KTH ROYAL INSTITUTE
OF TECHNOLOGY

Degree project in Technology
First cycle, 15 credits

Skill versus Luck: An Analysis of Excess Returns on Swedish Stock Market Using Fama-French Three-Factor Model and T-tests

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Stockholm Sweden 2024

Abstract

This thesis explores whether excess returns of funds in the Swedish stock market can be attributed to skill or luck by employing the Fama-French Three-Factor Model and t-tests. The study analyzes data from a selection of mutual Swedish funds during the time period 2004 and 2019 to determine if differences in returns result from managerial skill or random variations. Findings suggest that it is rarely the skill of fund managers that leads to positive excess returns. Instead, market factors and luck appear to be decisive. By offering a deeper understanding of the dynamics between skill and luck, this thesis contributes to the ongoing debate on active management in financial markets.

Sammanfattning

Denna rapport undersöker om överavkastning av fonder på den svenska aktiemarknaden kan tillskrivas skicklighet eller tur genom att använda Fama-French trefaktormodell och t-tester. Studien analyserar data från ett urval av svenska fonder under tidsperioden 2004 till 2019 för att avgöra om skillnader i avkastning beror på skicklighet eller tur. Resultaten tyder på att det sällan är fondförvaltarnas skicklighet som leder till positiv överavkastning. Istället verkar marknadsfaktorer och tur vara avgörande. Genom att erbjuda en djupare förståelse för dynamiken mellan skicklighet och tur, bidrar denna rapport till den pågående debatten om aktiv förvaltning på finansiella marknader.

Acknowledgements

This thesis work was written in a co-operation with Inverde, a Swedish finance advisory firm. Therefore, we want to thank Mikael Nord, board member of Inverde, and Göran Ivemark, CEO of Inverde, for their valuable insights and expertise that they generously shared with us throughout this project. We would also like to express our gratitude to our supervisor, Hans Lööf, and our examiner, Celia Garcia Pareja, for their support and the insightful comments. Last but not least, we want to thank Mark Hebner, the founder and CEO of Index Fund Advisors (IFA), for his guidance and knowledge.

Key Words

Skill, Luck, Equity Funds, Paradox of Skill, Fama-French, Excess Return, Alpha, T-test, T-distribution, T-critical, Significance Level, SIX Portfolio Return Index (SIXPRX).

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1 Introduction

The stock market, a captivating realm of potential fortune, has long been shrouded in the question of whether success is driven by skill or simply blind luck. This study delves deeper into this intricate debate, exploring the determinants of fund performance in the Swedish stock market using a robust analytical framework. A vital aspect of this study is the "Paradox of SKill", which emphasizes that when people get better at investing, the gap between the best and the average investors decreases [1]. This suggests that when skill increases, luck plays a bigger role. By distinguishing these factors, it will provide a clearer picture of the key drivers of investment outcomes, thereby guiding investors on whether to rely on active management or to follow market trends.

1.1 Purpose and Problem Statement

1.1.1 Purpose

Separating skill and luck in fund management is important for investors who want to make smart decisions. If excess returns can be attributed to skill, it may be possible to identify and select funds that are more likely to outperform the market consistently. On the other hand, if the excess returns are the result of luck, investment decisions should take into account potential regression to the mean over time.

In collaboration with Inverde, a financial advisory firm, the topic was chosen due to Inverde's interest in understanding the dynamics of luck versus skill regarding excess returns. This project provides an opportunity for learning while contributing insights to Inverde.

1.1.2 Problem Statement

The aim of this report is to determine if the excess return from Swedish funds is due to skill or pure luck, and to what extent the investor decision-making skills influence the likelihood of achieving excess returns.

1.2 Background

1.2.1 The Swedish Stock Market

Understanding the causes behind the success[1] of the Swedish stock market is essential for investors who want to maximize their portfolios. One factor to the success is the shareholder governance model which is common in Sweden and the

[1]The Swedish stock market has been one of the most profitable stock markets globally over the last 150 years. Swedish funds are appealing as a long-term saving option due to its history of outperforming global index funds. Between the years 1870 and 2015, the Swedish stock market had an average annual return of 8%, ranked third after the U.S. and Finland. Between 1970 and 2020, the annual return was 9.2%, positioning as the top leader [2].

other Nordic countries. Fund managers and shareholders have substantial influence over company's decision-making processes, stimulating a productive atmosphere for corporate success. Further, since Sweden is a relative small market, a lot of companies decide to expand globally early on, making Swedish companies successful at expanding internationally. Additionally, the global operations of many Swedish companies contribute to providing investors with better diversification of risk for Swedish funds. Moreover, choosing to invest in Swedish registered funds is a reliable choice since they are continuously inspected by the Swedish Financial Supervisory Authority [2].

1.2.2 The Alpha Myth

"The Myth of Alpha" is a well-known expression in financial literature. It refers to the skepticism surrounding the ability of active fund managers to consistently generate alpha, which is the excess return on an investment compared to a benchmark index. However, research by Dimensional Fund Advisors (DFA) casts doubt on this notion. Their analysis of over 4,700 U.S. mutual funds and ETFs over two decades reveals that only a tiny fraction consistently beat their benchmarks [3].

This underperformance primarily stems from the high costs associated with active management. These include expense ratios and trading costs incurred due to frequent portfolio turnover, which erode overall returns.

Survivorship bias further contributes to the issue. Underperforming funds might have ceased to exist, skewing the historical performance data by excluding them from the analysis [3].

Adding to this, Brad Steiman in his article "Paradox of Skill," argues that investors often misinterpret positive alpha as a sign of skill, overlooking the role of luck. Steiman aligns with DFA in emphasizing that past performance is not a reliable indicator of future results. He suggests that focusing on diversification, rather than individual fund selection, can improve risk management and potentially enhance long-term returns [4].

1.2.3 Efficient Market Hypothesis (EMH)

The debate surrounding the origins of excess returns (alpha) has centered on the interplay between investor skill and chance. Eugene Fama, a pioneer of the Efficient Market Hypothesis (EMH), posits that market prices fully reflect all available information due to the continuous actions of numerous rational buyers and sellers [5]. This ubiquitous information incorporation leads to fair pricing of securities, making it exceedingly difficult to consistently outperform a benchmark and capture alpha. Proponents of the EMH argue that such fair pricing renders market timing and in-depth security analysis futile endeavors [5].

1.2.4 Skill vs. Luck in Financial Markets

A widely recognized figure in the field of passive investments is Mark Hebner. Hebner's studies emphasizes the importance of understanding the difference between skill and luck when assessing fund managers' performance. He uses t-tests, among other statistical methods, in order to evaluate if fund managers' outperformances are a consequence of skill or pure luck. In addition, he has stated the importance of adopting a long-term strategy and to avoid being misguided by temporary achievements, which are more likely to be connected to luck rather than skill[6].

However, the question of whether excess returns are due to skill or luck remains highly debated. Despite the relevance and significance, the topic has not been as extensively researched in the Swedish market, leaving room for further investigation.

2 Mathematical and Economical Theories

2.1 Multiple Linear Regression Analysis

Multiple linear regression analysis is used to estimate the unknown parameters in the model by fitting the model to the data

The multiple linear regression model:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k + \epsilon \tag{1}$$

With k regressors, regression coefficients β and the regressor variables x.

2.2 Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) is a financial model used to estimate the cost of capital for an investment, R_i. It enables the assessment of the expected return of an asset by quantifying its volatility in comparison to the overall market, denoted as β. In CAPM, the asset's β, which can be obtained through linear regression, the risk-free interest rate, R_f, and the expected market return, R_m, are taken into consideration [7]. This yields the CAPM equation:

$$R_i - R_f = \alpha + \beta(R_m - R_f) \tag{2}$$

The asset's alpha, α, is the excess return and is obtained by the intercept of the regression model. It indicates the performance of an investment relative to its expected risk-adjusted return. A positive α means that the investment has outperformed its expected return, whereas a negative α implies underperformance. An α equal to zero suggests that the investment has earned a return exactly equal to what CAPM predicts, indicating neither outperformance nor underperformance relative to the market risk.

2.3 Fama-French Three-Factor Model

By expanding CAPM with two additional factors, the size of the firms (SMB) and the book-to-market value (HML), the Fama-French three-factor model is obtained. The Fama-French model, aimed at providing a more profound understanding of the sources of portfolio returns in comparison to CAPM, is an advanced asset pricing framework. Today, the three-factor model has been modified to a five-factor model. However, this study will only focus on the three-factor model. The following model is utilized as a linear regression framework in order to investigate excess returns: [8]:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{m,i}(R_{m,t} - R_{f,t}) + \beta_{SMB,i} \cdot SMB_t + \beta_{HML,i} \cdot HML_t + \epsilon_{i,t} \quad (3)$$

The left-hand side of the equation, $R_{i,t} - R_{f,t}$, is the difference in return of fund i at time t, where $R_{i,t}$ represents the return for each fund and $R_{f,t}$ is the risk free rate.

On the right-hand side, α_i represents the part of the excess return that cannot be explained by the three other factors.

Furthermore, $\beta_{m,i}$ is the market beta of fund i which measures the sensitivity to the market risk premium $(R_{m,t} - R_{f,t})$, where $R_{m,t}$ is the return of the market index and $R_{f,t}$ is the risk-free rate at time t.

SMB_t (Small Minus Big) measures the differences in size regarding market capitalization of companies at a given time t, thus capturing the historical size premium in asset pricing [9]. $\beta_{SMB,i}$ represents the sensitivity of the fund with respect to the SMB-measure. SMB can be interpreted as the extra returns investor can predict from investing in small-cap stocks compared to large-cap stocks.

HML_t (High Minus Low), on the other hand, captures the difference in returns between funds with a significant portion of value stocks, namely high book-to-market ratios, and those that invest primarily in growth stocks, defined by low book-to-market ratios [9]. $\beta_{HML,i}$ depicts the sensitivity of the fund with respect to the HML-measure. HLM can be interpreted as the extra return a investor can predict from investing in high book-to-market stocks compared to low book-to-market stocks.

The three betas are all obtained through linear regression[8]. Finally, $\epsilon_{i,t}$ is an error term.

2.3.1 SIX Portfolio Return Index (SIXPRX)

The SIX Portfolio Return Index (SIXPRX) represents the accomplishment of all listed companies on the Nasdaq Stockholm Stock Exchange [10]. SIXPRX is calculated and owned by SIX Financial Information and shows the average development and dividend on the market adjusted for the investment limitations suitable to equity funds. It is relevant to comparison of funds development investing in Swedish stocks [11].

2.4 One-Tailed T-test

A one-tailed t-test is a statistical method which is used to determine if there exists a significant difference in a specific direction for hypothesis. In this test, the critical area of a distribution is one-sided, meaning that it is greater or less compared to a specified value. When conducting a one-tailed t-test, a null- and an alternative hypothesis must be formulated in order to assess statistical significance. The null hypothesis, H_0, assumes that there exists no significant difference, or that the difference does not support the hypothesis. Conversely, the alternative hypothesis, H_1, states that it exists a difference in a specific direction. Hence, if the test sample falls into the one-sided critical area, the H_0 will be rejected in favor for H_1 [12].

The t-value determines the extent to which the sample mean, $\overline{x}$, deviates from the population mean, μ, and it can obtain both positive and negative values. The sign of the t-value depends on whether the sample mean less or greater than the population mean, as defined in the alternative hypothesis. In addition, it is scaled by the standard deviation of the sample, s, and the size, t. The following formula calculates the t-value:

$$t_{\text{one-sided}} = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{t}}} \tag{4}$$

Furthermore, a significance level, γ, must be specified. It represents the tolerance for a Type I error, which is the error of wrongly rejecting H_0. Commonly used significance levels in one-tailed t-tests are 1%, 5%, or 10%, depending on the desired confidence in the results. The chosen significance level corresponds to a critical t-value, $t_{\text{critical},\gamma}$, from the t-distribution. The t-distribution is selected based on the degrees of freedom $(t-1)$ associated with the sample size, t. Further, the t-distribution determines the threshold at which the observed t-value is considered statistically significant.

If the observed t-value exceeds the critical t-value $t_{\text{critical},\gamma}$, then H_0 is rejected, hence suggesting that the observed difference is statistically significant and supports H_1. Conversely, if the observed t-value does not exceed the critical t-value, there is insufficient evidence to reject H_0, and it might be possible that any observed difference is due to random variation, or that H_0 accurately reflects the reality.

2.5 Dataset

2.5.1 Survivorship Bias

Survivorship bias is a general bias that can be applied in various contexts, however, it holds a particular significance for investors. The phenomenon involves analysis, or conclusions, mainly based of data that is visible at the time. The bias becomes a problem when features from survivors systematically deviate from the features of the targeted population [13]. In finance, this phenomenon is a essential cause of why investors should not mainly rely on past performances when making decisions. Since fund managers are more likely to shut down underperforming funds, it might lead to an inaccurate overall performance of the entire peer group. For example, funds that are still active would give an average return of 11%, while taking all funds into account would solely be 3%. This emphasizes the importance of being cautious with data when making investment decisions [14].

2.5.2 Data Collection

For the data concerning the net asset value (NAV) for each fund, Refinitiv Eikon was utilized [15]. The Swedish risk free interest rate for each observed year was approximated as the Swedish Treasury Bills (SE TB) 1 month and was obtained from Swedish Central Bank . The SIXPRX index was obtained from Fondbolagens Förening [16]. Furthermore, the database of the size factor that measures the return difference between small- and large companies, SMB, and the value factor that measures the yield difference, HML, was sourced from Swedish House of Finance (SHoF) [17].

2.5.3 Time Frame of Data

All the data for this study covers the period, January 2004 to December 2019 which is a total span of 16 years. The long time frame helps the study to gain insight on how patterns and trends change over the years. Moreover, the data was collected monthly which enables a detailed observing for seasonal variations. Hence, every dataset consists of a maximum of 191 observations, $t = 1, ..., 191$.

2.5.4 Variables

The following are the variables that data have been collected for and are based on the Fama-French 3 factor model equation. Table 8.1 shows the funds for which data has been collected.

- The monthly percentage change of the net asset value (NAV) data will be represented by the term $R_{i,t}$, the return for each fund $i = 1, ..., 43$ at each month, t.
- The index SIXPRX is used as the market return, represented by $R_{m,t}$.
- $R_{f,t}$ is the risk free rate which is approximated as the Swedish Treasury bill (SE TB) at each month.

- The size- and value factors $SMB_{ew,t}$ and $HML_{ew,t}$, weighted equally (ew).

3 Methodology

3.1 Selection of Funds

To avoid survivorship bias, a number of Swedish funds were selected from those that were active in 2004. Specifically, equity funds with relatively similar characteristics were selected to ensure an accurate analysis where the funds are comparable.

3.2 Data Preparation

To adapt the datasets with daily closures to the rest of the collected data containing monthly values, a reformatting was made. Python was used to select the last daily closure each month, resulting in summarized monthly data of the NAV for each fund. NAV, the Net Asset Value includes management fees and other costs associated with the fund. NAV is calculated by taking the fund's total assets minutes liabilities, divided by outstanding shares.

$$NAV = \frac{\text{Assets} - \text{Liabilities}}{\text{Total Numbers of Outstanding Shares}} \tag{5}$$

The monthly NAV was then used to calculate the monthly returns for each fund:

$$R_{i,t} = \frac{NAV_{i,t} - NAV_{i,t-1}}{NAV_{i,t-1}} \tag{6}$$

Furthermore, in the dataset containing the size- and value factors, the data for May 2019 was missing. When addressing absent data there are two primary methods to use, imputation or removal. Removing data may help reduce bias, instead of imputation and reasonable guesses. Removing data may on the other hand effect the reliability of the analysis if there are not enough observations [18]. Since the the dataset contains a large amount of observations, data removal was used. Consequently, May 2019 was removed from all the collected data.

3.3 Fama-French Model

The Fama-French three factor model (3) will be used to obtain the excess return, α, and the coefficients, β. For SMB_t and HML_t, the equally weighted (ew) values will be used. The Fama-French factors are constructed by SHoF, using Finbas as databas. The factors are developed by sorting stocks into portfolios, based on book-to-market ratios and market capitalization. For HML, the stocks are classified into high and low book-to-market values, and into small and large companies for SMB. Moreover, the factors are constructed by taking the differences in average returns between these portfolios, for SMB and HLM respectively [19].

Through regressions, the goal is to find the intercept for each fund, α_i, representing the adjusted excess return that will be analysed. In addition, the coefficients $\beta_{m,i}$, $\beta_{SMB,i}$, and $\beta_{HML,i}$, are the factor coefficients, which are also obtained through

regression analysis, and represent the sensitivity (3).

3.4 Hypothesis

The null hypothesis, H_0, and alternative hypothesis, H_1, are formulated as follows:

H_0: The excess returns from Swedish funds can be attributed to luck, meaning that any outperformance is due to chance rather than the skill of the fund managers.
H_1: The excess returns from Swedish funds are due to skill, indicating that any outperformance is due to skill rather than luck.

The null hypothesis, H_0 , is that the alpha is not statistically significantly different from zero. The alternative hypothesis, H_1, is that the alpha is statistically significantly different from zero.

3.5 T-test

A one-tailed t-test was conducted to examine the values of α for each individual fund, aiming to decide whether their excess returns show a significant difference from zero. This is crucial in order to determine whether such returns can be attributed to skill or luck. The chosen significance level, $\gamma = 0.05$, is used.

The decision rules based on the t-values are defined as follows:

$$\text{Reject } H_0: \text{ if } |t_i| > t_{\text{critical},\gamma} \tag{7}$$

$$\text{Fail to reject } H_0: \text{ if } |t_i| \leq t_{\text{critical},\gamma} \tag{8}$$

The observed t-value for the alpha of the ith fund is denoted by t_i. $t_{\text{critical},\gamma}$ represents the critical t-value from the t-distribution corresponding to γ and the appropriate degrees of freedom. Rejecting H_0, and thus implicitly accepting H_1, suggests that there is statistically significant evidence to conclude that the excess returns are attributed to skill. Conversely, failing to reject H_0 indicates that there is insufficient evidence to determine that the excess returns are due to skill, implying that they could be due to luck.

4 Results

In this section, the results from the Fama-French model and the statistical tests are presented.

4.1 Returns Adjusted Using the Benchmark

The bar chart in figure 4.1 represents the return that the fund manager earned by comparison to the benchmark, SIXPRX, yielding the average excess return. The large majority of the funds had negative excess returns, red bars, meaning they underperformed relative to the benchmark. Only 8 out of the 43 funds had positive excess return and thereby outperformed the benchmark. Moreover, the dashed bars represents closed funds, meaning they are no longer active. As can be seen, 18 out of 43 funds are closed, leading to a 58.1% survivorship after 16 years among the chosen funds.

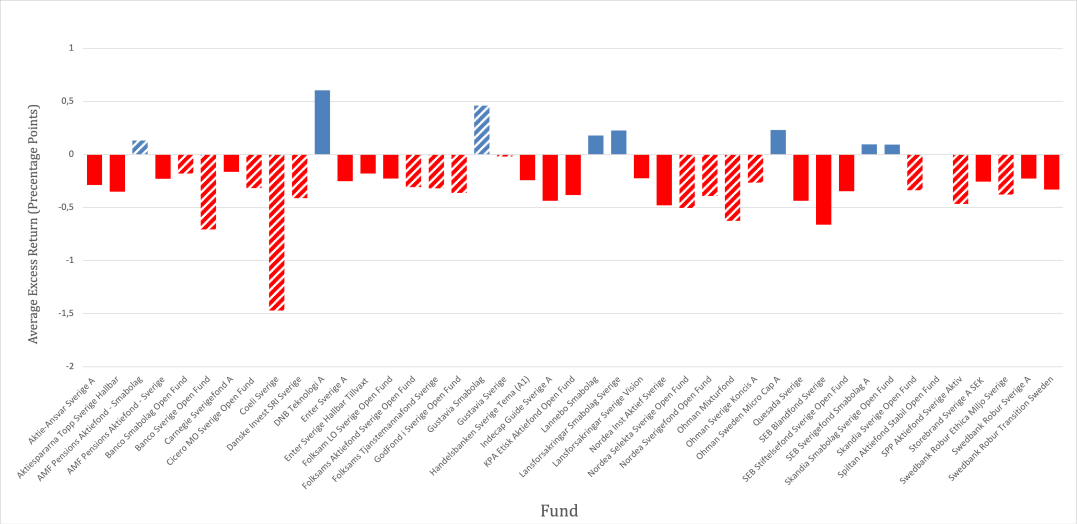

Figure 4.1: Average excess return, dashed bars represent closed funds.

4.2 Returns Adjusted Using Fama-French

Figure 4.2 illustrates the average alpha for the selected funds, where alpha denotes the excess return that cannot be explained by the three factors in the Fama-French model. It can be ascertained that the vast majority, 33 out of 43 funds, have negative alpha, indicating that they underperformed relative to the factors in the Fama-French model (3). However, there are ten funds that have positive alpha, meaning that they have outperformed after adjusting for Fama-French.

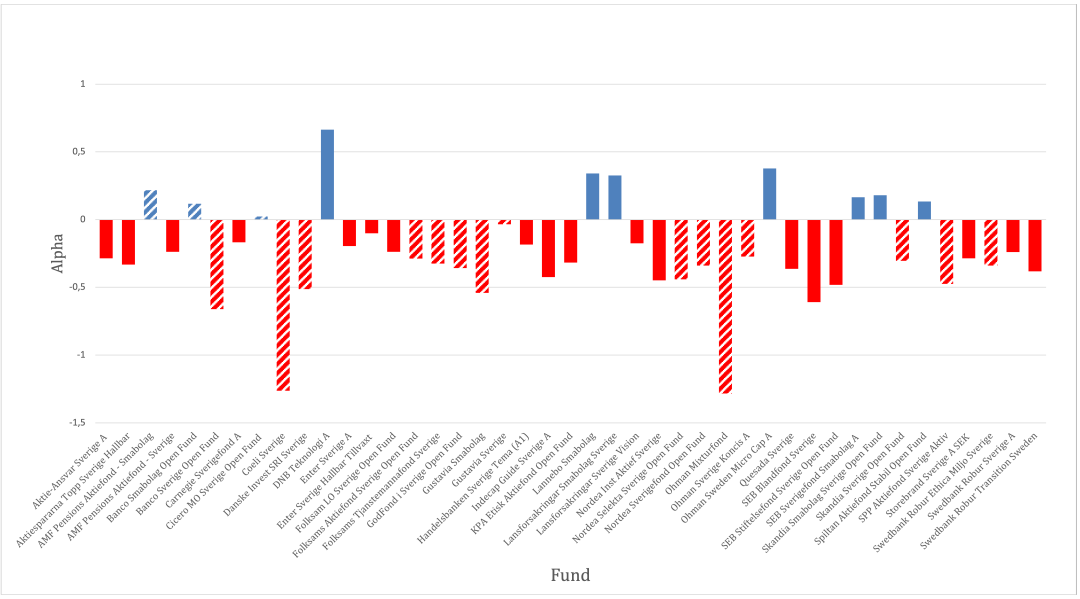

Figure 4.2: Average alpha, adjusted using Fama-French, for each fund.

4.3 T-test

The scatter plot in Figure 4.3 illustrated below is divided into four quadrants, blue, green, pink and red, by the intersection of a vertical line at a t-value of 2, and a horizontal line where alpha equals zero. These intersections categorize the data into different combinations of alpha- and t-values:

- **1. Skill ($\alpha \geq 0$, t-value > 2), Proportion: $\frac{2}{43}$:**

  The first quadrant represents data points where the t-value is strictly greater than two and alpha is greater than or equal to zero. These data points are statistically significant, based on γ.

- **2. Lack of Skill ($\alpha < 0$, t-value > 2), Proportion: $\frac{24}{43}$:**

  The second quadrant also depicts data points with t-values strictly greater than two, but with alpha values strictly less than zero. These points are statistically significant and implies that the negative excess return is a result of the lack of skill of the fund manager.

- **3. Bad Luck ($\alpha < 0$, t-value < 2), Proportion: $\frac{9}{43}$:**

  The third quadrant also denotes data points with alpha values strictly less than zero, however, with t-values strictly less than two. These points are not statistically significant and suggest a negative excess return is owing to bad luck.

- **4. Luck ($\alpha \geq 0$, t-value < 2), Proportion: $\frac{8}{43}$:**

  The fourth and last quadrant also constitutes of data points that have t-values strictly less than two, however, with alpha values greater than or equal to

zero. In this category, data points are not considered statistically significant, meaning that the excess return is a result of pure luck.

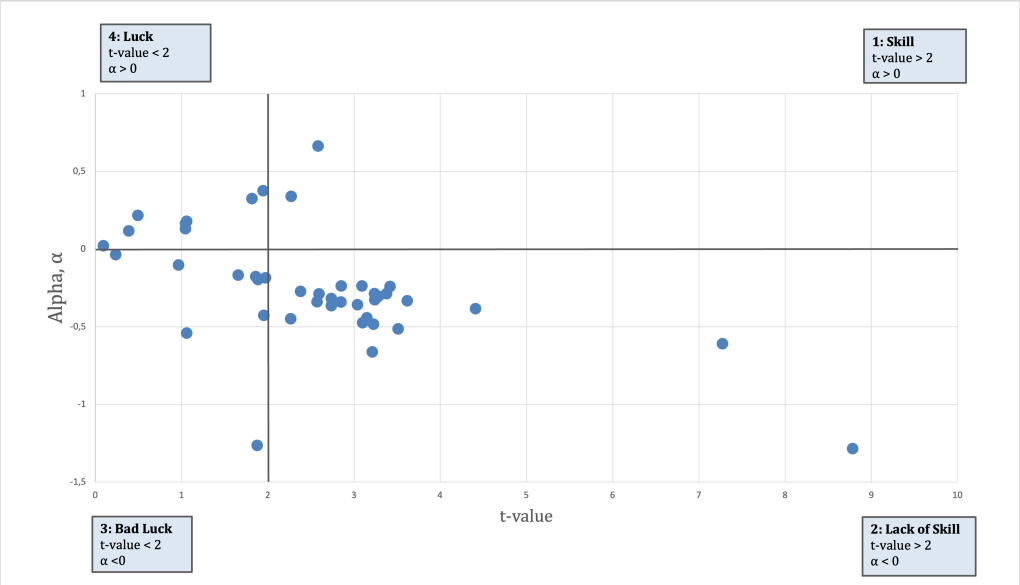

Figure 4.3: Alpha and its corresponding t-value

Table 4.1 presents the analysis of the Fama-French regression model for each fund. It shows the founds, alpha and belonging t-value, and betas ($\beta_1, \beta_2, \beta_3$), corresponding to the three different risk factors in the Fama-French model (3), market risk, size risk and value risk. The table is divided into four categories based on alpha and the magnitude of the t-value, same as in Figure 4.3.

Fund	α	α t-value	$\beta_{m,i}$	$\beta_{SMB,i}$	$\beta_{HML,i}$
$\alpha > 0$, **t-value** > 2 (Skill)					
DNB Teknologi A	0.665	2.582	0.991	17.174	-10.592
Lannebo Smabolag SEK	0.340	2.270	0.969	3.958	-27.296
$\alpha < 0$, **t-value** > 2 (Lack of Skill)					
Aktie-Ansvar Sverige A	-0.285	3.236	0.962	-0.100	-0.119
Aktiespararna Topp Sverige Hall	-0.332	3.617	0.974	-0.307	-2.749
AMF Pensions Aktiefond Sverige	-0.237	2.849	1.029	-1.702	0.875
Banco Sverige Open Fund	-0.662	3.211	1.070	-0.917	2.443
Danske Invest SRI Sverige	-0.512	3.509	0.972	-1.397	12.043
Folksam LO Sverige Open Fund	-0.237	3.089	1.037	-1.546	1.065
Folksams Aktiefond Sverige Open	-0.287	2.592	1.033	-2.171	-0.353
Folksams Tjanstemannafond Sverige	-0.325	3.238	1.018	-2.720	2.683
GodFond i Sverige Open Fund	-0.358	3.039	0.965	-5.496	-7.945
KPA Etisk Aktiefond Open Fund	-0.317	2.735	0.805	-0.330	-8.207

Continued on next page

Table 4.1 – continued from previous page

Fund	α	α t-value	β_1	β_2	β_3
Nordea Inst Aktief Sverige	-0.448	2.264	0.948	12.042	-4.679
Nordea Selekta Sverige Open Fund	-0.442	3.148	1.061	2.258	-2.200
Nordea Sverigefond Open Fund	-0.340	2.846	1.040	-2.273	-2.852
Ohman Mixturfond	-1.283	8.783	0.589	2.602	-6.131
Ohman Sverige Koncis A	-0.272	2.378	0.984	-2.022	0.856
Quesada Sverige	-0.363	2.735	0.956	0.904	-11.812
SEB Blandfond Sverige	-0.608	7.274	0.542	-1.258	-2.370
SEB Stiftelsefond Sverige Open	-0.482	3.226	1.037	-5.050	22.748
Skandia Sverige Open Fund	-0.304	3.282	1.023	-0.889	-5.975
SPP Aktiefond Sverige Aktiv	-0.474	3.099	1.015	-4.140	2.825
Storebrand Sverige A SEK	-0.286	3.377	1.006	-1.341	4.917
Swedbank Robur Ethica Miljo Sverige	-0.339	2.570	1.056	-0.302	3.132
Swedbank Robur Sverige A	-0.240	3.417	1.068	1.599	1.150
Swedbank Robur Transition Sweden	-0.383	4.408	1.028	-1.018	8.262
$\alpha < 0$, t-value < 2 (Bad Luck)					
Carnegie Sverigefond A	-0.167	1.655	0.962	-6.638	1.292
Coeli Sverige	-1.263	1.876	0.953	36.188	-45.238
Enter Sverige A	-0.195	1.885	1.014	0.336	-10.068
Enter Sverige Hallbar Tillvaxt	-0.101	0.963	0.991	1.389	-13.263
Gustavia Smabolag	-0.541	1.057	0.072	12.645	5.976
Gustavia Sverige	-0.035	0.234	1.014	13.333	0.474
Handelsbanken Sverige Tema	-0.184	1.972	1.044	-1.324	-10.740
Indecap Guide Sverige A	-0.425	1.953	1.001	1.945	-2.209
Lansforsakringar Sverige Vision	-0.175	1.857	1.007	-2.145	-8.641
$\alpha > 0$, t-value < 2 (Luck)					
AMF Pensions Aktiefond - Smabolag	0.217	0.493	0.226	-10.738	-3.293
Banco Smabolag Open Fund	0.117	0.386	1.088	26.787	-19.766
Cicero MO Sverige Open Fund	0.023	0.092	1.179	1.342	-22.707
Lansforsakringar Smabolag Sverige	0.326	1.816	1.109	18.079	-19.327
Ohman Sweden Micro Cap A	0.377	1.943	1.042	21.175	-26.209
SEB Sverigefond Smabolag A	0.165	1.043	1.048	-1.561	-12.837
Skandia Smabolag Sverige Open Fund	0.180	1.057	1.046	4.130	-15.621
Spiltan Aktiefond Stabil Open Fund	0.133	1.043	0.804	3.097	-20.675

Table 4.1: The table presents α values, their corresponding t-values, and β values for the market factor ($\beta_{m,i}$), size difference factor ($\beta_{SMB,i}$), and book-to-market value factor ($\beta_{HML,i}$) for each fund , grouped into four categories.

Table 4.2 below, presents the average value and the standard deviation of all three regression coefficients, β and of the intercept, α.

	Average	**Standard Deviation**
Intercept α	-0.2410	0.3705
β_m	0.9483	0.2126
β_{SMB}	2.8744	9.2142
β_{HLM}	-5.8868	11.871

Table 4.2: Analysis of β and α

5 Discussion

5.1 Returns Adjusted Using the Benchmark

As seen in table Figure 4.1, only 8 out of 43 funds exhibited a positive average excess return. This collective performance is consistent with previous studies indicating that very few funds outperform the benchmark and generate excess returns. The figure also illustrates the importance of the survivorship bias, as in this case, the survival rate was only 58.1%. If these funds had not been included in the analysis, the results would have been different. Accounting for survivorship bias decreases the average results, as funds that closes typically do so because of poor return and results.

Moreover, the overall negative performance may indicate broader market conditions or systematic factors that have an impact on these types of securities. Factor such as regulatory changes or macroeconomic trends among other, may had an impact on the outcome of these funds.

5.2 Returns Adjusted Using Fama-French

When observing Figure 4.2, it can be ascertained that it differs from 4.1. For instance, in Figure 4.2, 10 out of 43 funds obtained positive alpha, resulting in an increase of 4.7 percentage points in comparison to when adjusted for SIXPRX. The reason for this difference is attributed to the different methodologies used for adjusting the returns. While Figure 4.1 provides a straight-forward comparison, Figure 4.2 offers a more comprehensive explanation of the excess returns by including the three factors (3). Thus, by taking these factors into account, the model therefore isolates the part of the fund's return that is not a result of the systematic risks considered by the model. Hence, the presence of an additional fund, Gustavia Smabolag, with positive alpha in the Fama-French adjusted returns, might be due to exposure to the size and value factors that were not taken into consideration in Figure 4.1.

Moreover, 7 out of 8 funds with positive alpha were small-cap funds. This may be caused by the size factor in the Fama-French model(3). Another possible reason for this outcome might be that SIXPRX is not a suitable benchmark for small-cap funds. A suitable benchmark for this type of fund would therefore be an index that is specifically designed to reflect solely the performance of small-cap funds.

5.3 Systematic Risk Analysis

Table 8.1, presents the standard deviation and the average intercept and coefficients based on the Fama-french regressions. The average intercept, α is negative, -0.24 with a standard deviation of 0.37. This implies that, on average, the funds are underperforming the market, which have been noted in the tables, after accounting for the three risk-factors in Fama-french. The fact that the standard deviation is approximately equal to the value of α, implies that there is significant variation

among the values. In other words, the funds deviates from the expected return predicted by the model.

The market coefficient, β_m, is close to 1 with standard deviation 0.21, a relatively low value. This indicates that the funds are on average performing in a pattern similar to the market. The low standard deviation suggests that the pattern is relatively consistent among all funds and data.

The size factor coefficient β_{SMB} is 2.87. This indicates that on average, the funds analyzed tend to perform better when investing in small cap rather then large cap, meaning an expected additional return when investing in small cap stocks. Moreover, the average β_{SMB} had a notable high standard deviation of 9.21. Meaning that there are a high variation among the funds and that not all funds are consistently exposed to the small-cap premium. The high standard deviation can also be due to the different characteristics of the funds. Although the goal was to select similar funds, they still differ. Some funds may have stronger focus on small cap stocks leading to a higher exposure to the SMB factor, while others have less or no exposure at all. Furthermore, other factors as the decisions of fund managers and asset selection also effects the characteristics of the funds.

β_{HML}, the value factor coefficient had an average value of -5.89, with a high standard deviation of 11.87. The HLM factor measures the expected additional return from investing in value stocks, high book-to-market ratios, over growth stocks, low book-to-market ratios. The average negative value indicates that funds tend to underperform when investing in value stocks compared to growth stocks under the analyzed period. But since the standard deviation is very high, there exists a variation among the funds in terms if exposure to the value premium. This might be, among other factors, a consequence of different characteristics of the funds, as previous mentioned.

5.4 T-test and Rejection of Hypothesis

The scatter plot analysis in Figure 4.3 provides insights into the performance of fund managers. The vast minority in category *1.Skill* indicates that the positive excess return, that cannot be explained by the three Fama-French factors, is due to skill. This is because the absolute values of their t-values are greater than the critical t-value (7), $t_{\text{critical},\gamma}$, suggesting that these returns are statistically significant at the chosen γ.

In category *2.Lack of Skill*, however, suggests a trend of underperformance, since $\alpha < 0$. The underperformance is statistically significant, as their t-values surpass the critical threshold (7), pointing toward lack of skill rather than luck. This could potentially lead to investors questioning active management.

In contrast, fund managers category *3.Bad Luck* and *4.Luck* show t-values that do not reach the critical value (8), resulting in non-significant alpha. This implies that the performance could be attributed to random variations rather than the managers' investment decisions, and hence be due to luck.

5.5 Limitations and Feasibility

Potential issues that may have affected the outcome of this project are the limited extent of the number of chosen funds and years. The selection solely covers a subset of the Swedish market, hence, it does not fully provide a comprehensive view of the total market. Furthermore, the chosen period of time, January 2004 to December 2019, captures significant market events, such as the global financial crisis 2008. However, unexpected events, such as COVID-19 and the inflation triggered by Russia's attack on Ukraine, were hence not included. These events could significantly impact market dynamics and fund performances, suggesting valuable directions for future research.

Moreover, the Fama-French three factor model was utilized. While this model captures key aspects of fund's returns, it has been extended with two additional factors, hence making it a five factor model. By utilizing the three factor model within this study, it may not embody the nuances that the five factor model is able to capture. As a result, this could have impacted the evaluation of whether it is the fund manager's luck or skill that is attributed to the excess return.

6 Conclusion

This report analyzes the influence of skill versus luck in the excess returns of Swedish funds, using the Fama-French 3-factor model for regression and t-tests for analysis. Our findings indicate the limited ability of fund managers to consistently outperform the market over a longer period, especially when adjusting for size and value factors. The results suggest that when funds generate excess returns, these are more likely to be attributed to luck or market factors rather than managerial skill. Additionally, this thesis reveals that underperformance can be attributed to a lack of skill or bad luck. This distinction is important for investors who rely on past performance for fund selection, highlighting the uncertainty of predicting future success based solely on historical data.

The results yielded by this thesis notably challenge the traditional belief in the persistent skill of fund managers to beat the market, hence providing support for previous researchers and the Efficient Market Hypothesis. Out of the chosen funds, only a small minority exhibited statistically significant alpha, which can be seen as skill attributed to the manager. The analysis also captures the large influence of the market factors, size and value, which had a significant impact on the returns. The findings demonstrate the importance of taking these factors into consideration when evaluating funds and their performance, instead of solely attributing success to the expertise of fund managers.

Furthermore, the findings of this project have important implications for both individual investors and institutional stakeholders. Selecting funds based solely on historical performance may not be an appropriate strategy, since past successes might not repeat in the future, often due to changing market conditions or luck.

In conclusion, the results of this study contribute to an important understanding of skill and luck in excess returns. The findings could encourage additional research, allowing fund managers to examine the characteristics that differentiate funds with positive alpha from those with negative alpha, such as management strategies and fee structures. These complexities, similar to those observed in global financial markets, underline the challenging task of distinguishing between skill and luck.

7 References

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8 Appendix

Fund	Active 2019
Aktie-Ansvar Sverige A	Yes
Aktiespararna Topp Sverige Hallbar	Yes
AMF Pensions Aktiefond Smabolag	No
AMF Pensions Aktiefond Sverige	Yes
Banco Smabolag Open Fund	No
Banco Sverige Open Fund	No
Carnegie Sverigefond A	Yes
Cicero MO Sverige Open Fund	No
Coeli Sverige	No
Danske Invest SRI Sverige	No
DNB Teknologi A	Yes
Enter Sverige A	Yes
Enter Sverige Hallbar Tillvaxt	Yes
Folksam LO Sverige Open Fund	Yes
Folksams Aktiefond Sverige Open Fund	No
Folksams Tjanstemannafond Sverige	No
GodFond i Sverige Open Fund	No
Gustavia Smabolag	No
Gustavia Sverige	No
Handelsbanken Sverige Tema	Yes
Indecap Guide Sverige A	Yes
KPA Etisk Aktiefond Open Fund	Yes
Lannebo Smabolag SEK	Yes
Lansforsakringar Smabolag Sverige	Yes
Lansforsakringar Sverige Vision	Yes
Nordea Inst Aktief Sverige	Yes
Nordea Selekta Sverige Open Fund	No
Nordea Sverigefond Open Fund	No
Ohman Mixturfond	No
Ohman Sverige Koncis A	No
Ohman Sweden Micro Cap A	Yes
Quesada Sverige	Yes
SEB Blandfond Sverige	Yes
SEB Stiftelsefond Sverige Open	Yes
SEB Sverigefond Smabolag A	Yes
Skandia Smabolag Sverige Open Fund	Yes
Skandia Sverige Open Fund	No
Spiltan Aktiefond Stabil Open Fund	Yes
SPP Aktiefond Sverige Aktiv	No
Storebrand Sverige A SEK	Yes
Swedbank Robur Ethica Miljo Sverige	No
Swedbank Robur Sverige A	Yes
Swedbank Robur Transition Sweden	Yes

Table 8.1: Selected funds for analysis