Mutual fund performance

Bachelor thesis

in finance

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1. Introduction

The importance of mutual funds as both part of the U.S. financial market and elsewhere increased significantly over the recent decades. Mid-year 2010, the U.S. mutual fund industry managed assets of $10.5 trillion, accounting for more than ten times the $899 billion of assets of funds mid-year 1989. Over the same period, the amount of U.S. households owning mutual funds increased from 23.3 million to 51.6 million. Resulting in a 43.9 percentage of U.S. households owning mutual funds mid-year 2010 (Schrass and Bogdan, 2011). Although the growth trend of the mutual fund industry has spread to other countries around the world, the U.S. mutual fund market remained the biggest in the world as of year-end 2008, consisting of a 51 percentage from the $19 trillion in worldwide mutual fund assets (Investment Company Institute, 2009).

To give a better understanding of these numbers mentioned above, a brief definition of mutual funds will be useful. A mutual fund can be defined as a pooled investment from many investors. It collects resources from individuals to subsequently invest these in bonds, stocks and other securities. Through this way investors are able to distribute their money over more securities than one person could generally put in a portfolio. The proportionate ownership of each investor is represented in the number of shares. Investors can buy shares in funds, but the number of shares being issued varies according to demand (Cuthbertson, Nitzsche, O'Sullivan, 2008).

This paper will discuss the evaluation of mutual fund performance, which is an increasingly interesting and important issue to investors and managers as well as to researchers all over the world, given that identifying superior mutual funds is of crucial importance for the construction of mutual fund portfolios (Vrontos, Meligkotsidou, Vrontos, 2008). The literature on this evaluation using performance measures is quite comprehensive. Starting with Jensen (1967, 1969), who utilized and extended the Sharpe (1964), Linter (1965) single factor Capital Asset Pricing Model (CAPM). By doing so, Jensen derived a "risk-adjusted measure of portfolio performance" (Jensen's alpha). Jensen applied the measure to estimate the ability of fund managers to earn higher returns than the expected returns of individuals given the level of risk of their portfolios. He concluded that the net mutual fund performance was inferior to the net performance of randomly selected portfolios in the period 1945 – 1964. Chang and Lewellen (1984) and Henriksson (1984) concluded this as well, though they used statistical techniques developed by Henriksson and Merton (1981) for testing the fund

manager's forecasting ability with market-timing ability. In a subsequent study, Malkiel (1995) likewise found that mutual funds, after deducting all expenses except load fees, have tended to underperform the market. More recently, Fama and French (2010) came to the same conclusion. In a number of similar studies however, some conflicting results emerged. Ippolito (1989) for instance studied mutual funds over the period 1965 – 1984 and found that the net mutual fund performance did outperform index funds on a risk-adjusted basis. Grinblatt and Titman (1989) also found that superior performance among funds may in fact exist. Bams and Otten (2002) concluded this as well in their study of European mutual fund performance.

In addition, there are more methods in the literature to evaluate mutual fund performance. Studies at the empirical level have lead to multifactor asset pricing models, which are relevant for the explanation of cross-sectional variation at average returns (Vrontos, Meligkotsidou, Vrontos, 2008). The three-factor model of Fama and French (1992) is a well known model, which added two empirically determined variables to the CAPM, size and book-to-market equity. Another well known model is the four-factor model of Carhart (1997), who expanded Fama and French's three-factor model by an additional risk factor that captures the one-year momentum effect of Jegadeesh and Titman (1993). Which is the effect of generating significant positive returns over a maximal one–year holding period, by strategies buying in the past well performed stocks and selling in the past poorly performed stocks. Daniel et al. (1997) introduced a measure of portfolio performance as well, known as the DGTW performance measures, in which benchmarks are used based on the same characteristics as Carhart (1997), which are size, book-to-market and momentum characteristics of the stocks held by the portfolio. A more recent measure is developed by Cremers and Petajisto (2009).

This paper studies properties of mutual fund performance evaluations together with a number of their performance measures. It is going to provide an overview of the most common performance measures for mutual funds. After this evaluation, a small empirical study with the main contribution to give an analysis of a number of U.S. mutual funds will take place, using some previous discussed performance measures.

The remaining of the paper is organized as follows. A literature review is provided in the next section and section 3 gives a small empirical study. Finally, section 4 summarizes and concludes.

2. Literature review

This section of the paper will first introduce mutual funds and afterwards give an overview of several studies regarding the evaluation of mutual fund performance. Thereafter, a number of performance measures are discussed and finally some other issues concerning mutual funds.

2.1 Introduction of mutual funds

As mentioned previously, mutual funds can be defined as pooled investments from many investors. These investors are regarded as the fund's shareholders. Bergstresser, Chalmers and Tufano (2009) state that all mutual funds are independent legal entities with a board of directors, which has the duty of making decisions in favor of those shareholders. The board subsequently outsources the fund's activities to a number of service providing firms, including an investment advisor, an administrator, a custodian, an accountant, a principal underwriter and a transfer agent. So, a mutual fund is externally managed and has therefore no conventional employees.

2.1.1 Fees

There are a number of expenses and fees investors can expect paying when holding or purchasing shares of the fund. A distinction can be made between "Shareholder fees" and "Annual fund operating expenses", which are respectively paid directly by investors, consisting of four components and deducted from the fund's assets prior to the distribution of earnings to investors, encompassing two components. One of the components of shareholder fees includes a sales charge, which compensates brokers for their provided services. It is also known as a "load", that can be attached to the sale (a back-end load) or purchase (front-end load) of mutual funds. The Investment Company Institute (2011) shows that for 2010 the front-end loads paid by investors (1%) are considerably lower than the maximum front-end loads that funds may charge (5.3%), which are both percentages from the invested amount. The redemption fee is another component, which is paid to a fund in order to cover the costs incurred with a redemption. This fee is limited to 2 percent of the value of the purchased mutual fund. In addition, there are exchange fees, charged when investors transfer money from a specific fund to another. Finally, annual account maintenance fees may be charged by certain funds, for example, "to cover the costs of providing services to low-balance accounts". "Annual fund operating expenses" consists of a management fee, which is charged for the management of the fund's portfolio by the investment advisor and a distribution (12b-1) fee; charged for compensating brokers for their provided services to investors, related with selling,

purchasing and maintaining shares and marketing expenses. This 12b-1 fee is capped by law at a 1 percent (Investment Company Institute, 2005).

2.1.2 Distribution channels

Funds in the US are sold by two distinct methods. The first concerns sales through direct marketing of funds using newspapers and so on. Bergstresser, Chalmers and Tufano (2009) state that the financial arrangements with investors regarding to this direct channel are relatively straightforward. Loads are for instance generally not paid through this channel. Distribution fees (12b-1), however, are frequently levied. A fund which sells without 12b-1 fees, may market itself as a "pure no-load" fund. The second method concerns sales through a broker/dealer. These brokers/dealers may involve freestanding organizations, but they might also be part of banks. Unlike the direct channel, investors generally do pay back-end and front-end loads for the advisory services provided. Besides the loads, a variety of fees are charged, including redemption, exchange, 12b-1 and other previously mentioned fees (Cuthbertson, Nitzsche, O'Sullivan, 2008).

2.1.3 Investment objectives

At the fundamental level, funds may be exclusively or predominantly Money market, equity or fixed-income (bond) funds. At the additional level, mutual funds can be distinguished by their investment objectives. Morningstar (2008) defines investment objectives as "the financial goals of an investor". They are influenced by various aspects, including the investor's risk tolerance, time horizon, financial circumstances and so on. Although Morningstar lists more than 20 investment objectives, Falkenstein (1996) indicated a top 6 representing the equity ownership majority, including growth, growth-income, small company funds, equity-income, balanced and aggressive-growth funds.

2.1.4 Institutional and retail funds

At another level, mutual funds can be classified as either institutional or retail funds. Morningstar defines institutional funds as funds initially purchasing a minimum of $100,000 or more, or as funds stating that it has been designed for institutional investors. It is generally assumed, that institutional investors are better informed than the smaller retail investors, for instance due to economies of scale in the information production (James and Karceski, 2006).

2.1.5 Share classes

A mutual fund can offer multiple classes of shares, in order to provide differing services and advice to different investors who are all investing in the same fund. Although a particular

fund can have many share classes (multiple-class fund), there are typically three main classes, designated as A, B and C shares, with each having alternative sales charges, fee and expense structures. Investors investing in the class A shares for instance, pay front-end loads and annual 12b-1 fees of 25-35 basis points, or $0,25 to $0,35 for every $100 invested in assets. Unlike the front-end load charged by class A shares, class B shares charge investors a back-end load. In addition to this load, class B share investors also pay a 12b-1 fee annually of 100 basis points (1 percent). B shares however, are typically transformed into A shares following a period of six to eight years. Such as class B shares, class C shares charge a back-end load and an annual 12b-1 fee of typically 1 percent. However, C shares are not transformed into class A shares (Nanda et al., 2009). Multiple-class funds are defined by Nanda et al. (2009) as funds offering A, B and C shares or just A and B shares. While the various share classes of such multiple-class funds display claims on the same portfolio of investments, they differ in their net returns because of their difference in fee and expense structure.

2.1.6 Restrictions

Mutual fund restrictions are widespread and constrain portfolio investment policies in several ways. Almazan et al. (2004) reported evidence on prohibitions regarding a number of investment practices, by examining the investment constraints assumed by a sample of funds over the period 1994-2000. The six specific investment practices constraints which they have found are: prohibitions against borrowing of money to finance the portfolio, short-selling, purchasing a security on margin and holding positions in equity options, restricted securities and stock index futures. Almazan et al state that these restrictions affect the ability of funds to use leverage, derivatives and invest in assets which are illiquid.

2.2 Performance studies

As previously mentioned, the literature on the evaluation of mutual fund performance is extensive. Starting with the Sharpe-Lintner capital asset pricing model, which is based on the portfolio selection model developed by Markowitz (1959). The CAPM is a model based on the relation of risk to the expected return. It implies that the "the expected return on any asset is equal to the risk free rate plus a risk premium given by the product of the systematic risk of the asset and the risk premium on the market portfolio" (Jensen, 1967).

Jensen (1967) makes a distinction between two dimensions when it comes to the notion of portfolio performance; the first dimension concerns the fund manager's ability to get earn

higher portfolio returns by successful predicting future security prices and the second dimension regards the fund manager's ability of minimizing the sum of "insurable risk" born by the portfolio holders. Developments in the capital asset pricing theory by Sharpe (1964) and Lintner (1965) enabled Jensen (1969) to derive portfolio performance measures for both dimensions mentioned above. Jensen extended the Sharpe and Lintner's single period models to a multiperiod model. The study of Jensen (1967) is confined only to the first dimension's examination of the fund manager's predictive ability. Which implies the ability to earn higher returns than the individual's expected return for a certain level of risk of his portfolio, by means of successful predicting security prices. The absolute measure of portfolio performance which is used to examine the above is also a derivative form an "application of the theoretical results" of the CAPM. This one, however, has somewhat different properties than the one proposed in Jensen (1969). The final measure derived is a risk-adjusted measure of the portfolio performance, as what is now known as "Jensen's Alpha". Jensen subsequently applied this measure to 115 mutual funds over the period 1945-1964. The evidence on the mutual fund performance evaluation indicates that the 115 mutual funds mentioned above "were were *on average* not able to predict security prices well enough to outperform a buy-the-market-and-hold policy". Jensen concludes that both the benefits and costs of the trading and research activities need to be evaluated much more closely, with a view "to provide investors with maximum possible returns for the level or risk undertaken". It is also relevant to keep in mind that Jensen has not considered the issue of diversification here.

Some conflicting results emerged regarding the notion that mutual funds cannot outperform the market. For instance in the study of Ippolio (1989), who evaluated the investment performance of 143 mutual funds covering a 20-year period, 1965 – 1984, using the Jensen measure. Ippolito presented that net mutual funds, after deducting fees and expenses except load fees, actually did outperform index funds on a risk-adjusted basis. But although alpha was significantly positive in this study, it was not large enough to overcome the load charges, which characterized the most mutual funds in the sample. Eventually resulting in evidence that is inconsistent with the notion that mutual funds can outperform the market. In addition, Grinblatt and Titman (1989) also found that superior performance among some funds may in fact exist. They analyzed two datasets, containing observations from 1974 – 1984, using the Jensen equation as well. The study compared abnormal returns from actively and passively managed funds with and without fees, expenses and transaction costs. The results indicated that the risk-adjusted returns of a number of funds were significantly positive, particularly

among growth and aggressive-growth funds. These funds however turned out to have the most expenses, so their actual net returns exhibit no abnormal performance. This leads also to the notion that mutual funds eventually underperform the market.

In a subsequent study, Malkiel (1995) analyzes mutual fund returns over the period 1971 – 1991, likewise, in the context of the capital asset pricing model. The study found that, ex post, during the 1970s there existed investment strategies that produced major excess returns. The strategy however, did not work during the 1980s. Where rather inferior returns were produced. Malkiel nevertheless concluded that he was unable to generate a reliable strategy in which mutual fund managers can outperform the market in general. So this study confirms the Jensen conclusion.

All of the studies mentioned before in this section have in common that they adopt a capital asset pricing model framework. Hendrikson and Merton (1981) however, developed a statistical framework for testing a manager's forecasting ability with particular emphasis on superior market-timing skills without assuming the CAPM framework. The framework is derived from the model developed by Merton (1981), where the market timer forecasts that either stocks will outperform bonds or that bonds will outperform stocks. Hendrikson (1984) evaluated the market-timing ability of 116 mutual funds for the period 1968 – 1980, using these statistical techniques developed by Hendrikson and Merton. From the final empirical results obtained, he deduced that a mutual fund manager is not able to follow a strategy that successfully outperforms the market.

When examining the Capital Asset Pricing Model, Fama and French (1992) found instead of a positive relation between average stocks return and market beta, a flat relation. In response to this evidence, they developed a three-factor asset pricing model, which includes two additional empirically determined risk factors; 'size' and 'book-to-market equity'. After testing this model empirically, it turned out to have significantly more explanatory power than the single factor CAPM. Carhart (1997) confirms this finding, but shows however that the three-factor model is generally economically not different from the CAPM. Carhart therefore constructed a four-factor model, based on the Fama and French three-factor model together with an additional risk factor capturing the 'one-year momentum anomaly'. After studying mutual funds over the period 1962-1993, Carhart concluded that his results do not support that there is such thing as a stock picking ability of mutual fund managers and that overall, mutual funds underperform the market. Despite of Carhart's findings, his four-factor model is still

used as a performance measure in a number of studies, like the studies of Daniel et al. (1997) and Wermers (2006). Fama and French (2010) also used Carhart's four-factor model next to the Fama and French (1992) three-factor model and the CAPM for evaluating the mutual fund performance over the period 1984-2006. They found alphas for all three models that were close to zero before deducting expenses and fees. However, after deducting these costs, mutual funds turned out to underperform by approximately the amount of the expenses and fees.

Daniel, Grinblatt, Titman and Wermers (1997) introduced alternative measures of portfolio performance as well, also known as the DGTW performance measures, in which benchmarks are used based on the size, book-to-market and momentum characteristics of the stocks held by the portfolio. Daniel et al. applied these measures to the portfolio holdings containing over 2500 equity funds between the period 1975-1994. The results demonstrate that the average mutual fund, in particular aggressive-growth mutual funds, exhibit some "selectivity ability", but do not exhibit "timing ability". So they do outperform their benchmarks, however, the average "benchmark-adjusted returns" are rather small – approximately equivalent to the typical management fee. This characteristic-based performance measure is for instance also used by Kacperczyk et al. (2005) and Wermers (2006) to evaluate portfolio performance.

In a more recent study by Cremers and Petajisto (2009) a new measure for active portfolio management was introduced, called Active Share, which represents the proportion of difference between the portfolio holdings and benchmark index holdings. They argue that one of the main reasons that Active Share is useful is because it provides information on the potential of a fund to outperform its benchmark index. A significant positive Active Share level is therefore necessary. Moreover, by using the Active Share measure along with tracking error volatility, the same distinction as in Daniel et al. (1997) can be made between a manager's factor timing and stock selection ability, whereas tracking error is a reasonable proxy for factor timing and Active Share for the stock selection. When analyzing mutual funds for the period 1990-2003, they look at "gross returns", which detect whether there is an ability to outperform the fund's benchmarks, and "net returns", which detect whether there will be any such ability after fees and expenses. The final results about the stock selection and factor timing profitability correspond to the results of Daniel et al. (1997), i.e. mutual fund "managers can add value with their stock selection, but not with their factor timing". Cremers and Petajisto can, however, refine their results due to their active management measure. Hence, they also concluded that "concentrated stock pickers" (high Active share

with high tracking error) and "diversified stock pickers" (high Active Share with low tracking error) were the best performers, where each group appears to have a stock selection ability and most funds outperform the benchmark even after deducting fees and transaction costs.

All of these studies mentioned focus on US mutual funds in their performance evaluation. There are however also several studies that have evaluated fund performances outside the US, for instance Bams and Otten (2002) study European mutual fund performance from 1991 through 1998 using the Carhart (1997) four-factor model. From their results it appears that especially small European funds can add value to a portfolio. Their overall results suggest that before fees and expenses only UK funds turn out to outperform the market significantly, but after deducting these costs also UK funds appear to underperform. Moreover, a number of authors have studied the performance evaluation for individual countries. Christensen (2005) for example evaluated Danish mutual fund performance using the CAPM and a couple of other performance measures. They generally found neutral and even significantly negative fund performances.

2.3 Mutual fund performance measures

2.3.1 Sharpe ratio

Sharpe (1966) introduced a portfolio performance measure, defined as the "reward-to-variability ratio". It was developed as a tool to predict and evaluate the mutual fund's performance. It is a measure of the fund's average excess returns per unit of risk and can be described as:

$$S = \frac{R_p - R_f}{\sigma_p}$$

where R_p is the average return of the mutual fund portfolio for a specific period and R_f is the risk free return over that specific period. Sharpe defines the difference between these two variables as the provided investor's reward for bearing risks. σ_p measures the volatility of excess returns. The final results can be interpreted as follows: the higher the sharpe ratio, the better the mutual fund performance. Some examples of papers who used this measure are Kothari and Warner (2001), Keating and Shadwick (2002) and Ledoit and Wolf (2008). However, Sharpe (1994) himself acknowledges that when one or more assets involved are correlated with the portfolio, the ranking according to the Sharpe ratio may not be reliable.

2.3.2 Jensen alpha

The performance measure Jensen's alpha (Jensen, 1967, 1969) is defined as:

$$R_{j,t} - R_{f,t} = \alpha_j + \beta_j[R_{M,t} - R_{f,t}] + \varepsilon_{j,t}$$

Where $R_{j,t}$ is the return on the mutual fund portfolio j in an arbitrary interval of time with respect to the starting and ending dates. $R_{f,t}$ is the risk free interest rate on time t, $R_{M,t}$ denotes the return on the market portfolio in time t, $\varepsilon_{j,t}$ is a random error which has zero expected value, β_j is the portfolio's level of systematic risk and finally, Jensen uses α_j as the performance measure. A significant positive alpha implies a positive risk-adjusted fund performance. On the other hand, a portfolio manager's intercept that is not performing as well, will be negative. In addition average portfolio managers, who are having a "naïve random selection buy and hold policy", can expect a zero α_j.

2.3.3 Fama and French three-factor model

The model expresses that the portfolio excess return $(R_j - R_f)$ is explained by the correlation of the portfolio returns with three different risk factors: the excess return of a market portfolio $(R_M - R_f)$, the difference in returns between a portfolio of small versus large stocks (SMB, meaning small minus big) and the difference in returns between a portfolio with high versus low book-to-market stocks (HML, meaning high minus low) (Fama and French, 1996). More specific, the portfolio excess return is given by:

$$R_j - R_f = \propto_j + b_j(R_M - R_f) + s_j\text{SMB} + h_j\text{HML} + \varepsilon_j$$

where R_j is the return on stock j, R_f, R_M and ε_j are the same as mentioned above with the Jensen measure, the loadings b_j, s_j and h_j are slopes in time-series regressions, and $\propto_j$ is the Fama and French performance measure for portfolio j.

2.3.4 Carhart four-factor model

Carhart (1997) extended the above listed three-factor model with a fourth risk factor: the difference between high prior-year returns and low prior-year returns. The measure is described as:

$$R_j - R_f = \propto_j + b_j(R_M - R_f) + s_j\text{SMB} + h_j\text{HML} + p_j\ \text{PR1YR} + \varepsilon_j$$

Here, all variables are the same as with the three-factor model except for the $\propto_j$, which is the Carhart performance measure for portfolio j.

2.3.5 DGTW performance measures

The characteristic based performance method introduced by Daniel et al. (1997) decompose the overall return of a mutual fund into a "Characteristic Timing" measure (CT), a "Characteristic Selectivity" measure (CS) and an "Average Style" measure (AS). Together, these elements detect the mutual fund manager's ability to select stocks successfully "that outperform a portfolio of stocks with the same characteristics" and his ability to successfully time the portfolio weightings on the above mentioned characteristics (Kacperczyk et al., 2005).

The Characteristic Timing measure. This first aspect of performance measures the fund manager's ability to time the various investment styles, which implies whether managers can generate more performance through exploiting the time-varying returns of size, book-to-market or momentum strategies by changing portfolio weights to utilize the styles based on the manager's view of the future returns. The month *t* element of this measure can be written as:

$$CT_t = \sum_{j=1}^{N} (\widetilde{w}_{j,t-1} \tilde{R}_t^{b_{j,t-1}} - \widetilde{w}_{j,t-13} \tilde{R}_t^{b_{j,t-13}})$$

where $\widetilde{w}_{j,t-1}$ / $\widetilde{w}_{j,t-13}$ is the portfolio weight of stock *j* on the end of month $t - 1$ / $t - 13$ and $\tilde{R}_t^{b_{j,t-1}}$ / $\tilde{R}_t^{b_{j,t-13}}$ is the return in month t of a characteristic-based buy-and-hold portfolio matched to stock *j* at month $t - 1$ / $t - 13$. The average of the time-series, over all the existing months of a fund, provides the Characteristic Timing measure for that fund.

The Characteristic Selectivity measure. This second aspect of performance measures the fund manager's ability of stock selection, which is referred to as the manager's attempt to pick stocks that outperform a benchmark portfolio. The CS measure "uses as a benchmark the return of a portfolio of stocks that is matched to the fund's holdings each quarter along the dimensions of size, market-to-book ratio and momentum". The month *t* element of this measure is:

$$CS_t = \sum_{j=1}^{N} \widetilde{w}_{j,t-1} (\tilde{R}_{j,t} - \tilde{R}_t^{b_{j,t-1}})$$

where the additional variable $\widetilde{R}_{j,t}$ is the return on stock j for month t. Again, the average of all existing months of a funds is the Characteristic Selectivity measure for that fund. A positive significant CS measure implies that the manager had an additional selectivity ability.

The Average Style measure. Finally, the AS measure is used to measure the fund's earned returns, as a result of the tendency of that fund to hold stocks with some particular characteristics. The month *t* element of this measure is defined as:

$$AS_t = \sum_{j=1}^{N} \widetilde{w}_{j,t-13} \, \tilde{R}_t^{b_{j,t-13}}$$

Note that any stock held by a mutual fund at the month $t-13$ is aligned to its characteristic-based benchmark portfolio of the month $t-13$. Subsequently, the return of month t of this benchmark portfolio is multiplied by the portfolio weight of month $t-13$. To calculate the month t AS aspect, the resulting products are then summed over the total stocks held by the mutual fund at the month $t-13$. Finally, the AS measure is obtained by taking the average of all months. Note, also, that the sum of the three measures (CS, CT and AS) is equivalent to the total return of a particular fund.

2.4 Other issues concerning mutual funds

Naturally, the performance evaluation is not the only issue concerning mutual funds. Competition among mutual funds is for instance also a subject of much discussion. Like the study of Shy and Stenbacka (2003), where "a formal model of strategic competition between mutual funds" was build with a view to analyze the specialization-diversification tradeoff. From their analysis they were capable to determine a systematic relationship between the mutual fund industry market structure with investors that have different attitudes towards risk and the diversification incentives. If competition is sufficiently low, the "subgame perfect portfolio equilibrium will exhibit maximal risk differentiation" and funds will choose a specialization strategy. But when competition is more intensive, intermediate funds, which attract investors who have intermediate attitudes towards risk, will choose then for a diversification strategy. In a more recent study, Wahal and Wang (2011) examined "the impact of the entry of new mutual funds on incumbent mutual funds using the overlap in their portfolio holdings as a measure of competitive intensity". In competitive markets, these new funds compete for revenues and resources with the incumbent funds. Wahal and Wang found that incumbents which overlap much with entrants subsequently reduce management fees leading to price competition. Distribution costs however, in contrast to management fees, increase so that investors' benefits are not that large.

Research to mutual funds can also be linked to the agency theory. Bednarczyk and Eichler (2002) for example, aim on the agency conflicts between managers and investors of mutual

funds. When a person assumes that both mutual fund managers and mutual fund investors pursue independent strategies, both focusing on maximizing their individual utility, is it likely that the mutual fund managers (the agents) will not constantly act into the main interests of the mutual fund investors (the principals) (Jensen and Meckling, 1976). Bednarczyk and Eichler found that the manager's wealth increases at the investor's expense due to such behavior, resulting in a decrease of total wealth.

3. Empirical study

This section of the paper will first introduce the small fund database and thereafter give an overview of the performance measures used. Finally, the results are discussed.

3.1 Data

The sample covers twelve mutual funds for the four-year period 2006-2009, resulting in 576 observations of monthly excess return and 48 of the other variables. These variables include the monthly Fama and French factor returns and the risk free rate along with the market return. All of these variables are provided by Wharton Research Data Service. An overview of the descriptive statistics is shown in table 1. From this table, it may be seen that there is a negative average excess return on the market (-0.0005) with a standard deviation of 0.053. The average excess return of the mutual funds is, however, positive (0.0009) along with a higher standard deviation of 0.069, which indicates a higher risk for a positive expected return.

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Excess Return	576	-0.25525	0.244817	0.000885	0.068504
RMTRF	48	-0.18540	0.11040	-0.000534	0.053409
SMB	48	-0.04280	0.05880	0.001656	0.024600
HML	48	-0.09930	0.07620	0.000481	0.030376
UMD	48	-0.34750	0.12520	-0.006425	0.069176

Table 1: descriptive statistics

3.2 Performance models used

The mutual funds are evaluated using the Jensen alpha and the three-factor and four-factor models from respectively Fama and French, and Carhart.

$$R_{j,t} - R_{f,t} = \alpha_j + \beta_j \mathrm{RMTRF_t} + \varepsilon_{j,t} \quad (1)$$

$$R_{j,t} - R_{f,t} = \propto_j + b_j \mathrm{RMTRF_t} + s_j \mathrm{SMB_t} + h_j \mathrm{HML_t} + \varepsilon_{j,t} \quad (2)$$

$$R_{j,t} - R_{f,t} = \propto_j + b_j \mathrm{RMTRF_t} + s_j \mathrm{SMB_t} + h_j \mathrm{HML_t} + p_j\ \mathrm{UMD_t} + \varepsilon_{j,t} \quad (3)$$

where $t = 1,2,3 \ldots 48$ month, UMD is the momentum factor and RMTRF is the excess return on the market. All alphas are estimated using a pooled OLS regression. Before this regression can be run, the returns of the funds in excess of the risk free rate have to be calculated by subtracting the risk free rate from the fund returns ($R_{j,t} - R_{f,t}$). Subsequently this variable is included as the dependent variable in the regression and RMTRF as the independent variable in the Jensen measure. For the three-factor and four-factor model respectively SMB, HML and SMB, HML, UMD are added. The alpha will then come out as the constant of the regression. If this alpha is significantly positive, the funds outperform the factor portfolio. A significantly negative alpha implies underperformance of the funds.

3.3 The results

As can be seen from table 2, the Jensen measure's coefficient of determination (R^2) is 0.738. This means that almost 74% of the variance in excess return is explained through the variation in the independent variable RMTRF. From the tables 3 and 4, it can be seen that the coefficient of determination for the Fama and French three-factor model and for the Carhart four-factor model is respectively 0.752 and 0.753. These numbers indicate that for these models approximately 75% of the variance in excess return is explained through the variation in the independent variables. So, by adding the two independent variables SMB and HML to the Jensen measure, resulting in the Fama and French three-factor model, R^2 increases by one percent. Therefore, the three-factor model appears to fit better. When adding the variable UMD to this three-factor model, however, there appears to be hardly any change in R^2. Hence, this UMD variable does not seem to increase the explanatory power of the model.

	Coefficients	**p-value**
(Constant)	0.001475	0.313
RMTRF	1.102	0.000
R^2 = 0.738		

Table 2: Results of the Jensen regression, with the dependent variable: Excess Return

	Coefficients	**p-value**
(Constant)	0.001014	0.478
RMTRF	1.093	0.000
SMB	0.325	0.000
HML	-0.168	0.002
R^2 = 0.752		

Table 3: Results of the Fama en French three-factor regression, with the dependent variable: Excess Return

	Coefficients	**p-value**
(Constant)	0.000882	0.540
RMTRF	1.083	0.000
SMB	0.323	0.000
HML	-0.184	0.001
UMD	-0.021	0.413
R^2 = 0.753		

Table 4: results of the Carhart four-factor regression, with the dependent variable: Excess Return

As also can be seen from the tables 2 to 4, the excess return on the market (RMTRF) has the significant largest positive influence on the dependent variable excess return of mutual funds. The additional variables SMB and HML in equation 2 and 3 also seem to be significant, though HML has a negative effect on excess return in both equations. The fourth variable added in equation 3, UMD, appears to be highly insignificant. This could explain why R^2 does not seem to increase when adding UMD to the regression. The central and most important issue concerning the performance of mutual funds, however, revolves around alpha, which is the constant of the results. The alphas (constants) of the models differ slightly from 0.0014 in the Jensen measure to 0.0010 in the three-factor model and 0.0009 for the four-factor model. This would indicate a very little possibility for funds to outperform the portfolio. However, all three alphas appear to be highly insignificant with p-values of respectively 0.313, 0.478 and 0.540, shown in the tables 2 to 4. So, in this case there is no evidence that funds provide alpha.

4. Summary and conclusion

The thesis gave a thorough introduction of mutual funds in the first part of section 2, discussing a number of issues concerning mutual funds, like fees, distribution channels and restrictions. Thereafter, an overview of several mutual fund performance studies in the past is given. As can be seen by this part is that the evaluation of mutual fund performances is indeed very extensive. It discusses studies from 1976 to 2010. It appears however that mutual funds after fees and expenses generally underperform the market. In the third part of section 2, the most important performance measures used in the "performance studies" part are given. These measures include the Sharpe ratio, Jensen's alpha, Fama and French's three-factor model, Carhart's four-factor model and the DGTW performance measures. Finally, the last part of section 2 was dedicated to a number of other issues concerning mutual funds. For instance competition among mutual fund and the linkage between funds and the agency theory. Section 3 consisted of a small empirical study that illustrated the application and evaluation of three different performance measures. A sample of twelve mutual funds from the WRDS was taken following three pooled OLS regressions for the measures Jensen alpha, the three-factor model and the four-factor model. From the results of this empirical study it can be noticed that when the amount of risk factors increases, alpha decreases. Adding more factors to a model, might make it more difficult to refer possible superior fund performances to the skills of the fund manager. Most important, it can be concluded that there is no evidence that funds provide alpha in this empirical study, because of the highly insignificant alphas.

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