ИССЛЕДОВАТЕЛЬСКАЯ СТАТЬЯ

Имеют ли хедж-фонды с высокими комиссиями лучшие показатели?

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Аннотация: В данной исследовательской работе дается ответ на вопрос «Действительно ли хедж-фонды с высокой стимулирующей комиссией превосходят хедж-фонды с ниже среднего или низкой стимулирующей комиссией?» Исследование включает регрессионный анализ исторических данных и показателей, объясняющий сделанные выводы. Для дополнительного подтверждения результатов рассмотрены академические исследования других авторов. Помимо проверки того, действительно ли хедж-фонды с высокими комиссионными за стимулирование и управление превосходят хедж-фонды с низкими комиссионными за стимулирование и управление, автор также оценивает, будут ли они предлагать лучшие преимущества диверсификации в трудные времена, рассматривая корреляцию в кризисный период.

В статье анализируется, какова связь между структурой вознаграждения и абсолютными доходами, какова связь между структурой вознаграждения и доходностью с учетом риска, приводят ли более высокие комиссии к лучшим преимуществам диверсификации.

Тема актуальна из-за плохой производительности хедж-фондовой индустрии, что заставляет инвесторов задуматься о целесообразности инвестирования в хедж-фонды.
Ключевые слова: хедж-фонды, комиссии, эффективность, выгоды, диверсификация
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Do hedge funds with above average fees really outperform?

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RESEARCH ARTICLE

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Abstract: In this research paper the question ‘Do hedge funds with a high incentive fee really outperform hedge funds with a below average or low incentive fee?’ is answered by carrying out author’s own regression on historical data and the variables that may explain the outcomes in this question. The author also considers academic researches to support the findings and add additional explanations to the outcome. Aside from testing whether hedge funds with high incentive- and management fees really outperform the hedge funds with low incentive- and management fees, the author also assesses whether they will offer better diversification benefits in times of need by looking at the correlation during a crisis period.

In order to come to the article’s conclusion, the author answers the following questions: what relation does the fee-structure have to absolute returns, what relation does the fee-structure have to risk-adjusted returns, does paying higher fees mean better diversification benefits.

This topic is relevant since many investors started questioning the benefit of investing their money in hedge funds because of poor performance of the hedge fund industry.
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Introduction

Many investors started questioning the benefit of investing their money in hedge funds after the poor performance of the hedge fund industry during 2016. According to eVestment the hedge fund industry has seen the biggest number of redemptions since 2009.

Since the hedge fund industry as a whole has underperformed many indices such as the S&P 500, it can be said that it would be a waste of money to pay high fees for a fund that doesn't serve its purpose of generating uncorrelated returns and alpha.

Hedge funds are managed portfolios created to pool together the funds of multiple investors, manage the funds to generate significant returns and low correlation by active and more aggressive investment strategies. Some of the clients of hedge funds include retirement funds and wealthy individuals. Unlike mutual funds, which are also managed portfolios of pooled funds, hedge funds are less regulated by the SEC, and therefore have different perks and characteristics. For example, hedge funds are only accessible to accredited investors that have an income of $200k or more per year and are allowed to take (speculative) positions in derivatives and short sales. Hedge funds typically take on a high leverage to enhance their returns. Mutual funds generally only stick to stocks and bonds, while hedge funds can invest in any assets such as real estate, currencies or even make speculative positions on cattle, for example. Hedge funds are a fast-growing industry. The hedge fund industry is currently managing $3.2 trillion in assets under management (AUM) compared to $118 billion in 1997. Of this $3.2 trillion AUM roughly 71 % is managed by managers in the USA. Hedge fund managers typically receive their remunerations in the form of a fee structure. Hedge fund managers receive management fees similarly to mutual fund managers, which is a fixed percentage of the investor's principal investment. This number is roughly 1.57 % by mean with 2 % being seen as standard. Hedge funds also receive a performance/incentive fee, which is a fixed percentage of the profits over a certain benchmark. The mean Incentive fee is 19.29 % with 20 % being seen as standard.

Two additions that can be seen to the fee structure of hedge funds are high-water marks and a hurdle rate. A high-water mark is the principal plus the highest gain that the investor has received on this amount. If the fund has never made a profit, the high-water mark will equal the principal. After the fund has exceeded the high-water mark, it can charge the investor the incentive fee. This measure makes sure that investors are only charged when the fund is generating profit. The hurdle rate is a relative benchmark that must be passed before the fund can collect any incentive remuneration. The hurdle rate can also be seen as an indication of how risky the investment is. A high hurdle rate indicates a riskier investment.

Hedge funds follow diverse strategies. Hedge fund managers have their own individual strategies to distinguish themselves from other managers. However, most hedge funds can be classified within a few broad strategies such as Equity hedge, CTA, relative value, and fund-of-funds. This paper will be focussing on the equity hedge strategy since this strategy can be easily compared to the overall stock market and they have the largest presence in the dataset available from Bloomberg. This allows to reduce the sampling error.

The equity hedge strategy, which is also known as the equity long/short strategy, buys stocks that it believes are undervalued, and short-sells stocks that it believes are overvalued. This first of all creates a high leverage since the proceeds from the short-sale can be used to purchase other stocks. And second of all, gives the manager the opportunity to diversify market risk by taking on a short-position which can turn a positive correlation into a negative correlation.

Literature review

The literature review is based on 22 papers about hedge fund and mutual fund fee structures. The reason for this is that hedge funds and mutual funds have similarities in terms of structure and there is a large amount of research available on this subject for mutual funds. The literature review is structured to cover the following questions:

1. What are the key components to set or change the fee structure? And what is the impact of this structure?
2. What are the theories that relate fees and performance?
3. Does the fee structure have different effects on mutual funds?

What are the key components to set or change the fee structure? And what is the impact of this structure?

In theory, skilled portfolio managers are attracted to funds with a high incentive fee in order to reward them for their performance. Allowing the fund to yield better returns for their investors. This is the main reason why the fee structure of a hedge fund is seen as a signal on how skilled the fund manager is.

Generally speaking, a 2 % management fee and a 20 % incentive fee are seen as the median fee structure of a hedge fund.

According to empirical research done by Deuskar et al. (2011) and Ramadorai and Streatfield (2011) smaller hedge funds tend to charge lower management fees and higher incentive fees, while relatively large hedge funds charge higher management fees with lower incentive fees. Ramadorai and Streatfield (2011) found in their research that funds with relatively high management fees at launch do not tend to outperform the funds with low fees, indicating that it is "Money for nothing". On the contrary, funds with an above average incentive fee at launch are outperforming in terms of raw returns. Ramadorai and Streatfield

(2011) also discovered that North American hedge funds charge lower fees than European and offshore funds.

Deuskar et al. (2011) referred to the work of Gompers and Lerner (1999) on venture capital compensations and found similarities in the fee structure. Two of their main models were used to explain the return pattern mentioned above: **The signalling model** and **the learning model**.

The signalling model explains that experienced fund managers with a good track record tend to differentiate themselves from the less skilled fund managers by taking on more risk. Since the management fee is charged regardless of the fund's performance, a high management fee covers for example more overhead costs than a low management fee. Experienced fund managers feel that their stock picking skills are good enough to generate enough income to cover these costs. For this reason, small and new hedge funds tend to charge low management fees and high performance fees.

The assumption that more skilled hedge fund managers are chosen in these funds also explains the higher returns. Once the fund manager's skills have been proven, the manager will become more risk averse and charge higher management fees.

One possible objection to this is that hedge fund managers tend to take more risk in order to secure higher rewards. However, Brown, Goetzmann and Park (2001) did not find such a relationship in their work. Ackerman, McEnally and Ravenscraft (1999) claimed in their paper that an increase in fees would lead to less risk taking, as lower returns are required to generate the same amount of compensation. Kouwenberg and Ziemba (2007) however concluded from empirical research that high incentive fees lead to higher risk taking. This effect is mitigated if at least 30 % of the fund manager's money is invested into the fund. A high-water provision may also add to this amount of risk in the portfolio, as managers first need to pass a certain percentage of profit for the investor to receive the incentive fee. Panageas and Westerfield (2009) didn't find any significance to support this theory. Goetzmann, Ingersoll, and Ross (2001) however, describe the performance fee contract with a high-water mark provision as an option-like payout. The fund manager will only receive a payout when the fund performance is "in the money" and the value of an option increases when the variance or volatility of the underlying assets becomes larger. Therefore, the incentive fee contract becomes more valuable to the fund manager if more risk is taken, leading to more risk-taking by the manager. However, according to the prospect theory of Kahneman and Tversky (1979) managers are loss-averse and will therefore decrease the risk-taking once the fund is "in the money".

The learning model mentioned by Gompers and Lerner (1999) on the other hand explains that new and small funds set a lower fee structure because neither the fund manager nor investor know the ability of the fund manager. Once the fund has become more senior and the ability of the manager has become known, the improvement of knowledge from both parties allows the fund manager to determine fee structure. Another important factor in this model is the effort put in the outcome. During the "learning period" the fund manager has a strong desire to establish good reputation within the industry and therefore increases effort in the fund. In the "established period", the fund manager already has a reputation in the industry and therefore requires to be compensated more for the same time and effort that he put during the first period. This means that hedge funds with better past performance launch funds with a higher fee structure. Managers with lower performance will decrease their fees or terminate the fund.

Deuskar et al. (2011) mentioned in their work that according to the Bayesian rule, the conviction in a manager's ability to generate high returns is stronger if the past performance shows less volatility. If the track records are volatile and unreliable, little can be learned from the past performance.

Deuskar et al. (2011) also mentioned that there is a positive correlation between capital flows and the hedge fund fee structure. If the manager increases the management fee significantly, there will be fewer capital inflows and vice versa. Not changing the fees with an excellent track record will attract more new investors to the fund, allowing the fund to grow. Because of that, a successful fund manager has two options: generate more profit on the fee structure by increasing the fees or allow the fund to grow by not changing the fee structure and get more profit from the fees on the higher AUM. According to Berk and Green (2004) and Dangl, Wu, and Zechner (2008), managers have no obvious preference between these two options if they can freely adjust the portfolio risk.

One negative effect of the fund to grow is the diseconomy of scale effect. This occurs when the positions of hedge funds grow so large that entering or exiting the position requires more effort and costs.

This illiquidity has a negative effect on the performance. At the same time, according to the empirical evidence of Yin (2015), managers will have increased compensation if they allow the fund to grow, even when diseconomies of scale exist.

However, according to Dangl, Wu, and Zechner (2008), there is also a positive relation between the management fee and the amount of risk taken. As mentioned above, larger fund size means larger liquidity risks. This indicates that if the fund size is large, the fund manager will have to invest in more liquid assets, and thus save the investments. If the management fee is higher, and the fund size decreases, the manager can invest a larger percentage in more illiquid assets and thus risky investments.

What are the theories that relate fees and performance?

Rich and Lajbcygier (2015) mentioned two theories about the relations between hedge fund and fee performance in their work: **The efficient market theory** and the **Principal-Agent theory**.

The efficient market theory states that it is impossible to "beat the market" because all publicly traded stocks automatically reflect their true value. Therefore, it is impossible to possess superior stock picking skills. This means that managers from high-fee funds theoretically should not be able to outperform the managers from low-fee funds. Rich and Lajbcygier explained the higher average returns for high-fee funds by concluding that it is not effect of superior stock picking, but simply by having a higher leverage and this taking more risk. The claim that funds with a higher incentive fee take more risk has been supported by the work of Kouwenberg and Ziemba (2007) mentioned earlier.

The Principal-Agent theory discussed by Jensen and Meckling (1976) and Ross (1973) states that the principal (investor) hires an agent (fund manager) to execute a certain objective (making profit). According to the agency law the agent should always handle in the best interest of the principal. However, Ackerman, McEnally and Ravenscraft (1999) acknowledged that due to information asymmetry this is not always the case. They identified four measures that could mitigate this Principal-Agent problem: incentive fees, joint ownership structures, market forces and government regulation. Since with hedge funds most emphasises is put on the first two, they are the ones we will discuss.

Incentive contracts are put in place to maximize both efficiency and effort to act in the best interest of the principal. By linking output and payment the agent will naturally deploy the skills to the maximum.

A joint ownership structure could also significantly mitigate this risk as mentioned by Kouwenberg and Ziemba (2007). However, Ackerman, McEnally and Ravenscraft (1999) claim that if the fund manager has his own capital invested in the fund, the behaviour of the manager might significantly increase effort, but make the fund manager more risk averse. A high stake in the fund might also make it harder to replace the manager in case of bad performance.

Does the fee structure have different effects on mutual funds?

In order to discuss the difference between hedge fund fee structures and mutual fee fund structures, we will first discuss the major differences between the two. Then, we will look at each of the determinants and effects of the fees. Elton, Gruber, and Blake (2003) mentioned some important differences in their work, the most important one is that mutual funds fall under SEC regulation, which requires them to disclose their audited returns and other data such as AUM and fee-structure to the SEC. They are also prevented from using more risky techniques such as short-selling or using derivatives for non-hedging purposes. An amendment from 1970 of the 1940 Investment Act requires mutual funds to operate by a so-called 'fulcrum fee'. The fulcrum fee requires by law the mutual fund to charge investors a symmetrical fee, which means that the mutual fund will receive a fee when the fund outperforms the chosen benchmark and has to pay a fee when the fund underperforms the benchmark. Because of this symmetrical requirement, incentive fees are less common in the US. Elton, Gruber, and Blake (2003) also mention that out of the 6,716 bond and stock mutual funds in 1999, only 108 charged incentive fees. Therefore, this paper will mainly focus on management fees, unless mentioned otherwise.

Just like with hedge funds, Golec (1988) names the signalling theory, mentioned earlier in the literature review, as a potential explanation for the determinants of the fee-structure. Warner and Wu (2011) had similar results in their work. In addition, Golec (1988) adds that funds from a larger family tend to charge this symmetric performance fee because they are well capable of bearing the loss if the returns turn negative. However, Drago, Lazzari, and Navone (2010) did not find such evidence in their work. One explanation for this contrast in results would be that Drago, Lazzari, and Navone (2010) conducted their work on Italian mutual funds, rather than American mutual funds. Khorana, Servaes, and Tufano (2008) found a significant correlation between the location and the fee-structure of mutual funds. They found that U.S. onshore-funds charge lower fees than offshore-based funds. This can be explained due to the smaller economies of scale in the offshore countries where the funds are domiciled, requiring the funds to charge higher costs to cover the overhead costs. They also found correlation between GDP, education level and fees: Funds domiciled in countries with a high per-capita GDP and a well-educated population charge lower management fees.

In terms of change in fees, Warner and Wu (2011) found a positive relation between the increase in management fees and positive performance. However, they didn't find a link between poor performance and a decrease in funds. They did find a link between growth and fee structure, as funds that grow will have an economy of scale and can therefore decide to lower their management fees while maintaining the same revenue in terms of fee income. Christoffersen (2001) found that half of the U.S. mutual fund managers voluntarily waived the fees that they could rightfully claim to improve their net performance.

Risk, performance, and fees also play an important role. Earlier in the literature review, Kouwenberg and Ziemba (2007) claimed that a higher incentive fee indeed leads to more risk in hedge funds. Ackerman, McEnally, and Ravenscraft (1999) claimed it would lead to less risk-taking. For mutual funds Elton, Gruber, and Blake (2003) found that mutual funds with incentive fees have positive risk adjusted returns, but are still outperformed by the market. The simple reason for this is that incentive-fee mutual funds have a market beta of less than 1.

However, they do have a positive stock-picking ability. Elton, Gruber, and Blake (2003) found that incentive-fee mutual funds tend to increase risk after a period of poor performance, and vice versa. Golec (1988) with his signalling theory mentions that the incentive-fee funds attracts fund managers with an aggressive approach, and therefore allow incentive-fee funds to have more risk.

Grinblatt and Titman (1989) on the other hand, mentioned the incentive for more risk-taking is increased only when the fee-contract is poorly constructed without caps and symmetry. Carpenter (2001) mentioned that some companies/funds "reset the strike prices of their compensatory options" to avoid this additional risk-taking.

Drago, Lazzari, and Navone (2010) did not find any proof of more risk-taking in their work.

According to Elton, Gruber, and Blake (2003), managers believe that having a (higher) incentive fee will lead to more cash inflows as this signals their superior ability (which bears more risk). They also mention that the average investor prefers to have more risk in their investment since the inflow into incentive-fee funds is far greater than those that do not have such a fee. Admati and Pfleiderer (1997), however, claim that incentive-fees don't play a role on the fund's cash inflows as investors are uncertain about the risk tolerance of the fund manager.

Berk and Green (2004) found a relation between the past performance of funds and the inflow of new funds, even though the past performance does not persist. Since Golec (1988) concluded in his work that funds with an incentive fee structure outperform those that don't, we can conclude that these funds will also attract more cash inflows.

Data and methodology

Data has been gathered from the Bloomberg funds database. Bloomberg is known worldwide for its wide availability and easy access to the database for students, academics, and professionals. The Bloomberg funds database consists of hedge funds, both active and defunct. The author has restricted the analysis to United States Dollar denominated hedge funds and has filtered out non-equity hedge funds while also looking at the correlation between the MSCI world index. After applying these filters, 1170 funds remained in the list for the analysis. Hedge funds report on their results monthly by convention, and therefore all calculations are done with a monthly frequency.

For this analysis the author has split the data into a period of economic expansion and a period of recession. This was done to test the fees on their significance during crisis and (normal) expansion period. The data sample ranges between December 2001 and June 2009. The first period ranges from December 2001 to December 2007, as this was a period of an economic expansion according to the NBER. The economic expansion reached its peak in December 2007 and the recession period started in January 2008 and lasted until June 2009, which was the largest crisis in the U.S. since World War II. Another reason for the chosen timeframe is the amount of data available in the author's data set during this period, giving the model more robustness against sampling errors.

From the Bloomberg Funds Database, the author has gathered the following data: (1) Fund's monthly returns, (2) Fund's incentive fees, (3) Fund's management fees, (4) Fund's Inception dates, (5) Fund's high-water marks (1 if yes, 0 if no), (6) MSCI monthly returns and the (7) 1 Month T-bill returns.

Aside from the data mentioned above, the author has also created several extra variables that could explain the return movements: (8) monthly Sharpe ratio, (9) age of the fund, (10) MSCI correlation and (11) standard deviation of the fund.

The monthly Sharpe ratio was calculated using the following formula:

$$Sharpe_x = \frac{(R_x - R_f)}{\sigma_x},$$

where:

$Sharpe_x$ = The Monthly corresponding sharpe ratio for fund x;

R_x = The Monthly corresponding return for fund x;

R_f = The annualised 1 month Treasury bill converted to monthly for the correg periodspondin;

σ_x = Standard deviation of the fund returns of fund x.

The age of the fund was calculated using the following formula:

$$Age_x = \text{Reporting date} - \text{inception date}$$

The MSCI world correlation was calculated using a VBA script, which can be found in the appendix. This VBA script matches the Excel correlation function of the returns of to the returns of the MSCI World for the correct time period. A problem that must be acknowledged when using the Sharpe ratio on hedge funds is that hedge funds have highly (positively) skewed returns due to the use of derivatives. Because of this, the Sortino-ratio, which focusses more on downside risk, would be a better option. However, in order to compare the results to those of other authors with similar returns, the author has chosen to use the Sharpe ratio.

It also has to be noted that the MSCI correlation is static and will not change over time in the sample. It is a mere indication of how correlated the funds are to the MSCI.

The standard deviation has also been calculated using the Excel standard deviation function of the returns of .

The hedge funds have been sorted from high to low on three criteria:

- An average of the management and performance fee,
- Performance fee,
- Management fee.

From that point onwards, the dataset can be divided into four quartiles. Since the 2/20 structure is the most common as mentioned in the introduction, the author has merged the two top quartiles into one quartile. The bottom two quartiles have also been merged into one quartile. Due to the large amount of funds, the data was put in a dated unbalanced panel format by using a self-written Visual Basic script, which can be found in the appendix.

After the data has been divided following the three criteria, each group is analyzed separately. To determine whether there is a relation between the fee-structure of a fund and the returns of the fund, the author created the following order to structure the work:

1. First, looking at the descriptive statistics of the data collected. Then creating one table for the pre-crisis period and one table for the crisis period.
2. Splitting the OLS regression in two parts:
   a. **Part 1:** The OLS regressions with the returns as the dependent variable during the pre-crisis and crisis period.
   b. **Part 2:** The OLS regressions with the Sharpe ratio as the dependent variable during the pre-crisis and crisis period to proxy the risk-adjusted returns.
3. Looking at the diversification benefits each quartile offers to make the assumption whether paying high fees result in better diversification benefits.

After these analyses we want to be able to tell:

1. What relation does the fee-structure have to absolute returns?
2. What relation does the fee-structure have to risk-adjusted returns?
3. Does paying higher fees mean better diversification benefits?

For these three questions the author has created the following formulae that can be used in an OLS (Ordinary Least Squares) regression. Each formula (unless mentioned otherwise) will be used during crisis and pre-crisis period.

$$Return_x = \alpha + \beta_1 MSCI\_World + \beta_2\ PerformanceFee + \beta_3\ ManagementFee + \beta_4\ MSCI\_COR + \beta_5\ HighWaterMark + \beta_6\ Age + \beta_7\ StDEV + \varepsilon_x \quad (1)$$

$$Sharpe = \alpha + \beta_1\ MSCI\_World + \beta_2\ PerformanceFee + \beta_3\ ManagementFee + \beta_4\ MSCI\_COR + \beta_5\ HighWaterMark + \beta_6\ Age + \beta_7\ StDEV + \varepsilon_x \quad (2)$$

$$MSCI\_COR_x = \alpha + \beta_1\ MSCI\_World + \beta_2\ return + \beta_3\ ManagementFee + \beta_4\ PerformanceFee + \beta_5\ HighWaterMark + \beta_6\ Age + \beta_7\ StDEV + \varepsilon_x \quad (3)$$

Formulae 1 and 2 are similar to the models used by Rich and Lajbcygier (2015) and are constructed to find the variables that can explain the average returns and the risk-adjusted returns (Sharpe).

Formula 3 is also similar to the models used by Rich and Lajbcygier (2015) and has been constructed to detect a relation between the correlation of the fund and the management and performance fees.

The MSCI World index has been added as a variable since only equity hedge funds were picked for the research. The MSCI world index consists of 1652 stocks from 23 countries, and therefore serves as a good proxy of the global stock market. However, it must be noted that the MSCI world excludes emerging and frontier markets. Since the hedge funds can buy any stock from any country in the world, the author decided to use the MSCI World index.

The High-Water mark variable has been added to the variables to determine whether it truly is adding to the riskiness of the fund. Panageas and Westerfield (2009) claimed that it is not adding risk to the fund while Goetzmann, Ingersoll, and Ross (2001) claim it does add risk to the fund'sportfolio. Adding this variable also gives the opportunity to check whether it plays an important role in explaining the returns.

The Age variable has been added to find the possible correlation between the age of the fund and its performance. With this variable we can also look for an explanation to see whether the age of a fund determines the fee structure. Based on the signalling theory described earlier, the author expects the age variable to have significant impact on both the performance and the management fees.

The standard deviation variable has been added to see whether there is a relation between incentive fees and more risk-taking. Kouwenberg and Ziemba (2007) concluded from their research that this is indeed the case. However, they also noted that if the fund manager has 30% or more of his own capital in the fund, this risk-taking is significantly reduced.

Biases and problems

Since Hedge funds are not obliged to voluntarily report to the Bloomberg funds database, there may be biases present that can interfere with the results from the analysis. The following biases that can be present:

- **Survivorship bias,**
- **Instant-history bias,**
- **Self-selection bias,**
- **Causality problem,**
- **Return smoothing problem.**

The survivorship bias is the result of funds with consistently negative performance disappearing after they are closed. This happens because funds with positive performance are more likely to survive than those with negative performance. This particularly affects new funds since the Bloomberg fund database includes both inactive and live funds.

The instant-history bias, observed by Fung and Hsieh (2002), states that managers of new funds only want to reveal their returns if these have been meeting their expectations. If a new fund has been added to the database, the manager will add the prior returns to the database only if they are positive. The main reason to do this is to attract new investors for the fund. The Bloomberg database does not show when the returns are added to the database, and therefore we are unable to see the extent of the instant-history bias.

The self-selection bias mentioned by Fung and Hsieh (2002), on the other hand, states that funds with excellent returns that are not looking for new investors may not wish to be included into the database. Since the funds have never been present in the database, there may be some "invisible" funds with a fee-structure relevant to this research.

The causality problem mentioned by Rich and Lajbcygier (2015) would affect our result as we are not certain whether funds with high fees get higher returns, or whether their fees are higher after negotiation due to good performance. Rich and Lajbcygier (2015) mention that Deuskar et al. (2011) found that only 2 % of the funds in the TASS database renegotiated their fee-structure. It is not possible to observe this in the Bloomberg funds database.

The return-smoothing problem has been described in the work of Huang, Liechty, and Rossi (2009) and states that hedge funds often hold illiquid assets whose true values are hard to identify and are slowly reflected in the returns of the fund. Hedge funds can for this reason intentionally or unintentionally give the performance of the fund an upward bias. Huang, Liechty, and Rossi (2009) applied their model on a sample of U.S. equity funds and found that even for this relatively liquid strategy the funds show signs of return smoothing. Therefore, we can assume that return smoothing will also be present in funds within the dataset.

Results of the research

Descriptive data

After having gathered the data for the crisis and post-crisis period,the author has generated a descriptive statistics table for the periods included in the research. **Table 1** represents the pre-crisis period and **Table 2** represents the crisis period.

It is worth mentioning that the median values of the performance fees in both periods are 20 %, which is the same as the data mentioned by Preqin in the Introduction. For the management fees this number is 1.5 %, which is inconsistent with Preqin. However, these findings are similar to those made by Rich and Lajbcygier (2015).

The skewness and kurtosis test the normality of the data. If the skewness is greater than 1 or smaller than -1, the distribution is leptokurtic (fatter tails). A skewness between -0.5 and 0.5 indicates approximate symmetry. Kurtosis is better in measuring the peaks in a dataset. A kurtosis of exactly 3 means normal distribution while a value >3 indicates a leptokurtic dataset. Looking at the skewness and kurtosis of the management fee, we can see that they are symmetric, but leptokurtic. Indicating that the fees are roughly distributed around the mean but

Table 1. The descriptive data from December 2001 to December 2007 (pre-crisis)

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
RETURN	0.013	0.010	1.270	-0.559	0.041	2.721	63.212
SHARPE	0.240	0.203	7.720	-6.891	0.855	0.040	8.640
PERFORMANCEFEE	0.188	0.200	0.300	0.000	0.040	-3.530	15.604
MANAGEMENTFEE	0.015	0.015	0.040	0.000	0.004	0.128	6.123
MSCI	0.009	0.015	0.086	-0.111	0.028	-0.598	4.310
HIGHWATER	0.961	1.000	1.000	0.000	0.194	-4.749	23.555
MSCI_CORR	0.396	0.439	0.966	-0.864	0.315	-0.722	3.394
ST_DEV	0.046	0.037	0.298	0.001	0.034	4.931	64.691
AGE	860.998	728.000	2921.000	7.000	640.230	0.817	2.922

Table 2. The descriptive data from January 2008 to June 2009 (crisis)

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
RETURN	-0.006	-0.001	1.961	-0.828	0.087	1.712	52.963
SHARPE	-0.105	-0.048	9.006	-9.785	1.314	-0.173	4.824
PERFORMANCEFEE	0.187	0.200	0.300	0.000	0.043	-3.225	13.624
MANAGEMENTFEE	0.015	0.015	0.040	0.000	0.005	-0.329	4.488
MSCI	-0.025	-0.016	0.109	-0.191	0.077	-0.170	2.442
HIGHWATER	0.950	1.000	1.000	0.000	0.217	-4.149	18.210
MSCI_CORR	0.392	0.456	0.966	-0.909	0.345	-0.922	3.759
ST_DEV	0.052	0.041	0.298	0.001	0.044	5.399	55.690
AGE	1231.886	1095.000	3468.000	13.000	837.534	0.599	2.443

have some outliers. The performance fee is also non-normal and is more skewed to the left. Rich and Lajbcygier (2015) also found this in their work and were surprised since other academics founds negatively skewed returns in their empirical evidence. Rich and Lajbcygier (2015) mention that this can be explained since our sample occurs right after the dotcom bubble and at that moment the markets were recovering.

In terms of return, the mean fund return during normal market conditions were 1.3 % (1 % median) and during crisis this number was -0.6 % (-0.1 % median). This can easily be explained by the financial crisis during this period. The excessively high skewness and kurtosis numbers in the table indicate that the returns are highly not normal and leptokurtic. The skewness is positive during both periods, indicating a longer distribution on the right side of the curve. This right-skewed distribution is mitigated during the financial crisis, moving it to the left.

The high kurtosis values during pre-crisis and crisis period of 63 and 52.7 respectively indicates that there are massive outliers, and a risk-adjusted measurement would be more appropriate to mitigate this risk. This can be easily observed by the fact that the Sharpe-ratio has a lower skewness and kurtosis in both periods.

It was also noticed that the mean age (in days) of the funds before the crisis was 862 days (728 median) during pre-crisis period and 1232 (1095 median) during the crisis period. This could suggest that the older and more established funds had a higher survival rate during the financial crisis. Deuskar et al. (2011) and Ramadorai and Streatfield (2011) claimed that smaller and less established funds tend to charge higher performance fees. This, in combination with the conclusion from Kouwenberg and Ziemba (2007) that higher fees also lead to more risk taking could explain the increase in age. Another explanation

Table 3. OLS regression on returns pre-crisis. Bottom quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/03/17 Time: 18:56
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 214
Total panel (unbalanced) observations: 8239

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.003125	0.002778	-1.124839	0.2607
MSCI	0.502168	0.015491	32.41688	0.0000
PERFORMANCEFEE	0.022230	0.010711	2.075406	0.0380
MANAGEMENTFEE	0.320648	0.154967	2.069143	0.0386
HIGHWATER	-0.004251	0.002128	-1.997478	0.0458
AGE	-2.59E-06	6.81E-07	-3.801610	0.0001
MSCI_CORR	0.004545	0.001536	2.959417	0.0031
ST_DEV	0.159366	0.013428	11.86778	0.0000

R-squared	0.131543	Mean dependent var	0.012054
Adjusted R-squared	0.130804	S.D. dependent var	0.043806
S.E. of regression	0.040841	Akaike info criterion	-3.557289
Sum squared resid	13.72921	Schwarz criterion	-3.550476
Log likelihood	14662.25	Hannan-Quinn criter.	-3.554961
F-statistic	178.1042	Durbin-Watson stat	1.682974
Prob(F-statistic)	0.000000		

Table 4. OLS regression on returns during crisis. Bottom quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/03/17 Time: 19:02
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 263
Total panel (unbalanced) observations: 4273

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.007099	0.006264	1.133309	0.2571
MSCI	0.508588	0.014919	34.09002	0.0000
PERFORMANCEFEE	0.019349	0.024689	0.783708	0.4333
MANAGEMENTFEE	0.377278	0.338561	1.114355	0.2652
HIGHWATER	0.002667	0.004677	0.570238	0.5685
AGE	-6.87E-08	1.34E-06	-0.051355	0.9590
MSCI_CORR	-0.024374	0.003408	-7.152334	0.0000
ST_DEV	-0.025475	0.027528	-0.925417	0.3548

R-squared	0.224269	Mean dependent var	-0.008817
Adjusted R-squared	0.222996	S.D. dependent var	0.085219
S.E. of regression	0.075119	Akaike info criterion	-2.337623
Sum squared resid	24.06665	Schwarz criterion	-2.325715
Log likelihood	5002.331	Hannan-Quinn criter.	-2.333416
F-statistic	176.1484	Durbin-Watson stat	1.756857
Prob(F-statistic)	0.000000		

Table 5. OLS regression on returns pre-crisis. Top quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/03/17 Time: 21:34
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 459
Total panel (unbalanced) observations: 15033

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.036499	0.010701	-3.410720	0.0006
MSCI	0.407318	0.011010	36.99660	0.0000
PERFORMANCEFEE	0.219970	0.049363	4.456127	0.0000
MANAGEMENTFEE	0.381299	0.099542	3.830524	0.0001
HIGHWATER	-0.004307	0.002886	-1.492584	0.1356
AGE	-2.21E-06	4.98E-07	-4.434189	0.0000
MSCI_CORR	0.006338	0.001007	6.291703	0.0000
ST_DEV	-8.95E-06	9.11E-05	-0.098260	0.9217

R-squared	0.088188	Mean dependent var	0.014006
Adjusted R-squared	0.087763	S.D. dependent var	0.039599
S.E. of regression	0.037821	Akaike info criterion	-3.711367
Sum squared resid	21.49229	Schwarz criterion	-3.707313
Log likelihood	27904.49	Hannan-Quinn criter.	-3.710023
F-statistic	207.5965	Durbin-Watson stat	1.744468
Prob(F-statistic)	0.000000		

Table 6. OLS regression on returns during crisis. Top quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/03/17 Time: 21:35
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 588
Total panel (unbalanced) observations: 9301

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.051703	0.036526	1.415503	0.1570
MSCI	0.348263	0.016610	20.96687	0.0000
PERFORMANCEFEE	-0.171622	0.161112	-1.065237	0.2868
MANAGEMENTFEE	-0.228797	0.428129	-0.534412	0.5931
HIGHWATER	0.008169	0.009728	0.839731	0.4011
AGE	-4.98E-06	1.62E-06	-3.078786	0.0021
MSCI_CORR	-0.029652	0.003809	-7.783975	0.0000
ST_DEV	-4.59E-08	1.69E-07	-0.271709	0.7859

R-squared	0.051631	Mean dependent var	-0.004083
Adjusted R-squared	0.050917	S.D. dependent var	0.126858
S.E. of regression	0.123587	Akaike info criterion	-1.342889
Sum squared resid	141.9380	Schwarz criterion	-1.336750
Log likelihood	6253.107	Hannan-Quinn criter.	-1.340804
F-statistic	72.27537	Durbin-Watson stat	1.290348
Prob(F-statistic)	0.000000		

would simply be that due to the lack of trust in the market, no new hedge fund managers have entered the industry.

The use of a high-water mark also seems to be very popular among hedge funds. With 96 % of the funds having one in place before the crisis and 95 % after. According to Goetzmann, Ingersoll, and Ross (2001), this would lead to more risk-taking since the high-water mark is similar to an option-contract.

Average fees, part 1: Return as dependent variable

Let's discuss the OLS regression output of pre-crisis and crisis period for the bottom quartile funds that have been sorted by average total fees. After having used formula 1 in Eviews, the following results were calculated (**Table 3, 4**).

It is worth mentioning that before the crisis all variables were significant in explaining the returns of the hedge funds. For example, a 1 % increase in performance fees would lead to a 0.022 % increase in monthly returns if other parameters remain fixed. The management fee has a far greater effect on the performance. For every 1 % increase in management fee, the monthly returns are expected to rise by 0.32 %.

To assess why this could be the case, we will have to refer to some possible explanations given in the literature review. Gompers and Lerner (1999) explained in signalling model that fund managers first try to attract new cash flows to the fund by making it financially attractive. This means low fixed costs (management fees) and higher incentive-based fees. After the manager 'has proven' himself, he will become more risk averse and increase the management fee to cover more overhead costs. This can mean that the fund managers with more experience from the more established funds typically have higher management fees, and therefore the management fee is highly significant in explaining the returns. And vice versa, the less experienced fund managers have a lower management fee.

The significant management fee coefficient also contradicts Ramadorai and Streatfield, who claimed high management fees were 'money for nothing'. It supports Warner and Wu (2011), who found a positive relationship between an increase in management fees and positive performance among mutual funds.

The high F-statistic value with 0 % probability indicates that the values aren't related to each other by chance. However, during the crisis only the MSCI_Correlation and the MSCI world index keep on playing a role in explaining the model.

The funds in the bottom quartiles have such a high correlation to the MSCI world that no matter the level of management fees, performance fees or any other variable present, they will follow the market. An explanation for the standard deviation that became insignificant could be that hedge funds typically have a more asymmetric return profile due to the use of derivatives for hedging, which caps the losses. The negative coefficient on the MSCI correlation also indicates that the higher your correlation is, the lower your returns will be (**Table 5, 6**).

The results for the top quartile are similar to those in the bottom quartile. However, the coefficients, high-water mark and the standard deviation (risk) are different during both periods. On top of that, fund's age became significant for the crisis period.

The first thing to mention is that the coefficient for the performance fee is about 10x higher for the top quartile funds (**Table 5**) than for the lower quartile funds (**Table 3**) during the pre-crisis period. This shows that the effect of the performance fee is a lot stronger among the funds with above average fees than the ones with below average fees. A possible explanation for this would be the Principal-Agent theory discussed by Jensen and Meckling (1976) and

Ross (1973). It states that the more you pay the agent (fund manager), the more effort they will put in.

The signalling model from Gompers and Lerner (1999) could also play a role, indicating that better and more experienced fund managers are attracted to the funds with higher fees. The age variable, which is significant in both periods, could also support the theory from Gompers and Lerner (1999) that the fund managers with more experience from the more established funds typically have higher management fees.

The standard deviation and high-water mark variables that became insignificant are also worth mentioning. The insignificance of the standard deviation variable supports what Brown, Goetzmann, and Park (2001) found in their work: Higher hedge fund fees do not lead to more risk-taking. The high-water mark could be related to the standard deviation in our case, as it was already linked to more risk-taking due to the similarity of an option contract (Goetzmann, Ingersoll, and Ross, 2001).

Average fees, part 2: Sharpe ratio as the dependent variable

Let's discuss the OLS regression output of pre-crisis and crisis period for the bottom quartile funds that have been sorted by average total fees. This time the Sharpe ratio is used as the dependent variable to gauge risk-free returns. After having used formula 2 in Eviews, the following results were calculated (**Table 7, 8**).

The significance of the variables in **Table 7** are similar to those in Table 3. However, the variable high-water mark is now insignificant. Since the dependent variable is now risk-adjusted, we can assume that the high-water mark was linked to the riskiness of the returns. This would support Goetzmann, Ingersoll, and Ross (2001) claiming that a high-water mark leads to more risk due to the similarity with an option-contract.

Looking at the significances of the variables in **Table 8** during crisis period, we can see that the results are similar to those in **Table 4**. There is, however, a significance at the 10 % level of the management fee during the crisis period. Which indicates higher risk-adjusted returns for the funds in the lowest quartile. This is consistent with what Rich and Lajbcygier (2015) found in their work.

With the top-quartile funds, variables give different results. The high-water mark using the Sharpe ratio (**Table 9**) became highly significant in the top quartile, while the high-water mark became insignificant in the top-quartile using the returns (**Table 5**) as the dependent variable. The coefficient is negative, thus indicating that adding the high-water mark to the funds with high fees leads to lower risk adjusted returns. Since the high-water mark has previously been linked to the risk of a fund, we can conclude that funds with a high-water mark make riskier investments in terms of risk-adjusted returns.

Again, the coefficients of the top-quartile funds' performance fees are significantly higher than those in the bottom quartile. This indicates that under normal market conditions higher performance fees result in significantly higher risk-adjusted returns.

Do funds with higher average fees offer better diversification?

In order to see whether funds with a high fee-structure at least offer better diversification benefits we will first look at the correlation between the MSCI World index and the returns of the hedge funds. Please note that the correlation in **Table 11** is time-weighted and therefore different from the correlation in the descriptive statistics, which is weighted per fund. From this table we can see that both quartiles offer similar correlation during normal market conditions. However, during crisis period the funds in the top quartile offer significant diversification benefits. To assess these diversification benefits

Table 7. OLS regression on Sharpe ratio pre-crisis. Bottom quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 13:15
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 214
Total panel (unbalanced) observations: 8239

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.031891	0.048894	-0.652253	0.5143
MSCI	10.38564	0.278840	37.24587	0.0000
PERFORMANCEFEE	0.503875	0.192218	2.621369	0.0088
MANAGEMENTFEE	6.330128	2.779512	2.277424	0.0228
HIGHWATER	-0.000495	0.037838	-0.013074	0.9896
AGE	-6.05E-05	1.22E-05	-4.942659	0.0000
MSCI_CORR	0.083332	0.027290	3.053595	0.0023

R-squared	0.147248	Mean dependent var	0.196228
Adjusted R-squared	0.146627	S.D. dependent var	0.795802
S.E. of regression	0.735148	Akaike info criterion	2.223358
Sum squared resid	4448.918	Schwarz criterion	2.229320
Log likelihood	-9152.125	Hannan-Quinn criter.	2.225396
F-statistic	236.9092	Durbin-Watson stat	1.772717
Prob(F-statistic)	0.000000		

Table 8. OLS regression on Sharpe ratio during crisis. Bottom quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 13:14
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 263
Total panel (unbalanced) observations: 4273

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.086875	0.096717	0.898245	0.3691
MSCI	8.866666	0.237916	37.26801	0.0000
PERFORMANCEFEE	0.519337	0.389712	1.332616	0.1827
MANAGEMENTFEE	9.213663	5.374582	1.714303	0.0865
HIGHWATER	0.015004	0.072910	0.205784	0.8370
AGE	-2.45E-05	2.09E-05	-1.169401	0.2423
MSCI_CORR	-0.418342	0.053758	-7.781959	0.0000

R-squared	0.256177	Mean dependent var	-0.165592
Adjusted R-squared	0.255131	S.D. dependent var	1.388014
S.E. of regression	1.197937	Akaike info criterion	3.200715
Sum squared resid	6121.932	Schwarz criterion	3.211134
Log likelihood	-6831.328	Hannan-Quinn criter.	3.204396
F-statistic	244.8731	Durbin-Watson stat	1.720844
Prob(F-statistic)	0.000000		

Table 9. OLS regression on Sharpe ratio during crisis. Bottom quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/02/17 Time: 19:54
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 459
Total panel (unbalanced) observations: 15033

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.105718	0.239087	-0.442176	0.6584
MSCI	9.215314	0.245979	37.46384	0.0000
PERFORMANCEFEE	2.391619	1.102886	2.168510	0.0301
MANAGEMENTFEE	7.079320	2.222774	3.184903	0.0015
HIGHWATER	-0.260346	0.064468	-4.038350	0.0001
AGE	-4.39E-05	1.11E-05	-3.945226	0.0001
MSCI_CORR	-0.062241	0.022500	-2.766291	0.0057

R-squared	0.088009	Mean dependent var	0.264197
Adjusted R-squared	0.087645	S.D. dependent var	0.884663
S.E. of regression	0.845006	Akaike info criterion	2.501520
Sum squared resid	10729.10	Schwarz criterion	2.505067
Log likelihood	-18795.68	Hannan-Quinn criter.	2.502697
F-statistic	241.6726	Durbin-Watson stat	1.575260
Prob(F-statistic)	0.000000		

Table 10. OLS regression on Sharpe ratio during crisis. Bottom quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 13:14
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 588
Total panel (unbalanced) observations: 9301

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.434647	0.349564	1.243396	0.2138
MSCI	5.860265	0.159032	36.84971	0.0000
PERFORMANCEFEE	-1.510017	1.542251	-0.979099	0.3276
MANAGEMENTFEE	0.752637	4.095451	0.183774	0.8542
HIGHWATER	0.160850	0.093139	1.726989	0.0842
AGE	-6.84E-05	1.55E-05	-4.422037	0.0000
MSCI_CORR	-0.420798	0.036450	-11.54452	0.0000

R-squared	0.139452	Mean dependent var	-0.077043
Adjusted R-squared	0.138896	S.D. dependent var	1.275127
S.E. of regression	1.183263	Akaike info criterion	3.175181
Sum squared resid	13012.63	Schwarz criterion	3.180553
Log likelihood	-14759.18	Hannan-Quinn criter.	3.177006
F-statistic	251.0153	Durbin-Watson stat	1.660069
Prob(F-statistic)	0.000000		

Table 11. Correlation between the MSCI world and the returns (unbalanced panel)

	Bottom quartile		Top Quartile	
Pre-crisis	1	0.33	1	0.29
	0.33	1	0.29	1
Crisis	1	0.46	1	0.21
	0.46	1	0.21	1

Table 12. MSCI correlation vs Performance & management fee. Top Quartile

	Pre-crisis		Crisis	
Performance fee coefficient	-	4.774	-	4.673
management fee coefficient	-	4.214	-	5.278

Table 13. MSCI correlation vs Performance & management fee. Bottom Quartile

	Pre-crisis		Crisis	
Performance fee coefficient	-	1.666	-	1.209
management fee coefficient	-	13.943	-	2.608

Table 14. OLS regression on returns pre-crisis. Bottom quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/04/17 Time: 20:30
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 416
Total panel (unbalanced) observations: 14790

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000936	0.002036	0.459563	0.6458
MSCI	0.432836	0.010363	41.76785	0.0000
PERFORMANCEFEE	0.011204	0.008206	1.365404	0.1721
MANAGEMENTFEE	0.144037	0.095125	1.514188	0.1300
HIGHWATER	-0.003742	0.001819	-2.057188	0.0397
AGE	-1.72E-06	4.72E-07	-3.652225	0.0003
MSCI_CORR	0.003236	0.000987	3.277877	0.0010
ST_DEV	0.145093	0.010096	14.37106	0.0000

R-squared	0.120414	Mean dependent var	0.011209
Adjusted R-squared	0.119998	S.D. dependent var	0.038245
S.E. of regression	0.035877	Akaike info criterion	-3.816887
Sum squared resid	19.02703	Schwarz criterion	-3.812776
Log likelihood	28233.88	Hannan-Quinn criter.	-3.815522
F-statistic	289.0910	Durbin-Watson stat	1.716115
Prob(F-statistic)	0.000000		

Table 15. OLS regression on returns the crisis. Bottom quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/04/17 Time: 20:30
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 491
Total panel (unbalanced) observations: 8035

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.006983	0.004992	1.398842	0.1619
MSCI	0.404996	0.010126	39.99500	0.0000
PERFORMANCEFEE	0.016220	0.019205	0.844587	0.3984
MANAGEMENTFEE	0.222643	0.234080	0.951137	0.3416
HIGHWATER	0.002187	0.004209	0.519535	0.6034
AGE	-4.45E-07	9.73E-07	-0.457711	0.6472
MSCI_CORR	-0.020507	0.002301	-8.912091	0.0000
ST_DEV	-0.054697	0.022071	-2.478200	0.0132

R-squared	0.176453	Mean dependent var	-0.007204
Adjusted R-squared	0.175735	S.D. dependent var	0.076714
S.E. of regression	0.069648	Akaike info criterion	-2.489732
Sum squared resid	38.93765	Schwarz criterion	-2.482771
Log likelihood	10010.50	Hannan-Quinn criter.	-2.487350
F-statistic	245.6943	Durbin-Watson stat	1.663795
Prob(F-statistic)	0.000000		

we will use formula 3 to see how the correlation coefficients react to the fee structure of the fund.

In **Tables 12** and **13**, all variables were highly significant with a 0 % probability in explaining the correlation of the MSCI to the fees of the funds. What is interesting to see is that the funds in the top quartile get better diversification for every increase in management fee. At the same time, in the bottom quartile the diversification gets worse. From these two tables we can conclude that funds with a higher fee structure offer better diversification benefits when needed during a crisis.

Performance fees, part 1: Returns as the dependent variable

Let's discuss the OLS regression output of pre-crisis and crisis period for the bottom quartile funds that have been sorted by their performance fees. After having used formula 1 in Eviews, the following results were calculated (**Table 14, 15**).

Looking at the bottom quartile hedge funds sorted by their performance fee, we can see that both the management fee and the performance fee has become insignificant. In this data sample all the other values are similar to those sorted by average fees in **Tables 3** and **4**. The Principal-Agent theory discussed by Jensen and Meckling (1976) and Ross (1973) could again be a driver in the sudden insignificance of these fees. Since they get a low pay, the investment could be more passive, rather than active, explaining the high MSCI correlation and MSCI significance. For the funds in the top quartile sorted by performance fees the results are presented in **Tables 16** and **17**.

These results are again similar to those sorted by average fees in **Tables 5** and **6**. However, the standard deviation and high-water mark are now significant. The standard deviation is now a key driver in explaining the returns. From this we can conclude that the funds with a high performance fee take on more risk. The high-water mark has a negative effect on the returns, however, which is probably related to the risk-taking, since we have seen this combination before. The crisis period in **Table 17** has the same features as the crisis period in **Table 6**.

Performance fees, part 2: Sharpe ratio as the dependent variable

Let's look at the major discovery from the OLS regression output of pre-crisis and crisis period for the bottom quartile funds that have been sorted by performance fees. This time the Sharpe ratio is used as the dependent variable to gauge risk-free returns. After having used formula 2 in Eviews, the following results were calculated (**Tables 18, 19**).

The most important things worth noting in findings about the Sharpe ratio are the negative correlation between the management fee and the Sharpe ratio and the significance of the management fee during the financial crisis.

The negative correlation between the management fee and the Sharpe ratio is consistent with the conclusions from Deuskar et al. (2011), Dangl, Wu, and Zechner (2008) mentioned in the literature review. Deuskar et al. (2011) found a positivecorrelation between higher management fees and capital inflow. From this we can conclude that funds with a higher management fee get less cash inflows because they are less attractive to new investors. Dangl, Wu, and Zechner (2008) mentioned the combination of liquidity and economy of scale as one of the key drivers for fund managers to take risk. If the fund manager has a large amount of AUM, it will be very hard to enter and exit highly illiquid positions. Therefore, funds with a low cash inflow (high management fee) can invest in riskier assets. This could explain the drop in the Sharpe ratio for every increase in management fee. The reason why this is different from our earlier results in **tables 2 to 5** is that the management fees are distributed in with small increments compared to the performance fee, and therefore have less influence in the sorting process.

The observation of the management fee being significant at 10 % with a positive coefficient and an insignificant performance fee is also remarkable. This is consistent with the findings of Rich and Lajbcygier (2015). It is surprising since it predicts the principal-agent theory of Jensen and Meckling (1976) and Ross (1973), which links effort to payout. This finding does support the signalling model from Gompers and Lerner (1999), which states that better fund managers, which are risk-averse, charge higher management fees. This finding is important since the hedge fund industry prefers performance fee over fixed fee (Rich and Lajbcygier, 2015).

Do funds with higher performance fees offer better diversification?

To see whether funds with a high performance offer better diversification benefits than those with a lower one, we started looking at the correlation of the MSCI world index and the returns again. The results are very similar to those in **Table 11** and show that the correlation of funds with higher performance fees is indeed better. After using formula 3 in Eviews we obtained the coefficients of the funds that have been sorted by performance fee.

When we start looking at the coefficients, things are very different. Firstly, the coefficients show that an increase in both management and performance fees would still lead to better diversification. However, the bottom quartiles have a stronger relation to this increase in MSCI correlation. This is in line with the findings on the negative risk-adjusted coefficient in **Table 20**, connecting riskier investments with a higher management fee.

Management fees, part 1: Returns as the dependent variable

Let's discuss the OLS regression output of pre-crisis and crisis period for the bottom quartile funds that have been sorted by their management fees. After having used formula 1 in Eviews, the following results were calculated (**Tables 25, 26**).

Table 16. OLS regression on returns pre-crisis. Top quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/03/17 Time: 19:45
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 214
Total panel (unbalanced) observations: 8239

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.003125	0.002778	-1.124839	0.2607
MSCI	0.502168	0.015491	32.41688	0.0000
PERFORMANCEFEE	0.022230	0.010711	2.075406	0.0380
MANAGEMENTFEE	0.320648	0.154967	2.069143	0.0386
HIGHWATER	-0.004251	0.002128	-1.997478	0.0458
AGE	-2.59E-06	6.81E-07	-3.801610	0.0001
MSCI_CORR	0.004545	0.001536	2.959417	0.0031
ST_DEV	0.159366	0.013428	11.86778	0.0000

R-squared	0.131543	Mean dependent var	0.012054
Adjusted R-squared	0.130804	S.D. dependent var	0.043806
S.E. of regression	0.040841	Akaike info criterion	-3.557289
Sum squared resid	13.72921	Schwarz criterion	-3.550476
Log likelihood	14662.25	Hannan-Quinn criter.	-3.554961
F-statistic	178.1042	Durbin-Watson stat	1.682974
Prob(F-statistic)	0.000000		

Table 17. OLS regression on returns the crisis. Top quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/03/17 Time: 19:02
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 263
Total panel (unbalanced) observations: 4273

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.007099	0.006264	1.133309	0.2571
MSCI	0.508588	0.014919	34.09002	0.0000
PERFORMANCEFEE	0.019349	0.024689	0.783708	0.4333
MANAGEMENTFEE	0.377278	0.338561	1.114355	0.2652
HIGHWATER	0.002667	0.004677	0.570238	0.5685
AGE	-6.87E-08	1.34E-06	-0.051355	0.9590
MSCI_CORR	-0.024374	0.003408	-7.152334	0.0000
ST_DEV	-0.025475	0.027528	-0.925417	0.3548

R-squared	0.224269	Mean dependent var	-0.008817
Adjusted R-squared	0.222996	S.D. dependent var	0.085219
S.E. of regression	0.075119	Akaike info criterion	-2.337623
Sum squared resid	24.06665	Schwarz criterion	-2.325715
Log likelihood	5002.331	Hannan-Quinn criter.	-2.333416
F-statistic	176.1484	Durbin-Watson stat	1.756857
Prob(F-statistic)	0.000000		

Table 18. OLS regression on the Sharpe-ratio pre-crisis. Bottom quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 21:28
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 416
Total panel (unbalanced) observations: 14790

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.079913	0.043381	1.842125	0.065
MSCI	10.11403	0.232683	43.46705	0.000
PERFORMANCEFEE	0.158884	0.184250	0.862332	0.388
MANAGEMENTFEE	0.919559	2.132609	0.431190	0.666
HIGHWATER	0.033386	0.040590	0.822517	0.410
AGE	-5.11E-05	1.06E-05	-4.842069	0.000
MSCI_CORR	-0.002456	0.021751	-0.112927	0.910

R-squared	0.114544	Mean dependent var	0.19882
Adjusted R-squared	0.114185	S.D. dependent var	0.85591
S.E. of regression	0.805568	Akaike info criterion	2.40593
Sum squared resid	9593.270	Schwarz criterion	2.40953
Log likelihood	-17784.88	Hannan-Quinn criter.	2.40712
F-statistic	318.7252	Durbin-Watson stat	1.60421

Table 19. OLS regression on Sharpe ratio crisis period. Bottom quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 21:28
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 491
Total panel (unbalanced) observations: 8035

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.107683	0.081002	1.329384	0.1838
MSCI	7.325771	0.175378	41.77132	0.0000
PERFORMANCEFEE	0.262154	0.332369	0.788744	0.4303
MANAGEMENTFEE	4.139897	4.049779	1.022253	0.3067
HIGHWATER	0.034848	0.072029	0.483810	0.6285
AGE	-2.60E-05	1.65E-05	-1.572861	0.1158
MSCI_CORR	-0.397596	0.039184	-10.14687	0.0000

R-squared	0.188932	Mean dependent var	-0.144385
Adjusted R-squared	0.188325	S.D. dependent var	1.338901
S.E. of regression	1.206256	Akaike info criterion	3.213790
Sum squared resid	11681.16	Schwarz criterion	3.219881
Log likelihood	-12904.40	Hannan-Quinn criter.	3.215874
F-statistic	311.6757	Durbin-Watson stat	1.699355
Prob(F-statistic)	0.000000		

Table 20. OLS regression on the Sharpe-ratio pre-crisis. Top quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 21:33
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 257
Total panel (unbalanced) observations: 8482

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.594676	0.248498	2.393078	0.0167
MSCI	8.837350	0.311243	28.39369	0.0000
PERFORMANCEFEE	0.228893	1.099403	0.208198	0.8351
MANAGEMENTFEE	-7.229963	2.791071	-2.590390	0.0096
HIGHWATER	-0.206183	0.062148	-3.317606	0.0009
AGE	-5.90E-05	1.37E-05	-4.317251	0.0000
MSCI_CORR	-0.051061	0.029369	-1.738622	0.0821

R-squared	0.089882	Mean dependent var	0.312159
Adjusted R-squared	0.089238	S.D. dependent var	0.848276
S.E. of regression	0.809542	Akaike info criterion	2.416129
Sum squared resid	5554.165	Schwarz criterion	2.421944
Log likelihood	-10239.81	Hannan-Quinn criter.	2.418114
F-statistic	139.4968	Durbin-Watson stat	1.691246
Prob(F-statistic)	0.000000		

Table 21. OLS regression on Sharpe ratio crisis perio. Top quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 13:14
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 263
Total panel (unbalanced) observations: 4273

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.086875	0.096717	0.898245	0.3691
MSCI	8.866666	0.237916	37.26801	0.0000
PERFORMANCEFEE	0.519337	0.389712	1.332616	0.1827
MANAGEMENTFEE	9.213663	5.374582	1.714303	0.0865
HIGHWATER	0.015004	0.072910	0.205784	0.8370
AGE	-2.45E-05	2.09E-05	-1.169401	0.2423
MSCI_CORR	-0.418342	0.053758	-7.781959	0.0000

R-squared	0.256177	Mean dependent var	-0.165592
Adjusted R-squared	0.255131	S.D. dependent var	1.388014
S.E. of regression	1.197937	Akaike info criterion	3.200715
Sum squared resid	6121.932	Schwarz criterion	3.211134
Log likelihood	-6831.328	Hannan-Quinn criter.	3.204396
F-statistic	244.8731	Durbin-Watson stat	1.720844
Prob(F-statistic)	0.000000		

Table 22. Correlation between the MSCI world and the returns (unbalanced panel)

	Bottom quartile		Top Quartile	
Pre-crisis	1	0.32	1	0.28
	0.32	1	0.28	1
Crisis	1	0.41	1	0.19
	0.41	1	0.19	1

Table 23. MSCI correlation vs Performance & management fee. Top Quartile

	Pre-crisis	Crisis
Performance fee coefficie	- 1.666	- 1.209
management fee coefficie	- 13.943	- 2.608

Table 24. MSCI correlation vs Performance & management fee. Bottom Quartile

	Pre-crisis	Crisis
Performance fee coefficie	- 1.882	- 1.422
management fee coefficie	- 19.062	- 7.570

Table 25. OLS regression on returns pre-crisis. Bottom quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/04/17 Time: 23:32
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 440
Total panel (unbalanced) observations: 16504

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000862	0.001967	-0.438486	0.6610
MSCI	0.429559	0.009682	44.36672	0.0000
PERFORMANCEFEE	0.023458	0.008043	2.916392	0.0035
MANAGEMENTFEE	0.132590	0.093262	1.421693	0.1551
HIGHWATER	-0.004886	0.001706	-2.863669	0.0042
AGE	-7.74E-07	4.31E-07	-1.795263	0.0726
MSCI_CORR	0.002908	0.000934	3.112831	0.0019
ST_DEV	0.164856	0.009744	16.91828	0.0000

R-squared	0.123238	Mean dependent var	0.011908
Adjusted R-squared	0.122866	S.D. dependent var	0.038313
S.E. of regression	0.035883	Akaike info criterion	-3.816647
Sum squared resid	21.23955	Schwarz criterion	-3.812909
Log likelihood	31502.97	Hannan-Quinn criter.	-3.815412
F-statistic	331.2403	Durbin-Watson stat	1.716116
Prob(F-statistic)	0.000000		

Table 26. OLS regression on returns during crisis. Bottom quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/04/17 Time: 23:32
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 515
Total panel (unbalanced) observations: 8473

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000373	0.004551	0.082027	0.9346
MSCI	0.390814	0.009823	39.78486	0.0000
PERFORMANCEFEE	0.010494	0.018872	0.556047	0.5782
MANAGEMENTFEE	0.251211	0.239459	1.049078	0.2942
HIGHWATER	0.005720	0.003878	1.474861	0.1403
AGE	2.26E-07	8.91E-07	0.253729	0.7997
MSCI_CORR	-0.020117	0.002211	-9.097146	0.0000
ST_DEV	8.99E-10	9.49E-08	0.009474	0.9924

R-squared	0.166359	Mean dependent var	-0.006847
Adjusted R-squared	0.165670	S.D. dependent var	0.075909
S.E. of regression	0.069337	Akaike info criterion	-2.498735
Sum squared resid	40.69639	Schwarz criterion	-2.492084
Log likelihood	10593.89	Hannan-Quinn criter.	-2.496465
F-statistic	241.3223	Durbin-Watson stat	1.648763
Prob(F-statistic)	0.000000		

Table 27. OLS regression on returns pre-crisis. Top quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/04/17 Time: 23:34
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 233
Total panel (unbalanced) observations: 6768

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010923	0.006955	1.570398	0.1164
MSCI	0.477004	0.020184	23.63318	0.0000
PERFORMANCEFEE	0.026351	0.024812	1.062040	0.2883
MANAGEMENTFEE	0.083787	0.238259	0.351664	0.7251
HIGHWATER	-0.002906	0.004099	-0.709014	0.4783
AGE	-5.96E-06	9.25E-07	-6.439882	0.0000
MSCI_CORR	0.005706	0.001832	3.114726	0.0018
ST_DEV	-5.20E-05	0.000109	-0.476827	0.6335

R-squared	0.082984	Mean dependent var	0.016746
Adjusted R-squared	0.082035	S.D. dependent var	0.047179
S.E. of regression	0.045203	Akaike info criterion	-3.354133
Sum squared resid	13.81267	Schwarz criterion	-3.346072
Log likelihood	11358.39	Hannan-Quinn criter.	-3.351351
F-statistic	87.39145	Durbin-Watson stat	1.756177
Prob(F-statistic)	0.000000		

Table 28. OLS regression on returns during crisis. Top quartiles

Dependent Variable: RETURN
Method: Panel Least Squares
Date: 04/04/17 Time: 23:33
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 336
Total panel (unbalanced) observations: 5101

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.062215	0.030594	2.033569	0.0420
MSCI	0.411323	0.028241	14.56475	0.0000
PERFORMANCEFEE	-0.017706	0.082774	-0.213904	0.8306
MANAGEMENTFEE	-1.522901	1.210703	-1.257865	0.2085
HIGHWATER	0.003792	0.013713	0.276518	0.7822
AGE	-9.46E-06	2.88E-06	-3.280981	0.0010
MSCI_CORR	-0.041914	0.006551	-6.397691	0.0000
ST_DEV	0.000132	0.000409	0.322501	0.7471

R-squared	0.048894	Mean dependent var	-0.003459
Adjusted R-squared	0.047587	S.D. dependent var	0.160820
S.E. of regression	0.156947	Akaike info criterion	-0.864255
Sum squared resid	125.4521	Schwarz criterion	-0.854002
Log likelihood	2212.281	Hannan-Quinn criter.	-0.860665
F-statistic	37.40273	Durbin-Watson stat	1.271763
Prob(F-statistic)	0.000000		

Figure 1. Histogram of management fees from December 2001 – December 2007. Bottom quartile

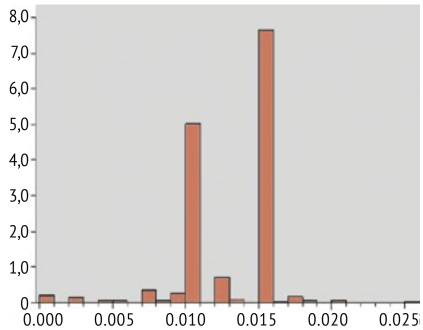

Figure 2. Histogram of management fees from December 2001 – December 2007. Top quartile

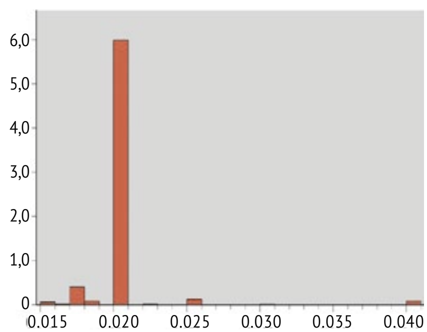

Table 29. OLS regression on the Sharpe-ratio pre-crisis. Bottom quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 23:33
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 440
Total panel (unbalanced) observations: 16504

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.043483	0.042105	1.032725	0.3017
MSCI	9.918642	0.217962	45.50636	0.0000
PERFORMANCEFEE	0.454718	0.180896	2.513700	0.0120
MANAGEMENTFEE	3.163400	2.090567	1.513178	0.1303
HIGHWATER	-0.008242	0.038105	-0.216296	0.8288
AGE	-3.62E-05	9.69E-06	-3.738080	0.0002
MSCI_CORR	-0.001831	0.020640	-0.088723	0.9293

R-squared	0.112510	Mean dependent var	0.215691
Adjusted R-squared	0.112187	S.D. dependent var	0.857311
S.E. of regression	0.807792	Akaike info criterion	2.411399
Sum squared resid	10764.74	Schwarz criterion	2.414669
Log likelihood	-19891.86	Hannan-Quinn criter.	2.412479
F-statistic	348.5633	Durbin-Watson stat	1.611011
Prob(F-statistic)	0.000000		

Table 30. OLS regression on the Sharpe-ratio during crisis. Bottom quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 23:32
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 515
Total panel (unbalanced) observations: 8473

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.078881	0.079636	0.990517	0.3219
MSCI	7.135958	0.171891	41.51448	0.0000
PERFORMANCEFEE	0.323641	0.330230	0.980047	0.3271
MANAGEMENTFEE	1.759549	4.188916	0.420049	0.6745
HIGHWATER	0.061953	0.067863	0.912905	0.3613
AGE	-1.38E-05	1.56E-05	-0.887291	0.3749
MSCI_CORR	-0.383633	0.038678	-9.918629	0.0000

R-squared	0.178786	Mean dependent var	-0.135758
Adjusted R-squared	0.178204	S.D. dependent var	1.338391
S.E. of regression	1.213291	Akaike info criterion	3.225375
Sum squared resid	12462.58	Schwarz criterion	3.231195
Log likelihood	-13657.30	Hannan-Quinn criter.	3.227362
F-statistic	307.1887	Durbin-Watson stat	1.703284
Prob(F-statistic)	0.000000		

The first thing that is observed is the fact that all variables in Table 25 are considered significant, except for the management fee. Given the fact that these returns have been sorted by management fee, it can relate to the learning model of Gompers and Lerner (1999), which states that fund managers first set a low management fee with an incentive fee contract to prove themselves. After the fund manager has proven himself, we would expect the management fee to increase and become significant. This can explain why the management fee has no significance while the performance fee is highly significant. Another explanation would be the signalling theory: Fund managers want to reflect their skillset and are therefore scared to set the fees below average. This results in fee-herding as shown in Figure 1 where most of the fees concentrate around 1 % and 1.5 %. This fee herding could mean that the management does not properly reflect the fund manager's skill and makes it harder to explain variations in the return.

During the crisis period, none of the variables except for the MSCI world index and the correlation with the MSCI world index seem to explain the returns.

Regarding the returns for the top quartile, we can again conclude that there is no significance in the model. The probable cause for this is likely to be fee herding again as shown by Figure 2, most management fees are around 2 %.

Management fees, part 2: Sharpe ratio as the dependent variable

With regards to the Sharpe ratio, the performance fee seems to be significant under normal market conditions. This indicates that the higher the performance fee corresponds to the higher the Sharpe ratio. This is consistent with the work of Ackerman, McEnally and Ravenscraft (1999), claiming in their paper that an increase in fees would lead to less risk-taking as lower returns are required to generate the same amount of compensation.

Table 31. OLS regression on the Sharpe-ratio pre-crisis. Top quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 23:34
Sample: 2001M12 2007M12
Periods included: 73
Cross-sections included: 233
Total panel (unbalanced) observations: 6768

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.319814	0.124383	2.571203	0.0102
MSCI	8.892919	0.360962	24.63671	0.0000
PERFORMANCEFEE	1.195571	0.443729	2.694375	0.0071
MANAGEMENTFEE	2.487635	4.260962	0.583820	0.5594
HIGHWATER	-0.304687	0.073310	-4.156116	0.0000
AGE	-8.53E-05	1.65E-05	-5.163696	0.0000
MSCI_CORR	-0.059112	0.032732	-1.805907	0.0710

R-squared	0.087647	Mean dependent var	0.299737
Adjusted R-squared	0.086837	S.D. dependent var	0.845967
S.E. of regression	0.808402	Akaike info criterion	2.413519
Sum squared resid	4418.405	Schwarz criterion	2.420572
Log likelihood	-8160.347	Hannan-Quinn criter.	2.415953
F-statistic	108.2515	Durbin-Watson stat	1.686194
Prob(F-statistic)	0.000000		

Table 32. OLS regression on the Sharpe-ratio during crisis. Top quartiles

Dependent Variable: SHARPE
Method: Panel Least Squares
Date: 04/04/17 Time: 23:34
Sample: 2008M01 2009M06
Periods included: 18
Cross-sections included: 336
Total panel (unbalanced) observations: 5101

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.535706	0.225072	2.380152	0.0173
MSCI	6.267477	0.207773	30.16500	0.0000
PERFORMANCEFEE	-0.343346	0.608980	-0.563804	0.5729
MANAGEMENTFEE	-9.327521	8.907115	-1.047199	0.2951
HIGHWATER	0.129820	0.100884	1.286820	0.1982
AGE	-0.000121	2.12E-05	-5.718291	0.0000
MSCI_CORR	-0.491661	0.048155	-10.20997	0.0000

R-squared	0.169447	Mean dependent var	-0.053690
Adjusted R-squared	0.168469	S.D. dependent var	1.266259
S.E. of regression	1.154680	Akaike info criterion	3.126895
Sum squared resid	6791.761	Schwarz criterion	3.135866
Log likelihood	-7968.146	Hannan-Quinn criter.	3.130036
F-statistic	173.2110	Durbin-Watson stat	1.636419
Prob(F-statistic)	0.000000		

Table 33. Correlation between the MSCI world and the returns (unbalanced panel)

	Bottom quartile		Top Quartile	
Pre-crisis	1	0.32	1	0.27
	0.32	1	0.27	1
Crisis	1	0.30	1	0.20
	0.30	1	0.20	1

Table 34. MSCI correlation vs Performance & management fee. Top Quartile

	Pre-crisis		Crisis	
Performance fee coefficie	-	2.526	-	1.464
management fee coefficie	-	9.453	-	18.289

Table 35. MSCI correlation vs Performance & management fee. Bottom Quartile

	Pre-crisis		Crisis	
Performance fee coefficie	-	1.609	-	1.391
management fee coefficie	-	20.023	-	8.965

Appendices

Appendix 1: The Panel Format Script

```
Sub PanelFormat()
Dim x As Integer
Dim J As Variant
Dim Column As String
Dim start As Integer
Dim last2 As String
Dim Rng As String
Dim rngDate As String
Dim rngName As String
Dim Fundname As String
Dim col As String
Dim col2 As String
Dim forJ As String
Sheets("panel output").Activate
'start of loop
'insert number of funds as maximum
For x = 3 To 1300
' selects the start and end point of the
    returns
'------------------------------------------------
'------------------------------------------------
start = Sheets("returns").Cells(2,
    x).End(xlDown).Row
Last = Sheets("returns").Cells(65536,
    x).End(xlUp).Row
amount = Last + 1 - start
col = Columns(x).Address
rngDate = ("A" & start & ":" & "A" & Last)
'pastes the date
Sheets("returns").Activate
Range(rngDate).Select
Selection.Copy
Sheets("panel output").Activate
Cells(WorksheetFunction.
    CountA(Range("A:A")) + 1, 2).Select
ActiveSheet.Paste
'pastes the fund number
Sheets("panel output").Activate
lrg = Range("A:A").Cells.CountLarge
last2 = Sheets("panel output").Cells(lrg, 1).
    End(xlUp).Row
forJ = (lrg + last2) - lrg
Sheets("panel output").Activate
For J = forJ To forJ + (amount - 1)
Cells(J + 1, 1) = x - 1
Next J
Next x
End Sub
```

Appendix 2: The script that matches the fund correlation to the right MSCI periods

```
Sub Correlation()
Dim start As String
Dim Last As String
Dim letter As String
Dim Rng As String
Dim MsciRng As String
Dim col As String
'Starts the loop. Enter the total number
    of funds here
For x = 2 To 1175
'finds the column reference. A table with
    all the columns and their correspond-
    ing letters has been created in the
    MSCI world tab
Sheets("MSCI WORLD").Activate
col = WorksheetFunction.VLook-
    up(x, Sheets("MSCI World").
    Range("D2:G1176"), 2, 0)
' selects the start and end point of the
    returns
Sheets("returns").Activate
start = Sheets("returns").Cells(2, x).End(x-
    lDown).Row
Last = Sheets("returns").Cells(65536,
    x).End(xlUp).Row
Rng = (col & start & ":" & col & Last)
MsciRng = ("B" & start & ":" & "B" & Last)
vll = WorksheetFunction.Correl(Sheets("M-
    SCI World").Range(MsciRng),
    Sheets("returns").Range(Rng))
Outputs the correlation date to the appro-
    priate fund in the tab 'correlations'
Sheets("correlations").Cells(x, 2) = vll
Next x
Sheets("correlations").Activate
End Sub
```

References

Ackermann C., McEnally R., Ravenscraft D. The Performance of Hedge Funds: Risk, Return, and Incentives. *The Journal of Finance.* 1999. No. 54(3). P. 833–874. In English

Admati, A., Pfleiderer P. Does It All Add Up? Benchmarks and the Compensation of Active Portfolio Managers. *The Journal of Business*. 1997. No. 70(3). P. 323-350. In English

Berk J., Green R. Mutual Fund Flows and Performance in Rational Markets. *Journal of Political Economy*. 2004. No.112(6). P. 1269-1295. In English

Carpenter J. Does Option Compensation Increase Managerial Risk Appetite? *The Journal of Finance.* 2000. No. 55(5). P. 2311-2331. In English

Christoffersen S. Why Do Money Fund Managers Voluntarily Waive Their Fees? *The Journal of Finance*. 2001. No. 56(3). P. 1117-1140. In English

Dangl T., Wu Y., Zechner J. Market Discipline and Internal Governance in the Mutual Fund Industry. *Review of Financial Studies*. 2008. No. 21(5). P. 2307-2343. In English

Deuskar P., Wang Z., Wu Y., Nguyen Q. The Dynamics of Hedge Fund Fees. *SSRN Electronic Journal*. 2011. In English

Drago D., Lazzari V., Navone M. Mutual Fund Incentive Fees: Determinants and Effects. *Financial Management*. 2010. No.39(1). P. 365-392. In English

Elton E., Gruber M., Blake C. Incentive Fees and Mutual Funds. *The Journal of Finance*. 2003. No. 58(2). P. 779-804. In English

Fung W., Hsieh D.A. Hedge Fund Benchmarks: Information Content and Biases. *Financial Analysts Journal*. 2002. No. 58(1). P. 22-34. In English

Goetzmann W., Ingersoll J. Jr., Ross S. High-Water Marks and Hedge Fund Management Contracts. *SSRN Electronic Journal*. 2001. In English

Golec J. Do Mutual Fund Managers Who Use Incentive Compensation Outperform Those Who Don't? *Financial Analysts Journal*. 1988. No. 44(6). P. 75-78. In English

Gompers P., Lerner J. An Analysis of Compensation in the U.S. Venture Capital Partnership. *Journal of Financial Economics*. 1999. No. 51(1). P. 3-44. In English

Grinblatt M., Titman S. Adverse Risk Incentives and the Design of Performance-Based Contracts. *Management Science*. 1989. No. 35(7), P. 807-822. In English

Huang J., Liechty J., Rossi M. Return Smoothing and its Implications for Performance Analysis of Hedge Funds. *SSRN Electronic Journal*. 2009. In English

Jensen M., Meckling W. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics*. 1976. No. 3(4), P. 305-360. In English

Kahneman D., Tversky, A. Prospect Theory: An Analysis of Decision under Risk. *Econometrica*. 1979. No. 47(2). P. 263. In English

Khorana A., Servaes H., Tufano P. Mutual Fund Fees Around the World. *Review of Financial Studies*. 2008. No. 22(3). P. 1279-1310. In English

Kouwenberg R., Ziemba W. Incentives and Risk Taking in Hedge Funds. *Journal of Banking & Finance*. 2007. No. 31(11). P. 3291-3310. In English

Lajbcygier P., Rich J. The Gap between Desert and Entitlement: Performance Fees in Hedge Funds. *SSRN Electronic Journal*. In English

Panageas S., Westerfield M. High-Water Marks: High Risk Appetites? Convex Compensation, Long Horizons, and Portfolio Choice. *The Journal of Finance*. 2007. No. 64(1). P. 1-36. In English

Ramadorai T., Streatfield M. Money for Nothing? Understanding Variation in Reported Hedge Fund Fees. *SSRN Electronic Journal*. 2010. In English

Warner J., Wu J. Why Do Mutual Fund Advisory Contracts Change? Performance, Growth, and Spillover Effects. *The Journal of Finance*. 2011. No. 66(1). P. 271-306. In English

Yin C. The Optimal Size of Hedge Funds: Conflict between Investors and Fund Managers. *The Journal of Finance*. 2016. No. 71(4). P. 1857-1894. In English

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