

Timo Pekkala

Automated investment services

Performance and cost comparison of actively managed Finnish mutual funds to analyse profits for investors

Helsinki Metropolia University of Applied Sciences

Bachelor of Business Administration

European Management

Bachelor Thesis

09.05.2016

Author(s) Title Number of Pages Date	Timo Pekkala Automated investment services; performance and cost comparison of actively managed Finnish mutual funds to analyse profits for investors 32 pages + 11 appendices 9 May 2016
Degree	Bachelor of Business Administration
Degree Programme	International Degree Programmes
Specialisation option	European Management
Instructor(s)	Fatawu Bakare, Senior Lecturer
<p>Performance and cost analysis of automated investment services, compared to actively managed funds. Contains the cost analysis of automated investment services and selected actively managed Finnish funds, risk and performance analysis.</p>	
Keywords	Roboadvisor, automated investment services, performance,

	risk
--	------

Contents

1. Introduction	5
1.1 Finance Market Overview	5
1.2 Exchange Traded Funds ETFs	6
1.3 Automated Investment Services	6
1.4 Research questions	7
1. Literature review	8
1.1 Active vs Passive funds	8
1.2 Efficient Market Hypothesis	10
1.3 Benchmark for performance	11
1.4 Persistence of Performance	13
1.5 Portfolio Theories; Diversification and Rebalancing	14
1.5.2 Literature Review Summary	19
2. Research methodology	20
2.1 Research Approach	20
2.2 Data Collection and Analysis	21
2.3 Limitations	22
Chapter 4. Data presentation, data analysis and discussion	22
2.4 Fund performance analysis	22
2.5 Fund cost analysis	27
2.6 Fund Return - Cost analysis	30
3. Conclusion	34
4. References	36
5. Appendices	40
5.1 Appendix 1. Father of passives has doubts about ETFs	40
5.3 Appendix 2. Fund performance data	42
5.4 Appendix 3. Fund cost data	45
5.5 Appendix 4. Cost comparison of actively and passively managed funds	48
5.6 Appendix 5. performance comparison 2014	49
5.7 Appendix 6. S&P500 market volatility 2011-2015	50

1. Introduction

This paper gives a market overview for Finnish mutual fund market, explains exchange traded funds and automated investment services. In addition, this paper discusses the relevant literature. Starting from fund performance and persistence of performance by explaining relevant analysis tools. Then the paper discusses modern portfolio theory, explains life-cycle allocation and the concepts of rebalancing the portfolio and tax loss harvesting, and connects it with the different costs, included in investing costs. After that, the paper analyses the performance for selected 119 actively managed Finnish mutual funds and compares the results to the performance of automated investment services. In addition, the paper includes the by calculates costs calculations for actively managed mutual funds and for automated investment services in the research. Lastly, the research is concluded making cost – profit calculations to find out the costs and profits for an average Finnish investor.

1.1 Finance Market Overview

In Finland, according to the bank of Finland (2014 p.4) new capital in Finnish investment funds expanded EUR over 4.5 billion and at the end of the 2014 aggregated capital was EUR 86 billion. According to the Same report, (2014 p.14) there were 492 funds registered in Finland. In addition, the order of the companies with the largest number of funds under management stayed the same. Nordea Funds had 64 funds and Danske invest with 61 funds and through a merger of FIM asset management and two S Bank and Tapiola Bank had the third highest number of funds. At the same time, banks mentioned above are the biggest banks in Finland. For example, Danske Invest Fund Management is the third largest fund management company and had EUR 11 billion assets under management in 2014. (Danske Bank Plc 2014 p.5) Furthermore, the fourth biggest by a number of funds OP bank had the highest amount of assets under management, totalling to EUR 17.5 billion in 2014. (OP 2015) Hence, can be argued that the fund market in Finland is concentrated to big banks, as the biggest and third biggest banks have total of EUR 28.5 billion assets under management in mutual funds from the total of EUR 86 billion. Especially, when according to the information based on biggest and third biggest bank, the second-biggest bank must have EUR 17.4 billion to EUR 12 billion assets under management. Thus, this would mean that the three biggest banks have between EUR 40.5 to 45.9 billion assets under management of total EUR 86 billion.

1.2 Exchange Traded Funds ETFs

In an oligopolistic situation like this, prices are quite often at the same level and imperfect competition. Later, as the study shows, the pricing between these companies follows the same pattern. In addition, in oligopolistic markets, there can be barriers to entry for new funds. ETFs are combinations of shares or bonds and instead of mutual funds, including mutual index funds, which are bought after the market closes, can be bought during the day, like normal shares. (ETF Database 2015) This makes ETFs more flexible, and in theory, would allow the investor to follow the real-time development of the ETF's price, and therefore, buy ETFs if the price is cheaper at some point of the day. Exchange Traded Funds (ETFs) have tried to break the entry barriers and change the mutual fund weighted investment environment by providing price competition against traditional mutual funds. In Europe, according to Morningstar Manager Research (2014), the ETF market was EUR 362 billion in September 2014. Globally there has been a rapid growth in ETFs market. For example, in U.S, the amount of invested for ETFs was \$1.974 trillion at the end of 2014 (ICI 2015)

1.3 Automated Investment Services

Partly, the popularity of the growth in ETFs market can be explained by automated investment services. The first company was founded in U.S. in 2009 and since then automated investment companies have become highly popular in U.S. According to the study made by AT Kearney (2015 p. 26) The industry is estimated to grow into a \$2.2 trillion business by the end 2020. Currently, there is no automated investment service company in Finland. However, the service has spread into Europe, thus, it is most likely, that in future the service will be available in Finland.

Automated investment service is a passive online platform for wealth management, designed to use algorithms and to produce financial services without human financial planners. Automate investment service imitates the basic surveys that financial planners' needs to conduct to fulfil regulation instructions to know the customer and to ensure that advisor has the reasonable basic understanding that the investment strategy and risk tolerance is suitable for the investor (Finra.org 2015). Moreover, the accessibility provided by the automated investment service can help the investors to access the services outside the office hours. For example, according to Jeff Buckstein in his article in the Bottom Line (2015 p.10) tech-savvy investors finds the ser-

vices appealing. Hence, when the world becomes more technologically advanced and younger generation of investors starts to invest, the automated investment services can provide an easy access to them.

The services provide low costs investing and help the investor to avoid paying high fees for the advice. For example, like Ludwig explains in his articles that financial advisors can take 1-2% annually where cheapest AIS only charges 0.15-0.89% annually. Moreover, according to Ludwig's study, some of the automated investment services does not have a minimum investment amount. (Ludwig 2015) Thus, it could be viable for big institutional investors and to average investors, who does not have big sums to invest, but would like to do small monthly investments, without paying high fees.

In addition, automated investment service can bring pricing transparency in the market, since, according to Roger Gershman (2014) mutual fund fees are difficult to identify. Moreover, funds can have costs which are indirectly affecting the investments. For example, in the case where the bank takes a monthly fee from the bank account, the investor uses for investing. Hence, it would be easier for the normal investor to understand and evaluate the costs when there are transparency and one price. In addition, lower costs can help smaller investors to invest. High costs of investing can prevent smaller deposits or it would be impossible to generate profit, since, the costs of investments would become so high and reduce the investment.

Automated investment services can mitigate the aspect of human error of financial advisors, like the overconfidence of human advisor, which can cause to faulty decisions. (WSJ. 2016) Moreover, a human error can be simpler, for example, accidentally typing the wrong number while keying an order., this is also known as 'fat fingers'. This kind of errors can have costly effects, for example, Steve Slater writes in Reuters (2016) that an investor might have lost around £400,000 in 30 seconds. (Reuters 2016) in addition, to avoid active funds, which are underperforming. However, since, the automated investment service gives the investing decisions to the investors, thus, it also increases the risk of human error from the investors behalf. Thus, it would be necessary to provide information and encourage investors for long-term decisions. (see appendix 1.)

1.4 Research questions

The following research questions have been defined for this study.

1. To analyse selected Finnish funds and automated investment services to determine the performance and possible differences.
2. To examine cost structures for selected Finnish funds compared to automated investment services.
3. To calculate total costs and profits for selected funds and for automated investment services, to find out if automated investment services could offer a viable solution for Finnish investors.

1. Literature review

This section discusses the available past literature for the subject. Firstly, by shortly discussing the debate around active funds and passive funds, in this case, automated investment services, to point out the relevance of this study. Starting for explaining the performance theories and benchmarks for passive and active funds. Secondly, takes the performance theories further and studies diversification and rebalancing to link it to performance theories. Lastly, the literature review draws a link from the performance to fund costs and discusses the cost side of performance, diversification and rebalancing.

1.1 Active vs Passive funds

Mutual funds can be divided into a passive and active funds, based on how investment strategies are used. In actively managed funds, fund managers decide if he is selling or buying shares and uses the available information to increase profits. In passively managed funds, like Exchange Traded Funds, the funds are designed to follow certain companies or indexes. The debate around active and passive funds have been going on for some time and is one of the most crucial ones and tries to answer the question if the manager in the active fund can bring additional value to the investor. On this debate, on another side of the table there is the computer without emotions and on another side of the table, there is the human advisor with feelings.

One of the topics discussed is that does the automated investment service know the investor and provide additional value to the investor. According to the article in Advisor Focus (2014), there are subjects which automated investment services does not know, and therefore, makes human financial advisors better. For example, human advisors know your background story and can guide you through unexpected life event. Furthermore, Advisor Focus makes a claim that the human advisor gives you

a comprehensive financial plan with multiple choices, and in addition, makes the investor answer difficult questions about their financial life to find out the risk tolerance and investment objectives.

The part of the computer not knowing the investor is unquestionably true, since, current artificial intelligence could not understand human emotions, or to draw a line with personal questions and investment choices. However, it might conflict between the investor and the fund manager, since, the fund manager gets money, for selling the product. Moreover, Paul Mahoney (2004), how the average investor can know if they are paying the fair price. He argues that the pricing should be more transparent and it should be regulated more tightly.

In addition, John Drachman (2015) argues that the pricing is something which human advisors needs to change to keep up with the race. Thus, human advisors need to explain the fees and benefits which come with them. Since the investor might not even know all the fees and it is difficult to find comparisons for the different fees. Moreover, sometimes the investor needs to ask the fund manager specific questions to get the answer. For an average investor can be difficult to know the questions, which should be asked. (Gershman 2015) Otherwise, it would be a situation of asymmetric information and would give the fund manager the chance to sell more expensive investment services.

This debate has moved slightly and now, instead of choosing sides, some authors have started to speak on behalf of a combination of automated investment services and mutual fund manager, thus, it could get benefits from both systems. For example, SigFig which gives automated service and a possibility to contact wealth manager (BenefitsPro 2015) According to the same study, financial industry is moving towards integration of automated investment services and mutual human advisors, since, even the authors who do speak towards the human advisors sees it that they can benefit by using the automated services, as a part of fund managers' portfolio. However, the most important question still remains that does the fund manager in the actively managed fund to bring benefit to the investor, or if the automated investment service is more stable and better choice. To answer this question, it is important to study the performance, persistence, allocation of shares and costs of investing to answer that question.

1.2 Efficient Market Hypothesis

According to the efficient market hypothesis made by Eugene Fama (1970) the possibility to achieve returns in the capital market, higher than the index, would depend on the degree of market efficiency. Thus, the efficient market the prices would reflect the available information. Eugene Fama categorises the markets into three different categories; weak, semi-strong and strong markets.

In weak form the share prices fully reflect all the available data. Moreover, that the past price and volume data do not have a relationship with the future prices. Thus, according to Eugene Fama, excess returns cannot be achieved using technical analysis and new information is the only way to change the price. (1970 p. 390) In the semi-strong, share prices adjust to all available public information, however, the prices have factored in the market and non-market information. Thus, it would be impossible to achieve excess returns by using fundamental analysis, since, price adjustments happen immediately after the new public information is released. (1970 p. 404) In the last one, strong form of efficient market, the information would fully reflect all public and private information. Furthermore, in the strong form, market, non-market and inside information is all included in the prices and no one has a monopolistic access to the information, hence, it would be impossible to use insider information to achieve excessive returns (1970 p. 409)

However, Warren Buffet has criticised the theory by saying that the investors can beat the index by looking for gaps between price and value of the stock. (Business insider 2010) However, if the prices are not constantly reflecting the information, it would mean that the available information is asymmetric and the market is imperfect, thus, it would be possible to gain excessive profits through market imperfections. For the investor, the problem would be to know, if the fund manager has the information to beat the market and how viable that information is. For example, the fund manager might become overconfident, and therefore, misinterpret the accuracy of the information available. Hence, it would lead to a faulty investment decision. (Nofsinger 2014 p.12) Additionally, behavioural finance theory states that human risk perception does vary, thus, the decisions are based on the risks taken earlier. (Nofsinger 2014 p.36) Thus, it would mean that the fund manager could take an excessive risk based on past behaviour. In addition, according to Lisa Kramer in the Wall Street journal (2016), makes a statement, that human advisers can have cognitive biases which might lead to bad financial decisions.

Since the automated investment services are following indexes, it does not try to beat the market by exceeding the index. Thus, it does not require additional information, hence, avoids the problems of human error, mentioned by Nosfinger, and other asymmetric information on the market.

1.3 Benchmark for performance

The first benchmarks for calculating fund performance are based on Harry Markowitz (1959 p. 8) model where the optimal performance is at the point where the variance is lowest and maximises the most efficient return for that variance, by allocating investments so it does not correlate with other investments inside the portfolio.

$$\text{Expected Return} = r_f + \beta(r_m - r_f)$$

r_f = risk free rate

β = Beta

r_m = return on the market

Figure 1. Capital Asset Pricing Model (CAPM) formula (Finance Formulas 2016)

Sharpe and Lintner used the model and converted it into a Capital Asset Pricing Model by including two new factors, investors agreement on the distributions of returns and risk-free rate. (Fama E. F. & French K. R. 2004 p.49)

Later on, this led to inventing the Sharpe ratio. The Sharpe Ratio for risk-adjusted investment performance analysis and is commonly used tool to calculate the fund performance to evaluate fund volatility and persistence of performance over a longer period of time.

$$\text{Sharpe Ratio} = \frac{r_p - r_f}{\sigma_p}$$

The strengths of the Sharpe Ratio are that the calculation is easy and it does not require additional information, the only r_p , which is the returns of the investment and r_f , which is the risk-free rate, divided by standard deviation. However, the weaknesses of this ratio come from its simplicity. Choosing the risk-free rate, which can affect the results greatly, is difficult. The typical risk-free rate is an interest rate of the central bank, but opinions differ if it should be 3-month, one year or the duration of

the investment. Another limitation for the ratio comes, that the ratio does not count inflation. (Sharperatio.net)

There are improved versions of Sharpe Ratio, for example, probabilistic Sharpe Ratio (PSR) which corrects the inflationary effect. It allows establishing a track record needed for rejecting the hypothesis that a measured Sharpe ratio is below a certain threshold with a given confidence level. Furthermore, it removes the trade-off between historical data needed and removes negative skewness with positive excess kurtosis. Thus, a rational investor would prefer the balanced ratio, since, it remove skewness and excess kurtosis, removing volatility, but generating similar profit. (Bailey D.H. de Prado M. L. 2012)

Deflated Sharpe ratio corrects two leading sources of performance inflation, selection bias under multiple testing and non-normally distributed returns and separate findings from statistical flukes. (Bailey D.H. de Prado M. L. 2014)

where the Sharpe ratio uses the portfolio volatility to calculate the risk for excess return per unit of risk, the Treynor Ratio compares the performance against the market. Thus, the Treynor's ratio uses the investments beta to evaluate the riskiness.

$$\textit{Treynor Ratio} = \frac{r_p - r_f}{\beta_p}$$

For the Treynor's Ratio the beta is calculated with formula:

$$\beta_p = \frac{\text{Cov}(r_p, r_b)}{\text{Var}(r_b)}$$

Where the covariance of return of the investment and the return of the used benchmark then divided by using the variance of the used benchmark. The problem with the beta is that the results depend on of the benchmark used. Thus, it is important to pick a proper index. However, this can be difficult for funds and portfolios which are operating in different markets. For this purpose, the use of weighted beta gives better results. In weighted beta, the shares in one company in the portfolio are divided

by the value of the portfolio and multiplied by the beta of the share. Thus, the results give a more accurate estimation for the riskiness of fund or portfolio.

However, the limitations for Treynor ratio is that it ignores specific risks. In the case where the portfolio is fully diversified the Treynor ratio gives the same ranking as the Sharpe's ratio. One solution would be to use the systematic risk as a denominator. (Bacon 2008 p.66) Thus, this would mean that the Treynor ratio could use wrong information, since, it uses market risk instead of portfolio risk.

Another calculation used to evaluate the performance is Jensen's alpha, in this the

$$E(\tilde{R}_j) = R_F + \beta_j [E(\tilde{R}_M) - R_F]$$

Jensen's alpha measures fund manager's ability to generate excess returns and beat the market. In Jensen's alpha, R_f is the risk-free rate of the portfolio, β_j is the beta of the portfolio and $E(R_M)$ is the expected return of the portfolio. A positive alpha measures a situation where the portfolio manager has managed to perform and beat the market. However, negative alpha tells that portfolio manager underperformed and did not succeed to beat the market. (Jensen 1968) However, the theory does have its limitations as well, for example, one reason for negative alpha can results that present in the fund returns but are not present in the returns of the benchmark index. Moreover, since, the Jensen's alpha uses beta its accuracy highly relates with the accuracy of beta. (Haslem 2009 p.168)

1.4 Persistence of Performance

Most of the investment strategies are based on past performance. However, the historical performance does not state the success in future, and short-term success to beat the index does not give a sufficient image of the performance of the funds. Thus, it is important to study the persistence of performance to find out if the active managers can bring persistent value for the investor.

According to Grinblatt and Titman (1992 p.1983) mutual funds which had been performing well in the past managed to keep the persistence in the future and that the persistence could not be explained by inefficiencies in CAPM beta. However, another research shows that mutual fund managers underperform against passive portfolios. Moreover, funds with higher fees underperform against the funds with lower fees and turnover. (Elton, Gruber, Das, Hlavka 1993) In addition, recent studies bring more evidence and supports this view. According to Madison Marriage (2016)

in Financial Times, overall four out of five active equity funds failed to beat their benchmarks over the past five years after the fees were deducted. A similar development can be seen in U.S and in emerging markets.

For the investor, one of the risks of failing to achieve the persistence performance comes from the easiness of changing investments in automated investment services to sell exchange traded funds. Thus, the investor can make biased decisions and have a wrong timing on entering and exiting the market. John Bogle (2015) has criticised ETFs in his article, see appendix 1 for further details, by saying that the only winners for a short-term trading for ETFs are the traders and brokers. In addition, he adds that broad-market ETFs are better for long-term investing if the investor is keeping them long-term. (Bogle 2015) However, Vanguard Group's current chief executive McNabb said that Bogle's critique was confused, self-serving and utter nonsense. (The Irish Times. 2015) According to a study which was made in 2012 by Vanguard studied the investors behaviour of the ETFs possibility to sell them quickly and would it change the investing behaviour of the investors. According to this study on average people who held the holdings from mutual fund kept their shares for 42 months compared to 34 months for ETFs. This study suggests that the difference is small and does not produce any behavioural changes for investors to do short-term investments because of the ETFs. (Vanguard. 2012) However, a study conducted by 2013 indicated that people who owned ETFs suffered from the bad market timing when they had the possibility to sell their ETFs short-term. (Bhattacharya, Loos, Meyer, Hackethal, Kaesler 2013)

However, it is important to notify, since, the passive funds are built to follow the index, they are consistently underperforming the index, and thus, the positive persistent performance and profit generation are based on the diversification to reduce risks and to cost structure. Furthermore, for the passive index funds, the tracking error, is relevant for considering its ability to perform. Nevertheless, it is the amount of volatility and the amount the active funds are underperforming which causes problems to the performance in a long run.

1.5 Portfolio Theories; Diversification and Rebalancing

As important as picking the right fund with persistent performance, is to pick a selection of investments which reduces the risk. Hence, the investor can reduce risks and have a portfolio which can correct the negative performance of an another fund and

increase the performance as a whole. In addition, investors risk tolerance can vary during lifetime, thus, investment behaviour can change and cause a rebalancing of the portfolio.

1.5.1.1 Modern Portfolio Theory

As discussed earlier, the Modern Portfolio theory was developed by Harry Markowitz in 1959. To analyse it deeper, it allows investors to allocate the investments to balance the performance. Harry Markowitz says that the challenge would be to find a perfect combination of assets to have a good portfolio in terms of yield and risk.

Moreover, Markowitz (1952) says that the portfolio with the highest risks is not automatically the one with the lower variance. This statement does have two outcomes. Firstly, the expected return increases if the investor takes more risks, and secondly, an investor who wants to reduce variance can do so by lowering the expectations for the return. Thus, this lead to an expected return – variance of returns (EV) rule (figure 1.)

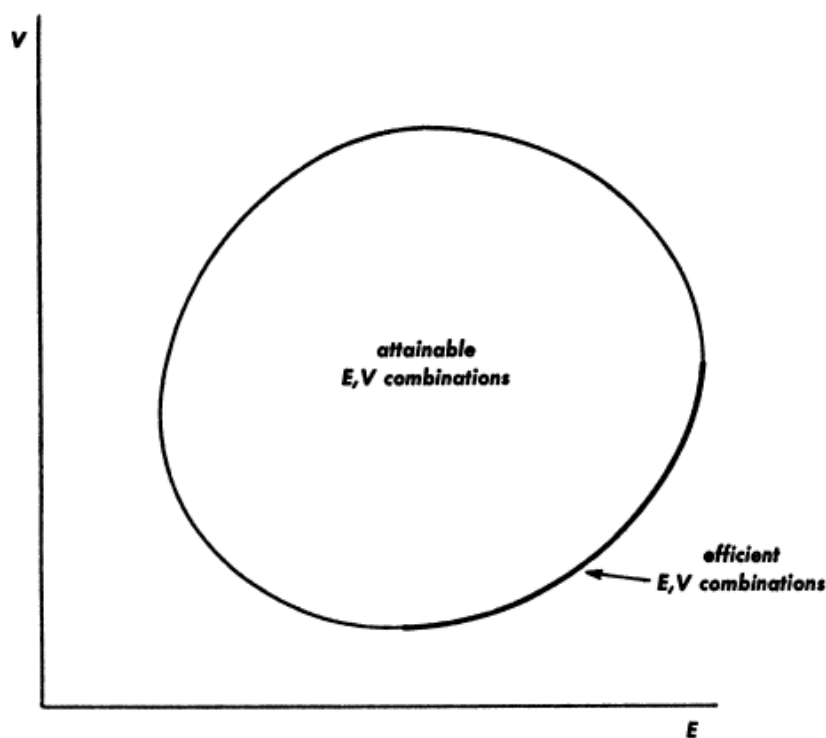


Figure 3. expected return – variance of returns Markowitz H. 1952 Portfolio Selection The Journal of Finance, Vol. 7, No. 1. (Mar. 1952), p.82

Correlation affects the risk level; two positively correlated investment move to the same direction when the market moves. Thus, if investors invest in the same sector inside the country, the market changes can affect the whole sector. Moreover, there

can be a cross-sector positive correlation where the goods are similar. A negative correlation is an opposite, meaning that if one sector reduces value, another sector increases value.

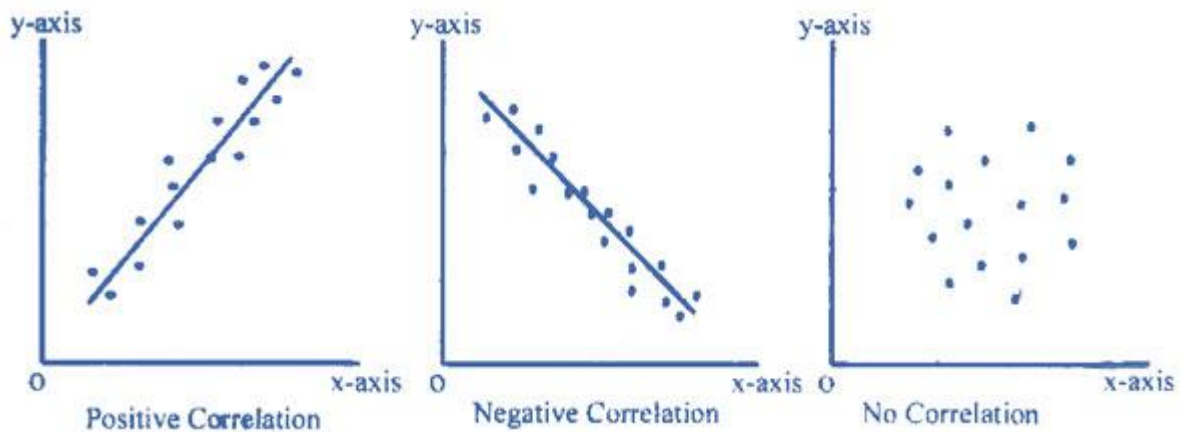


Figure 4. eMathZone (2016)

Thus, the investor could create a diversified portfolio, which can offer riskier investments which are balanced with the less risky option or risk-free option. For example, the investor could build a portfolio with stocks, bonds and cash and spread it for different countries. Hence, the investor would have low-risk bonds, riskier stocks and spread it to multiple countries to reduce risks, which could happen if something happens in the country's economy. The figure 2. Explains the location of an optimal portfolio, when risk-free assets are included in the portfolio.

Investment Opportunities

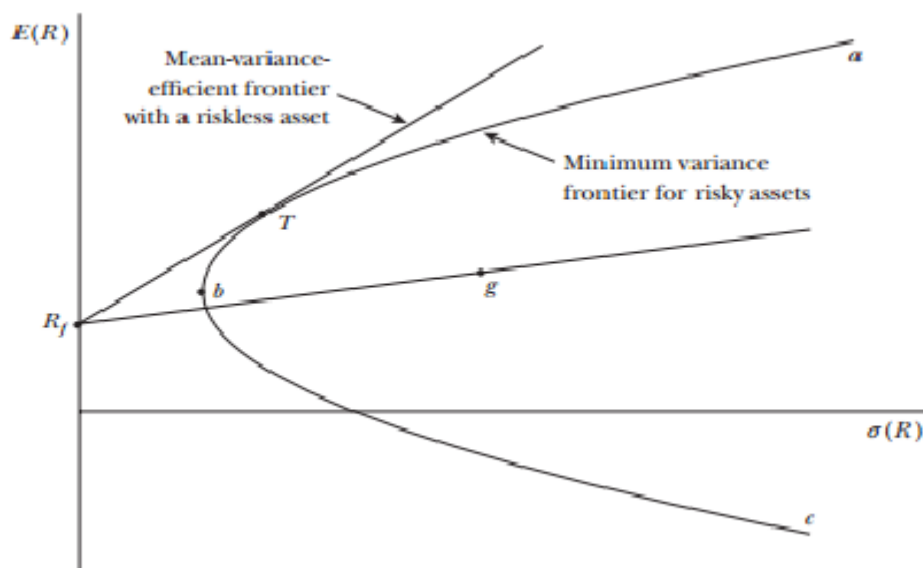


Figure 5. location of the optimal portfolio when there is a risk-free asset. Fama E. F. & French K. R. 2004 The Capital Asset Pricing Model: Theory and Evidence Journal of Economic Perspectives vol. 18, no. 3 (Summer 2004) p.27

In actively managed funds this could mean that the investor would have to pick several funds to get a diversified portfolio, which would include bonds, stocks and cash, domestic and international. Selection of multiple funds would reduce risks, however, it would increase costs. Moreover, it would require rebalancing to keep the risk tolerance, in the case of changes in markets. However, Automated investment services automatically offer portfolios, which are widely diversified. Thus, making it easier for the investor to pick one option, instead of researching multiple funds to diversify. Furthermore, automatically rebalances the portfolio.

1.5.1.2 Post-Modern Portfolio theory

The theory uses the downside risk of returns to allocate the portfolio, hence, the post-modern portfolio theory recognises that the risk should be tied to each investor's specific goals. In the theory, the investor does have a target volatility and below that target is a risk and all the returns above this cause uncertainty. In post-modern portfolio theory, there is a minimum rate of return or minimum acceptable return (MAR) which must be earned. An another aspect in post-modern portfolio theory is that the downside risk statistics can be divided into two different parts, which can be analysed separately. First of the components is downside probability, which measures the likelihood to achieve the minimum acceptable return. The second one is the average downside magnitude; it measures the average shortfall below the minimum accepted return. Hence, the theory measures the consequence of failure. (Rom & Ferguson 1993) Thus, when the failure is calculated into the portfolio allocation, it is possible to determine and rebalance the portfolio's optimal asset as capital market change and if the market and economic factors change. Moreover, this theory has become more popular, since, the interest on behavioural finance increased. Hence, the portfolio allocation based on the post-modern portfolio theory could be suitable for an investor who is more risk-averse and is ready accept lower returns. Therefore, the automated investment services could help the investors who are more risk-averse. (Rasiah 2016 p. 86)

1.5.1.3 Life-Cycle hypothesis and rebalancing the portfolio

According to Life-Cycle Hypothesis, made by Albert Aho and Franco Modigliani (1963) spending and saving habits changes during life. The Younger generation would be borrowing more money and making major purchases, like a house. Thus, it would reduce the amount of investment. After starting a career income would increase, the investor would pay off the borrowed money and start planning to invest for retirement. Hence, the amount of money on investments would increase. (Ruby D 2003)

In a study made by Morin and Suarez (1983) the risk aversion increases with age. Hence, younger investors would prefer riskier investments and seek growth, while older investors would prefer safer investments with higher dividend payments. However, according to Hui Wang and Sherman Hanna (1997) investors risk tolerance increases when an investor gets older. The Younger generation would be more risk averse, since, they have limited resources for investing, hence, could not bear the possible losses. Nevertheless, studies indicate that spending habits, investing needs and risk tolerance changes during the age. Thus, it requires rebalancing investors' portfolios to meet those new investment goals and to rebalance the risk to meet investors risk tolerance.

Another aspect of rebalancing is tax loss harvesting, where unperformed shares are sold. This can be done as a prevention of future losses or for tax purposes. In tax purposes, the shares are sold and to gain tax reduction. In tax-loss harvesting, the investor is taking voluntary losses for creating tax deduction to offset other gains. Thus, the investor can invest money somewhere else in the portfolio. To success in this, the investor needs to use accounting to keep track for gains and losses. Moreover, there is a time limit in a case the investor tries to buy the same share back, a fail to follow the time limit would break taxation law for wash-sale. However, the deduction can act as an interest-free loan. (Horvitz 2016)

Tax-loss harvesting might contain extra costs as well. For example, redemption fee and a subscription fee for the new share. Automated investment services, can help the investor to keep track with gains and losses, plus avoid getting in problems with tax authorities by breaking the wash sale rule. In an automated investment service, the bad share is realised and similar share is bought. Thus, the investor gets the tax reduction and new share which can help gain returns. Most often the service in-

cludes in automated investment services, thus making it a cheaper service to rebalance the portfolio (Betterment 2016)

1.5.1.4 Importance of investing costs

Investing fees are increasing the risks for not getting expected profit for the investment, furthermore, reduces the cumulative gain for the investment. The subscription fees mean the investor can invest less to gain profits. Moreover, investing fees can increase fund managers pressure to take additional risks to meet the target or means that the fund manager underperforms. In case the fund manager fails the investor bears the risk and till have to pay the fees for the manager Automated investment services remove or reduces the costs, thus, tries to generate profits by following the index.

There are several fees a mutual fund can hold. These includes Subscription fee, redemption fee, management fee and holding fees. One formula to calculate the costs is a total expense ratio. The ratio tells the total costs of the fund for the investor. (Financial Times Lexicon. 2016) For investors, it is a good and easy measure to calculate fund costs to evaluate possible returns.

$$\text{Total Expense Ratio} = \frac{\text{Total Fund Costs}}{\text{Total Fund Assets}}$$

In addition, diversifying the portfolio would mean that the investor needs to buy different asset classes, thus, it means that the costs changes and increases. Moreover, when rebalancing the portfolio, by selling and buying, there can be redemption and subscription fees included, thus, the rebalancing costs money, affects the portfolio, and thus, the returns of the portfolio.

In some funds, the costs can be so high, that small investment is not profitable. For example, this would be the case in where, instead of using the percentage, the company would use minimum money payments.

1.5.2 Literature Review Summary

In summary, the literature review gave an insight of the debate between the actively managed funds and automated investment services, to pinpoint the different views. For example, how much more value it can bring for the investor that the fund manager knows the investors background, or are the investors at the position, where

they have an advantage of asymmetric information, and thus, can sell services which are costly, but does not necessarily bring any extra value for the investor. In addition, the literature review explained different analytical tools, to find out, if the mutual fund is outperforming or underperforming, and the limitations of these tools, so it later would be possible to find out the performance of actively managed Finnish mutual funds, to see if they bring extra value to the investor by performing well and generating excessive returns. Moreover, the literature review discussed the persistence of performance, which is more important for a long-term investor, than short-term gains which are highly volatile, and therefore a riskier choice for the investor. Furthermore, explained how automated investment funds are less volatile, because of nature, where the fund is following an index, and hence, trying to have small tracking error to be less volatile and follow the index.

This paper explained different theories for portfolio optimising and the limitations of those, moreover, to in some extent to discuss the asset allocation, rebalancing and tax-loss harvesting. Hence, draw a connection to the cost side of the study, explained the calculations for total expense ratio, which is a good tool for evaluating the costs in the fund. and discussed the importance of costs for the investor and hence, it can reduce the investment.

In overall, the literature review discussed the topics around the research questions to find out the performance, persistence, costs and profits of actively managed Finnish mutual funds and automated investment services. Hence, gave the theories to answer the question if actively managed funds bring any extra value for the Finnish investor, or are the automated investment services a better choice.

2. Research methodology

2.1 Research Approach

The primary purpose is to evaluate the performance of actively managed Finnish funds from 2010 to 2016 and compare the results to the performance of automated investment service companies, from the same time period. The timeframe was chosen because first automated investment company was founded in 2009, and thus, the first available data was from 2010 and latest available data from the end of 2015. The used tool for fund performance analysis is Sharpe Ratio, since even its limitations, it gives a good image of how the fund has performed.

The secondary purpose is to take the study further from the performance analysis and analyse how the fund costs affect the investors returns. For this, the paper creates a hypothetical group of investors who invests money in 2010 and calculate the costs from that point to the point in 2016 when the shares are sold. Then compare the amount of costs and profits generated from the actively managed funds to the costs and profits generated from the automated investment service fund.

2.2 Data Collection and Analysis

The research methodology for data collection includes historical quantitative secondary data from actively managed Finnish mutual funds, which have started before 2010 and have been operating until 2016. Data has been collected from fund companies key investment files and from Morningstar. To have a sufficient amount of Finnish mutual funds for the comparison, the sample size of 141 funds was selected for the research. The sample includes both mutual funds and ETFs used by automated investment companies.

Sharpe ratio has been calculated by taking a yearly profit from the funds, from where according to regulations, management costs are already subtracted. The paper studies an investment made for 5 years, thus, the risk-free premium has been selected as a 5 year U.S. treasury bond rate from 2010. However, to compare the effects of Sharpe ratio caused by the risk-free premium, the study uses yearly average Euribor rate from 2010 to 2016 as a comparison. In addition, the study used standard deviation to analyse the volatility on funds.

For-profit calculations, the study has calculated the ongoing charges, former Total Expense Ratio and the effects of subscription and redemption fees, and a calendar year profits from where the ongoing charges have been subtracted. Moreover, the analysis includes a short explanation of fees and effects.

For costs – cumulative returns calculations, the study has chosen 10 Finnish actively managed mixed mutual funds, with different portfolio allocation, varying from 25% bonds to 75% shares to 75% bonds to 25% bonds. To examine the cost – performance effect the study built 4 different portfolios from ETFs used by automated investment services. For both automated investment companies, the first portfolio included 30% bonds and 70% shares and second portfolio 70% bonds and 30% shares. Since the purpose of this paper is primary look from the point of an average small investor the initial investments are lower. For the first calculation an amount of

EUR 1,000 was divided and for the second calculation an initial amount of EUR 1,000 and additional EUR 500 per year.

2.3 Limitations

Since the automated investment trend is quite new, there are limitations to a number of companies and data available. In this study, it included 22 ETFs, from 2 automated investment companies, which have started before 2010. Further study is needed to gather longer period of information.

Moreover, this study does not include possible currency exchange costs or additional bank costs or services, which could increase fund costs and cost of investing. Furthermore, this study only studies pre-tax returns and does not calculate the possible tax effect, when portfolios are sold. However, when the tax is a percentage, the percentile effect affects all investment profits mutually.

Because of the Sharpe Ratio limitations, inflation rates were not calculated and studied in this research. Moreover, because of the limitations for this study, Treynor Ratio and Jensen's alpha was not calculated. Sharpe ratio was calculated to show the volatility, to draw a connection to performance, however, the deeper study with other analytical tools could give an improved image of the situation and performance between automated investment services and actively managed Finnish mutual funds.

Chapter 4. Data presentation, data analysis and discussion

2.4 Fund performance analysis

Sharpe Ratio has been widely used for performance analysis, since, it measures how much excess returns the investor gains for the extra volatility. There is no exact rule for ratio, anything over 0 is profit and negative would implement that it would have been better to hold the risk-free asset instead of the fund. However, as a guideline can be used that 1 is considered a good ratio, 2 very good and three excellent. (Yahoo Finance 2013)

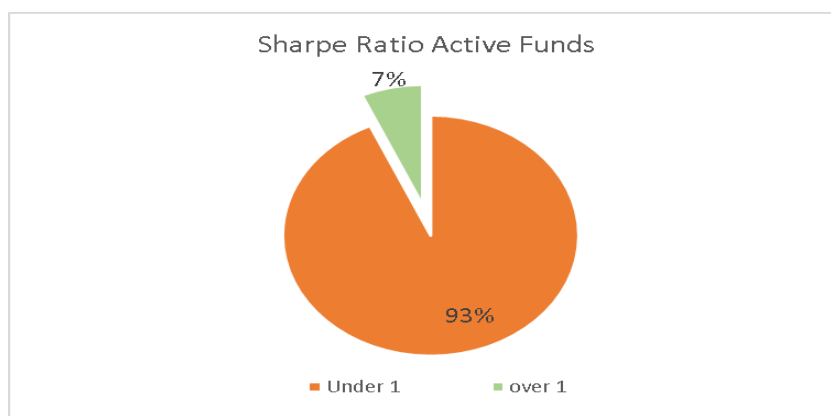


Table 1, Sharpe Ratio active Finnish funds

According to Sharpe's ratio, from 119 Finnish funds, from 2010 to 2016, 93% achieved a lower ratio than 1.00 and only 7 % of Finnish funds managed to get a ratio over 1. When 1. Is considered as a good ratio for funds, thus, it would mean that 93% of the cases the risk was too high and the fund managers underperformed. At the same time, between 2010 and 2016, 68% of the funds failed to get higher ratio than 1. Moreover, 32% funds got a ratio higher than one. None of the funds (119), calculated for this research managed to get a ratio over 2.

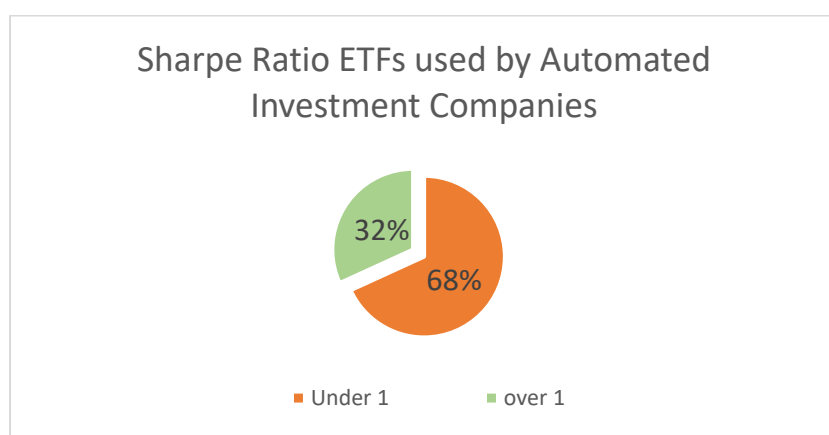


Table 2. Sharpe Ratio Automated Investment Services

In comparison, there are 22 ETFs which are used by automated investment services, of which 7 were over one. From the active funds, 8 out of 119 managed to get a ratio over 1. Hence, it would mean that between 2010 and 2016, the automated investment services outperformed the mutual funds and it would have been easier to pick an automated investment company which performs better than a mutual fund.

However, partly, the difference could be explained with the risk-free premium used for this study. Comparison calculated for this study used the average of 5 year Euribor (1%), from years 2010 to 2016. In comparison, the results for automated investment services stayed the same, while the over 1 ratio for Finnish funds changed from 5% to 13%. Therefore, depending the interest rates used it improved the performance of Finnish funds.

Nevertheless, the differences cannot completely have explained by risk-free rate. Thus, the actively managed Finnish funds were more volatile and underperformed against automated investment services. The comparison for equity funds, operating outside the Finland shows similar performance. (See appendix 5.) However, in com-

comparison the 5-year underperformance was between 51% to 88%, depending the area selection. Hence, the percentile underperforming of actively managed Finnish funds were over the of underperforming than the level of the global comparison. In case, where the risk-free rate would be lower the Finnish funds would have performed at the same level as the global comparison.

The small sample size of automated investment services makes the comparison little bit more difficult, for a comparison automated investment services would have been around the outperforming levels of Eurozone. Since, the Sharpe ratio evaluates volatility, the overall bad performance, could be explained by bad economic conditions and overall market volatility. However, the economic situation cannot completely explain the differences.

Sharpe Ratio can be an inefficient tool in a market which is highly volatile. According to the table 3. Below Actively managed Finnish mutual funds were volatile. Max volatility was 41.54 and min volatility 0.4 during the 6-year period. Median, the most common volatility was 10.23 and thus, had slightly lower volatility, than automated investment services (see table 4.). the difference could be explained by different fund types, since, riskier funds tends to be more volatile.

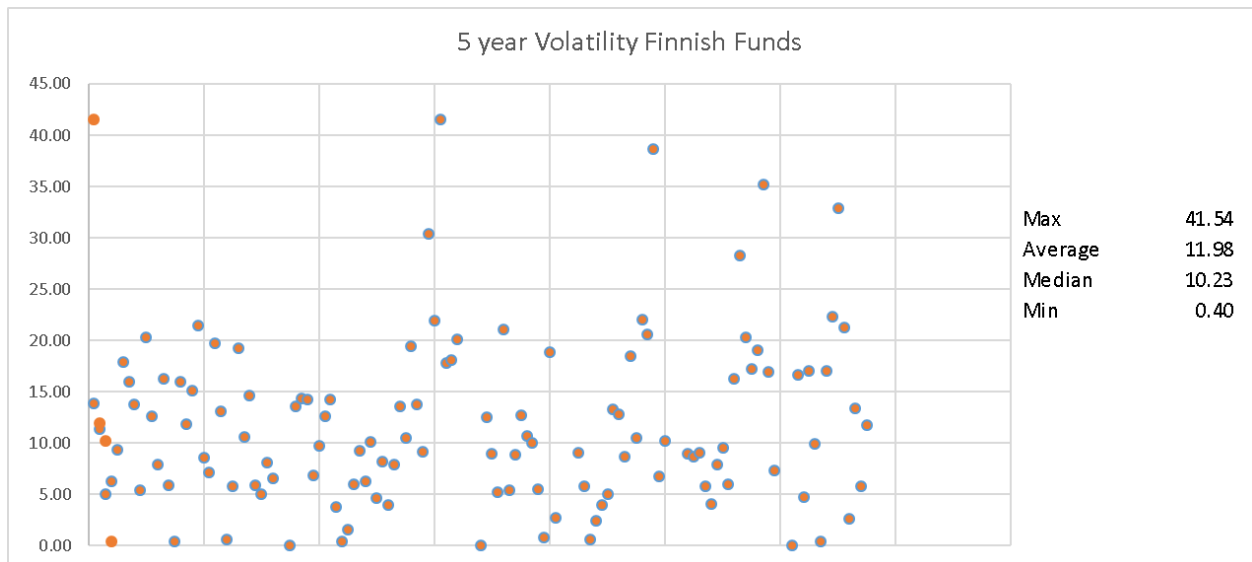


Chart 1. 5-year volatility of actively managed Finnish funds.

Automated investment services were volatile but did not see similar high max and min, as actively managed Finnish funds. (See table 4.)

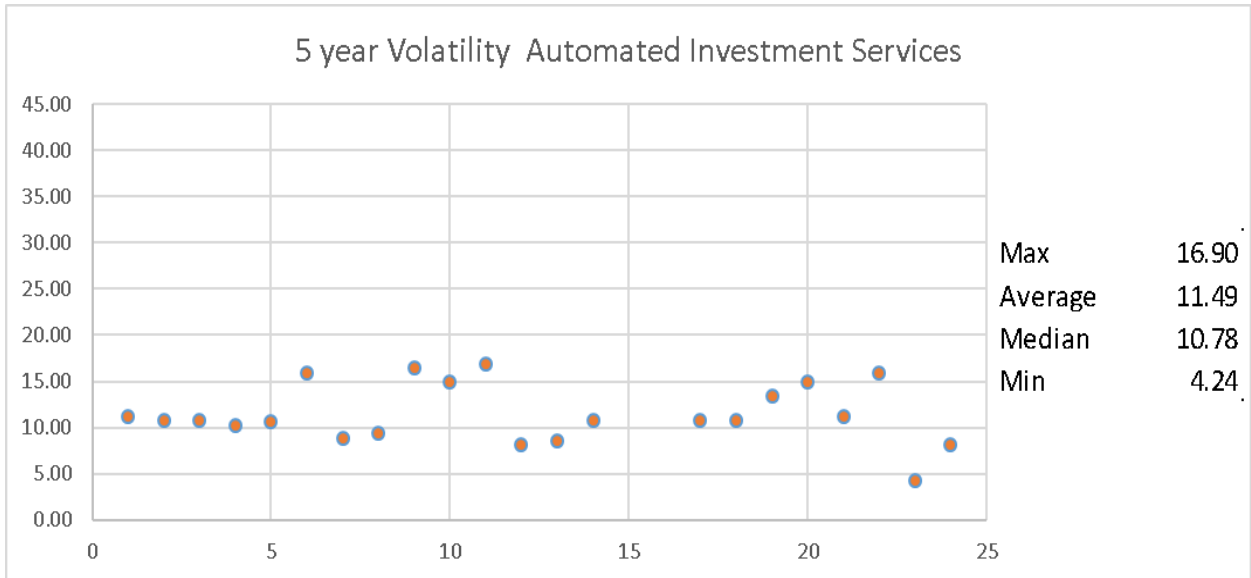


Chart 2. Volatility of automated investment services

Volatility in automated investment services should be lower, since, the funds are usually following the index and tries to minimise the tracking error. One explanation for the volatility, seen in both, actively managed Finnish funds and in automated investment services could be explained by unforeseen market conditions and sudden drop in the equity market. However, the volatile shows move between highest and lowest, thus, it does not necessarily calculate excessive positive volatility. The comparison shows (see appendix 6.) the volatility of S&P500 between 2011 and 2015. From the comparison can be seen that the whole market became more volatile after 2011. Therefore, this can explain the high volatility levels, especially in automated investment services, which should be more stable. Thus, it is important to study the profits from the funds to figure out how well they have been performing from the point of profit.

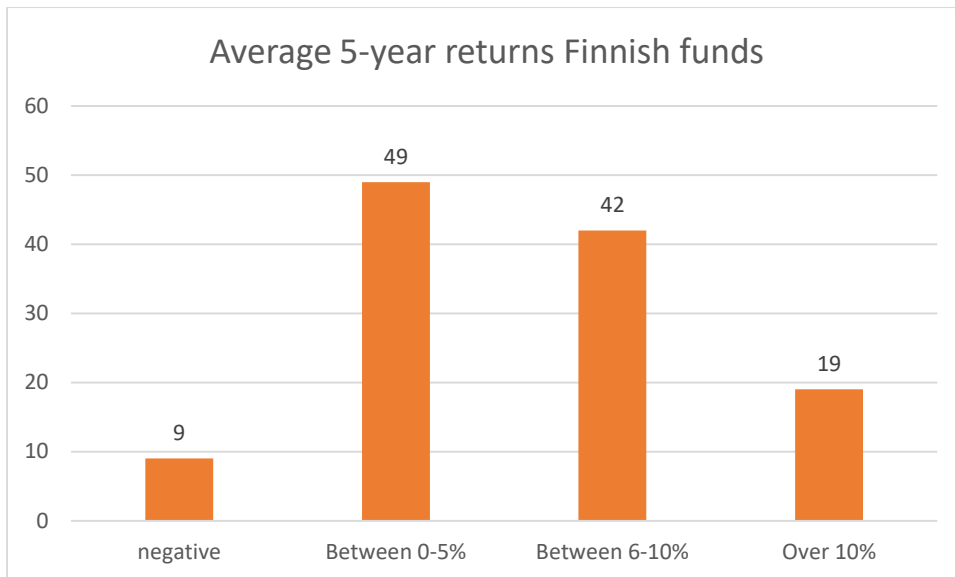


Chart 3. Average 5-year returns of actively managed Finnish Funds

From the table 5. above, we can see the average profits for Finnish funds between 2010 and 2016. The table is divided by consideration of a good return on an economic time like now, thus, a percentage between 6 and then can be seen as a good return on investment. For Finnish funds, 61 funds out of 119 managed to get a percentage over 6, in percentage, this would mean that around 51% of the funds managed to generate profit over 6%. When comparing to the volatility, this could be explained that half of the funds, managed to balance its volatility changes during the 5-year period. In addition, it is important to notify, that the table contains bond funds as well, which can explain the higher number of funds, near the zero.

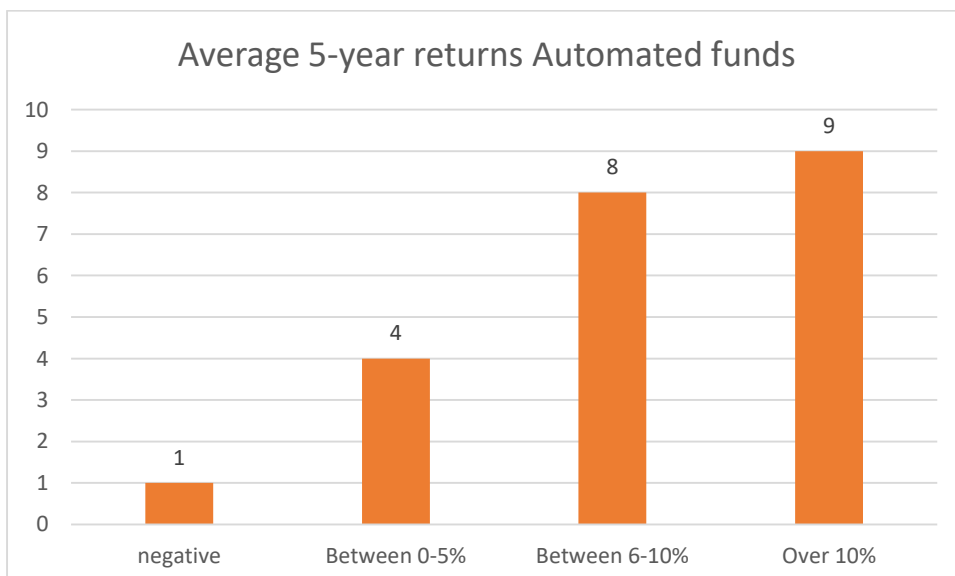


Chart 4. Table 5. Average 5-year returns Automated Investment companies

From automated investment companies' ETFs according to table (6.) above, 17 out of 22 managed to generate a profit over 6%. This would mean that 77% of the ETFs cumulated the over 6% profit during 2010 and 2016, In this case, as well, it is important to notify, that there are lower profit bond funds on list, and that, when the automated investment service ETFs are sold, they are sold in a package, thus, it balances the difference of lowest profit and highest profit.

Finnish funds		Automated funds	
Max	14.98%	Max	16.15%
Average	5.71%	Average	8.44%
Midian	5.45%	Midian	6.46%
Min	-8.02%	Min	-8.38%

chart. 5 Max, Average, Midian and Min 5-year returns

According to table 6. Above the automated investment services generated approximately 2.73% better profit between 2010 and 2016. Minimum profit for automated investment funds was slightly lower than the min from actively managed Finnish mutual funds. Contrariwise, the max was higher in automated services. However, in the case of automated investment services, the products are sold as a bundle, thus, the max and min balances in overall returns. Nevertheless, the 5-year average return would have been higher than the return of actively managed Finnish funds, from the same time period.

2.5 Fund cost analysis

In Finnish equity Funds (table 7.) below, the minimum ongoing charge was 0.65% and the highest ongoing charge was 2.8%, Median charge for the funds was 1.83%- When subscription and redemption fees were added to the calculation the minimum charge increased 1.5% and was 2.15%. The highest fee was 5.8% and median 3.7%

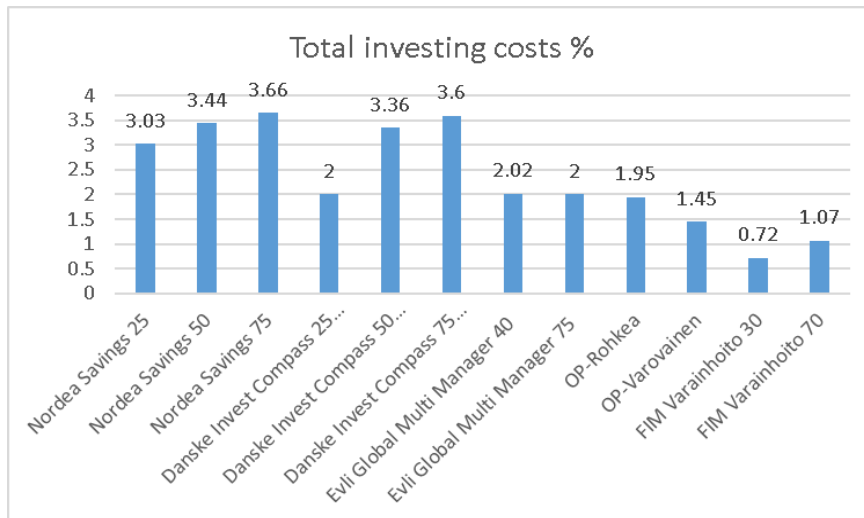
Equity Funds (69)				Bond & Interest Funds			
ongoing charges %		total charges %		ongoing charges %		total charges %	
Min	0.65	Min	2.15	Min	0.3	Min	0.55
Max	2.8	Max	5.8	Max	1.2	Max	2.2
Average	1.84	Average	3.73	Average	0.74	Average	1.53
Median	1.83	Median	3.7	Median	0.7	Median	1.675

Chart 6. Charges actively managed Finnish funds

When studying Finnish Bond and interest Funds from the table (7.) above, the minimum fee was 0.14% and the highest 1.23%. When the subscription and redemption

fees were added the median fee increase almost at the same level as the median in Equity funds.

In mixed funds table 8. below, which are closer to automated investment services, from the diversification point of view, the fees varied greatly, depending the allocation percentage on bonds and shares. However, it is interesting to see that there seem to be big differences between similar fund allocations. Funds are allocated according to the risk tolerance, and the difference in lowest risk funds varied from



0.72% to 3.03%. Similar variations can be found in riskier equity weighted funds, where the fees varied from 3.665 to 1.07%

Chart 7. Total investing costs mixed funds.

According to European Fund and Asset Management Association EFAMA (2011), the average costs in Europe, by portfolio type and distribution channels was around 1.75% for equity funds and for bonds funds 1.17%. This would mean that the median of Finnish actively managed mutual funds had a slightly higher (1.84%) fund fee. On other hand, the average of ongoing charges was lower. On average the fee was around 0.70% when the average in Europe was 1.17%. Moreover, in many places in Europe the prices for actively and passively managed funds have gone down from 2002 to 2012. (See appendix. 4.) The reduction in prices has been higher in passive funds, thus, can be estimated that the exchange traded funds and automated investment services have and will cause pressure for active funds to check

their fee structures. Especially, in the case where they cannot improve the performance.

For this study, the total expense ratio was calculated, however, the Finnish actively managed mutual funds had a different variety of different costs. (See appendix 3.) Firstly, the subscription fee, which was taken before the investment was made and used to cover the expenses. Secondly, funds informed the management fee, which was taken on a yearly basis. Secondly, some funds included a holding fee, for holding the portfolio for the investor. Fourthly, there was a redemption fee which was taken for selling the investment. Lastly, some funds had a performance fee, based on the performance of the fund. For this study, those funds were excluded, for the reason of difficulties to estimate the costs and its effect. In addition, funds informed the ongoing charger, the former total expense ratio, which included most of the fees, but excluded subscription and redemption fees. For an average investor, it might be difficult to estimate the whole amount of different fees. Furthermore, especially if banks hold the funds, they might have different indirect fees or monthly, relate to a bank account and for other possible services. Those would be difficult for the average investor to estimate and include in their profit calculations.

For most problematic for the investor are a subscription fee and redemption fee. The subscription fee is charged every time shares are bought. Thus, it makes expensive for an investor to diversify and rebalance their portfolios. Rebalancing costs, in addition to subscription fees, would also include redemption fees. Hence, the investor would have to pay both fees, if the investor decides to rebalance their portfolios by selling shares. Thus, they basically have two different options, to rebalance the portfolio by buying more shares, or accept the increased risk, or that the possible returns get lower, because of the reduced risk in the portfolio. In addition, redemption fees also act as a changing cost, thus making it difficult for an investor, to change between portfolios, without losing money.

The fees in automated investment services are usually low but varies. The main benefit is that there are no hidden fees, it is easy to find the total expense of the fund when the investment amount is known. In two services studied for this research table (9.) below in Wealthfront, the minimum cost was 0.35% or USD 8. Thus, this can be expensive for a smaller investor, in case the investor has to pay the money fee. Fees

are still much lower than in Finnish actively managed mixed funds. The difference is between 0.37% to 3.31% lower than the total expenses in Finnish funds. Moreover, the difference increases 0.1% if the investment is higher than 10,000. In Betterment, there is no fee until the investment amount grows to 10,000. After that the total expenses follows Wealthfront, only making a small exception for investment over 100,000 when the fee reduces to 0.15%

Wealthfront	
Investment	
< 10,000	8\$ or 0.35%
> 10,000	0.25%
Betterment	
Investment	
< 10,000	0.35
10,000 - 100,000	0.25
> 100,000	0.15

Chart 8. Total expenses automated investment funds

Hence, can be said that the investment costs are much lower than in actively managed Finnish funds, moreover, more transparent, since, the subscription fees and redemption fees are missing. However, the situation is similar to actively managed funds, that the investor pays the fee, even in a situation, where the fund does not manage to generate returns. In addition, in automated investment services the computer automatically diversifies the portfolio by buying multiple portfolios, without any extra costs. Moreover, rebalances the portfolio, for free, to reflect the investor's risk tolerance. Since the automatic investment services do not have a redemption fee, it is easy for an investor to withdraw their money, if something happens or they decide that they want to try different investing options.

An additional benefit, which comes with automated investment services, that it does the tax loss harvesting automatically, thus selling a share which has had made a loss and replace it with a similar one, keeping the optimal asset allocation and expected return expectations. The investor can use the realised loss for reducing their tax burden from income. However, this might be different depending the country.

2.6 Fund Return - Cost analysis

For the investor, it is important to know how the performance and investing fees realise over time. Thus, it is possible to estimate true fund performance and how the fees have affected the return. More importantly, how the cumulative return of the portfolio is affected by the costs. In this paper the true performance and cumulative

returns are calculated by using Finnish actively managed mixed funds, which contains both, bonds and shares and compared it to automated services based on the allocation.

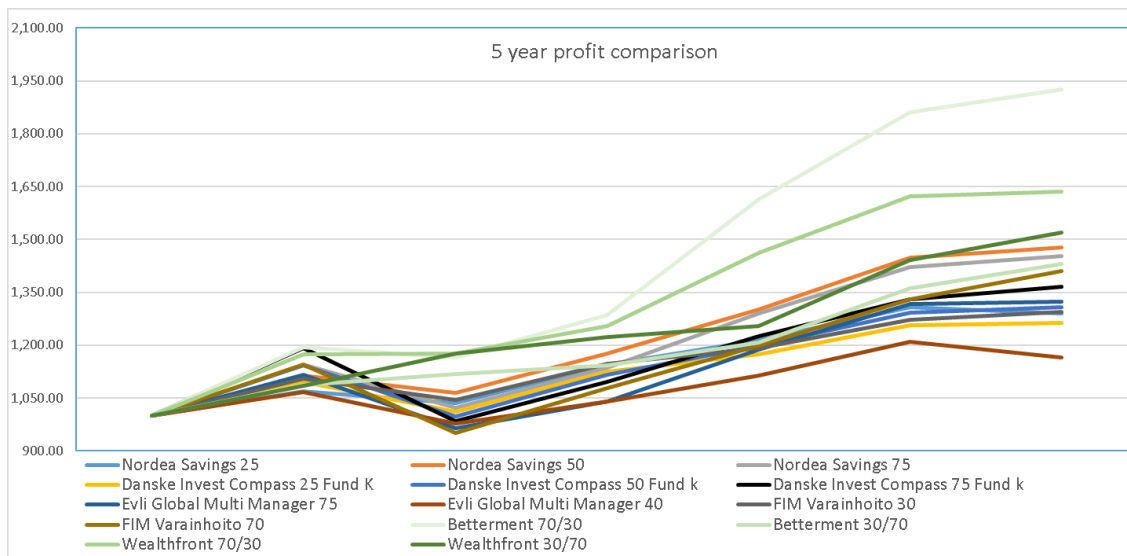


Chart 9. 5-year profit comparison

In table 10. The green ones present the profits from automated investment services and other colours present the actively managed mixed funds. As it can be seen from table 10. Above, two out of four automated investment services provided a greatly higher return between 2010 and 2016 than actively managed mixed funds. Moreover, the third fund generated little bit higher return as the highest actively managed fund. The fourth automated investment fund managed to outperform most of the actively managed mixed funds. Moreover, it can be seen that the redemption fee reduced the investment in the end, which can explain some of the difference in returns. A closer look on to the figures shows that the highest return the fund generate was around EUR 925 profit while the lowest generated a profit of EUR 280. When comparing similar funds, the betterment 70/30 fund generated a profit of EUR 925 and The Danske Savings 75 generated a profit of EUR 481. The difference of the returns on these funds is EUR 444, or as a percentile, the difference is 92%. Thus, it can be said that this is a huge difference. Part of the difference could be explained the difference in costs. The total expenses for Danske Savings 75 over the investment period were EUR 163. At the same time, the costs for the higher profit were around EUR 66. Quite interestingly, the Wealthfront 30% bonds and 70% shares portfolio generated more return than the best actively managed fund options.

In case there are multiple investments (Table 11.) below, the investments balanced the bad timing of investment effect. The automated investment services managed to outperform the actively managed funds.

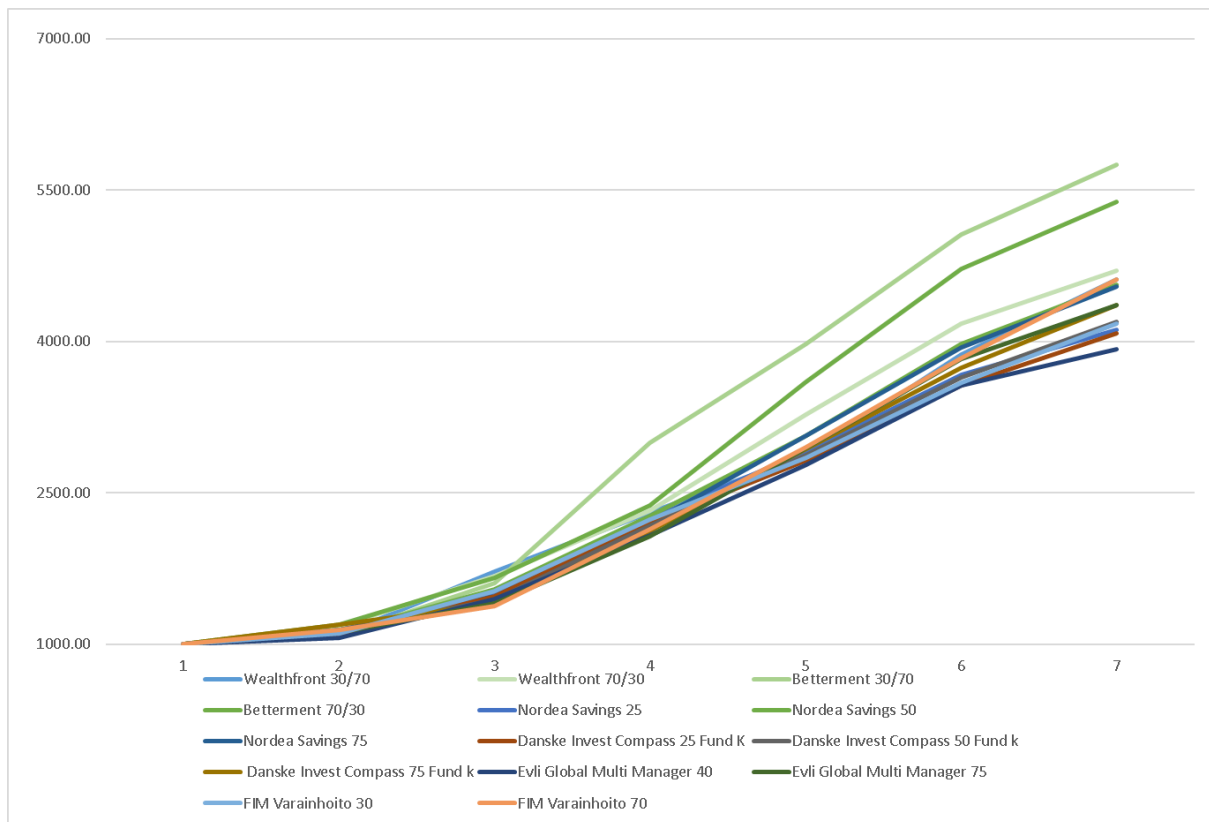


Chart 10. Yearly initial investment analysis 2010-2015

Closer look into profits in table 11. Above tells that the portfolio with maximum value was the betterment 70% shares 30% bonds with an end value of around EUR 5,381. Portfolio with minimum value was Evli Global 40 with the value of EUR 3,922. When comparing to portfolios with more similar allocation the highest was the betterment 70/30 with value EUR 5,38` and the closest one was FIM Varainhoito 70 with a value of EUR 4,617. The difference between these two was EUR 764. During the 2010 to 2015 period, almost all automated investment funds beat the Finnish mutual funds. From the bond weighted funds the Betterment 30/70 generated a return of EUR 5752 and from Finnish counterparts the FIM Varainhoito 30 generated a return of EUR 4174, hence, the difference was EUR 1578, which is even higher than in equity weighted funds. Since the fees are generally lower in FIM bond funds (0.72%) and the fund does not have subscription or redemption fees. The difference cannot be explained with fees. Since, the volatility was higher in FIM varainhoito 30 than in betterment 30/70, thus the volatility could be one explanation for the big difference.

As a comparison to earlier one table (10.) above can be said that the additional yearly investment managed to reduce the bad timing of only investment, at least this was the case for some funds. Differences are still quite high, from the perspective of an investor. Without the high fees in actively managed Finnish mutual funds, there would have been less spread on the differences of automated investment funds. Thus, it looks like that the less volatile ETFs automated investment services are a viable option for the investor.

The difference in some funds could be explained with the fees. According to the table (12.) below, the Finnish investor would have paid fees for Finnish equity weighted funds between EUR 378.20 to 169.96. The fee differences are high even between Finnish equity funds. One explanation could be that the FIM Varainhoito 70 does not have the subscription or redemption fees. Thus, it could also explain why the fund outperformed the Nordea Savings 75 fund. In case the fee difference is included in the profit of Nordea 75 fund, it would have generated more return than FIM Varainhoito 70.

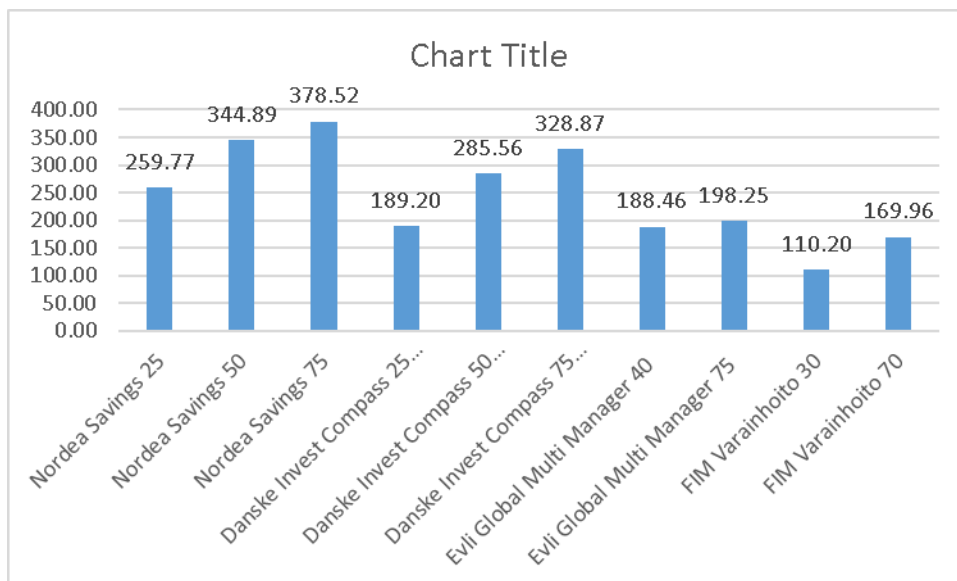


Chart 11. Total expenses between 2010-2016

From the bond funds, the lowest fee was EUR 110.20 in FIM Varainhoito 30 and the highest fee was in Nordea Savings 25, in where it was EUR 259.77. Also, in this case, the high fees caused that the Nordea Savings 25 underperformed against FIM Varainhoito 30.

Table 12. does not show the fees for Betterment, but it is easy to calculate because of the flat fee. Wealthfront is excluded from the table, since, it does not have fees.

3. Conclusion

In Finnish market, which fills the characterises for oligopolies, since, the three biggest banks have between EUR 40.5 to EUR 45.9 billion assets under management of total EUR 86 billion, and next big fund companies are banks as well. Plus, the findings in this study, which shows the higher fee structure in banks, comparing to Europe, excluding the bond funds in Finland can be attractive for an investor. Moreover, the risk reduction through diversification or through rebalancing can be expensive if the investor needs to pay the subscription fees and redemption fees. Thus, the automated investment services can provide a cheaper solution for the investor, and help the investor to diversify the portfolio easily. Furthermore, the changing costs are lower in automated investment service, thus, it makes easier for the investor to use the exit strategy if life situation changes or the investor is not happy with the service. The exit costs from actively managed mutual fund are expensive, since, in most cases the investor has to pay the redemption fee. In some cases, multiple redemption fees, if the investor has diversified the portfolio using multiple different active mutual funds. In addition, the study shows, that the fee transparency is higher in automated investment services than in mutual funds. Usually, there is one flat cost per investment amount thus, it makes it easier for an average investor to find the relevant fees to calculate costs and possible returns.

Lastly, and most importantly, the research shows that the automated investment service is performing better against Finnish actively managed mutual funds. The volatility and the variances in volatility were lower in automated investment services than in mutual funds. In actively managed funds only 7% - 12%, depending the risk-free rate, managed to get a Sharpe ratio over one, which is considered to be a good ratio. Few exceptional actively managed Finnish fund managed to get a better result and better return than the automated investment services. The same figure, of the funds who got over 1, for the automated investment services were 32%. From the study it is possible to draw a conclusion, that automated investment services are more performing better in the volatile market than the actively managed mutual funds in Finland.

Therefore, even when the volatility is high, the automated investment services can be more persistent because of the low fee structure, generate a higher cumulative return. According to the research findings in this paper, when compared to mixed

mutual funds, three out of four, automated investment funds managed to generate a higher return than the Finnish actively managed mutual funds. When compared mixed mutual funds with weight on equity allocation, the difference was EUR 444 for the investment of EUR 1,000 between 2010 to 2015. When compared the investments with a yearly initial investment, in some cases the bad timing for actively managed mixed mutual funds reduced. However, the difference in returns increased. In the comparison, the difference was EUR 764. This change in difference can be partly explained by the higher fees due initial subscription payments. In both comparisons, the more expensive actively managed Finnish funds underperformed against the cheaper Finnish funds. In addition, the average returns were higher in many cases in Automated investment funds than in actively managed Finnish funds, thus improving the persistence.

Therefore, this study shows that between the beginning of 2010 and end of 2015, the automated investment services would have been a better choice for the Finnish investors. The invested amounts in this study, was relatively low, due the concentrating to small investors. However, the cumulative return effects follow the similar pattern for larger investments. In addition, in the case of monthly investing or active rebalancing, the fee effect of the actively managed Finnish funds is higher and favours the automated investment services.

Thus, this study shows, that automated investment services are a viable, cheaper and a better choice for investors. No matter, if the investor is an institutional, experienced or an average investor. However, the costs structure and the low or no minimum investment makes this a good choice for a small investor, who wishes to do small monthly investments. Thus, the fee structure in automated investment funds does not eat the equity and it keeps a better chance to earn returns for the investment. Moreover, it can be seen as an excellent option for an investor, who is tired of the complicated fees in the bank, and wants to get a transparent service, which immediately tells the costs to the investor. Lastly, it is a good choice for investors, who wants to build a diversified portfolio, or wants to add diversification to a current portfolio. The low costs – index combination is a good choice to reduce volatility and thus to reduce risk. Nevertheless, the past performance is not a guarantee for future returns, but the automated investment service provided good returns during 2010 and 2015.

4. References

Ando A. & Modigliani F. 1963 The "Life Cycle" Hypothesis of Saving: Aggregate Implications and Tests *The American Economic Review*, Vol. 53, No. 1, Part 1 (Mar. 1963), pp. 55-84 Published

AT Kearney 2015 Hype vs. Reality: The Coming Waves of Robo-Advisors Hype vs. Reality: The Coming Waves of Robo-Advisors [ONLINE] Available at https://www.atkearney.com/documents/10192/7132014/Hype+vs.+Reality_The+Coming+Waves+of+Robo+Adoption.pdf/9667a470-7ce9-4659-a104-375e4144421d [Accessed 1 May 2016].

Advisor Focus. 2014. *You or a Robo Advisor?* [ONLINE] Available at https://www.emoneyadvisor.com/emacorp/pdf/newsletters/AdvisorFocus_MarApr2014.pdf. [Accessed 10 May 2016]

Bacon C.R., 2008. *Practical Portfolio Performance Measurement and Attribution*. 2 Edition. Wiley.

Bailey D.H. de Prado M. L. 2012 The Sharpe Ratio Efficient Frontier 2012' *Journal of Risk*, Vol. 15, No. 2, Winter 2012/13

Bailey D.H. de Prado M. L. 2014 *Journal of Portfolio Management*, 40 (5), pp. 94-107. 2014 (40th Anniversary Special Issue).

Bank of Finland (2015) Investment funds Annual Review 2014 [ONLINE] Available at http://www.suomenpankki.fi/en/julkaisut/tilastojulkaisut/sijoitusrahastot/Documents/Investment%20funds_2014.pdf [Accessed 1 May 2016].

BenefitsPro. 2015. *SigFig robo-advisor aimed at retirees*. *BenefitsPro*. [ONLINE] Available at <http://www.benefitspro.com/2014/10/31/sigfig-robot-advisor-aimed-at-retirees>. [Accessed 14 April 2015].

Betterment. 2016. *Tax Loss Harvesting+ - Betterment*. [ONLINE] Available at: <https://www.betterment.com/tax-loss-harvesting/>. [Accessed 10 May 2016].

Bhattacharya U, Loos B, Meyer S, Hackethal A, Kaesler S. The Dark Side of ETFs and Index Funds 2013 [ONLINE] Available at <http://carlsonschool.umn.edu/file/14326/download?token=cXLHF0uo> [Accessed 15 March 2016].

Bogle J. 2015. Father of passives has doubt about ETFs. *Financial Times* 16 March 2016 Appendix 1.

The Bottom Line - January 2015. 2016. The Bottom Line - January 2015. [ONLINE] Available at: http://www.thebottomline-digital.com/thebottomline/january_2015?pg=11#pg11. [Accessed 05 May 2016]

Business Insider 2016. Here's What Warren Buffet Thinks About The Efficient Market Hypothesis [ONLINE] Available at <http://www.businessinsider.com/warren-buffett-on-efficient-market-hypothesis-2010-12?IR=T>. [Accessed 24 March 2016].

Carhart, M. M. 1997 on persistence in Mutual Fund Performance Journal of Finance, Volume 52, Issue (Mar 1997), 57-82

Danske Bank Plc 2014. Annual Report 2014 [ONLINE] Available at: https://www.danskebank.fi/en-fi/About/Press/Publications/Documents/Danske%20Bank%20Plc%20-%20Financial%20information/Danske-Bank-Plc_Annual-Report_2014.pdf [Accessed 4 May 2016].

EFAMA (2011) European Fund and Asset Management Association (EFAMA) FUND FEES IN EUROPE: [ONLINE] Available at https://www.efama.org/Publications/Statistics/Other%20Reports/EFAMA_Fund%20Fees%20in%20Europe%202011.pdf [Accessed 09 May 2016].

Elton, E. J., Gruber, M. J., Das, S., & Hlavka, M (1993) Efficiency with costly information: A reinterpretation of Evidence from Managed Portfolios. The Review of Financial Studies, pp. 1-22.

eMathZone. (2016). *Positive and Negative Correlation* . [ONLINE] Available at: <http://www.emathzone.com/tutorials/basic-statistics/positive-and-negative-correlation.html>. [Accessed 11 May 2016].

ETF Database. 2015. *ETFs vs. Index Funds: What's The Difference?* | *ETF Database*. [ONLINE] Available at <http://etfdb.com/financial-advisor-center/etfs-vs-index-funds-whats-the-difference/>. [Accessed 06 March 2016].

Fama, Eugene F. 1970, "Efficient Capital Markets: A Review of Theory and Empirical Work", The Journal of Finance, Vol. 25, No 2, pp. 383-417

Fama E. F. & French K. R. 2004 The Capital Asset Pricing Model: Theory and Evidence Journal of Economic Perspectives vol. 18, no. 3 (Summer 2004):25–46

Finance Formulas 2016. *Capital Asset Pricing Model*. [ONLINE] Available at: <http://www.financeformulas.net/Capital-Asset-Pricing-Model.html>. [Accessed 11 May 2016].

Financial Times Lexicon. 2016 *Total Expense Ratio Definition* [ONLINE] Available at <http://lexicon.ft.com/Term?term=total-expense-ratio>. [Accessed 10 May 2016].

Gershman R. 2014. Forbes - You Probably Have No Idea What You Pay Your Financial Advisor In Fees, Here's Why – Forbes 06/03/2014. [ONLINE] Available at:

<http://www.forbes.com/sites/rogergershman/2014/06/03/you-probably-have-no-idea-what-you-pay-your-financial-advisor-in-fees-heres-why/>. [Accessed 14 March 2016].

Grinblatt, Mark. and Titman, Sheridan. (1992), "The Persistence of Mutual Fund Performance", *Journal of Finance*, Volume 47, No 5, p. 1977-1983

Horvitz J. E. 2016. Tax Deferral and Tax-Loss Harvesting . [ONLINE] Available at <http://www.cfapubs.org/doi/pdf/10.2469/cp.v2005.n5.3518>. [Accessed 10 May 2016].

ICI. 2015. *ICI - Frequently Asked Questions About the U.S. ETF Market*. [ONLINE] Available at http://www.ici.org/etf_resources/background/faqs_etfs_market. [Accessed 25 March 2016].

The Irish Times. 2015 ETFs are they for the better or for the bettors?. *The Irish Times* Mar 31. 2015 [ONLINE] Available at: <http://www.irishtimes.com/business/personal-finance/etfs-are-they-for-the-better-or-for-the-bettors-1.2158806>. [Accessed 15 February 2016].

Jensen M.C. 1968. The performance of mutual funds in the period 1945-1964 *Journal of Finance*, Volume 23, Issue 2, Papers and Proceedings of the Twenty-Sixth Annual meeting of the American Finance Association Washington D.C. December 28-30, 1967 (May 1968). 389-416

Ludwig L. 2015. Investorjunkie - *The Rise of the Robo Advisors - Should You Use One?*. [ONLINE] Available at <http://investorjunkie.com/35919/robo-advisors/>. [Accessed 14 March 2016].

Mahoney P.G. 2004 Manager-Investor Conflicts in Mutual Funds *Journal of Economic Perspectives*—Volume 18, Number 2—Spring 2004—Pages 161–182

Markowitz H. 1952 Portfolio Selection *The Journal of Finance*, Vol. 7, No. 1. (Mar. 1952), pp. 77-91.

Marriage, M. (2016) *Financial Times* - 86% of active equity funds underperform [ONLINE] Available at: <http://www.ft.com/cms/s/0/e555d83a-ed28-11e5-888e-2eadd5fbc4a4.html> [Accessed 24 March 2016].

Morin, R. A. & Suarez, A. F. (1983). Risk aversion revisited. *The Journal of Finance*, 38(4), 1201-1216

Morningstar Manager Research, 2014. A Guided Tour of the European ETF Marketplace [ONLINE] Available at http://media.morningstar.com/eu/Events/ETFEU/ETFEU14/ETF_Industry_Report_4Nov.pdf [Accessed 10 May 2016].

Nofsinger, J.R., 2014. *The Psychology of Investing*. 5th ed. New Jersey: Pearson.

OP (2015) Operations and earnings by business segment [ONLINE] Available at <https://op-year2014.fi/en/report-by-the-executive-board/operations-and-earnings-by-business-segment> [Accessed 4 May 2016].

Rasiah, D. 2012 Post-modern portfolio theory supports diversification in an investment portfolio to measure investment's performance Journal of Finance and Investment Analysis, vol.1, no.1, 2012, 69-91

Reuters. 2016. *'Fat finger' trade seen costly after HSBC price spike | Reuters*. [ONLINE] Available at <http://www.reuters.com/article/us-hsbc-spike-idUSBREA0T0S720140130>. [Accessed 5 May 2016].

Rom, B.M. & Ferguson K. W. Post-Modern portfolio comes of age Journal of Investing, Winter 1993.

Ruby D, 2003. Digital Economist The Life-Cycle Hypothesis. [ONLINE] Available at http://www.digitaleconomist.org/lch_4020.html. [Accessed 05 May 2016].

Sharpe Ratio Strengths and Weakness. 2016. *Sharpe Ratio Strengths and Weakness*. [ONLINE] Available at <http://www.sharperatio.net/Sharpe-Ratio-Strengths-and-Weakness.html>. [Accessed 10 May 2016].

Vanguard. 2012 ETFs: are they for the better or for the bettors? Vanguard [ONLINE] Available at <https://personal.vanguard.com/pdf/s318.pdf>. [Accessed 1 April 2016].

WSJ. 2016. *Can Robo Advisers Replace Human Financial Advisers? - WSJ*. [ONLINE] Available at <http://www.wsj.com/articles/can-robo-advisers-replace-human-financial-advisers-1456715553>. [Accessed 10 May 2016].

Yahoo Finance. 2013. [ONLINE] Why you should use the Sharpe ratio when investing in the medical device industry Available at <https://finance.yahoo.com/news/why-sharpe-ratio-investing-medical-042514170.html>. [Accessed 09 May 2016].

5. Appendices

5.1 Appendix 1. Father of passives has doubts about ETFs

John Bogle

Financial Times, 16 March 2015

Vanguard founder says traders and brokers are the only winners of short-term trading

The only sure winners in the zero-sum game of trying to beat the market are the brokers and dealers of Wall Street, says John Bogle

The rise of index investing — passively-managed portfolios that seek to match the returns of various indexes of the stock and bond markets — represents one of the most remarkable changes in the history of investment strategy.

December this year will mark the 40th anniversary of the creation of the world's first index mutual fund — originally First Index Investment Trust, now the Vanguard 500 Index Fund. The indexing concept was slow to catch on. Nine years passed before the second index fund was formed in 1984.

The index fund share of equity mutual fund assets, less than 1 per cent in 1984, rose to 4 per cent in 1995, to 15 per cent in 2005, and to 32 per cent by the start of this year. Including pension funds, more than \$4tn of US equities are committed to index strategies, controlling some 22 per cent of all corporate shares.

My idea in creating that original index fund was the essence of simplicity: buy the stocks representing the lion's share of the US stock market, weight them by their market capitalisations, hold them forever, pay no investment advisory fees, and operate on an "at-cost" basis, without profit to the sponsor.

The result would be a virtual guarantee that index fund investors will earn their fair share of the returns generated by the stock market itself. Put another way, an investment in which you enjoy the magic of compounding investment returns over your lifetime, while substantially eliminating the tyranny of compounding investment costs.

I believe that the basic principles of indexing continue to represent, for the vast majority of long-term investors, the surest possible route to wealth accumulation.

But a funny thing happened. Beginning in 1993, a new concept of indexing began. Yes, it was still about owning the S&P 500 Index, but in a form in which it could be "traded all day long, in real time," according to the advertisements for the first "exchange traded fund" (ETF) developed by Nathan Most.

Mr Most offered Vanguard the opportunity to join forces with him, using our Vanguard 500 Index Fund as the trading vehicle. But the idea of using Vanguard's original index fund for frequent trading was anathema to my investment philosophy.

I had come to realise that, as investors trade stocks with one another, the zero-sum game (before costs) of striving to beat the market becomes a loser's game (after costs are deducted). The only sure winners are the brokers and dealers of Wall Street.

When I rejected Mr Most's proposal, he turned to State Street Global Advisors, which formed the SPDR (Standard & Poor's 500 Depository Receipts). Today, the 'Spider' remains the largest ETF, with assets of \$185bn.

The SPDR is not only huge, it is active. It is the most widely-traded stock in the world, averaging \$21bn in trading each day, an annualised total of \$5.3tn that represents an annual turnover of some 2,700 per cent. By way of contrast, the annual redemption rate for the Vanguard 500 Index Fund came to about 12 per cent of assets.

Yes, ETFs are largely vehicles for short-term trading, while traditional index funds are largely held for long-term investment.

Should we amend Gresham's famous law — bad money drives out good — to a new law — bad indexing drives out good? Not entirely. Since 1993, both types of index funds have grown rapidly. ETF assets grew to roughly match those of traditional index funds by 2008,

after which both have grown at about the same rate. Current assets of ETFs: \$2.0tn; traditional index funds: \$1.9tn.

For better or for worse, ETFs have opened indexing to a new market of stock traders. About 65 per cent of the assets of ETFs — \$1.3tn — are held by institutional investors. They turn over their shares at alarming rates — the most active ETFs have annual turnover rates between 2,000 and 4,000 per cent.

Among the individuals who hold the remaining 40 per cent, I estimate that one quarter are largely buy-and-hold investors, with three-quarters who trade them fairly actively. In all, ETF share turnover came to almost 1,000 per cent last year.

But it is not only the level of trading activity that differentiates traditional index funds and ETFs. TIF assets are dominated by broad-market portfolios, while ETFs offer a remarkable variety of less diversified strategies focused on narrow market sectors.

There are now some 1,700 US ETFs (based on 1,300 distinct indexes), offering something for everyone. Assets of ETFs holding various market sectors and subsectors, some offering triple leverage (watch out), and non-US stocks and emerging markets total \$1.13tn. Broad-based portfolios holding the stocks in the S&P 500 (or the entire stock market) total but \$510bn.

What is more, ETFs have also opened up new distribution channels for fund managers. While no-load funds have largely crowded out funds that charge sales loads, brokers are roaring back into the mutual fund business through ETFs. Investors, who have come to expect their index funds to be commission-free, beware.

Mark me as a member of the small group of cohorts who are dubious about the utility of ETFs for long-term investors. Yes, broad-market exchange traded funds are fine, as long as investors do not trade them.

I freely concede that the ETF is the greatest marketing innovation of the 21st century. But is the ETF a great innovation that serves investors? I strongly doubt it. In my experience — almost 64 years in the fund industry — I have learnt to beware of investment “products”, especially when they are “new” and even more when they are “hot”.

Avoiding hot new products is unlikely to impair the returns investors earn. Far more likely the reverse is true. Staying the course with less exciting, inexpensive, broad-market traditional index funds should enhance investor returns.

John “Jack” Bogle is founder and former chief executive of Vanguard

5.3 Appendix 2. Fund performance data

Nordea	2010	2011	2012	2013	2014	2015	Average	stdev	Sharpe R
Nordea Europe	14.88	-20.3	17.17	10.53	1.99	9.61	5.647	13.742	0.411
Nordea Equity Portfolio	15.5	-14.61	10.42	14.75	12.53	6.12	7.452	11.324	0.658
Nordea Savings 25	4.25	-4.6	9.42	4.6	6.45	-1.44	3.113	5.189	0.600
Nordea Savings 50	8.82	-5.56	9.79	9.87	10.42	2.85	6.032	6.331	0.953
Nordea Savings 75	11.96	-11.65	10.66	12.89	9.74	3.51	6.185	9.340	0.662
African Equity BP	21.05	-26.38	16.54	-0.26	2.1	16.63	4.947	17.589	0.281
Asian Focus Equity BP	22.87	-20.36	10.96	-4.18	16.16	-3.23	3.703	15.903	0.233
China	16.44	-19.54	12.83	0.95	15.77	2.93	4.897	13.646	0.359
Corporate Bond A	1.47	-0.67	12.35	0.03	5.82	-2.76	2.707	5.526	0.490
Eastern Europe	18.85	-23.57	22.8	-11.14	-22.4	-8.63	-4.015	20.171	-0.199
Emerging Consumer BP	16.05	-17.79	14.61	8.53	3.44	-1.39	3.908	12.509	0.312
Emerging Market Bond	8.58	4.74	14.17	-8.22	4.44	-2.41	3.550	7.929	0.448
Emerging Market Equity	23.69	-18.34	13.76	-9.46	8.73	-8.87	1.585	16.225	0.098
Euro Bond A	-0.58	-1.13	10.16	-0.7	10.98	-1.71	2.837	6.009	0.472
Euro Liquidity A	-2.29	-1.66	-1.97	-2.56	-2.58	-2.66	-2.287	0.398	-5.741
European Small&MidCap BP	22.24	-18.31	22.37	15.41	3.82	18.5	10.672	15.756	0.677
European Value BP	18.66	-11.75	19.21	11.96	2.47	9.75	8.383	11.643	0.720
Far East	22.3	-16.74	15.67	-4.72	15.84	-0.84	5.252	15.043	0.349
Finland	25.53	-31.61	13.05	26.39	2.13	9.31	7.467	21.328	0.350
Global Stable Equity BP	-0.45	3.05	4.97	22.82	11.85	0.59	7.138	8.832	0.808
Global Value BP	6.38	3.65	4.48	19.56	9.36	-2.77	6.777	7.436	0.911
India	28.94	-3.0821	11.67	-4.88	44.15	1.57	13.061	19.673	0.664
Japan	20.34	-12.28	5.16	20.84	2.69	16.01	8.793	12.846	0.685
Moderate Yield A	-1.92	-1.77	-1.14	-2.58	-2.51	-2.65	-2.095	0.594	-3.527
Multi-Asset BP	-9.35	-6.43	5.33	-4.42	0.63	3.53	-1.785	5.839	-0.306
Nordic	31.03	-22.84	20.85	14.24	-1.37	14.57	9.413	18.997	0.496
North America	15.58	2.53	4.13	23.75	27.96	6.62	13.428	10.714	1.253
North American Value BP	21.73	-3.36	-3.45	23.06	28.59	1.47	11.340	14.664	0.773
Pro Euro Bond	0.01	-0.89	10.29	-0.36	11.26	-1.13	3.197	5.892	0.543
Stable Return A	1	-0.6	6.68	11.84	7.12	-1.95	4.015	5.366	0.748
World	12.31	-7.13	8.74	12.67	15.09	5.6	7.880	8.072	0.976
Yield A	-1.79	-4.71	13.82	3.01	-0.51	-1.84	1.330	6.610	0.201

Fund name	risk free premium fixed						Average	stdev	Sharpe R
DanskeBank	Subscription and redemption fee deducted						Average	stdev	Sharpe R
Danske Invest 2020 Fund d	19.25	-19.65	12.05	9.65	6.65	2.25	5.033	13.359	0.377
Danske Invest 2030 Fund D	20.55	-20.85	12.35	11.15	8.95	5.75	6.317	14.196	0.445
Danske Invest 2040 Fund D	20.35	-20.85	11.85	10.65	8.55	4.95	5.917	14.073	0.420
Danske Invest Compass 25 Fund K	6.95	-9.45	9.85	2.65	5.55	-0.15	2.567	6.826	0.376
Danske Invest Compass 50 Fund k	11.75	-14.15	10.75	6.25	6.75	1.35	3.783	9.533	0.397
Danske Invest Compass 75 Fund k	16.75	-18.65	10.45	10.85	7.75	3.45	5.100	12.419	0.411
Danske Invest Compass Equity Fund D	20.65	-20.25	12.05	11.75	8.95	5.55	6.450	14.007	0.460
Danske Invest Compass Liquidity Fund D	2.55	-3.05	7.35	-1.75	2.15	-0.75	1.083	3.769	0.287
Danske Invest Money Market Fund D	-2.15	-1.65	-1.95	-2.65	-2.55	-2.65	-2.267	0.417	-5.439
Danske Invest Liquidity Fund D	-1.55	-1.95	1.95	-1.15	-1.35	-2.55	-1.100	1.574	-0.699
Danske Invest Bond Fund D	-6.15	0.45	9.15	-0.25	8.55	-2.75	1.500	6.148	0.244
Danske Invest Emerging Markets Debt Fund D	10.35	2.85	16.95	-9.25	2.55	-2.25	3.533	9.217	0.383
Danske Invest Euro Corporate Bond Fund D	2.65	-4.35	12.55	1.15	4.05	-4.25	1.967	6.261	0.314
Danske Invest Euro High Yield Fund D	8.45	-7.15	21.65	5.95	3.05	-3.25	4.783	10.092	0.474
Danske Invest Government Bond Fund D	-4.05	3.95	4.75	-3.55	5.25	-4.25	0.350	4.734	0.074
Danske Invest High Yield Fund D	9.95	0.15	10.05	3.55	-3.95	-10.15	1.600	7.949	0.201
Danske Invest Sustainability Bond Fund d	1.25	-0.95	7.85	-0.95	2.15	-3.95	0.900	4.009	0.225
Danske Invest European Balanced Fund d	5.25	-11.35	9.15	10.55	1.25	3.85	3.117	7.868	0.396
Danske Invest Golden Piggy Bank Fund g	16.95	-20.05	5.95	16.05	9.85	3.15	5.317	13.562	0.392
Danske Invest European Equity Fund D	7.35	-11.05	20.35	11.75	2.65	9.45	6.750	10.500	0.643
Danske Invest Finnish Equity Fund	23.55	-26.85	16.65	25.15	2.55	12.25	8.883	19.331	0.460
Danske Invest Japanese Equity Fund d	17.45	-18.45	2.45	14.95	6.35	16.35	6.517	13.618	0.479
Danske Invest North America Equity Fund D	16.65	1.55	7.15	21.85	22.35	4.45	12.333	9.109	1.354
Danske Invest Arvo Russia Value Fund D	38.95	-32.95	3.25	-6.25	-41.55	15.85	-3.783	30.147	-0.125
Danske Invest Baltic Equity Fund	44.75	-18.25	14.15	8.75	-5.85	0.15	7.283	21.579	0.338
Danske Invest Black Sea Fund	34.05	-36.65	58.65	-30.95	31.95	-28.05	4.833	41.395	0.117
Danske Invest China Fund	10.55	-28.15	17.55	-1.25	19.25	-3.95	2.333	17.702	0.132
Danske Invest Emerging Asia Fund	27.25	-19.45	11.25	-13.45	9.25	-8.95	0.983	17.822	0.055
Danske Invest Latin America Fund d	22.65	-22.25	7.25	-21.55	-8.25	-27.85	-8.333	19.759	-0.422

Fund name	risk free premium fixed						Average	stdev	Sharpe R
	Subscription and redemption fee deducted								
Aktia									
Aktia America	20.55	-4.85	5.75	20.25	24.15	-0.75	10.850	12.381	0.876
Aktia Asset Allocation	12.05	-10.85	9.65	3.35	8.45	-2.95	3.283	8.749	0.375
Aktia Bond Allocation	1.45	-0.85	9.25	-3.75	5.05	-4.05	1.183	5.214	0.227
Aktia Capital	24.25	-29.25	14.45	28.45	-0.65	9.95	7.867	20.928	0.376
Aktia Corporate Bond+	1.95	-0.95	12.15	0.95	5.95	-2.95	2.850	5.452	0.523
Aktia Emerging Market Bond+	9.35	2.45	11.75	-8.65	6.25	-8.45	2.117	8.831	0.240
Aktia Emerging Market Local Currency Bond+	17.05	-3.55	13.95	-14.65	5.45	-8.05	1.700	12.567	0.135
Aktia Eurooppa	10.85	-13.85	16.05	8.35	-0.45	7.75	4.783	10.582	0.452
Aktia Global	16.75	-9.65	7.65	12.05	12.25	-0.95	6.350	9.863	0.644
Aktia Inflation Bond+	0.55	3.15	7.15	-8.05	2.75	-4.05	0.250	5.472	0.046
Aktia Likvida+	-0.65	-1.05	0.25	-1.45	-1.55	-2.25	-1.117	0.857	-1.303
Aktia Nordic	36.25	-19.65	15.75	18.95	6.35	18.95	12.767	18.595	0.687
Aktia Solida	1.65	-1.85	4.65	0.25	3.75	-1.75	1.117	2.738	0.408

Fund name	risk free premium fixed						Average	stdev	Sharpe R
	Subscription and redemption fee deducted								
Evli									
Evli European High Yield	12.85	-6.45	18.55	6.55	1.85	-0.35	5.500	9.119	0.603
Evli European Investment Grade	2.35	-2.95	11.65	0.55	4.75	-4.35	2.000	5.792	0.345
Evli Euro Liquidity	-0.45	-0.85	-0.55	-1.65	-1.55	-2.05	-1.183	0.656	-1.803
Evli Short Corporate Bond	-0.55	-3.15	4.25	0.25	-0.45	-1.15	-0.133	2.440	-0.055
Evli Euro Government Bond	-0.35	-1.35	5.85	-1.35	6.95	-1.75	1.333	3.967	0.336
Evli Corporate Bond	3.05	-1.15	11.25	2.35	2.95	-3.55	2.483	5.040	0.493
Evli Europe	19.48	-11.04	25.67	20.49	6.51	16.37	12.913	13.341	0.968
Evli Japan	18.25	-13.55	8.95	16.15	3.15	21.05	9.000	12.842	0.701
Evli Global	12.75	-4.25	10.25	21.55	16.35	11.15	11.300	8.667	1.304
Evli Nordic	30.95	-21.25	13.95	17.65	10.85	26.85	13.167	18.515	0.711
Evli North America	18.85	2.95	2.35	21.85	22.85	1.15	11.667	10.524	1.109
Evli Finnish Small Cap	22.55	-25.85	9.55	36.15	-0.45	24.35	11.050	22.069	0.501
Evli Finland Select	22.85	-31.15	9.35	23.95	-3.35	12.65	5.717	20.633	0.277
Evli Russia	55.15	-39.35	10.75	-11.95	-49.25	15.85	-3.133	38.642	-0.081
Evli Global Multi Manager 40	3.95	-10.05	4.95	5.55	7.05	-4.35	1.183	6.814	0.174
Evli Global Multi Manager 75	8.95	-15.35	6.35	12.65	9.35	-0.05	3.650	10.233	0.357

Fund name	risk free premium fixed						Average	stdev	Sharpe R
	Subscription and redemption fee deducted								
OP									
OP-High Yield	6.45	-8.49	18.14	5.27	1.22	-1.4	3.532	8.935	0.395
OP-EMD Hard Currency Sovereign	7.89	3.79	13.13	-11	2.23	-4.33	1.952	8.613	0.227
OP-Obligaatio Tuotto	-3.16	-11.58	12.83	2.7	10.19	-2.01	1.495	9.060	0.165
OP-Yrityslaina	2.06	0.07	13.1	-0.08	5.94	-3.44	2.942	5.849	0.503
OP-Obligaatio Prima	-2.36	4.26	2.17	-4.79	4.73	-2.84	0.195	4.039	0.048
OP-Eurooppa Osake	7.42	-9.46	12.59	7.01	-0.4	7.1	4.043	7.806	0.518
OP-Rohkea	6.74	-14.85	9.63	8.71	10.08	3.63	3.990	9.527	0.419
OP-Varovainen	-0.33	-9.2	8.49	-0.15	4.54	-1.27	0.347	5.973	0.058
OP-Japani	13.59	-13.24	5.25	25.48	4.26	32.06	11.233	16.283	0.690
OP-Intia	30.33	-33.1	16.48	-13.95	43.06	5.47	8.048	28.203	0.285
OP-Kehittyvä Aasia	37.84	-8.72	13.77	-10.98	21.83	-8	7.623	20.050	0.380
OP-Kiina	20.21	-23.58	19.28	4.96	18.19	-1.73	6.222	17.102	0.364
OP-Latinalainen Amerikka	23.36	-25.89	-16.15	6.73	3.08	-19.09	-4.660	18.792	-0.248
OP-Venäjä	53.28	-39.97	6.57	-4.09	-35.96	17.79	-0.397	34.943	-0.011
OP-Kehittyvät Osakemarkkinat	22.65	-23.57	10.81	-4.36	10.47	-10.08	0.987	16.792	0.059
OP-Maailma	8.54	-4.63	11.45	15.14	12.48	3.22	7.700	7.281	1.058

Fund name	risk free premium fixed						Average	stdev	Sharpe R
	Subscription and redemption fee deducted								
S-Bank FIM									
FIM BRIC+ A	14.85	-29.95	9.85	-7.65	6.45	-9.25	-2.617	16.487	-0.159
FIM Euro	1.45	3.25	8.45	-1.15	9.85	-1.35	3.417	4.779	0.715
FIM Eurooppa	-1.65	-20.95	24.95	22.75	-1.15	3.45	4.567	17.145	0.266
FIM Kehittyvä Korko	14.05	2.75	12.15	-12.25	1.45	-3.45	2.450	9.804	0.250
FIM Likvidi	-1.75	-1.55	-1.85	-2.35	-2.35	-2.55	-2.067	0.402	-5.140
FIM Maailma A	9.75	-29.65	13.25	16.85	6.35	7.25	3.967	16.924	0.234
FIM Nordic	16.55	-32.95	22.25	30.45	4.95	6.05	7.883	22.227	0.355
FIM Russia	41.75	-37.05	-3.65	-17.05	-46.15	13.15	-8.167	32.626	-0.250
FIM Sahara A	23.35	-21.75	15.05	29.35	27.55	-8.45	10.850	21.120	0.514
FIM Tuotto	5.65	0.05	4.85	5.15	6.55	1.45	3.950	2.583	1.529
FIM USA	13.95	-13.65	8.65	21.75	23.15	11.35	10.867	13.304	0.817
FIM Varainhoito 30	7.75	-7.45	8.15	1.85	4.95	0.65	2.650	5.800	0.457
FIM Varainhoito 70	11.85	-18.65	11.95	9.65	9.45	5.75	5.000	11.803	0.424

Automated Investment Services	risk free premium fixed						Average		
Wealthfront	Subscription and redemption fee deducted						return	stdev	Sharpe R
Vanguard FTSE Developed Markets Index Fund ETF Shares	9.10	-14.30	10.70	16.92	-2.78	2.74	3.730	11.134	0.335
Schwab International Equity ETF™	10.08	-14.56	10.96	14.07	-2.47	0.50	3.097	10.775	0.287
Vanguard Total Stock Market Index Fund ETF Shares	18.46	-0.93	8.69	28.32	16.90	3.52	12.493	10.777	1.159
iShares Core S&P Total U.S. Stock Market ETF	17.22	-0.16	8.09	27.61	17.35	4.10	12.368	10.240	1.208
Schwab U.S. Broad Market ETF	18.12	-0.53	8.58	28.07	17.05	3.55	12.473	10.583	1.179
Vanguard FTSE Emerging Markets Index Fund ETF	20.57	-20.80	11.32	-9.33	3.50	-13.58	-1.387	15.850	-0.087
Vanguard Dividend Appreciation Index Fund ETF Shares	15.69	4.30	4.09	23.82	14.27	1.08	10.542	8.796	1.198
iShares Select Dividend ETF	18.84	9.99	2.98	23.81	19.35	0.95	12.653	9.436	1.341
Energy Select Sector SPDR® Fund	22.96	0.95	-2.07	21.25	-5.67	-19.58	2.973	16.410	0.181
iPath® Bloomberg Commodity Index Total Return(SM) ETN	17.24	-16.02	-9.06	-15.43	-16.20	-26.71	-11.030	14.966	-0.737
Vanguard Energy Index Fund ETF Shares	22.22	0.90	-3.81	20.84	-6.99	-21.43	1.955	16.903	0.116
iShares National Muni Bond ETF	0.59	11.17	-2.08	-7.89	13.50	6.22	3.585	8.192	0.438
SPDR® Nuveen Barclays Municipal Bond ETF	-0.04	12.06	-1.05	-8.32	13.94	6.73	3.887	8.541	0.455
PowerShares National AMT-Free Municipal Bond Portfolio	0.03	11.93	2.33	-11.51	19.82	7.31	4.985	10.746	0.464
Betterment 0.35% or 3\$ month (0.6 from 500)									
Vanguard Total Stock Market Index Fund ETF Shares	18.11	-1.28	8.34	27.97	16.55	3.17	12.143	10.777	1.127
Vanguard Value Index Fund ETF Shares	15.14	-1.14	7.13	27.62	17.21	1.75	11.285	10.764	1.048
Vanguard Mid-Cap Value Index Fund ETF Shares	22.59	-2.66	7.92	32.20	18.05	0.79	13.148	13.462	0.977
Vanguard Small-Cap Value Index Fund ETF Shares	26.03	-6.51	10.75	31.01	14.43	-2.25	12.243	14.906	0.821
Vanguard FTSE Developed Markets Index Fund ETF Shares	8.75	-14.65	10.35	16.57	-3.13	2.39	3.380	11.134	0.304
Vanguard FTSE Emerging Markets Index Fund ETF	20.22	-21.15	10.97	-9.68	3.15	-13.93	-1.737	15.850	-0.110
iShares Short Treasury Bond ETF	0.27	-2.19	-7.36	-4.86	3.22	2.79	-1.355	4.238	-0.320
iShares National Muni Bond ETF	0.24	10.82	-2.43	-8.24	13.15	5.87	3.235	8.192	0.395

5.4 Appendix 3. Fund cost data

Fund name	Subscription	redemption	Management	Ongoing	Holding
Nordea	Fee %	fee %	fee %	charges %	fee %
Nordea Europe	0.8	1	1.5	1.5	
Nordea Equity Portfolio	0.8	1	1.9	1.97	
Savings 25	0.8	1	1.2	1.23	
Savings 50	0.8	1	1.6	1.64	
Savings 75	0.8	1	1.8	1.86	
African Equity BP	0.8	1	1.95	2.4	
Asian Focus Equity BP	0.8	1	1.5	1.91	
China	0.8	1	1.85	1.86	
Corporate Bond A	0.4	0.5	0.6	0.6	
Eastern Europe	0.8	1	1.6	1.61	
Emerging Consumer BP	0.8	1	1.5	1.92	
Emerging Market Bond	0.4	0.5	1	1	
Emerging Market Equity	0.8	1	0.5	2	
Euro Bond A	0.4	0.4	0.6	0.6	
Euro Liquidity A	0	0	0.1	0.14	
European Small&MidCap BP	0.8	1	1.3	1.69	
European Value BP	0.8	1	1.5	1.95	
Far East	0.8	1	1.6	1.61	
Finland	0.8	1	1.4	1.51	
Global Stable Equity BP	0.8	1	1.5	1.91	
Global Value BP	0.8	1	1.5	1.97	
India	0.8	1	1.85	1.86	
Japan	0.8	1	1	1	
Moderate Yield A	0	0	0.15	0.18	
Multi-Asset BP	0.8	1	1.7	1.34	
Nordic	0.8	1	1.6	1.6	
North America	0.8	1	1	1	
North American Value BP	0.8	1	1.5	1.93	
Pro Euro Bond	0	0	0.3	0.3	
Stable Return A	0.8	1	1.75	1.77	
World	0.8	1	1	1	
Yield A	0	0	0.6	0.6	

Fund name	Subscription	redemption	Management	Ongoing	Holding
Aktia	Fee %	fee %	fee %	charges %	fee %
Aktia America	1	1	0	1.85	
Aktia Asset Allocation	1	1	0	1.68	
Aktia Bond Allocation	1	1	0	1.12	
Aktia Capital	1	1	0	1.83	
Aktia Corporate Bond+	0.5	0.5	0	0.65	
Aktia Emerging Market Bond+	0.5	0.5	0	0.9	
Aktia Emerging Market Local Currency Bond+	0.5	0.5	0	1.2	
Aktia Eurooppa	1	1	0	1.87	
Aktia Global	1	1	0	1.87	
Aktia Inflation Bond+	0.5	0.5	0	0.65	
Aktia Likvida+	0	0	0	0.5	
Aktia Nordic	1	1	0	1.86	
Aktia Solida	0.5	0.5	0	1.05	

Fund name	Subscription	redemption	Management	Ongoing	Holding
S-Bank FIM	Fee %	fee %	fee %	charges %	fee %
FIM BRIC+ A	1	2		1.91	
FIM Euro	0	0		0.5	
FIM Eurooppa	1	1		1.8	
FIM Kehittyvä Korko	0.5	0.5		0.9	
FIM Likvidi				0.18	
FIM Maailma A	1	1		1.8	
FIM Nordic	1	1		1.82	
FIM Russia	1	2		2.27	
FIM Sahara A	1	2		2.23	
FIM Tuotto	0.5	0.5		1.61	
FIM USA	1	1		1.5	
FIM Varainhoito 30	0	0		0.72	
FIM Varainhoito 70	0	0		1.07	

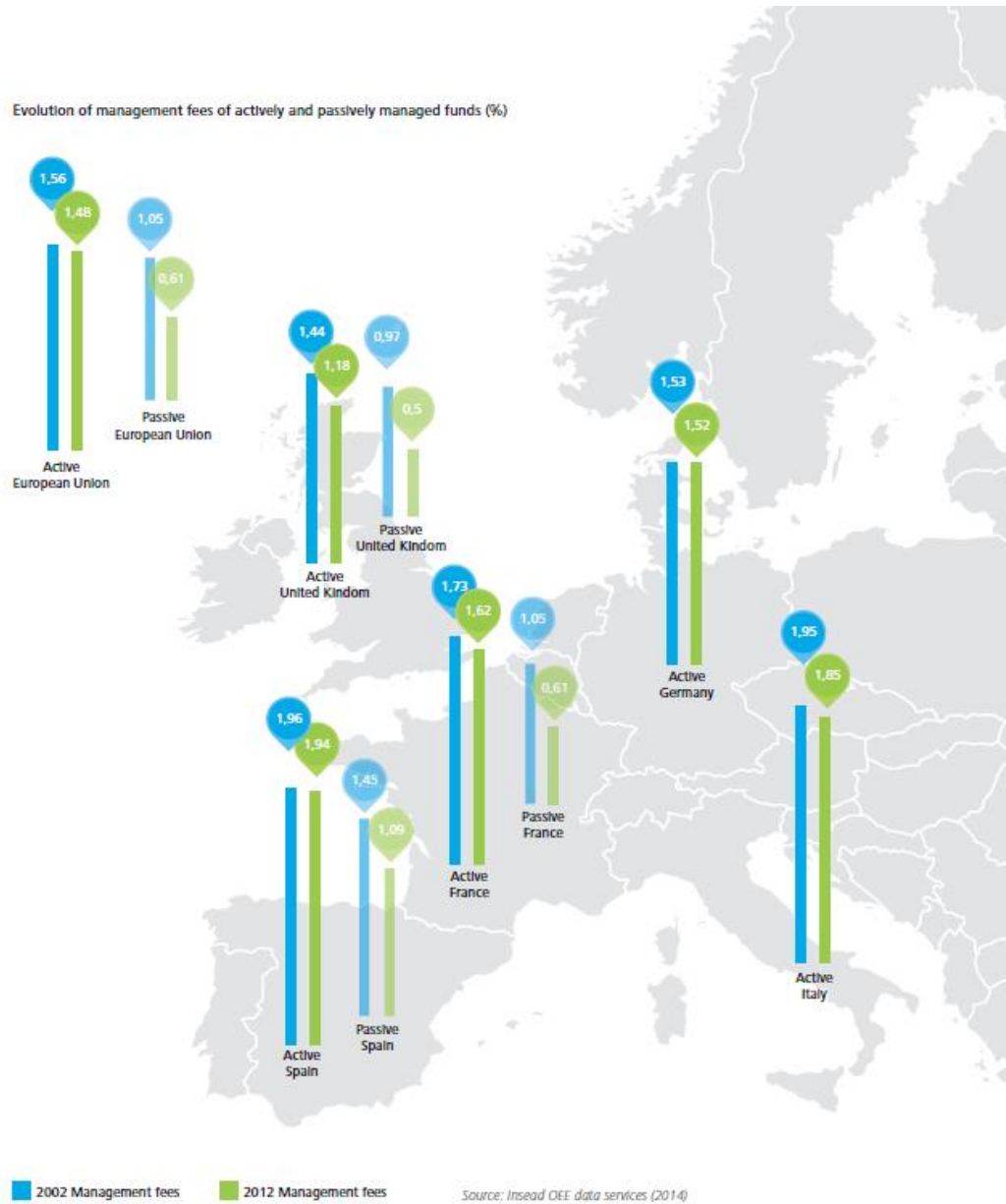
Fund name	Subscription	redemption	Management	Ongoing	Holding
DanskeBank	Fee %	fee %	fee %	charges %	fee %
Danske Invest 2020 Fund d	1	1	0.5	1.68	
Danske Invest 2030 Fund D	1	1	0.5	1.93	
Danske Invest 2040 Fund D	1	1	0.5	2.02	
Danske Invest Compass 25 Fund K	0.5	0.5	0.1	1	
Danske Invest Compass 50 Fund k	1	1	0.25	1.36	
Danske Invest Compass 75 Fund k	1	1	0.35	1.6	
Danske Invest Compass Equity Fund D	1	1	0.5	1.99	
Danske Invest Compass Liquidity Fund D	0	0.5	0.1	0.78	
Danske Invest Money Market Fund D	0	0	0.33	0.22	
Danske Invest Liquidity Fund D	0.5	0.5	0.6	0.6	
Danske Invest Bond Fund D	0.5	0.5	0.7	0.7	
Danske Invest Emerging Markets Debt Fund D	0.5	0.5	0.6	1.12	
Danske Invest Euro Corporate Bond Fund D	0.5	0.5	0.85	0.85	
Danske Invest Euro High Yield Fund D	1	1	0.95	0.95	
Danske Invest Government Bond Fund D	0.5	0.5	0.6	0.95	
Danske Invest High Yield Fund D	1	1	0.6	1.23	
Danske Invest Sustainability Bond Fund d	0.5	0.5	0.75	0.75	
Danske Invest European Balanced Fund d	1	1	1.7	1.7	
Danske Invest Golden Piggy Bank Fund g	0	1.5	0.5	1.76	
Danske Invest European Equity Fund D	1	1	1.35	1.35	
Danske Invest Finnish Equity Fund	1	1	1.9	1.9	
Danske Invest Japanese Equity Fund d	1	1	1.5	1.5	
Danske Invest North America Equity Fund D	1	1	1.5	1.5	
Danske Invest Arvo Russia Value Fund D	1	2	2.8	2.8	
Danske Invest Baltic Equity Fund	1	2	2.4	2.4	
Danske Invest Black Sea Fund	1	2	2.8	2.8	
Danske Invest China Fund	1	2	2.8	2.8	
Danske Invest Emerging Asia Fund	1	1	1.9	1.9	
Danske Invest Latin America Fund d	1	2	2.8	2.8	

Fund name	Subscription	redemption	Management	Ongoing	Holding
Evli	Fee %	fee %	fee %	charges %	fee %
Evli European High Yield		1		0.95	
Evli European Investment Grade		1		0.75	
Evli Euro Liquidity		0		0.3	
Evli Short Corporate Bond		0		0.55	
Evli Euro Government Bond		0		0.65	
Evli Corporate Bond		1		0.85	
Evli Europe		1		1.6	
Evli Japan		1		1.6	
Evli Global		1		1.6	
Evli Nordic		1		1.6	
Evli North America		1		1.6	
Evli Finnish Small Cap		1		1.6	
Evli Finland Select		1		1.8	
Evli Russia		2		2.75	
Evli Global Multi Manager 40		1		1.02	
Evli Global Multi Manager 75		1		1	

Fund name	Subscription	redemption	Management	Ongoing	Holding
OP	Fee %	fee %	fee %	charges %	fee %
OP-High Yield	0.5	0.5		0.8	
OP-EMD Hard Currency Sovereign	0.75	0.75		1.05	
OP-Obligaatio Tuotto	0	0.25		0.55	
OP-Yrityslaina	0.25	0.25		0.63	
OP-Obligaatio Prima	0	0.25		0.4	
OP-Eurooppa Osake	0.75	0.75		1.8	
OP-Rohkea	0	0.5		1.45	
OP-Varovainen	0	0.5		0.95	
OP-Japani	0.75	0.75		1.95	
OP-Intia	0.75	0.75		0.65	
OP-Kehittyvä Aasia	0.75	2		2.5	
OP-Kiina	0.75	0.75		2.5	
OP-Latinalainen Amerikka	0.75	0.75		2.2	
OP-Venäjä	0.75	0.75		2.5	
OP-Kehittyvät Osakemarkkinat	0.75	0.75		1.35	
OP-Maailma	0.75	0.75		1.6	

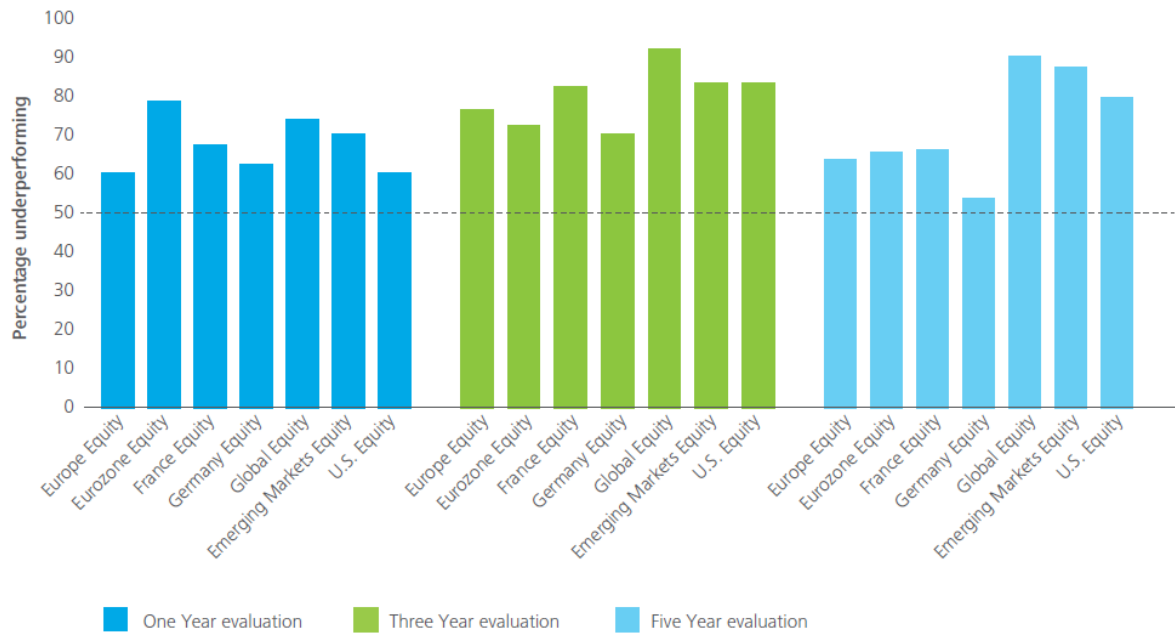
Automated Investment Services	Subscription	redemption	Management	Ongoing	Holding
Wealthfront	Fee %	fee %	fee %	charges %	fee %
Vanguard FTSE Developed Markets Index Fund ETF Shares			0		
Schwab International Equity ETF™					
Vanguard Total Stock Market Index Fund ETF Shares		Free up to USD 10,000			
iShares Core S&P Total U.S. Stock Market ETF		No transaction costs			
Schwab U.S. Broad Market ETF		After USD 10,000			
Vanguard FTSE Emerging Markets Index Fund ETF		0.25% yearly			
Vanguard Dividend Appreciation Index Fund ETF Shares					
iShares Select Dividend ETF					
Energy Select Sector SPDR® Fund					
iPath® Bloomberg Commodity Index Total Return(SM) ETN					
Vanguard Energy Index Fund ETF Shares					
iShares National Muni Bond ETF					
SPDR® Nuveen Barclays Municipal Bond ETF					
PowerShares National AMT-Free Municipal Bond Portfolio					
Betterment 0.35% or 3\$ month (0.6 from 500)			0.35		
Vanguard Total Stock Market Index Fund ETF Shares		0.35% yearly			
Vanguard Value Index Fund ETF Shares		After USD 10,000			
Vanguard Mid-Cap Value Index Fund ETF Shares		0.25% yearly			
Vanguard Small-Cap Value Index Fund ETF Shares		After USD 100,000			
Vanguard FTSE Developed Markets Index Fund ETF Shares		0.15% Yearly			
Vanguard FTSE Emerging Markets Index Fund ETF					
iShares Short Treasury Bond ETF					
iShares National Muni Bond ETF					

5.5 Appendix 4. Cost comparison of actively and passively managed funds



5.6 Appendix 5. performance comparison 2014

Percentage of actively managed US mutual funds underperforming their benchmark (2014)



5.7 Appendix 6. S&P500 market volatility 2011-2015

