A valuation of Swedish hedge funds performance

Elis Grönqvist, Johan Wennerström

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Supervisor: Jian Hua Zhang

Department of Economics

School of Business, Economics and Law

University of Gothenburg

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Abstract

In this thesis we present annual returns of Swedish hedge funds sorted by investment strategies and investigate which strategy performs best and how the Fama-French factors: market premium, value premium and growth premium affect these returns. The Fama-French three-factor model is built on the Capital Asset Pricing Model which tries to describe the relationship between the expected return of an asset and the risk of the asset compared to the market. By adding the value- and growth factors to further explain the expected returns and risks, we examine which of the hedge fund strategies is performing best in terms of returns and risk over the period 2000-2019. A similar and earlier study on American hedge funds by Ding & Shawky (2007) found that all the strategies studied performed better than the market index, which is similar to the findings in this study. This study finds that the Fama-French factors do explain the performance of Swedish hedge funds and that four out of five strategies statistically affect the performance of hedge funds. The study also finds that the highest ranked hedge fund strategy within the study is Equity. It is interesting to see how Swedish hedge funds strategies perform against the market and against each other, the result could help investors make more informed investments.

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1. Introduction

The first hedge fund was established in 1959, since then hedge funds as an alternative investment have gained popularity. In the last decades there has been a spectacular growth in the number of hedge funds. The amount of assets under management globally in the third quarter of 2022 is estimated to be $4,712 Billion (Barclayhedge 2022). In the uprising of the hedge funds mostly wealthy people were interested in hedge funds but in more recent decades institutional investors such as pension funds, foundations and insurance companies have started to invest in them (Riksbank 2012). Thus hedge funds have begun to play a larger role in the financial markets.

The definition of hedge funds varies because of their many different investment strategies. Though there are some characteristics that they have in common such as long/short strategies, the use of derivatives and hedging, even though many hedge funds invest in traditional securities such as bonds, stocks, commodities and real estate. Hedge funds are typically illiquid because the investors' money is usually locked in a period called the “lock-up period” and usually there is a big minimum investment (Barclayhedge 2012).

In Sweden a hedge fund is classified as a “special fund” this is because the regulations are more relaxed compared to mutual funds, as a result managers practically use whatever investment strategy they want and invest in many different assets. Therefore hedge fund managers have a crucial role regarding the returns of the fund. This differs from other types of investment vehicles, which is more correlated to the market. (Avanza 2016). Hedge funds usually have two fees that investors have to pay: Management fees and performance fees. These fees usually are 1-2 percent of the amount invested as an annual fee and a larger percentage (15-20 percent) of the excess returns beyond a benchmark (Bodie, Kane & Marcus 2021, p.898). This study does not take transaction costs into account.

It is important to study hedge funds because of the value they can provide to investors. For instance, George Soros’ hedge fund (Quantum Fund) has reported excess returns of 30 percent per year over a long period (Boasson & Boasson 2011). Hedge funds play an important role since they improve market efficiencies, also they can help investors to hedge against market fluctuations and offer good diversification opportunities. In this thesis, the

performance of hedge funds is measured using the Fama-French three-factor model. Four traditional measures are also used, the Sharpe ratio, Treynor ratio, Jensen's alpha and the Appraisal ratio to evaluate performance. The rationale behind choosing the models and measurements is discussed in the methodology section.

In order to use the Fama-French model the assumptions from the Capital Asset Pricing Model (CAPM) needs to hold, because the Fama-French factor is an extension of CAPM. If different markets have different buy and sell prices the excess returns of the different strategies and the effect of the Fama-French factors are inconclusive as the funds' returns could be gained from arbitrage opportunities and not from the factors and diversification choices.

This study finds that the Fama-French factors do explain the risk and return of the hedge funds and that four of the five different strategies studied also affect the risk and return of the hedge funds. Three of the five strategies show a positive alpha when run against the model individually, showing which strategies find excess return against the market. All strategies have a higher Sharpe ratio than the market while also having a lower mean annual return than the market, showing that the hedge fund strategies has lower risk but gain more risk-adjusted returns. The study shows that when ranking the strategies based on expected return, the equity strategy ranks at the top.

1.1 Purpose

The purpose of this study is to evaluate Swedish hedge funds' strategies and their performance in terms of risks and returns. The Fama & French three-factor model is used to evaluate how these factors explain the strategies' returns. To examine the strategies performance, risk-adjusted returns are also calculated with four widely used performance measurements, to account for the priorities of the different strategies. The results can help investors make investment decisions and deepen the knowledge on Swedish hedge funds and their performance. To our knowledge there is not a study of this kind, which also incorporates dummy variables for controlling each strategy on Swedish hedge funds strategies performance.

1.2 Research question

In this thesis the main objective is to investigate the performance of hedge fund strategies and how the three Fama-French factors affect the returns over the period 2000-2019. This leads to two research questions: "Which hedge fund´s strategy generates the best value for investors

in terms of risk and return" and "How do the three Fama & French factors explain the expected returns over the period".

1.3 Layout

In the *second* section we present the theoretical background, then in section *three* we review past literature. Section *four* presents the hypotheses. In section *five* we present the methodology, followed by an explanation of the data in section *six*. Finally the results are presented in section *seven* followed by concluding remarks and suggestions for future research in section *eight*.

2.Theory

In this section we describe the CAPM theory which is the theory behind the Fama & French three factor model. The Capital Asset Pricing Model (CAPM) was developed by William F. Sharpe (1964), John Lintner (1965) and Jan Mossin (1966). The model measures the relationship between risk and expected returns. CAPM shows that the expected rate of return of a capital asset is dependent on the risk free rate of return, the excess return of the market and the assets risk in relation to market risk. (Fama & French 2004).

$$E(r_i) = r_f + \beta_i\left(E(r_m) - r_f\right)$$

In order for CAPM model to work eight assumptions are formed:

1. Investors are rational and mean variance optimizers
2. All investors invest in the same time horizon
3. All investors use identical information when investing
4. All relevant information is publicly available
5. All assets are publicly held and traded on public exchanges.
6. Investors can borrow and lend at a common risk-free rate.
7. No taxes
8. No transaction costs.

As a consequence of these assumptions all investors end up having the same capital allocation line and thereby end up with the same optimal portfolio *P.* If all investors choose the same

risky portfolio, it is then the market portfolio. The proportion of each stock/asset in the market portfolio is the market value of each stock divided by the total market value of all stocks/assets. Because of the price mechanism, prices on assets adjust based on demand, e.g if a stock is not in the market portfolio then its price will fall until it's cheap enough to be included in the market portfolio. This will ensure that all stocks/assets are included in the market portfolio (Bodie, Kane & Marcus 2021, p.275-285).

To evaluate if an asset's (*i*) risk premium is adequate you have to look at the contribution of asset *i* risk to the whole portfolio. Since the market portfolio is the whole portfolio investors hold in the CAPM theory. The risk of asset *i* is measured by the contribution to the variance of the market portfolio and is stated as: $w_i \ Cov(R_m, R_i)$. The contribution of risk is here measured by the covariance of asset *i* and the market portfolio. If asset *i* has a negative covariance with the market portfolio then the asset provides a negative contribution to risk thus making the total risk smaller.

In equilibrium all assets offer the same reward-to-risk ratio, the market mechanism of price and demand will ensure that they do. Thus the reward-to-risk ratios of asset *i* and the market portfolio are equal $\frac{E(R_i)}{Cov(R_i,R_m)} = \frac{E(R_m)}{\sigma_m^2}$.

Thus the fair risk premium of asset *i* after rearranging the equation above would be:

$$E(R_i) = \frac{Cov(R_i, R_m)}{\sigma_m^2} E(R_m) .$$

The risk of asset *i* is measured by its covariance to the market portfolio, the total risk of the added investment *i* must be the covariance of asset *i* and the market portfolio divided by total variance of the market portfolio : $\frac{Cov(R_i, R_m)}{\sigma_m^2}$. This ratio is called *beta* (β).

Now we can rearrange and get the expected return-beta relationship also known as CAPM:

$$E(r_i) = r_f + \beta_i\left(E(r_m) - r_f\right)$$

The CAPM show that the expected return of asset i is the sum of the risk-free rate (r_f) plus a risk premium. The risk premium is determined by the product of the market risk premium and the risk of asset *i* as measured by beta which measures the contribution to risk of the overall risky portfolio (Bodie, Kane & Marcus 2021, p.275-285).

The CAPM holds for both portfolios and individual assets. The beta of the market portfolio is equal to one because the covariance between the market itself divided by the total variance of the market portfolio is equal to one. This makes 1 the weighted-average value of beta across all assets (Bodie, Kane & Marcus 2021, p.275-285).

CAPM is a reward-to-risk equation and can be shown visually (figure 1) as the security market line (SML) . The blue line represents the SML. Beta on the horizontal line, expected return of the asset *i* and the market on the vertical line. The beta of the market is one and the slope of the SML line is the market risk premium. Assets that are fairly priced should plot exactly on the line. If assets plot above the SML line they are considered undervalued by the market since the expected return is higher than predicted by the CAPM model. And overvalued stocks plot below the SML (Bodie, Kane & Marcus 2021, p.275-285).

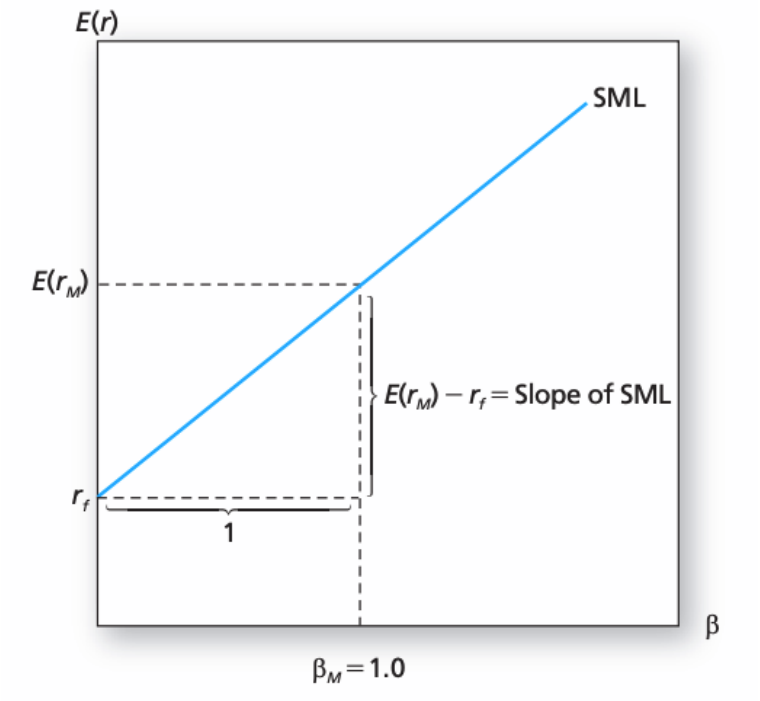

Figure 1 (Bodie, Kane & Marcus 2021, p.284).

3. Literature review

In the last decades there has been a great increase in the number of hedge funds, and this has naturally led to an increased interest in the research field. Researchers use different methods and models when measuring the performance of hedge fund strategies.

Ding and Shawky (2007) estimate the performance of hedge fund strategies in the period 1990-2003 with two different models, the Fama-French three factor model (1993) and Harvey-Siddique two factor model (2000) that incorporates skewness. They find that all hedge fund strategies perform above average when measured against an aggregate equity market index.

Boasson and Boasson (2011) examine the risk and return performance of hedge fund investment strategies in the period 1990-2006. They focus on twelve commonly used hedge fund strategies and apply the Carhart (1997) multi-factor asset-pricing model and estimate the alphas and betas of the strategies. They find similar results as Ding and Shawky (2007), that every strategy produces on average positive and statistically significant alphas. Alpha measures the average return of the portfolio over and above the return predicted by CAPM and a multi-factor asset-pricing model. The Carhart (1997) model is an extension of the Fama & French three-factor model; it adds a fourth factor (Bodie, Kane & Marcus 2021, p.411-412).

Metzger and Shenai (2019) study the performance of various hedge fund strategies over the period 2007–2017. They use different methods and measurements such as correlations, Carhart's four-factor model, the persistence of performance and reward-risk ratios. They find that all the examined strategies performed better than the benchmark index S&P 500 during crisis periods, and seven strategies did better than the benchmark index over the whole period. In contrast, Ackermann et al. (1999) found using data from 1988-1995 that hedge funds consistently perform better than mutual funds but not better than the market index. They also find that hedge funds are more volatile than both mutual funds and the market index and that the superior performance could be explained by the incentive fees.

Capocci and Hübner (2004) used different pricing models such as an extension of Carhart (1997) combined with Fama and French (1998) and Agarwal and Naik (2004) models, they found that one fourth of individual hedge funds produces significant positive excess returns.

And when analyzing each strategy individually they find that 10 out of 13 strategies produce significantly positive excess returns. The results from the studies above are mixed although most of the authors find that the hedge fund strategies outperformed the benchmark index.

4. Hypotheses

The research questions addresses how the strategies of hedge funds have performed in terms of risk and returns and how the Fama-French factors relate to the strategies. The expectation is that strategies that have high beta values with the three factors also have a higher return. The reason behind this is that Fama and French (1998) showed that on historical evidence value stocks outperform growth stocks and small-cap stocks outperform large-cap stocks. In the Fama-French three-factor model, the factors (SMB, HML) try to capture that statement. Thus funds that have high factor betas should perform better compared to other funds that have lower relationships with those variables.

To answer the two research questions two null hypotheses are formulated.

H_0: *Different hedge fund strategies do not statistically affect the expected returns of the hedge funds.*
H_A: *Different hedge fund strategies do statistically affect the expected returns of the hedge funds.*

H_0: *The Fama-French factors do not statistically explain the hedge funds' expected returns.*
H_A: *The Fama-French factors do statistically explain the hedge funds' expected returns.*

If these two hypotheses are rejected and the alternative hypothesis is assumed, the research questions can be answered. If the first null hypothesis is rejected, a ranking of the strategies can be presented, which in turn would answer the first research question of which strategy generates the best value for investors in terms of risk and return. If the second hypothesis is rejected it shows that the Fama-French factors in the model do explain the expected returns of the hedge funds and can further be analyzed about *how* they explain the returns.

5. Methodology

This study uses panel data to investigate how hedge funds have performed over the time period 2000-2019 on a yearly basis. From the regression analysis, the hedge fund's excess returns and relationship to the Fama-French factors is obtained and compared to the other hedge funds with different investment strategies. We also rank the strategies based on performance.

To nuance the results, correlation matrices, performance measurments and descriptive statistics of each strategy are presented. The descriptive statistics consists of the time-series mean, standard deviation, skewness, and kurtosis for each fund in the strategy as a grand mean for each strategy.

5.1 Performance measurements

The Sharpe ratio measures the risk-adjusted excess returns. A high Sharpe ratio equals a higher return for each unit increase in risk (volatility). Therefore, investors want as high a Sharpe ratio as possible. In order for investors to potentially invest in the hedge fund, the Sharpe ratio needs to be greater than the Sharpe ratio of the benchmark index, this is because otherwise investors would invest in passive index funds and collect returns with higher returns and less effort (Bodie, Kane & Marcus 2021, p.135). William F. Sharpe (1966) developed the Sharpe Ratio to describe the performance of an investment while accounting for its risk. It is defined as:

$$\frac{R_i - R_f}{\sigma_i}$$

The Sharpe ratio of each fund is calculated with the difference in the estimated mean return and the estimated mean risk-free return divided by the standard deviation of each fund:

$$\frac{\hat{\mu}_i - \hat{\mu}_{Rf}}{\sigma_i}$$

The Sharpe Ratio has been critiqued when ranking hedge funds because of hedge funds inherent characteristics of not being normally distributed. This can result in Sharpe ratios that overstate or understate the returns of hedge funds (Andrew W. Lo 2002). The authors Metzger and Vijay (2019) argue that it could be a problematic tool when measuring hedge funds as the

Sharpe ratio assumes that the assets are long only, but hedge funds are not, they use options and short selling.

However the authors Eling and Schuhmacher (2007) showed that even though hedge funds' return distribution is not normally distributed, their means and variance are sufficient enough to evaluate performance. This indicates according to Eling and Schuhmacher (2007) that the Sharpe ratio, which uses mean and variance as components in the performance measurement, is sufficient to evaluate hedge fund performance. They conclude that when rating hedge funds, the top 100 hedge funds, measured with another preferred measurement. 98 of them also ranked in the top 100 when using the Sharpe ratio. This, combined with the simplicity and notability of the ratio shows that it suits well enough to measure hedge fund performance.

The Treynor Ratio is a reward-to-risk ratio that divides the expected excess return by systematic risk (beta). It differs from the Sharpe ratio in that its risk component is divided by beta, while the Sharpe ratio's risk component is the volatility of the asset itself (Bodie, Kane & Marcus, 2021, p.816).

$$\frac{R_i - R_f}{\beta_i}$$

Jensen's alpha measures the average return on the portfolio over and above the return predicted by the CAPM, given portfolio beta and the average market return (Bodie, Kane & Marcus 2021, p.817). Jensen's Alpha is calculated by using a time-series single-factor model of the market risk premium with the mean of each strategy return for that year:

$$\overline{R_i} - R_{f_t} = \alpha + \beta_1 \left(R_{m_t} - R_{f_t} \right) + \varepsilon_t$$

Jensen's alpha is used to both measure each strategy's excess expected return above the market but also to calculate the Appraisal ratio.

The Appraisal Ratio is calculated by taking Jensen's Alpha, and dividing it by the standard deviation of the error term from the regression and raising it to the second power. This performance measurement is used to explain how good investment managers are at picking investments. The standard deviation of the error terms can be interpreted as unsystematic risk.

$$\left(\frac{\alpha_i}{\sigma(\varepsilon_i)}\right)^2$$

It measures this ability by using the abnormal return and the risk that can be changed through diversification (Bodie, Kane & Marcus 2021, p.817). This gives a measurement of how good a manager is at investing.

The equation without being raised to the second power is called the information ratio, which measures how much a portfolio has outperformed a benchmark (Goodwin 1998). By using the excess expected return of the market and dividing it by the standard errors of the regression, the information ratio can be calculated which in turn is used to calculate the appraisal ratio.

To compute these ratios, the time-series mean of the return of market- and risk-free return variables are calculated in relation to each separate fund. For fund number 1 which had 12 years of observational data, the mean of the said variable during those years was calculated and used in the ratios. A grand mean for each strategy containing these funds is then calculated using the means of each fund's time period.

A correlation matrix is also constructed to see if the returns of the different strategies were linearly related. The matrix shows each strategy's correlation with each other and the market index (R_m) with a value between -1 and 1 for perfect negative correlation and perfect positive correlation respectively. A separate but similar matrix is also presented for the Fama-French factors SMB, HML and the market premium RM-RF.

5.2 Fama & French three-factor model

The reasoning behind using the Fama and French three-factor model is that the model is considered to give a better explanation of hedge fund behavior compared to CAPM, since it includes two more risk premiums which the returns could be explained and adjusted by.

Hedge funds use various and different investment strategies and a multi-factor model can better explain these variations (Boasson & Boasson 2011). The Fama-French three factor model is at the center stage in the research field (Bodie, Kane & Marcus 2021, p.405). Though many authors use the Carhart (1997) four-factor model which is an extended version of the Fama-French three-factor model. But according to Capocci & Hübner (2002) the additional fourth factor (momentum factor) does not prove to be a strong indicator of hedge funds' behavior. The authors found that only 6 out of 28 examined investment strategies show significant momentum loadings at the 10 percent level.

Since the data in this thesis consists of five different strategies, analyzing how each strategy relates to the factors in the Fama & French three-factor model and which of them has the highest excess return can be used to draw conclusions about the strategies in terms of what types of assets and risk they invest in and how it affects their returns.

Fama & French (1993) extended CAPM with two more factors to explain asset´s excess return compared to the market. The model uses a market premium as the first factor and portfolios of small and big assets as the second factor and as the third factor portfolios of value assets and growth assets, to see how assets are captured by the different risk premiums. The explanation of how these factors are gathered and computed is explained in the Data section (section *six*). The Fama-French model is as follows:

$$r = R_f + \beta_1(R_m - R_f) + \beta_2 SMB + \beta_3 HML \quad (1)$$

Since the model has the constant R_f in front of the coefficients of the factors, the model used in the panel data regression is:

$$r_{it} - Rf_t = \alpha + \beta_1(Rm_t - Rf_t) + \beta_2 SMB_{it} + \beta_3 HML_{it} + \varepsilon_{it} \quad (2)$$

To measure the relationship between the three factors and the different strategies, five different regressions with the yearly returns of the funds in each strategy were done. This method makes it hard to rank the strategies and examine the highest performing strategy, because the five regressions have different factor coefficients between them and the regressions have different slopes. To deal with this problem a pooled OLS regression according to equation (3) is done, where the factors and dummies controlling for the strategies

are run against all the hedge funds. With this regression it is possible to rank the strategies and answer the research question since all hedge funds are regressed collectively.

Pooled OLS model.

$$r - Rf = \alpha + \beta_1(Rm - Rf) + \beta_2 SMB + \beta_3 HML + \beta_4 S2 + \beta_5 S3 + \beta_6 S4 + \beta_7 S5 + \varepsilon \qquad (3)$$

Pooled OLS with panel data is a standard OLS regression that does not interpret the time series and cross-sectional effects. This model uses dummy variables S2, S3, S4, and S5 representing 4 of the 5 strategies in the data. No dummy for the first strategy was created because it would cause the dummy variable trap, as explained by Jaggia & Kelly (2019, p.630) if the intercept of the linear model is included, one of the dummies representing a categorical variable should be excluded to avoid multicollinearity.

To test which model is the best fit for the data when performing one regression analysis of all strategies, three different types of models were used. Pooled OLS, fixed effects, and random effects.

After conducting the regressions, the estimates of the fixed- and random effects regressions are stored to perform a Hausman test to test whether to use the random effects model or fixed effects model. The null hypothesis of the Hausman test is that a random effects model is a better fit due to there being no correlation between the error terms and the regressors (Glen 2022). This is to test whether the dependent variable has a fixed relationship with the independent variables or if the relationship differs between observations. If the test does not reject the null hypothesis the conclusion is that a random-effects model suits the data better than a fixed-effects model and if the null hypothesis is rejected a fixed-effects model is preferred.

A Breusch-Pagan Lagrangian Multiplier test is used to determine whether to use the random-effects model or the pooled OLS model. It tests whether the data is homo- or heteroscedastic where the null hypothesis assumes homoscedasticity. If the test does not reject the null hypothesis, meaning there are no random effects in the data and a pooled OLS model will be used to analyze and discuss the results. The results in detail from these tests to determine which model is used is explained in the result section.

6. Data

The hedge fund data is collected from HedgeNordic (2022). Hedgenordic is a company that provides data and other projects to the Nordic alternative investment space. From their website, we have collected data on average returns from 61 active hedge funds in the period 2000-2022. However only 52 hedge funds are used, section 6.2 describes why. The data of hedge funds in the hedge nordic index is submitted on a voluntary basis. This leads to the fact that data of hedge funds is hard to get, because hedge funds are not obligated to report financial results like other types of investment alternatives. Hedge funds typically share data and information because they want to attract new investors and inform the investors they already have (Capocci, Hübner 2002).

In the data sample collected on the Swedish hedge funds from HedgeNordic (2022), there are five different strategies that the hedge funds employ. The strategies are described below.

1. Equity strategy funds invest both long and short in equity markets, of different sizes and types. Typically diversifying or hedging across different sectors or regions. They also trade with equity futures, options, equity-related debt and securities (Credit-Suisse 2022).
2. Multi-strategy funds are characterized by allocating capital with several hedge fund strategies. This strategy seeks to deliver positive returns regardless of the market situation and invest in equity, interest rate or currency. Diversifying like this reduces risk and helps to smoothen returns (Credit-Suisse 2022).
3. Fixed income strategy attempts to generate profits by exploiting price inefficiencies in fixed-income securities. They often try to limit volatility by hedging, this includes leverage in long and short positions (Credit-Suisse 2022).
4. Fund of funds strategy invests in different hedge funds (Bodie, Kane & Marcus 2021, p.883).
5. Managed Futures & CTA (Commodity Trading Advisors) invest in listed global: bonds, commodity futures, currency markets and equity. Employs systematic trading programs and applies technical analysis. A high degree of leverage can be used (Credit-suisse 2022).

6.1 Survivorship bias

Survivorship bias is a common problem when studying hedge funds. Survivorship bias is a form of selection bias and can generate an upward bias for the results. In this case survivorship bias is when defunct hedge funds are being overlooked because they are deleted from the database and only data on currently active hedge funds are taken into account. To deal with this problem many data vendors do not eliminate defunct funds from the database. They can also backfill a fund's performance history when the fund is added to the database (Capocci, Hübner. 2002). The data we have used do unfortunately only present data on current actively Swedish hedge funds, thereby our data suffer from survivor bias. This means that the result of our study will give results that are overly optimistic in the sense that the hedge funds in general will appear to perform better than they actually do.

6.2 Fama & French factors

The Fama and French factors, the risk-free rate, and the market returns are collected from the research institution Swedish house of finance (2022). Since the Fama and French factors are only available up until 2019, 9 hedge funds that started to operate after 2019 are sorted out. This leaves 52 hedge funds. It should also be noted that the funds in the dataset have different inception dates, leading to unbalanced panel data and the funds with the earliest inception dates may not have another strategy or fund with the same date observations.

As the risk-free rate variable (Rf) the Swedish one-month treasury bill is used as a proxy. As a proxy for the Market return (Rm) the SIX return index is used. The SIX return index is value-weighted with all stocks listed at the Stockholm Stock Exchange and includes reinvested dividends.

The factors SMB and HML are constructed using 6 created portfolios from 21 different stock market segments. The HML factor is the average return of the two value (high) portfolios minus the average return of the two growth (low) portfolios.

As explained by Aytug, Fu and Sodini (2020) the market- and risk-free returns are proxies made from return indices of the Stockholm stock market and Swedish treasury bills. The two

added factors SMB and HML are portfolio differences constructed by the Swedish House of Finance and are size- and value factors respectively.

In order to capture size- and value factors adequately six portfolios are constructed. To generate the SMB and HML variables, Market Equity (ME) is used which is bid price multiplied by the number of shares and a percentile breakpoint at the 80th percentile. All stocks above the 80th percentile were marked as Big and all stocks under that breakpoint were marked Small. Then the reported Book equity (BE) from each company is used to compute the book-to-market ratio of these stocks (BE/ME). They then made percentile breakpoints in this ratio to generate Value, neutral and growth stocks at 70th and 30th percentile, meaning that companies under the 30th percentile were marked as growth, companies between 30th and 70th were marked as neutral and companies over the 70th percentile were marked as value (Aytug, Fu & Sodini, 2020).

Aytug, Fu and Sodini (2020) constructed six portfolios from these companies as follows:

Small–Growth, Small–Neutral, Small–Value, Big–Growth, Big–Neutral, Big–Value. Finally, to compute the variable SMB they took the average return of the Small–Growth, Small–Neutral, Small–Value portfolios and subtracted the average return of the three Big portfolio counterparts.

$$SMB = \frac{(SG+SN+SV)}{3} - \frac{(BG+BN+BV)}{3}$$

To compute the HML variable Aytug, Fu and Sodini (2020) took the average return of the Value portfolios minus the average return of the Growth portfolios.

$$HML = \frac{(SV+BV)}{2} - \frac{(SG+BG)}{2}$$

According to Fama & French (1993) these two stock market factors are used to proxy some risks found in investing. They explain that stocks with low BE/ME ratio are associated with high earnings and stocks with high BE/ME are associated with low earnings. Further, Fama & French (1993) also explain that bigger-size stocks have higher earnings than smaller stocks. So the variable SMB is trying to imitate the relationship between size and earnings. Similarly, the HML variable is trying to imitate the relationship between book-to-market and returns. With these factors, the analysis of performance could be more informative as the size- and value factors are incorporated into the model.

The returns of the hedge funds were obtained as monthly returns but converted to yearly returns, which also was the case for the fama-french factors. The data was converted to yearly because the number of funds in the data was substantially smaller than the number of time observations. By converting the time scale to yearly the number of funds was just a bit larger than the number of time observations. Pesaran & Smith (1995) showed that with T larger than N it is more appropriate to estimate each group separately. The goal in this study was however to estimate the strategies which consist of many groups against each other, thus it was found suitable to convert the data so that N is larger than T.

7. Empirical results and analysis

7.1 Descriptive statistics

Table 1 shows that the SIX return index has the highest mean annual return of 13.7 percent followed by Equity, Fixed income, Multi-strategy, Fund of Funds and Managed Futures & CTA. The SIX return index also has the highest standard deviation followed by Equity, Multi-strategy, Fixed Income, Managed Futures & CTA, Fund of Funds. The standard deviation measures the risk of the asset. It is expected that the market index offers a high return since a higher risk should offer a higher reward.

The mean annual return and standard deviation of the strategies in table 1 convey that the hedge funds have less volatility than the market factor. It also shows that four of the strategies have a relatively low standard deviation compared to the mean while the Equity strategy has an above average standard deviation. This is most likely due to the unbalanced data which consists of nearly 50 percent Equity hedge funds. As expected, the strategies with higher mean return generally have a higher standard deviation.

Hedge fund returns typically fall outside the normal distribution. As a result skewness and kurtosis occur in the data. In table 1 we also present statistics of skewness and kurtosis of the data for all strategies and the independent variables. Managed Futures & CTA, Fund of Funds, and Multi-strategy exhibit negative levels of skewness and Equity, Fixed income strategy exhibits positive levels of skewness. Skewness measures the asymmetry in the distribution. Negatively skewed distributions have a “fatter” left tail than the normal distribution which means that the probability of extreme negative outcomes is higher compared to if the data

were normal distributed. Positive levels of skewness means the opposite, that there is a higher probability of extreme positive returns compared to a normal distribution (Bodie, Kane & Marcus 2021, p.138). To explain skewness in simple terms, the risk-free rate is heavily skewed to the right. This is logical because the risk-free rate is very stable and almost never negative, skewing the distribution to the right.

Kurtosis is a measurement to describe how likely outliers are in the distribution. A normal distribution has a kurtosis of 3 and the values in the descriptive statistics show the difference from that value. A negative kurtosis implies that outliers in the distribution are less likely and a positive kurtosis implies that outliers are more likely to occur compared to a normal distribution (Bodie, Kane & Marcus 2021, p.139).

Table 1. Descriptive statistics of hedge fund returns by strategy

This table presents the descriptive statistics of yearly returns for hedge funds sorted by their strategies. The yearly returns of the market index (RM), risk-free rate (RF), SMB factor and HML factor are also included in the bottom of table 1.

	Funds	Obs.	Mean return	Std. Dev	Skewness	Kurtosis
Equity	23	209	0.088	0.132	0.250	0.941
Multi-strategy	11	64	0.031	0.038	-0.143	1.167
Fixed Income	10	81	0.041	0.030	0.503	-0.080
Fund of Funds	4	40	0.029	0.022	-0.495	-0.516
Futures & CTA	4	44	0.011	0.029	-0.700	-0.305
Total	52	438	0.044	0.092	0.748	1.110
RM			0.137	0.208	-0.244	0.143
RF			0.008	0.011	1.543	1.556
SMB			0.003	0.178	1.259	0.853
HML			0.075	0.112	0.405	2.679

The results from the correlations matrices in table 2 panel A show that all the hedge fund strategies have relatively low correlations to the market. Equity has the highest followed by Multi-strategy, Fund of Funds, Fixed Income and Managed Futures & CTA with a negative correlation. This shows that the hedge fund can offer good diversification opportunities.

Panel B of table 2 shows that the size premium factor has a small positive correlation with the market premium factor while there is a small negative correlation between the size- and value factors respectively. The positive correlation between the market premium factor and the two other factors is expected as the portfolios that the factors consist of are a part of the market. The negative correlation between the size- and value factors shows that they are able to capture different risk premiums of the market.

Table 2. Correlation Matrices

Panel A, correlations between the market index and strategies.

	SIXRX	Equity	Multi-Strategy	Fixed Income	Fund of Funds	Managed Futures & CTA
SIXRX	1.0000					
Equity	0.5132	1.0000				
Multi-Strategy	0.4691	0.3764	1.0000			
Fixed Income	0.1953	0.9458	0.0664	1.0000		
Fund of Funds	0.3478	-0.6362	0.1792	-0.6880	1.0000	
Managed Futures & CTA	-0.3106	-0.2637	0.4497	-0.5015	-0.0404	1.0000

Panel B, correlations between the Fama & French factors Rm-Rf, SMB and HML.

	Rm-Rf	SMB	HML
Rm-Rf	1.0000		
SMB	0.0535	1.0000	
HML	0.1203	-0.2315	1.0000

7.2 Performance ratios

The result in table 3 where performance ratios are presented shows that all strategies have higher mean Sharpe ratios compared to the market index which means that they outperformed the market on a risk adjusted market, this is also found by Boasson & Boasson (2011). Fund

of Funds generated the highest mean Sharpe ratio of 1.685 followed by fixed income, multi-strategy, Equity and managed futures & CTA.

The mean Treynor ratio of the strategies are all positive with Fund of Funds being the highest followed by Equity, Managed Futures & CTA, Fixed Income and Multi-Strategy being the lowest. The Treynor ratios show that an investor gains more return per unit of risk compared to the market if they invest in those strategies with a higher Treynor ratio than the market.

Jensen's alpha only shows statistical significance with two strategies, Fund of Funds and Managed Futures & CTA. Both strategies have a positive alpha which signifies that the fund managers in the two strategies outperformed the market.

The mean appraisal ratio of the strategies show that the strategy Fixed Income has the highest appraisal ratio followed by Fund of Funds, Multi-strategy, Equity and Managed Futures & CTA. The appraisal ratio shows that the managers of the funds which employ Fixed Income strategy are better at choosing which investments to make, in terms of the returns of their specific investment in relation to the risk of their investments.

Table 3. Performance Ratios

Table 3 presents the performance measurements of the sample hedge funds sorted by strategies and the market index. The measurements are Sharpe ratio, Treynor ratio, Jensen's alpha and Appraisal ratio and are explained further in the methodology section. We also present the mean and median of the measurements. The boldfaced alphas are statistically significant at 5%. "N" represents the amount of funds in each strategy and "n" represents the amount of observations in each strategy.

			Sharpe Ratio		Treynor Ratio		Jensen´s Alpha			Appraisal Ratio	
	N	n	Mean	Median	Mean	Median	Alpha	t-stat.	p-value	Mean	Median
Equity	23	209	0.679	0.575	0.289	0.252	0.0081	2.05	0.057	0.452	0.149
Multi-Strategy	11	64	0.714	0.576	0.021	0.119	0.0030	1.32	0.207	0.614	0.041
Fixed Income	10	81	1.493	0.881	0.079	0.292	0.0056	1.17	0.106	2.814	0.684
Fund of Funds	4	40	1.685	1.010	0.785	1.048	**0.0058**	2.46	0.013	1.842	1.122
Managed Futures & CTA	4	44	0.344	0.288	0.230	-0.112	**0.0144**	2.43	0.026	0.391	0.466
Risk free rate Treasury bill			0.000		0.000						
Market index SIXRX			0.322		0.083						

7.3 Performance estimate

7.3.1 Fama & French three factor model by different strategies

From the regression model runned for each strategy totaling five times as seen in table 4, three of the strategies had a statistically significant alpha, Fixed Income and Managed Futures & CTA and Fund of Funds at the one, five and ten percent level. Because the model already accounted for the risk-free return by using the difference between the fund return and the risk-free return as the dependent variable, the intercept can be credited to something else. The intercept in the model can be interpreted as the excess return, if all the independent variables are zero. Since the excess return of the fund cannot be explained by the risk-free return, the managers of the funds in these strategies could be the reason that their funds are outperforming the factors (Boasson & Boasson 2011).

Table 4. Fama & French three factor model by different strategies.

Table 4 presents the regression result using the Fama & French three factor model on a yearly basis. Panel data regression for each strategy with the three Fama-French factors as independent variables. Number of observations as well as how many funds within each strategy. The adjusted R-squared is also reported.

	Intercept	RM-RF	SMB	HML	N	Funds	Adj. R-square
Equity	0.017 (1.38)	0.398*** (8.41)	0.098* (1.80)	0.099 (1.38)	209	23	0.288
Multi-Strategy	0.007 (0.80)	0.147*** (4.54)	0.069* (1.80)	0.012 (0.17)	64	11	0.261
Fixed Income	0.014*** (3.22)	0.047*** (2.96)	0.004 (0.21)	0.086*** (2.82)	81	10	0.163
Fund of Funds	0.012* (1.70)	0.080*** (3.28)	0.058* (1.87)	0.052 (1.12)	40	4	0.264
Managed Futures & CTA	0.055** (2.62)	-0.126* (-1.78)	0.045 (0.48)	0.102 (0.97)	44	4	0.038

1. t-values are in parentheses.

2. *, **, *** denotes significance at the 0.10, 0.05 and 0.01 level or better

In four of the five strategies, the factor (RM-RF) is statistically significant at the one percent level with a positive coefficient, showing that the market premium does affect the returns of the funds in all five strategies. This is expected since the assets in the funds are a part of the market. The strategy Managed Futures & CTA has a negative coefficient and is statistically significant at the 10 percent level. This negative coefficient could be explained by the investment style in these funds, for instance a wider use of derivatives compared to the other strategies.

The strategies Equity, Multi-strategy and Fund of Funds has a positive SMB coefficient at the 10 percent level which suggests that these strategies have a positive correlation with size effect. Boasson & Boasson (2011) found similar results on the size effect for Equity and Fund of Funds strategies with Fama-French factors from the US. The Fixed income strategy has a significant positive HML coefficient at the 1 percent level. This indicates that funds which employ the strategy correlate more with the value stocks compared to growth stocks. According to BlackRock (2022) the Fixed Income strategy is about preserving capital and offering a steady stream of income while striving for less risk than the market. The HML factor is trying to capture the value premium in the market. This offers a debate on how value assets are perhaps less riskier than growth assets but provides less returns. The descriptive statistics of the data shows that the Fixed Income strategy has a considerably less standard deviation than the market (0.03 to 0.208). While having less risk than the market, it also has a lower return, but it still accomplishes its goal of preserving capital and a steady stream of income at a lower risk than the market average.

All of the strategies have a relatively low r-squared value suggesting that the model used did not capture the variance very well. The two strategies with the lowest r-squared values are Managed Futures & CTA and Fixed Income, which could be due to the unbalanced nature of the data or that the independent variables in the model simply do not capture the variance of the dependent variable very well at all. There could also be unobserved variables that are explaining the expected returns of the strategies that the model does not capture.

To answer the first research question which is about which strategy generates the best value for an investor. Based on the regression in table 4, the strategy Managed Futures & CTA generated the highest excess return followed by Fixed Income and Fund of Funds. The Equity and Multi-strategy is not significant.

7.3.2 Fama & French three factor model with strategy dummies

To analyze further if the strategies and the Fama-French factors can explain the expected return of all the hedge funds collectively instead of by strategies, a pooled OLS regression model is used. To determine that the pooled OLS is the most suitable to the dataset, two tests for deciding the best fit of the model are conducted. The Breusch-Pagan Lagrangian multiplier and Hausman test tests which model to use in panel data analysis.

The Hausman test is used to test whether to use a random- or fixed effect model for the panel data. The null hypothesis was not rejected because the Hausman test had a p-value of 0.4347 which suggests that the models did not differ, the random effects model is preferred because it is more efficient than the fixed effects model. The Breusch-Pagan test tests if the model has heteroscedasticity present. If heteroscedasticity is present the random effects model is more efficient than a pooled OLS model. The test does not reject the null hypothesis which states that homoscedasticity is present, since the p-value is above 0.05. This test draws the conclusion that the random effects model is not more efficient than a pooled OLS model and for that reason a pooled OLS model is used.

The regression results in table 5 uses three models to explain expected returns of the hedge funds. The first (1) model regresses with all factors included, the second (2) with only the dummy variables controlling for the strategies and the third (3) with only the Fama–French factors to explain expected returns. The results show when using the pooled OLS model for our panel data that all independent variables except for the dummy S5 (Managed Futures & CTA) are significant. It also shows that the Fama-French factors do capture the expected return of the hedge funds.

To calculate the effects of each strategy, the intercept and the respective dummy coefficients are added together to get a value which represents the effect of each strategy. The intercept of model (1) which represents the Equity strategy is 0.0389, and variable S2 which represents the Multi-Strategy is -0.049. The difference between these two strategies is -0.0101 which is the effect of S2. The dummy S3 is the strategy Fixed Income and has a difference to the intercept of -0.0119. The effect of S4 which is the strategy Fund of Funds is -0.0115 which again is the difference between the intercept and the dummy S4. The last strategy S5, Managed Futures & CTA, has an effect of 0.0168. The dummy S5 is however not statistically

significant in the model which means that only a ranking between the other four strategies is appropriate to present. According to model (1) in table 5, Equity ranks highest, followed by Multi-Strategy, Fund of Funds and lastly Fixed Income. When compared to model (2) in table 5, the rankings are the same and as in model (1), Managed Futures & CTA is not statistically significant in model (2) either. The intercept which represents the omitted variable Equity is different between model (1) which has a coefficient of 0.0389 and model (2) which has a coefficient of 0.0750. The difference between the intercepts of the models is because in model (1) the Fama-French factors also explained some of the expected returns of hedge funds, while in model (2) only the strategies can explain the expected returns of hedge funds.

Table 5. Fama & French three-factor model with strategy dummies

Table 5 presents the regression results from the pooled OLS model with dummy variables for controlling the different strategies. The regression has 438 observations. The three different models show how all factors explain expected returns of the hedge funds (1), how the strategies explain expected returns of the hedge funds (2) and how the Fama-French factors explain expected returns of the hedge funds (3). The Intercept represents the Equity strategy, S2 the Multi-strategy, S3 the Fixed income strategy, S4 the Fund of Funds strategy and S5 the Managed Futures & CTA strategy. In the third model (3) the intercept represents the excess expected return of all the hedge funds.

	ESTIMATE (1)	ESTIMATE (2)	ESTIMATE (3)
S2	-0.0490*** (-3.06)	-0.0468*** (-2.68)	
S3	-0.0508*** (-3.46)	-0.0478*** (-2.99)	
S4	-0.0504*** (-2.60)	-0.0468** (-2.22)	
S5	-0.0221 (-1.19)	-0.0228 (-1.13)	
RM-RF	0.2076*** (8.02)		0.2057*** (7.82)
SMB	0.0775** (2.50)		0.0745** (2.36)
HML	0.1367*** (2.75)		0.1328*** (2.63)
INTERCEPT	0.0389*** (4.34)	0.0750*** (8.86)	0.0160** (2.22)
ADJ. R-SQUARE	0.1795	0.0238	0.1500

1. t-values are in parentheses.
2. *, **, *** denotes significance at the 0.10, 0.05 and 0.01 level or better.

Lagrangian multiplier test for random effects: Probability> $\overline{chi}^2 = 1.000$

Hausman test to determine random- or fixed effects: Probability> $chi^2 = 0.4347$

These rankings differ from the results of the regression done in table 4, where the strategy Managed Futures & CTA ranked the highest followed by Fixed Income and Fund of Funds. The results from table 5 are preferred to table 4 since the model in table 5 has the same slope for all hedge funds, making it easier and more clear to rank the strategies against each other. Table 5 also has model (2) and (3) which reinforces the consistency of the results in model (1) of table 5 by having coefficients that are very similar and with equal significance levels across all three models.

With these rankings the first hypothesis can be rejected because the different strategies do affect hedge fund's expected return significantly. The results from table 5 shows that the second hypothesis is also rejected, because the Fama-French factors do explain the hedge fund's expected return significantly. Relating this back to the first research question: Which strategy generates the best value for an investor in terms of risk and return, the results show that the Equity strategy ranks the highest of the strategies in the models.

The results from table 5 also show that the Fama-French factors are positive and significant in both model (1) and (2) which is used to estimate expected return, meaning that small cap assets captured by the SMB factor and high BE/ME assets captured by the HML factor do affect hedge fund expected return in the sample data. The hedge funds also show a relatively low beta value of 0.208 from the market premium factor (RM-RF) which indicates that the hedge funds are less volatile than the market.

Ding & Shawky (2007) found when applying the Fama-French three factor model on US hedge funds between 1990 and 2003, that the estimates of the size- and value factors SMB and HML of live equity-oriented hedge funds had an estimate of 0.08 at 10 percent significance for SMB and 0.13 at 1 percent significance for HML. However this study had an estimate for SMB and HML of 0.0755 at 5 percent significance and 0.1367 at 1 percent significance respectively, which is similar to Ding & Shawky (2007) findings. Gregoriou et.al (2016) found that the mean estimate of the Fama-French factors for all 20 strategies analyzed were 0.16, 0.08 and -0,03 for RM-RF, SMB and HML respectively, although incorporating a fourth factor into their model. The only major discrepancy between Gregoriou et.al (2016) and this study's results is the HML factor, which they found to be negatively significant. The study by Viet et. al (2005) showed that out of their 31 Australian hedge funds, more funds had a negative significant HML factor than positive.

The result from table 5 in regards to the HML factor may depend on the unbalanced dataset this study uses. The funds in the Equity strategy make up almost 50 percent of the total observations in the dataset which may skew the HML coefficient to a bigger positive value than what would be the case with balanced data of equal observations from each strategy.

8. Conclusion

To study the performance of Swedish hedge funds, data from HedgeNordic on 52 active Swedish hedge funds in the period 2000-2019 is collected. First the statistical properties of yearly returns of all hedge funds sorted by strategies are examined. The market index (SIX return index) performed best with yearly returns of 13.7 percent but has also the highest standard deviation at 20.8 percent. Followed by Equity strategy with 8.8 percent yearly return and 13.2 percent standard deviation. The results are not surprising since higher risk should offer a higher reward. The results also show that the strategies Equity and Fixed income which exhibit positive levels of skewness also generate higher returns.

The results from the correlation matrix shows that all hedge funds have low correlations with the market index, the Equity strategy has the highest of 0.5132 followed by Multi-Strategy, Fund of Funds, Fixed Income and Managed Futures & CTA with a negative correlation. This shows that hedge funds offer a good diversification opportunity for investors. The negative correlation between the size- and value premiums show that the factors are able to capture different parts of the risks involved and capture more of the expected returns of hedge funds better.

To adjust returns for risk four traditional performance measurements are calculated: The Sharpe ratio, Treynor ratio, Appraisal ratio and Jensen's alpha. All strategies generated a higher Sharpe ratio than the market index. Thus all hedge fund strategies outperform the index on a risk-adjusted basis. The results from the calculated Treynor ratio show that only three of the strategies have a better ratio than the market. This shows that it is better to invest in the strategies Equity, Fund of funds and Managed Futures & CTA rather than the market for the best reward to risk taken. The appraisal ratio shows a manager's ability to pick good investments the results show that the strategy Fixed Income has the highest ratio and

Managed Futures & CTA the lowest. Only two strategies show a positive statistically significant alpha. This indicates that these strategies outperformed the market.

Based on the regressions done by different strategies, the results show that the strategy Managed Futures & CTA generated the highest expected excess return followed by Fixed Income and Fund of Funds. However, the preferred model to draw conclusions from is the Pooled OLS model which shows that the Equity strategy statistically generated the highest expected excess returns followed by Multi-Strategy, Fund of Funds and Fixed Income. Since the model captures the strategies collectively it cannot be distinguished how the Fama-French factors explain the strategies individually. It does show that the Fama- French factors significantly capture the risk and return of hedge funds and that four of five strategies significantly affect the risk and return of the hedge funds.

The research questions are answered because the Fama-French factors do explain the expected returns of hedge funds and different strategies do affect the expected returns of hedge funds. If investors are to invest in hedge funds, the Equity strategy ranks the highest in terms of expected return out of all the strategies and has an excess return above the market.

Unfortunately the data is suffering from survivorship bias since the HedgeNordic hedge fund index only includes currently active funds. This means that the result will give an opportunistic representation of the returns, in the sense that the hedge funds in this study will appear to perform better than the population of hedge funds actually do. The study do not account for management fees, performance fees or any other fees associated with hedge funds, which investors should be wary of when choosing which hedge fund strategy to invest in. Risk-averse investors should choose hedge funds to invest in as they, according to the study, have lower risk than the market. Hedge funds have low volatility and low correlation to the market, which make them a good investment during recessions and crises.

It would be interesting to further examine how a model with more factors would affect the results, e.g Carhart four-factor model (1997) or the Fama & French five factor-model (2014). Applying these models may better capture the hedge fund`s strategies' expected returns thus offering a more accurate result. Another suggestion to deepen the knowledge of hedge funds' performance would be to analyze hedge funds individually to better understand what generated their performance.

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Appendix

Table 6. Fixed effects model

Bold coefficients indicate significance at the 5% level.

Used to determine the best model for the dataset.

	Coefficient	t-stat.	p-value
RM-rF	**0.2062**	7.92	0.000
SMB	**0.0806**	2.55	0.011
HML	**0.1254**	2.47	0.014
Intercept	**0.0165**	2.32	0.021

R-squared: 0.1557
Observations: 438
Funds: 52

Table 7. Random effects model

Bold coefficients indicate significance at the 5% level.

Used to determine the best model for the dataset.

	Coefficient	z-stat.	p-value
S2	**-0.0490**	-3.06	0.002
S3	**-0.0508**	-3.46	0.001
S4	**-0.0504**	-2.60	0.009
S5	-0.0221	-1.19	0.236
RM-rF	**0.2076**	8.02	0.000
SMB	**0.0775**	2.50	0.013
HML	**0.1367**	2.75	0.006
Intercept	**0.0389**	4.34	0.000

R-squared: 0.1926
Observations: 438
Funds: 52

Table 8. List of hedge funds used in the study with strategy and inception year.

Fund #	Hedge fund name	Strategy name	Strategy ID	Inception year
1	Accendo Capital	Equity	1	2008
2	Adrigo Small & Midcap L/S	Equity	1	2017
3	Agenta Alternativa Investeringar	Multi-Strategy	2	2019
4	Agenta Alternative Fixed Income	Fixed Income	3	2012
5	Alcur	Equity	1	2007
6	Alcur Select	Equity	1	2018
7	Atlant Hedge	Equity	1	2002
8	Atlant Multi-Strategy	Fund of Funds	4	2016
9	Atlant Opportunity	Multi-Strategy	2	2016
10	Atlant Protect	Multi-Strategy	2	2016
11	Atlant Sharp	Equity	1	2007
12	Atlant Stability	Fixed Income	3	2008
13	Brummer Multi-Strategy	Fund of Funds	4	2002
14	Calgus	Equity	1	2010
15	Carlsson Norén Macro Fund	Fixed Income	3	2008
16	Carlsson Norén Yield Opporunity	Fixed Income	3	2019
17	Carnegie Credit Edge	Fixed Income	3	2018
18	Carnegie Vega	Fund of Funds	4	2003
19	Celina Credit Opportunity	Fixed Income	3	2014
20	Celina Hedgefond	Multi-Strategy	2	2004
21	Celina Nordic Corporate Bond Flex	Fixed Income	3	2010
22	Coeli Absolute European Equity	Equity	1	2018
23	Coeli Energy Transition	Equity	1	2019
24	Crescit	Multi-Strategy	2	2013
25	Crescit Protect	Equity	1	2019
26	DNB TMT Long/Short Equities	Equity	1	2010
27	Elementa	Equity	1	2015

Fund #	Hedge fund name	Strategy name	Strategy ID	Inception year
28	Excalibur Fixed Income	Fixed Income	3	2001
29	Foghorn	Equity	1	2009
30	Chelonia Market Neutral	Equity	1	2017
31	ia	Multi-Strategy	2	2018
32	Länsförsäkringar Multistrategi	Multi-Strategy	2	2019
33	Lynx	Managed Futures & CTA	5	2000
34	Nordic Cross Stable Return	Multi-Strategy	2	2017
35	Nordkinn Fixed Income Macro Fund	Fixed Income	3	2013
36	Norron Select	Equity	1	2011
37	Norron Target	Multi-Strategy	2	2011
38	Origo Quest	Equity	1	2013
39	Plain Capital BronX	Multi-Strategy	2	2012
40	PriorNilsson Yield	Equity	1	2002
41	PriorNilsson Balans	Fund of Funds	4	2019
42	PriorNilsson Idea	Equity	1	2006
43	Proxy Renewable Long/Short Energy	Equity	1	2018
44	QQM Equity Hedge	Equity	1	2008
45	RAM ONE	Equity	1	2002
46	Ress Life Investments	Multi-Strategy	2	2011
47	Rhenman Healthcare Equity L/S	Equity	1	2009
48	RPM Evolving CTA Fund	Managed Futures & CTA	5	2013
49	Scandinavian Credit Fund I	Fixed Income	3	2016
50	SEB Asset Selection	Managed Futures & CTA	5	2007
51	Thyra Hedge	Equity	1	2007
52	Volt Diversified Alpha Fund	Managed Futures & CTA	5	2017

Note: Some funds had an inception date after 2019 after which the data for the Fama-French factor data were not recorded and subsequently removed, leaving 52 out of 61 hedge funds available for this study.