The Relation of Fund Characteristics and Fund Family Membership to Equity Funds' Risk-Taking Behavior - Empirical evidence from the equity fund market in Finland

Finance
Master's thesis
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2009

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Master's Thesis in Finance
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Abstract
December 17, 2009

THE RELATION OF FUND CHARACTERISTICS AND FUND FAMILY MEMBERSHIP TO EQUITY FUNDS' RISK-TAKING BEHAVIOR

PURPOSE OF THE STUDY

The first objective of this thesis is to reveal if equity funds with certain characteristics (e.g. large asset size, high fees) commit to certain type of risk-taking behavior in the Finnish fund market. Fund volatility is employed to measure funds' risk-taking behavior, and a market-adjusted volatility ratio is introduced in order to commensurate volatility levels of funds operating in different markets.

The second objective is to assess if equity funds' membership in a retail bank-backed fund family affects funds' risk-taking behavior (family fund) in a way that their behavior differs from the risk-taking of funds with no retail bank background (non-family fund). Also, the goal is to find out if riskier or less risky funds are clustered into certain fund families.

DATA

The thesis uses monthly equity fund data collected from the official Mutual Fund Reports, published by the Federation of Finnish Financial Services. The sample includes all equity funds marketed in Finland and included to the Mutual Fund Reports during the sample period. The aggregate dataset consists of 27,372 monthly observations, covering a period from January 1998 to July 2009. Monthly figures for fund characteristics are collected, and monthly volatility levels for both sample funds and their respective market benchmark indices are gathered. Market indices are MSCI Barra indices, and identical with the official benchmarks used on the Mutual Fund Reports.

RESULTS

The main characteristic related to risk-taking is the size of assets under management (AUM). Smaller funds commit to higher volatility levels both in absolute and market-adjusted terms. Lower subscription fees are charged by funds that favor higher volatility levels, whereas other fund fee types show no statistical relation. Funds having performed worse in previous month commit to higher risk levels during the following month whereas well-performed funds tend to commit to relatively lower risk levels in the following period.

The second main finding states that funds belonging to a fund complex of a Finnish retail bank differ from the funds of non-retail bank funds. Within the nine largest retail bank fund families in Finland, risk is not randomly distributed across families, and low risk funds tend to be concentrated in smaller fund families. The risk concentration in turn can have a major impact on the risk profile of an investor confining her investments to a single fund family.

KEYWORDS

Equity fund, volatility, fund family, fund return, fund size, subscription fee

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Tiivistelmä
17. joulukuuta 2009

RAHASTOMUUTTUJIEN JA RAHASTOPERHEESEEN KUULUMISEN VAIKUTUS OSAKERAHASTOJEN RISKINOTTOKÄYTTÄYTYMISEEN

TUTKIMUKSEN TAVOITE

Tutkimuksen tavoitteena on selvittää, onko osakerahastojen piirremuuttujilla (kuten rahaston koolla tai palkkioiden suuruudella) yhteyttä rahastojen riskinottokäyttäytymiseen. Riskinottokäyttäytymistä kuvataan volatiliteetilla. Lisäksi riskinottoa mitataan markkinakorjatulla volatiliteettiluvulla eri markkinoilla operoivien rahastojen suhteuttamiseksi.

Toisena tavoitteena on tutkia, onko vähittäispankkitaustaisten rahastoyhtiöiden rahastojen ja ei-vähittäispankkitaustaisten rahastoyhtiöiden rahastojen riskinottokäyttäytymisessä eroja. Lisäksi tavoitteena on selvittää, onko riski jakautunut tasaisesti eri vähittäispankkien rahastoperheisiin vai ovatko joidenkin rahastoperheiden rahastot riskisempiä kuin toisten.

AINEISTO

Tutkimuksessa käytetään kuukausittaista osakerahastodataa, joka on kerätty Finanssialan Keskusliiton julkaisemilta Rahastoraporteilta. Aineisto sisältää kaikki Suomessa markkinoidut osakerahastot, jotka otosperiodin aikaan ovat olleet Rahastoraportilla. Koko aineisto käsittää 27,372 kuukausittaista rahastomuuttuja- ja volatiliteettihavaintoa ja kattaa periodin 1/1998–7/2009. Lisäksi aineisto sisältää kuukausittaiset havainnot rahastomuuttujista sekä kuukausittaiset volatiliteettitasot rahastoille ja vertailuindekseille. Rahastojen vertailuindekseinä käytetään MSCI Barran markkinaindeksejä, joita on käytetty rahastojen virallisina vertailuindekseinä Rahastoraporteilla.

TULOKSET

Merkittävin osakerahastojen riskinottokäyttäytymiseen liittyvä muuttuja on rahaston pääomien koko. Pienemmillä rahastoilla on korkeampi volatiliteettitaso, mitattuna sekä absoluuttisesti että markkinakorjatusti. Korkeamman riskitason rahastot myös veloittavat matalampia merkintäpalkkioita. Lisäksi edellisellä periodilla huonommin menestyneiden rahastojen riskitasot ovat seuraavalla periodilla suhteessa korkeammat kuin edellisellä periodilla hyvin menestyneillä rahastoilla.

Vähittäispankkitaustaisten rahastoyhtiöiden rahastot poikkeavat riskinottokäyttäytymiseltään muiden rahastoyhtiöiden rahastoista. Yhdeksän suurimman suomalaisen vähittäispankkiperheen sisällä korkean ja matalan riskin rahastot ovat keskittyneet tiettyihin rahastoperheisiin, ja pienemmillä rahastoperheillä on suhteessa enemmän matalariskisiä rahastoja kuin suurilla rahastoperheillä. Riskikeskittymillä voi puolestaan olla merkittävä vaikutus niiden rahastosijoittajien salkussa, joilla rahasto-omistukset ovat keskittyneet vain yhteen rahastoperheeseen.

AVAINSANAT

Osakerahasto, volatiliteetti, rahastoperhe, rahaston tuotto, rahaston koko, merkintäpalkkio

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1 INTRODUCTION

1.1 Motivation of the study

"Put all your eggs in one basket, and watch that basket."

Investment advice by Mark Twain

The managers of active mutual funds construct portfolios with specific risk characteristics in order to beat their benchmark indices. Actively managed mutual funds can strive for offering whether lower or higher volatility portfolio than the benchmark index but altogether, the fund should generate excess returns in order to offer a motivation for investing into the actively managed fund instead of in passive index fund. In turn, investors invest in mutual funds since they are generally acknowledged to offer 1) diversification benefits, 2) professional asset management and 3) lower marginal costs compared to direct investments.

Previous academic studies since Jensen (1968) largely show that an average equity fund rarely outperforms passive benchmark indices. If the fund proves to beat the passive index in one year, the probability of performance persistence during following years is fairly low. However, actively managed mutual funds choose continuously risk levels that deviate from the one of their benchmark index. Thus, half of the managers of active mutual funds pursue investments decisions that often deteriorate fund's overall performance rather than generate positive alphas. If it is acknowledged among fund managers that roughly only half of the funds are able to beat their benchmark index, why do they repeatedly choose risk levels and portfolios that deviate from the ones of passive benchmark indices? In addition to the hunt of superior returns, do some other variables explain the risk-taking behavior of mutual funds?

Recent academic studies present several incentives which may drive mutual funds and managers within specific investment category to commit to certain kind of risk-taking behavior. One branch of the research indicates that incentive fee structures explain some part of funds' risk-taking [see e.g. Elton, Gruber and Blake (2003)], whereas other studies show that characteristics of fund managers can have significant role in managers' risk-taking behavior [see e.g. Golec (1996) and Chevalier and Ellison (1999)]. However, most of the time the fund manager does and even cannot act based on his personal interests. Asset management can be significantly dependent on the fund characteristics and operational strategies of an

individual fund, on a complex consisting of several funds or on the overall strategy of the fund company. Similarly to these fund characteristics (e.g. fee structure and fund size), membership in a fund family consisting of several fund siblings may function as the kind of externality inducing the fund to commit to certain type of risk-taking behavior. In more detail, how much do these externalities or fund characteristics tell about the risk-taking behavior of the fund and to how large extent are they related to funds' risk-taking behavior?

By August 2009, the capital invested in domestic mutual funds had grown to 48.1 billion euro in Finland. More than 75 percent of this capital was invested in mutual funds belonging to a complex consisting of several funds, or *a fund family*, managed by a retail bank operating in Finland. By the same time, mutual funds offered asset management to over 2.38 million Finnish fund investors – over 90 percent of these investors had invested in mutual funds belonging to the few largest fund families.

Across fund families, 62.2 % of the assets in Finnish mutual funds were managed by two major retail bank-backed fund companies; measured by the number of investors, the two leading fund companies captured 65 % of all fund shareholders. With high probability, the main reason behind these investment decisions was rather the ease of combining banking services and investment management than a throughout and reasoned comparison of attractive and suitable investment alternatives.

In the United States, many investors are obliged to concentrate their investments into one fund family due to the restrictions of 401k retirement plans [Elton, Gruber and Blake (2006)]. However in Finland, the majority of private investors hold shares in funds that belong to a single fund family although there does not exist any restrictive factors why the investor would have to confine her investments to a single fund family. The fund market in Finland is dispersed only to some extent, so most of the capital is concentrated into few larger bank-managed families. The retail bank-managed funds in turn have found to yield lower returns [Knuutila, Puttonen and Smythe (2007)].

Massa (2003) argues that the investor first chooses the fund family and only after that the individual fund in which to invest. Investors may also prefer to invest in one family as it reduces the search costs incurred, explaining a significant part of fund investor behavior [see e.g. Sirri and Tufano (1998)]. The investor behavior described would at first appear rational, but in this case, the investor would not only concentrate his wealth into family funds instead

of allocating one part to non-family funds, but would also confine his investments into a single fund family. How does the situation change if the funds belonging to the same family follow similar investment strategies, concentrate on same industries or even buy same companies? Similar strategies of individual funds in the family can result in a situation where family fund returns are highly correlated and low and high risk funds are concentrated into certain families [Elton, Gruber and Green (2007)]. This in turn would mean an increase in the distribution of risk across investors and in the probability that the investor encounters a bad outcome by investing only in funds of a single family.

1.2 Objective of the study

The objective of this thesis is to examine if fund characteristics, such as fund size or fees, are related to the risk-taking behavior of equity funds. Secondly, the purpose is to reveal whether family funds of large retail banks operating in Finland commit to different kind of risk-taking behavior than non-family funds whose distribution channels are not that extensive and are thus not as easily available for the Finnish investors. Finally, investors in several countries, including in Finland, confine their fund investments to a single fund family, which is why one of the objectives is to uncover if high or low risk funds are concentrated into certain families.

This thesis contributes to the prevailing academic studies in two ways: first, it reveals several motivators for mutual funds' risk-taking behavior that have been only separately covered in previous studies; this is advantageous since it allows the recapitulation of findings and examination of possible linkages between these motivators. Second, the analysis on the differences of family and non-family funds brings up new evidence about the effect of fund family membership on the behavior of individual funds. On the practical side, this thesis importantly contributes to the studies on the highly bank-dominated Finnish mutual fund market by showing, that the concentration of capital to certain families does not necessarily motivate the families in their product proliferation and can significantly affect the risk profile of investor's portfolio.

1.3 Main findings

This thesis shows that several fund characteristics can be related to the risk-taking behavior of mutual funds. Consistent with previous academic studies, the thesis shows that funds smaller in net asset value (NAV) commit to higher risk levels and to more aggressive risk-taking behavior. In terms of risk-return relationship, superior returns in prior period seem to be

followed by relatively lower volatility levels, implying that funds do lock into profits rather than overconfidently maintain or shift to higher risk levels. The results show strong evidence on high-risk funds trying to attract capital inflows by lower subscription fees. Measured both with raw and market-adjusted volatility, the relation of some fund characteristics and risk level differs depending if risk-taking is examined in relation to market risk levels. Finally, the findings imply that the relation of risk-taking behavior and fund characteristics is conditional to the extent fund's volatility deviates from the market volatility.

I find evidence that family and non-family funds differ by their risk-taking behavior, a phenomenon explained by the differences in their fund characteristics. The results show that also in the fund market in Finland, high and low risk funds are concentrated into certain families, and that especially funds of smaller families tend to be less aggressive in their risk-taking behavior. Taken together, the findings suggest that externalities are closely related to the risk-taking behavior of funds, and that the bank-dominated fund market in Finland may not be the most functional one from the perspective of an individual investor – mainly due to the fact that the risk across investors is not randomly distributed but clustered to the portfolios of shareholders owning funds in certain families.

1.4 Structure of the thesis

The structure of the thesis is organized as follows. Section 2 discusses the main findings of previous academic research and synthesizes the theories for the purpose of this study. Section 3 presents the hypotheses. Section 4 describes the methods applied in this study, whereas Section 5 presents the dataset and descriptive statistics of the sample. Section 6 is the most relevant for the thesis as it presents the findings and analyzes the results. Section 7 concludes.

2 THEORETICAL BACKGROUND FOR MUTUAL FUNDS' RISK-TAKING BEHAVIOR

The risk-taking behavior of mutual funds has been subject to a broad academic research in terms of what actually drives funds and fund managers in their risk-taking behavior. Following the findings of preceding studies, the next four subsections categorize the main three incentives for funds' risk-taking behavior. Each of these incentives is then analyzed in light of how they can drive mutual funds to commit to certain type of risk-taking behavior. Finally, the theoretical discussion is guided towards the hypothesis that, in addition to other previously studied attributes, also fund characteristics and fund family membership could be exploited in evaluating the risk-taking behavior of mutual funds.

2.1 Categorization of risk-taking incentives

The incentives that steer mutual funds' risk-taking behavior can be divided into several categories depending on if they are set externally or relate to a more personal level of fund manager. The incentives that have been found to affect the risk-taking differ by their visibility to investors; namely, only a small fraction is salient or regularly reported, and it is not possible to even evaluate many of them due to the fact that they can relate to personal characteristics of the manager. Thus, in many cases it is difficult to measure what kind of impact the incentives can indirectly have on the value of investor's portfolio.

In their study on the effects of prior performance on the following managerial risk-taking, Ammann and Verhofen (2007) divide the incentives that steer fund managers' decision-making into two categories that relate to managerial compensation and investor behavior. Golec (1996) in turn studies the impact of managerial characteristics on fund performance and behavior and argues that "managers make investment decisions based upon their personal abilities and risk preferences". For the purpose of this study, I define three incentive categories which I argue to explain the risk-taking behavior of mutual funds:

A) Compensational variables

B) Behavioral variables

C) Organizational fund variables

Compensational variables relate to compensation schemes and bonuses managers receive regularly. For example, the manager can have interests in maintaining higher risk levels as it can have a positive impact on fund's return and consequently on manager's personal wealth through a compensation scheme. In turn, behavioral variables are internal and generated on a more personal level of the fund manager; for example, the manager can be induced to adjust fund's risk level in order to beat the benchmark index and to obtain a favorable ranking and eligible status in the eyes of market participants.

Organizational fund variables relate to fund characteristics that the manager cannot affect directly or at all. For example, legal investment limitations, investment policy of the fund and fund attributes defined in the market can construct external limits for risk-taking behavior. Managers of younger funds can be more active risk-adjusters as they aggressively try to survive during the first critical period by attracting new capital inflows, in addition to which risk levels can be adjusted in order to maximize the profits collected through different fees. The complexity and structure of the fund family can also create different set of objectives for funds in the family and therefore directly affect the risk-taking of individual fund.

Both compensational and behavioral incentives are fairly difficult to observe although there has been a tendency in favor of for example public information closures of managerial ownership and compensation schemes; namely, the requirements for more detailed reporting of managerial ownership and compensation schemes are justified due to information asymmetry and agency problems that exist in the mutual fund market.[1]

Instead, organizational fund attributes that are reported regularly or otherwise salient to investors (e.g. fund's asset size, ownership structure and distribution channel) have attracted mainly secondary role in previous studies. Still, it can be argued that organizational fund variables set the outermost limits for fund's risk-taking behavior; consequently, they can have contribution in estimating fund's risk-taking behavior, which means that they could also have direct effects on the decision-making of an investor who tries to estimate how fund's risk profile fits to his aggregate portfolio. Before examining the role of organizational fund attributes in the risk-taking behavior of funds, it is important to understand the other two incentive categories in order to comprehend how all the three contribute to mutual fund

[1] See for example http://www.sec.gov/news/speech/spch051205css.htm. "Conflicts of Interests in Asset Management", May 12, 2005, Chester S. Spatt.

behavior. Thus in the next three subsections, I discuss each of the three incentive categories separately.

2.2 Compensational variable as an incentive

Increasing requirements for transparency and disclosure of additional information have motivated academic instances to estimate what are the actual effects of compensation schemes and managerial ownership on fund performance [see e.g. Carpenter (2000), Elton, Gruber and Blake (2003) and Kumlin (2008)]. In addition, managerial compensation schemes have attracted attention as it has not been clear if they are efficient enough to serve their initial purpose of eliminating agency problems. Based on both academic research and discussion of practitioners, it is ambiguous how for example augmented disclosure of the information on managerial compensation schemes would serve for the decision-making process of investor if the effects of the compensation schemes on managerial behavior are not clear and consistent.

In general, fund managers receive economic incentives, or compensation based on their relative performance and assets under management (AUM). Chevalier and Ellison (1997) study managerial incentives in terms of the shape of flow-performance curve. They employ a sample of growth and income funds from 1983 to 1993 to estimate the shape of the flow-performance relationship. Their semiparametric model shows that the curve is convex and that the significant deviation from the linearity in particular explains the risk taking behavior of fund managers. Due to the convexity, the flow-performance relationship serves as an incentive scheme set by the market participants, and fund managers alter their risk levels according to the incentivizing effects of this relationship. The fund managers are induced to increase risk since the fund is rewarded with larger capital inflows if it is able to generate superior performance, but on the other hand, is not commensurately punished if the higher risk-taking ends up to large losses. If the investors do not redeem their shares in case of bad performance, this means that funds do not necessarily have the incentive to move to more conservative risk levels. The compensational incentives can be directly derived from the findings of Chevalier and Ellison: as the managers strive for both increasing the capital inflow and AUM and maximizing the profit in order to obtain larger economic compensation, they evidently take more risk due to the convex shape of the curve.

Carpenter (2000) models managerial risk-taking in the framework of risk aversion when the compensation scheme is a call option on fund's assets. She starts solving the manager's

investment problem under the assumption that if the manager aims at maximizing personal utility, the option ends up deep in or deep out of the money. The manager is hence induced to increase fund volatility as the value of option goes to zero, an evolution analogous to the one created by the flow-performance convexity. However, Carpenter suggests that option compensation does not necessarily lead to higher risk levels and may even induce the manager to adjust the fund volatility to lower levels than if the manager was trading for his own account, since the leverage inherent in the option increases manager's exposure to fund volatility. She also finds that options that are deep out of the money provide incentives for excessive risk-taking, a finding consistent with the theory of behavioral finance that investors tend to be more risk-seeking when a negative outcome is more prevalent.

Elton, Gruber and Blake (2003) study the impact of incentive fees[2] on fund managers' behavior. While studying the relation of beta, return (alpha) and incentive fees they find that mutual funds with an incentive fee system exhibit more aggressive risk-taking than funds that do not have incentive fees. They link the incentive-fee-funds to better stock selection ability which implies that the managerial compensation schemes function correctly from the point of agency-problem at least for these funds. Their results also show that managers increase the risk level after a period of poor performance which is consistent Brown, Harlow and Starks (1996) who suggest that the risk increase effect is even more dominant for mid-year losers who also tend to manipulate their volatility levels differently.

In aggregate, the previous literature implies that the year-end increase in risk appetite is due to the managerial compensation schemes that are based on annual fund flows and the level of funds' net asset value (NAV) at the end of the year. It also seems that the risk-taking behavior in the presence of a compensation plan does not necessarily amend the agency problem in the market for mutual funds, and this asymmetry originates from the convexity of flow-performance curve.

[2] Incentive fees are more commonly used among hedge funds, and they can be defined as reward structures that make management compensation a function of investment performance relative to some specific benchmark. For example, only 1.7% of all bond and stock mutual funds in 1999 had incentive fees [Elton, Gruber and Blake (2001)].

2.3 Behavioral variable as an incentive

Incentives for managerial risk-taking are behavioral if the fund manager is induced to conduct certain behavior to gain non-monetary and non-concrete recognition on a personal level. For example, a manager can be induced to make certain decisions about fund's risk level in order to try to obtain a higher performance ranking among the peer group. Fund's ranking within both peer group and against market benchmark index at the end of the year affect the amount of managerial compensation, but they also have direct impact on status-related factors of manager; the well-performing manager is perceived as a talent who has superior stock-picking abilities and the status is further enforced if the manager manages to generate positive alpha also in the following year.

Mutual funds and individual fund managers are ranked by several parties based on their performance, and the rankings have been found to have positive correlation with fund flows [see e.g. Goezmann and Peles (1997) and Sirri and Tufano (1998)]. For example, Brown, Goetzmann and Park (2001) study how the volatility level decisions of hedge fund managers and commodity trading advisors (CTAs) relate to their career concerns and fund survival. They argue that fund termination is a function of performance relative to industry benchmarks so that funds lacking in the industry are less probable to survive. Thus, reputation costs in the investment industry are highly dependent on manager's relative ranking points, and a bad status can dramatically affect the career of the manager.

Kosowski, Timmermann, Wermers and White (2006) in turn use a bootstrap analysis to uncover if star managers really exhibit stock-picking talent or if their superior performance is due to pure luck. In addition to the results supporting the superior talents of star managers, they find that funds often have dynamic strategies that are dependent whether on overall market movements or on fund's relative ranking among similar funds. Their findings thus also suggest that fund's risk-taking is closely related to its benchmark universe. Therefore, the manager has incentives for both ameliorating his ranking among the other fund managers and maximizing fund inflows next year.

2.3.1 Mutual fund tournaments

In previous academic research, the phenomenon of risk increase towards the end of the year is referred as *mutual fund tournaments* [see e.g. Brown et al (1996), Busse (2001), Koivulintu (2002) and Goriaev, Nijman and Werker (2005)] as the managers who lack benchmark

performance in mid-year strategically increase their portfolio volatility in order to beat or at least to catch up with their peer group. Controversially, funds having performed well during the preceding period tend to move to conservative risk levels.

Koski and Pontiff (1999) study the usage of derivatives in the mutual fund industry and find a negative relation between change in fund risk and prior performance within calendar year, and this relation is significantly less severe for funds using derivatives. Their findings are also consistent with the majority of academic research suggesting that the above-benchmark managers lock in to their profits towards the end of the year and consequently decrease their risk-taking.

On the other hand, Busse (2001) studies the tournament phenomenon with different method by using daily return data instead of monthly data. His results prove the tournament effect to disappear after controlling for the autocorrelation between daily returns. He also claims that irrespective of incentive fee contracts, the competitive environment in the mutual fund industry affect managers' risk taking behavior. Deriving from his arguments, the behavior of the manager can be seen as a function of the benchmark performance alongside with the incentives created by compensation schemes. As the above-benchmark manager receives non-monetary recognition from behalf of both investors and fund industry in addition to the monetary compensation, the argument strongly suggests that a large part of the managerial risk-taking is based on behavioral incentives.

Koivulintu (2002) studies the relation of risk-taking behavior and preceding returns of Finnish equity funds. By employing a sample consisting of all funds investing in Finnish equities during 1989-2000, he finds indications that also Finnish funds commit to tournament behavior. He shows that funds having performed well in the previous period tend to decrease their risk levels on the consequent period, whereas worse-performing funds are prone to increase their volatility towards the end of the year. In addition, he finds significant differences between the behavior of funds managed by larger retail banks and smaller fund companies; especially, bank-managed funds tend to offer significantly lower returns than non-bank funds.

2.3.2 Behavioral finance and risk-taking

In recent research, the concepts of behavioral finance have been related to managerial risk-taking. Carpenter (2007) argues for example that, irrelative of option compensation, the volatility of fund converges to the Merton constant[3] as asset value goes to infinity, providing that the fund manager has constant relative risk aversion (CRRA). The logic of Carpenter suggests that there exists a break point for manager's risk-taking behavior that is based on the magnitude of manager's risk aversion – when a certain break point is crossed manager's behavior is no longer dependent on external factors to the same extent. In this case, the risk-taking behavior of fund is significantly affected by the risk aversion level of the manager. Nevertheless, although the risk-taking behavior of individual investor is mainly driven by the person's level of risk aversion, fund manager has to first consider the external factors determining the limits for risk-taking. This means that the risk aversion of manager eventually has impacts only within the limits emerging from external factors.

Ammann and Verhofen (2007) approach managerial risk-taking from a Bayesian perspective and argue that managers update their beliefs according to their prior performance. They find that prior performance has a positive impact on fund's following risk level so that the well-performed managers are eager to take more risk in the following year, suggesting tendency of overconfidence for these managers as the study does not provide any proof of return persistence. Similar Bayesian models of fund managers' strategic behavior have been used in studies of Lynch and Musto (2003) and Dangl, Wu and Zechner (2008), for example. The implications of their studies, especially the usage of Bayesian perspective, relate closely to the concepts of anchoring and adjustment of reference point[4], well-known psychological heuristics in the behavioral finance literature. However, although fund managers would act as Bayesians and updated their behavior according to prior performance and fund market reactions, it does not necessarily signify that their behavior is biased. Fund managers' adjustment and anchoring for these purposes can serve as a rational means to respond to the expected or anticipated behavior of fund investors.

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[3] For theoretical presentation of the Merton constant, see Merton (1969), *Lifetime Portfolio Selection Under Uncertainty: The Continuous-Time Case*.

[4] Anchoring describes the tendency of individuals to lock into a reference point to which they compare and evaluate the subsequent outcomes. Adjustment in turn relates to the reassessment and re-setting of reference point according to preceding events.

The academic research offers evidence of the effect of behavioral incentives on fund's risk-taking, especially of the importance of managerial status in the industry and ranking among the peer group. However, as in case of compensational incentives presented in subsection 2.1.1., these behavioral incentives are difficult to observe or quantify for an average fund investor. Consequently, the next subsection presents the third incentive category for mutual funds' risk-taking behavior: these incentives can be directly derived from the information which is salient and easily interpretable for the investor.

2.4 Organizational fund attribute as an incentive

Organization incentives arise from variables that are explicitly observable or regularly reported fund attributes, set legal conditions or relate to fund's investment strategy. They can affect fund or managerial-level risk-taking both in a restrictive or incentivizing way. For example, the size of fund portfolio can significantly predefine what kind of investments or transactions the fund is able to carry out. Incentivizing variables in turn do not explicitly restrict fund's risk-taking but instead steer the fund towards specific kind of risk-taking behavior.

In general terms, organizational variable is any qualitative or quantitative fund-specific information that can vary over time. For example variables relating to shareholder base, fund size or fund administration and strategy can be defined as organizational fund variables. Another specification for the variables is that all of this information is regularly reported or otherwise observable for fund investors. The next subsections discuss the relation of organizational variables and risk-taking in light of prior research and present the theoretical rationalization for why the linkage between them should exist.

2.4.1 The impact of fund size on risk-taking behavior

Pollet and Wilson (2008) study the effect of fund size on fund behavior. They argue that funds with larger NAV confront more often liquidity constrains, higher ownership costs and regulatory investment restrictions[5] and that the diminishing returns to scale of actively managed mutual funds make fund managers to alter their investment behavior as the AUM

[5] For example, the EU restricts mutual funds classified as UCITS funds from investing more than 10% of their net assets in transferable securities of any sole issuing body. These kinds of restrictions have direct effect on the level of diversification and thus, have significant impact on mutual fund's risk profile and investment behavior. (http://www.ey.nl/download/publicatie/UCITS_III-A-Practica-_Guide-June-2003.pdf)

increases. Pollet and Wilson employ a matched sample of funds' equity holdings by stock from 1975 to 2000 and find that managers of larger funds diversify only because they are prevented by their size from increasing existing stock weights without incurring significant ownership costs. Thus, if the fund confronts liquidity constraints it is more probable that the manager diversifies his portfolio. According to Pollet and Wilson, "*funds choose a minimal level of diversification to reduce risk*". Consistent with this argument, the results of Prather, Bertin and Henker (2004) imply that fund's market capitalization has a direct impact on fund's ability and flexibility to pursue a particular investment strategy and this effect is negative – they find analogously that fund performance is negatively related to market capitalization of the fund.

Based on the convexity of the flow-performance curve, it can be argued that larger funds have more conservative behavior in terms of risk. As fund flow is a convex function of past performance, asset size is consequently a function of flow and performance. As fund's AUM gets larger, the fund collects more fees in form of management fees and may not have such a high incentives to increase its portfolio risk further or to aim at the highest performing deciles in its peer group. Furthermore, larger funds are often older which means that they have reached relatively stable status and reputation among investors; fund flows are not necessarily dependent on prior performance to such extent as they are for smaller and younger funds which suggests these funds are able to maintain their position in the market with less effort and with only moderate returns.

Consistent with the argument of fund size affecting negatively to fund performance, both Chen, Hong, Huang and Kubik (2004) and Yan (2008) find a significant inverse relation between fund size and fund performance. As fund's risk-taking is considered, there exist two feasible explanations: larger funds take consciously less risk or they take wrong kind of risk in form of bad investments which deteriorates their overall performance. Larger funds have normally larger resources devoted to the research of investment opportunities. They should thus have longer lists of feasible investment opportunities and pursue better investment decisions indicating that, on average, they should incur fewer losses due to taking wrong risk. Therefore, the inferior performance of larger funds can stem from decreased volatility of their portfolios.

Tapio (2002) employs Finnish mutual funds data to examine the size effect on mutual funds' tracking error.[6] By analyzing the relation of fund size and tracking error magnitude for a period of 1997-2001, she finds that Finnish mutual funds do not show propensity to move to more passive strategies as their size increases. The findings of Tapio indicate that during the sample period, Finnish funds do not seem to suffer from decreased returns to scale (e.g. liquidity constrains or higher transaction costs). After year 2001 however, the average asset size of Finnish funds has increased significantly which may have affected their trading possibilities and investment behavior.

2.4.2 Fund age and risk-taking behavior

For younger funds, flow-performance incentives are higher firstly because they are smaller and require more resources, for example in terms of advertising, to attract capital inflows and secondly, as they incur challenges in terms of survivorship. Ackermann, McEnally and Ravenscraft (1999) study the performance of hedge funds in terms of risk, return and incentives. Their findings suggest that fund age does not significantly affect portfolio risk for hedge funds but that there exist significant differences in the total risk profiles among specific hedge fund categories.

Controversially, Brown, Goetzmann and Park (2001) find that the survivorship of older funds is less sensitive to performance which implies that funds with longer track record should have lower risk and have an incentive to aim only at average benchmark returns. Consistent with the argument of diminishing incentives to growth, older funds have reached larger AUM to which fund fees and managerial compensation is linked, which arguably can act as a disincentive for managers of older funds. In addition, the results of Brown et al indicate that funds lacking in the industry are less likely to survive, and even though the short-term profit maximization through risk-taking is not that attractive even for younger funds, their survivorship in the industry is more dependent on their relative performance. This finding suggests that younger funds should reach for higher relative returns owing to the costs of higher probability of termination, and these incentives induce them to take more risk than their older counterparts.

[6] Tracking error is widely used as the measure of active management for mutual funds. It describes how closely the fund follows the index to which it is benchmarked. More precisely, tracking error is measured as the standard deviation of the difference between index and fund returns.

2.4.3 Impact of fee level on risk-taking

Higher fee level generally indicates that the portfolio is more actively managed, i.e. fund's turnover ratio is higher. Actively managed funds consistently attract larger inflows than index funds, and investors thus continue to pay higher fees even though many studies have shown that active funds underperform their benchmark indices at least after accounting for expenses [see e.g. Gruber (1996) and Edwin, Gruber and Busse (2004)]. The diverging risk-taking behavior of actively managed funds should appear as higher or lower relative volatility levels and consequently, funds with higher fees should have proportionally higher volatility levels than low-fee funds. Although in general high fee levels of funds are associated with more active management, it should be remarked that previous studies also suggest the higher fees not to be solely a result of active management but also dependent on decreased search costs[7] [Sirri and Tufano (1998)].

2.5 Risk-taking behavior of family funds

Fairly few academic studies have focused on the question of how fund's belonging to a fund family affects the behavior of individual funds in the family [see e.g. Gaspar, Massa and Matos (2006), Elton, Gruber and Green (2007), Pollet and Wilson (2008)]. A fund family refers to a mutual fund company managing multiple own funds. The more profound examination of the subject is justified since the role and popularity of fund families in several countries is significant and before, the matter has not attracted vast discussion.

To start with, the managers of family funds can have less freedom in influencing the risk profile of their fund; family funds are more to serve for the requirements *within* the fund family and do not necessarily pursue strategies irrespective of other family funds. The concentration of portfolio management at family level can mean that family funds do not necessarily offer a diverse set of funds with low correlation, which would mean that, to diversify effectively, the investor should have to go outside the family. In other words, the latest studies show that concentrating one's investments into one fund family can have detrimental effects on investor's portfolio risk.

[7] Previous academic research suggests that investors are willing to incur higher fund fees if the specific fund is found and identified with less effort, for example due to heavy advertising.

Elton, Gruber and Green (2007) examine how the risk profile of investor's portfolio is affected if all investments are confined to a single fund family. In their study, they employ a sample of 988 individual funds from 100 families to study the effect of the family on the risk-taking of individual fund. They find that family funds' volatilities are often highly correlated which arises from similar investment strategies, i.e. simultaneous concentration on specific sector or industry and therefore, fund variances are not randomly distributed across fund families. Their results also prove the families to show a propensity to focus on either high or low risk strategies, so for the investor, investing within one fund family means an increase in the probability of a bad outcome. They estimate that if an additional fund is selected from the family rather than outside, the added fund would need to offer a return from 50 to 70 basis points higher in order to maintain the same Sharpe ratio on investor's portfolio.

Bliss, Potter and Schwarz (2008) examine how the performance and risk-taking activities of team-managed funds differ from the activities of individually managed funds. By studying the risk-taking behavior of 3,000 US equity funds for a sample period of 12 years, they find that team-managed funds are significantly less risky and exhibit lower turnover ratios than individually managed funds. Also, team-managed funds prove to attract significantly larger capital inflows than individual funds, indicating that many funds managed by a group should be larger than individually managed, and possibly belong to a larger fund complex consisting of several fund siblings.

Team-managed funds are analogous to family funds as also family fund strategies are outlined at a more centralized level, meaning the framework for individual fund strategies is determined by a group of managers. The findings of Bliss et al. therefore support the results of Elton et al. on group-managed funds having less risky portfolios, but on the other hand, do not show that group-managed funds would at the same time hold portfolios that have significantly higher risk levels.

Pollet and Wilson (2008) contribute to the family discussion by suggesting that funds in more complex organizations are less likely to diversify in response to the growth in fund's AUM. The organizations of several funds prefer establishing new funds instead of increasing fund's ownership shares in stocks they already own. Their study shows that, absent ownership constraints, family funds tend to diversify to the proportion of their existing portfolio and rather focus on fewer stocks on an individual fund level. In aggregate, the pace of

diversification tends to decrease as the number of siblings in the family increases. This in turn would suggest that family funds have higher volatility levels.

The findings of Pollet and Wilson also rationalize for diversification carried out on the family level, meaning that fund families offer diversification possibilities to investors more *among family rather than among one fund.* Also from fund family's point of view, the As for a single fund the investment strategy relates to fund's relative target position among its competitors, family funds' risk-taking behavior and strategies are dependent also on the overall family strategy. The need for this two-fold attention also suggests that family funds compared to single funds should have differing attitude towards risk and that this difference could be observed in their choices of risk level. Inductively, fund families operate like a single fund and the risk-taking behavior of a family fund depends also on its relative position among other funds in the family. Considering that the majority of investors can be estimated to hold only 1-3 funds on average, the kind of family behavior would be inconsistent with the first motivation of why investor should invest in a mutual fund in the first place; diversification benefits.

Gaspar, Massa and Matos (2006) argue that fund families pursue risk sharing and strategic cross-fund subsidization in order to maximize the profit of the fund company in aggregate. They examine how funds within the family are conveyed among the organization and if certain funds are favored at the expense of other family funds. Their results do suggest differing incentives for family funds and show that these funds exhibit strategic performance shift among the funds in the family in order to favor the ones that are to increase the overall family profit. They consider the cross-fund subsidization to happen from low to high fee funds, from low performing to currently better performing funds and from older to younger funds. High-fee, better performing and younger funds are considered of higher value and therefore they are preferred among the fund family. Consistent with other studies, the findings of Gaspar et al suggest that family funds have specific incentives for risk-taking and that family funds alter their portfolio risk level more often than single funds.

In aggregate, the implications of previous studies strongly suggest that organizational fund variables or more precisely, *fund characteristics,* can have significant role in mutual funds' risk-taking behavior. The fact that organizational attributes are the only incentive category that is easily observable for fund investor further supports the motives of this thesis to more

closely examine and recapitulate the impact of organizational fund variables on mutual funds' risk-taking behavior.

3 HYPOTHESES

3.1 Research questions

This thesis has two main objectives in terms of evaluating the risk-taking behavior of mutual funds. First, the purpose is to study if in general, salient and reported fund characteristics relate to fund's risk-taking behavior and to discuss why certain types of funds show differences in their risk-taking behavior. Second, the objective is to examine the role of fund family membership in mutual funds' risk-taking behavior. The thesis is built on the following three main research questions:

I. Which fund characteristics are related to equity funds' risk-taking behavior?

II. Do family and non-family funds engage in different kind of risk-taking behavior?

III. Do fund families show a propensity to concentrate on high or low risk strategies?

3.2 Conceptualization of risk-taking behavior and fund family membership

3.2.1 Risk-taking behavior

I define the term *risk-taking behavior* as mutual fund's style to perceive risk and maintain specific risk level from period to period in relation to fund's benchmark index or group. Thus, risk-taking behavior refers to fund's tendency to have higher or lower risk levels than other funds in its peer or comparison group have.

Conventional risk-taking behavior signifies that the fund prefers to maintain low risk (volatility) levels from period to period and this behavior differs from the one of fund's peer group. Inversely, if the fund exhibits more *active* or *aggressive risk-taking* behavior, it more probably has a portfolio that has higher risk level than the one of an average fund in its benchmark group.

3.2.2 Fund family membership

By fund family membership, I refer to fund's belonging to a larger fund complex managed by a retail bank operating in Finland. The motivation for this type of division relies on the fact that the mutual fund market in Finland is highly bank-dominated. The designation as a fund

family signifies that funds belonging to the family have more extensive distribution channels due to their retail banking background than funds not belonging to a family. In practice, the definition does not set any lower limit for the number of funds in the family, but includes the assumption that the fund manager cannot manage independently his fund irrelevant of the strategies of other funds in the family. This means that, in addition to following individual investment strategies, their strategies are constructed to serve for the goals of the fund complex in aggregate.

3.3 Hypotheses: risk-taking and organizational fund characteristics

As presented in Section 2 discussing the theoretical background, previous academic research presents controversial or deficient results on the effects of fund variables on mutual funds' risk-taking behavior. I argue that organizational fund variables can be whether directly or indirectly related to fund's risk-taking behavior, and this relation is either positive or negative depending on the variable. The organizational fund variables or, characteristics, employed in this study are: fund size, age (AUM), minimum investment requirement, fund's one month-performance in previous month, number of shareholders and the level of subscription, redemption and management fee.

Next, I set the hypotheses for the relation of fund variables and fund's risk-taking behavior. The analysis is based on the following eight null hypotheses that are derived from the implications of previous academic research discussed in section 2.

H_1: Larger funds take less risk.

Mutual funds compete for new capital inflows that can be attracted through above-benchmark performance. The flows are directly related to the size of the fund complex [Sirri and Tufano (1998)] and a large fund having accumulated inflows in the past has presumably also had a good track record that has attracted the capital. Thus on average, the size serves as *a proxy* of good quality for the investor. A large fund is not incentivized to aim at superior performance since the size attests the good prior performance of the fund. The flow-performance curve that previously incentivized fund managers to increase risk now affects negatively to their hunt for performance after a certain break point in fund size is reached [Koski and Pontiff (1999)].

Additionally, management fees based on the size of AUM affect fund's willingness to increase risk. Large asset base ensures a larger flow of annually collected management fees. If the regular fee flow is perceived to be large enough, the fund may have incentives to only

maintain the current NAV level which means the fund ends up holding a more traditional portfolio. Furthermore, the fund companies prefer to set up new high-risk funds rather than increase the risk-level of larger, well-established funds [Pollet and Wilson (2008)]. This can be a consequence of larger funds being used as "cash cows" for the fund company.

Analogously, funds that do not have too a dispersed shareholder base are more closely monitored by their shareholders. This monitoring effect prevents the fund manager from taking risks that *are not justified*. The capital investment of shareholders can be larger than the investment of an average fund investor, and the shareholders are more often sophisticated or professional investors. More sophisticated shareholders perceive risk differently and tolerate larger variation in the value of their investment. The manager thus has a possibility to increase fund's risk level as the shareholders approve of and better understand this behavior.

H_2: Funds having performed better in relative terms (excess return) in the previous period take less risk during the following period.

Funds that have had above-average performance receive proportionally larger inflows [Sirri and Tufano (1998)]. As the fund has experienced both excellent performance which means direct popularity among the investors, and consequent inflow, the manager has an incentive to firstly lock in to the profits and secondly, reach for only conventional return levels during the following period. Locking in to profits and maintaining average performance level both mean that the fund with high probability decreases its risk level to in order to achieve them. Inversely, poor-performing funds tend to increase fund volatility [Brown et al (1996)].

On a managerial level, the decrease in fund's risk level after a period of high returns can relate to manager's risk aversion: the manager locks into profits and honors for the high performance ranking rather than further gamble with paper gains. If fund manager has managed to produce high performance during the period, he probably is not incentivized to aim at superior returns in the following period. In some situations, the fund manager can be so gratified with his previous accomplishments that the ambition for high returns in the following periods receives less emphasis.

H_3: Younger funds commit to more aggressive risk-taking behavior.

Younger funds are more incentivized to increase risk as they aggressively strive for reaching new capital inflows. Above-average performance assures that the fund attracts new capital inflows and continues to exist also after the demanding beginning [Brown et al (2001)]. As the fund gets older, it has established a position among its peer group and it does not have to

struggle anymore for example with survivorship-related problems. Therefore, fund age has similar de-incentivizing effects on fund's risk-taking behavior than fund size.

In addition, younger funds are more often growth funds that strategically have higher risk profiles and adjust their risk levels more aggressively. Since younger funds are often also smaller they rarely encounter problems that relate for example to size of ownership, whereas increased liquidity or ownership costs can limit larger funds to have more diversified portfolios and therefore set the limits for fund's risk-taking behavior [Pollet and Wilson (2008)].

H_4: Funds having higher minimum investment requirement commit to more aggressive risk-taking behavior.

Only wealthy individuals and institutions are able to invest in funds that have higher minimum investment requirements. While an unsophisticated investor often reacts irrationally towards high risk level and changes in it, sophisticated private investors and institutions have a more rational understanding about the concept of risk and about its effects on their portfolio. This in turn means that the fund can have higher risk level and adjust its portfolio risk more freely as the shareholders perceive the concept of risk differently and accept larger variation in their portfolio: the fund is not punished by outflow because of every unsuccessful risky investment decision or volatility level that is higher than the market risk levels in general.

Additionally, funds that have less legal and financial investment restrictions can have higher risk profiles and more aggressive risk-taking behavior. These funds more often also require that the investor is professional which implicitly sets the assumptions on investor's wealth and therefore also for the required amount of minimum investment.

H_5: The level of equity fund's fees is related to its risk-taking behavior.

Worse performing funds are punished with capital outflows and these outflows incur back-end loads if the fund charges redemption fees. However, salient **front-end-load fees (*or subscription fee*)** are negatively related to mutual fund flows [Barber, Odean and Zheng (2004)]. Subscription fee is incurred at the very beginning of the investment, before the value of investor's portfolio is exposed to fund's investment decisions. Funds that maintain relatively higher risk levels than their peers have a higher probability of ending up in the best performing deciles which in turn, according to previous studies, attracts large capital flows. If the fund has established a good track record in consequence of aggressive risk-taking, this attracts new capital. New capital in turn accumulates the profits the fund company collects

through subscription fees. At the same time, investors have been shown to react irrationally towards fees and favor good prior performance over low fees; thus, the managers of these funds succeed in attracting inflows regardless of the higher subscription fee level. Subscription fee is also charged up-front, so the consequent fund performance does not reduce the amount the fund company has managed to collect, and it may thus continue to have higher volatility.

The population of mutual funds having higher **redemption fees** should include relatively the same proportion of poor performing funds as other funds. Previous studies have not found significant relationship between redemption fees and fund performance, meaning these funds should be punished by capital outflows to the same extent than other poor performing funds. However if a fund has higher redemption fee ratio, investors are willing to accept more risk and changes in risk; they are not willing to withdraw their investment and incur the salient redemption fee. In other words, investors are ready to gamble further and accept the increased uncertainty they wouldn't otherwise accept in order to avoid a certain loss (redemption fee). Thus, load fees discourage excessive variation in investor redemptions, as found by Koski and Pontiff (1999). As fund managers acknowledge that they are not necessarily punished to the same extent because of their larger risk-taking and possible consequent unsuccessful investment decisions, they can whether consciously or unconsciously dispose differently towards risk-taking.

Management fee is to cover the expenses that follow from the investment management and often, it is related more precisely to expenses that the fund has to incur because it has a strategy of active trading.[8] The funds having higher management fee ratios should thus have risk levels that often differ from the risk level of benchmark indices. The purpose of actively managed fund is to outperform its market benchmark index, and this goal induces the fund to have often moreover higher than lower risk profile [Gruber (1996)]. High level of management fee can signal superior investment skills [Golec (1996)], implying that the risk profile of these funds can significantly differ from the risk level of market index.

[8] Inversely, index funds that follow closely the composition of their benchmark index have generally lower expenses than equity funds since they trade only based on changes in the respective index.

3.4 Hypotheses: risk-taking and belonging to a fund family

An investor confining all of his investments to a single fund family is exposed to greater total portfolio risk as fund families tend to favor whether high or low risk strategies [Elton et al. (2007)]. Considering that many fund investors often estimate the diversification effect only on *a within family level* rather than *between families level* further underlines the fact that the possible family effect on funds' risk-taking behavior should not be underestimated. To examine the effect of fund family membership on mutual funds' risk-taking behavior, I present the following last two null hypotheses.

H_6: Family and non-family funds differ by their risk-taking behavior.

Mutual funds ultimately serve for the purposes of the fund company as a whole. If the fund company has for example 10 funds under management they presumably function in a different conditional environment than two funds that are the sole products of another fund company. Due to the different complex structures, non-family funds are more flexible than family funds functioning in a conditional environment of the family. For example, for smaller complexes the scope of activities is expanded for existing funds whereas larger complexes prefer allocating new functions by establishing new funds [Elton et al. (2007)]. Also, fund families use individual funds to maximize the profits of the overall family by strategically transferring performance from a fund to another – this in turn means that the mutual fund industry is distorted by fund family organizations [Gaspar, Massa and Matos (2006)].

H_7: High and low risk funds are concentrated in certain families.

Fund families consisting of multiple funds have generally centralized investment research that derives its advantages from economies of scale. This signifies that the funds within the family construct and alter their portfolios based on the aggregate universe of possible investment opportunities that the internal research generates. The probability that the portfolios of individual funds are exposed to e.g. same sectors or geographical regions is therefore higher for *within* family funds than for funds operating in different families. Thus, funds in larger complexes have also higher probability of having common holdings with their sibling funds. Fund variances are thus not randomly distributed across fund families but funds with low or high risk profiles are rather concentrated in the same families [Elton et al. (2007)].

Table 1

Summary of Hypotheses on Mutual Fund Risk-Taking Behavior

The following table sums up the seven hypotheses presented in this section. The first five null hypotheses relate to the organizational fund characteristics discussed in subsection 2.4 and describe how the variable at issue is hypothesized to relate to fund's risk-taking behavior or, to the relative risk level the fund tends to maintain. The 6th and 7th hypotheses concentrate on the possibility that fund family membership or belonging to a certain fund family is related to fund's risk profile. Here, the concept '*risk-taking behavior'* signifies fund's style to have certain risk level, whether more conservative or aggressive, over time from period to period. The seven null hypotheses presented below constitute the framework for the discussion and analysis in the rest of the thesis.

	Panel A: Explaining risk-taking behavior by fund characteristics
H_1	Larger funds take less risk (measured by net asset value or number of shareholders).
H_2	Funds having performed better in relative terms (excess return) in the previous period take less risk during the following period.
H_3	Younger funds commit to more aggressive risk-taking behavior.
H_4	Funds having higher minimum investment requirement commit to more aggressive risk-taking behavior.
H_5	The level of equity fund's fees (subscription, redemption, management) is related to its risk-taking behavior.
	Panel B: Explaining risk-taking behavior by fund family membership
H_6	Family and non-family funds differ by their risk-taking behavior.
H_7	High and low risk funds are concentrated in certain families.

4 METHODS

To analyze the risk-taking behavior of mutual funds, I apply two methods that follow the framework of hypotheses presented in the previous section. The first method is used to analyze the relationship between fund characteristics and risk-taking behavior. The second method examines the role of fund family membership in funds' risk-taking behavior. For estimating the level of risk-taking, I construct a modification of the method used by Brown et al. (2001) in order to better address the nature of risk-taking behavior and perspectives of this study, issues that will be discussed in the next sections. The methodology applied to examine the risk-taking behavior of fund families is consistent with the one used by Elton et al. (2007).

In the next sections, I first describe the methods and variables that are employed to quantify the risk-taking behavior of mutual funds in terms of fund characteristics and fund family membership. Also the model which I apply to examine the determinants of risk-taking behavior is presented. Finally, subsection 4.3 discusses the methodological limitations.

4.1 Measuring risk-taking behavior across equity funds

4.1.1 Measuring risk-taking behavior by simple fund volatility

I measure the level of funds' risk-taking, or risk-taking behavior, by two variables. First, I use simple volatility of daily returns to examine if a fund employs conservative or aggressive risk-taking behavior. As shown in Equation 1, fund volatility is calculated as the standard deviation of daily fund returns:

(1) $$\textit{Simple volatility (SV)} = \sigma_{i,a} = \sqrt{\frac{\sum(x-\bar{x})^2}{(n-1)}}$$

where $\sigma_{i,a}$ is the annualized volatility of fund i in year a, a figure obtained from the dataset. Volatility is widely used in previous academic studies to examine the risk-taking behavior of funds [see e.g. Brown et al (1996), Brown et al (2001), Busse (2001) and Elton et al. (2007)], although its employment as the sole initial measure – and constructed variables of it – may present some limitations. Volatility as a risk measure and its limitations will be discussed in more depth in the following sections.

In order to match the annualized volatility figures with monthly observations of variables measuring fund characteristics, Equation 2 is exploited to scale down volatility to monthly figure:

$$(2) \qquad \sigma_{i,t} = \sigma_{i,a} \times \sqrt{(1/12)}$$

where $\sigma_{i,t}$ is the monthly volatility of fund *i* in period *t*.

4.1.2 Measuring risk-taking behavior by market-adjusted volatility

As a second measure to examine the risk-taking behavior, I employ a modification of the variable used by several studies [e.g. Brown et al. (2001)][9], or a modification of *tracking error*, as generally denoted. The measure is market-adjusted and takes into consideration that the sample equity funds operate in different markets. The definition of the second risk measure, henceforth denoted as *Relative volatility* (RV), is shown in Equation 3.

$$(3) \qquad Relative\ volatility\ (RV) = \frac{\sigma_{i,t}}{\sigma_{m,t}}$$

where $\sigma_{i,t}$ is the realized standard deviation of fund *i* daily returns in period *t* and $\sigma_{m,t}$ is the volatility of comparable market index *m* returns in the same period.

Relative volatility is employed, instead of tracking error, due to the time-nature of mutual fund's risk-taking behavior. The main difference between relative volatility and risk variables used in prior studies is that for RV, the monthly volatility of daily returns for fund *i* is first calculated and only then the ratio of fund volatility to market index volatility is measured; inversely, prior studies use the *volatility of excess returns between daily fund and market index returns*. I argue that the justification for RV variable relies on the fact that fund's investment decisions that relate to general risk-taking behavior, and are more strategic, are not realized on a daily basis (as measured by e.g. tracking error) but need a longer period of examination. For example, few large realized daily excess returns during a one-month period cannot be directly derived to stem from the strategic risk-taking behavior of the fund. For the purpose of studying the general risk-taking behavior of funds, it is thus justified to measure

[9] For example Brown et al. (2001) examine the level of risk-taking as the variance of excess returns between monthly fund returns and market benchmark index returns, $Risk = var\ (r_{i,t} - r_{m,t})$.

the risk-taking behavior as *long-term behavior* rather than in terms of daily deviations, that may not have much to do with the strategic motivations of the fund.

The two measures presented above are applied in the regression model (presented in the next Subsection 4.1.3) to examine how the organizational fund characteristics relate to fund's risk-taking behavior. Moreover, the objective of the risk measures is to examine over time if certain type of funds can be shown to consistently have lower or higher risk levels than their comparison group – and inversely, if it is possible to estimate how a fund ranks among its peer group by its risk profile by only analyzing salient fund characteristics, or variables.

4.1.3 Regression model: Risk-taking and fund characteristics

To examine the relation of fund characteristics to mutual fund risk-taking behavior, I employ multivariate ordinary least square (OLS) regression. I measure fund's risk-taking behavior (risk level) as a function of the following eight variables: ln of asset size (*AUM*)[10], fund age in months *(AGE)*, fund's prior period excess return (*EXRET 1-MTH)*, management fee (*MGMTFEE*), the amount of minimum investment requirement (*MININV*), redemption fee (*REDFEE*), number of shareholders (*OWNERS*) and subscription fee (*SUBSFEE*). The explained variable in the regression is risk-taking which is measured with the two previously presented risk-taking variables, simple and relative volatility.

A following initial[11] regression model is applied:

(4) $$\boldsymbol{RISK-TAKING\ MEASURE} = \beta_0 + \beta_1 \ln(AUM_t) + \beta_2(MGMTFEE_t) + \beta_3(SUBSFEE_t) + \beta_4(REDFEE_t) + \beta_5(\mathrm{AGE_t}) + \beta_6(EXRET\ 1-MTH_{t-1}) + \beta_7(OWNERS_t) + \beta_8\ (MININV_t) + \varepsilon_t$$

where ε_t is the model error term. For risk measures that are calculated for a one-month period, the organizational fund variables are measured at the end of each month *t*. The prior performance variable is measured at time point $t-1$.

As there are no previous studies conducted with the mentioned eight model variables, I use a process called *backward elimination*[12] in order to test if it is justified to include all these variables in the model. Thus, backward elimination along the examination of regressor

[10] Monetary values in fund data in the dataset are stated in Finnish marks before January 1999. These values are converted to euros by using the exchange rate of 5.94573.
[11] The model and included variables are further discussed in Section 6.
[12] http://en.wikipedia.org/wiki/Stepwise_regression

correlations is applied in Section 6 to examine which regressors will be included to the final model.

4.2 Fund families and risk-taking behavior

To analyze if the risk-taking behavior of mutual funds is related to fund's belonging to a fund family, I employ two methods that follow the hypotheses presented in section 3. The first method studying the risk-taking differences of family and non-family funds is related to the regression model, and is simply the family dummy applied in the regression model (presented in Subsection 4.1.3). The second method examines the risk-taking differences across fund families and is consistent with the method used by Elton et al. (2007).

4.2.1 Measuring fund family membership effect on risk-taking

To examine if the risk-taking behavior differs between family and non-family funds, I employ a family dummy (*FAMILY*) as the ninth explaining variable in the regression model presented in the previous section. The family dummy denotes for 1 if the fund is managed by a fund company functioning under a retail bank operating in Finland, otherwise 0.

Funds of foreign fund families are defined as non-family funds as the dataset does not necessarily cover all the funds belonging to the family. Also funds of smaller fund companies that do not have a retail bank background are denoted as non-family funds originating from the fact that these companies have fairly narrow distribution channels compared to funds of retail banks' fund management companies. The framework is chosen since the retail bank-backed funds are significantly more popular in Finland than non-bank funds, measured both by assets under management and by the number of shareholders. Also, service providers offering simultaneously retail banking services have continuously the advantage of attracting fund investors due to the service package covering both banking and investing services; for the investor, this means decreased search costs since he doesn't have to go outside the bank in order to find investment opportunities [Sirri and Tufano (1998)].

The inclusion of the dummy and the examination of family membership effect are justified since the importance of distribution channel has been found to be highly significant in the Finnish mutual fund market [see e.g. Knuutila, Puttonen and Smythe (2007)]. As family and non-family funds can be hypothesized to differ by their organizational characteristics, family membership should thus have effect on fund's risk-taking behavior.

4.2.2 Measuring risk concentration in fund families

The second method is applied to examine if high and low risk funds are clustered into certain fund families. From the aggregate sample, I separate the families that are managed by a retail bank-backed fund company operating in Finland. The final sample for examining the risk concentration in fund families consists of nine families whose funds are sold through a retail bank and managed by a fund company that essentially operates under the retail bank in question.

The purpose is to analyze the differences in variance across fund families. I first sort out the median relative volatility observation for each period *t* [13]. Second, I denote each observation with a relative volatility above (below) the median as HIGH (LOW) risk observation in the respective period. The observations are then grouped to family subsamples. Then, I examine if the distribution for HIGHs and LOWs in a fund family is different from the one expected by chance. If low and high risk funds are randomly assigned to different fund families, the following normally distributed test statistic can be applied [Elton et al. (2007)][14]:

$$Z = \left(\sum_{h=1}^{H} \left(T_{g,h} - \sum_{h=1}^{H} E\left[T_{g,h}\right]\right) / \sqrt{\sum_{h=1}^{H} VAR\left(T_{g,h}\right)}\right. \tag{5}$$

where

$$T_{g,h} = \left(Y_{g,h} - \frac{1}{2}g\right)^2 \tag{6}$$

$$E\left[T_{g,h}\right] = var\left(Y_{g,h}\right) = \frac{g}{4} \tag{7}$$

$$VAR[T_{g,h}] = var\left(Y_{g,h} - \frac{1}{2} * g\right)^2 = \frac{g(g-1)}{8} \tag{8}$$

$Y_{g,h}$ denotes for the number of HIGHs obtained for fund family *h* when there are *g* funds in the family. A two tailed t-test is run in order to examine the possible concentration of risk into certain fund families.

[13] Elton et al. (2007) use simply standard deviation to sort out LOW and HIGH risk observations. I apply relative volatility as the sample contains equity funds with different geographical concentrations. The relative volatility measure levels down the market-related risk component in volatility and emphasizes the part of volatility that the fund has materialized over general market volatility during the period.

[14] For more detailed derivation of Elton's test statistic, see Appendix A.

The funds are defined as being in the same family if they have the same management company. Nine subsamples fulfilling the requirements set for the sample size are sorted out from the aggregate sample and henceforth, are separately denoted as Family *N*, where $N \in [1,9]$. Each management company (family) is part of a retail bank operating in Finland. Many families have grown significantly in the beginning of the 21st century and before that include fairly low number of member funds, which is why I examine *risk concentration within families* only for the period from 01/2002 to 7/2009.

The disadvantage of the family analysis is that the family subsamples are fairly small, a characteristic that will be addressed when analyzing the results. Elton et al. (2007) study the risk concentration for fund groups having separate investment objectives; as for my analysis, I do not separate funds with different objectives in order to preserve valid number of funds for families. In turn, I use relative volatility measure to proportion the risk level of sample funds. The measure maintains a similar perspective for LOW and HIGH risk comparison across families than the method of Elton et al. and at the same time takes into consideration the possible style differences of the sample equity funds. For a point of comparison, Elton et al. calculates the test statistic *also* for all funds with different objectives by using standard deviation and still finds statistically significant risk clustering in fund families.

4.3 Methodological limitations

4.3.1 Discussion on the validity of risk-taking measures

There exists several methods like multivariate regression[15] or style measures of risk, such as high-minus-low (HML) factor, small-minus-big (SMB) factor and momentum (UMD) factor, to be exploited in a study on mutual funds' risk-taking behavior [see e.g. Busse (2001) and Ammann and Verhofen (2007)]. These measures would serve for breaking down between the components of risk and concentrate on the active risk funds are taking, whereas analysis based on volatility does not break down between the actual reasons for risk deviation. Unfortunately, the Finnish database which I use in this study does not provide the information for the calculation of variables and there is no public database available that would contain funds' equity holdings by stock. However as mentioned previously, the volatility is widely

[15] Busse (2001) employes a single-index time-series regression to model fund's return, defined as $R_{pt} = \alpha_{p,t} + \beta_{p,t}R_{m,t} + \varepsilon_{p,t}$. He measures fund's risk level as the standard deviation of model residuals ($\varepsilon_{p,t}$).

used in previous studies to measure funds' risk-taking in relation to market index volatility [see e.g. Brown et al. (1996), Busse (2001) and Brown et al. (2001)].

Mainly due to the characteristics of risk-taking behavior, the additional variable for measuring risk-taking based on simple fund and market volatilities (*relative volatility*) is constructed – whereas prior studies have used the variance of excess returns. I justify the usage of relative volatility by the fact that the monthly volatility reflects better the strategic risk-taking decisions of fund than the estimation of funds return deviation from the index on a daily basis. As relative volatility is a new, constructed variable, I also use simple volatility as a risk-taking measure, so I am able to compare "raw" risk-taking behavior and market-adjusted risk-taking behavior; or in other words, how much fund's risk level has deviated from the one of its market benchmark index.

4.3.2 Comments on the restricted sample size of fund family analysis

For the examination of risk concentration in families, the small size of the Finnish fund market signifies that the sample size is fairly restricted in size which may affect the reliability of results. However, a closer examination of the risk-taking of family versus non-family funds is highly justified as firstly, to my best knowledge there exist only few academic studies on the subject, each conducted with US data, and secondly, since the Finnish fund market is significantly dominated by the retail bank-backed families and among them, by the few largest families.

The main problem present in the sample is mainly the fairly low number of fund members for other families than for the few largest ones. However, Elton's test statistic uses median to rank funds as *LOW* or *HIGH* risk funds, so the extreme volatility observations in the aggregate family sample do not distort the figure (as they would in case of mean figure, for example). Also, each family contains all family's observations, so it is the actual *family population* for the sample period and not a sample of it – the observations thus describe the actual situation and investment opportunities/outcomes of an investor investing in funds of a single fund family.

Table 2

Two Methods for Measuring the Relation of Risk-Taking Behavior and Fund Characteristics

This table presents the variables that are used to examine the risk-taking behavior of funds. The variables are measured as a function of organizational fund variables in model $RISK\text{-}TAKING\ MEASURE = \beta_0 + \beta_1 \ln(AUM_t) + \beta_2\ (MGMTFEE_t) + \beta_3\ (SUBSFEE_t) + \beta_4\ (REDFEE_t) + \beta_5(AGE_t) + \beta_6\ (EXRET\ 1\text{-}MTH_{t-1}) + \beta_7\ (OWNERS_t) + \beta_8\ (MININV_t) + \beta_9\ (FAMILY) + \varepsilon_t$. For simple and relative volatility (risk measures), the benchmark employed in calculation and time period of measurement is defined. The variables do not address whether the lower (higher) risk level of fund results for example from higher volatility of underlying stocks or if they originate from strategically active portfolio management. In theory, the investor should be indifferent to the cause of risk deviation that affects his wealth and consider only *how* these risk changes correlate with risk changes in his overall portfolio. Therefore if anything, the two risk measures presented above do not set assumptions for the source of the risk level but are rather used to estimate the implications of risk levels from investor's perspective on the investor's portfolio in aggregate.

Variable	Measure of Variation	Benchmark	Time Period of Measurement	Description
Simple volatility	σ	No benchmark	Monthly	Standard deviation of fund's daily raw returns.
Relative volatility	σ	Market index	Monthly	Simple fund volatility to market index volatility.

5 DATA AND DESCRIPTIVE STATISTICS

In this section, I first present the aggregate dataset and describe the samples obtained both for fund characteristic and fund family analysis. Second, I define the market benchmark indices used for the calculation of variables measuring the risk-taking behavior. The rest of this section presents descriptive statistics and analysis of sample characteristics, both in terms of fund characteristics, family attributes and risk-taking variables.

5.1 Data

The dataset employed in the thesis is obtained from the monthly fund reports of the Finnish Association of Mutual Funds. The reports include monthly data on funds that are sold in Finland, and provide information on such variables as fund size, fees and return and risk characteristics, for example. As the dataset contains nearly all funds provided to Finnish investors, it includes observations on funds managed both by domestic and foreign mutual fund companies. From the dataset, I extract data on monthly fund and benchmark index volatilities, organizational fund variables defined previously and on one-month return data for funds. For funds having multiple share classes (i.e. growth and profit), I exclude the other fund class that has fewer shareholders.[16]

Several funds present incomplete data on fund characteristics during the sample months. For the analysis of these characteristics and risk-taking, I exclude all observations that do not contain complete information on required variables. The incomplete data is mainly provided by foreign mutual fund companies who are not obliged to provide with all information presented on the Mutual Fund Reports. However, the exclusion of these observations does not decrease sample validity since the analysis concentrates on the risk-taking behavior across equity funds, regardless of funds' home country. The final sampled dataset contains 27,372 observations for a period of over ten years, from January 1998 to July 2009.

For the analysis of risk-taking within and across family funds, I further exclude all foreign funds. The limitation does affect the sample size in a restrictive way but is indispensable, as foreign families rarely offer all their funds for the Finnish market – the within-family comparison of these family funds thus is not valid as all the observations of these families are

[16] Different fund share classes invest in the same portfolio so a duplicate entry of them would bias the sample. For a large majority of funds having two share classes in the sample, growth shares are significantly larger in terms of shareholder base and are also more regularly traded than the profit class shares.

not included and presumably, the subsample drawn from the family would not describe the risk-taking of the family in aggregate. In turn, the sample for family analysis does not suffer from the problem of incomplete observations as data on only returns and volatilities is required. The final sample for fund family analysis contains all equity funds belonging to a fund family managed by a retail bank-backed fund company (denoted as family funds) or by another fund company (denoted as non-family funds) being a member of The Finnish Association of Mutual Funds[17]. The family and non-family fund samples together total to 18,903 monthly observations.

Of broad objective categories, the analysis concentrates on equity funds, a limitation consistent with several previous studies. The final sample includes all equity funds with adequate data regardless of their geographical investment strategy[18], containing equity funds that invest in Finland, Nordic countries, Europe, North America, Japan, Asia, emerging markets and globally. All index, specialized, money market, hedge and balanced funds are excluded from the aggregate sample as presumably, their fund characteristics and thus incentives for risk-taking behaviour can differ significantly from the ones of normal equity funds.

[17] For more information, see http://www.sijoitusrahastot.fi/.
[18] As presented in Section 4 – Methods, the risk levels are defined as the ratio of fund volatility to benchmark index volatility in order to smooth out specific systematic risk components of different geographical markets.

Table 3

Annual Characteristics of the Aggregate Sample, 1998–2009

Summary statistics of the sample on an annual basis are presented. The table reports yearly figures for the aggregate number of monthly observations and funds, percentage of funds that belonged to a family in respective year, average total net assets TNA (million €), average 1-month raw return (r_i) and average 1-month excess return ($r_i - r_m$). The number of funds is measured at the end of the last month of each year and the number of observations sums up all the monthly fund observations during the sample year in question. In 2009, the observations cover only the period from January to July, as July was the last data month available at the time of the research. On average, when funds' average 1-month simple return is lower, e.g. during economic downturns, funds tend to underperform their benchmark indices, meaning the average 1-month excess return is lower. One explanation could be sample funds' higher beta compared to their benchmark indices' betas (more aggressive risk-taking of actively managed equity funds). The average fund size (TNA) between years 1998–2009 reflects well the increase in mutual fund investments, whereas also the economic cycles can be seen in the annual average fund sizes; for 2008, the average fund size decreases over 40 % from the figures of 2007, due to simultaneous economic downturn and consequent capital redemptions experienced during the second half of 2008. In the sample, a fund is denoted as a family fund if it belongs to a fund company backed by a retail bank operating in Finland, otherwise a non-family fund.

Year	No of Obs.	No. of Funds	Percentage of Family Funds	Average TNA (m€)	Avg. 1-th Simple Return, %	Avg. 1-mth Excess Return, %
1998	595	69	43.5	9.32	0.13	-0.99
1999	987	115	37.8	17.25	3.50	1.03
2000	1,549	172	34.9	19.92	0.61	0.33
2001	1,922	218	36.3	13.74	-1.80	-0.12
2002	2,106	229	42.5	50.60	-1.94	-0.18
2003	2,507	238	43.6	41.53	0.94	0.58
2004	2,651	257	42.9	62.38	0.60	-0.05
2005	2,905	287	43.2	80.01	2.32	0.25
2006	2,976	313	43.1	100.63	1.43	0.12
2007	3,314	349	45.5	110.70	0.29	-0.14
2008	3,368	424	35.2	64.89	-2.77	-0.39
2009	2,492	308	48.6	65.65	-0.01	-0.00
Total	27,372	2,979	n/a	n/a	n/a	n/a

During the sample period, the number of funds increased from 69 to 308, whereas the number of monthly observations during a year rose with a similar rate from 595 (1998) to 3,368 (2008) observations, reflecting well the fast development of the mutual fund industry in Finland. The median size of the fund increased from 4.1 million € in 1998 to 32.2 million euros in 2009, respectively, an increase deriving both from the increased interest of Finnish investors to mutual funds and establishment of larger, foreign funds to Finnish markets. On the other hand, the fairly small median size of fund during the sample period indicates that there are many small funds operating in the Finnish fund market. On the macroeconomic level, the sample statistics also reveal the dramatic impact of the economic downturn in year 2008, as the average fund TNA decreases over 40 % from year 2007.

Table 4

Summary Statistics for Organizational Fund Characteristics

The table presents descriptive statistics of the aggregate sample in terms of organizational fund variables. The figures are calculated from the aggregate sample containing 27,372 monthly observations between years 1998–2009. For each variable, a minimum, maximum, mean and median observation is presented in addition to the standard deviation of the observations. All the observations are monthly, indicating that for example, the maximum fund size during the sample period was 1.72 billion euro (measured at the end of sample month) or that the worst-performing fund during the sample period managed to generate a monthly raw return of –58.81 %.

Variable	Min.	Mean	Median	Max.	Std. Dev.
TNA (€ million)	0.00	63.46	24.98	1,718.52	108.85
Fund age (months)	0.00	81.96	66.00	353.00	62.24
1-month simple return (%)	-58.81	0.07	0.60	50.20	7.16
1-month excess return (%)	-57.39	0.02	0.03	42.20	4.43
Management fee (%)	0.00	1.56	1.58	2.60	0.66
Subscription fee (%)	0.00	1.06	1.00	6.50	0.65
Redemption fee (%)	0.00	0.88	1.00	5.00	0.42
Minimum investment (€)	0.00	29,171	500	1,680,000	139,353
Number of shareholders	0.00	7,472	1,215	518,174	22,822

The absolute complex size of Finnish fund companies increased significantly during the sample period, but the relative number of Finnish family funds in the aggregate sample remained around 40 % for each sample year. The evolution implies that the complex size of Finnish fund families grew relatively as fast as the number of entries of Finnish non-family or foreign funds. In 2009 (January–July), the proportion of family funds in the sample reached its peak by over 48 % of all observations.

The average fund in the aggregate sample has a TNA of 63.5 million euro, whereas the largest manages an asset base of 1.72 billion euro. Measured by the number of owners, the largest fund has more than 518,000 shareholders, whereas the median fund has an owner base of only 1,215 shareholders. The oldest fund in the sample holds on operation history of 353 months (~ 29.4 years); still, for these funds the sample includes data only for the period that fits to the sample period range of 1998–2009 and that was included in the original dataset. If the fund existed before appearing in the dataset, this history is not included to the sample.

The most expensive fund in the sample announces to charge a subscription fee of 6.5 %. Also the average subscription fee proves to be 1.06 %, compared to the fairly low mean redemption

fee of 0.88 %. The figures indicate that capital inflows are addressed with larger front-end loads[19] than redemptions; namely, this would imply that the barriers to exit for the shareholder in terms of bad performance were lower.

Based on the significant deviations present in fund characteristics, the sample is fairly heterogeneous and thus serves well the purposes of the analysis. The sample period includes also observations for periods of both economic boom and downturn, so I am able to capture funds' risk-taking behavior in both scenarios.

5.2 Distinct characteristics between family and non-family funds

Funds belonging to Finnish fund families have two distinctive features. First, family funds operate in a special environment and in a market largely dominated by the operations of larger retail banks. Capital flows for bank-managed funds in Finland prove to follow totally different patterns than for example the high-Morningstar rated funds in the US market [Knuutila et al. (2007)]. Second, a large majority of the shareholder base of these families consists of Finnish private and institutional investors. Consequently, the population of family funds offers a special environment for the study of both fund market characteristics *and* Finnish investor behavior.

The mean family fund in the sample has 12 months shorter operating history than the average non-family fund and the difference is statistically significant at the 1 percent level. The difference can whether indicate that fund families in general have simply started to supply new funds at a later stage of the sample period to the market or that family funds are more easily liquidated/terminated than non-family funds. Since the survivorship of a family is not highly dependent on one, for example bad-performing fund, families may have an incentive to terminate/liquidate/merge these funds faster. On the other hand, non-family fund companies have a smaller number of funds under management or even in some cases only one fund, so they in turn are induced to continue even though the fund would perform relatively poorly. It should be also noted that the same flow-performance curve should apply for both family and non-family funds. Analogously, one can hypothesize that this could induce family- and non-family funds to engage in different type of risk-taking behavior.

[19] The fee component levied on the subscription at the time of purchase.

Table 5

Differences in Mean Characteristics of Family and Non-Family Funds

Organizational fund characteristics and differences in them between family and non-family funds are reported. The observations constitute two subsamples, totaling 18,903 observations. Subsamples are formed based on whether the fund belongs to a fund company of a retail bank (family fund) or another fund company (non-family fund) operating in Finland. For each variable of interest, each row presents the subsample-wide median value, the first column reporting the figures for family funds and the second for non-family funds, respectively. The third column shows the *p*-value of the tests estimating if the two means are equal *or* if the belonging to a fund family does not explain the differences between the values of presented variables. As the two subsamples form the population for all observations in question, *z*-statistic is used to examine if family and non-family funds differ by their average fund characteristics. The differences shown below provide a useful starting point for the analysis of possible differences in risk-taking behavior between family- and non-family funds.

	Family Funds (Median)	**Non-Family Funds (Median)**	***p*-Val. Difference of Mean Values**
1-month simple return (%)	0.66	0.61	0.436
1-month excess return (%)	0.03	0.04	0.939
TNA (€ million)	50.6	29.9	<0.001
Fund age (mths)	60.0	70.0	<0.001
Minimum investment (€)	100	5,000	<0.001
Number of shareholders	4,034	872	<0.001
Management fee (%)	1.60	1.50	<0.001
Subscription fee (%)	1.00	1.00	0.038
Redemption fee (%)	1.00	1.00	<0.001
Number of observations	9,221	9,682	n/a

The median family fund has smaller minimum investment requirement than the median non-family fund. The lower threshold of accessibility for family funds can affect the fact that the average non-family fund also has significantly smaller shareholder base. Considering the special characteristics of the sample and Finnish fund markets, the difference may also be explained by higher search costs that the investor has to incur while searching for a suitable non-family fund, whereas fund families are easily reached due to their wide-spread distribution channels and linkage with retail banking services.

Table 6
Summary Statistics on Sample Fund Families

The table shows summary statistics of the sample fund families. The nine families present the subsamples that are sorted out from the aggregate sample based on the retail bank background of the family: each family reported below is managed by a fund company that is part of a retail bank operating in Finland. The first column shows the total number of monthly observations for all funds belonging to each family and the second reports the aggregate number of different funds in the family during the sample period. The third column shows the average net asset value of a fund in the family and the fourth presents the average monthly excess return ($r_i - r_m$). The last column presents the average risk level (monthly standard deviation of daily returns) for the funds in the family. The sample collected for analyzing fund families covers the period from 1/2002 to 7/2009 since 1) earlier observations of fund number for smaller families before this are fairly small and 2) retail banks have started to exploit mutual funds more aggressively only after the turn of the 21st century. The family subsample consists of 9,221 observations in total.

Family subsample	No. of Obs.	No. of Funds*	Average TNA, m€	Average Excess Return (%)	Average Risk (%)
Family 1	501	13	49.5	-0.13	5.29
Family 2	560	25	55.9	0.07	6.13
Family 3	1,835	50	103.4	-0.06	5.29
Family 4	2,238	55	127.3	-0.06	5.97
Family 5	2,657	55	87.6	-0.07	5.78
Family 6	157	6	10.6	-0.08	5.90
Family 7	270	8	34.4	-0.03	4.88
Family 8	694	21	45.2	0.16	5.43
Family 9	309	12	24.6	0.05	5.34
				-	

* The total number of different funds for a family during the sample period.

If the number of shareholder base for family and non-family funds is compared, the median family fund has a shareholder base over four times larger (4,034 vs. 872 shareholders) than the median fund in the non-family subsample. An average family fund charges a subscription fee of 2 basis points higher than the one charged by the mean non-family fund. Also in terms of management and redemption fees, the average family fund appears to charge more than the average non-family fund. Bank-managed family funds are evidently able to attract more investors in absolute numbers and their average size difference to non-family funds is statistically significant, although their fee structure appears to be of higher level. Interestingly, the average non-family fund performs better measured with monthly excess return although the mean family fund has a positive raw return. Ultimately, the average excess return for both

samples is negative, indicating both family and non-family funds have hard times beating their benchmark indices.

Family and non-family funds seem to significantly differ by their characteristics. I argue the difference largely originates from the large role of the distribution channels of family funds and the consequent higher search costs that the investor will have to incur if he decides to go outside the family. The acknowledgement of this in turn induces mutual fund companies to engage in certain type of strategies. If fund characteristics prove to explain the risk-taking behavior of mutual funds in compliance with the presented eight first null hypotheses, it further implicates that the risk-taking behavior between family and non-family funds should also differ.

5.3 Survivorship biases

The rapid growth of the Finnish mutual fund industry and especially the increase in foreign funds marketed in Finland signify that the sample employed in this study contains special characteristics. First, the median fund in the sample holds an operating history of less than six years since the number of funds in the industry has grown fast during the recent years. Second, as for foreign funds, the dataset contains only the operating history during which the fund has been marketed for Finnish investors, signifying that the sample does not contain the aggregate operating history for all foreign funds.[20]

In addition, the dataset suffers from survivorship bias as it contains the observations of all funds that have been merged or liquidated, but also the observations for funds that have ceased to exist during the aggregate sample period. The bias is not however significant in terms of validity as I measure the risk-taking at a point in time, not over time or in terms of change, and for each point of time, the dataset includes all funds at that time. The inclusion of ceased funds is in fact highly justified since it decreases biases that could otherwise exist due to the rapid growth of Finnish mutual fund industry.

[20] The Finnish Association of Mutual Funds provides the ratios for fund performance and risk measures that are self-calculated in order to assure the comparability of fund data. This presents problem for e.g. combining another database to the one used here as firstly, the variables are not necessarily commensurate and secondly, the other database should also contain data on organizational fund variables for the same sample of funds. For more information, see http://www.sijoitustutkimus.fi/rahastoraportti.shtml.

5.4 Market benchmark indices

The differing risk characteristics of regional markets are taken into account by using comparable market benchmark indices. As the variables employed in the thesis are constructed on the fund volatility in excess of the volatility in market index and determine a large part of the validity of the analysis, it is justified that, considering the characteristics of the fund sample, more than one benchmark index is employed. Several previous studies have used only single benchmark index like S&P 500 [see e.g. Busse (2001) and Ammann and Verhofen (2007)] or constructed style benchmarks [see e.g. Brown et al. (2001)]. However, the usage of only one benchmark to evaluate fund's excess volatility does not take into account funds with different styles and regional concentrations, distorting the validity of the benchmark as the actual benchmark index.

Thus, I apply multiple benchmark indices, identical to the ones used by the Finnish Association of Mutual Funds in the Mutual Fund Reports. The benchmark indices applied are provided by MSCI Barra[21] and widely used by portfolio managers; in addition, equity funds investing in Finland are benchmarked to OMX Helsinki Cap Index[22]. Indices are of total return basis and they assume that all dividends and other distributions are re-invested into the portfolio. Benchmark indices applied are the official indices used in the monthly published Mutual Fund Reports, and are allocated to individual funds based on each fund's regional or other investment strategy. For each index, annualized volatilities are obtained from the Mutual Fund Reports and scaled back to monthly volatilities.

The benchmark indices employed are not the actual benchmarks used by funds themselves; however, MSCI indices in general are widely used among portfolio managers on a global scale. Here, the purpose of using joint benchmark indices is to proportion fund's risk level to the general risk level in the particular geographical market; in fact, the method is even more justified compared to the previous academic studies that have used common benchmark indices rather than individual benchmark index of separate markets. Furthermore, benchmark indices used by funds themselves are not valid indices for measuring absolute and objective

[21] The indices are gross benchmarks and are therefore suitable for adjusting the risk levels of funds that report their figures as dividends-re-invested. For more information, see *http://www.mscibarra.com/.*
[22] The index was called HEX Portfolio Index before January 2002. For more information, see http://www.omxnordicexchange.com/.

performance (and thus risk levels) as they often are composite indices or otherwise subjectively chosen to promote fund's internal purposes.

6 RESULTS

In this section, I present the quantitative results of the analysis based on the seven null hypotheses of the thesis. The analysis is divided into three parts: the first one concentrates on discussing the implications of the initial regression model on the relation of fund characteristics and risk-taking, developing and arguing on the form of the final model applied in this thesis. The second part employs the final regression model to analyze the relationship of fund characteristics and risk-taking, discussing whether the first five hypotheses can be accepted. The third part focuses on the differences of family and non-family funds' risk-taking and inductively, on the risk-taking differences across fund families; the section analyzing the effect of family membership is based on the sixth and seventh null hypotheses. In the end of Section 6, I shortly contemplate the main findings from fund investor's perspective and discuss the implications between them and the dominant role of family funds in Finland.

6.1 Relation of fund characteristics and risk-taking behavior – Initial model

There exists several practical and theoretical motivations for why the nine fund characteristics of the initial model can be seen to be closely related to incentives for risk-taking. As shown in correlation Table 7, the original model for the causality of nine initial fund characteristics and risk-taking behavior has a possibility of encountering problems with multicollinearity. Table 7 shows that there exists three cases in which the correlation coefficients is more than 0.3; the relationship between variables measuring fund size (total net assets and number of shareholders) and the management fee versus both subscription and redemption fee variable. The background for these correlation coefficient figures is more closely examined.

Variables ln(assets) and number of shareholders (*OWNERS*) have a correlation coefficient of +0.302. However, ln(assets) has a negative correlation with the risk-taking measures whereas number *OWNERS* is positively correlated both with simple and relative volatility. If ln(assets) is first solely regressed to the risk-taking measure and after this both ln(assets) and *OWNERS* variables, coefficients or respective t-value for ln(assets) do not change significantly. When the aggregate regression is examined in Table 8, it is contradictory that the sign for ln(assets) coefficient is negative (–0.052), as suggested by Hypothesis 1, whereas the variable for

number of owners has a positive, although really small, coefficient value (< 0.001); this even though ln(assets) and *OWNERS* are positively correlated.

Table 7

The Correlation Matrix for Risk Measures and Fund Characteristics

This table reports the correlations between the two risk measures (simple and relative volatility) and the nine explanatory variables. The purpose of the correlation table is to represent the interdependence of the model variables in order to detect if the model has a possibility of encountering problems with multicollinearity. The correlations between the variables are estimated from the aggregate sample covering the period from January 1998 to July 2009. The sample contains 27,372 observations and includes all funds that ceased to exist, merged or were liquidated during the sample period. The inclusion of these observations is justified since they increase the validity of the sample and decrease biases that would possibly exist due to the rapid growth of Finnish mutual fund industry and the increase in the amount of foreign funds sold in Finland. The correlations between most of the variables are < 0.3, some however > 0.3 [denoted with an asterix (*)] which can be a possible indication of multicollinearity of variables in the model. The possible problems between these variables are discussed below in the text.

Variable	Simple Volatility	Relative Volatility	ln (assets)	Age (mths)	Prior Excess Return 1-mth	Management Fee	Subscription Fee	Redemption Fee	Owners	Mininv	Family
Simple Volatility	1										
Relative Volatility	0.316*	1									
ln (assets)	–0.156	–0.132	1								
Age (mths)	0.017	–0.002	0.095	1							
Prior Excess Return 1-mth	–0.038	–0.044	0.006	0.012	1						
Management Fee	0.092	–0.003	0.081	0.053	–0.018	1					
Subscription Fee	–0.010	–0.054	–0.017	0.043	–0.019	0.302*	1				
Redemption Fee	0.082	–0.008	–0.012	0.001	–0.012	0.423*	0.142	1			
Owners	0.100	0.067	0.302*	0.177	–0.005	0.112	0.138	0.000	1		
Mininv	–0.034	–0.024	0.086	0.025	0.004	–0.241	–0.081	–0.225	–0.064	1	
Family	–0.070	–0.017	0.219	–0.117	–0.013	0.058	–0.102	0.090	0.051	0.083	1

Table 8

Initial Model: Regressions by Progressively Adding Variables

This table presents the regressions for the initial model where fund's risk-taking behavior (relative volatility) is explained with all original nine fund variables. The table reports the regression coefficients step by step in order to show how the model is developed while the variables are added one by one; the analysis for progressive regressions is produced in order to address possible problems of the initial model (i.e. multicollinearity of model variables that was observed in correlation matrix, Table 7). Relative volatility is defined as the ratio of monthly fund volatility to monthly market index volatility. The coefficient estimates of two-tailed tests and their associated t-values (in parentheses) are described for denoted significance levels. The sample consists of 27,372 monthly observations for relative volatility (regressand) and fund characteristics (regressors), and covers the period from January 1998 to July 2009. The high correlation between fee variables can be observed in Regression 1.–9., where the coefficient and t-values change significantly for subscription and redemption fee when management fee variables is introduced to the model.

Variable added	1.–2.	1.–3.	1.–4.	1.–5.	1.–6.	1.–7.	1.–8.	1.–9.	1.–10.
1. Intercept	1.276	1.275	1.269	1.269	1.264	1.314	1.320	1.307	1.345
	(201.8)***	(201.9)***	(175.2)***	(175.2)***	(168.6)***	(144.9)***	(122.9)***	(115.8)***	(118.4)***
2. ln(assets), m€	–0.039	–0.039	–0.040	–0.039	–0.040	–0.040	–0.040	–0.041	–0.052
	(-22.03)***	(-22.01)***	(-22.08)***	(-21.82)***	(-21.81)***	(-21.78)***	(-21.80)***	(-22.11)***	(-27.05)***
3. Prior excess return 1-mth		–0.500	–0.502	–0.501	–0.500	–0.513	–0.514	–0.511	–0.502
		(-7.21)***	(-7.23)***	(-7.22)***	(-7.19)***	(-7.40)***	(-7.41)***	(-7.37)***	(-7.30)***
4. Age (mths)			< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< -0.001
			(1.82)*	(1.86)*	(2.19)**	(2.52)**	(2.54)**	(2.33)**	(0.77)
5. Min investment				< –0.001	< –0.001	< –0.001	< –0.001	< –0.001	< –0.001
				(-2.18)**	(2.35)**	(-3.06)***	(-3.25)***	(-2.49)**	(-0.73)
6. Family dummy					0.016	0.010	0.011	0.010	0.006
					(2.46)**	(1.58)	(1.71)*	(1.49)	(0.92)
7. Subscription fee						–4.556	–4.477	–5.024	–6.294
						(-9.68)***	(-9.42)***	(-10.18)***	(-12.73)***
8. Redemption fee							–0.901	–2.116	–1.260
							(-1.19)	(-2.61)***	(-1.56)
9. Mgmt fee								2.224	1.792
								(4.09)***	(3.32)***
10. Owners									< 0.001
									(19.98)***
F-value	485.6***	269.2***	180.6***	136.7***	110.6***	108.0***	92.8***	83.4***	119.5***
Adj. R^2	0.017	0.019	0.019	0.020	0.020	0.023	0.023	0.024	0.038
Number of obs.	27,372	27,372	27,372	27,372	27,372	27,372	27,372	27,372	27,372

***, **, * denoting the statistical significance at levels 0.01, 0.05 and 0.10, respectively.

OWNERS variable is preserved in the final regression model as it appears that it measures different concept than ln(assets); first, correlation coefficient of different sign for ln(assets) and risk-taking vs. *OWNERS* and risk-taking implies that the two variables are related with risk-taking behavior due to different reasons. Second, Table 8 presenting the regressions by progressively adding the variables shows that when introducing *OWNERS* to the model as the ninth and last variable, the coefficient or respective t-value of ln(assets) does not change significantly. Neither do the two variables have any higher standard errors when individually or jointly regressed to risk-taking measure; both variables are also statistically significant while individually regressed to the risk measure, as shown in Appendix B.

Management fee variable is excluded from the final model. Table 8 strongly indicates that the model is exposed to multicollinearity if all three fee variables are included. The variable has a correlation of 0.302 and 0.423 with subscription and redemption fee, respectively. In Table 8, the high correlation can be observed in Regression 1.–9.; coefficient and t-values of correlated subscription and redemption fees decrease significantly from the previous regression level when management fee variable is introduced to the model. Subscription fee coefficient decreases from –4.48 to –5.02 and redemption fee coefficient from –0.90 to –2.12. In addition, the redemption fee coefficient that is not statistically significant at Regression level 1.–8. becomes significant at the 1 percent level as management fee variable is introduced.

In addition, as model variables are individually assessed against the risk-taking measure (see Appendix B), family dummy produces contradictory results. Individually regressed to relative volatility, family dummy coefficient is negative (–0.017) and statistically significant at the 1 percent level, but in the aggregate model in Table 8, produces a positive and statistically insignificant coefficient. After a closer examination, ln(assets) appears to be the co-variable that changes the sign of family variable, simultaneously inflating respective coefficient and t-values. As the correlation between the two variables is 0.219 and the results imply possible problems if both variables are included, I exclude family dummy from the final regression. The effect of fund family membership is later examined by using other methods in subsection 6.3.

Appendix B also shows that age variable produces a negative R^2 when individually regressed to the risk measure, and the age coefficients and their respective t-values develop irrationally in Table 8. Due to these results that indicate the age variable moreover to inflate the model than improve it, I exclude age variable from the final regression model.

Table 9

Final Model: Regressions by Progressively Adding Variables

This table presents the final regression model by progressively adding the selected six fund variables. The management fee variable observed to inflate the validity of other regressors (due to multicollinearity) is excluded from the final model presented below. Also age variable and family dummy are excluded since they appear to deteriorate the model and co-variables rather than improve it. The regressions reveal that some variables prove statistical significance in all regressions; in fact, all the significant variables in the aggregate model show statistical significance also when they are individually regressed to risk-taking measure, so their statistical interpretation is not inflated when all variables are included to the regression. Risk-taking is measured in terms of relative volatility which is the ratio of monthly fund volatility to market index volatility. The six regressions are conducted by adding the six fund variables progressively to the model, in order to show how the final model differs from the initially presented model (Table 8). The results of the aggregate/full regression model are also applied as the final ground for the analysis and for testing the hypotheses. The coefficient estimates of two-tailed tests and their associated t-values (in parentheses) are described for denoted significance levels. The sample consists of 27,372 monthly observations of risk-taking variable (relative volatility) and fund variables (characteristics).

Variable added	1.-2.	1.-3.	1.-4.	1.-5.	1.-6.	1.-7.
1. Intercept	1.276	1.275	1.276	1.325	1.331	1.356
	(201.78)***	(291.94)***	(201:94)***	(163.67)***	(131.89)***	(134.34)***
2. ln(assets), m€	–0.039	–0.039	–0.039	–0.039	–0.039	–0.052
	(–22.04)***	(–22.01)***	(–21.74)***	(–21.88)***	(–21.87)***	(–27.29)***
3. Prior excess		–0.500	–0.500	–0.512	–0.513	–0.506
return 1-mth		(–7.21)***	(–7.20)***	(–7.40)***	(–7.41)***	(–7.36)***
4. Min investment			< –0.001	< –0.001	< –-0.001	< –0.001
			(–2.15)**	(–2.92)***	(–3.07)***	(–1.25)
5. Subscription fee				–4.571	–4.513	–5.929
				(–9.76)***	(–9.56)***	(–12.51)***
6. Redemption fee					–0.735	–0.175
					(–0.98)	(–0.23)
7. Owners						< 0.001
						(20.3)***
F-value	485.6***	269.2***	181.0***	160.1***	128.2***	177.1***
Adj. R^2	0.017	0.019	0.019	0.023	0.023	0.037
Number of obs.	23,372	23,372	23,372	23,372	23,372	23,372

***, **, * denoting the statistical significance at levels 0.01, 0.05 and 0.10, respectively.

The final regression model and selected six fund variables are presented in Table 9, once again with progressive regressions in order to show how the final model develops when variables are added. The next subsections present and analyze the results of final regression and answer the question of whether the five hypotheses on risk-taking and fund characteristics can be accepted.

6.2 Fund characteristics and risk-taking behavior – Final model

Figure 1 shows that equity funds with the lowest volatility levels follow the risk levels of their market benchmark indices fairly closely. More than 70 % of the time the realized volatility of low-risk fund is lower than market volatility in general (RV < 1). In terms of active fund management, the difference indicates that whether these actively managed funds target to create lower volatility levels than their market benchmark index or they maintain low-risk profiles for some other reason. Instead, average-risk equity fund tends to maintain a higher risk level than its benchmark index, whereas high-risk fund proves to lock to a risk level that is roughly 1.3x the market index volatility, on average.

Funds with the lowest risk levels (25 % of sample funds with the lowest relative volatility) differ from comparable high-risk funds in terms of fund characteristics, as reported in Table 10. The median high-risk fund is over 40 % smaller in asset size than the median low-risk fund, implying that the managers of larger portfolios commit to more conservative risk-taking behaviour. Interestingly however, measured by the dispersion of shareholder base, funds with fewer owners are more likely to realize lower volatility levels in excess of market volatility.

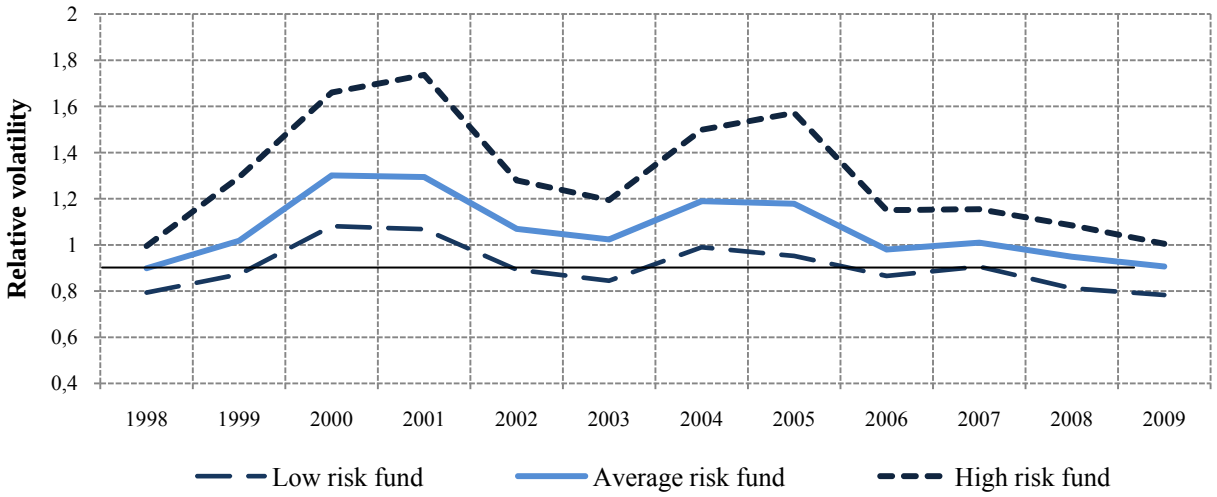

Figure 1. Fund volatility to market index volatility from 1998 to 2009. The figure presents the annual average volatilities in excess of market index volatility (relative volatility) for three fund sample groups. The ratios are presented for the 25th, average and 75th percentile relative volatility observations for the sample years in question. The steeper slope shows that funds in the high risk quartile change their risk level more aggressively along general market movements, whereas the average low risk fund tends to alter its volatility to benchmark volatility with smaller adjustments. The figure also shows that funds' risk-taking in comparison to their benchmark indices is cyclical.

Table 10

Characteristics of High and Low Risk Level Funds

Table 10 compares the fund characteristics for two fund groups consisting of high and low volatility funds. The aggregate sample is sorted by monthly relative volatility (RV) and 25 % of the funds with the lowest and 25 % of funds with the highest risk level are chosen to present low and high volatility fund groups, respectively. The subgroup of low (high) risk funds contains all observations with $RV < Q_1$ ($RV > Q_3$). The table presents the mean, median and standard deviation for each fund variable in low and high volatility group. The data covers the aggregate sample period from January 1998 to July 2009. During this period, the subsamples include 6,843 observations for both high volatility fund groups, sorted out from the aggregate sample of 27,372 observations.

	Mean		Median		Std. Dev.	
Variable	Low Risk	High Risk	Low Risk	High Risk	Low Risk	High Risk
TNA (€ million)	68.4	44.0	26.9	15.69	128.6	80.0
Fund age (months)	73.8	80.5	58.0	59.0	57.0	66.56
Return 1-mth (%)	0.52	–0.16	1.33	0.17	7.24	8.11
Excess return 1-mth (%)	0.02	–0.07	0.16	–0.10	4.76	5.70
Management fee (%)	1.62	1.55	1.60	1.55	0.64	0.59
Subscription fee (%)	1.20	1.05	1.00	1.00	0.79	0.59
Redemption fee (%)	0.91	0.89	1.00	1.00	0.49	0.38
Minimum investment (€)	20,762	20,856	500	500	115,985	119,939
Number of shareholders	8,542	9,488	1,123	1,269	25,092	33,491

Evaluated both with raw and excess return, investors' decision to choose low risk fund over high risk fund has been profitable; the average high risk fund has not only generated larger uncertainty to its shareholders in terms of higher volatility, but has also been incapable to generate higher returns in exchange to the higher risk; both raw and excess returns are lower compared to the ones of an average low-risk fund.

On average, low-risk funds charge higher total fees (front-and back-end load fees plus management fee); as relative volatility is the ratio of fund volatility to market volatility, this indicates that the 'least actively' managed funds have been the more expensive ones to invest in. If we consider that one motivation for fund investor to choose active fund over passive index fund is that the manager actively alternates the portfolio composition to differ from market index movements in terms of performance or volatility, higher fee levels should be moreover allowed to high-risk funds.

As shown in Table 10, the fee component that especially makes the mean low-risk fund more expensive is subscription fee, being 15 basis points higher than for the average high-risk fund. The subscription fee is incurred at the time of purchase, before the value of investor's portfolio is affected by the investment choices of the fund manager, which means that although these choices

Table 11

Cross-Sectional Regressions for Risk-Taking Behavior – Simple and Relative Volatility

The regression results for testing the relation of risk-taking behavior and the selected six fund attributes are presented. The risk-taking behavior is analyzed in terms of the two monthly measures, simple and relative volatility (RV). Simple volatility is the standard deviation of daily fund raw returns, whereas relative volatility is the ratio of simple volatility to market index volatility. The regressions are run for the aggregate sample of 27,372 observations, covering the sample period from January 1998 to July 2009. The coefficient estimates of two-tailed tests and their associated t-values (in parentheses) for denoted significance levels are presented for both cases. As the sample covers all equity funds regardless of the market they are investing in, it is important to notice that simple volatility does not take into account market differences, whereas relative volatility is a market-adjusted measure. For example, a fund can have high volatility levels in absolute terms but when the risk level is adjusted to the general levels of the specific market, the volatility is of normal level. Both regressions show multiple statistically significant variables, but the magnitude differs significantly depending on the risk-taking measure used.

Variable	Simple Volatility (SV)	Relative Volatility (RV)
1. Intercept	0.067 (121.23)***	1.356 (134.34)***
2. ln(assets), m €	–0.003 (–33.44)***	–0.052 (–27.29)***
3. Prior excess return 1-mth	–0.023 (–5.98)***	–0.506 (–7.36)***
4. Min investment	< 0.001 (1.87)*	< –0.001 (–1.25)
5. Subscription fee	–0.213 (–8.15)***	–5.929 (–12.51)***
6. Redemption fee	0.597 (14.56)***	–0.175 (–0.23)
7. Owners	< 0.001 (27.05)***	< 0.001 (20.3)***
F-value	279.7***	177.1***
Adj. R2	0.058	0.037
Number of obs.	27,372	27,372

***, **, * denoting the statistical significance at levels 0.01, 0.05 and 0.10, respectively.

result in deterioration of investor's share value, the subscription fee has already been charged. For a point of comparison, the average management and redemption fees of a low-risk fund are 7 and 2 basis points higher, respectively, than the ones for the average high-risk fund. This difference raises

the question of why do low-risk funds charge a large majority of fees up-front in form of subscription fees.

H_1: Larger equity funds take less risk

Equity funds being smaller measured by their net asset value commit to more aggressive risk-taking behavior, a finding consistent with **Hypothesis 1**. As reported in Table 11, both simple and relative volatility regressions produce a negative coefficient, being statistically significant at the 1 percent level for both cases. The negative causality implies that funds with larger asset base commit to more conservative risk-taking behavior and maintain lower volatility levels in absolute terms, but also lower than their respective market benchmark index volatility level.

As fund's risk-taking behavior is measured by relative volatility (RV), the asset variable contributes significantly stronger to risk-taking behavior, compared to the regression where simple volatility (SV) is used as the risk measure. The coefficients for SV and RV are –0.003 and –0.052, respectively; this indicates that for the model measuring risk in relation to market risk, the negative contribution of asset size to fund's risk-taking behavior is over tenfold compared to the model using fund's absolute volatility. Relative volatility separates between active and passive risk component on fund's behavior, so it appears that for larger funds it would be a more delicate issue to lose out to their market index, which is why they maintain lower risk levels. In aggregate, funds with larger assets under management (AUM) prefer lower risk levels also in absolute terms, so the underperformance in relation to market index is not necessarily their only motivation to take less risk.

The results are in line with Beckers and Vaughan (2001) who argue that managers operating with smaller AUM maintain their flexibility; the average transaction costs of smaller funds may be higher (lower economies of scale), but on the other hand, they can buy and sell stocks more flexibly as their transaction size is significantly smaller than transactions of larger funds. As Pollet and Wilson (2008) find that larger funds respond to asset growth by increasing their existing ownership shares rather than by further diversification, it appears that the relatively more aggressive risk-taking behavior of smaller funds would originate from their flexibility rather than from their different investment style.

The regression results of larger funds being more conventional in their risk-taking behavior are also consistent with other results of Pollet and Wilson (2008) who find larger funds to have lower risk levels, whereas smaller funds tend to hold riskier portfolios. They find the funds with larger TNA to

diversify more rapidly in response to asset growth which could also explain the significant coefficients in Table 11; the largest sample funds, often belonging to a family, have fairly large resources devoted to investment research. As opposite, smaller sample funds are often part of a smaller company managing only few funds the most; the research for these funds is often made by few people alone and is thus fairly restricted. The portfolios of these funds are thus less diversified which in most cases will directly result in higher volatility. A more detailed examination of this is however out of the scope of this thesis.

Controversially, funds having more shareholders commit to higher risk levels, a finding inconsistent with **Hypothesis 1.** Although *OWNERS* coefficient is statistically significant at the 1 percent level for both regressions, the coefficient for *OWNERS* remains really small (< 0.001), implying number of owners has only a marginal effect on fund's risk-taking behavior; still, the contribution of *OWNERS* does not change even though it is regressed alone to the risk measure (Appendix B), so the variable contributes to funds' risk-taking behavior.

The negative relation between number of shareholders and fund's risk-taking can be an indication of *the principal-agent problem*. As argued previously, fund asset size and number of owners relate to risk-taking behavior because of different reasons, which supports the idea of shareholders' monitoring power being diluted as the number of shareholders increase. The correlation between minimum investment requirement and number of shareholders is negative (–0.064), meaning funds with fewer shareholders require higher capital stakes from the investors. In turn, investors investing larger amounts are more often wealthier and more sophisticated, so one could expect that they monitored their fund investment with more scrutinity. Controversially, funds with more shareholders are often family funds with a retail bank background and their ownership is highly dispersed over different types of investors. The average capital stake of an investor assumedly is also lower. Funds with more shareholders are thus incentivized to commit to riskier portfolios since the influence of larger shareholders is relatively weaker, and in a case where the higher risk is realized, capital redemptions of a group of investors is not that critical to fund's existence as would be for a smaller fund.

H_2: Funds having performed better in relative terms (excess return) in the previous period take less risk during the following period.

Poor performance in previous month encourages funds to have higher volatility levels in the following month. Both simple and relative volatility regressions produce negative coefficients, –0.023 and –0.506, respectively, and are statistically significant at the 1 percent level. The finding is

consistent with **Hypothesis 2** of the inverse relationship between prior performance and consequent risk-taking behavior. The results are also consistent with the findings of Brown et al. (1996) who find funds to increase their portfolio volatility after a period of poor performance. Set against the convexity of flow-performance curve, this would mean that the fund has an incentive to aim at better performance by increasing its risk level, since although the probability of larger losses is higher, the fund will not be punished with outflows to the same extent it will attract inflows if the risk-taking turns out profitable.

The worse the performance in previous month, the more the funds are tempted to increase their risk level in the next month compared to their benchmark index. The coefficient for relative volatility regression is significantly larger than the prior return coefficient for simple volatility regression, implying that after a poor period of performance funds are more aggressive and choose more often higher risk levels than the risk level of the market index in general. The finding is inconsistent with Ammann and Verhofen (2007) who show that the prior performance has a positive impact on the choice of risk level. More precisely, they find funds to increase beta and tracking error, i.e. fund's deviation from the market index after a period of good performance. Their finding supports the idea of overconfidence after a period of good returns, but on the other hand the overconfidence reasoning can be also applied to the negative relation found in the regressions of this thesis.

One would expect that after a period of poor performance the fund manager decreased fund's risk level in order to avoid larger losses in the next period. However, it appears that, instead of becoming more conservative, funds increase risk level in hope of generating higher excess returns in the next period. The finding on the relation of previous return and following risk-taking is in line with Koivulintu (2002) who also finds poor-performing Finnish equity funds to increase their risk levels and well-performing funds to lock into profits by decreasing risk levels. The latter type of behavior appears rational whereas risk increase after a poor performance reflects manager's competitive attitude towards losing out to the market and overconfidence of own capabilities.

The relation of consequent high risk after a poor period of performance implies that the fund managers having incurred relative losses in the previous period become more risk-seeking although there has not been any increase in the probability that they will beat the market index in the following period. The risk measure does not however take account *change* in the risk level, so the results only signify that worse-performing funds have higher risk levels in the next period *in relation to the better-performing funds.*

H_3: Younger funds commit to more aggressive risk-taking behavior.

The regression results do not support the relation of fund age and risk-taking behavior, and thus **Hypothesis 3** is not accepted. Age variable does not contribute to funds' risk-taking behavior in the initial model (Table 8), nor does it provide any sign of relationship if individually regressed to relative volatility (Appendix B). The finding is inconsistent with Brown et al. (2001) who find the survivorship of younger funds to be more sensitive to industry benchmark performance; their results indicate that younger funds would act differently in the market.

The results show that the length of funds' operating history does not affect the way equity funds convey risk in their current operations, and may also reflect the nature of risk-taking: the performance is evaluated moreover in short-term periods, and also the older, well-established funds act in the market as actively as younger funds. It thus appears that, despite their longer operating history, older funds do not experience any age advantages that could be observed in their risk-taking behavior.

H_4: Funds having higher minimum investment requirement commit to more aggressive risk-taking behavior.

The two risk-taking measures produce contradictory results for the relation of minimum investment requirement and risk-taking behavior. In simple volatility regression, the coefficient is extremely small ($< 0.001^{-3}$) but positive, and significant at the 10 percent level. However in relative volatility regression, the coefficient estimate is not only negative and extremely small, but also insignificant. Since the coefficients for both regressions are extremely small and conflicting, I am not able to draw any further conclusions about the fact whether funds with higher minimum investment requirement commit to more aggressive risk-taking; as there exists no theoretical background about why the results of the two regressions should produce different results, **Hypothesis 4** cannot be accepted.

H_5: The level of mutual fund fees is related to equity funds' risk-taking behavior

Funds charging higher **subscription fees** commit to more conservative risk-taking behavior. Subscription fee coefficients are highly negative for both simple and relative regression and significant at the 1 percent level, a finding supporting **Hypothesis 5.** However, a striking difference between the two models is that, for relative volatility the negative coefficient of –5.93 is multifold compared to the subscription fee coefficient in simple volatility model (–0.21).

The finding indicates that equity funds at the high-risk end would exploit lower front-end loads to attract capital inflows and that the lowest subscription fees were offered by funds that deviate the most from the risk level of their benchmark index. The results support the implications of Barber, Odean and Zheng (2005) who state that high salient front-end load fees chase away potential investors. If theoretically only 50 % of funds are able to beat their benchmark indices in the long run and performance persistence does not exist, it would appear logical that high-risk funds used low subscription fees in order to attract inflows; a fund with a high risk portfolio is more probable to also incur larger losses than an average equity fund which means that capital flows for these funds react differently towards volatility, i.e. these funds locate at the other end of the flow-performance curve.

At the same time, family dummy is negatively correlated with subscription fee (–0.102), implying that retail bank funds charge lower subscription fees. Family funds thus use low front-end loads to attract new capital inflows, although at the same time one might expect that the search costs for investing in a family fund were fairly low. Interestingly, both management and redemption are positively correlated with family dummy, which would imply that retail bank funds collected the majority of fees only after the investor has approved to invest in a certain retail family. As people generally buy retail banking services from one provider for a long-term period, one could expect that the capital once invested in retail bank family funds would remain longer in the family on average; I thus argue that, in Finland, this type of action of retail family funds is a good example of strategic fee-setting practice.

Measured with simple volatility, equity funds with higher risk levels charge higher **redemption fees**. The redemption fee coefficient of 0.597 is statistically significant at the 1 percent level, supporting again **Hypothesis 5** arguing for the relationship of fund fees and risk-taking behavior. The finding is in line with Koski and Pontiff (1999) who find load fees to discourage excessive flow variation. For high-risk funds, the usage of higher back-end loads thus incentivizes investors to maintain their ownership instead of cashing them out in case of risk realization.

The previously presented results of Barber et al. (2005) state that, in addition to subscription fees, investors react strongly towards high redemption fees. Based on the risk-return relationship, it is highly probable that funds engaging to more aggressive risk-taking behavior also experience larger losses than the lower-risk funds in their peer group. Although bad performance is not always punished with commensurate outflows as would be expected from rational investors, it is obvious that realization of these bad outcomes has negative effect on fund's reputation. When an investor is

induced to withdraw his ownership from the fund due to risk realization and losses the fund has been experiencing, he may be motivated to stay as a shareholder; to hold ownership and wait for appreciation, and at the same time avoid even larger losses for paying redemption fees of share selling under subscription price.

However, **redemption fee** coefficient proves to be statistically significant only for the simple volatility model. The positive coefficient estimate is statistically significant whereas for relative volatility model, the redemption fee variable is not only insignificant but also the coefficient is negative. As there exists no theoretical explanation of why the coefficients produced by the two risk-taking measures should differ by their sign, I am not again able to draw any conclusions on the final relationship of redemption fees and risk-taking behavior. Thus, I am not able to accept **Hypothesis 5** in terms of redemption fee variable, and only subscription fee is concluded to have effects on funds' risk-taking behavior.

6.3 Fund family membership and risk-taking behavior

Family and non-family funds differ significantly by their characteristics, as reported in Section 5. The differences reported in previous sections signify that, as the results in section 6.2 show that fund characteristics are related to mutual funds' risk-taking behavior, I should be able to find significant differences also in the risk-taking behavior between family and non-family funds. To my best knowledge, the differences in risk-taking behavior between family and non-family funds has not been studied with the bank-dominated Finnish market data, which further highlights the importance of this section.

6.3.1 Risk level differences between family and non-family funds

The division of sample funds to family and non-family funds provides a natural starting point to examine the relation of fund family membership and the motives for mutual funds' risk-taking behavior. Theoretically, there exists no distinct explanation why, on average, family fund's risk-taking should differ from the risk-taking of a non-family fund. Elton et al. (2007) find that high risk funds tend to concentrate in certain families but no theory supports the idea of why this effect would not even out when dissecting across families and equity fund population. The population of non-family funds should evenly embody both low and high risk level funds and equally, family funds should practice both more conservative and aggressive risk-taking.

On an annual basis, non-family funds show a propensity to maintain higher risk levels in comparison to family funds. Measured by relative volatility, the *average* non-family fund appears to have more aggressive risk-taking behavior through the sample period from January 2002 to July 2009, although during some periods family funds seem to commit to more aggressive risk-taking behavior. The time points of intersection for the two groups in Figure 2 are interesting; at bull market (2004–2007), non-family funds take more risk in relation to market index compared to family funds, whereas during bear market (2003 and 2007–2009) they have been more conservative in risk-taking than family funds. After the start of the financial crisis in 2007, both family- and non-family funds have significantly decreased their risk levels below those of market indices. In aggregate however, the sample period is too short for further analysis about family- and non-family funds' behavioral differences in various market conditions.

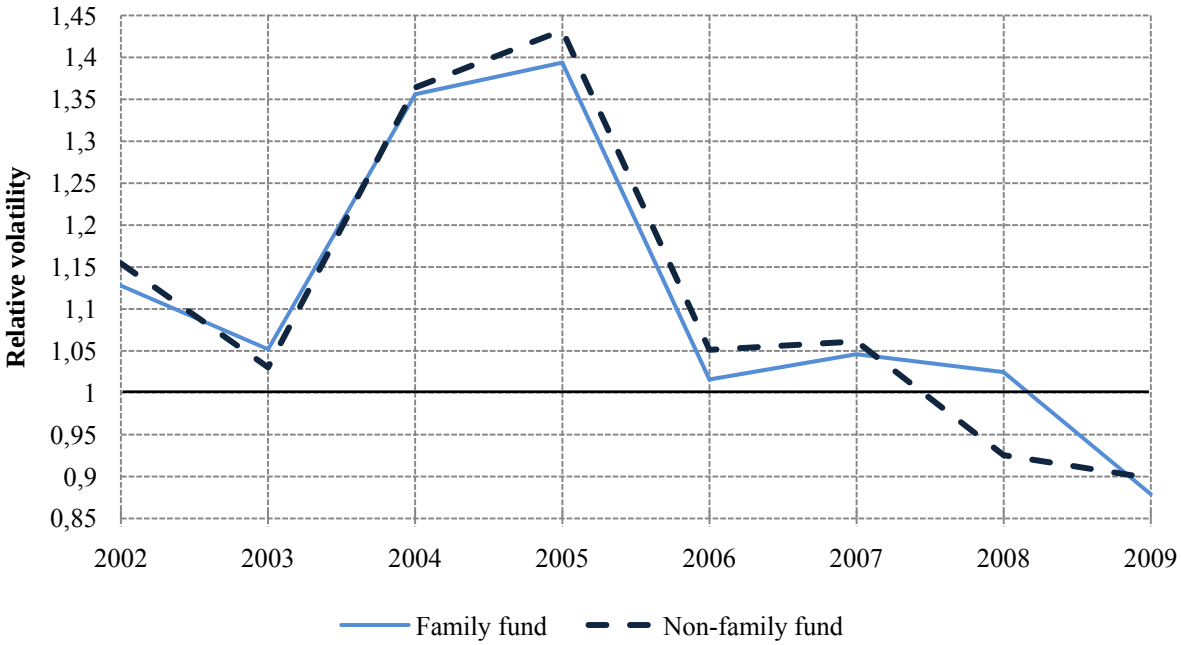

Figure 2. Annual average risk levels of family and non-family funds. The figure plots the average annual risk levels for family and non-family funds. The annual risk level is measured in terms of relative volatility (RV) which describes funds tendency to have materialized volatility below or above respective market index volatility. In general, if RV < 1, the fund has had lower volatility than the market index; respectively, if RV > 1, the standard deviation of fund returns has been larger than the standard deviation of market index returns.

The sample for family and non-family funds produces contradictory results on the theoretical assumption of volatilities being randomly dispersed across the two groups. Table 12 shows that non-family funds commit to higher risk levels in terms of simple volatility, whereas for relative volatility the differences in risk levels are not so clear. The standard deviation of simple volatilities across family funds is 2.56 % whereas for non-family funds the dispersion is 2.95 %; similarly, in case of relative volatility the standard deviation for non-family funds 0.48 in comparison to the family-figure of 0.43, indicating that non-family group includes more often funds that deviate from the general risk levels (in absolute or relative terms). The observations are in line with theoretical assumptions, [23] since if both family and non-family funds exploit the same population of investment opportunities across different regions, industries and sectors, the possible differences should even out while examining *the simple volatility measure* across these two groups.

[23] The similar magnitude of standard deviations for volatility figures also indicates that both family and non-family funds are diversified in different markets (i.e. geographical, industry). For example, if non-family funds were more often funds that invested in emerging markets or small cap companies, i.e. in more volatile markets, this skew should be observed in the standard deviation of volatility for the group. Thus, by measuring the sum of systematic and idiosyncratic risk, the two groups do not differ from each other by their risk characteristics, which should be the case also in theory.

Table 12

Risk Levels of Family and Non-Family Funds

The table reports the scale for the two variables measuring risk-taking behavior, simple and relative fund volatility. Simple volatility is the standard deviation of fund's daily returns whereas relative volatility is the ratio of fund's simple volatility to market index volatility. For both variables, a minimum, 1st quartile, mean, 3rd quartile and maximum observation is presented. The figures are drawn from the sample between January 2002 and July 2009, consisting of funds that are managed by a fund company backed by a Finnish retail bank (family funds) or other management companies that have a permanent establishment in Finland (non-family funds) and belong to the Finnish Association of Mutual Funds. The sample excludes funds of foreign mutual fund families and mutual fund companies that do not have a place of business established under their own name. Panel A describes the two risk measures for a subsample of funds belonging to a fund family. Panel B reports the same figures for non-family funds. The sample size totals 18,903 observations, of which 9,221 are family observations and 9,682 counts for non-family funds.

Panel A: Risk Levels of Family Funds

Risk measure	Min.	25th	Mean	75th	Max
Simple volatility (%)	0.232	3.745	5.660	7.005	21.412
Relative volatility	0.023	0.892	1.111	1.207	5.665

Panel B: Risk Levels of Non-Family Funds

Risk measure	Min.	25th	Mean	75th	Max
Simple volatility (%)	0.593	3.770	6.026	7.579	20.822
Relative volatility	0.106	0.852	1.096	1.193	5.766

The correlation matrix (Table 7) in Section 6.1 and Appendix B show that family dummy predicts that funds belonging to a family held more conservative portfolios. The correlation between relative volatility and family dummy is negative, and in individual regression the negative family coefficient is statistically significant at the 1 percent level. However, Table 8 in Section 6.1 shows that ln(assets) variable renders family dummy positive for each progressive regression due to their relatively high correlation of 0.219. Thus, family dummy is not applicable to the regression model if ln(assets) is included. In turn, the model excluding ln(assets) in Appendix C shows that family dummy ultimately produces negative coefficients for both simple and relative volatility regressions, and the results are statistically significant at 1 percent level. The risk-taking behavior of family and non-family funds thus does differ, a result consistent with **Hypothesis 6**; funds belonging to a fund family hold less risky portfolios than non-family funds.

The differences between risk levels for family and non-family funds conform to the findings suggested by previous studies. Koivulintu (2002) finds Finnish bank-managed funds to generate inferior returns compared to non-bank funds. The studies of both Knuutila et al. (2007) and Korkeamäki and Smythe (2004) show that Finnish bank-managed funds have received significantly

fewer Morningstar top ratings than non-bank funds[24], indicating also that bank-managed family funds earn lower risk-adjusted returns than non-bank funds. For the sample employed in this thesis, however, I am not able to find similar return-related differences that would be statistically significant.

The differences in risk-taking behavior between family and non-family funds can emerge because of two reasons. First reason: the median family fund in the sample is over 40 % larger than a non-family fund. Thus with higher probability, bank-managed family funds are faced with operational constrains presented by Pollet and Wilson (2008), such as higher ownership and liquidity costs. However, as Pollet and Wilson suggest that funds respond to asset growth by increasing their existing holdings rather than diversifying further, this would mean that family funds were relatively less diversified and thus held more volatile portfolios. As family funds in the sample have more often portfolios with more conservative risk levels, my results do not conform to the rationalization suggested by Pollet and Wilson. Finnish family funds are also relatively small compared to the funds of larger, international fund companies, which would also not support the hypotheses of fund size affecting the risk-taking behavior of family funds.

The second reason: the investor has to incur high search and switch costs if he switches to another fund company. Fund families often offer the opportunity to switch funds within the family at no cost and the investor is easily kept in the family. In order to go outside the family the investor should first make effort to find a new fund and then, pay fees for subscribing shares. The high costs of switching the company are widely acknowledged among families, and as the findings of Massa (2003) indicate, this affects '*the target level of performance the family wants to reach and the number of funds it wants to set up*'. This directly thus signifies that the risk-taking behavior of family funds is affected by *the target level of performance*. As family funds attract larger capital flows [Knuutila et al. (2007)] but generate lower risk-adjusted returns and offer more often passive asset management, they are evidently offering investor with some other benefits than the general ones related to risk and return characteristics.

As Massa (2003) suggests, family funds actively compete with non-performance-related characteristics such as fees and thus are not competing in terms of performance. On average however, salient subscription and redemption fees are both higher for family funds, which indicates

[24] Morningstar mutual fund rating service provides start ratings that are based on fund's historical performance in terms of return and risk characteristics in comparison to fund's peer group. In more detail, the ratings are based on 36-month load-adjusted returns that are employed to calculate a three-year risk-adjusted rating for each fund.

that the Finnish retail bank funds do not compete in terms of price. In aggregate, the lack of performance-related incentives seem to directly affect the risk appetite of family funds and thus explain the phenomenon of family funds having more conservative portfolios. This would indicate that for example larger family funds chose certain investment strategies since they trade in larger capital bulks.

6.3.2 Are high-risk funds concentrated into certain families? Panel evidence

The existence of economic self-interest of fund families suggests that return correlation within family was low – to assure the maximum capture of investor's assets the family should offer wide diversification possibilities so that the investor would not have to go outside the family. Similar argumentation applies to the risk-taking behavior of funds within the family, meaning the family should offer funds with different risk profiles. Larger fund complexes often *do* claim to offer extensive diversification possibilities within the complex. Presumably this marketing argument also largely explains why many investors more often confine their fund investments to one single fund family rather than search for diversification potential from funds of other companies.

Elton et al. (2007) show that investing in an additional inside-family fund would require this fund to yield an extra 50 to 70 basis points to maintain the same Sharpe ratio on investor's portfolio. However in reality, the finding does not take into account that firstly, the investor avoids significant search costs if he chooses the new additional fund from inside the complex rather than starts hunting out another mutual fund company and fund to invest in. Secondly, many retail bank-driven mutual fund companies offer 'service packages' with various client bonus programs, meaning the client is offered with some benefits if not straight reductions in trading costs, if he concentrates his investments for certain service provider. In these types of scenarios, the effective advantages of investing in one fund complex will serve as an offsetting asset for the possible decreased Sharpe ratio.

Table 13

Concentration of Low and High Risk Funds in Families

The table reports the level of concentration of low (LOW) and high (HIGH) risk funds in the nine sample families. In Panel A, observations are classified as LOWs and HIGHs by using the median relative volatility figure of the period for grouping high and low risk funds, a method consistent with Elton et al. (2007). The observation is defined as LOW if relative volatility figure is smaller than median observation in the period, and HIGH if it is larger than the median risk during the period. Panel B presents the concentration of extreme low and high risk in each family; the observation is defined LOW (HIGH) if fund's relative volatility is smaller (larger) than the 25^{th} (75^{th}) quartile observation. For calculating the median and quartile figures, only the sample containing family funds is employed. The second column presents the aggregate number of observations in the family. In third and fourth columns, the proportion of LOW and HIGH observations is presented as the ratio of LOW (HIGH) observations to the aggregate number of observations for the specific family; the proportional number takes into account the varying number of observations for different families. Fourth column reports the standard deviation of risk in the family/ the dispersion of relative volatility figures within the family. The normally distributed test statistic assumes that the distribution of high and low variances in fund family is random so that an average family contains g(*number of funds in the family*) / 2*HIGHs. The sample size for both Panel A and Panel B is the aggregate family sample of 9,221, from January 2002 to July 2009.

Panel A: Median as Divisor for Risk Classes

Family subsample	Number of Observations	Proportion of LOWs	Proportion of HIGHs	Standard Deviation of Relative Volatility
Family 1	501	47.8 %	52.2 %	0.447
Family 2	560	50.0	50.0	0.358
Family 3	1,835	47.2	52.8	0.501
Family 4	2,238	50.7	49.3	0.444
Family 5	2,657	44.9	55.1	0.414
Family 6	157	74.0	26.0	0.135
Family 7	270	70.1	29.9	0.251
Family 8	694	54.4	45.6	0.338
Family 9	309	72.1	27.9	0.245

Panel B: 25th and 75th Quartiles as Divisors for Risk Classes

Family subsample	Number of Observations	Proportion of Extreme LOWs	Proportion of Extreme HIGHs	Decrease in Number of Observations
Family 1	501	22.6 %	24.2 %	53.1 %
Family 2	560	26.8	24.5	48.7
Family 3	1,835	23.2	25.9	50.9
Family 4	2,238	24.2	31.7	44.1
Family 5	2,657	21.0	25.0	54.0
Family 6	157	26.0	1.0	72.9
Family 7	270	32.1	0.6	67.3
Family 8	694	36.5	22.9	40.6
Family 9	309	41.3	0.0	58.7

Small families are significantly more often populated with low risk funds than large families. Panel A in Table 13 shows that the funds of small families concentrate on the low risk levels far more often than establish high risk levels among their peer group; the standard deviations of relative volatility is also significantly smaller, demonstrating that a large part of funds is concentrated into the same end of the risk distribution. The phenomenon is even stronger if LOW and HIGH risk funds are divided based on the 1st and 3rd quartile risk observations in the sample. Three of the smallest families offer only a minimal fraction of funds that practice aggressive risk-taking in relation to other funds in the market.

The sample size for large versus small families differ, but the fact that funds of smaller families have proportionally more LOWs should not be outstripped; even though the median and quartiles are greatly defined by the risk distribution of the largest families, there exists no motivation for why smaller families should not equally have observations for HIGHs or LOWs within its own fund supply. In other words, the large number of observations for larger families should not decrease the probability of small families having extreme low or high risk funds. The average fund in smaller families (less than 14 funds) has 32 % less assets under management which is a sign of larger flexibility of funds of smaller families. My analysis does not however reveal the level of diversification for small family versus large family funds, so I am not able to analyze the role of flexibility in risk concentration.

Large fund families offer both LOW and HIGH risk funds to the market, but it appears that some of them offer more often HIGH than LOW risk funds. Panel B shows that large families have more funds committing to *extreme* high/ aggressive risk-taking than do small families; the three largest families have more than 25 % of observations in the high-risk group. As shown in Panel A, only two families out of nine (Family 2 and 4) contain evenly both low and high risk observations when compared to the median risk of all families; this should be the case if LOW and HIGH risk funds were randomly distributed.

To examine more specifically the risk concentration while considering the number of funds in the family, I apply the normally distributed test statistic developed by Elton et al. (2007)[25]. Based on the results, also in the Finnish fund family market, HIGH and LOW risk funds tend to be concentrated in certain families more often than would be predicted by chance. The t-statistic for the risk concentration equals to –3.98, a figure significant at the 1 percent level. The result supports

[25] The method of Elton is more specifically described in Section 4 (Methods) and in Appendix A.

the preceding results obtained by simply examining the proportion of HIGH and LOW observations in families. The test statistic results are significantly similar to the ones presented by Elton et al. (2007), who presents a test statistic of 4.09 across all fund objectives. For equity funds, Elton also presents a statistically significant test statistic of 3.02. The similarities indicate that, like in the US fund market, also the Finnish fund market and the fund families operating in the market tend to concentrate on low or high risk strategies.

The risk concentration can be seen as a more severe phenomenon in the Finnish fund market as evidently the families have fewer funds, which in turn decreases the absolute number of investment opportunities within the family if the investor chooses to stay in one family. Combined, these two points mean that the probability of investor choosing another additional HIGH or LOW risk fund is higher than for investor choosing within a larger family. Elton et al. (2007) also show that, already for the US fund families that are significantly larger in size than Finnish families, an investor owning initially one fund within the family would need altogether three within-family funds in order to maintain the volatility of his previous portfolio. If the investor initially owns more than one fund within the family, the number of within-family funds need to be added to the portfolio to maintain the risk level will increase substantially.

6.4 Investor perspective to mutual funds' risk-taking behavior

Together with the findings of Koivulintu (2002) who shows that Finnish bank-managed funds offer lower returns than non-bank funds, the results presented in the previous sections indicate that family funds more seldom reach superior returns due to the fact their risk-taking behavior is more conservative. On the other hand, a family fund is less probable to end up in the lowest performance quartile.

It appears interesting that the aggregate sample shows that funds with smaller net asset value commit to more aggressive, or active, risk-taking than larger funds. However, this relation does not transfer analogously to the results as I examine smaller and larger fund complexes (as for smaller families, the average fund size also tends to be smaller). This can indicate that the explaining factor here again would be fund family's liaison to retail banking business; also the previously reported, statistically significant result for family dummy and risk-taking would support this intuition. In general terms, these kinds of causalities would mean that fund characteristics steered risk-taking behavior differently for family and non-family funds, but the causality in this case would exist rather between family membership and risk-taking than fund characteristics and risk-taking.

The concentration of high and low risk funds into certain families appears illogical in terms of the overall family strategy; theoretically any fund complex would want to offer funds with different risk or/and return profile as this would guarantee larger market share. For example Massa (1998) discusses product proliferation within the fund family, which would also serve for the interests of the investor – since, if the investor experiences that the costs of finding an additional fund outside the family are too high, and decides to choose another one within the family, the best situation would prevail if family siblings were highly differentiated from each other.

However the findings presented in the previous sections show that an investor confining all his investments to a single fund family may hold significant risk concentration, whether low or high, in his portfolio. Finnish fund families thus do not differ from US families. Although Elton et al. (2007) present risk concentration for US families to be even more severe, the fact that majority of mutual funds in Finland are sold through retail banks makes the phenomenon in this small market even more severe. The truth of diversification possibilities within the family promised at the time of purchase are not necessarily realized if the investor stays within the one family. If however the convenience of staying in the same family is favored over more diversified risk and relatively higher excess returns, the investor may not have committed himself to the most rational behavior.

Table 14

Acceptance of the Seven Main Hypotheses

The table concludes on the acceptance of the seven null hypotheses of this thesis. Panel A presents the five hypotheses concentrating on the relationship of fund characteristics and risk-taking behavior, whereas Panel B presents the null hypotheses for the relation of family membership and funds' risk-taking behavior. In the first second column, the formulation of each hypothesis is described and the second column concludes if the results shown in Section 6 support the null hypothesis in question. The second column for Acceptance reports a positive sign if the hypothesis can be accepted based on the results in Section 6. If the findings are contradictory to the null hypothesis, the column presents a negative sign.

Panel A: Explaining risk-taking behavior by fund characteristics

	Null hypothesis	Acceptance
H_1	Larger funds take less risk.	+ (measured by net asset value) – (measured by number of shareholders)
H_2	Funds having performed better in relative terms (excess return) in the previous period take less risk during the following period.	+
H_3	Younger funds commit to more aggressive risk-taking behavior.	– (age variable excluded from the final model)
H_4	Funds having higher minimum investment requirement commit to more aggressive risk-taking behavior.	–
H_5	The level of equity fund's fees is related to it's risk-taking behavior.	+ (low subscription fee funds commit to higher risk levels)

Panel B: Explaining risk-taking behavior by fund family membership

	Null hypothesis	Acceptance
H_6	Family and non-family funds differ by their risk-taking behavior.	+ (family funds commit to lower risk levels)
H_7	High and low risk funds are concentrated in certain families.	+ (low risk funds concentrated in small fund families)

7 CONCLUSIONS

The academic research has given a lot of attention to the studies on the relation of mutual funds risk and return. However, only a small fraction of the research concentrates on the possible motivations for risk-taking other than the risk-return optimization. The first emphasis of this thesis is on examining the role of equity funds' risk-taking incentives – the relation of fund characteristics (such as fund size, fees and fund family membership) and funds' risk-taking behavior. Previous studies have found some fund characteristics to significantly affect the way mutual funds behave in terms of risk-taking [e.g. Gaspar et al. (2006) and Pollet and Wilson (2008)], but to my best knowledge, no similar studies have been conducted with the Finnish mutual fund data. If there exists relation between funds' risk-taking appetite and fund characteristics, it is an important indicator for an investor who chooses between different types of equity fund investment opportunities.

The second part of this thesis concentrates of studying the possible risk concentration in Finnish retail bank-backed fund families. The Finnish mutual fund market has been well studied and the bank-domination of the market and its effects are widely acknowledged [e.g. Korkeamäki and Smythe (2004) and Knuutila et al. (2007)]. However, the main focus in previous studies has also been on the return rather than risk. The Finnish mutual fund market is highly dominated by the few large retail bank-backed fund families that continue to attract large capital flows instead of funds of other fund companies. The funds of these bank families do not only have distinctive fund characteristics due to e.g. their widespread distribution channels, but they also prove to generate inferior returns compared to non-family funds [Knuutila et al. (2007)]. Due to their distinctive characteristics and significant dominance of the Finnish fund market, it is of importance to analyze fund families' risk-taking behavior more closely.

This thesis employs a large dataset of 27,327 monthly observations from the Finnish equity fund market. The sample covers a period of over 11 years, and is gathered from the Mutual Fund Reports published by the Federation of Finnish Financial Services. A multivariate regression analysis is employed to define the relation of fund characteristics and risk-taking behavior, and an absolute and a market-adjusted measure of risk-taking is constructed.

This thesis shows that several fund characteristics are related to equity funds' risk-taking behavior. The most significant fund characteristic in terms of risk-taking is fund size measured by the amount of assets under management; larger equity funds commit to more conservative risk levels than smaller funds, a result in line with the findings of Pollet and Wilson (2008) who find larger funds to

have lower risk levels. The results are also supported by the study of Beckers and Vaughan (2001) who argue that funds with smaller AUM maintain their flexibility, being able to deviate more effectively from the general market. Pollet and Wilson however also argue that funds with large AUM find it difficult to diversify in response to growth and thus make their additional investments into the stocks already in the portfolio, which would indicate larger funds were less diversified and had higher risk levels. The effect of diversification on the risk-taking behavior of large funds remains unrevealed however, as the dataset employed in this thesis does not include information on the content of funds' portfolios.

The regressions results in each analysis highly underline the importance of subscription fees in funds' risk-taking behavior. High-risk funds charge significantly lower subscription fees if the risk level is measured in absolute volatility levels. The effect is even more significant for funds that have high risk levels in relative terms, meaning funds that commit to higher risk levels than the respective market in general charge even lower front-end load fees. The low subscription fee level of high-risk funds is a direct implication of these funds trying to attract capital inflows through low subscription fees that are salient for the investor at the time of purchase. The trend conforms to the results of Odean and Zheng (2005) who find salient subscription fees to chase away potential investors.

This thesis shows that family and non-family funds differ by their risk-taking behavior. Funds belonging to a retail bank-backed fund family commit to more conservative risk levels compared to the non-family funds that are more active in their risk-taking. Non-family funds also deviate more often from the general market index and maintain higher volatility levels than those of their respective market indices. The more aggressive risk-taking behavior of non-family funds is whether an indication of their larger flexibility in investment operations or a sign of family funds' inefficiencies and lack of incentives.

The results reveal significant risk concentration in the Finnish retail bank-backed fund families, a similar but a stronger phenomenon Elton et al. (2007) find for US fund families. Low risk funds are concentrated in the smallest fund families, whereas only larger fund families offer proportionally equally also high risk funds. The distortion is highly relevant in the Finnish mutual fund market where not only a large majority of capital is concentrated into family funds, but also over 90 % of the Finnish fund holders have confined their fund investments into these families. The simultaneous concentration of capital in family funds and their lower risk-adjusted returns [Korkeamäki and

Smythe (2004)] prove that the Finnish retail bank-backed funds compete against non-family funds with other factors than performance or efficient product proliferation in terms of risk diversification.

This thesis has two shortfalls that relate firstly to the nature of the regression model and secondly, to the reliability of the method of measuring funds' risk-taking behavior. In the analyses performed in this thesis, the multivariate regression model for explaining the relationship of risk-taking and fund characteristics has a probability of being endogenous. The model regressors are not necessarily the direct determinants of risk-taking behavior, and it is not definite that the subscription fee level, for example, would explain risk levels instead of funds' risk levels defining the level of subscription fee. The issue is somewhat problematic as there evidently exists several explanatory variables for funds' risk-taking behavior, but it is not obvious which are the exogenous ones that affect the risk-taking behavior in reality.

Another shortfall is related to the method of measuring funds' risk-taking behavior. The absolute (volatility) and relative (market-adjusted volatility ratio) risk-taking measures produce similar results for the relation of risk-taking and fund characteristics, but for few variables, deviate in terms of how significantly these variables contribute to risk-taking. Absolute volatility has been employed in previous academic studies [e.g. Busse (2001) and Brown et al. (2001)], but on the other hand it does not take into account that the risk levels of equity funds should be examined relative in terms of their market index. Absolute volatility is not necessarily the most relevant measure to examine risk-taking as assumedly, mutual funds adjust their operations in relation to their peers or general market movements rather than manage funds irrespective of these factors.

This thesis sets a background for further studies on the fund family membership effect on funds' risk-taking behavior. Fund companies managing a set of own funds have the advantage of attracting a large part of investor's capital into their own funds, which certainly affects the way funds within the family operate. I argue that the problem of investors conveying their investments into a single family is presents in several countries due to the nature of mutual fund markets, but the phenomenon is even more severe in markets like Finland.

The role of fund families in the market should thus receive further academic attention. The Finnish fund market being largely dominated by the retail bank-backed fund companies and their widespread distribution channels, it is not guaranteed that the investments of Finnish fund investors, especially the capital of private investors, is allocated in the most profitable way. Large fund families may have the advantage of economies of scale in research and operations, for example, but

is their product proliferation efficient enough and the large market share justified from investor's point of view?

APPENDICES

Appendix A

The Derivation of Test Statistic for Measuring Risk Concentration in Fund Families

The derivation for the test statistic for measuring the concentration of risk in fund families is presented. The test statistic is developed by Elton et al. (2007) who analyze if funds with higher or lower risk levels tend to cluster to certain fund families. The rationalization of Elton et al. starts from the theoretical assumption of high and low risk funds being randomly assigned to different families, as there are no theoretical justifications for the opposite. If high and low risk funds are randomly distributed to different fund families, then on average, one could expect a fund family to have $g/2$ funds with above-median risk, where g is the number of funds in the family. $Y_{g,h}$ denoting for the number of HIGHs (above-median risk observations) in the family, under the null hypotheses this number of HIGHs is an independent binomial random variable with parameters (g, ½).

Test statistic: $Z = [\sum_{h=1}^{H} T_{g,h} - \sum_{h=1}^{H} E(T_{g,h})] / \sqrt{\sum_{h=1}^{H} VAR(T_{g,h})}$

$$= [\sum_{h=1}^{H} (Y_{g,h} - g_h/2)^2 - \sum_{h=1}^{H} (g_h/4)] / \sqrt{\sum_{h=1}^{H} \frac{g_h(g_h-1)}{8}}$$

where $Z \sim N(0,1)$.

Moments: $E[T_{g,h}] = E\left[(Y_{g,h} - \frac{1}{2g})^2\right] = VAR(Y_{g,h}) = \frac{g}{4}$

$$VAR[T_{g,h}] = VAR(Y_{g,h} - \frac{1}{2g})^2$$

$$= \{E\left[\left(Y_{g,h} - \frac{1}{2g}\right)^4\right] - \left[E\left(Y_{g,h} - \frac{1}{2g}\right)^2\right]^2\}$$

$$= \{\left[3g^2\left(\frac{1}{2}*\frac{1}{2}\right)^2 + g\left(\frac{1}{2}*\frac{1}{2}\right)\left(1 - 6\left(\frac{1}{2}*\frac{1}{2}\right)\right)\right] - \left[g\left(\frac{1}{2}*\frac{1}{2}\right)\right]^2\}$$

$$= \frac{g(g-1)}{8}$$

where $T_{g,h} = (Y_{g,h} - 1/2g)^2$

$Y_{g,h}$= number of HIGHs for family h having g funds in the family

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Appendix B

Initial Model: Individual Regressions for Model Variables

This table presents the individual regressions for the nine initial fund characteristics. The risk measure used here is the relative volatility which is defined as the ratio of fund volatility to market index volatility. The table reports the individual regression coefficients in order to show the pure contribution of individual variables to risk-taking without any noise caused by other model variables (e.g. multicollinearity of model variables that was observed in the correlation matrix in Section 6, Table 7). The coefficient estimates of two-tailed tests and their associated t-values (in parentheses) are described for denoted significance levels. The sample consists of 27,372 monthly observations for relative volatility (regressand) and fund variables (regressors), and covers the aggregate sample period from January 1998 to July 2009.

Variable	1	2	3	4	5	6	7	8	9
1. Intercept	1.276	1.154	1.155	1.156	1.161	1.199	1.162	1.158	1.143
	(201.8)***	(373.3)***	(225.0)***	(366.0)***	(286.6)***	(203.8)***	(163.00)***	(148.66)***	(351.69)***
2. ln(assets)	–0.039								
	(–22.04)***								
3. Prior excess return 1-mth		–0.510							
		(–7.28)***							
4. Age (mths)			< –0.001						
			(–0.36)						
5. Min investment				< –0.001					
				(–4.04)***					
6. Family dummy					–0.017				
					(–2.74)***				
7. Subscription fee						–4.219			
						(–8.95)***			
8. Redemption fee							–0.956		
							(–1.30)		
9. Mgmt fee								–0.269	
								(–0.57)	
10. Owners									< 0.001
									(11.08)***
F-value	485.59***	53.03***	0.13	16.28***	7.52***	80.06***	1.70	0.33	122.87***
Adj. R2	0.017	0.002	Negative	0.001	< 0.001	0.003	< 0.001	< 0.001	0.004
Number of obs.	27,372	27,372	27,372	27,372	27,372	27,372	27,372	27,372	27,372

***, **, * denoting the statistical significance at levels 0.01, 0.05 and 0.10, respectively.

Appendix C

Final Model: Family Dummy Included Instead Of Assets Variable

This table presents the regressions results for the final regressions model when ln(assets) variable is excluded. The regressions results are presented for both simple and relative volatility regressions. Ln(assets) variable and family dummy have a correlation coefficient of +0.219, and the two variables are inflated if simultaneously included to the model. This table shows that, as ln(assets) is excluded from the model, the regressions still produce relevant results for the variables that are statistically significant in the model including ln(assets); the adjusted R^2 and F-values for family regressions are though lower than for ln(assets) regressions, since fund's assets size explain a large majority of funds' risk-taking behavior. Based on the results presented by the regressions below, belonging to a fund family is negatively related to fund's risk appetite, meaning family funds have lower risk levels. The coefficient estimates of two-tailed tests and their associated t-values (in parentheses) are described for denoted significance levels. The sample consists of 27,372 monthly observations covering the aggregate sample period from January 1998 to July 2009.

Fund characteristic	Simple Volatility (SV)	Relative Volatility (RV)
1. Intercept	0.059	1.214
	(120.61)***	(137.27)***
2. Family dummy	–0.005	–0.027
	(–14.15)***	(–4.26)***
3. Prior excess return 1-mth	–0.024	–0.524
	(–6.32)***	(–7.52)***
4. Min investment	< –0.001	< –0.001
	(–0.24)	(–3.71)***
5. Subscription fee	–0.209	–5.446
	(–7.84)***	(–11.28)***
6. Redemption fee	0.645	–0.172
	(15.36)***	(–0.23)
7. Owners	< 0.001	< 0.001
	(18.17)***	(12.48)***
F-value	123.7***	54.67***
Adj. R2	0.026	0.012
Number of obs.	27,372	27,372

***, **, * denoting the statistical significance at levels 0.01, 0.05 and 0.10, respectively.

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