golec writes: "Long tenure may imply greater job security, and hence, less

short-run behaviour by the manager." Prather et al. (2004) studied the performance of over 5,000 equity funds during the period 1996-2000. They find that the coefficient estimates for tenure are positive when regressing on alpha, but the coefficient is not statistically significant. The study thus complements Golec's study, but does not find nearly as strong correlations between tenure and performance as Golec did.

Other studies show very slight evidence consistent with skilled or informed mutual fund managers. Carhart (1997) found very little support for informed mutual fund managers. The only result regarding manager skill is not robust to model misspecification, and overall the evidence is consistent with the market efficiency hypothesis. Instead, Carhart found that investment costs (expense ratios, transaction costs and load fees) account for almost all the important predictability in mutual fund returns.

2.1.4 Expense ratio

The expense ratio is negatively related to fund age (e.g. Golec 1996). Due to this, the variable is interesting when the relationship between fund age and performance is being studied.

Sharpe (1966) studied the performance of 34 mutual funds 1954-1963. In the study, he found that good performance is associated with low expense ratios. Sharpe found that differences in performance to a major extent can be explained by differences in expense ratios and transactions costs. This is in a sense a support of the efficient market hypothesis, where skill is not a factor in investment: rather the fund managers that can keep the costs (e.g. expense ratio) low are the managers that perform well. Golec (1996) found that the coefficient for expense ratio on risk-adjusted performance is negative, but statistically insignificant.

Carhart (1997) found that buying last year's top-decile mutual funds and selling last year's bottom-decile funds yields a return of 8 percent per year. Of this spread, expense ratios explain 0.7 percent (transaction costs 1%, differences in the market value and momentum of stocks 4.6%). In the study, he found that expense ratios are significantly and negatively related to performance. Carhart also found that large management fees do not necessarily imply poorer performance, indicating that large management fees can signal superior investment skill.

2.1.5 Age effect

Older fund age indicates that the fund has succeeded in the past, implying manager's ability and good performance. One may argue that older funds should perform better as young funds might face some learning costs in the beginning. One could also argue that young funds will be more alert and nimble, which could lead to better returns. Bauer, Koedijk and Otten (2002) found that younger funds underperform, with the explanation that they are subject to higher market

risk as they are less diversified at the beginning of the investment period. Opposing this view, Otten and Bams (2002) found a negative relation between age and performance. Carhart (1997) found that fund age is negatively correlated to excess returns (but this is statistically insignificant). Prather et al. (2004) found no relationship between fund age and risk-adjusted performance.

In summary, the evidence for the relation between fund age and performance is mixed and there are plausible reasons for both positive and negative correlation between fund age and performance.

CHAPTER 3

METHODOLOGY

Data on Nordic equity mutual funds was collected from Thomson Reuters Datastream, the funds' annual reports and Morningstar. After the data collection- and preparation was done, regressions were run to determine the relationship between the dependent variables risk-adjusted returns, cumulative performance and monthly standard deviation and the independent variables expense ratio, fund age, manager tenure and size of fund investments.

3.1 Data collection

This study uses data on equity mutual funds collected mainly from Thomson Reuters Datastream, accessed via Stockholm School of Economics e-resources. Datastream aggregates data regarding performance, fund age, expense ratios and much more on mutual funds. Further, specific fund characteristics such as manager tenure were retrieved from the respective funds' websites and annual reports. Manager tenure was difficult to get historical information on and thus manager tenure was only retrieved for circa half of the funds studied, and only for some of the time periods. The effect of manager tenure on fund performance is studied for the available data, to examine the importance of this variable.

The fund performance data on a monthly basis was collected from Datastream.

The mutual funds used in the study are all domiciled in Sweden, Finland, Norway or Denmark. The reason for this is that these are the funds that exhibit the geographic investment criteria that are used in the study: At least 50% of the investments should be in the Nordics and at least 85% of the investments should be in the Western world. The reason for the geographic criteria is that these investments are subject to similar risk exposures and thus are more comparable than for example a Southeast Asian-oriented fund and a North American-oriented fund. The reason for not applying even stricter criteria (for example 90% Nordic investments) is that this reduced the sample size very significantly. It was a trade-off between a clean and a large data set.

The passively managed mutual funds (index funds) were manually removed from the data set, through checking the fund's annual report and Morningstar for fund profile. Furthermore, non-mutual funds such as hedge funds, funds of funds and exchange traded funds were removed.

A criterion of having at least 80% invested in equities was used, as other asset classes provide different return characteristics. Thus, fixed-income, money-market- and multi-asset mutual funds were removed from the data set. The data on investment per asset class was collected from Morningstar and the fund's annual reports. As with the geographic criteria, a stricter criterion could be used (e.g. having 100% in equities) but this would reduce the sample size significantly.

The size of the mutual fund's investments is categorised as small and large cap, as the two groups of funds show different return characteristics. Inspired by Morningstar's style box that defines large cap stocks as the group that accounts for the top 70% of the capitalisation of each geographic area, mid cap the next 20%, and small cap stocks the last 10%, an asset-weighted average of the underlying stocks' size scores is used to create the overall fund score. The difference between our categorisation and Morningstar's style box is that small cap and mid cap

stocks are grouped together as small cap (i.e. last 30% of market cap) and large remain large cap (i.e. largest 70% of market cap in geographic area) in our categorisation. The reason for our changed split is twofold: to get a larger sample size of small cap funds, and that the size effect is most pronounced for very small- contra very large stocks (and there seems to be no significant difference between small- and mid-cap stocks (Dahlquist, Engstrom and Soderlind) (2000)). As Morningstar's classification was partly used, only funds that were listed on Morningstar's website were used (which was a small restriction, as the Morningstar's website had very broad coverage).

The funds that did not have a performance record for the whole five-year period were removed. Thus, the time period used has implications for the extent of survivorship bias in the data. The longer the time period, the larger the survivorship bias, as more funds will be eliminated from the data set.

Mutual funds that were inactive today, but had been active for at least one full five-year period, were kept in the data set, to mitigate survivorship bias.

3.2 Data preparation

Having obtained the funds' performance and the data on fund characteristics, the performance of the funds was split into four five year periods: 1997-2002, 2002-2007, 2007-2012 and 2012-2017. The reason for why 1997 was chosen as the starting period is that before that, there were few equity mutual funds in the Nordics and the sample size for small Nordic funds 1992-1997 was very small. The time period five years was chosen because it was deemed an appropriate time to measure performance. Five is in some sense an arbitrary number: three, four, six or seven years could also have been chosen. 3-7 years is the standard time frame to evaluate fund performance in studies - shorter time periods might not give the fund enough time to show performance, and longer time periods would have led to a higher risk that the initial fund characteristics (e.g. age, expense ratio) would not be relevant for the whole time interval (e.g. a fund with an age of two years at the beginning of a 10-year period will be twelve years at the end of the period).

Using different time periods over a long time interval has the benefit of spreading out the effects of different substantial market events that otherwise could skew the results in favour of specific types of funds. For example, our time periods cover the global stock market cash flash in October 1997, the dot-com bubble in 2000, the September 11 attacks in 2001, the financial crisis of 2007-2008 and the European sovereign debt crisis in 2010.

The funds' ages at the start of each time period was calculated. The cumulative performance (in %) of the funds was calculated as:

$$\frac{(Price\,of\,fund_t) - (Price\,of\,fund_{t-1})}{(Price\,of\,fund_{t-1})} \tag{3.1}$$

Where t is the time at the end of a time period of five years and t_{-1} the beginning.
The monthly standard deviation of the funds was calculated. Then, the risk-adjusted return measure was calculated as:

$$(Risk-adjusted\,return) = \frac{(Cumulative\,performance)}{(Monthly\,standard\,deviation)} \tag{3.2}$$

The fund size metric (large versus small cap) was transformed into a dummy variable, where the value 1 indicated large cap. Fund age (in years), expense ratio (in percentage of assets under management) and manager tenure (in years) were used as standardised variables, and calculated at the beginning of each time period. Fund age was also transformed to dummy variables, where 0-3 years and 3+ years were the two categories, and fund aged 0-3 years were given the dummy value 1, to see if there was a difference between very young funds and older funds.

Descriptive statistics of the funds used in the study can be seen in Table 3.1. More descriptive statistics on the data of the funds in different time periods can be found in the appendix.

Descriptive statistics of the data used in the study

	Small cap	Large cap	All
Funds	62	108	170
Age	8.911	9.590	9.351
Performance (5 year cumulative)	77.711%	40.143%	53.317%
Monthly std.dev	5.725%	5.147%	5.334%
Risk-adjusted returns	17.351	9.288	12.116
Expense ratio	1.465%	1.206%	1.296%
Management tenure (years)	4.460	3.715	4.018

Table 3.1: Descriptive statistics of the data used in the study.

As can be seen in Table 3.1, the funds' ages seem to be similar for small- and large cap mutual funds (8.911 and 9.590 years, respectively). Small cap stocks seem to have significantly higher performance than large cap stocks, 77.711% versus 40.143%, which is in line with theory. This higher absolute performance seems to come at the cost of a higher risk, as standard deviation is 5.725% for small cap funds and 5.147% for large cap funds, which is also in line with theory. Small cap stocks seemed to have higher risk-adjusted returns. Expense ratios were similar, but slightly higher for small cap stocks. Management tenure was slightly longer for small cap stocks than large cap stocks.

3.3 Data analysis

Step 1

The relationship between manager tenure and the dependent variables cumulative performance, monthly std. dev and risk-adjusted returns was studied. With manager tenure, ER (expense ratio), fund size (dummy for large cap which takes on the value 1 when the fund is large cap) and fund age, two regressions were run per dependent variable, one with fund age and one with fund age as an indicating variable (with the value 1 for funds under three years of age).

(3.3)
$$Dependent variable = \beta_0 + \beta_1 * ER + \beta_2 * Fund size + \beta_3 * Fund age + \beta_4 * Manager tenure + \epsilon$$

Step 2

Regressions were run on cumulative performance, monthly std. dev and risk-adjusted returns with expense ratio, fund age (non-dummy) and fund size (with a dummy for large cap, i.e. the dummy takes the value one when the fund is a large cap fund) as independent variables. For each time period, three regressions were run (one on each dependent variable) and in total there were four time periods, so twelve regressions of this kind were run in total.

(3.4) $$Dependent variable = \beta_0 + \beta_1 * ER + \beta_2 * Fund size + \beta_3 * Fund age + \epsilon$$

ER was only available for the two latest of the four time periods. For the other two, regression (3.4) was run, but without ER as an independent variable.

Step 3

Regressions were run on cumulative performance, monthly std. dev and risk-adjusted returns with expense ratio, fund size and fund age (dummy for funds younger than three years old, i.e. the dummy takes the value 1 when the funds are younger than three years old) as the independent variables. For each time period, three regressions were run (one on each dependent variable), and in total there were four time periods, so twelve regressions of this kind were run in total.

(3.5) $$Dependent variable = \beta_0 + \beta_1 * ER + \beta_2 * Fund size + \beta_3 * Fund age (Dummy) + \epsilon$$

ER was only available for the two latest of the four time periods. For the other two, regression (3.5) was run, but without ER as an independent variable.

CHAPTER 4

Results and analysis

The regression results indicate that age generally does not have a statistically significant relationship with performance, standard deviation and risk-adjusted returns. Size had the strongest (negative) relationship with the three dependent variables. Expense ratio, alike the age variable, did not show statistically significant results in most cases. Similarly, manager tenure did not have a significant relationship with any of the variables, though this relationship was only examined for 2012-2017 due to lack of data.

4.1 Manager tenure

The regressions performed on manager tenure for the time period 2012-2017 showed insignificant results for all dependent variables both when using age as an indicating variable and not. This, in combination with the lack of data, prompted the removal of manager tenure as a variable to examine further. These findings oppose Golec (1997), who found a positive relationship between manager tenure and fund performance. However, these findings are in line with Prather et. al (2004), who did not find a statistically significant relationship between manager tenure and fund performance. Though, the sample size of 77 manager tenures (in comparison to the 155 funds that were studied in the time period 2012-2017), is low. Thus, there is a possibility of sample selection bias as there could be a relationship between having manager tenure publicly available and fund performance characteristics. Optimally, manager tenure would be studied for all time periods and for all the funds, but the results of manager tenure being insignificant for at least one time implies that it is not a very important variable that is being omitted from the model (however, this could of course change in another time period).

Regression results for manager tenure 2012-2017

	Cumulative performance	Cumulative performance (Indicator)	Std. Dev	Std. Dev (Indicator)	Risk-adjusted returns	Risk-adjusted returns (Indicator)
R^2	0.185	0.205	0.117	0.132	0.201	0.184
Observations	77	77	77	77	77	77
Constant	31.971***	1.200***	0.042***	0.038***	1.306***	32.190***
	(4.012)	(0.158)	(0.003)	(0.003)	(0.156)	(4.069)
Manager tenure	-0.356	-0.010	0.000	0.000	-0.012	-0.361
	(0.318)	(0.012)	(0.000)	(0.000)	(0.012)	(0.316)

Table 4.1: Regression results for manager tenure 2012-2017

Unstandardised coefficients main metric, standard errors in parenthesis. Significance levels: ***p<0.01, **p<0.05 and *p<0.1. Regression for time period 2012-2017, manager tenure, fund age, fund size and expense ratio as independent variables (resulting coefficients only shown for manager tenure). As can be seen in the highlighted row, manager tenure shows no statistical significance in any of the regressions.

4.2 Cumulative performance

As illustrated in Figure 4.1 and 4.2, size has a negative relationship with cumulative performance in three out of four time periods, both when using age as an indicating variable and not. The time period that showed a positive relationship between size and cumulative performance was 1997-2002. A reason for this surprising result could be that the dot-com bubble burst circa 2000-2001. While the stock market in general was affected, particularly small- and mid-cap IT-companies (i.e. companies held by small cap equity mutual funds) took the largest hit. Apart from the 1997-2002 deviation, the findings are in line with previous literature, e.g. Fama and French (1982) and Daniel and Titman (1997), whose studies found higher cumulative performance for small cap stocks.

Expense ratio does not have a relationship with cumulative performance, neither for age without indicating variable nor with age as indicating variable. This contrasts the findings of Sharpe (1966), Golec (1996) and Carhart (1997) that expense ratio is negatively correlated with performance. The idea of these original results was the assumption that no mutual fund managers had any skill to pick the winners (but not losers either). In that case their expected overperformance before fees should be 0 and after fees 0 less fees. Thus, the higher the fees, the lower the after-fee performance. Indeed, these studies pointed to this direction. However, our result can be explained by assuming that some mutual fund managers are more skillful than others, and due to their past track record investors are willing to invest with them even if they charge higher fees. In this story the higher fees and higher skills might exactly offset each other and thus, no correlation can be found. This is in line with Carhart's (1997) findings which indicate that large management fees can signal superior investment skill.

Another explanation for this finding is that it could be that pre-expense alpha is correlated with the expense ratio, but that the net alpha is uncorrelated. In this case the manager is either extracting, or dissipating, all gross alpha through the expenses.

Depending on whether an indicating variable is used or not, the age variable has different effects on cumulative performance. When no age indicator is used, age is insignificant in three time periods and has negative effects (i.e. older fund have lower cumulative performance) on cumulative performance in the time period 1997-2002. The reason for this is unclear as the time period was characterised by very high volatility and saw both the rise and the fall of IT-stocks, which makes it hard to reason regarding causalities. Figure 4.2 shows that when age is used as an indicating variable it was positively related to cumulative performance in two time periods, negatively related in one (1997-2002) and statistically insignificant in one. Very young funds thus seem to have higher cumulative performance than funds that have existed for at least three years. As for 1997-2002, a possible explanation for the underperformance of funds that are under

three years of age could be that the IT-boom which started in the mid 90's attracted new investors and lead to establishment of funds capitalising on easily accessible capital. When the bubble burst, these funds were likely to have had a larger exposure to the IT-sector.

Cumulative performance, no indicating variable for age

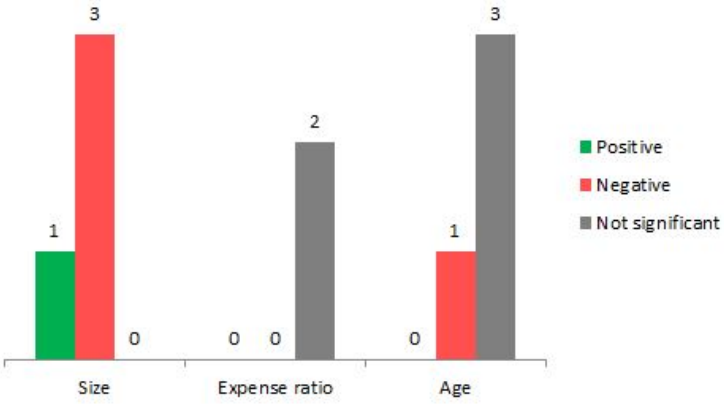

FIGURE 4.1. *Significance level at least 90%. The figure describes the number of observations from the regressions split into positive (statistically significant), negative (statistically significant) and not significant coefficients. Cumulative performance is the dependent variable. Size, expense ratio and age (no indicator) are independent variables. For age and size, there are 4 regression results (one from each time period), for expense ratio, the results are only from 2 time periods, 2007-2012 and 2012-2017 (due to lack of data). For more detailed regression output, see appendix: regression output.

Cumulative performance, indicating variable for age, where the dummy value takes the value 1 for funds that are younger than three years

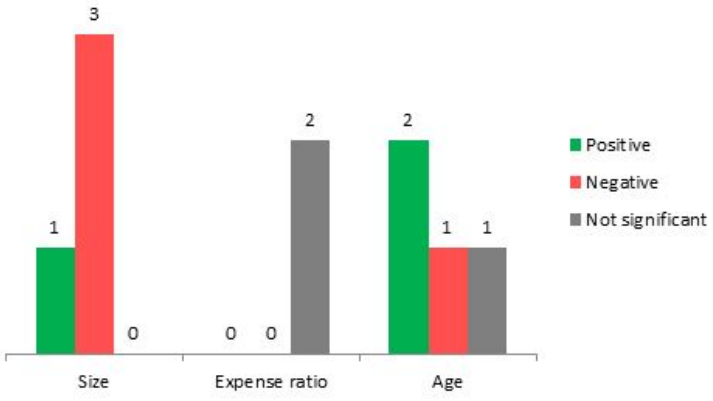

FIGURE 4.2. *Significance level at least 90%. The figure describes the number of observations from the regressions split into positive (statistically significant), negative (statistically significant) and not significant coefficients. Cumulative performance is the dependent variable. Size, expense ratio and age (indicator) are independent variables. For age and size, there are 4 regression results (one from each time period), for expense ratio, the results are only from 2 time periods, 2007-2012 and 2012-2017 (due to lack of data). For more detailed regression output, see appendix: regression output.

4.3 Monthly standard deviation

Size has a negative correlation to monthly standard deviation, both when using age as an indicator and not, in three out of four time periods. In the period when the relationship was insignificant (2002-2007), the coefficient was negative. The magnitude of the relationship is large: between 2007 and 2012, funds that invested in large cap stocks had 1.5 percentage points lower monthly standard deviation (on an average standard deviation of 6.3 percentage points for all funds in the period). The most plausible explanation for this is that large cap stocks on average have lower standard deviation than small cap stocks, which reflects on the standard deviation of portfolios consisting of respective stocks.

As illustrated in Figure 4.3 and 4.4, expense ratio is statistically insignificant when age without the indicating variable was used and positive in one of the time periods when age was used as an indicating variable. The positive relationship may be a consequence of that more active managers charge higher expense ratios. These managers are probably more likely to trade more often and take more risky bets than the less active counterparts - leading to higher standard deviation.

Age has a positive relationship with monthly standard deviation when no indicating variable for age is used for two out of four time periods. For the two other time periods, no significant relationship can be found. The positive relationship with monthly standard deviation for 50 percent of the observations suggests that older funds are riskier. This finding is unexpected as a positive relationship between age and standard deviation is not established in previous literature. A possible explanatory reason for this relationship is that older funds already have tried using different conventional investment ideas, and now might need to resort to more volatile investments to be able to invest all its assets or to continue outperforming. However, this relationship is not as clear when using age as an indicator as one time period showed a negative relationship and another period showed a positive relationship (two time periods still showed no significant relationship).

Monthly standard deviation, no indicating variable for age

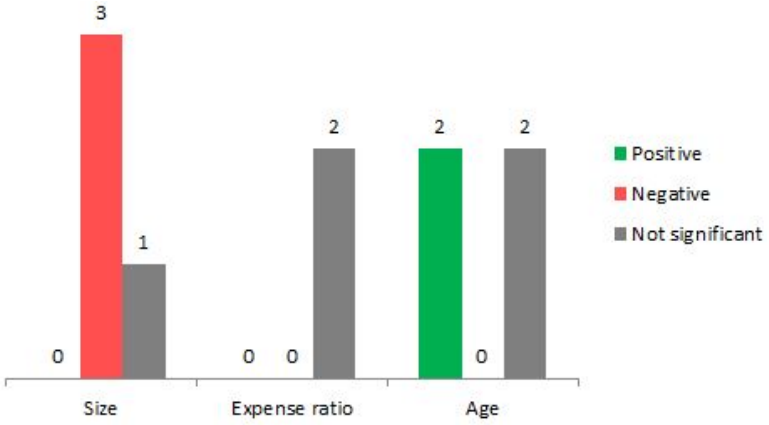

FIGURE 4.3. *Significance level at least 90%. The figure describes the number of observations from the regressions split into positive (statistically significant), negative (statistically significant) and not significant coefficients. Monthly standard deviation is the dependent variable. Size, expense ratio and age (no indicator) are independent variables. For age and size, there are 4 regression results (one from each time period), for expense ratio, the results are only from 2 time periods, 2007-2012 and 2012-2017 (due to lack of data). See appendix: regression output.

Monthly standard deviation, indicating variable for age, where the dummy value takes the value 1 for funds that are younger than three years

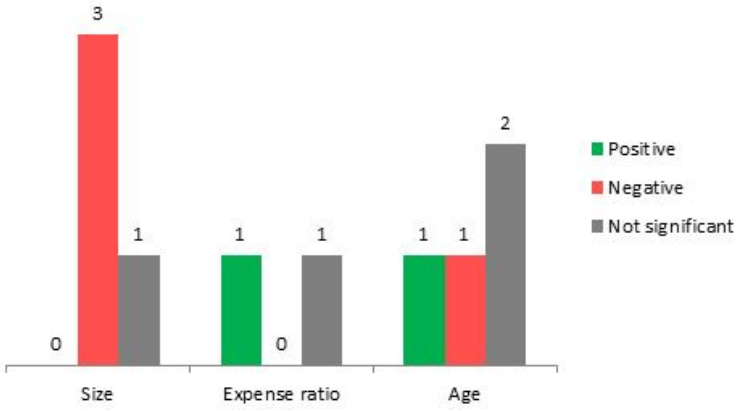

FIGURE 4.4. *Significance level at least 90%. The figure describes the number of observations from the regressions split into positive (statistically significant), negative (statistically significant) and not significant coefficients. Cumulative performance is the dependent variable. Size, expense ratio and age (indicator) are independent variables. For age and size, there are 4 regression results (one from each time period), for expense ratio, the results are only from 2 time periods, 2007-2012 and 2012-2017 (due to lack of data). For more detailed regression output, see appendix: regression output.

4.4 Risk-adjusted returns

Size is negatively correlated with the dependent variable (i.e. risk-adjusted returns), both when using age as an indicator and not, in three out of four time periods. The time period that showed a positive relationship between size and risk-adjusted returns was 1997-2002. This negative relationship implies that small funds provide higher risk-adjusted returns than large funds which is well-established in previous literature and again is consistent with the conclusions of Dahlquist, Engstrom and Soderlind (2000), as they found that that mutual fund size had a strong and robust negative relation to the performance of the funds.

No relationship could be found between risk-adjusted returns and expense ratio which again is surprising considering previous studies which indicate that expense ratio is negatively correlated to risk-adjusted returns. A possible explanation for this is that firms with higher expense ratio actually outperform other funds pre-expense owing to superior investment skills. However, this overperformance might be dissipated through higher fees.

The relationship between age and risk-adjusted returns is negative for one out of four observations when age as an indicator was not used which suggest that older funds perform worse on a risk-adjusted basis. When using age as an indicator (i.e. indicator for funds that are younger than three years old), the relationship between age and risk-adjusted returns still hold. Funds that are younger than three years old have a positive relationship with risk-adjusted returns in one out of four time periods (1997-2002), while the result is insignificant for three periods. In both cases, the young funds risk-adjusted overperformance is solely due to higher cumulative performance (age has no statistically significant effect on standard deviation in the time period).

Risk-adjusted returns, no indicating variable for age

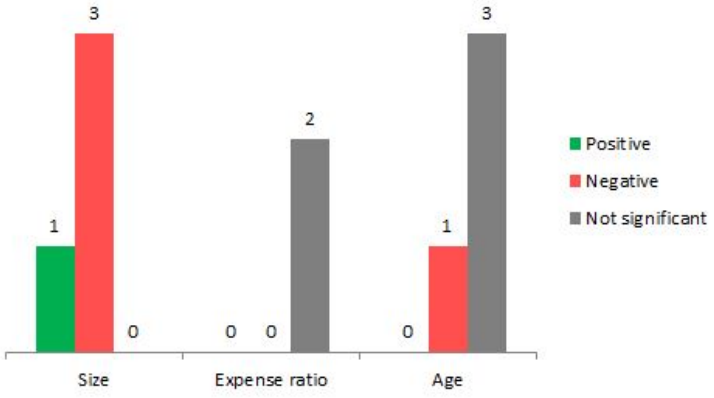

FIGURE 4.5. *Significance level at least 90%. The figure describes the number of observations from the regressions split into positive (statistically significant), negative (statistically significant) and not significant coefficients. Risk-adjusted return is the dependent variable. Size, expense ratio and age (no indicator) are independent variables. For age and size, there are 4 regression results (one from each time period), for expense ratio, the results are only from 2 time periods, 2007-2012 and 2012-2017 (due to lack of data). See appendix: regression output.

Risk-adjusted returns, indicating variable for age where the dummy value takes the value 1 for funds that are younger than three years

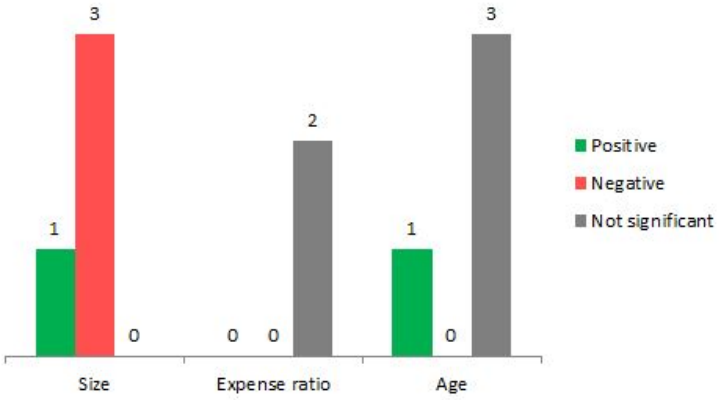

FIGURE 4.6. *Significance level at least 90%. The figure describes the number of observations from the regressions split into positive (statistically significant), negative (statistically significant) and not significant coefficients. Risk-adjusted return is the dependent variable. Size, expense ratio and age (as an indicator) are independent variables. For age and size, there are 4 regression results (one from each time period), for expense ratio, the results are only from 2 time periods, 2007-2012 and 2012-2017 (due to lack of data). See appendix: regression output.

CHAPTER 5

CONCLUSION AND DISCUSSION

Investors' common prerequisite of funds having existed for at least two to three years before they invest in them seems to be unwarranted in the Nordic equity mutual market. On the contrary, if anything, the results suggest that investors could be missing out on higher risk-adjusted returns due to this investment criterion (the results are ambiguous as three time periods show no statistical significance, while one time period shows positive risk-adjusted returns, see Figure 4.6).

5.1 Conclusion and discussion

The main conclusion in this study is that older funds do not exhibit higher risk-adjusted returns than young funds. Rather, the relationship between fund age and performance is statistically insignificant in 75% of the time periods, and negative in 25% of the time periods, i.e. older age indicates lower risk-adjusted performance. This also holds when age is used as a dummy variable, with funds under three years of age showing higher risk-adjusted returns in 25% of the cases. For the rest of the time periods, age shows no statistical significance. These results are in line with Carhart (1997) and Prather et. al (2004), as these studies showed no relationship between fund age and risk-adjusted performance. Furthermore, Otten and Bams (2002) found a negative relationship between fund age and performance, which finds some support in this study as the negative relationship holds in 25% of the time periods.

Although the relationship between risk-adjusted returns and fund age seems to be weak, there could be some merit to investing in older funds. From the professional investor's perspective, it is important to legitimise portfolio choices to the stakeholders, especially if a fund underperforms. Even if the rationale for buying two different funds ex-ante is similar, ex-post the underperformance, it could be easier for the investor to rationalise an investment in an older fund. As the investment adage goes: no one ever got fired for buying IBM.

When an indicating variable is used for age, one period showed a negative relationship and another period showed a positive relationship with standard deviation, and the other two periods showed no significant relationship. In terms of this study's focus, the implications are that very young funds (< 3 years old) do not seem to systematically differ from funds that are older than three years in terms of standard deviation. However, age had a positive relationship with monthly standard deviation in 50% of the time periods when no indicating variable for age was used, the other 50% showed no significance. Thus, there seems to be a correlation between fund age and standard deviation, but not in the age intervals that are relevant for investors that demand at least three years of fund existence. It could be interesting to analyse age and standard deviation for different fund age cohorts, e.g. funds aged 3-5 or 5-7 years to determine if there is an interval where risk-averse investors could benefit. When age is used as an indicating variable, younger funds had higher cumulative performance than old funds (but the result was ambiguous as the results from different time periods differed). When age was not used as an indicator, a negative effect was found between fund age and cumulative performance. One explanation can be that younger funds are more eager to prove themselves than their competitors as they need to demonstrate capabilities to attract more capital. Older funds, on the other hand, might be more satisfied with the status quo.

We found that the size of investments was negatively correlated to standard deviation, cu-

mulative performance and risk-adjusted returns. Thus, we confirmed the current consensus. However, our metric of risk-adjusted return does not overcome the commonly faced problem in performance measurement - that it is always a joint hypothesis test, i.e. the model (in this case cumulative performance/standard deviation) is also tested. A seemingly higher risk-adjusted return for funds investing in small cap stocks might be the result of the risk-adjusted model not accounting for all relevant risk-factors.

In general, the results of this study are not very definite. When a statistically significant relationship was shown, it often did not hold in the next period. The only exception to this was the size effect. The lack of definite results is not surprising considering the efficient market hypothesis. If the hypothesis holds, or approximately holds, there should be no large difference in risk-adjusted returns). If large differences existed, the hypothesis predicts that the differences would be arbitraged away by rational investors. The existence of the size effect is surprising in an efficient market framework, but could be explained by popular risk-adjusted performance metrics not being complete.

CHAPTER 6

METHODOLOGY CRITICISM

As with most studies regarding fund performance, this study is sensitive to two sources of biases: sample selection bias and a imperfect metric of risk-adjusted returns. Also, an underlying assumption throughout the thesis is that the fund manager's objective is to maximise risk-adjusted returns. However, considering recent behavioural finance advances regarding principal-agent theories, the underlying assumption might not hold. This could be an area of further studies.

6.1 Methodology criticism

One shortcoming of the study is that there is a problem with sample selection bias. In this study, there is a requirement of funds having shown five years of performance to be included, as this is deemed to be an appropriate period of time to judge fund performance. However, this leads to that funds that existed for less than five years are excluded from the sample. This could be a problem as newly started funds that perform very poorly might be taken off the market in less than five years - either due to lack of investments or the fund company saving face. An implication of this is that young funds in our sample, at the beginning of a time period, are not representative for all young funds at the beginning of a time period. Rather, they probably perform better than the average funds, as it is unlikely that high performing funds are taken off the market. One way to deal with this problem is to include funds that did not survive the entire examined period of five years (by for example extrapolating their performance) or to decrease the examined cohort period to e.g. two or three years, and to contrast these results to the results when the criteria of survival is used, to get a measurement of sample selection bias.

Like other studies that focus on risk-adjusted return, there are problems with the metric of risk-adjusted returns. There are many different performance metrics: e.g. Sharpe Ratio, Treynor Ratio and Jensen's Alpha. However, none of the metrics are complete, which can lead to erroneous conclusions. Proponents of the efficient market hypothesis often criticise studies that show excess returns with this reasoning. To further ascertain the findings, a range of risk-adjusted return metrics could be used (however, this does not fully solve the problem, by the same reasoning).

Further, most previous studies have shown relationships between manager tenure and fund performance. In this study, data for manager tenure was only available for circa 50% of the funds in the last time period (2012-2017). For this time period, manager tenure was statistically insignificant for all our dependent variables, which, although comforting, is not completely assuring in our choice to omit the variable. It is possible that the 50% data points we got were subject to sample selection bias, and it is also possible that other time periods would have shown other results. Also, it could be interesting to track individual managers rather than studying manager tenure, as this is a rather unexplored area of research that makes intuitive sense to study - but due to time constraints, it was out of the scope of this study to explore.

As we find no support for only buying funds over three years of age when examining the data from a quantitative perspective, it could be interesting to approach the subject from a qualitative angle. The portfolio manager's goal might not always be to maximise the risk-adjusted returns, which is the underlying assumption throughout this and most other studies on the topic. Rather, the portfolio manager does not want to be fired and therefore a lot of the manager's work is about legitimising investments and not striving too far away from other investors. Approaching the

subject with a stronger focus on for example this agency-conflict (investors want to maximise risk-adjusted returns, portfolio managers want to keep their jobs) could possibly have larger explanatory value for why institutional investors shy away from very young funds rather than only looking at the data on risk-adjusted returns.

Appendix A

A.0.1 Appendix - Overview of data

Descriptive statistics of all the data used in the regressions

	1997-2002	2002-2007	2007-2012	2012-2017
Observations (n)	66	102	119	155
Expense ratio (%)			1.28	1.31
Age (years)	4.95	7.29	10.92	11.44
Manager tenure (years)				3.95 (n = 77)
Cumulative performance (%)	71.86	56.95	(17.65)	97.52
Monthly standard deviation (%)	6.68	5.41	6.26	3.89

Table A.1: Descriptive statistics of all the data used in the regressions

The data is split into the four different time periods. Manager tenure only available for the time period 2012-2017, expense ratio only available for 2007-2012 and 2012-2017.

Descriptive statistics of the small cap fund data used in the regressions

	1997-2002	2002-2007	2007-2012	2012-2017
Observations (n)	23	31	39	62
Expense ratio (%)			1.45	1.48
Age (years)	4.25	7.59	10.51	10.44
Manager tenure (years)				4.46 (n=33)
Cumulative performance (%)	54.49	131.56	(14.35)	117.31
Monthly standard deviation (%)	7.33	5.65	7.33	4.07

Table A.2: Descriptive statistics of the small cap fund data used in the regressions

The data is split into the four different time periods. Manager tenure only available for the time period 2012-2017, expense ratio only available for 2007-2012 and 2012-2017.

Descriptive statistics of the large cap fund data used in the regressions

	1997-2002	2002-2007	2007-2012	2012-2017
Observations (n)	43	71	80	93
Expense ratio (%)			1.18	1.20
Age (years)	5.33	7.16	11.12	12.10
Manager tenure (years)				3.57 (n=44)
Cumulative performance (%)	81.11	24.37	(19.26)	84.37
Monthly standard deviation (%)	6.33	5.31	5.73	3.77

Table A.3: Descriptive statistics of the large cap fund data used in the regressions

The data is split into the four different time periods. Manager tenure only available for the time period 2012-2017, expense ratio only available for 2007-2012 and 2012-2017.

A.0.2 Appendix - Regression outputs

Regression output for the time period 2012-2017

	Cumulative performance	Cumulative performance (Indicator)	Std. Dev	Std. Dev (Indicator)	Risk-adjusted returns	Risk-adjusted returns (Indicator)
R^2	0.195	0.205	0.065	0.078	0.145	0.147
Observations	155	155	155	155	155	155
Constant	1.179***	1.098***	0.042***	0.041***	28.507***	27.659***
	(0.094)	(0.96)	(0.002)	(0.002)	(2.406)	(2.485)
Age	-0.005		0.000		-0.045	
	(0.031)		(0.000)		(0.089)	
Age (Younger than three indicator)		0.124**		0.002**		1.351
		(0.063)		(0.001)		(1.616)
Size (Large indicator)	-0.313***	-0.314***	-0.003***	-0.003***	-6.874***	-6.861***
	(0.059)	(0.058)	(0.001)	(0.001)	(1.513)	(1.500)
Expense ratio	0.030	0.025 (0.055)	0.000	-0.001	0.953	0.928
	(0.057)		(0.001)	(0.001)	(1.459)	(1.426)
Manager tenure	-	-	-	-	-	-

Table A.4: Regression output for the time period 2012-2017.

Unstandardised coefficients is the main metric, standard errors in parenthesis. Significance levels: ***p<0.01, **p<0.05 and *p<0.1.

Regression output for the time period 2007-2012

	Cumulative performance	Cumulative performance (Indicator)	Std. Dev	Std. Dev (Indicator)	Risk-adjusted returns	Risk-adjusted returns (Indicator)
R^2	0.042	0.046	0.321	0.283	0.100	0.101
Observations	119	119	119	119	119	119
Constant	-0.112**	-0.123***	0.065***	0.066	-1.659**	-1.861**
	(0.043)	(0.045))	(0.004)	(0.004)	(0.762)	(0.798)
Age	0.001		0.001***		0.056	
	(0.002)		(0.000)		(0.043)	
Age (Younger than three indicator)		0.047 (0.049)		0.004		1.195
				(0.005)		(0.882)
Size (Large indicator)	-0.058**	-0.051*	-0.016***	-0.015***	-1.656***	-1.443***
	(0.027)	(0.026)	(0.003)	(0.003)	(0.473)	(0.472)
Expense ratio	-0.032	-0.018	0.001	0.005**	-0.619	-0.155
	(0.028)	(0.026)	(0.003)	(0.003)	(0.505)	(0.468)
Manager tenure						

Table A.5: Regression output for the timer period 2007-2012

Unstandardised coefficients is the main metric, standard errors in parenthesis. Significance levels: ***p<0.01, **p<0.05 and *p<0.1.

Regression output for the time period 2002-2007

	Cumulative performance	Cumulative performance (Indicator)	Std. Dev	Std. Dev (Indicator)	Risk-adjusted returns	Risk-adjusted returns (Indicator)
R^2	0.584	0.592	0.128	0.072	0.529	0.531
Observations	102	102	102	102	102	102
Constant	1.227***	1.341***	0.050***	0.057***	23.734***	24.455***
	(0.103)	(0.077))	(0.003)	(0.002)	(2.104)	(1.584)
Age	0.012		0.001***		0.069	
	(0.084)		(0.000)		(0.186)	
Age (Younger than three indicator)		-0.198*		-0.007**		-1.538
		(0.102)		(0.003)		(2.112)
Size (Large indicator)	-1.067***	-1.047***	-0.003	-0.003	-19.736***	-19.574***
	(0.920)	(0.091)	(0.002)	(0.002)	(1.876)	(1.889)
Expense ratio						
Manager tenure						

Table A.6: Regression output for the time period 2002-2007

Unstandardised coefficients is the main metric, standard errors in parenthesis. Significance levels: ***p<0.01, **p<0.05 and *p<0.1.

Regression output for the time period 1997-2002

	Cumulative performance	Cumulative performance (Indicator)	Std. Dev	Std. Dev (Indicator)	Risk-adjusted returns	Risk-adjusted returns (Indicator)
R^2	0.182	0.197	0.102	0.099	0.179	0.190
Observations	66	66	66	66	66	66
Constant	0.703***	0.403***	0.074***	0.073***	10.518***	6.133***
	(0.101)	(0.095)	(0.004)	(0.004)	(1.655)	(1.556)
Age	-0.037***		0.000		-0.546**	
	(0.014)		(0.001)		(0.227)	
Age (Younger than three indicator)		0.297***		0.000		4.320**
		(0.102)		(0.004)		(1.665)
Size (Large indicator)	0.307***	0.319***	-0.010**	-0.010**	5.275***	5.444***
	(0.103)	(0.103)	(0.004)	(0.004)	(1.685)	(1.681)
Expense ratio						
Manager tenure						

Table A.7: Regression output for the time period 1997-2002

Unstandardised coefficients is the main metric, standard errors in parenthesis. Significance levels: ***p<0.01, **p<0.05 and *p<0.1.

APPENDIX B

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