Active Share in the Swedish Premium Pension System
A Study on Mutual Fund Activity and Performance

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Summary
We investigate the activity and performance of 64 Swedish registered mutual equity funds available in the Swedish Premium Pension System from October 2002 to December 2011. Fund activity is measured by applying the holdings based analysis Active Share combined with Tracking Error Volatility (TEV). Active Share is a relatively new measure that compares a fund’s holdings with its benchmark index constituents (Cremers & Petajisto, 2009; Petajisto, 2013). This is used as a proxy for the fund’s stock selection strategy. As a complement, TEV is used as a proxy for the factor timing strategy. Performance are measured by using Jensen’s (1968) model, Fama and French’s (1993) model and Carhart’s (1997) model.

We document that Swedish funds in the Premium Pension System are relatively passive in term of Active Share compared to US funds. We attribute this finding to the relative number of stocks held by a fund compared to the market. Swedish equity funds hold a relatively larger share of the number of stocks in the Swedish market while US funds hold a relatively smaller share of the stocks in the US market.

We run a panel regression analysis to test the relation between Active Share and various variables. We find that funds with higher TER fees and fewer stocks on average have higher Active Share. There are also indications that TEV is positively related to Active Share. However, the overall explanatory power of the variables is low. We attribute this as evidence that Active Share is an independent measure of fund activity.

Overall, we find neutral performance for an equally weighted portfolio of all funds in the PPS. To examine the performance differences between different levels of activity, we sort funds into five portfolios based on Active Share and TEV. The results show that, given a medium-to-low TEV, funds with high Active Share significantly outperform funds with low Active Share. Furthermore, it appears that the fee rebate in the Premium Pension System is important especially for the passive funds. Without the rebate, the passive funds underperform significantly.

We run a panel regression analysis on the future fund performance to test the predictive abilities of Active Share and TEV. The results indicate that Active Share does not explain future performance differences. Conversely, TEV is negatively related to future performance which can be explained by fund managers being overconfident (Jones & Wermers, 2011, p. 40).
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1 Introduction
For the past decade, the Swedish public pension system has been evolving and adjusting to the changing needs of society. Following the most recent reform in 1998, the new individual account called the Premium Pension System (PPS) was introduced (Sundén, 2006, p. 142). The PPS requires individuals to be more responsible for managing their retirement savings by granting them the option to invest part of their public pension savings in mutual funds (Sundén, 2006, pp. 142–143). In the PPS, individuals can choose a maximum of five funds from a total of approximately 800 (Pensionsmyndigheten, 2012, p. 43). For those who do not make an active choice, their pension savings will automatically be invested in a default fund. However, the process of choosing funds can be difficult and even professionals struggle with the task of selecting high performing funds. Therefore, an individual trying to select five funds for his or her portfolio in the PPS might ask oneself: Should I choose actively- or passively managed funds? Are active funds really active as they claim? Are higher fees charged by active funds covered by higher return?

For actively managed funds, two commonly employed investment strategies are factor timing and stock selection (Fama, 1972, p. 551). Factor timing strategy takes bets on specific sectors or macroeconomic factors meanwhile stock selection strategy invests in stocks that a manager believes will perform best (Cremers & Petajisto, 2009, p. 3329). Sometimes, fund managers might also employ these strategies in unison. However, when investing in active funds it is important for the investor in the PPS that fund manager activity leads to high performance. Therefore, the two main criteria when investing in active funds should intuitively be one, that the fund is really active and two, that the fund performs better compared to its benchmark index.

As mentioned above, the first criterion for investing in active funds is to choose a truly active fund. Traditionally, Tracking-Error Volatility (TEV) is used to define how active a fund is (Cremers & Petajisto, 2009, 3330). The basic idea is that, the higher value of TEV, the higher degree of fund activity. The measurement is usually considered as a proper proxy for funds using factor timing strategy. However, Cremers and Petajisto (2009, p. 3330) argue that TEV misrepresents the true picture of the funds using the stock selection strategy. They explain that it is possible that a highly active fund using the stock selection strategy will generate a low TEV. Therefore, Cremers and Petajisto (2009) have developed a new measure, Active Share, to capture the degree of activity for a fund. Active Share is considered as a better proxy for the stock selection strategy. Active Share measures the difference between fund holdings and benchmark index holdings. The more a fund deviates from the index, the more active it is considered to be.

The second criterion for investing in active funds is to choose the funds that outperform their benchmark indices. However, to generate excess returns is not an easy task. The fees for actively managed funds are often higher than index funds due to two reasons. One is that beating the index is a costly process that requires active fund managers to employ resource and analyzing techniques. Another reason is that fund managers also need to generate profit from managing the funds. Therefore, active funds need to be profitable enough to, first cover the cost and fees, and then generate excess return for investors compared to benchmark indices.
The fact is that, historically, it has proved to be difficult for active fund managers to persistently generate higher returns than the market (Jones & Wermers, 2011, p. 30). Furthermore, the traditionally most accepted theory of finance states that no investor should be able to beat the market (Fama, 1970). However, to claim that all active funds are bad investment choices may be overgeneralized. Indeed, active fund management when using strategies like factor timing or stock selection can lead to higher performances (Cremers & Petajisto, 2009, p. 3362; Petajisto, 2013, p. 25). Cremers and Petajisto's (2009) study on US mutual funds shows that funds with high Active Share on average generate higher excess returns than funds with low Active Share.

Dahlquist, Martinez, and Söderlind (2012) examine the individual investor’s activity and performance in PPS and find that investors who actively manage their pension investment outperform passive investors. Unfortunately, choosing the best five funds from a total of 800 available in the PPS is a difficult task and choosing the best five ones might be even more difficult. Furthermore, the vast amount of funds in the PPS might lead to individual information overload. The information overload can cause the investor to become overwhelmed and as a result passively end up in the default fund (Tapia & Yermo, 2007, p. 25). To help the pension investors to conquer these obstacles, this study seeks to evaluate whether the active Swedish equity funds available in the PPS are really active, and whether they generate higher returns than their benchmark indices. To measure the degree of activity for the Swedish equity funds, we combine Active Share and TEV. As performance evaluation, we use Jensen’s (1968) model, Fama and French’s (1993) model and Carhart’s (1997) model.

1.1 Theoretical point of departure
The Efficient Market Hypothesis (EMH) first surveyed by Fama (1970) is one of the most fundamental theories in finance. According to the definition of the EMH, no investor should be able to outperform a relatively efficient market. If someone does happen to outperform the market, it should merely be a matter of luck (Fama, 1970, pp. 384-385). If the EMH is true no one should engage in active security selection and investors should not pay fund managers to actively manage their portfolios. However, tests of the EMH reveal that it does not seem to explain all aspects of market behavior. Scientists have found a vast amount of anomalies that the EMH cannot fully explain (see for example Shiller, 2003). These findings explain why fund managers try to actively select an optimal portfolio of securities in order to beat the market.

In practice, equity fund managers can actively pursue different strategies in order to beat the market. Two main strategies that academics have identified are stock selection and factor timing. The first discussion and analysis regarding these two strategies emerged during the 1970's. Fama (1972, p. 566) suggests that a portfolio can be evaluated by examining the individual assets in the portfolio, that is, by the portfolio’s security selection strategy. He defines security selection as comparing returns between two portfolios containing different assets, but having the same level of risk (Similar to Cremers and Petajisto (2009) and Petajisto (2013), we define security selection as stock selection because there are only equity funds in our sample). Furthermore, Brinson, Hood and Beebower (1986, pp. 39-41) propose that a portfolio can be evaluated not only by the stock selection strategy but also a factor timing dimension. This new dimension is the process of altering the portfolio structure, depending on short term fluctuations in asset class prices.
In order to examine the degree to which funds are actively managed, the conventional method is to use tracking error volatility (TEV). TEV measures the standard deviation of the difference between the returns of a fund and its benchmark index (Cremers & Petajisto, 2009, p. 3334). In theory, a passively managed fund that follows an index in lockstep would produce a zero TEV (Sorensen, Miller, & Samak, 1998, p. 26). On the other hand, an actively managed fund aiming to beat the market should deviate from the index as much as possible. When fund managers' incentives are related to the performance of their portfolios, it is possible that the managers will take excessive risks (Jorion, 2003, p. 70).

The common practice for investors to make sure that the return is in line with the risk exposure is to limit the TEV (Jorion, 2003, p. 70). However, the limited TEV would imply fewer chances to produce superb returns. Moreover, Cremers and Petajisto (2009, pp. 3330-3334) state that TEV alone is insufficient for measuring fund strategies. For example, a fund following the stock selection strategy could produce a rather low TEV even if the fund is highly active.

Because TEV may not be suitable for evaluating funds using the stock selection strategy, Cremers and Petajisto (2009) introduce Active Share as a new measure. The intuitive idea behind Active Share is that it measures the difference of fund holdings compared to its benchmark’s holdings at the same point in time. Cremers and Petajisto (2009, p. 3330) state that the ultimate fund strategy to beat the benchmark index is to differ the fund portfolio from the benchmark index as much as possible. If a fund is truly active, its holdings should diverge largely from its benchmark index holdings. In this regard, Active Share is a better method than TEV as a measure of fund activity. Moreover, the two measures can be used together to obtain a comprehensive picture of the fund strategy.

There are several ways to investigate whether active management can contribute to the performance of a portfolio. Building on the work of Markowitz (1952), Sharpe (1964) initiated the development of the Capital Assets Pricing Model (CAPM). Jensen (1968) later modified the CAPM in order to evaluate the performance of a portfolio. Following the findings of the size and book to market anomalies, Fama and French (1993) extended Jensen’s one-factor model with two additional factors: company size and book-to-market ratio. They argued that their three-factor model better explained the stock return than Jensen’s one-factor model. After the finding of the momentum anomaly (Jegadeesh & Titman, 1993), Carhart (1997) added a momentum factor to Fama and French's model. He argued that this momentum factor could control for the fact that fund managers hold previous year's winning stocks by chance.

Empirically, Dahlquist, Engström and Söderlind’s (2000) study is one of the few studies that have investigated fund performance in Sweden. They find that active funds perform better than passive funds. However, Dahlquist et al. (2000) have not investigated fund activity on a holding basis. To our knowledge, there is only one student thesis by Holmgren and Sterndahlen (2012) that measures activity of Swedish equity funds using Active Share. They evaluate 37 Swedish mutual funds during 2001 and 2012. They calculate Active Share annually using SIX Portfolio Return Index (SIXPRX) as benchmark. As performance measurement, they apply the Sharpe ratio in combination with the Information ratio. In contrast to Cremers and Petajisto (2009), they find that Active Share is not related to fund performance but TEV is.
This study relates to existing literature in several ways. First, we calculate Active Share on a quarterly basis of 64 funds that has been available in the PPS from 2002 to 2011. In comparison with Holmgren and Sterndahlen (2009), we include 29 more funds in our sample. Second, we do not use SIXPRX as the only benchmark, but also include Carnegie Small Cap Return Index Sweden (CSRXSE) and Carnegie Small Cap Index Sweden (CSXSE). By including two extra small cap indices we improve the accuracy when measuring Active Share for the small-cap funds. This is because SIXPRX represents the average performance on the Stockholm OMX while CSRXSE and CSXSE set focus on small- and mid-cap stocks. Lastly, we extend previous performance measurement to include Jensen’s (1968) model, Fama and French’s (1993) three-factor model and Carhart’s (1997) four-factor model.

1.2 Purpose
The purpose of this study is to examine the relationship between activity and performance for Swedish equity funds available in the Swedish PPS. Because the concept of Active Share is relatively new, one sub-purpose is to investigate Active Share in relation to various fund characteristics.

1.3 Research questions
Our research questions are:

How active are Swedish equity funds in the PPS?

Can actively managed funds generate excess returns?

Are Active Share and TEV related to fund performance?

1.4 Theoretical and practical contribution
Studies on active portfolio management and performance have mostly emphasized the use of TEV as a measure of fund activity. However, TEV alone may not correctly reflect the whole picture of whether the fund is actively managed. Active Share can better demonstrate the degree of fund activity. Active Share has only been studied in a limited range and studies relating to the Swedish market are scarcer. As stated previously, the only study to our knowledge in the Swedish market is from Holmgren and Sterndahlen (2009). Therefore, the result of our study can provide new out of sample evidence of the relationship between Active Share and fund performance to Cremers and Petajisto’s (2009) and Petajisto’s (2013) studies. Furthermore, by examining fund performance, this study also provides evidence for or against the EMH.

Practically, the results provide a fair view on activity and performance of the Swedish equity funds, which can be used as a basis when individual investors form their investment decisions in the PPS. Moreover, the Swedish Pensions Agency can benefit from the study when making regulatory adjustments in the PPS. Furthermore, our study can assist fund managers to form their portfolio strategies. Lastly, fund advisors can provide recommendations to their clients based on the results of this study.

1.5 Limitations
First, we have limited our fund sample to only include Swedish registered active funds that are investing in the Swedish equity market. Second, the study solely investigates the Swedish equity funds in the PPS. Third, due to data availability, the measuring period stretches from September 2002 to December 2011. Ideally, we would like to investigate the whole period for which the PPS have existed. However, we believe the length
of the period is long enough to estimate the historical fund activity and performance in the PPS.
2 Methodology

2.1 Preconception

“After all, when a mountaineer falls to his or her death, we do not put gravity on trial for murder.”

Frankfurter and McGoun (1999, p. 173)

Arbnor and Bjerke (1977, pp. 26–27) argue that a researcher’s preconception cannot avoid being affected by her personal background. Different people can perceive the world in various ways. Similarly, Frankfurter and McGoun (1999, p. 160) point out that the ontology and the epistemology in financial economics are not unbiased. They mean that what we believe, the preconception, will greatly affect the method applied during the journey of finding the “truth” and consequently the destination of the journey will also be affected. Therefore, it is important that we as authors state our preconception about academic knowledge, philosophy and common sense because all will affect our choice of scientific approach, epistemology and ontology.

We are two students enrolled in Business Administration and Economics Program at Umeå School of Business and Economics, specialized in Finance on the master’s level. During the previous years of study, we have taken courses such as Business Administration, Statistics, Basic Course in Law, Economics and Financial Management on master level. Therefore, our knowledge concerning business, the finance world and economics will to some extent affect our decision on the research. Our interests in finance and capital market have led to the choice of the topic about active management for Swedish equity funds. As mentioned by Frankfurter and McGoun (1999, p. 174), finance academics are traditionally categorized in business school. Consequently, compared to economists, the finance academics like us are often considered technical and tend to be more positivistic. Therefore, our academic background and prior knowledge can to some extent affect the choice of research topic, methods and how we interpret the results.

We are clearly aware of that the preconception could affect the way of our study. Since all the methodologies applied and the theories used have been commonly tested and approved by many previous academics, we do not think that our previous knowledge and background will affect the reliability and validity of the study.

2.2 Epistemological and ontological basis

The choice of epistemological basis is an important issue for social researchers since it directly relates to the ability to generate accepted knowledge (Van Gigch, 2002a, p. 203). A concept that is closely related to epistemology is ontology which concerns how reality is constituted (Burrell & Morgan, 1985, p. 1). Based on the definitions of epistemology and ontology, our interpretation of the concepts is that: they jointly explain how reality should be studied in order to generate accepted knowledge.

Historically positivism has been the mainstream epistemological philosophy in natural- as well as social sciences such as economics (Caldwell, 1980, p. 53) and finance (Frankfurter & McGoun, 1999, p. 1). Maybe the most important assumption by positivism is that the knowledge generated is based on “secure foundations”, in the forms of experience and rational thinking (Phillips & Burbules, 2000, pp. 1–11). That is, a positivist objectively collects data and draws conclusions based on objective analysis of the existing relationships within the data. Thus, positivists apply an objective ontological ap-
approach when studying reality (Burrel & Morgan, 1985, p. 3). However, research in scientific methodology have come to the conclusion that positivism have flaws, and there is an ongoing debate between the positivistic and interpretivistic advocates regarding the best methodology of conducting social research. The main issue in this debate is whether social science researchers should adopt the same philosophical and epistemological assumptions as positivism (Johnson & Onwuegbuzie, 2004, p. 14; Van Gigch, 2002b, p. 554). Interpretivists and constructivists argue that the same methodological and philosophical assumptions as physics should not be applied in social sciences. On the contrary, the positivistic advocates argue that the same assumptions as physics indeed can be applied.

Researchers in the field of ontology also disagree on what the best approach is to study the social reality and what role researchers should adopt in the research process. Objectivists argue that researchers should be objective, taking an external view of reality and observing the reality without interfering with the studied objects (Burrel & Morgan, 1985, p. 4). In contrast, the subjective advocates argue that social researchers and their studied subjects are an integrated part of the social reality. As a result, researchers can only generate accepted knowledge by studying the subjective interpretations of individuals. Because objectivity fits well in the epistemological foundation of positivism, the objective dimension is commonly used as the ontological basis in research based on a positivistic like epistemology (Van Gigch, 2002b, p. 554).

When assessing how our study best can generate accepted knowledge we start by analyzing the ontological and epistemological choice in relation to the research questions and purpose of this study. First, we state that it is not suitable to conduct interviews or send surveys to all the active fund managers and ask them if they regard themselves as active. These two methods could give managers incentives to answer that they indeed are active even if they in reality are passive. Even if these data collection methods could be interesting to use from a psychological approach, the methods are not suitable for answering our research questions. Instead, we require quantitative data that can objectively reflect fund management activity because these data are hard to manipulate by the fund managers. Moreover, because we need to analyze quantitative data, it would not be trustworthy for us to study the data and subjectively make an interpretation of the relationships we find. Our own interpretation of the relationships in the data would likely bias the results of the study. Therefore, the best ontological and epistemological point of departure for this study seems to be as objective as possible and analyze quantitative data using academically accepted models.

Based on the argumentation in the prior paragraph, we indeed seem to epistemologically lean towards the positivist paradigm. However, we do not agree with all aspects of the positivistic paradigm. It is maybe more important to position our epistemological and ontological basis on what this study aims to achieve rather than to make an absolute decision. In order to position our study’s methodological basis we use Burrel and Morgan’s (1985, p. 27) four sociological paradigms. These paradigms are shown in Figure 1.
According to Burrel and Morgan (1985, pp. 16-19) the sociology of radical change in Figure 1 stands for a utopian view of society. It reflects a scientific view of society that is concerned with finding explanations for what is possible, how society can be changed and not to maintain status quo. In contrast, the sociology of regulation stands for a scientific view that is concerned with finding explanations for the current order in society. The subjective paradigms of social research are presented to the left in Figure 1. We have already concluded that these are not suitable for our study. Therefore, we will focus on the two objective paradigms to the right. Burrel and Morgan (1985, pp. 25-35) describe the radical structuralist in the top right paradigm as taking an external view of society, trying to find explanations for relationships that are contradicting normality. On the other hand, the functionalist is described as mainly focused on providing explanations for the current social order, that is, how society currently are structured. Because our main focus is to understand the existing regularities of fund manager behavior and objectively give solutions to the practical problem of deciding which fund to invest in, the functionalist paradigm is a good overall description on the underlying epistemological and ontological basis for this thesis.

To conclude, the choice of the epistemological basis for any academic paper should depend on the nature of the research questions and the type of problem to be solved. Because these questions and problems may differ extensively, as well as the author’s preconceptions, there is no absolute correct choice of epistemological and ontological basis. However, we can conclude that the best epistemological basis for this study is to lean towards positivism and ontologically try to be as objective as possible.

2.3 Research approach
Based on the discussion covering our epistemological and ontological basis, this study follows a deductive research approach. Bryman and Bell (2011, p. 24) state that, with a deductive approach, researcher deduces a hypothesis on the basis of existing knowledge or theories. The theoretical frame of this study derives from the previous researches on Active Share and the purpose is to test the theory regarding relationship between Active
Share and fund performance in the Swedish PPS. Hence, the study follows the basic philosophy of what deductive research is about. Furthermore, as previously discussed, the characteristics of this study make it preferable to implement a deductive study. Saunders, Lewis and Thornhill (2012, p. 125) point out that there must exist a search to explain causal relationships between two or several variables in the deductive research. The search in this study is to explore the relationship between three variables: Active Share, TEV and fund performance in the Swedish market. Saunders et al. (2012, p. 125) means that researchers have to fulfill the requirement of being totally independent of the observed data when implementing a deductive research approach. In the attempt of demonstrating the underlying connection between Active Share and fund performance, quantitative data such as holdings and prices of funds and indices are collected in this study. All the data are originally from companies and authorities in the Swedish finance industry, which assures that the data is objective and cannot be interpreted in other ways. Overall, based on the purpose of the study and the data type, the proper approach in this case would be deductive research.

2.4 Literature search
We started our literature search by searching for studies on pension funds and pension system in the “EBSCO” database in order to obtain a general idea about the studies in the field. It followed by an investigation on the Swedish Pension System by using the Google search engine with the purpose to find out how the system functions. Most of the information about the Swedish PPS was gathered from the homepage of the Swedish Pensions Agency, government documentations and a series of academic articles done by previous researchers. For the studies of Active Share, we used “EBSCO” database, Social Science Research Network (SSRN) and Google Scholar to find the latest research on the subject. Examples of keywords used when searching for information are “Swedish pension funds”, “fund performance”, “active share”, “tracking-error” and “four-factor alpha”. References from the studies of Cremers and Petajisto were further investigated. Academic textbooks are as well used for explaining conceptual terms and calculations like Efficient Market Hypothesis, Capital Assets Pricing Model and TEV.

2.5 Source criticism
We have critically reviewed the articles that were used in this study. All the academic articles are primarily from EBSCO, SSRN and Google Scholar, which are considered having solid reputation and credibility. We aim to use the primary source instead of secondary source to assure the accuracy of the concepts and theories. In order to increase the credibility of the study, we use the database Ulrichsweb to double check whether the journals that articles are published on are peer reviewed. Of all the articles, there are two student theses which are not peer reviewed. They are by Holmgren and Sterndahlen (2012) and Johansson and Määttä (2012). The books we refer to in the study are from Umeå University’s library and most of them are currently used as literatures in different courses given in the university. Therefore, we consider the content from these sources solid and trustworthy.

Ejvegård (2009, p. 77ff) points out that the utilized source supposes to be authentic, independent, current and also simultaneous. The databases where we search for articles are well-known and used widely by academics, therefore the articles from those databases are considered authentic and independent. We are aware of the large time span of the articles we use. The oldest article is Markowitz’s Portfolio Selection published in 1952. All the articles that considered “old” are classic models and theories from big names in the area. Numerous researchers have referred to and are still referring to their
models/theories. Therefore, we consider these articles current. By simultaneous, Ejvegård (2009, p. 73) means that the time when research conducted should be as close as possible to the events that are studied. We are aware that the articles containing historical data back to many decades ago can decrease their simultaneity. Unlike a certain historical event, the data in these studies are mostly quantifiable data like stock prices and risk of being changed or modified in the later point of time is very low.

2.6 Reliability and validity
In social science research, measurement is usually described as “the process linking abstract concepts to empirical indicants” (Carmines & Zeller, 1979, p. 10). In order to determine to what extent measurement represents an empirical indicant, two important properties of empirical measurements need to be discussed, namely reliability and validity. This study covers a great range of measurements, such as fund prices, TEV, Active Share and performance models. Therefore, reliability and validity of the study will be discussed below.

Reliability
Reliability refers to the consistency or stability of measurement and the part of a measure that is free of random error (Bollen, 1989, pp. 206–207). The research method needs to be of great transparency and other observers in other occasions should be able to obtain the same data when replicating the original study (Saunders et al., 2012, p. 156). The methods used in this study to collect data are in great detail described step by step and therefore is replicable. The observed data are prices and holdings of funds and indices from different financial institutions, on which we do not have any influence. Hence, the content of data should be identical when being collected by others in another point of time. Bollen (1989, p. 207) mentions that a high reliability does not necessarily guarantee a valid research. For example, in order to increase the reliability, a person measures his/her height a thousand times with the same ruler and then calculates the average of the measurements. However, the ruler is not accurate and always displays 10 cm longer for every one meter the ruler measures. In this case, the reliability of the whole activity is high but the validity is totally a disaster. Therefore, the validity of this study is discussed next.

Validity
Carmines and Zeller (1979, p. 12) describe validity as an indicator of whether an abstract concept is measured properly by the methods implied in the research. Mainly four types of validity were identified when evaluating the validity of a study: measurement validity, internal validity, external validity and ecological validity (Bryman & Bell, 2011, p. 42). Because ecological validity fits better with studies using interviews or surveys (Cicourel, 1982, p. 11) and this study bases on the objective data, we omit the discussion about this term.

Measurement validity concerns the question of whether a measurement of a concept really reflects the concept (Bryman & Bell, 2011, p. 42). The main concepts that are reflected in this study are: fund activity and performance. We use Active Share and TEV to measure the fund activity and Jensen’s model, Fama and French’s model and Carhart’s model to measure the fund performance. Active Share is a new concept to measure fund activity and proved to be effective by Cremers and Petajisto (2009) and Petajisto (2013). Therefore, Active Share is considered to correctly reflect the fund activity. Both TEV and the three performance models have been extensively tested and
proved in the history. We thereby believe they precisely represent the underlying concepts, respectively.

*Internal validity* can be defined as whether a conclusion is able to explain the causal relationship between independent variables and dependent variables (Bryman & Bell, 2011, p. 42). The causal relationship in this study is to find out whether the two independent variables, Active Share and TEV, have any impact on the dependent variable, alpha. In general, we apply two methods in order to grasp the true relationship between the two variables and the alpha. The first one is to include historical dead funds into account, by which survivor bias can be eliminated. Secondly, we need to eliminate the effects that derive from other factors. The other factors considered in this study are size, book-to-market, momentum and market. In order to remove the effects from those factors, three models by Jensen (1968), Fama and French (1993) and Carhart (1997) are used. These two methods guarantee that the models implied in this study can reflect a more comprehensive picture of the real world and thereby the internal validity can be improved.

*External validity* refers to whether the results of a study can be generalized to the whole population (Bryman & Bell, 2011, p. 43). In another word, external validity indicates if the study includes proper samples that can represent the whole population. The purpose of the study is to investigate the fund performance in relationship to Active Share and TEV for the active Swedish equity funds in the Swedish PPS. Therefore, the whole population should be all the active Swedish equity funds in the PPS. We have even included the funds that no longer exist. That means, our sample represents the whole population of the Swedish equity funds in the PPS and therefore has no problem in term of external validity.
3 Theory
The chapter outline is as follow. First, the theory of fund manager activity is introduced. Second, the classic theories covering efficient markets and efficient portfolios are presented. Third, the performance models are presented. Lastly, empirical findings on fund manager activity and performance from a holdings based perspective are presented.

3.1 Fund manager activity
A portfolio’s alpha is a tantamount standard when evaluating fund manager’s performance and is computed as the difference between portfolio return and market return (Jensen, 1968). In order to obtain a more comprehensive understanding of a fund manager’s performance, Fama (1972, pp. 551-566) develops a finer partition for the alpha. He decomposes the portfolio’s alpha into two parts, one part that is generated by stock selection ability and another that is derived from market risk (“factor timing”).

The return from stock selection is the contribution to alpha from the stock selecting ability of the fund manager (Fama, 1972, p. 557). This part of return can be divided into the return from portfolio diversification and the return from the pure stock selection ability of the fund manager (Fama, 1972, p. 558). The return from market risk basically represents the factor timing ability of the fund manager. The return from market risk can be divided into three parts, one part from manager’s timing ability, another part from expected deviation from the market and the last part from market risk (Fama, 1972, p. 561). The finer breakdown of portfolio return is an attempt to combine the concepts from portfolio selection theories and market capital equilibrium (Fama, 1972, p. 566). The process of breaking down the alpha into finer parts helps investors to evaluate the performance of fund managers and to clarify the real source of the alpha on the portfolio.

Between stock selection and factor timing, fund managers often prefer one of them (Cremers & Petajisto, 2009, p. 3329). Some fund managers focus on picking the stocks that hopefully will outperform the market and others spend more time on predicting various macroeconomic factors. There are currently two main measures when evaluating fund manager activity: TEV (Roll, 1992) and Active Share (Cremers & Petajisto, 2009). Introduced by Cremers and Petajisto in 2009, Active Share measures the stock selection strategy of a fund. The intuitive idea is to demonstrate how different the fund holdings are compared with the index holdings. If a fund’s portfolio is an exact replica of its benchmark index, the fund’s Active Share will be zero. Conversely, a fund with an Active Share of 100% will have a portfolio structure that is completely different from its benchmark index. Therefore, funds with high Active Share can be seen as more active in their stock selection strategy. As exemplified by Cremers and Petajisto (2009, p. 3335), imagine fund A with a total portfolio market value of SEK 100 million. Out of the total portfolio value, SEK 50 million exactly overlaps with its benchmark index. Fund A therefore has an Active Share of 50%. Now imagine fund B, also with a portfolio value of SEK 100 million. In B’s portfolio, SEK 10 million of its assets exactly overlaps with its index. Thus B will have an Active Share of 90%. Therefore, B can be seen as more active in its stock selection strategy and more likely to actually beat its benchmark index.

Roll (1992, p. 13) describes Tracking Error Volatility (TEV) as the volatility of the difference between a portfolio’s return and its benchmark’s return. The common practice in the investment world is to keep a higher return than the benchmark and at the same time, to have a minimum TEV in order to avoid accidental losses (Roll, 1992, p. 14). By
fulfilling those two criteria, the portfolio will be able to generate a constantly higher return than the benchmark. Hence, at a given level of risk and return, the constant return will result in a zero TEV (Roll, 1992, p. 13).

Investors often set up a constraint on TEV for fund managers. However, when fund managers are trying to fulfill the low TEV requirement, they will ignore the overall portfolio risk and the excess return will also be limited (Jorion, 2003, p. 70). Cremers and Petajisto (2009, p. 3331) state that stock selection and factor timing could generate very different TEVs despite the fact that both strategies have potential to produce a high alpha. For instance, a fund manager can employ a stock selection strategy by creating a well-diversified portfolio of stocks from different industries. In this case, it is quite possible that the TEV of this highly active portfolio will be low due to the well diversified stock picking strategy. Therefore, it is not always correct to use TEV as a standard measure for active management, especially for the stock selection strategy.

Cremers and Petajisto (2009, p. 3330) state two reasons for why Active Share is a proper method to measure active management. Firstly, the ultimate way to beat the benchmark is to deviate from it. Secondly, Cremers and Petajisto (2009, p. 3336) claim that Active Share and TEV can better represent one of the two strategies. TEV puts more weight on Factor Bets which is a more suitable proxy for the factor timing strategy. On the other hand, Active Share puts equal weight on all bets, which is a more reasonable proxy when evaluating funds using the stock selection strategy. Therefore, a combination of Active Share and TEV is necessary in order to capture the true picture of active management (Cremers & Petajisto, p. 3337). Based on using Active Share and TEV as proxies for different management strategies, Cremers and Petajisto (2009, p. 3331) create a two dimensional illustration that represents five types of active and passive management.

![Figure 2. Portfolio classification](image_url)

Figure 2 show that funds having a high Active Share and a high TEV in comparison to their peers are classified as Concentrated Stock Pickers. These funds are active both in the stock selection strategy and in the factor timing strategy. Funds having a high Active Share and a low TEV are classified as Diversified Stock Pickers. These funds are active mainly in the stock selection strategy. Hence, the Diversified Stock Pickers diversify their portfolio more compared to the Concentrated Stock Pickers and therefore are more likely to generate a lower TEV. Factor Bets are the funds with portfolios concentrated to specific sectors, thus being active in the factor timing strategy. Finally, Closet Indexers are not actively applying either the stock selection or the factor timing strategy.

The theory presented so far state that fund manager activity should lead to higher performance. However, high activity might also be a bad thing. The behavioral finance literature mean that investors can exhibit overconfidence which leads to performance penalties due to excessive trading (Odean, 1998; Odean, 1999; Barber & Odean, 2000; Barber & Odean, 2001). Jones and Wermers (2011, p. 40) argue that fund managers generating abnormal returns and at the same time showing a high active share and a high TEV might have done so because they are overconfident and have taken excessive risk. They base their argument on Cremers and Petajisto’s (p. 3332) findings showing that TEV alone is not related to fund performance. They therefore recommend investors to look for funds showing a high active share and a low TEV in order to minimize the risk of fund manager overconfidence. Similar to Jones and Wermers (2011), we also state that the problem of overconfidence should be considered when evaluating fund activity and performance.

One could argue that the problem of window dressing could be a problem when measuring Active Share. Window dressing can result in fund managers trying to adjust their reported holdings just before the disclosure date, in order to hide information about their investment strategies (Kacpercyk et al., 2008, p. 2381). However, Cremers and Petajisto (2009, p. 3341) argue that it is unlikely that window dressing will significantly distort the Active Share measure. Because the holdings reports are on a quarterly basis, a fund needs to engage in rigorous trading in order to increase the active share. This unnecessary trading would incur large trading costs that would in turn harm the fund performance. Thus, the Active share measure is rather robust against the window dressing risk.

3.2 Efficient portfolios and efficient markets

The seminal article PORTFOLIO SELECTION* published in 1952 by Harry Markowitz introduces the foundation for modern portfolio theory. Markowitz argues for the hypothesis that investors are risk averse wealth maximizers, that is, investors should strive to maximize the return given a specific level of risk. Therefore, a portfolio is only efficient when it produces the highest return possible, given a specific level of risk.

Unfortunately, the assumption of investors being completely rational is likely to be false. Or as Markowitz (1959, p. 207) says:

“The theory of rational behavior is not a substitute for human judgment. There is no integrated theory by which we could dispense with human beings if we had a sufficiently large and fast computer. The study of rational behavior has produced only general principles to be kept in mind as guides. Even the significance of some of these principles is subject to controversy. The value of the study of ra-
tional behavior is that it supplies us with a new viewpoint on problems of criteria - a viewpoint to be added to common sense to serve as a basis of good judgment”

Even if the basic assumption about rationality is not likely to reflect the true behavior of investors, rationality still serves as a reasonable description of investor behavior. Maybe more important, the assumptions of rational and risk averse investors provided an important foundation for researchers and investors to continue to develop and analyze the financial markets.

CAPM
Following the work of Markowitz (1952), one of the most important theoretical models for the continuing development of the modern theory of finance is the CAPM. The CAPM was firstly brought up in 1964 by William F. Sharpe in his article “Capital Assets Prices: A Theory of Market Equilibrium under Conditions of Risk”. Sharpe (1964, pp. 425-426) state that most academics at that time focused on using investor preferences and physical attributes of the capital assets to explain the movement of price. However, there was lacking models that took the condition of risk into account when explaining the asset prices in the capital markets. In order explore the relationship between the price of capital assets and its related risks, Sharpe (1964, p. 433) describe the mechanism of equilibrium in capital markets, with two assumptions 1) All the investors can borrow or lend at the same risk-free interest rate and 2), the investors’ expectations on expected values, standard deviations and correlation coefficients are homogeneous.

Sharpe (1964, pp. 433-436) argues that under the assumption of market equilibrium, there can be many efficient portfolios lying along the Capital Market Line, all with different combinations of assets and different types of risks. One special risk is the systematic risk which cannot be diversified away by adding additional assets into the portfolio. Sharpe (1964, pp. 441-442) further points out that an asset’s risk should be related to the rate of return and the level of economic activity. Assets that are not affected by changes in economic activity should generate returns equivalent to the interest rate. Conversely, assets that are affected by economic activity should have higher expected rates of return. Hence, if an investor undertakes higher risk she should also demand higher return. The expected risk-return relationship in the CAPM can formally be described as (Bodie, Kane and Marcus, 2011, p. 310):

\[ \text{E}(R_p) = R_f + \beta_p \left[ \text{E}(R_m) - R_f \right] \]  

(1)

where \( \text{E}(R_p) \) is the expected return on the portfolio, \( R_f \) is the risk-free rate, \( \beta_p \) is the systematic risk of the portfolio and \( \text{E}(R_m) - R_f \) is the market return in excess of the risk-free rate. The term \( \beta_p \left[ \text{E}(R_m) - R_f \right] \) is the portfolio risk premium. Furthermore, the systematic risk of the portfolio, commonly known as the beta of the portfolio, can be further broken down into:

\[ \beta_p = \frac{\text{Cov}(R_p, R_M)}{\sigma^2_M} \]  

(2)

In the CAPM, the market is assumed to be a Markowitz (1952) efficient portfolio. However, CAPM has been criticized for its incompatibility with reality. We can begin with the two assumptions assuming that all investors can borrow and lend at the same rate and that investors’ expectation are the same. Sharpe himself admits in his article about the incompatibility of those assumptions with the real world. He argues that all the models in classical financial doctrine are simplified versions of reality and the assumption is always needed (Sharpe, 1964, p. 434). For this reason, it is therefore im-
portant to test whether the CAPM’s results are sensitive to violation of the assumption of lending and borrowing at the same rate. In this case, CAPM is rather robust (Bodie et al., 2011, p.325). Another important problem concerning CAPM’s predictability is that the CAPM fails empirical tests. Since the market portfolio is unobservable, academics often use proxies such as S&P 500 index to represent the real market portfolio with the assumption that those indices are close enough to the true market portfolio (Bodie et al., 2011, p. 326). Quite obviously, CAPM did not perform well in these tests. Roll (1977, p. 130-131) largely confirm Sharpe (1964) in the criticism of CAPM. However he also states that the only testable hypothesis that is associated with the CAPM is whether the market portfolio is efficient.

The Efficient Market Hypothesis

The EMH, in relation to the CAPM and the modern portfolio theory, has also become a central concept to the entire discipline of finance and economics. In the seminal article “Efficient Capital Markets: A Review of Theory and Empirical Work” published in 1970, Eugene Fama reviews the existing literature on capital markets and introduces the foundations for the EMH. Fundamental to the EMH is the definition of an efficient market. Fama (1970, p. 384) defines an efficient market as when asset prices always “fully reflect” all available information. The underlying assumption for an efficient market is that the price at time t is based on the expected return at time t + 1 which in turn is based on the available information at time t. This assumption imply that the price of an asset in time t+1 is equal to the expected price in time t+1 conditional of all available information in time t. Therefore, Fama (1970, p. 385) states that no trading strategy based on all available information in time t can systematically generate higher returns compared to the market return.

Fama (1970, p. 387) describes the following sufficient conditions for a market to be efficient:

- There are no transaction costs.
- All available information is costless available to all market participants.
- All market participants agree on what implication the available information has on the current and future market price of an asset.

However, these conditions are unlikely to be fulfilled in practice. Fama (1970, p. 388) therefore states that a market can be efficient even when these conditions are not fulfilled. He argues that, as long as a sufficient number of market participants are trading on available information, the market can be efficient. Furthermore, he states that even if there are transaction fees or market participants disagree on how to interpret the information, prices can still fully reflect all available information. He concludes that the conditions are sufficient for market efficiency but not necessary. Therefore, he highlights the need for researchers to test the EMH.

Fama (1970, p. 383) presents three forms of market efficiency in order to empirically test the EMH. The three forms are: the weak form, the semi-strong form and the strong form. According to him the weak form of market efficiency is fulfilled when the historical price information of an asset is incorporated in the price. He bases the tests on the weak form of efficiency partly on Kendall’s (1953) findings showing that stock prices seem to follow a random walk. Kendall (1953, p. 11) statistically analyzes time series data of stock prices, aiming to fit trend models to the data. His intention is not to directly test if the time series data follow a random walk. However, it soon becomes apparent
to him that the price fluctuations seem to be randomly distributed. His findings are important for economics in general and particularly for the EMH. If prices follow a random walk, all information available in past prices could be seen being fully reflected in the price at time t.

Fama (1970, p. 383) defines the semi-strong form of market efficiency as when both historical price information and publicly available information are incorporated in the stock prices. Lastly, the strong form of market efficiency is defined as when historical price information, publicly available information and private information are incorporated in the stock prices. The strong form is the highest form of efficiency and means that all available information is reflected in the stock prices.

Similarly to the CAPM and the modern portfolio theory, the EMH also rests on unrealistic assumptions. Fama (1970, p. 388) clearly acknowledges this issue when he highlights the need to empirically test the EMH. In order to test the EMH, Fama (1970, p. 401) states that a model of equilibrium is required. However, because of the apparent shortcomings of the CAPM, the tests of the EMH might not be valid. For example, if the tests reveal that the EMH is inefficient, we do not know if the CAPM is incorrect or if the EMH is inefficient. This dilemma is known as the joint-hypothesis problem (Fama, 1991, p. 1575-1576). Nevertheless, beating the market is difficult. Thus, even if the EMH is unrealistic, it is still a reasonable description of the behavior in the financial markets.

As stated previously, the mainstream approach has been to use mathematically based models and theories to explain the behavior in the financial markets. Due to human complexity, these theories and models cannot explain all the aspects of the behavior in financial markets. However, we believe that the purpose of the classic theories and models are not to perfectly explain the behavior of financial markets. They should instead be used as approximations of the behavior in financial markets for researchers to generate accepted knowledge. Therefore, it should be understandable why our choice of epistemology in chapter 2.2 is not entirely positivistic.

Many researchers are disappointed in the shortcomings of the classic theory we review in this chapter. They have therefore turned to the relatively new research paradigm called behavioral finance. However, behavioral finance has not managed to come up with a coherent theory. Instead, we believe it is best to use the research in behavioral finance as a complement to the classical theory of finance.

3.3 Performance evaluation

In this study we use Jensen’s model, Fama and French’s (1993) model and Carhart’s model to evaluate fund performance. First, we present the most common models available for performance evaluation and then discuss the choice of models for our study.

Conventionally, the performance of a portfolio manager is evaluated by either time-weighted rate of return or dollar-weighted rate of return without taking any consideration of risk factors (Bodie et al., 2011, pp. 847-849). Therefore, in order to compare performance of different fund managers, returns need to be adjusted for risk. Through history, several models based on the CAPM have been developed to measure the risk-adjusted return, e.g. Sharpe’s (1964) measure, Treynor's (1965) measure, Jensen’s (1968) model, Fama and French’s (1993) model, Carhart’s (1997) model and the Information Ratio (Bodie et al., 2011 p. 850).
Bodie et al. (2011, pp.850-854) argue that these models more or less have their limitations when used for performance evaluation. Sharpe’s measure examines excess return per unit of overall portfolio risk, which suits better when measuring the excess return on total risk of an investor’s portfolio. In contrast, Treynor’s measure uses systematic risk instead of the total risk. By ignoring the nonsystematic risk, Treynor’s measure separately evaluate each sub-portfolio in the whole portfolio. The reason for excluding the nonsystematic risk in the model is that this risk can/will be diversified away by the other sub-portfolios in an investor’s whole portfolio.

Similarly, Jensen’s model, Fama and French’s model and Carhart’s model also consider the systematic risk exposure of a portfolio compared to the overall market portfolio. The models return a risk-adjusted performance measure known as alpha. On the other hand, the Information ratio divides the alpha by the nonsystematic risk. Because the nonsystematic risk can be diversified away by adding an index portfolio, the information ratio is more suitable to use when combining an active portfolio with an index portfolio.

Because pension savings are a sub-portfolio of an individual’s total portfolio and we have no information of the individual's total portfolio, performance models based on systematic risk will be best to use when evaluating fund performance. Furthermore, because the Jensen’s model, Fama and French’s model and Carhart’s model are directly comparable to each other, these models are chosen for our performance evaluation.

**Jensen’s model**

The EMH is closely related to the CAPM because the EMH requires an equilibrium model of expected returns to be tested (Fama, 1970, p. 401). However, because the CAPM alone is not testable, Jensen (1968) extends the work on the model in order to make it empirically testable. Jensen (1968, p. 389) describes the CAPM as a model that explains the performance of a portfolio in two dimensions: 1) the portfolio manager’s ability to generate higher return by his/her investment strategy and 2) the portfolio manager’s ability to minimize the diversifiable risks that exist in the portfolio. To confine the attention only on the first dimension, Jensen tries to measure how much extra return a portfolio manager can generate compared with the expected return at a given level of risk. The formula is presented as follow (Jensen, 1968, p. 393):

\[
RP_i - RF_t = \alpha_i + \beta_i [ \text{RM}_t - RF_t ] + \epsilon_{it}
\]

where \( RF_t \) is the return on the risk-free rate , \( RP_i \) is the return the portfolio, \( \alpha_i \) is the intercept for the portfolio, \( \beta_i \) is the portfolio exposure to the overall market movements (beta) and \( \epsilon_{it} \) is a random variable assumed to be i.i.d. Jensen’s model compares the difference between expected return and realized return of a portfolio. Jensen (1968, p. 394) explains that the value of \( \alpha \) represents the predictive ability of the portfolio manager in term of abnormal returns. This means if a portfolio manager is able to predict security prices, the value of \( \alpha \) will be positive and vice versa. On the other hand, Jensen (1968, p. 396) also states that the value of \( \alpha \) will never be negative. He argues that managers should learn from past mistakes and, therefore, at least generate a zero alpha.

The argument is true if all managers are rational wealth maximizers. However, as discussed previously the assumption of all market participants being rational is likely to be false. Therefore, the argument that the alpha can only be greater than or equal to zero
should only be viewed from a theoretical perspective. Moreover, Jensen admits that the model can overestimate a portfolio manager’s ability for forecasting the market. The reason is that the estimated risk parameter $\beta$ is biased downward, which in turn will have a positive effect on the value of $\alpha$. Therefore, there are two driven factors that could raise the value of $\alpha$: the portfolio manager’s predictability and the biased $\beta$. (Jensen, 1968, p. 396).

**Fama and French’s (1993) model**

Following the work of Fama (1970) researchers started to rigorously test the EMH. However, flaws were found in the CAPM that were commonly applied to measure the performance of portfolios (Fama, 1991, p. 1590-1599). Fama and French (1992, p. 427) emphasize the size effect as one important contradiction to the CAPM. The size effect is the result of the empirical finding by Banz (1981, pp. 3–4) showing that small firm stocks, on average, exhibit higher risk-adjusted returns compared to large firm stocks. Furthermore, Fama (1992, p. 427-428) emphasizes the importance of the relationships between returns and leverage, book-to-market ratio (BM) and earnings-price ratio (BP). However, Fama (1992, p. 428) discovers that a strong relation exist among the E/P, BM and leverage effects. Therefore, these effects can be considered inherent in the BM effect.

As a result of the findings of the BM and size effects, Fama and French (1993, p. 9) extend the CAPM performance model introduced by Jensen (1968) to include the SMB (small minus big) and HML (high minus low) factors. In order to construct the factors, they sort the stocks in their sample into two groups based on their market value (ME). The median ME of all stocks represents the breaking point between small size and big size stocks. Furthermore, they sort the stocks into three groups based on their book-to-market ratio (BM). The breaking points for the three BM groups are decided to the lowest 30%, the medium 40% and the highest 30%. They then form six portfolios based on the ME and BM breaking points and calculate the monthly value weighted returns for year t to year t+1. In year t +1 they reform the six portfolios and redo the return calculations. The results are a continuous monthly return pattern for each of the six groups over the whole sample period.

They construct the SMB factor for each month by subtracting the average return for the three small ME portfolios from the average return of the three big ME portfolios. Similarly, they construct the HML factor by subtracting the average return of the two high BM portfolios from the two low BM portfolios. They argue that the procedure of using a weighted average return across the different BM portfolios results in the high BM portfolios and the low BM portfolios having approximately the same ME. Thus the resulting HML are a good proxy for the difference in return premium between high BM stocks and low BM stocks. They apply the same reasoning for the construction of the SMB factor.

When testing the explanatory power of the two additional SMB and HML factors Fama and French (1993, p. 20) uses the following formula:

$$RP_{it} - RF_{t} = \alpha_{i} + \beta_{i} [ RM_{t} - RF_{t} ] + s_{i}SMB_{t} + h_{i}HML_{t} + \epsilon_{it} \quad (4)$$
where RF, is the return on the risk-free rate, RP, is the return on the portfolio, α, is the intercept, β, is the slope for the market factor (beta value). The si and hi are the return premium of the SMB and HML factors and ε it is a random variable assumed to be i.i.d. When regressing the three-factor model on 25 constructed portfolios, Fama and French (1993, p. 54) find that the additional HML and SMB factors better explain the risk premium of an asset. Therefore, they recommend using the three-factor model instead of Jensen’s model when evaluating portfolio performance.

Carhart’s (1997) model
Historically, a strategy to test the EMH in the weak form was to examine whether past short term returns (daily, weekly and monthly) could predict future returns (Fama, 1991, p. 1578-1580). Researchers had found that short term return correlation explained future returns. However, the autocorrelation was close to zero and therefore not directly rejecting the EMH in the weak form (Fama, 1991, p. 1609). Some academics had also begun to examine the effects of past returns for longer time horizons (Fama, 1991, p. 1580-1581).

Investigating longer periods, Jegadeesh and Titman’s (1993, p. 89) momentum effect is an important finding for the explanation and evaluation of equity portfolios and mutual fund performance. They discover that a strategy of buying past 3 to 12 month winning stocks and selling past 3 to 12 month losing stocks generate significant abnormal returns. According to Carhart (1997, p. 57) this momentum effect might explain why Hendricks, Patel and Zeckhauser’s (1993, p. 122) strategy of selecting past year’s top performing funds was shown successful. Hendricks et al. (1993, p. 94) attribute their findings to fund managers exhibiting hot hands, that is, fund managers are persistently delivering short run abnormal performance. Conversely, Carhart (1997, p. 58) argues that fund managers might simply hold previous year’s winning stocks by chance.

To support his argument Carhart (1997, p. 61) extends Fama and French’s (1993) model to include one additional momentum factor denoted PR1YR (We use PR1YR and MOM interchangeably in this study). He constructs the PR1YR factor by first sorting all stocks in his sample based on their one month lagged prior eleven month return. Then he subtracts the equally weighted return of the top 30% stocks from the equally weighted return of the bottom 30% stocks. The procedure is then repeated for each month in the entire sample period. The result is a continuous monthly return pattern reflecting the difference between the stocks with the previous year highest return and the stocks with the previous year lowest return. Finally, the four-factor regression model is expressed as:

\[
RP_{it} - RF_t = \alpha_i + \beta_i [ \text{RM}_t - RF_t ] + s_i \text{SMB}_t + h_i \text{HML}_t + p_i \text{PR1YR}_t + \varepsilon_{it}
\]  

(5)

where, RF, is the return on the risk-free rate, RP, is the return on the portfolio, α, is the intercept, β, is the slope of the market factor (beta value). The si and hi and pi are the return premiums of the SMB, HML and PR1YR factors and ε it is a random variable assumed to be i.i.d. In order to test the explanatory power of the four-factor model in general and the PR1YR in particular, Carhart (1997, p. 61) forms different portfolios of funds based on the prior one year returns and thereby replicates the methodology of Hendricks et al. (1993). He finds that the four-factor model, and in particular the SMB and PR1YR factor explains most of the portfolio return variation. Furthermore, the four-
factor model better explains the return variation of mutual funds compared to the CAPM and the three-factor model. Carhart (1997, p. 79-81) concludes that buying funds based on their prior one year performance is a good strategy for investors to capture the momentum effect. However, the returns generated by funds following the momentum effect are not necessary a result of skilled fund managers.

3.4 Empirical findings
Research in the area of active management are voluminous (Jones & Wermers, 2011, p. 29). For the purpose of this study, we will only include the most recent and important empirical findings. Furthermore, we will only present the international studies that have utilized a holdings based analysis when measuring the activity and performance of fund managers. Because there are relatively few studies in Sweden applying holdings based analysis, we choose to include some studies from Sweden that have used different analyzing approaches.

International holding-based studies
Cremers and Petajisto (2009) use active share combined with a modified TEV regression technique, when evaluating the activity and performance of 2,647 US equity mutual funds for the period 1980 to 2003. As benchmarks for the Active Share calculations they use 19 of the most common equity indices in the US. They assign a benchmark index to each fund by first calculating Active Share using all indices for a specific fund. The index that produces the lowest Active Share for a specific fund is then assigned as the benchmark index for the particular fund. To evaluate the performance for the funds in their sample they use Carhart’s model. Interestingly they find that funds with high Active Share generate higher performance compared to funds with a low Active Share. Furthermore they find that small funds are more active compared to large funds.

Using the same type of data as Cremers and Petajisto (2009), Petajisto (2013) further investigates the relationship between Active Share, TEV and performance. The major differences compared to Cremers and Petajisto (2009) is that Petajisto (2013, p. 3) extends the sample period by six years. Furthermore, as a fund’s benchmark index he uses the index as reported by the fund itself. The data on indices as reported by funds is acquired from a Morningstar summary of mutual fund prospectuses. Moreover, he calculate TEV not by regression, instead he uses the more commonly used TEV calculation. Interestingly, Petajisto (2013) also finds that the most active stock pickers have been able to generate significantly higher performance compared to the least active funds. However, there is no relationship between factor betting and performance, which he argues is the result of factor betting portfolios being more efficiently priced.

Daniel, Grinblatt, Titman and Wermers (1997) evaluate the performance of over 2500 funds from 1975 to 1994. The purpose of their study is to examine whether fund managers have the ability to consistently pick stocks that outperform the benchmark. They use a characteristic-based approach to measure portfolio performance using benchmarks based on three characteristics of stocks held by the portfolios. The characteristics are market capitalization, book-to-market equity value, and prior-year return. The study shows that fund managers as a group demonstrate some ability of selecting outperforming stocks, but there is no evidence on fund managers’ factor timing ability. Moreover, the abnormal returns generated by fund managers are not significant enough to cover the fund expenses. However, no performance persistence was proved in their study.
Cohen, Coval and Pástor (2005) suggest a performance evaluation approach that judges a fund manager’s skill by the stock they keep in the portfolio. In their study, the stocks holdings or stock trades of a fund manager are compared with those of other managers who historically have been successful. Overlap of stock holdings represents the stocks that both the fund manager and other successful managers have in their portfolio. Overlap of stock trades is defined as the similar trades made by a fund manager and the successful managers. The higher degree of overlap on stock holdings or stock trades compared with successful managers, the more skilled a fund manager is considered. Empirically, there are on average 502 funds per quarter in the sample and the sample period is from 1980 to the second quarter in 2002. The results of their study show that this new approach is more precise than the traditional return-based measures and demonstrates high predictability when forecasting a fund manager’s future performance.

Kacperczyk, Sialm and Zheng (2008) investigate whether unobservable actions of fund managers affect fund performance. To measure the effect of unobservable actions, they use the difference between the actual return of a fund compared with a portfolio replicating the fund’s most recent holdings disclosure. They name this difference the return gap, which captures fund managers unobserved ability to add (or destroy) value in the short run. By analyzing more than 2500 US equity funds from 1984 to 2003 they find that the effect of unobserved actions is persistent for the top and bottom performing funds. Furthermore, they find that the unobserved actions significantly predict fund performance.

Huang, Sialm and Zhang (2011) test whether fund managers’ risk-shifting behavior is related to fund performance. They hypothesize that the previous findings showing that mutual fund flows increase for funds that perform well and decrease for funds that perform badly. The increased flows by funds that perform well are higher than decreased flows for funds that perform badly. This should give fund managers incentives to change the portfolio risk in order to attract more fund investors. By shifting the portfolio risk, fund managers could manipulate fund performance in the short run and increase fund flows. Even if this fund managers’ behavior might seem destructive, they argue that risk-shifting also can be seen as an indication of fund manager activity. To measure risk-shifting, they calculate the difference between a fund’s current holdings and the prior standard deviation of the fund’s return. Investigating 2979 funds from 1980 to 2009, they find that risk-shifters can perform badly. They attribute their findings to increased trading costs. Interestingly, they conclude that risk-shifting is especially costly for active funds that exhibit, for example, a high Active Share.

Wei, Wermers and Yao (2009) study whether fund managers that adopt a contrarian investment strategy (betting against the overall trend in the market) outperform herding strategies (following the overall trend in the market). They hypothesize that funds might follow a contrarian investment behavior because some fund managers have access to more information compared to herding funds. Fund managers might also follow a contrarian behavior because they simply counteract the overall trend in the market. However, they point out that the contrarian behavior can also be a result of overconfidence. Therefore, Wei, Wermers, and Yao (2009, p. 2) hypothesize that contrarian managers could exhibit overconfidence and as a result underperform. They base their analysis on the holdings of the funds in their sample during 1994 to 2006. Interestingly, they find that a small (large) part of their sample adopt contrarian (herding) strategies that outperform (underperform) the herding (contrarian) strategy.
Wermers (2000) investigates active fund managers’ ability to add value by examining the performance and attributes of stocks held by funds. Using data from 1975 to 1994 he finds that the funds’ stock portfolios outperform the broad market by 1.3% annually. 0.6% is explained by the characteristics of the stocks held by the fund and 0.7% is explained by stock picking skill. However, he states that net of fees, all funds underperform. Following the same theme and using the same type of data as Wermers (2000), Chen, Jegadeesh and Wermers (2000) also investigate whether active fund managers are able to add value by examining the stocks held by the funds. They find that stocks held by mutual funds show no return difference compared to all stocks in their population. On the other hand, they do find that mutual fund trading activity is related to higher performance in the traded stocks. Stocks bought by funds have higher returns compared to stocks sold by funds. They state that their findings of a relationship between fund trading activities and stock return indicate that fund managers have significant stock selection abilities. However, they attribute the higher performance of winning funds as mostly being a result of the momentum effect rather than fund managers’ stock picking skill.

Swedish Studies on activity and performance

Engström (2004) uses a holdings based analysis approach when investigating the activity and performance of Swedish equity funds. He uses data on 112 funds and their holdings for the period 1996 to 2000. Using approximately the same technique as Grinblatt and Titman (1989), he creates a passive stock portfolio that replicate the portfolio structure of a particular fund. He then examines the difference of the passive portfolio return compared to the actual fund return. The results are two measurements reflecting a fund’s tactical and strategic decisions. Strategic decisions refer to the performance of the one year buy and hold replicating portfolio. Tactical decisions reflect the changes to the strategic portfolio. Interestingly he finds that, on average, both small and large funds outperform their benchmarks. Furthermore, small funds tactical decisions are significantly creating performance while large funds generate performance through their strategic decisions. He attribute his findings to small funds not having to compete as hard for gathering information on pricing errors as large funds need to.

Dahlquist et al. (2000) investigate fund performance in Sweden from the end of 1993 to the end of 1997. They study if different fund attributes are related to fund performance. They find that larger equity funds tend to perform worse compared to smaller equity funds. The relationship is inverted for bond funds, that is, large bond funds perform better compared to small bond funds. They attribute the different relationships among equity and bond funds as a result of bond (equity) funds being relatively small (large) actors on the Swedish bond (equity) market. Therefore, large equity funds might be too large actors on the Swedish stock market in order to trade aggressively. Furthermore they find that fees affect performance negatively, that is, high fee funds tend to perform worse compared to low fee funds. Moreover, they find that actively managed funds perform better compared to passively managed funds and that performance is positively related to funds’ trading activity.

Based on the method introduced by Cremers and Petajisto (2009), Holmgren and Sterndahlen (2011) investigate the fund activity and performance using Active Share and TEV on 37 Swedish equity funds for the period 2001-2012. As benchmark index for the Active Share and TEV calculations they use the SIXPRX. The analyzing techniques used to judge the performance are the benchmark index return, the risk-free return, the Sharpe ratio and the Information Ratio. The findings indicate that the average
Active Share for Swedish equity funds is 35% and TEV is 3.8%. However, they find no relation between Active Share and fund performance.

*Johansson and Määttä (2012)* examine the activity and performance of 150 Swedish mutual funds using data for the period 1993 to 2011. They estimate fund performance using Carhart’s (1997) four-factor model. Furthermore, they apply a bootstrap technique to investigate if fund manager performance is due to skill or luck. They find that Swedish funds have outperformed their benchmark by 1.7% annually before fees. However, fund managers’ excess returns barely manage to offset the fees charged. Interestingly, they also find that some fund managers’ can generate abnormal returns by skillful management.

Instead of fund activity, *Dahlquist et al. (2012)* examine activity and performance of individual investors in PPS. They investigate 70,000 individual pension investors during the period 2000 to 2010 and measure the activeness of fund investment by frequency of fund changes. Their results suggest that investors who actively monitor and manage their portfolio on average outperform passive investors. However, the higher frequency of fund changes by the active investors seem to negatively affect the passive investors, because the extreme outflows from mutual funds negatively affect the funds’ net asset values.
4 Methods and Data

4.1 Fund sample

The purpose of the study is to investigate Active Share and fund performance for the Swedish equity funds in the Swedish PPS. Therefore, the criteria for a fund to be included in our sample are: 1) the fund must be registered in Sweden; 2) the fund must be an equity fund investing in the Swedish equity market; 3) the fund must exist or have existed in the Swedish PPS during the period from 2002.09.30 to 2011.12.31.

The process of selecting funds for our sample is undertaken through the register of the Swedish Pensions Agency, which records all the funds that exist or have existed in the Swedish PPS. Because our study specifically focuses on the Swedish registered equity funds that are investing in the Swedish market, we select funds classified by the Swedish Pensions Agency as investing in “Sverige” (Sweden) and “Sverige Småbolag” (Sweden Small Cap). To make sure the funds are registered in Sweden, we perform another filter to only select funds with “SE” in its ISIN number initial. The selection results in 52 funds that were available in the Swedish PPS by the end of 2011. To eliminate survivorship bias, we also include all the dead funds that existed in the PPS during the sample period. Taken together, we have in sum 66 Swedish equity funds in the Swedish PPS, of which 52 were active by the end of 2011 and 14 were dead funds. Due to the mismatching between fund prices and fund-holdings data, one dead fund and one alive fund are excluded which makes the total number of sample funds to be 64.

4.2 Active Share

We use Active Share to measure a fund’s stock selection strategy. Intuitively, Active Share captures how much a fund’s holding of assets deviate from the constituents of its benchmark index. The formal expression for Active Share is

\[
\text{Active Share} = \frac{1}{2} \sum_{i=1}^{N} |w_{\text{fund},i} - w_{\text{index},i}|
\]

where, \(w_{\text{fund},i}\) and \(w_{\text{index},i}\) are weights for the \(i^{th}\) stock in the fund and the benchmark index (Cremers & Petajisto, 2009, p. 3335). Following the method of Petajisto (2013), we assign benchmark indices to funds based on the information reported by the funds themselves. The benchmark indices are mainly gathered from two sources: the Key investor Information Document (KIID) and the funds’ annual reports. KIID is a two-page legal document containing essential information about the fund (Fondbolagens Föreningen, 2012, p. 5-6; SFS 2004:46). From those two sources, there are totally ten different indices that funds claim as their benchmark indices. They are: SIXPRX, SIX Return, SIX 60 Index Cap, SIX 30 Return Index, OMXS50EW, OMXS, OMXSB, OMX Small Cap, OMXSB CAP GI, OMXSB CAP Net, Carnegie Small Cap index, Carnegie Small Cap Return Index, and Affärsvärdens Generalindex. The most common benchmark indices are SIXPRX (21 funds), CSRXSE (9 funds) and OMXS (8 funds). We have retrieved index constituent data for SIXPRX, CSXSE and CSRXSE. Therefore we directly cover 32 funds benchmark indices. We have also tried to retrieve data for the other indices. Unfortunately it is hard to get data over a long period. Therefore we use these three indices as our main benchmark indices. To match the three benchmark indices with our funds we prioritize as follows. First, if a fund have stated or compared itself to one of the three benchmark indices, we use that benchmark index. If the fund has stated that it
uses another index than our three indices, we use SIXPRX if it is a Sweden fund and CSRXSE if it is a small-cap fund.

Data on index constituents for SIXPRX, CSXSE and CSRXSE are provided by SIX-Telekurs and Carnegie Bank AB respectively and are on a quarterly basis. Constituent weight data for SIXPRX are available for the entire period. However, constituent weight data on CSRXSE are only available from the beginning of 2004. A closer examination of CSRXSE and CSXSE revealed that their constituents are identical, with the same weights. Therefore, we use CSXSE as a benchmark for funds following CSRXSE when calculating Active Share. However, to be able to match the index constituent data with the data from the fund holdings database we require ISINs for all index constituents. Unfortunately, the entire constituent data on SIXPRX and data on CSXSE prior to 2006 do not include ISINs. This data only provide ticker codes as asset identification. By consulting SIX-Telekurs, they assured that they used the same ticker codes as Nasdaq OMX. Therefore, to match ticker codes in the indices with the corresponding ISINs of the assets’ we use monthly data including ticker codes and ISIN’s provided by Nasdaq OMX. This data is for all stocks registered on the Stockholm OMX exchange at a specific date and was available for quarter one in 2001, and from the end of quarter three in 2004 to the end of quarter four in 2011.

For the periods from quarter four 2004 to quarter four 2011, we are careful to use the exact same dates when matching the OMX data with the index data. This increases the likelihood of finding all ticker codes represented in the indices and minimizes the risk of matching a ticker code with the wrong ISIN. A total of nine tickers are missing in the SIXPRX data after the ticker matching. A closer examination of these nine codes reveal that eight ticker codes have a weight of zero percent in the SIXPRX index and one have a weight of 0.13%. Therefore, the result of the ticker code matching during this period is successful and will not seriously affect the active share calculation. For CSXSE we use the same matching technique, with the difference that the CSXSE only are missing ISIN data prior to 2006. Furthermore, for the period quarter three 2002 to quarter four 2004 we use the OMX ISIN data for the periods quarter one of 2001 and quarter four of 2004. This matching technique generates more missing ISINs, at the most 7% and 5% of the total weights in SIXPRX and CSXSE respectively. This means that the Active Share will be at the most 7% and 5% higher for a fund during this period.

Data on fund holdings are retrieved from the Swedish Financial Supervisory Authority (FI). The data consist of detailed holdings data as well as Total Net Assets (TNA) and market value of the portfolio for each Swedish registered mutual fund. To identify the funds in our sample, we use FI’s institutional numbers (FI Institut nummer). We match the fund holdings’ weights with the related index constituents’ weights. We merge the fund-holdings data with the index constituent data and extract all unique ISIN’s used by funds and indices from the data. In this procedure, we use ISINs to match the stocks held by funds and indices. We then calculate Active Share for all funds in our sample. As recommended by Cremers and Petajisto (2009, p. 3335) we use the sum across all positions, that is, we divide the market value of an asset with the TNA in order to get the asset weight in the portfolio. Because the index data do not contain any cash, we treat the remaining weight in the fund portfolios as cash or cash equivalents. However, the data of fund holdings for a few funds is missing in some quarters, which in turn leaves no value for Active Share. We therefore use linear interpolation to construct the value of missing Active Share. We do not think the interpolated values will hugely affect the result since it only accounts for 5.5% of the whole dataset. Furthermore, the
values of Active Share are quite stable in the short term. Therefore, the interpolated values should be quite close to the actual values.

**4.3 Tracking Error Volatility**
Following Petajisto (2010) we use TEV as a measure of the funds’ factor timing strategies. TEV basically measures the volatility of a fund’s excess return compared to its benchmark index return. The formal expression for TEV is described in formula 7:

\[ \text{TEV} = \text{Stdev} \left[ R_{\text{fund},t} - R_{\text{index},t} \right] \]  

where, \( R_{\text{fund},t} \) is the fund return and \( R_{\text{index},t} \) is the index return (Cremers & Petajisto, 2009, p. 3334). Because TEV requires both fund returns and corresponding index returns, daily prices of the funds are collected from the Swedish Pensions Agency in form of the Net Asset Value (NAV). To extract the fund prices for our sample funds from the Swedish Pensions Agency’s fund price dataset, we use Fund Number to match funds with price. The reported NAV prices are net of dividends and the PPS fund rebate. We choose to base the TEV calculations on the NAV prices because there are problems with adjusting the NAVs for dividends and fees. We will return to this issue in the performance chapter (4.4).

Daily price data on the benchmark indices are provided by SIX-Telekurs and Carnegie Bank AB and are also on a daily basis. In order to calculate TEV we first match the daily prices of the indices with the daily prices of the funds. We base the matching on the prices of the funds. If there are dates in the index data that do not correspond to the dates in the fund price data, we use linear interpolation to fill in missing index data or we delete the excess index data. After the price matching we calculate the daily returns for each fund and index using the expression in formula 8.

\[ R_t = \frac{P_t}{P_{t-1}} - 1 \]  

Where \( R_t \) is the fund return at time \( t \), \( P_t \) and \( P_{t-1} \) is the price at time \( t \) and \( t - 1 \) respectively. Using Formula 7, we then calculate TEV for a specific date using the prior six months of daily return data, requiring at least 100 days of return data. This method of calculating TEV replicates the method used by Cremers and Petajisto (2009) and Petajisto (2013).

**4.4 Fund activity portfolios**
In order to measure the relative performance between funds we first designate the funds into portfolios based on their Active Share and TEV. The construction of the portfolios is as follow: First, all the funds are sorted into tertiles based on their Active Share for a specific quarter. The funds are then further divided into TEV tertiles based on their TEV for the same quarter. This sorting results in a total of nine groups with different Active Share and TEV values. One third of the funds have the highest Active Share, one third of them have the lowest Active Share and rest in between have medium Active Share. The same principle also applies to TEV. The nine groups from the fund sorting is then classified into five portfolios, following the classification as described in Petajisto.
In Figure 3, the numbers stand for five different portfolios. The funds in portfolio 1 are *Closet Indexers* that have a low value both on Active Share and TEV. In portfolio 2, funds are classified as *Moderately Active*. Funds in portfolio 3 are categorized as *Factor Bets* due to their relatively high TEV and relatively low Active Share. Portfolio 4 contains funds that are *Concentrated Stock Pickers*. These are the funds that have both highest Active Share and TEV. Portfolio 5 consists of *Diversified Stock Pickers*.

![Portfolio classification diagram]

To start the performance evaluation we first adjust the daily fund price data to monthly prices and calculate the monthly return for each fund in our sample using formula 8. We now return to the issue of dividends and fees. Because we require dividend adjusted prices when estimating the performance of each portfolio, we need to adjust the NAV prices for dividends. The data on dividends is collected from the Swedish Pensions Agency and Fondbolagens Förening. The data from the Swedish Pensions Agency cover the period from 2006 to 2013, while the data from Fondbolagens förening cover the period from 2000 to 2011. The data from the Swedish Pensions Agency have the exact date as investors in the PPS received dividends. However, the Fondbolagens förening’s data is based on dividends in the retail market. Because the data from the Swedish Pensions Agency only cover the period 2006 to 2012, we need to use Fondbolagens förening’s data for the years prior to 2006. A comparison of the differences in dividend dates between the Fondbolagens förening’s data and the Swedish Pensions Agency’s data revealed that dividends are not paid to the investors at the same dates. Instead the investors in the PPS received their dividends on average 13 days later than the retail investors during 2006 to 2013.

In order to solve the issue of mismatching dates for the years prior to 2006, we choose to adjust the monthly returns for dividends instead of the daily prices. Because the Fondbolagens förening’s data contains currency dividends per share and NAV per share, we calculate the dividends to the percentage of NAV by dividing the dividend with the NAV price at that date. This measure, $\text{DIV}_t$, reflects how many new shares an
investor would receive per one share owned. We then calculate the monthly dividend-adjusted return for each fund by using the following formula:

\[
R_{\text{div adjusted}} = (1 + R_{\text{NAV},t}) \times (1 + \text{DIV}_t) - 1
\] (9)

Adjusting the monthly returns minimizes the date matching error because the calculation is not dependent on the exact dividend date, only the month in which the dividend occurred. Therefore, if the dividend day in the retail market is less than 13 days to the end of the month, we choose to move the dividend to the next month.

Monthly data on fees are collected from the Swedish Pensions Agency and cover the period from 2006 to 2013. The data include both the fee after the PPS rebate and the Total Expense Ratios (TER). The TER fees do not include trading costs (Pensionsmyndigheten, 2013). Ideally these costs should also be included in the fee calculation. However, we assume that the NAV price is based on the reduction of the TER fee. To adjust the monthly returns for fees we first divide the PPS and TER fees by 12 to get the monthly fee. We then assume that the NAV price is based on the reduction of the TER fee and thus calculate the performance after the PPS rebate each month as:

\[
(1 + R_{\text{div adjusted}}) \times (1 - \text{FEE}_{\text{PPS}}) / (1 - \text{FEE}_{\text{TER}}) - 1
\] (10)

For the months prior to 2006 we use the average fee for a particular fund for the period from 2006 to 2011. If the data do not contain any fees for a particular fund during the period, we use the time-series equally weighted average fee for all funds in our sample during 2006 to 2011. When calculating the gross return we use Formula 10 but removing the PPS fee term from the formula. For each portfolio we then calculate the following three month equally-weighted average return using three versions of monthly return data, that is, net of fees, after PPS fee and, with no fee reduction. At quarter end we update the portfolio by again sorting the funds into the portfolios. The result is a continuous monthly return pattern for each portfolio in three different fee settings.

As mentioned, our sample period stretches from 2002.09.30 to 2011.12.31. This is mainly due to the availability of index constituents and prices. In order for a fund to be included in the portfolios, there are three important parameters: Active Share that requires fund holdings and index constituents, TEV that requires fund price and index prices, and performance evaluation that requires fund prices to calculate fund returns. For Active Share, fund holdings and index constituents are available through the whole period. However, there are some special criteria for funds in order to compute TEV and measuring the performance. To compute TEV on the end date of each quarter, the fund needs to have existed for at least six months before that date. To measure the performance, the fund needs to have price data for at least three months after the date. If we would include funds that do not have returns in the subsequent three months, the fund would be included in a portfolio without generating any returns which would bias our results. Because the idea is rather abstract, we hereby demonstrate an example graphically in Figure 4.
As mentioned in the beginning of this chapter, two funds do not meet the criterion in Figure 4 and therefore are excluded. This is mainly due to the requirement of calculating TEV. Alternatively, we could have used a shorter period for calculating TEV. However, this could generate inaccurate estimates of TEV. Cremers and Petajisto (2009) argue that a six-month period for the TEV calculation is reasonable. Because there are only two funds missing, we do not believe that the problem of survivorship bias is severe.

4.5 Performance evaluation

In order to evaluate the performance of the five portfolios in the three different fee settings we use Jensen’s model, Fama and French’s model and Carhart’s model. To be able to compute the alpha with these three models, there are totally four factors needed: \( R_{Mt} - R_{Ft} \), \( SMB_t \), \( HML_t \) and \( PR1YR_t \). For Jensen’s model, only \( R_{Mt} - R_{Ft} \) is needed. For Fama and French’s model \( R_{Mt} - R_{Ft} \), \( SMB_t \) and \( HML_t \) are necessary. For Carhart’s model, all the factors are required to obtain alpha value. In our calculation, we use the four factors provided by Johansson and Määttä (2012) who calculated the factors on a monthly basis for the Swedish market. Their calculations are based on Fama and French (1993) and Carhart (1997). We will first describe how the factors are constructed by Johansson and Määttä and then explain how alphas are calculated from these three models.

For the factor \( R_{Mt} - R_{Ft} \), Johansson and Määttä use the return of SIXPRX for \( R_{Mt} \) and \( R_{Ft} \) is represented by the Swedish one-month rate for SSVX, which is a Swedish treasury bill. The rest of factors were constructed from stock return in the Swedish market. The measuring period was from 1993.01.01 to 2011.12.31 and the size of sample was 1477 stocks. When constructing \( SMB_t \) and \( HML_t \), all the stocks were divided into different groups according to their size and book-to-market value. By size, stocks were distinguished by the median of market capitalization at the time t. For \( HML_t \), all the stocks were divided into three groups based on BE/ME ratio. The higher 30th percentile on BE/ME were growth stocks and the lower 30th percentile were value stocks. The rest in the middle were neutral stocks. Thus, there were totally six portfolios constructed. They were Small Value, Small Neutral, Small Growth, Big Value, Big Neutral and Big Growth. To calculate SMB factor, the following formula was used:

\[
Q_{t-2} \quad Q_t \quad Q_{t+1}
\]

6 months of past daily return for TEV calculation
3 months future return in portfolio
Reordering portfolios

At least 9 months of return data required to be included in the portfolios

Figure 4. Requirements to be included in a portfolio
\[ \text{SMB}_t = \frac{1}{3} (\text{Small Value} + \text{Small Neutral} + \text{Small Growth}) - \frac{1}{3} (\text{Big Value} + \text{Big Neutral} + \text{Big Growth}) \]  

(11)

To calculate HML factor, the following formula was used:

\[ \text{HML}_t = \frac{1}{2} (\text{Small Value} + \text{Big Value}) - \frac{1}{2} (\text{Small Growth} + \text{Big Growth}) \]  

(12)

The six portfolios are presented in Table 1 (Johansson & Määttä, 2012). When constructing the momentum factor, stocks were also divided into six portfolios, in which the book-to-market ratio was substituted by the prior 12-month returns. The higher 30th percentile represented high return stocks and the lower 30th percentile represented low return stocks. The rest in between, of course, were the neutral return stocks. The six portfolios are in Table 2 (Johansson & Määttä, 2012). Formula for the momentum factor is as following:

\[ \text{PR1YR}_t = \frac{1}{2} (\text{Small} + \text{High}) - \frac{1}{2} (\text{Small Low} + \text{Big Low}) \]  

(13)
In all the models (Formula 3 to 5), we use $R_P^t$ as the monthly return for a portfolio at time $t$. For $RM_t-RF_t$, $SMB_t$, $HML_t$ and $PR1YR_t$ we use the values calculated by Johanson and Määttä (2012). We then run time-series regressions on each portfolio in the three different fee settings using the three regression models.

4.6 Determinants of Active Share and predictors of alpha

To evaluate the relationships among Active Share, alpha and other variables we run a pooled panel regression on the following independent variables: $lg(size)$, fund return over index, index return, TEV, TER and number of stocks held by the fund, where the fund size is the Total Net Assets (TNA). We also include quarter dummies to capture fixed effects in each quarter. The reason for selecting these particular variables is based on the variables used by prior studies (see Cremers & Petajisto (2009) and Petajisto (2013)). Due to the accessibility of the data and limited time, some variables used by prior studies are excluded in our test, for example, fund turnover, fund age, manager tenure and funds inflow from the previous period. All independent variables are lagged one quarter. For the two regressions the generic model is as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \ldots + \beta_n X_{it} + \epsilon_{it}$$  \hspace{1cm} (14)$$

Where $Y_{it}$ represents the dependent variables and $X_{it}$ represents the independent variables. According to Dougherty (2011, p. 525), it is preferable to use random effects estimation, such as a pooled panel regression because fixed effects estimation loses more degrees of freedom. However, random effects require two preconditions to be fulfilled. First, the observations must be seen as drawn randomly from the population. Because we investigate approximately all funds that have been available in the PPS during the investigated period, this precondition is not violated. Secondly, the effects that are unobserved, that is, effects that are assumed to be inherent in the error term, need to be independently distributed from the $X$ variables.

In order to make the panel regression test as realistic as possible we assume that an investor is standing in quarter $t$. However, the fund holdings data for quarter $t$ is not yet published by FI at the time. The fund holdings data is usually published some weeks after the quarter ends, between $t$ and $t+1$ (Finansinspektionen, 2013). We therefore lag all independent variables by one quarter to time $t-1$. This means that Active Share is also lagged one quarter. Thus when testing the predictors of alpha we use lagged independent variables and when testing the predictors of Active Share we use non-lagged predictors. We estimate alpha based on the future 12 months returns from time $t$. Altogether we require at least 21 months of returns for a fund to be included in the calculations. The idea is described graphically in figure 5.
At least 21 months of return data required to be included in the panel regressions

Figure 5. Description of the panel regressions

A total of 59 funds are included in the two panel regressions due to insufficient data. This means that five funds are excluded from the total of 64 funds in the sample. However, some survivorship bias is inevitable. An alternative would have been to use shorter time periods for the alpha and TEV estimation. This would have increased the number of funds in the regressions. On the other hand, this would increase the risk of obtaining inaccurate estimates of TEV and alpha. Therefore, a compromise is necessary. We believe that the excluded data will not significantly affect the validity of the results.

4.7 Source criticism

There are mainly three types of source related to this study: data for funds and indices, academic sources and other informational sources. The fund and index data are directly from the databases of different government agencies. Index providers are SIX-Telekurs and Carnegie Bank AB. SIX Financial Information is the third biggest financial information provider in Europe and Carnegie Bank AB is one of the leading financial advisor in Nordic (SIX Financial Information AB, 2013; Carnegie Bank AB, 2013). Both of the institutions provide a series of indices that are used by many fund companies. Data on fund holdings and price are from two Swedish government agencies: Swedish Pensions Agency and FI. Therefore, we consider the data trustworthy. However, there is always a risk that data from agencies and financial institutions can be incorrect due to administrational reason. For example, fund holdings for the first two quarters in 2005 are missing from the FI without any explanation. We sent the inquiry asking for the reason of missing data. However, we did not receive any reasonable explanation.
5. Results and Analysis
This chapter is organized in six main parts: First, we present detailed statistics of the five portfolios, Active Share and TEV. Second, we analyze the determinants of Active Share. Third, we investigate the performance of the funds in the portfolios. Fourth, we analyze the portfolios’ factor exposures. Fifth, we examine the predictors of alpha. Lastly, we summarize our findings.

5.1 Descriptive statistics
Figure 6 presents the development of the fund quantity in our sample. The number of active funds has climbed at a steady pace from 37 active funds in 2002 to 51 funds in 2011.

![Graph](image)

**Figure 6. Number of funds from October 2002 to December 2011**

Table 3 presents descriptive statistics of various time-series average values for the five portfolios. There are roughly 10 funds in each portfolio except for the portfolio of the Concentrated Stock Pickers. The fact that there are fewer funds for Concentrated Stock Pickers is a result of the classification shown in Figure 3 in Chapter 4.4. This is because that the portfolio of the Concentrated Stock Pickers contains approximately 33% of the funds in the highest Active Share tertile and approximately 33% of the funds in the highest TEV tertile.

Starting with Active Share, the Concentrated Stock Pickers and the Diversified Stock Pickers have mean values of approximately 70%, which are higher than the other portfolios. The Concentrated Stock Pickers have a standard deviation of the mean Active Share of 5%, which is the highest value of all portfolios. Conversely, the Closet Indexers have an Active Share of 26% with a standard deviation of 2.3%, which are the lowest among all the portfolios. Continuing with TEV, the Factor Bets and the Concentrated Stock Pickers have the highest value of roughly 13% and also a relatively high standard deviation of approximately 5%. The rest of the portfolios have a TEV of 9% on average with a standard deviation of about 3.5%.

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The average TER fee charged by five portfolios differs substantially. Before the PPS fee rebate, the Diversified Stock Pickers charge a TER fee of 1.5%, which is highest among the portfolios. The Concentrated Stock Pickers and the Moderately Active charge a TER fee slightly lower than 1.4%. The Factor Bets and the Closet Indexers charge the lowest TER fee at roughly 1%. After the rebate in the PPS, the differences in fees between the portfolios are smaller. However, the Closet Indexers still have the lowest fees among the portfolios.

When comparing the fee charge with Active Share, the portfolios having higher Active Share consequently charge higher fees. This is in line with the idea that active funds are more expensive. Furthermore, the most active funds seem to be smaller and hold fewer stocks than the other funds.

<table>
<thead>
<tr>
<th>Label</th>
<th>Portfolio</th>
<th>Number of funds</th>
<th>Active Share</th>
<th>SD Active Share</th>
<th>TEV</th>
<th>SD TEV</th>
<th>TER</th>
<th>PPS Fee</th>
<th>TNA</th>
<th>No. of stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Diversified Stock Pickers</td>
<td>10</td>
<td>68%</td>
<td>3.6%</td>
<td>8.6%</td>
<td>3.3%</td>
<td>1.50%</td>
<td>0.61%</td>
<td>3 017</td>
<td>45</td>
</tr>
<tr>
<td>4</td>
<td>Concentrated Stock Pickers</td>
<td>6</td>
<td>76%</td>
<td>5.0%</td>
<td>13.5%</td>
<td>5.4%</td>
<td>1.39%</td>
<td>0.62%</td>
<td>744</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>Factor Bets</td>
<td>10</td>
<td>34%</td>
<td>3.9%</td>
<td>13.1%</td>
<td>5.3%</td>
<td>1.09%</td>
<td>0.47%</td>
<td>3 548</td>
<td>56</td>
</tr>
<tr>
<td>2</td>
<td>Moderately Active</td>
<td>9</td>
<td>42%</td>
<td>4.1%</td>
<td>9.0%</td>
<td>3.6%</td>
<td>1.38%</td>
<td>0.59%</td>
<td>2 638</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>Closet Indexers</td>
<td>11</td>
<td>26%</td>
<td>2.3%</td>
<td>9.5%</td>
<td>3.5%</td>
<td>0.93%</td>
<td>0.39%</td>
<td>3 312</td>
<td>66</td>
</tr>
</tbody>
</table>

Table 3. Descriptive statistics for October 2002 to December 2011

Table 3 shows statistics of mean values for the fund portfolios defined in figure 2. Following Petajisto (2013, p. 34), the equal-weighted means are calculated for each quarter for all portfolios. The reported values are the time-series average for each quarterly mean over all quarters in the sample period. Standard deviation values are calculated as the volatility of the quarterly time-series mean values. TNA is expressed in SEK millions. Daily TEV is converted to annual TEV using the formula: $\text{TEV}_A = \text{TEV}_D \times 252^{0.5}$.

Our results show that there is a wide spread of Active Share and TEV among the Swedish mutual funds available in the PPS. A portfolio consisting of the funds with both the highest Active Share and TEV shows a mean time-series Active Share of 76% and a TEV of nearly 13.5%. In comparison, a portfolio consisting of the funds with the lowest Active Share and TEV has a mean time-series Active Share of 26% and a TEV of 9.5%. Petajisto (2013, p. 34) shows that the Active Share for the US funds in his sample ranges from 59% to 98% and that fund fees are between 1.05% and 1.6%. In contrast, the Active Share for the Swedish equity funds is lower given the similar TER fees. This could be explained by the difference of the chosen sample period, in which Petajisto (2013) includes all US mutual funds from 1990 to 2009. Petajisto (2013, p. 45) shows a declining trend on the value of Active Share starting from the last decade in 20th century. Our sample only covers 9 years from 2002 to 2011, thus, it seems reasonable to have lower Active Share for this period. Despite the difference of Active Share, we find similar results on TEV comparing to Petajisto (2013).
An explanation for the difference in Active Share between our results and Petajisto’s (2013) results can be the number of stocks held by funds relative to the overall market. US funds hold a smaller proportion of the number of stocks available in the US market while Swedish funds hold a larger proportion in the Swedish market. Thus, if Swedish fund managers want to be well diversified and at the same time pick outperforming stocks, they might have to choose stocks that they actually would not like to own. For example, the Diversified Stock Pickers in our sample have on average 45 stocks in their portfolio. In comparison, SIXPRX consists of approximately all 300 stocks available in the Nasdaq OMX Stockholm exchange. Thus the managers have owned roughly 15% of the stocks in SIXPRX by only investing in Sweden. In comparison, the Diversified Stock Pickers in Petajisto’s (2013, p. 34) had an average portfolio of 66 stocks. However, the US stock market consists of thousands of stocks, leaving the fund managers with potentially more stocks to choose from. Thus, it seems to be less difficult to form a portfolio in the US market that diverges from the index than in the Swedish stock market.

To further investigate the time-series development of Active Share, we divide funds into Active Share quintiles. Figure 7 shows the percentage distribution for the number of funds in each quintile over the sample period. There are three relatively large groups that have an Active Share between 20% and 80%. These funds account for roughly 90% of all the Swedish equity funds in our sample. Approximately 30% of the funds have an Active Share higher than 60%. Furthermore, the funds having an Active Share higher than 80% are relatively stable over the sample period. However, a declining pattern is shown for the funds having an Active Share below 20%.

![Figure 7. Time series of Active Share from 2002 to 2011](image)

Figure 7 shows the Active Share development for the funds in our sample. Each quarter, funds are divided into five categories based on their absolute Active Share value. For example, funds having an Active share below 20% are categorized in the 0% - 20% category. Similarly, funds having an Active Share equal to or lower than 100% and equal to or higher than 80% are categorized in the 80% - 100% category.
About 70% of the funds have an Active Share below 60%. In contrast, Petajisto (2013, p. 46) finds that approximately 50% of the total fund assets in his sample have an active share below 60% in 2009. However, this proportion includes the pure index funds with an active share below 20%. Roughly 20% of the fund assets in his sample consist of pure index funds, while approximately 30% are categorized as Closet Indexers. Subtracting the pure index funds assets increases the proportion of the Close Indexers to roughly 40%. Even if fund assets are interesting to investigate, we believe that the number of funds is more interesting for the individual investors in the PPS. This is because the number of funds represents the chance (risk) of selecting a potentially good active (bad passive) fund.

Comparing our results with the discussion of closet indexing by Petajisto (2013, p. 10) is interesting. He states that theoretically, an active fund that tries to beat its benchmark index should never have an Active Share below 50%. This is because one generally could expect 50% of the index constituents to perform above the average and the other 50% to perform below the average. If active fund managers recognize this and at the same time want to beat the benchmark index, they would only invest in the 50% of the index constituents that they believe will perform best. Therefore, he sets the cut-off value for Closet Indexers below 60% Active Share. Thus, the Swedish funds in the PPS are relatively passive in terms of Active Share both theoretically and in relation to empirical findings on the US market.

Figure 8 demonstrates the time-series TEV for the five portfolios during the period from 2002 to 2011. Over the time, the TEV for all portfolios is above 5%. The two most fluctuating periods for TEV are 2002-2003 and 2008-2009, in which TEV reaches 20% and 30%, respectively. TEV also demonstrates an upward tendency from the beginning of 2011. The two great fluctuations are mostly due to the stock market downturn in 2002 and the financial crisis in 2008. The upward trend of TEV at end of the sample period also indicates the stock market fall in 2011.
Among five portfolios, the Concentrated Stock Pickers and the Factor Bets generate higher TEV than other three portfolios. In contrast, TEV for the Diversified Stock Pickers are lower. This is consistent with Table 3 which shows that the Factor Bets and the Concentrated Stock Pickers have the highest mean TEV.

### 5.2 Determinants of Active Share

We run a pooled panel regression in order to analyze which factors are important in explaining the variation in Active Share. The results from the regression are shown in Table 4. As predictive variables we include TER, number of stocks held by a fund, logarithmic total net asset (TNA), TEV and fund return over benchmark index. Similar to Cremers and Petajisto (2009, p. 3346), we include quarterly dummy variables to control for time effects. We find evidence for heteroscedasticity (see Dougherty (2011, p. 280) for information about heteroscedasticity) among the residuals for TEV and \( \log(TNA) \). We also find evidence of heteroscedasticity of the residuals when including all variables. Therefore, similar to Cremers and Petajisto (2009), we cluster residuals by fund in order to get more trustworthy t-values of the coefficients.

We find that the TER and number of stocks variables explain the most of the variation in Active Share. The TER variable shows a strong positive relation with Active Share. An increase in the TER fee of 1% corresponds to an increase in Active Share by approximately 25%. This finding is consistent with Table 3, in which the funds with the highest Active Share on average charge higher fees. This finding is reasonable. Funds that employ more resources when analyzing the stocks to invest in, should charge higher fees. Similarly, Cremers and Petajisto (2009, p. 3346) also find a positive relation between expenses and Active Share. They find that a 1% increase in the expense ratio corresponds to a roughly 5% increase in Active Share. Our results show that the TER fee explains more of the variation in Active Share compared to the US funds.

The number of stocks variable has the second strongest explanatory power of Active Share. The relationship is though negative, that is, an increase in the number of stocks
will consequently decrease the value of Active Share. This result is in line with the statistics in Table 3, in which the Diversified Stock Pickers and the Concentrated Stock Pickers hold the smallest amount of stocks. Similarly, Cremers and Petajisto (2009, p. 3346) also find a negative relationship between the number of stocks and Active Share.

Cremers and Petajisto’s (2009, p. 3346) analysis shows a significant relation between TEV and Active Share. We also find an indication of a relationship between TEV and Active Share. The relationship is positive, that is, a higher TEV corresponds to a higher Active Share. This finding is reasonable because stocks are not perfectly correlated. Consequently, TEV should increase if fund holdings deviate more from the index constituents and this would hold even if the funds are well diversified. Therefore, it seems like TEV and Active Share are not measuring totally different aspects of fund manager activity.

Furthermore, we find that the TNA variable is not related to Active Share. This result contradicts Cremers and Petajisto (2009, p. 3346)’s finding showing that TNA is positively related to Active Share. Our finding is consistent with Table 3, in which both small and large funds have a high Active Share. Moreover, the return over index variable is not related to Active Share.

When using all variables in the regression the $R^2$ is 34.4%. Cremers and Petajisto (2009, p. 3346) and Petajisto (2013, p. 38) find similar $R^2$ when using all variables in their regression. The low explanatory power of the variables confirms that Active Share is an independent measure of fund activity. Therefore, it is reasonable to use Active Share as a measure of fund manager activity.
Table 4. Determinants of Active Share

Table 4 shows the results of a pooled panel regression on Active Share with p-values in parentheses. The regression is based on fund returns that includes dividends and are net of fees. The number of stocks held by a fund at the end of a quarter is divided by 100. TNA values are divided by one billion and transformed to logarithmic values. The return variable is the compound return for the end of the previous quarter to the end of the current quarter.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TER</td>
<td>25.285</td>
<td>25.388</td>
<td>22.961</td>
<td>23.541</td>
<td>23.325</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Number of stocks/100</td>
<td>-0.255</td>
<td>-0.248</td>
<td>-0.211</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEV</td>
<td>0.897</td>
<td>0.842</td>
<td></td>
<td>(0.110)</td>
<td>(0.119)</td>
</tr>
<tr>
<td>Return over index, t-1 to t</td>
<td>-0.250</td>
<td></td>
<td></td>
<td>(0.161)</td>
<td></td>
</tr>
<tr>
<td>lg(TNA)</td>
<td></td>
<td>-0.028</td>
<td></td>
<td></td>
<td>(0.351)</td>
</tr>
<tr>
<td>Quarter dummies</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>1445</td>
<td>1445</td>
<td>1445</td>
<td>1445</td>
<td>1445</td>
</tr>
<tr>
<td>R²</td>
<td>23.5%</td>
<td>23.9%</td>
<td>31.9%</td>
<td>33.5%</td>
<td>34.4%</td>
</tr>
</tbody>
</table>

5.3 Performance

Table 5 shows regression statistics of the equally weighted returns for all funds in our sample. The fund returns are adjusted for the PPS rebate, thus representing the real return for the PPS investors. Our results show that the funds perform neutrally. The beta estimates are close to one, which means that every 1% increase in market return will on average correspond to a portfolio return of 1%. Controlling for size and BM effects in the Fama and French’s model increases the adjusted R² by 0.004 compared to Jensen’s model. Furthermore, the size factor is statistically different from zero in both the three-factor and four-factor model. Examining the adjusted R², the results indicate that all three models explain most of the variation in the fund returns. However, the multifactor models seem to slightly better explain the returns of the equally weighted portfolios compared to Jensen’s model. Adding the momentum factor in Carhart’s model does not significantly increase the adjusted R² compared to Fama and French’s model.
Table 5. Regression statistics for all funds equal-weighted

Table 5 shows regression statistics for the time period October 2002 to December 2011, with p-values of the estimates in parentheses. The fund returns include dividends and the fee rebate in the PPS. Alphas are expressed on an annual basis by multiplying the monthly alphas by 12.

<table>
<thead>
<tr>
<th>Model</th>
<th>α</th>
<th>β</th>
<th>s</th>
<th>h</th>
<th>m</th>
<th>R² adj</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jensen’s model</td>
<td>-0.081%</td>
<td>0.994</td>
<td></td>
<td></td>
<td></td>
<td>0.975</td>
</tr>
<tr>
<td></td>
<td>(0.939)</td>
<td>(0.000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fama and French's model</td>
<td>-0.403%</td>
<td>1.005</td>
<td>0.077</td>
<td>0.004</td>
<td></td>
<td>0.979</td>
</tr>
<tr>
<td></td>
<td>(0.683)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.826)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carhart’s model</td>
<td>-0.373%</td>
<td>1.001</td>
<td>0.079</td>
<td>0.008</td>
<td>-0.015</td>
<td>0.979</td>
</tr>
<tr>
<td></td>
<td>(0.706)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.681)</td>
<td>(0.500)</td>
<td></td>
</tr>
</tbody>
</table>

The results from the regressions of the five portfolios sorted by Active Share and TEV are presented in Table 6. The only portfolio that has a positive alpha is the Diversified Stock Pickers, although it is statistically non-significant. For the Closet Indexers and the Factor Bets, Fama and French's model and Carhart's model do not further explain the return differences by adding extra factors. The size factor is significant and shows a positive effect on returns for the Moderately Active, the Concentrated Stock Pickers and the Diversified Stock Pickers. The HML and MOM factors are non-significant for all portfolios. The beta estimates for the Closet Indexers, Moderately Active and Factor Bets are significant and slightly above one while the Concentrated Stock Pickers and the Diversified Stock Pickers show slightly less beta exposure. All models exhibit high values of R² which indicates that these models explain most of the variance in excess returns.

Cremers and Petajisto (2009, p. 3353) find that funds with higher TEV tend to be more exposed to market risk and small-cap stocks. They also find that funds with higher TEV prefer growth stocks (HML) and momentum (MOM). However, they do not find any patterns for Active Share and the factor exposures. In contrast we find that funds with higher Active Share tend to have lower market exposure. Similarly, we find that funds with higher Active Share are more exposed to small-cap stocks. There is no relation between momentum and growth stock preferences compared to Active Share and TEV. Hence, it seems like funds with high Active Share prefer to invest in small-cap stocks.

Results from Petajisto (2013, p. 35) suggest that the Diversified Stock Pickers in the US market outperform their indices net of transaction cost and fees. This is in line with our findings on the Swedish equity funds in the PPS. The Diversified Stock Pickers have a tendency of outperforming the other funds and the market, even if the alpha is statistically non-significant. However, funds using the factor timing strategy, such as the Factor Bets, generate neutral performance. This confirms the result from Daniel et al. (1997) who find that mutual fund managers do not demonstrate factor timing abilities.
### Table 6. Detailed regression statistics for the five Active Share-TEV portfolios

Table 6 shows regression statistics for the period from October 2002 to December 2011, with p-values of the estimates in parentheses. The fund returns include dividends and the fee rebate in the PPS. Alphas are expressed on an annual basis by multiplying the monthly alphas by 12.
The relative buy and hold performance of the five portfolios compared to the SIXPRX is presented in Figure 9. By denoting the cumulative value of the portfolios at time $t$ as $V_{pt}$ and the cumulative value of the SIXPRX at time $t$ as $V_{it}$, the relative performances shown in the figure are calculated as $V_{pt}/V_{it}$. For example, in the beginning of 2006, the relative performance for Factor Bets compared to the SIXPRX is roughly -8%, which indicates that if investor invested in this portfolio in 2002, it would have been worth 92% of the SIXPRX at the end of 2011.

From 2006, the Diversified Stock Pickers start to outperform both the SIXPRX and the other portfolios. This is in line with the results from the performance evaluation in Table 6. The most volatile portfolio is the Concentrated Stock Pickers. This is probably due to the fact that Concentrated Stock Pickers are the funds with highest Active Share and TEV. Factor Bets, which have high TEV and low Active Share, exhibit a downward performance trend in the first half of the sample period and join the other underperformers at end of the period. The Diversified Stock Pickers perform better than the SIXPRX and all the other portfolios while the Closet Indexers perform the worst of all portfolios.

In order to investigate the difference in performance between the Diversified Stock Pickers and the Closet Indexers, we run a time-series regression of the return difference. The results from the regression are shown in Table 7. Jensen’s model shows an economically and statistically significant alpha of 2.8%. The explanatory power of the multifactor models is higher compared to Jensen's model. Our results show evidence of actively managed funds outperforming passively managed funds with a compelling margin after the PPS rebate. Similar results are found by Petajisto’s (2013, p. 17) study, in which the difference between the two portfolios is 2.17% with a statistical significance, net of transaction costs and fees.
Table 7. Return difference between Diversified Stock Pickers and Closet Indexers

Table 7 shows regression statistics for the time period from October 2002 to December 2011, with p-values in parentheses. The fund returns include dividends and the fee rebate in the PPS. Alphas are expressed on an annual basis by multiplying the monthly alphas by 12.

<table>
<thead>
<tr>
<th>Model</th>
<th>α</th>
<th>b</th>
<th>s</th>
<th>h</th>
<th>m</th>
<th>R^2 adj</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jensen’s model</td>
<td>2.821%</td>
<td>-0.081</td>
<td></td>
<td></td>
<td></td>
<td>0.110</td>
</tr>
<tr>
<td></td>
<td>(0.061)</td>
<td>(0.000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fama and French's</td>
<td>1.985%</td>
<td>-0.066</td>
<td>0.143</td>
<td>0.034</td>
<td></td>
<td>0.361</td>
</tr>
<tr>
<td>model</td>
<td>(0.127)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.175)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carhart's model</td>
<td>2.051%</td>
<td>-0.074</td>
<td>0.148</td>
<td>0.042</td>
<td>-0.034</td>
<td>0.363</td>
</tr>
<tr>
<td></td>
<td>(0.114)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.103)</td>
<td>(0.258)</td>
<td></td>
</tr>
</tbody>
</table>

To obtain a comprehensive picture of the five portfolios’ performances, we compare them with funds in two other fee settings: net returns in the retail market and gross returns (Appendix 1 and 2). Alphas are generally higher than PPS alphas for all portfolios in term of gross return and lower in the retail market since investors cannot benefit from the rebate in PPS. However, p-values indicate that the alphas are not distinguishable from zero in most of the cases. On the other hand, when examining the gross returns, the performance difference between the Concentrated Stock Pickers and Closet Indexers are statistically significant, at the 5% level when using Jensen’s model and at the 10% level when using Fama and French’s model and Carhart's model. When examining net returns, the difference is significant at the 10% level using Jensen’s model but non-significant in the multifactor models. However, the Closet Indexers show significantly negative alphas at the 5% level in all three performance models. These results show that highly active funds like the Diversified Stock Pickers outperform the Closet Indexers before fees, net of the PPS fee and net of all fees.

We investigate whether the performance results of the portfolios are stable over time by running a split period regression for the five portfolios. The regression estimates for the two periods are shown in Table 8. In the period January 2007 to December 2011, the alpha and the other factors for all five portfolios are statistically non-significant. In the period October 2002 to December 2006, Factor Bets indicate a severe underperformance with an alpha of -2.65% in Jensen’s model. However, the performances are neutral for all portfolios in the multifactor models. Moreover, the return difference between the Diversified Stock Pickers and the Closet Indexers is significant in the first period. The difference is higher than the difference from the test for the whole period (see Table 7). Unlike the first period, differences in the second period are non-significant for any models.
### OCTOBER 2002 TO DECEMBER 2006

<table>
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<tr>
<th>Label</th>
<th>Portfolio</th>
<th>Jensen’s model</th>
<th>Fama and French’s model</th>
<th>Carhart’s model</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Diversified Stock Pickers</td>
<td>2.84%</td>
<td>1.00%</td>
<td>1.01%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.21)</td>
<td>(0.66)</td>
<td>(0.66)</td>
</tr>
<tr>
<td>4</td>
<td>Concentrated Stock Pickers</td>
<td>2.36%</td>
<td>-2.71%</td>
<td>-2.68%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.53)</td>
<td>(0.38)</td>
<td>(0.39)</td>
</tr>
<tr>
<td>3</td>
<td>Factor Bets</td>
<td>-2.65%</td>
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<td>-1.32%</td>
</tr>
<tr>
<td></td>
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<td>(0.04)</td>
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<td>(0.34)</td>
</tr>
<tr>
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<td>Moderately Active</td>
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<td>(0.35)</td>
<td>(0.84)</td>
<td>(0.85)</td>
</tr>
<tr>
<td>1</td>
<td>Closet Indexers</td>
<td>-1.39%</td>
<td>-0.76%</td>
<td>-0.59%</td>
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<td></td>
<td></td>
<td>(0.20)</td>
<td>(0.53)</td>
<td>(0.62)</td>
</tr>
<tr>
<td>Difference 5 - 1</td>
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<td>1.61%</td>
</tr>
<tr>
<td></td>
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<td>(0.07)</td>
<td>(0.46)</td>
<td>(0.50)</td>
</tr>
<tr>
<td>All</td>
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<td></td>
<td></td>
<td>(0.99)</td>
<td>(0.55)</td>
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### JANUARY 2007 TO DECEMBER 2011

<table>
<thead>
<tr>
<th>Label</th>
<th>Portfolio</th>
<th>Jensen’s model</th>
<th>Fama and French’s model</th>
<th>Carhart’s model</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Diversified Stock Pickers</td>
<td>1.38%</td>
<td>2.28%</td>
<td>2.31%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.56)</td>
<td>(0.28)</td>
<td>(0.27)</td>
</tr>
<tr>
<td>4</td>
<td>Concentrated Stock Pickers</td>
<td>-1.42%</td>
<td>-0.23%</td>
<td>-0.02%</td>
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<tr>
<td></td>
<td></td>
<td>(0.66)</td>
<td>(0.94)</td>
<td>(0.99)</td>
</tr>
<tr>
<td>3</td>
<td>Factor Bets</td>
<td>1.37%</td>
<td>1.53%</td>
<td>1.53%</td>
</tr>
<tr>
<td></td>
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<td>(0.38)</td>
<td>(0.34)</td>
<td>(0.35)</td>
</tr>
<tr>
<td>2</td>
<td>Moderately Active</td>
<td>-0.32%</td>
<td>0.24%</td>
<td>0.27%</td>
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<tr>
<td></td>
<td></td>
<td>(0.84)</td>
<td>(0.87)</td>
<td>(0.86)</td>
</tr>
<tr>
<td>1</td>
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<tr>
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<td>(0.71)</td>
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<td>Difference 5 - 1</td>
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<td>1.86%</td>
<td>2.68%</td>
<td>2.73%</td>
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<td>(0.13)</td>
<td>(0.12)</td>
</tr>
<tr>
<td>All</td>
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<td>0.11%</td>
<td>0.68%</td>
<td>0.73%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.95)</td>
<td>(0.66)</td>
<td>(0.63)</td>
</tr>
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</table>

**Table 8. Split period performance results**

Table 8 shows split period performance statistics with p-values in parentheses. The fund returns include dividends and the fee rebate in PPS. Alphas are expressed on an annual basis by multiplying the monthly alphas by 12.
Overall, we find a neutral performance for the five different fund portfolios in all performance models net of the PPS fee. However, our results do indicate a relationship between activity and performance, although not statistically significant. By the end of 2011, the accumulated value of the portfolio of Diversified Stock Pickers is 10% higher than the SIXPRX (Figure 9). Conversely, the other four portfolios have lower accumulated values than the SIXPRX. When further examining the effects of fees and performance, some interesting results appear. We find that the PPS rebate is important especially for the Closet Indexers. If the PPS rebate would not have existed, the portfolio consisting of the Closet Indexers would have shown significant negative alphas in all three regression models. Even if the Closet Indexers do not underperform when we add on the PPS rebate, our results do indicate that the Diversified Stock Pickers generate higher abnormal returns compared to the Closet Indexers. Thus, it seems like the funds with relatively high Active Share and medium-to-low TEV are able to generate higher alphas compared to funds with low Active Share and medium-to-low TEV, even if the former category charges higher fees.

In comparison, Petajisto (2013, p. 35) finds that the Closet Indexers underperform net of fees and the Diversified Stock Pickers outperform. He also finds that the Diversified Stock Pickers show a significantly higher abnormal return compared to Closet Indexers. Our results indicate a similar relationship in the Swedish PPS. We find that the difference between the Closet Indexers and the Diversified Stock Pickers is marginally significant before fees, which can be explained by the relatively higher fees charged by the Diversified Stock Pickers. However, we do not find positive abnormal returns for the Diversified Stock Pickers, even before fees. The difference of our results compared to Petajisto (2013, p. 35) might be explained by the construction of our portfolios. Because we investigate a limited number of funds, we need to sort the funds based on tertiles rather than quintiles. This is because we want to be sure that there is at least one fund in every portfolio for each time period. This means that our groups possibly include a broader type of funds in terms of Active Share and TEV. Thus, the portfolios might not be as homogenous as in Petajisto’s (2013) and Cremers and Petajisto’s (2009) studies.

Johansson and Määttä (2012) find that Swedish fund managers outperform their benchmark by 1.7% annually before fees. However, their study covers the period from 1993 to 2011. Examining the split period analysis by Johansson and Määttä (2012, p. 49) reveals that until 2002, the funds in their sample generate excess returns. Conversely, the funds perform neutrally from 2003 to 2011. Hence, our results are consistent with the results of Johansson and Määttä (2012).

Higher activity seems to explain some performance differences between the Diversified Stock Pickers and the Closet Indexers. However, the high Active Share and TEV for the Concentrated Stock Pickers do not result in excess returns. This can be explained by the reasoning from Jones and Wermers (2011, p. 40), who state that high Active Share and TEV can be the result of fund managers’ overconfidence. Therefore, Jones and Wermers’ (2011, p. 40) recommendation to select funds with a high Active Share but stable TEV seems reasonable. By doing this, investors minimize the risk of ending up with an overconfident fund manager or a Closet Indexer.

5.4 Factor exposure analysis
We conduct a time-series factor analysis of Carhart's model for each portfolio to further investigate the time-series development of the factors related to the five portfolios. Figure 10 presents the monthly rolling alpha for the five portfolios. The value of the rolling
alpha is annualized and calculated using a 36-month rolling window regression model. The graph gives an intuitive picture of how the portfolios have performed over the previous 36 months at any point of time (monthly). At most of the time, the Diversified Stock Pickers show economically significant alpha compared to their peers. Factor Bets also demonstrate positive alpha from 2007. Alphas of other three portfolios appear to be below zero. The most fluctuating portfolio is the Concentrated Stock Pickers that have a range of rolling alpha from -6% to nearly +1%. As expected, the Closet Indexers and Moderately Active show mediocre performance with alphas close to zero.

![Figure 10](image_url)

**Figure 10. Time series of Alpha - rolling 36 months**

Furthermore, we measure the portfolio exposures to Carhart’s four factors: $R_m - R_f$, SMB, HML and MOM (see Appendix 3). As previously showed, we find that funds with higher Active Share tend to have a lower exposure to market movements. However, the market exposure for the funds with high Active Share show a higher volatility compared to the funds with lower Active Share. This might reflect that funds with high Active Share are more active and therefore actively change their exposure to the movements of the market.

Examining the exposure to the SMB factor, the Concentrated Stock Pickers show a declining exposure to small-cap stocks over time. Conversely, the Diversified Stock Pickers show an increase in exposure to small-cap stocks around 2008. Hence, funds with high Active Share are more exposed to small-cap stocks and show a greater variation in their portfolio structure. This finding might reflect the higher activity among funds with high Active Share.

Continuing with the HML factor, the Concentrated Stock Pickers and the Diversified Stock Pickers appear to employ different investment strategies depending on the situation of the market. Before the financial crisis in 2008, the funds with high Active Share tend to invest in value stocks that have high book-to-market values. In the second half
of the period, they adjust their strategy and shift focus to growth stocks that have low book-to-market values.

Lastly, the exposure to the MOM factor reveals that the Concentrated Stock Pickers and the Diversified Stock Pickers have a higher variation in the exposure to momentum stocks compared to the other portfolios before the financial crisis in 2008. However, the Concentrated Stock Picker's momentum exposure is largely negative after the financial crisis, while the Diversified Stock Pickers exposure is close to zero. Overall, the factor analysis is consistent with Table 8 in which the Concentrated Stock Pickers show a positive alpha in Jensen's model but a negative alpha in Fama and French’s model and Carhart’s model from 2002 to 2006. This is because the Concentrated Stock Pickers have had a large exposure to small-cap stocks and value stocks during this period.

According to Huang et al. (2010), the shift in market exposure can be an indication of fund activity but also fund managers’ incentives to increase the short term performance in order to attract more customers. This means that risk shifting can be either good or bad. We find that both Diversified Stock Pickers and Concentrated Stock Pickers have a relatively high volatility in their factor exposures. However, the Concentrated Stock Pickers show no indications of generating a higher performance. Hence, it is possible that Concentrated Stock Pickers shift their risk exposure for the purpose of attracting customers while the Diversified Stock Pickers actively shift their risk in order to generate persistent good performance.

5.5 Predictors of alpha
We run a predictive panel regression in order to test if Active Share and TEV are related to future performance. The results from the predictive panel regression are presented in Table 9. We find strong evidence of heteroscedasticity. Therefore, similar to Cremers and Petajisto (2009, p. 3358) who cluster residuals by year, we cluster residuals by quarter. In line with their findings, we find evidence that TEV is negatively related to the 12 month alpha. The negative relation implies that funds that have shown historically high TEVs have lower alphas than funds with lower TEVs. However, Active Share shows no relationship with alpha. In contrast, Cremers and Petajisto's (2009, p. 3358) results show that both Active Share and TEV are related to the future performance while Petajisto (2013, p. 38) only finds Active Share to be related.

The non-significant relation between alpha and Active Share can be explained by the market efficiency. If the market is efficient, it should be difficult to generate abnormal returns by stock selection strategies. Furthermore, the negative relation between TEV and alpha can also be explained by market efficiency. It is possible that funds with higher TEV actively take bets against the market. However, if the market is efficient the funds will systematically take irrational bets which would negatively affect the alphas. As proposed by Jones and Wermers (2011, p. 40), it is likely that the high TEV is an indication of fund manager overconfidence. This confirms our previous discussion in the chapter 5.3.

The one quarter return over index is negatively related to alpha. Hence, there is evidence of a kind of momentum effect, that is, buying past losers generates higher future alphas when controlling for the other variables. This confirms Cremers and Petajisto’s (2009, p. 3358) showing a negative relationship between the return over index for year t-3 to t-1 and alpha. Thus, our results also show a momentum like effect on alpha but for a shorter time period. However, Cremers and Petajisto (2009, p. 3358) do not find a
significant relationship between year t-1 to t for the return over index variable and alpha.

<table>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
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<tr>
<td>Active Share</td>
<td>0.008</td>
<td>0.011</td>
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</tr>
<tr>
<td></td>
<td>(0.576)</td>
<td>(0.443)</td>
<td></td>
</tr>
<tr>
<td>TEV</td>
<td>-0.069</td>
<td>-0.182</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.383)</td>
<td>(0.004)</td>
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<td></td>
<td>(0.630)</td>
<td></td>
<td></td>
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<tr>
<td>Concentrated Stock Pickers</td>
<td>-0.011</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.194)</td>
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<td></td>
</tr>
<tr>
<td>Factor Bets</td>
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<td>(0.413)</td>
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<tr>
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<td>(0.805)</td>
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<tr>
<td>Return over index, t-1 to t</td>
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<td>-0.311</td>
<td>-0.312</td>
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<td></td>
<td>(0.013)</td>
<td>(0.001)</td>
<td>(0.001)</td>
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<td>lg(TNA)</td>
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<td>0.003</td>
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<td>(0.010)</td>
<td>(0.061)</td>
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<tr>
<td>Quarter dummies</td>
<td>No</td>
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</table>

Table 9. Predictors of alpha

Table 9 shows the results of a panel regression on the four-factor alpha with p-values in parentheses. The number of stocks variable are divided by 100. The lg(TNA) variable is calculated as the log10 value of TNA divided by one billion.

When including quarter dummies we find indications that the number of stocks and fees are negatively related to the future alpha. Conversely, the size of funds is positively related to future alphas. This indicates that when controlling for the other variables, larger funds, funds that hold fewer stocks and funds with lower TER fees generate higher future 12 month alphas.
Similar to Petajisto (2013, p. 38), we also test the predictive power of dummy variables that represent the portfolio category a fund belongs to. We find no significant difference of all categories compared to the Closet Indexers. In contrast, Petajisto (2013, p. 38) finds that the Diversified Stock Pickers are positively related to future alpha. These findings can also be evidence of market efficiency. In an efficient market, it should be hard to identify the funds that generate higher alpha than other funds.

5.6 Summary of findings

Overall, our results show that activity in terms of Active Share of the Swedish equity funds in the PPS is lower compared to the US studies by Cremers and Petajisto (2009) and Petajisto (2013). We find that the TER fee is the strongest related variable to Active Share. Funds with higher TER on average have a higher Active Share. This evidence indicates that higher fund activity can be related to the resource demanding security analysis. The number of stocks held by a fund is also significantly related to Active Share. We attribute these findings to the relative amount of stocks available on the Swedish stock market compared to the US market. US funds have more stocks to choose from while Swedish funds have relatively fewer stocks to choose from.

We find neutral performance for a portfolio with the equally weighted returns of all funds in our sample. When examining the performance of the five portfolios sorted on Active Share and TEV, we find that the Diversified Stock Pickers outperform the Closet Indexers. This finding is in line with the findings of Cremers and Petajisto (2009) and Petajisto (2013). Furthermore, the Closet Indexers significantly underperform in all three performance models net of all fees. However, we do not find significant abnormal returns for any of the five portfolios in the three different fee settings. The only portfolio that generates a positive alpha net of the PPS fee, although not significant, is the Diversified Stock Pickers. This finding is also confirmed in the rolling alpha analysis. Furthermore, holding the portfolio of Diversified Stock Pickers would have yielded a roughly 10% higher portfolio value compared to holding a portfolio that exactly followed SIXPRX.

When running a split period regression we find that the Diversified Stock Pickers have outperformed the Closet Indexers from October 2002 to December 2006 in Jensen’s model. However, this finding disappears in Fama and French’s model and Carhart’s model. By investigating the factor exposures of the portfolios, we find that the differences in performance between the Jensen’s model, Fama and French’s model and Carhart’s model can be explained by the higher factor exposure of the Diversified Stock Pickers and the Concentrated Stock Pickers. Furthermore, we find that the volatilities of the exposures to the different factors seem to be higher for the Diversified Stock Pickers and Concentrated Stock Pickers. We attribute this finding to higher activity of funds with high Active Share. However, the Concentrated Stock Pickers do not seem to be able to generate abnormal returns by their higher activity. Therefore, it is possible that these fund managers exhibit overconfidence or risk shifting tendencies.

When investigating the predictive powers of Active Share and TEV, we find no evidence that Active Share predicts higher future alphas. However, TEV seems to be negatively related to alpha. We attribute this as evidence of market efficiency because it should be hard to actively generate abnormal returns in an efficient market. Conversely, funds that hold fewer stocks, are larger in size and less expensive generate higher future alphas. Furthermore, larger past underperformance also seems to predict higher future alphas.
6 Conclusion

In this study, we investigate activity and performance of 64 actively managed Swedish equity funds in the Swedish Premium Pension System (PPS) from October 2002 to December 2011. To measure fund activity we use the relatively new measure Active Share in combination with Tracking Error Volatility (TEV). Based on the results of the study, we conclude four main findings.

Firstly, we find that the Swedish equity funds in the PPS on average demonstrate a passive management style in terms of Active Share. Petajisto (2013) argues that a fund should be considered as passive if the Active Share is less than 60%. Our results show that there are proportionally 30% of funds that have Active Share above 60% and 10% for the funds have Active Share higher than 80%. We also find that fees and the number of stocks held by funds are closely related to Active Share. Funds with higher TER fees and fewer stocks on average have higher Active Share. Furthermore, we find indications that TEV is positively related to Active Share. However, together the variables have low explanatory power on Active Share. This is evidence of Active Share being an independent measure of fund activity.

Secondly, when we sort funds based on Active Share and TEV, we find no evidence that actively managed funds, as a group, outperform their benchmark indices. This result confirms the EMH, stating that no one should be able to persistently generate higher return than the market (Fama, 1970). Similarly, Johansson and Määttä (2012) also find that Swedish equity funds do not outperform the market net of fees. Therefore, these findings indicate that the Swedish equity funds in the PPS cannot generate excess returns and the Swedish stock market appears to be efficient.

Thirdly, we find indications that the degree of activity is related to fund performance in the PPS. Given similar TEV, the funds with the highest Active Share, as a group, outperform the funds with the lowest Active Share. This is in line with the results from Cremers and Petajisto (2009) and Petajisto (2013). Our result is consistent when comparing gross returns, net returns in the PPS and net returns on the retail market. Furthermore, we find that holding a portfolio of funds with high Active Share and medium-to-low TEV would have resulted in a roughly 10% higher portfolio value compared to the SIX Portfolio Return Index. Thus, for an investor who aims to invest in actively managed funds, the result of this study suggests that funds with high Active Share and moderate TEV would be an appropriate choice compared to other active funds. One should however avoid investing in funds with low Active Share and medium-to-low TEV.

Lastly, in order to find out if it is possible to form a practical strategy to generate excess returns, a series of predictors for future alpha are tested. We do not find any predictive ability of Active Share for the future alpha. Dummy variables representing the five portfolios of funds, categorized by Active Share and TEV, can neither predict the 12-month future alpha. TEV is however negatively related to the future alpha. The results are partly in line with Cremers and Petajisto (2009), who find that Active Share is positively related to future alpha and TEV is weakly negatively related to future alpha. The negative relation between alpha and TEV indicates that fund managers can be overconfident.

An investor should be aware that it is difficult to select funds that are active and simultaneously generate high returns. Our results suggest that investors should look for funds with medium-to-low TEV and high Active Share. However, this is not a guarantee for
receiving higher than normal returns. There is a risk of ending up with a bad performing active fund while the chance is very small to end up with an outperforming fund. Therefore, the investors who do not want to engage in thorough fund analysis should choose index funds.

As our results demonstrate, active Swedish equity funds are on average relatively passive compared to US funds, given a similar fee structure. This raises the question about whether it is an ethical behavior for fund companies to charge higher fees when being passive. One could argue that the individuals should bear the risk of ending up with an expensive but passive fund. However, due to the vast amount of funds available in the PPS, it is difficult for individual investors to choose five funds and maybe even harder to assess the degree of fund activity. Instead, we believe that the responsibility of providing high quality funds in the PPS should rest on the Swedish authorities. The Swedish Pensions Agency should act more responsibly when adding new funds to the PPS. Therefore, the methods of evaluating fund activity and the results in this study can be used as a basis for the Swedish Pensions Agency when making such decisions.

6.1 Future studies

Our sample period is between October 2002 and December 2011 due to data availability. Thus, if possible, longer sample period can be taken in order to have a thorough examination of consistency in fund performance. Moreover, due to time constraints, we used monthly data when estimating the fund performance. Future studies could use daily or weekly return data and compare the results.

Despite that Cremers and Petajisto's (2009) study and Petajisto's (2013) study are similar, they differ on one important point. Petajisto (2013) investigates active funds and uses the indices stated by the funds themselves as benchmark. On the other hand, Cremers and Petajisto (2009) investigate both active and index funds. They assign the benchmark index that produces the lowest Active Share to the funds. Because we follow the approach of Petajisto (2013) it would be interesting to conduct a study following Cremers and Petajisto's (2009) approach. It would be interesting to compare Active Share and TEV of the index funds with the active funds and the additional indices. Future studies could also include more indices. It would also be interesting to compare the individual attributes of the funds in the five portfolio categories. For example, a comparison of individual performance among funds within the same portfolio could be conducted.

Even though we have tried to follow the approach of Cremers and Petajisto (2009) and Petajisto (2013) as close as possible, there are still many tests and variables in their studies that we have not covered. For example, variables that are excluded in our study can be used in the future when testing the predictors of alpha and the determinants of Active Share.

Students who are interested in conducting a similar study should be aware of that calculating Active Share quarterly for many funds and indices is technical and requires good computer knowledge, preferably some programming experience. Also, the calculations require access to a large amount of data from various sources.
7. References


## Appendix 1. Portfolio performance net of fees

<table>
<thead>
<tr>
<th>Label</th>
<th>Portfolio</th>
<th>Jensen’s model</th>
<th>Fama and French’s model</th>
<th>Carhart’s model</th>
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</thead>
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<tr>
<td>5</td>
<td>Diversified Stock Pickers</td>
<td>0.87%</td>
<td>0.09%</td>
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<td></td>
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<td>(0.58)</td>
<td>(0.95)</td>
<td>(0.92)</td>
</tr>
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<td>(0.72)</td>
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<td>(0.36)</td>
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<td>(0.34)</td>
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</tr>
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</table>

### Table 10. Portfolio performance net of fees

The table shows regression statistics for the time period October 2002 to December 2011, with p-values of the estimates in parentheses, for the fund portfolios defined in figure 2. The fund returns are adjusted for dividends and the fee rebate in PPS. Estimates are presented for Jensen’s alpha, the three-factor model and the four-factor model regressions respectively. Alphas are expressed on an annual basis by multiplying the monthly alphas by 12.
## Appendix 2. Portfolio performance before TER fee

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<th>Fama and French’s model</th>
<th>Carhart’s model</th>
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<tr>
<td></td>
<td></td>
<td><strong>(0.04)</strong></td>
<td><strong>(0.09)</strong></td>
<td><strong>(0.08)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>All</strong></td>
<td><strong>0.45%</strong></td>
<td><strong>0.13%</strong></td>
<td><strong>0.16%</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>(0.66)</strong></td>
<td><strong>(0.89)</strong></td>
<td><strong>(0.87)</strong></td>
</tr>
</tbody>
</table>

**Table 11. Portfolio performance before TER fee**

The table shows regression statistics for the time period October 2002 to December 2011, with p-values in parentheses, for the return differences between Diversified Stock Pickers and Closet Indexers. The fund returns include dividends and are before fee reduction. Estimates are presented for Jensen’s alpha, the three-factor model and the four-factor model regressions respectively. Alphas are expressed on an annual basis by multiplying the monthly alphas by 12.
Appendix 3. The portfolios’ factor exposures

Figure 11. Market exposure (β)

Figure 12. SMB exposure
Figure 13. HML exposure

Figure 14. MOM exposure