UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

# Rebalancing of stockholdings with evidence from cohort analysis

An empirical study of households´ rebalancing of stockholdings as a proxy for investments in the risky portfolio.

Bachelor thesis in Industrial and Financial Management

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# Abstract

This thesis aims to examine how Swedish households have rebalanced their investments in the risky portfolio from 2001 through 2014, using direct holdings in stocks as a proxy for investment in the risky portfolio that consists of risky mutual funds and direct holdings in stocks. Furthermore, investigations of how different income levels and age groups have coped with the financial crisis of 2008 are carried out by the authors. The statistics used in this thesis are from Statistics Sweden as well as from the Swedish investment fund association. The method of investigation, regressions and theoretical framework have been developed primarily from the findings of Calvet, Campbell, Sodini (2007), Calvet, Campbell, Sodini (2009) and Campbell (2006).

This thesis shows, among other things, a tendency for Swedish households to rebalance their investments in risky shares based on their previous weight in risky shares as well as the gross return on risky shares during the time period studied (2001-2014). Moreover, this thesis demonstrates that different age groups and income levels seem to have dealt with the financial crisis in diametrically different ways. To generalise, younger individuals rebalanced their risky share portfolio marginally, below-average income earners yielded insignificant results, and middle-aged individuals and above-average income earners held their weight in risky shares relatively constant. Elderly individuals and high-income earners, in comparison, rebalanced towards a greater weight invested in risky shares.



**Keywords:** *Portfolio rebalancing, financial crises, aggregate level of household investment data, risky share, household investments, stock market, cohort analysis*

# Table of contents

# 1. Introduction

*In this chapter, the background and problem statement are presented and discussed. Subsequently, the research questions and the aim of the study are introduced in more detail.*

## 1.1 Background

The field of household finance is a multifaceted subject with many special features that provide this research area with a unique context in comparison to other areas, according to Campbell (2006). More specifically, Campbell (2006) continues, households need to plan over a long but finite timeline and often have a large amount of non-tradable assets such as human capital. In addition, households often hold illiquid assets such as houses, but also face borrowing limits and are subject to quite complex taxation laws and regulations.

All individuals involved in financial markets display different characteristics, including wealth, education level, age, income and risk preferences. These unique characteristics affect the composition of households' investment portfolios and their participation and performance in financial markets. The vast amount of economic and financial theory is built on the assumption of homogeneity, which entails that all participants in financial markets are assumed to hold homogenous expectations. Owing to these homogenous expectations, their behaviour may be modelled by the analytic device of a so-called representative agent, i.e. one single market participant whose behaviour is by definition representative of all actual participants in the market place. However, empirical studies by Levy and Levy (1997) show that heterogeneous expectations are far more realistic, for instance when determining asset prices. Investors form their expectations by using different methods, and consequently some might attribute high importance to accounting data while others might examine price-earnings ratios or other inputs such as sophisticated time-series algorithms (Levy and Levy 1997). Levy and Levy (1997) argue further that a small degree of heterogeneous expectation can have a dramatic effect on risky asset price determination and conclude that the homogenous expectation assumption ultimately leads to inefficient markets with periodic booms and crashes. Therefore, when heterogeneous expectations are introduced, market inefficiencies vanish and the dynamics become more realistic.

In other words, since individuals display different preferences and characteristics, a much more accurate assumption is that market participants are heterogeneous, as is argued by Calvet, Campbell and Sodini (2009).

In their work, Calvet, Campbell and Sodini (2009) analyse the worldwide assets owned by all Swedish residents on 31 December each year during the period of 1999 to 2002, focusing on each residents' rebalancing of risky shares each year. The risky share is defined by Calvet, Campbell and Sodini (2007) as the weight of the risky portfolio, which contains of stocks and mutual funds but excludes cash, in the complete portfolio, which contains all stocks, mutual funds and cash. According to Berk and DeMarzo (2011), rebalancing is the adjustments that an investor makes in his or her own portfolio in order to retain the same risk and asset allocation. Rebalancing the portfolio allows the investor to prevent his or her portfolio from becoming too risky or too conservative based on their individual risk preference.

## 1.2 Problem discussion

Behavioural finance theory is an empirical field within the area of household finance that describes how households make their investment decisions in practice. This contrasts with standard neoclassical "textbook finance theory", which, as Campbell (2006) explains, is much more concerned with how households *should* behave in order to maximise their welfare.

Campbell (2006) concludes that some households make serious investment mistakes. These mistakes come in many forms, such as under diversification of risky portfolios and non-participation in risky asset markets. According to Campbell's (2006) research poorer and less-educated households are more likely to make investment mistakes than wealthier and better-educated households. Furthermore, his article shows that households that make investment mistakes are aware of their restrictions and might withdraw from participating in risky asset markets altogether because of those same mistakes. Investment mistakes on the part of households cause poor returns, which lead to decreased wealth for households in the long run, affecting society at large. In other words, it is of the utmost importance that the investment mistakes and overall behaviour of individual households be studied, as various stakeholders will benefit from such knowledge.

There is a certain degree of debate between academics and practical financial advisers regarding age-related portfolio behaviour, as is described by Porterba and Samwick (2001). In the standard textbook portfolio-choice paradigm, the only factor that could explain age-related differences in portfolio structure is differential risk aversion. However, a number of academics claim to have found proof of age-related differences in portfolio structure (see theory section "2.6 Age as a variable" for an in depth discussion).

Information about the general tendencies of households with certain characteristics, such as the age and income level of individual stockholders, would be helpful to family financial planners and counsellors in order to better understand clients' requests and more effectively serve their needs. This contrasts with standard investment advice, which does not take into the account the age or income level of its subjects (Pålsson 1996). Companies that participate in the market may also benefit from the findings, since the amount invested in risky shares will affect the price of other assets such as stocks and bonds. This is mainly due to the fact that as investments in risky shares increase, the liquidity in the market also increases, which on the one hand drives up stock prices and lowers their dividend yield, and on the other hand, drives down their cost of capital (WACC) due to excess liquidity, in accordance with The Riksbank (2014a).

If companies' cost of capital decreases along with investments in risky shares, their discount rates will decline, because firms do not hold a constant debt-to-equity ratio according to Oded, Michel and Feinstein (2011) and therefore, the firms' value will increase as the WACC decreases.

## 1.3 Research questions

1. How have Swedish households' investments in risky shares changed over the period of 2001 through 2014?
2. Does the amount invested in risky shares vary depending on the household characteristics *age* and *income level*?

3. Are there cross-sectional differences in risky shares investments between different income levels and age groups prior to and after the financial crisis in 2008?

## 1.4 Aim of study

This thesis aims to contribute to furthering the field of household finance by increasing the understanding of Swedish households' investments in risky shares during the period of 2001- 2014. This study adopts a descriptive, positive approach, trying to describe actual behaviour rather than prescribing behaviour as in normative research. The thesis investigates the household characteristics of income level and age closely, with a mind to explore whether they correlate with differences in investment behaviour and risk preferences. This understanding and knowledge could be of benefit to various stakeholders, such as financial advisers, policy makers, companies and households in particular.

In this thesis, the authors will examine if and how the financial crisis of 2008 has affected the amount invested in risky shares by the studied age groups and income levels. Such investigations might provide beneficial knowledge, considering that a discernible pattern might emerge with regards to Swedish households' rebalancing efforts prior to, during and in the wake of a financial crisis. To the best of our knowledge, our study of households' rebalancing of risky-share portfolios is the first of its kind within the context of a financial crisis.

The data used in this thesis is for the most part based on Statistics Sweden (SCB)'s semi-annual report on the aggregated ownership of shares in Sweden as well as from the Swedish Investment Fund Association. We will focus on the aggregate rebalancing of direct holdings in stocks from 2001 through 2014. Calvet, Campbell and Sodini (2009) analysed the worldwide assets owned by all Swedish residents on 31 December each year during the period of 1999 to 2002, including bank accounts, mutual funds, and stocks. Due to confidentiality and the fact that Sweden in 2007 abolished the wealth tax that provided the detailed information about each households' wealth in property, bank accounts, mutual funds, and stocks etc., further specific data could not be accessed for this thesis.

The risky share is defined by Calvet, Campbell and Sodini (2007) as the weight of the risky portfolio in the complete portfolio. These concepts shall further be referred to as *risky share CCS* and *risky portfolio CCS,* respectively, from this point on. Due to the data limitations referred to earlier, this thesis also employs a second set of definitions, which will henceforth be referred to as *risky share BB* and *risky portfolio BB.* Whereas the CCS definitions encompass both stocks and mutual funds, the BB definitions are restricted to direct holdings in stocks only. However, since risky mutual funds make up a substantial amount of Swedish household investments, we revert to the CCS definitions whenever possible in order to provide the most complete picture as possible, most notably by including holdings in mutual funds when graphing aggregate household direct holdings in funds, instead of limiting the analysis to direct holdings in stocks.

In other words, this thesis uses the risky portfolio BB as a proxy for the risky portfolio CCS. Moreover, the possibility of differences in investments in risky shares between different income levels and age groups, as well as whether there are cross-sectional differences, will be examined. Finally, this thesis explores whether households with different characteristics coped differently with the financial crisis of 2008, focusing on their amount of investment in risky shares BB.

# 2. Theory

*This section provides an overview of previous research within the field. Acknowledged theories, which will be useful when analysing the investigation results as such and answering the research questions, are also described.*

## 2.1 Expected Utility Theory

Expected Utility Theory was developed by Neumann and Morgenstern (1944), and states that decision makers choose between risky or uncertain prospects by comparing expected utility values, i.e. the weighted sums obtained by adding up the utility values of outcomes multiplied by their respective probabilities. According to Expected Utility Theory, individuals have different risk attitudes: risk-averse, risk-neutral or risk-seeking. A risk-neutral individual has a linear utility function (see Figure 1) and is indifferent between choices with equal expected payoffs, even if one choice is riskier than the other. A risk-averse (or risk-avoiding) person is reluctant to accept gambles with uncertain payoffs and would rather opt for one with more certain, but possibly lower, expected payoff. For instance, a risk-averse person might put his money in a bank account with a low but guaranteed interest rate instead of taking the risk of purchasing stocks. In other words, the utility function of a risk-averse individual is concave (see Figure 1). A risk-seeking (or risk-loving) individual, finally, has a preference for taking on risk and is likely to invest in stocks or other risky securities that may have higher expected returns than a simple savings account. Such an individual gladly takes on the higher risk of losing value because the expected return is likewise higher. The higher preference for risk of a risk-seeking individual is represented by a convex utility function, as shown below in Figure 1.

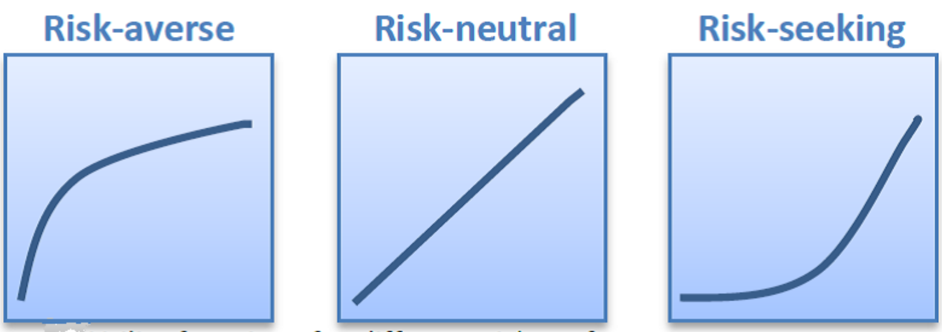


Figure 1- Utility functions for different risk preferences.

Pålsson (1996) in her study "Does the degree of relative risk aversion vary with household characteristics?" recognised that households compose different risky portfolios due to their varying characteristics. She claims that the degree of relative risk is not systematically correlated to the economic variables such as net wealth, income and taxes. In her study, on the contrary to Calvet, Campbell and Sodinis (2009), the degree of risk aversion was found to increase with age.

## 2.2 Prospect Theory

Individual decision-making does not behave in accordance with the axioms of Expected Utility Theory claim Kahneman and Tversky (1979). To remedy this deficiency, they have developed a descriptive model called Prospect Theory. This theory seeks to model a psychologically more accurate description of decision making between alternatives that involve risk, instead of focusing on an optimal decision model. The theory states that people make decisions based on the *potential* value of future losses and gains rather than the final outcome, and that people evaluate these potential losses and gains using certain heuristics. A further difference between the two theories is that probabilities are replaced by decision weights in the latter theory.

Furthermore, Kahneman and Tversky (1979) have found that people underweight outcomes that are merely probable as compared to outcomes that are certain. They state that this overweighting of low probabilities may contribute to the attractiveness of both insurance and gambling.

In summary, Kahneman and Tversky (1979) propose that the value function is defined on deviations from the reference point; generally concave for gains and commonly convex for losses and steeper for losses than for gains, as is shown in Figure 2 below. Hence, Prospect Theory differs from Expected Utility Theory, in which a rational agent is indifferent to the reference point.

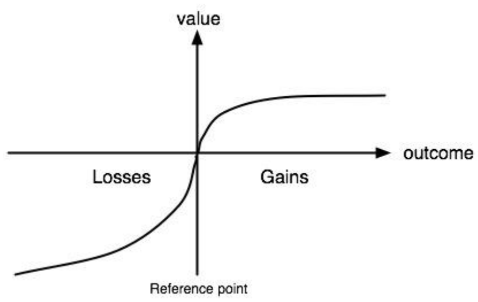


**Figure 2-** A hypothetical value function in Prospect theory. Source: Kahneman and Tversky (1979).

## 2.3 Portfolio Rebalancing

Berk and DeMarzo (2011) define a portfolio as a collection of securities such as stocks, bonds or cash and that portfolio weight is the fraction of total investments of each individual investment in the portfolio.

According to Berk and DeMarzo (2011), rebalancing is adjustments to an investment portfolio that realign the investor's holdings with his or her targeted allocation of assets. Asset allocation plans differ based on the investor's goals and appetite for risk. Over time, as the market moves and various investments in an investor's portfolio rise or fall, their value, and, as a result, the allocation of assets within the portfolio may change. For the investor to retain the same risk and asset allocation he or she must adjust or rebalance his or her portfolio. Rebalancing the portfolio allows the investor to prevent his or her portfolio from becoming too risky or too conservative.

Rebalancing can be divided in passive- and active rebalancing, according to Calvet, Campbell and Sordini (2009). No nominal change between year t and t+1 in risky shares means that there is passive rebalancing while a change in nominal amount invested in risky share between two years means active rebalancing.

Calvet, Campbell and Sodini (2009) show that households do indeed rebalance their portfolios of risky shares. They also conclude that wealthy, more educated investors with more diversified portfolios tend to rebalance more actively. Moreover, the authors find some evidence that households rebalance towards a greater risky share as they become richer. This is consistent with the assertion that relative risk aversion decreases as one gets wealthier.

In addition, Calvet, Campbell and Sodini (2009) conclude that households rebalance their risky portfolios on a general basis by divesting from risky shares if their risky portfolios have performed poorly. Conversely, if their portfolios have performed well, households tend to adjust them through both fund purchases and sales of stocks. Lastly, the tendency of wealthier investors with diversified portfolios to fully sell off winning stocks is weaker in comparison with less wealthy investors.

Continuing on the subject, Campbell (2006) argues that a minority of households make investment mistakes, especially households that are less-educated and poorer.

Investment mistakes are not surprising, per se. After all, the financial system itself is complex and households face many issues such as financial planning, complex taxation, complex financial products, etc. Calvet, Campbell and Sodini (2009) reach the same conclusion and explain that households are willing to take on financial risk when they are confident in the understanding of basic rules of investing in financial markets. However, investment mistakes inevitably lead to welfare costs, which in turn affect society at large, according to Campbell (2006). Therefore, it is important to learn from investment mistakes in order to minimise welfare costs.

## 2.4 Underdiversification

Diversification, according to Berk and DeMarzo (2011), is the averaging of independent risks in a portfolio consisting of a wide variety of investments. Independent risks are diversified in a large portfolio, since the fluctuations in the stocks return is due to firm-specific or diversifiable risk, whereas common or systematic risks cannot be diversified because they affect all stocks simultaneously. Therefore, the benefits of diversification will only be realised if the securities in the portfolio are not perfectly correlated, the authors continue. If an investor diversifies his or her portfolio appropriately, he or she can reduce risk without reducing expected returns. Despite the benefits, there is much evidence that individual investors fail to diversify their portfolios adequately. Campbell (2006) shows in his study of Swedish investors that approximately one-half of the volatility in investors' portfolios is due to firm-specific risk, which theoretically could be diversified away.

Calvet, Campbell and Sodini (2007) investigate Swedish households´ inefficiency with regard to their investment decisions. They find that two sources of inefficiency are underdiversification ("down") and non-participation in the risky asset markets ("out"). They conclude that even though a minority of Swedish households are poorly diversified, the majority invest efficiently and are better diversified.

The strongest impact on participation in the risky asset market has financial wealth, followed by disposable income, age, education, immigration and the share of private pensions. Variables that predict underdiversification are for instance low educational levels and low wealth, which predict non-participation in the risky asset markets, according to the authors.

## 2.5 The disposition effect

Hersh and Statman (1985) outlines theory and evidence as to why investors are more likely to “sell winners too early and ride losers too long”, which is referred to as the *disposition effect*. The disposition effect is the tendency of investors to hold on to stocks that have lost value and sell stocks that have risen in value since the time of the purchase. This also influences how investors hold their risky portfolios and how and when they choose to rebalance them. Moreover, the authors conclude that investors become more prone to take on excess risk in the face of losses. Calvet, Campbell and Sodini (2009) in the same vein conclude that households are more prone to sell stocks that have performed well, which is consistent with the disposition effect.

Talpsepp (2010) states that there is a negative correlation between the disposition effect and portfolio performance: less biased investors generally perform better and reach higher returns. Furthermore, she claims that there is a distinct difference in trading and performance results between different age groups, with older investors clearly outperforming younger investors. Younger age groups, and men in particular, have a higher trading intensity, which harm their results and is part of the explanation for their poor performance.

Barber and Odean (2001) points out that overconfidence and the lack of experience within the young age groups are the main cause of overtrading. Talpsepp (2010) suggests that the negative effect of the disposition effect bias, which mostly harms the younger age groups, could be lowered and returns could be improved simply by increasing the knowledge regarding the bias.

## 2.6 Age as a variable

Classical financial theory suggests that there should be age effects on portfolio choices if older investors have a shorter horizon than younger investors do according to Bodie, Merton, and Samuelson (1992). In addition, they state that investment opportunities are time varying, and older investors seem to have less human wealth relative to financial wealth than younger investors, which makes it hard to rule out either time or age effects when studying portfolio choices. Ameriks and Zelders (2004) argue that there is no evidence of a gradual reduction in portfolio shares with age. Nevertheless, they show some proof of a tendency of older individuals to leave the stock market around the time of retirement.

The literature on optimal portfolio behaviour of individuals at different ages is characterised by a degree of controversy between academics and practical financial advisers, according to Porterba and Samwick (2001). In the standard textbook portfolio-choice paradigm, the only factor that could explain age-related differences in portfolio structure is differential risk aversion. Moreover, regardless of their risk aversion, there are strong predictions that all households should hold risky assets in the same proportions within their risky asset portfolios. The common practical recommendation, as stated by Canner, Mankiw, and Weil (1997), is that households should change the relative proportions of risky assets in their portfolios as they age. In addition, Samuelson's (1989) analysis of utility functions and age-related differences in risky asset holdings allows for time-varying risk tolerance.

Porterba and Samwick (2001) claim that financial assets initially decline as households age, but then begin to increase again at advanced ages. By contrast, the life cycle model suggested by Modigliani (1963), stipulates that households accumulate assets during their working years and subsequently spends them, "runs them down", during the retirement years. Viceira (2001) finds that investors shift their financial wealth towards stock when their human capital is large.

Porteba and Samwick (2001) also point out that if non-financial risks increase with age, then rational behaviour may lead to a reduction in risky asset exposure as households age. Viceira (2001) concurs and argues that people should invest more in stocks during their working age than in retirement. The reason for investing during one's working age, she adds, is that investing is an additional source of income and that an employed person can afford to have a more aggressive portfolio policy than a retiree.

When examining the age-specific patterns of asset holdings and portfolio structure, it is important to keep in mind the role of financial market frictions, caution Porterba and Samwick (2001). For example, a friction faced by many Swedish households is that one must save up to roughly 15% of a real estate's market value before one can afford to purchase it. This could explain the pattern of financial asset accumulation of younger households before they purchase a property, as well as the high level of real estate assets (and low level of financial assets) of households in the years immediately after purchasing a property.

## 2.7 Income as a variable

Kennickell & Shack- Marquez (1992) conclude in their investigation of the median value of stocks, bonds, and non-taxable bonds held by American households that the proportion of owning stocks and bonds increases rapidly as a households' income level increases.

Wachter and Yogo (2010) argue that the share of household wealth invested in stocks, or risky assets more generally, rises as wealth increases. Hence, they find a positive relation between the two. They also find that poorer households are less likely to participate in the stock market, and that households with higher permanent incomes are less risk averse, and consequently allocate a higher share of their wealth into stocks. Thus, their findings coincide with those of Campbell (2006).

## 2.8 Summary theory section

Expected Utility Theory states that individuals have different risk attitudes and that decision makers choose between risky or uncertain prospects by comparing expected utility values. Prospect Theory on the other hand states that people make decisions based on the potential value of future losses and gains rather than the final outcome, and that people evaluate these potential losses and gains using certain heuristics.

The disposition effect is the tendency of investors to hold on to stocks that have lost value and sell stocks that have risen in value since the time of purchase. The disposition effect also influences how investors hold their risky portfolios and how and when they choose to rebalance them. Households rebalance their risky portfolios on a general basis by divesting from risky shares if their risky portfolios have performed poorly. Conversely, if their portfolios have performed well, households tend to adjust them through both fund purchases and sales of stocks. Wealthy, more educated investors with more diversified portfolios tend to rebalance more actively. Some evidence show that households rebalance towards a greater risky share as they become richer. Consistent with the disposition effect investors become more prone to take on excess risk in the face of losses and are more prone to sell stocks that have performed well. This change in risk perception is thought to cause the disposition effect. Prospect theory thus has the role of a pure preference-based explanation for the disposition effect.

The theories and methods in this section is given to provide a basic understanding and overview of area-specific the theories and terms. Some of the authors work will be studied and used in great detail, like CCS work to build the regression model, while some contribute to the comprehensive picture. They all will help us conduct a substantiated analysis and conclusion.

In order to answer the research questions we proceed from Calvet, Campbell and Sordini (2009) and build a regression model to analyse Swedish households aggregate rebalancing of risky shares. The regression model assumes active rebalancing since the data is given at an aggregate level. The regression model examines how different age groups and Swedish households have rebalanced their investments in risky shares on a semiannual basis. The independent variables in the regression model are previous time periods weight in risky shares and the return on risky shares.

# 3. Methodology

*This section describes in detail the method used in order to investigate the research questions from a quantitative perspective. In addition, a presentation of the gathered data is given alongside the regression model used. Moreover, several statistical tests are presented as well as a small guide to the interpretation of the regression results. Finally, it ends with a continuous discussion and critique with regard to the reliability and validity of the findings.*

## 3.1 Research philosophy

This thesis is a quantitative study employing several types of measuring instruments to capture the relationships, allocation and variation across the categories investigated. It is comprehensive in the sense that all individuals in the Swedish population are included, which excludes the possibility of any selection uncertainty. This study adopts a descriptive, positive approach, trying to describe actual behaviour rather than prescribing behaviour as in normative research.

## 3.2 Working procedure

The working procedure of this thesis consisted of several different stages.

Great thought was put into choosing the subject and field of research. After reviewing previous research, research questions were formulated but had to be adjusted slightly upon examining their feasibility in terms of the available data. Due to confidentiality, Swedish households' investments on an aggregate level would have to suffice for the purpose of this thesis.

The data containing Swedish households' investments were not provided in an accessible format, so much time went into simply typing the required data into Excel, Stata (version 11) manually. Stata was chosen as the main tool for this thesis, due to the great amount of regressions required. Additionally, various statistical tests were carried out to ensure the validity of the findings. The results were discussed and compared within the framework of existing literature in an attempt to answer the research questions. Finally, the thesis and its process were discussed and critiqued, suggestions for further research within the field of study were made.

## 3.3 Literature review

The theory section establishes a framework of existing literature by studying previous research within the field of study. Examining the extensive corpus of existing research helped to identify key models and variables, which would prove valuable for the investigation. This thesis almost exclusively uses published articles, since they are generally peer-reviewed and may be considered more reliable.

## 3.4 Data collection

*The data for this thesis was primarily gathered from the websites of Statistics Sweden (SCB) and the Swedish Investment Fund Association. This section sheds light on the manner in which the statistics were compiled as well as on important changes that occurred during the given time period.*

### 3.4.1 Statistics Sweden's semi-annual report "Ownership of shares in companies quoted on Swedish exchanges"

Statistics Sweden's semi-annual reports on the ownership of shares in companies quoted on Swedish exchanges outlines the number of shareholders in Swedish households, how the ownership of shares is spread across different age groups, the levels of taxable income of labour and capital, and the households' average portfolio-value and size both as a mean and a median value. The data regarding the value of households' ownership of shares is presented both as a nominal (par) value and as a percentage of the market value. Stock issues are valued in accordance with the stock price of each marketplace. The data gathered from these reports are primarily used in the regressions of this thesis. SCB has produced these statistics annually since 1983 on behalf of Finansinspektionen, which is responsible for the official statistics within the field. Each such report represents a comprehensive survey that includes the entire population, excluding the possibility of any selection uncertainty. Since year 2001 the reports have been issued semi-annually, on the last of June and the last of December. They are based on Euroclear Sweden's register of companies quoted on Swedish exchanges. Euroclear Sweden AB is described by the Riksbank (2015b) as "Sweden's central securities depository and Sweden's only domestic system for settling securities, which means that Euroclear Sweden clears and settles transactions with Swedish shares and fixed-income securities. In its role as central securities depository, Euroclear Sweden holds registers of most shares and fixed-income securities traded on the Swedish financial markets."

The survey gathers information about the shares in Euroclear Sweden's register, which is divided into two parts, one part consisting of data from a company index regarding the issuers of shares quoted on Swedish marketplaces from a company index, the other part consisting of data regarding the owners of the shares, whether direct owners or accounts registered in the name of the asset managers. The aforementioned contain specifications about the final owner through the asset manager in most of the statistics.

### 3.4.2 Statistics Sweden's distributional analysis system for income and transfers

Graphs are used to give a broad picture on an aggregate level of Swedish households' investments in cash holdings and stocks and the returns on different assets. This provides the reader with a clear idea of in what manner Swedish households have altered their investments in direct holdings of stocks throughout the studied period. Figures 10, 12, 13, 14 are based on Statistics Sweden's (2015a) "Distributional analysis system for income and transfers". Statistics Sweden (2015c) describes itself as an administrative agency that coordinates Sweden's official statistics and provides both government agencies and the private sector in a broad sense with useful statistics.

### 3.4.3 Swedish Investment Fund Association

The data from Statistics Sweden (2015a) is combined with additional statistics regarding the market value of various types of funds, i.e. money market funds and equity funds, from the Swedish Investment Fund Association (2014). These are used in order to calculate and produce Figures 11 and 14 and provide the reader with information on how Swedish households decide to rebalance their investments between cash holdings, money market funds and risky mutual funds.

The Swedish Investment Fund Association's members represent approximately 90 % of the net fund assets held in the Swedish market and the association aims to be the unified voice of both the investment fund sector and fund savers in general and seeks to promote a sound investment fund market, according to Swedish Investment Fund Association (2015).

## 3.5 Data time frame

This thesis focuses on the period of December 2001 through December 2014, which is the same as that of the SBC reports. The same is true of the regressions carried out in Stata 11.

The selected time frame allows for examining the impact of the financial crisis of 2008. Another positive is that the selected time frame encompasses roughly as many years prior to as after, which is of obvious benefit to the analysis. Nevertheless, if older comparable data had been accessible, they would of course have been included for the sake of comprehensiveness. The time frame is diverged from the graphs in chapter 4.1, which take the year 1996 as their starting point, as this information was very simple to obtain. This also provides the add value of the possibility to compare the financial crisis of 2008 to that of 2000 to see if there are similar patterns to be detected.

## 3.6 Definitions and changes of the data

### 3.6.1 Definition of risky shares

The definitions of the risky portfolio and with them those of the risky share will differ throughout this thesis.

Calvet, Campbell and Sodini (2009) define risky shares as the weight of the risky portfolio in the complete portfolio. Whenever the terms risky portfolio and risky share are used in this sense, they will be referred to as risky shares CCS and risky portfolio CCS respectively. The risky portfolio CCS consists of risky mutual funds and stocks, but excludes cash.

In other cases, the two terms by a very similar but different definition will be referred to as *risky shares BB* and *risky portfolio BB* respectively. In these BB definitions, risky share remains the weight of the risky portfolio in the complete portfolio, but they differ in one respect derived from our definition of the risky portfolio, and thus the risky share.

As the data regarding different age groups and income levels were unobtainable due to confidentiality, and no official statistical database with such information exists, when carrying out regressions, the risky portfolio BB had to be given a working definition as direct holdings in stocks noted on Swedish exchanges. In that way, the BB definition function as a proxy for investments in the risky portfolio CCS. Conversely, we revert to the original CCS definitions when studying the "larger" aggregate picture of how Swedish households' holdings in different asset classes have changed throughout the given period.

| Commonalities and discrepancies between CCS and BB definitions | |
|---|---|
| **Complete portfolio:** direct holdings in stocks, risky mutual funds, money market funds, cash holdings | |
| **Risky portfolio CCS:** direct holdings in stocks and risky mutual funds | **Risky shares CCS:** the weight of the risky portfolio CCS in the complete portfolio |
| **Risky portfolio BB:** direct holdings in stocks | **Risky share BB:** the weight of the risky portfolio BB in the complete portfolio |

Table 1

### 3.6.2 Further definitions and limitations

This thesis only studies households that are participants in the Swedish stock market. However, in reality there are many households who do not participate in the market, as mentioned in the theory section, by Calvet, Campbell and Sodini (2007).

This thesis treats balanced funds in the same way as any other mutual fund, assuming a relatively stable risk profile in accordance with Calvet, Campbell and Sodini (2009). However, one should note that managers of balanced funds do rebalance their portfolios and thus, maintain a stable risky share.

Risk-free assets consist of cash holdings, including or excluding money market funds, as such assets are generally considered to be low risk. Risky mutual funds are defined as equity funds, mixed funds (balanced funds) and risky bond funds (corporate bonds).

Furthermore, return calculus of the money market funds and risky mutual funds are is not performed, since this thesis mainly focuses on the investments in risky shares and the manner in which Swedish households have rebalanced their investments in risky shares.

### 3.6.3 Definition of income levels

In the semi-annual reports by SCB, the Swedish population is divided into twelve different income levels. Given the limited amount of time available, it was decided to only perform the regressions on three income groups. These are defined as "under average income earners", "above-average income earners" and "high-income earners".

The SBC's (2015) Statistics Database contains information about the average income in Sweden, which varies between 181 000 SEK in 2001 and 262 000 SEK in 2013. In order to accurately divide the data into the defined income levels given the income levels employed in the SCB reports, 0-299 999 SEK was defined as below-average income, whereas 300 000 SEK-700 000 SEK was defined as above-average income (which is a separate category from "high-income earners").

There is no official threshold as to when someone is considered a high-income earner, but Heggeman (2004), who was responsible for income statistics at SBC at the time places it around 700 000 SEK for the year 2002. It was not possible to find out whether or how this threshold may have changed since then. However, to improve the accuracy, the threshold adjusted in accordance with Ekonomifakta (2015a) for an average inflation rate of 1.2% per year (obtained for the years 1995 through 2013).

This enabled the calculus of the new income threshold, which was approximated at roughly 800 000 SEK per annum for high-income earners, using this calculation:$(700\ 000\ SEK \times 1{,}012)^{18} = 867\ 655\ SEK$. Since the time period of this thesis spans from 2001 through 2014, it is reasonable to use the threshold of 800 000 SEK as an approximation.

The SBC reports contain an income group called "Others", which includes individuals with an income of 1 million SEK or more, but also individuals whose income could not be classified. Since this group cannot be divided further into more explicit groups, the dataset forced us to make these assumptions regarding income levels, which may very well affect the reliability of the results.

| Income group | Income level |
|---|---|
| **Under average income earners** | 0 - 299 000 SEK/year |
| **Above-average income earners** | 300 000- 799 000 SEK/year |
| **High-income earners (and others)** | 800 000 SEK/year + Others |

Table 2

### 3.6.4 Definition of age groups

The semi-annual SCB reports divide the Swedish population into nine age groups. Given the limited amount available, it was decided to carry out the regressions on only three age groups, defined as "young", "(middle-aged) working age" and "elderly". The normal retirement age is 65 in Sweden, and from that point on, the economic situation of an individual changes considerably. For this reason, there retirement age is a natural breaking point and 65 years of age and above was therefore taken as definition of "elderly" in this thesis.

According to Ekonomifakta (2015b), the average university graduation age in Sweden (which defines the point of entering the labour market) is 29. When Heggeman (2004) analyses different income levels, he only looks at ages 25-64. Given SCB's age-categories, this thesis defines age 25-64 as "working age (middle-aged)" and "young" as 0-24 years. Obviously, large parts of the last group have not yet entered the labour market.

| Age group | Age |
|---|---|
| **Young** | 0-24 |
| **Working age (middle-aged)** | 25-64 |
| **Elderly** | 65-above |

Table 3

### 3.6.5 Comparability between the semi-annual SBC reports

The SCB report of December 2006 introduced several changes regarding how the represented statistics are produced. The NGM lists were divided into NGM Equity on the stock exchange and NGM Nordic MTF on other markets. NGM Nordic MTF and the Gothenburg list were merged into one category, since relatively few shares are quoted on one index but not the other.

Three lists, Large Cap, Mid Cap and Small Cap, replaced the A-and O-lists on the OMX Stockholm Stock Exchange. Companies are listed on one of the three new lists depending on their market value. The prior listing requirements had some more parameters to take in to consideration, namely:

- *Large Cap*-The market capitalisation of the company had to exceed $10 billion.
- *Mid Cap*- The market capitalisation of the company had to be between $2 billion and $10 billion.

- *Small Cap*- The market capitalisation of the company had to be between $300 million and $2 billion.

- *A-list*-The company had to have conducted its operations for three years, and been able to present financial statements for those years. The company had to have a market capitalisation of at least 300 million SEK. Moreover, a company on the A - list had to have at least 2 000 shareholders.

- *O-list* – The Company had to have sufficient financial resources to carry out planned activities during the next twelve months after the first listing day. A company on the O-list had to have a minimum of 500 shareholders.

Aktietorget was discontinued as an authorised marketplace on the 29 March 2007 and was categorised under "other marketplaces" from that point on.

## 3.7 Calculations performed on the gathered data

*This section presents the calculus used to create the graphs in this thesis as well as the regression model and various types of statistical tests used to verify the regressions.*

### 3.7.1 SBC's semi-annual report "Ownership of shares in companies quoted on Swedish exchanges"

To carry out the regressions, households' ownership of shares, in MSEK, had to be calculated for different market places, by age. In the SBC (2001-2014) reports, information about the allocation between the different market places per age group were given in percentage terms. It was also possible to determine the total ownership per year and hence through a simple calculation acquire households' ownership of shares in different market places, by age, in MRK, as shown below.

$$\begin{aligned}&\textit{The total Swedish households ownership of shares, in MSEK}\\&*\ \textit{Household ownership of shares in different market places, by age, in percent}\\&=\ \textit{Household ownership of shares in different market places, by age, in MSEK}\end{aligned}$$

### 3.7.2 Statistics Sweden distributional analysis system for income and transfers

In order to compute the yearly average amount invested in direct holdings in stocks by Swedish households, quarterly data from Statistics Sweden's (2015a) distributional system for income and transfer are used. In order to compute a yearly average, it sufficed to add the market value per quarter (denoted MV below) invested in direct holdings in stocks that are quoted on Swedish market places and then divide them by four in order to get the average amount invested. In mathematical terms, it is expressed in the following manner:

$$\frac{\left(MV_{Q1} + MV_{Q2} + MV_{Q3} + MV_{Q4}\right)}{4} = \textit{Average yearly amount in direct holdings in stocks } (\textit{market value in stocks})$$

Moreover, cash holdings and money market funds for Swedish households were calculated in the same manner as above for retrieving the yearly amount invested. Computing the return on the direct holdings in stocks is done by using simple arithmetic calculus which is computed as follows:

$$\textit{Yearly return on direct holdings in stocks } (\textit{risky shares}) = \frac{(\textit{Market value stocks}_{t+1} - \textit{Market value stocks}_t)}{\textit{Market value stocks}_t}$$

### 3.7.3 Swedish Investment Fund Association

The market values for the risky mutual funds which consist of equity funds, mixed funds and risky bond funds, where already given on a per annum basis by the Swedish investment fund association. The return calculus is arithmetical and is computed in the following way:

$$Yearly\ return\ on\ risky\ mutual\ funds = \frac{Market\ value\ risky\ mutual\ funds_{t+1} - Market\ value\ risky\ mutual\ funds_t}{Market\ value\ risky\ mutual\ funds_t}$$

## 3.8 Regression model

### 3.8.1 Presentation of the regression model

This thesis employs a similar method as Calvet, Campbell and Sordini (2009) in order to compute the active and passive rebalancing and return of the risky portfolio.

Households can either actively or passively rebalance their amount invested in risky shares. Active rebalancing means that the nominal amount invested in risky shares has changed between two years. This can also be stated in mathematical terms as the change of the weight ($w_{g,\,t+1}$- $w_{g,\,t}$) in risky shares between year *t* and *t+1*. Where *g* denotes the age group, which can vary between 1 to *n* groups and *t* is defined as the period, semi-annual, of each year, which can vary between 1 and 2.

This enables the computation of the weight of risky share invested at a specific age and time period for each year. Furthermore, *g* can be substituted by *h* in any of the formulas, if one is studying Swedish households' investments in risky shares on an aggregate level.

The passive change in the risky portfolio of households is when households *do not* change their amount invested in risky shares between year *t* and *t*+1, which is referred to as passive rebalancing. Hence, the households do not trade any risky assets during the year.

The weight of asset $j$ $(1 \leq j \leq J)$ in the risky portfolio is $w^*_{g,j,t}$ and if the investor does not trade between year *t* and *t+1* the risky share portfolio value at *t+1* is the value of the risky share portfolio at year *t* multiplied by its gross return. The gross return of the risky share portfolio is:

$$(Equation\ 1) \qquad 1 + r_{g,t+1} = \sum_{j=1}^{J} w^*_{g,j,t}\left(1 + r_{j,t+1}\right)$$

The active change in the risky share portfolio is expressed in mathematical terms as:

$$(Equation\ 2) \qquad A_{g,t+1} = w_{g,t+1} - w^p_{g,t+1}$$

The index $p$ in $w_{g,t+1}^{p}$ denotes that one is looking at the passive risky share, which is the risky share at the end of the year if the household does not change its amount invested in risky shares during the year. Thus, as mentioned earlier, if there is a difference between year *t* and *t+1* in the amount invested in risky shares, this is due to active rebalancing of risky assets. Conversely, no change in risky shares between year *t* and *t+1* indicates that there is passive rebalancing of risky assets. The difference between the active rebalancing and the passive rebalancing gives the exact amount of active portfolio rebalancing.  In order to compute the active rebalancing; if there is no passive rebalancing, one uses the linear regression given in equation 3:

$$(Equation\ 3) \qquad w_{g,t} = \alpha + b_1 * (1 + r_j) + b_2 * w_{g,t-1} + \varepsilon$$

Analogously, the above regression can be formulated in the form of natural logarithm, which is given by equation 4:

$$(Equation\ 4) \qquad ln(w_{g,t}) = \alpha + b_1 * ln(1 + r_j) + b_2 * ln(w_{g,t-1}) + \varepsilon$$

Where the weight ($w_{g,\,t}$) of risky share for a specific group and time is determined by the return of asset *j* ($r_j$) and the previous time periods weight in risky assets. Moreover, $\alpha$ denotes the intercept and is where the regression line crosses the Y-axis and the error term is denoted as ($\varepsilon$) and is expected to be zero in the regression.

With the regression model it is possible to test the null hypothesis, which is stated below as “if the active side of the portfolio preforms poorly, Swedish households will rebalance their portfolios”. The null hypothesis test can be stated in mathematical terms as a two-sided test, which looks like this:

$$H0 : b1 = 0 \ and \ H1 : b1 \neq 0$$

This means that one is be able to either accept or reject the null hypothesis based on statistical analysis.

### 3.8.2 OLS regression assumptions

The ordinary least square (OLS) linear regression implies some assumptions, according to IDRE (2015a). First of all, it assumes that the relationship between the dependent variable (left-hand side) and the explanatory variables (right- hand side) is linear. Furthermore, the error term ($\varepsilon$) is expected to be zero for all observations. Homogeneity is expected, which means that the variance of the error term is constant and the covariance of individual terms is expected to be zero. Lastly, OLS regression assumes strict exogeneity, which is a constant that is equal to zero. By strict exogeneity, the OLS model assumes that the dependent variable is uncorrelated with the error term or the explanatory variables. In other words, no endogeneity is assumed.

### 3.8.3 Statistical tests in conjuncture with the regressions

*In this thesis, several statistical tests are conducted that are de rigueur in these types of dataset analyses. They are presented below alongside an interpretational "guide" to the regression results.*

#### *3.8.3.1 Missing value analysis and test*

Datasets often contain missing values, i.e. no data value is stored for the variable in an observation. It is important to understand why there are missing observations, whether it is a measurement error or data that are actually missing. The presence of missing data can influence the results, and therefore all observations with missing values have to be deleted or the missing values have to be substituted in order for a statistical procedure to produce meaningful results, states Acock (2005) and IDRE (2015b).

#### *3.8.3.2 Outlier test through Grubbs' test*

An outlier is an observation that deviates significantly from the normal observations, and may indicate that the data have been coded incorrectly, or that an experiment has been run incorrectly. It may also be due to random variation. A Grubbs' test, which is also known as the maximum normed residual test, is a statistical test used to detect outliers in a univariate dataset assumed to come from a normally distributed population. The test was developed by Grubbs (1950). Before applying the Grubbs' test, it must be verified that the data can be reasonably approximated by a normal distribution. Since this thesis is studying investments in risky shares for the whole Swedish population normal distribution is assumed.

#### *3.8.3.3 Natural logarithm (ln)*

The reason why a natural logarithm is used in the regressions is mainly due to the fact that the changes in the independent variables which affect the dependent variable are given in percentage terms, as stated by Gellman and Hill (2007). Thus, through the natural logarithm the marginal effect that the independent variables have on the dependant variable may be interpreted.

#### *3.8.3.4 Heteroscedasticity*

Before exercising the regressions the dataset is tested for heteroscedasticity, which is the opposite of homoscedasticity (Halbert and Xun, 2014). If the dataset is biased due to heteroscedasticity, the fundamental OLS assumptions are violated because the OLS regression assumes homoscedasticity as mentioned earlier. This yields the possibility that the conclusions of the statistical analysis might not be correct, Halbert and Xun (2014) continues. Heteroscedasticity is defined by Gujarati and Porter (2009) as a situation where the variance of the residual increases or decreases with each observation, a definition that is inconsistent with the fundamental assumptions of OLS because variance is assumed to be constant for the residual.

#### *3.8.3.5 Robustness check*

A robustness check examines how regression coefficients behave when the regression specification is modified by adding or removing covariates/regressors, according to IDRE (2015c). If the coefficients are plausible and robust, this is commonly interpreted as evidence of structural validity. Furthermore, the robustness check allows for some of the OLS assumptions to be relaxed, in particular the assumption regarding heteroscedasticity, which therefore works a complement to the heteroscedasticity test.

#### *3.8.3.6 Testing for endogeneity*

Furthermore, rigorous testing for endogeneity is carried out as strict exogeneity is required for the OLS regression. Endogeneity is defined as a correlation between the variables and the error term, stated by Epstein (1989). Endogeneity typically arises as a result of a measurement error or omitted variables. Therefore, it is important to test for these types of errors, as they will affect the result of the regression. Omitted variables are defined as a case in which the created regression model leaves out one or more important causal factors, which makes it over- or underestimate the explanatory power of one of the other factors. In the regression, the omitted variable is correlated with both the dependent variable and one or more independent variables that are included in the regression model. A method to exhume the endogeneity from the regression model is to use instrumental variables instead of the endogenous variable.

An instrumental variable is another external variable, which is used instead of the endogenous variable, Epstein (1989) continues. However, if there do not exists any external instrumental variables, one can use GMM regression, which instead uses so-called internal instrumental variables.

#### *3.8.3.7 Generalised method of moments (GMM regression)*

As mentioned in the earlier section, if one does not have any external instrumental variables that are applicable instead of the endogenous variable, one can use the GMM regression in order to use the regression model´s own internal instrumental variable instead of the endogenous variable. Trough using internal instrumental variables the GMM regression is able to exhume the endogeneity from the regression model Hansen (2007). For further explanations regarding the GMM regression the reader is referred to appendix 1.

### 3.8.4 Differences in Differences (DD) test

In order to explore whether the financial crisis of 2008 has affected Swedish households’ investments in risky shares, and whether there are differences between households of different age groups and income levels, a Differences in Differences (DD) test will be used, which is a quasi-experimental technique used to understand the effect of a sharp change in the economic environment, according to (Meyer, 1995). DD relies crucially on exogeneity and sharpness of the treatment and comparability of the treatment and control groups and uses a parallel trends assumption. In the regressions, dummy variables are used to test different age groups’ and income levels’ rebalancing of risky shares BB prior to and after the financial crisis of 2008. In a more intuitive way, this thesis’s research questions 2 and 3 are illustrated below in Figures 2 and 3.

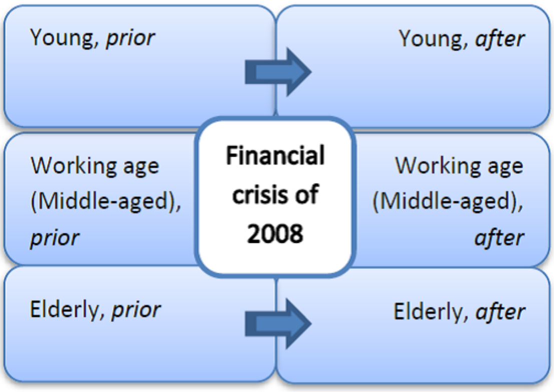


Figure 2

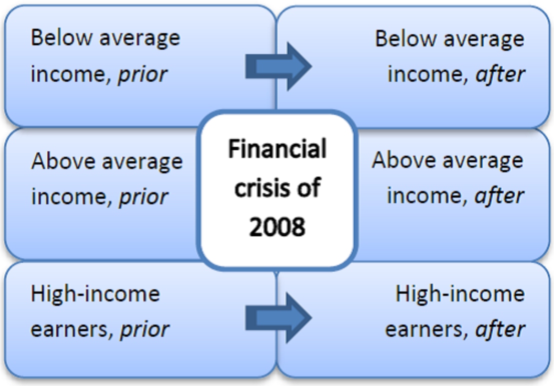


Figure 3

### 3.8.5 Interpreting the regression results

After the regression is done, $R^2$ and adjusted $R^2$ is looked at as these provide the explanatory value of the regression line. This is the same as the ratio of explained variation to total variation, IDRE (2015d). If more independent variables (right-hand side) are included in the regression, $R^2$ rises. However, adjusted $R^2$ takes this effect into account and adjusts for it. Furthermore, the p-value of the independent variables is examined. The p-value should be less than 0,05, since the null hypothesis test is carried out with a 95 % confidence interval. Otherwise, the results are insignificant, according to IDRE (2015d). In addition, the t-value is examined since it explains if any of the coefficients are different from zero. The coefficients themselves are also examined, as a one-unit change in the independent variables explains the change in the dependent variable. The F-statistic is the mean square model divided by the means square residual and should be as low as possible since it is the explained variance divided by the unexplained variance, according to IDRE (2015d). Lastly IDRE (2015d) explains, one should examine the root MSE (mean square residual) that is the root of the error term.

## 3.9 Reliability, replicability, validity and critique of the research method

### 3.9.1 Reliability

According to Collis and Hussey (2009), the reliability of a study is dependent on whether the results would be the same if the study were replicated. In a quantitative study such as this, it is important to ensure that the measures are stable and not random. In order to improve the reliability of this study, several statistical tests, which are de rigueur in these types of dataset analyses, were carried out (see chapter 4.8.3).

Since this thesis is based on manually input data into Excel and Stata 11, one should always factor in the possibility of a human error. However, the dataset was double and even triple checked throughout the process. Therefore, one can argue that the human factor is kept to a minimum.

### 3.9.2 Replicability

Replicability is closely connected to reliability, declares Collis and Hussey (2009). They describe it, as in order for future researchers to be able to test the reliability of the report, it is important that the working procedure is being completely documented, so that the replication can be carried out correctly. To enable replicability and increase reliability, the working process is documented in great detail. The data is described in a very detailed manner in chapter 3.4. In chapter 3.6, the reader is provided with an exhaustive picture of the definitions and changes to the data. Chapter 3.7 describes the calculations performed on the data. The regression model and statistical tests made prior to the regressions are presented closely in section 4.8. The results are documented in graphs in chapter 4.1, as well as in writing in chapter 4.2 and in the appendix, which is intended to give an almost complete picture of the results as possible.

### 3.9.3 Validity

The validity of a study determines whether the conclusions drawn may be generalised and considered valid, according to Collis and Hussey (2009). The validity of quantitative studies is generally divided into five categories: *concept validity* tells if the measures used are adequate proxies for the matters being studied. *Internal validity* regards the causality between the variables being studied. *External validity* on the other hand, refers to approximate truth of conclusions that involve generalisations. To achieve *ecological validity*, it is required that the methods, materials and setting of the study approximate the real world that is being examined. Lastly, *measurement validity* is the degree to which a measurement measures what it purports to measure, and is hence important to take into consideration.

The concept validity of this thesis is decreased by the fact that we have not found other theses or literature that have used risky shares CCS in the terms of direct holdings only as a proxy for investments in the risky share portfolio. Even so, we assert that this was the most accurate proxy based on the available statistics. The internal validity is shown clearly in the regression model presented in chapter 3.8. The external validity of our conclusions, which are presented chapter 6, and should be considered acceptable if one keeps in mind all the limitations of the underlying data, research, results and analysis. When drawing and formulating the conclusions we have been be careful and self-critical which increases the external validity of the thesis. The ecological validity of the study can be argued to be comparatively low since it is based on second-hand data and does not contain any qualitative elements. On the other hand, the second-hand data used and the ways it has been inspected before publishing is outlined in chapter 3.4.1, which increases the ecological validity to some extent. The measurement validity is discussed partly in the analysis section 5.2.2, concerning our high $R^2$-values.

However, given the explicit restrictions in this thesis it may be argued that the validity of this thesis is relatively good, but one has to keep in mind that the results cannot be generalised to areas that are not directly linked to the field of study.

### 3.9.4 Critique of the OLS regression model

It is obvious that the OLS-linear regression model is only applicable if there is a linear relationship between the dependent variable and the explanatory variables and conversely, if there is a non-linear relationship, the OLS model should not be employed. Moreover, the reader should be aware that the assumption of strict exogeneity is for most economic experiments not true, as there are factors outside the regression that affect the variables within the model itself.

For instance, the negative interest rates set by the central bank of Sweden, which affect the amount invested in risky shares (The Riksbank 2014b), is not included as a factor in the regression model, but the negative interest rates nevertheless do influence investor behaviour. Another example is the error term, which is assumed to be zero, even though this is not always the case. For instance, when the data do not explain the dependent variable, the residual goes to the error term.

### 3.9.5 Critique of the regression model's variables

On an intuitive level, it is quite obvious that other factors, which are not part of the regression model are going to affect the amount invested in risky shares. As mentioned in the theory section, it is known that wealth and educational levels influence the amount invested in risky shares. However, these are not variables that are explored in this thesis as they have been studied earlier in other theses. Furthermore, because of time restrictions when making this thesis, these variables simply could not be studied in greater depth. Therefore, the reader is referred to the thesis of Calvet, Sodini, Campbell (2007) if he or she is interested in how the variables mentioned that are not included in the regression of this thesis affect investments in risky shares.

### 3.9.6 Critique of the SCB reports

According to SBC's (2014) publications regarding the manner in which the semi-annual reports are produced, the reliability of the statistics is generally very good since the data is based on register information. The most important sources of uncertainty include the sector classification of the final owner of the shares and the fact that the owners are not always reported, which is a result of faulty information provided by the asset managers and investment firms to Euroclear and of inaccuracy in Företagsdatabasen's, FDB's, sector codes.

To assure high quality, SCB has put a lot of resources into manual examination of the sector classifications. The number of individual shareholders in the population is at risk of being slightly underestimated, since accounts registered in the name of asset managers must reach at least 501 individual shares in a company for the final owner to be registered. Holdings of foreign asset managers are not included regardless of the number of shares. The shareholders' wealth of identified individuals is lower than the total household ownership since the total ownership also includes unidentified individuals and unreported owners.

Moreover, it should be noted that the thresholds used for the income levels are an approximation and that in reality these thresholds vary with the passage of time. However, it was decided to use these fixed income thresholds for the sake of simplicity and comparability throughout the years studied.

# 4. Results

*This chapter presents the findings of this thesis. Firstly, illustrations of the ways in which different holdings of assets have changed during the given time period are presented in the form of graphs. Secondly, the regression results are presented.*

## 4.1 Graphing of Swedish households' investments in risky shares

### 4.1.1 Direct holdings in Swedish stocks and risky mutual funds

Figure 4 and 5 illustrates how Swedish households have changed their investments held in stocks and risky mutual funds. Direct holdings in stocks are given from year 1996 thorough 2014. The investment in risky mutual funds starts in the year of 2000 due to the fact that the statistics were not presented in this way before.

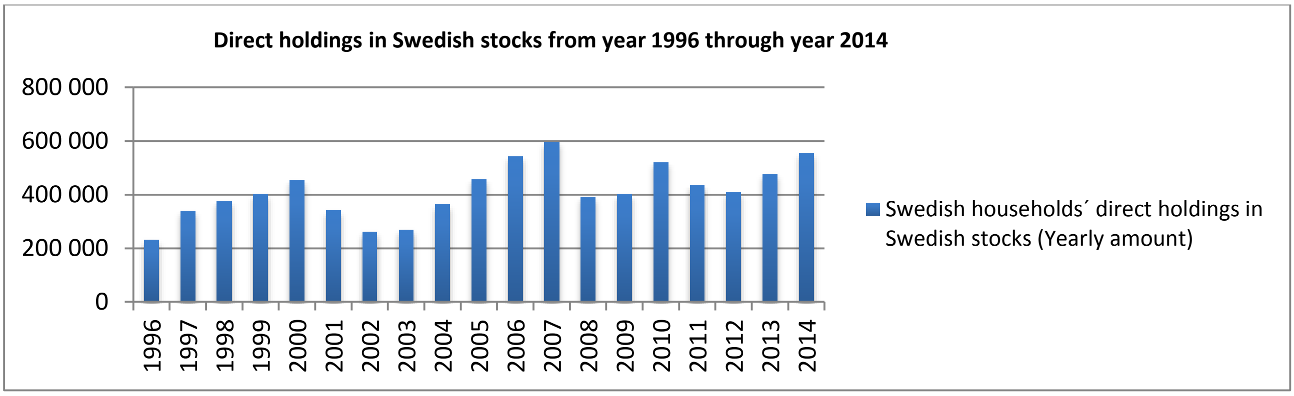


Figure 4

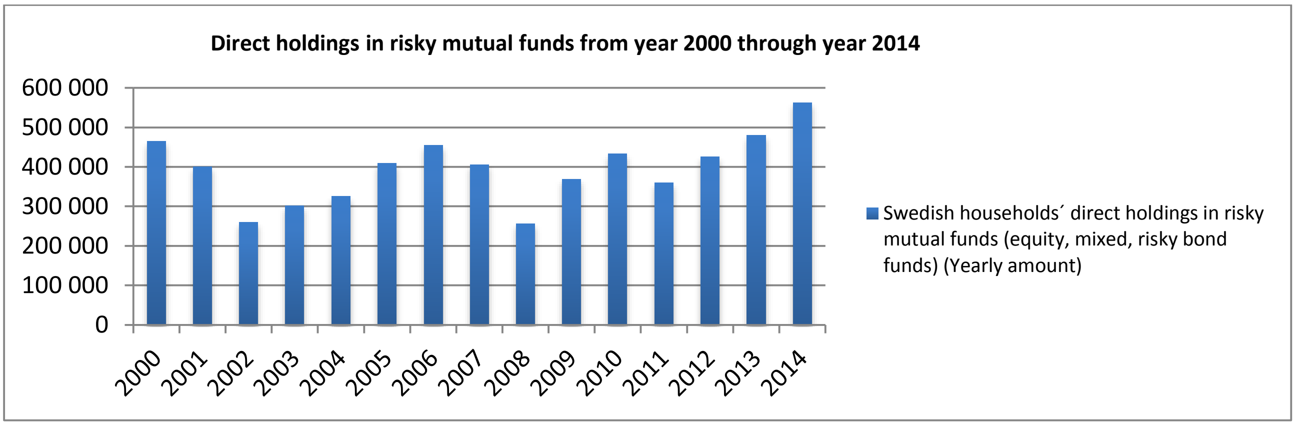


Figure 5

### 4.1.2 Return on risky shares BB

Figure 6 graphs the return on Swedish households' investments in risky shares BB in percentage terms, from year 1997 through year 2014. The return is given between year t and t+1.

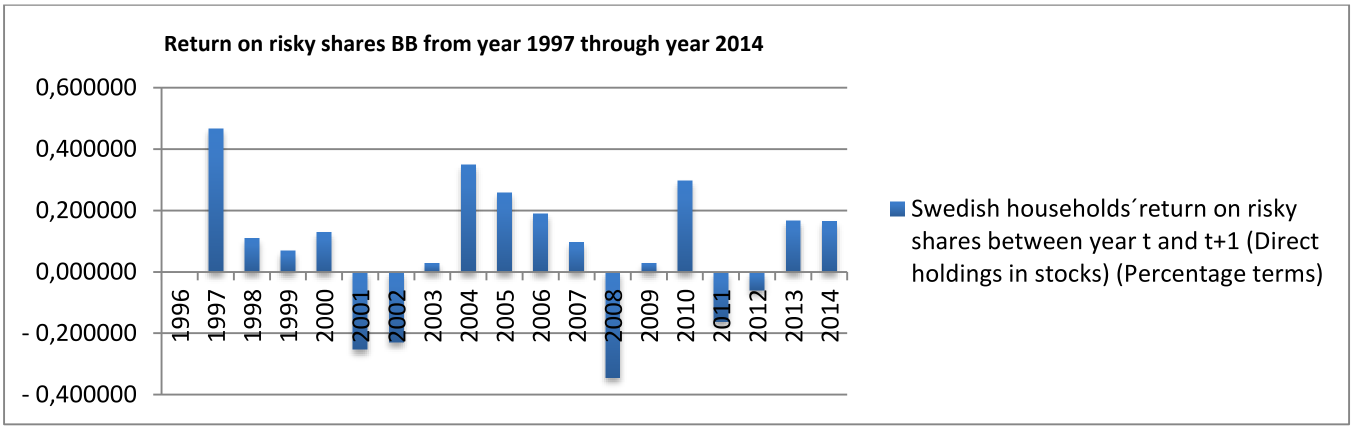


Figure 6

### 4.1.3 Cash holdings excluding and including money market funds

Figure 7 and 8 illustrate Swedish households' cash holdings for the years 1996-2014. In Figure 7, the cash holdings are given excluding money market funds, and in Figure 8 money market funds are included. As mentioned previously, after 2010, there was a change by Statistics Sweden to the manner in which money market funds were presented in their reports and therefore, the amount invested 2011 and onwards are unfortunately inconsistent with the rest of the graph in Figure 8.

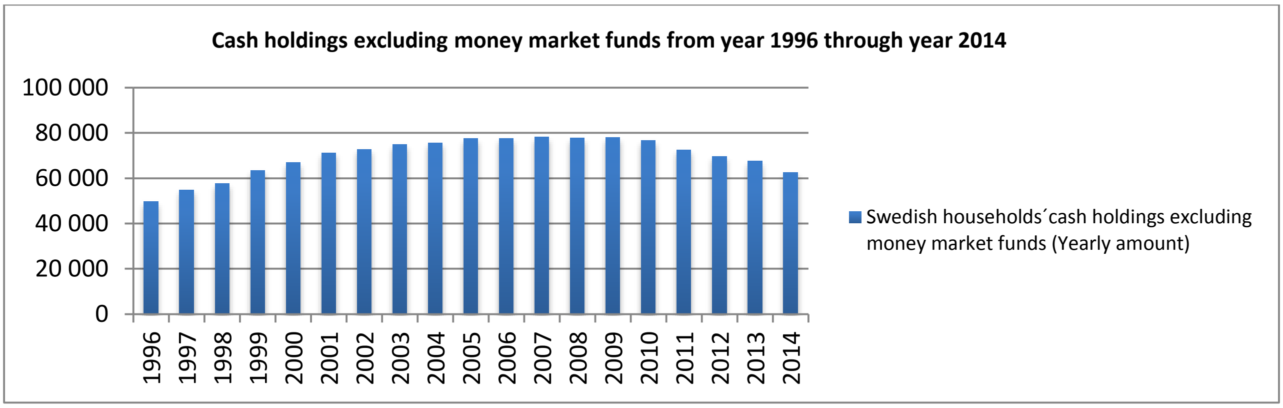


Figure 7

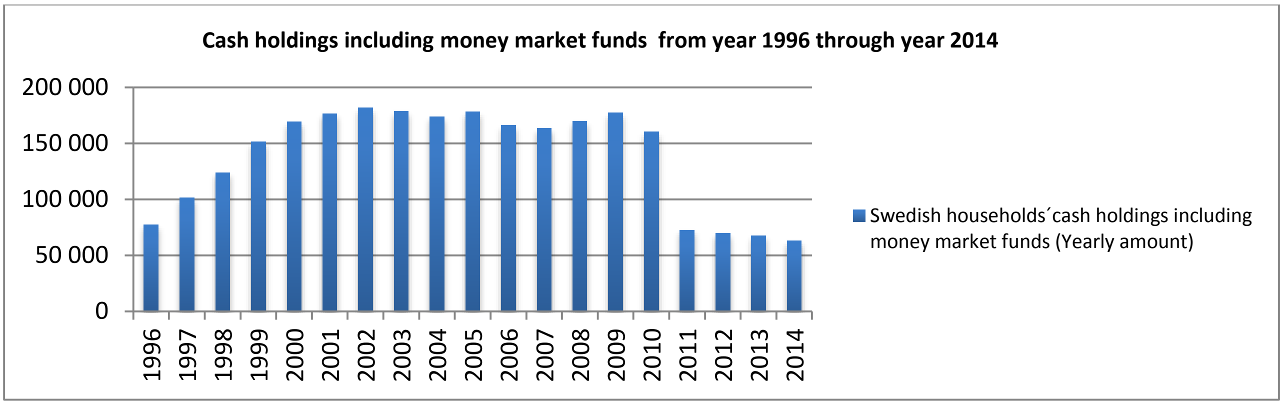


Figure 8

### 4.1.4 Percentage invested in different market exchanges

Figure 9 illustrates how the holdings of stocks listed on different exchanges have changed in percentage terms from 2001 through 2014. As explained previously, from December 2006 onwards three lists; Large Cap, Mid Cap and Small Cap replaced the A-and O-lists. Also, The NGM lists have been divided into NGM Equity and NGM Nordic MTF (which from that point also includes the Göteborgs-list).

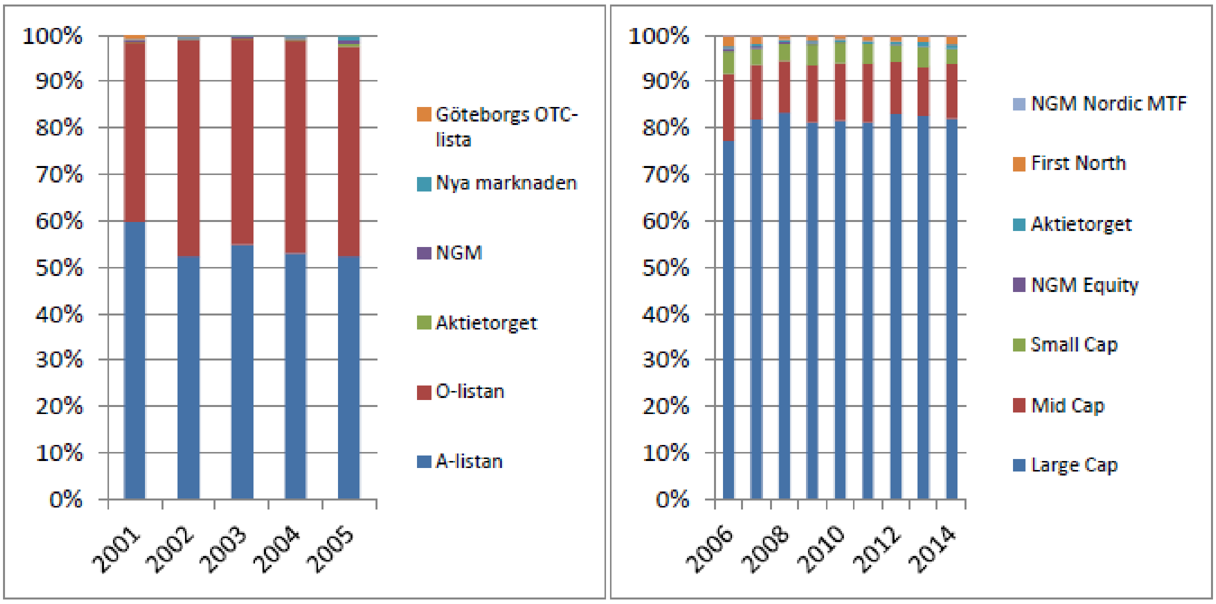


Figure 9- Percentage invested in different market exchanges from 2001 through 2014.

## 4.2 Regression results

*The regressions results are presented as follows: Firstly, by a normal regression using equation 3 and a robustness check. Second comes the natural logarithm regression using equation 4, followed by another robustness check. After this, the results regarding how different age groups and income levels coped with the financial crisis of 2008 are presented. In addition, some regression results are not been* *elaborated on further because they merely validate other regressions results and can be found in the appendix.*

### 4.2.1 Regression of Swedish households' portfolio rebalancing of risky shares

Through rigorous testing and based on the percentile data, which can be found in the appendix (A), there seem to be no significant jumps between different percentiles. Apart from when scrutinising the gross return column, where there are significant jumps between the 99$^{th}$ percentile and the 99.5$^{th}$ percentile and also between 99.5$^{th}$ percentile and the 99.9$^{th}$ percentile. Furthermore, the dataset is tested for outliers using the Grubbs' test, which resulted in zero outliers in the dataset, which can be seen in the appendix (B).

**All Swedish households´rebalancing of risky shares from 2001 through 2014**

| Name | C | D | E | F |
|---|---|---|---|---|
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight |
| weight | . | . | | |
| | (.) | (.) | | |
| weighttminus1 | 0.959*** | 0.959*** | | |
| | (147.509) | (82.999) | | |
| grossreturn | 0.001*** | 0.001*** | | |
| | (7.841) | (2.587) | | |
| ln_weight | | | . | . |
| | | | (.) | (.) |
| ln_weighttminus1 | | | 0.944*** | 0.944*** |
| | | | (127.387) | (57.420) |
| ln_grossreturn | | | 0.178*** | 0.178*** |
| | | | (9.225) | (3.971) |
| Constant | 0.003*** | 0.003*** | -0.235*** | -0.235*** |
| | (2.848) | (3.082) | (8.457) | (4.266) |
| Observations | 1,728 | 1,728 | 1,687 | 1,687 |
| R-squared | 0.928 | 0.928 | 0.914 | 0.914 |
| Adj. R-squared | 0.928 | 0.928 | 0.914 | 0.914 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regression (C) yielded a significant result when it came to the previous time periods weight invested in risky shares (referred to as "weighttminus1" in the regression model) as well as based on the previous return on risky shares (referred to as gross return in the regression model). $R^2$ is equal to 0.928 and all the independent variables have a p-value lower than 0.05, which implies that the independent variables are all statistically significant. However, the F-statistic is roughly 11 000 and the independent variables have a very small positive coefficient. When employing the robust check as shown in regression (D), the F-statistic decreases to roughly 4 000 and the t-value decreases for both independent variables. In regression (D) the coefficients are still positive for all the independent variables and $R^2$ remains equal to 0.928. The F-statistic increases to roughly 8 000 and the p-value implies that all the independent variables as well as the constant term are significant in regression.

Regression (F) using the robustness check for the regression in natural-logarithm form (E) yields a somewhat lower t-value for all the independent variables, but they all remain statistically significant.

**Endogenity test (BN) Testing for heteroscedasticity (BO) Testing ln_regression for heteroskedasitcity (BP)**

| Name | BN | BO | BP |
|---|---|---|---|
| VARIABLES (dependent) | weight | ln_weight | ln_weight |
| weight | . | | |
| | (.) | | |
| weighttminus1 | 0.959*** | | |
| | (147.509) | | |
| grossreturn | 0.001*** | | |
| | (7.841) | | |
| ln_weight | | . | . |
| | | (.) | (.) |
| ln_weighttminus1 | | 0.944*** | 0.853*** |
| | | (127.387) | (30.073) |
| ln_grossreturn | | 0.178*** | 1.167*** |
| | | (9.225) | (4.174) |
| Constant | 0.003*** | -0.235*** | -0.829*** |
| | (2.848) | (8.457) | (4.804) |
| Observations | 1,728 | 1,687 | 1,687 |
| R-squared | 0.928 | 0.914 | 0.779 |
| Adj. R-squared | 0.928 | 0.914 | 0.779 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The dataset is tested for heteroscedasticity, as seen from (BO, BP) and the results are negative. In addition, we test the gross-return variable for endogeneity (BN) and the result is positive based on the p-value. No suitable external instrumental variables are found, due to low correlation with the endogenous variable. (These results are not included in the appendix because the regressions yielded insignificant results). Therefore, the GMM regression is employed, which uses internal instrumental variables, as mentioned earlier in section 4, and requires no external instrumental variables.

The GMM regression is carried out in order to exhume the dataset of the endogenous variable(s), as mentioned in section 4. The results are shown below and the instruments used are age and years only.

**GMM regression (BK) Robustness check of GMM regression (BL) Normal regression (C) Robustness check (D)**

| Name | BK | BL | C | D |
|---|---|---|---|---|
| VARIABLES (dependent) | weight | weight | weight | weight |
| | | | | |
| weight | . | . | . | . |
| | (.) | (.) | (.) | (.) |
| weighttminus1 | 0.920*** | 0.920*** | 0.959*** | 0.959*** |
| | (0.503) | (0.460) | (147.509) | (82.999) |
| grossreturn | 0.009** | 0.009** | 0.001*** | 0.001*** |
| | (0.589) | (0.521) | (7.841) | (2.587) |
| | | | | |
| Constant | (-0.104** | (-0.104** | 0.003*** | 0.003*** |
| | (0.536) | (0.476) | (2.848) | (3.082) |
| | | | | |
| Observations | 1,728 | 1,728 | 1,728 | 1,728 |
| R-squared | 0.593 | 0.593 | 0.928 | 0.928 |
| Adj. R-squared | e(r2_a) | e(r2_a) | 0.928 | 0.928 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results are significant and allow for the conclusion that Swedish households rebalance towards a greater risky share based on their previous weight invested in risky shares as well as based on their previous return from risky shares. Thus, the GMM regression (BK, BL) yields the same result as regression (C, D) based on the p-value, which is still statistically significant. The only difference between (BK, C) are the smaller t-values for the independent variables, which in this thesis are, the previous weight invested in risky shares and the return from risky shares and the coefficient values of the independent variables.

## 4.3 How Swedish households invested in risky shares before and after the financial crisis of 2008

### *4.3.1 Investments in risky shares before and after the financial crisis for all Swedish households*

**Before: Normal regression (G) Robustness check (H) After: Normal regression (K) Robustness check (L)**

| Name: | G | H | K | L |
|---|---|---|---|---|
| VARIABLES (dependent) | weight | weight | weight | weight |
| | | | | |
| weight | . | . | . | . |
| | (.) | (.) | (.) | (.) |
| weighttminus1 | 0.968*** | 0.968*** | 0.981*** | 0.981*** |
| | (96.866) | (57.256) | (180.299) | (105.622) |
| grossreturn | 0.000*** | 0.000*** | 0.001*** | 0.001* |
| | (4.297) | (6.062) | (3.173) | (1.860) |
| | | | | |
| Constant | 0.002 | 0.002* | 0.001 | 0.001** |
| | (1.450) | (1.757) | (1.610) | (2.035) |

| | | | | |
|---|---|---|---|---|
| Observations | 720 | 720 | 864 | 864 |
| R-squared | 0.930 | 0.930 | 0.975 | 0.975 |
| Adj. R-squared | 0.930 | 0.930 | 0.975 | 0.975 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

On an aggregate level, regressions (G) and (H) show that Swedish households invested less heavily in risky shares prior to as compared to after the crisis of 2008 if one considers the previous weights invested in risky shares' coefficients for regression (G) and (H) and compares them to regression (K) and (L). These conclusions can be inferred because the coefficients are slightly lower in regression (H) and (G) in comparison to regression (K) and (L). However, the gross return variable is significant when scrutinising (K) but regression (L) is insignificant.

Therefore, it is not possible to conclude that the previous return on risky shares would be different after the financial crisis of 2008 if compared to the time before the crisis.

### *4.3.2 How the young coped with the financial crisis of 2008*

**Before: Normal regression (O) Robustness check (P) After: Normal regression (S) Robustness check (T)**

| Name: | O | P | S | T |
|---|---|---|---|---|
| VARIABLES (dependent) | weight | weight | weight | weight |
| weight | . | . | . | . |
| | (.) | (.) | (.) | (.) |
| weighttminus1 | 0.622*** | 0.622*** | 0.893*** | 0.893*** |
| | (18.405) | (2.882) | (48.128) | (24.966) |
| grossreturn | 0.000*** | 0.000*** | 0.000 | 0.000 |
| | (17.141) | (57.958) | (0.357) | (0.233) |
| Constant | 0.003*** | 0.003 | 0.000 | 0.000 |
| | (5.294) | (1.369) | (0.137) | (0.092) |
| Observations | 240 | 240 | 288 | 288 |
| R-squared | 0.717 | 0.717 | 0.892 | 0.892 |
| Adj. R-squared | 0.714 | 0.714 | 0.891 | 0.891 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

If one compares regression (O), which shows how the young invested in risky shares prior to the crisis of 2008, with regression (S), which shows how they invested in risky shares after the crisis. Based on the p-value the results are statistically significant and it may be inferred that the young invested more after the financial crisis as than before it based on the coefficient values of each regression.

The robustness check when comparing (P) to (T) yields a significant result when the previous return from risky shares prior to the financial crisis is examined, while the result after the crisis of 2008 does not yield a significant result based on the p-value. Therefore, it cannot be inferred how the young have changed their weight invested in risky shares based on their previous return from risky shares prior to or after the financial crisis.

### *4.3.3 How middle-aged (working age) coped with the financial crisis of 2008*

**Before: Normal regression (W) Robustness check (X) After: Normal regression (AA) Robustness check (AB)**

| Name: | W | X | AA | AB |
|---|---|---|---|---|
| VARIABLES (dependent) | weight | weight | weight | weight |
| weight | . | . | . | . |
| | (.) | (.) | (.) | (.) |
| weighttminus1 | 0.947*** | 0.947*** | 0.945*** | 0.945*** |
| | (44.149) | (31.034) | (85.385) | (53.648) |
| grossreturn | 0.001** | 0.001** | 0.001*** | 0.001** |
| | (2.107) | (2.395) | (3.165) | (2.397) |
| Constant | 0.006 | 0.006 | 0.005** | 0.005** |
| | (1.374) | (1.407) | (2.359) | (2.307) |
| Observations | 320 | 320 | 384 | 384 |
| R-squared | 0.868 | 0.868 | 0.951 | 0.951 |
| Adj. R-squared | 0.867 | 0.867 | 0.950 | 0.950 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Normal regressions (W, AA) and robustness checks (X, AB) show how those who are middle-aged (also referred to as working age) invested in risky shares prior to and after the financial crisis.

Based on the coefficient value of the weight invested in risky shares middle-aged (working age) for the previous time periods, there seem to be a marginal difference prior to and after the financial crisis.

The findings are statistically significant based on the p-value of both the normal regressions and the robustness checks. It cannot be concluded how the previous return from risky shares has affected the current weight invested in risky shares because of the insignificant results based on the p-value prior to and after the crisis.

### *4.3.4 How elderly coped with the financial crisis of 2008*

**Before: Normal regression (AE) Robustness check (AF) After: Normal regression (AI) Robustness check (AJ)**

| Name: | AE | AF | AI | AJ |
|---|---|---|---|---|
| VARIABLES (dependent) | weight | weight | weight | weight |

| | | | | |
|---|---|---|---|---|
| weight | . | . | . | . |
| | (.) | (.) | (.) | (.) |
| weighttminus1 | 0.893*** | 0.893*** | 1.001*** | 1.001*** |
| | (25.357) | (21.026) | (59.414) | (54.507) |
| grossreturn | 0.000 | 0.000 | -0.000 | -0.000 |
| | (0.918) | (0.960) | (0.340) | (0.994) |
| | | | | |
| Constant | 0.013*** | 0.013*** | 0.005* | 0.005** |
| | (3.054) | (3.203) | (1.768) | (2.043) |
| | | | | |
| Observations | 160 | 160 | 192 | 192 |
| R-squared | 0.808 | 0.808 | 0.950 | 0.950 |
| Adj. R-squared | 0.805 | 0.805 | 0.950 | 0.950 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

If one compares the normal regressions (AE, AI) and the robustness checks (AF, AJ), the elderly seems to rebalance towards a greater risky share in comparison to their behaviour prior to the financial crisis of 2008.

These findings are statistically significant based on the p-value, and the coefficient value prior to the financial crisis was 0.893 and increased to 1.001 after the crisis of 2008. However, the previous return on risky shares is statistically insignificant and therefore, it cannot be concluded how the previous weight invested in risky shares has affected the present weight invested in risky shares.

### *4.3.5 Cross-sectional comparison between different age groups*

**Before: Robustness checks (R, Z, AH) After: Robustness checks (V, AD, AL)**

| Name: | R | V | Z | AD | AH | AL |
|---|---|---|---|---|---|---|
| VARIABLES (dependent) | ln_weight | ln_weight | ln_weight | ln_weight | ln_weight | ln_weight |
| ln_weight | . | . | . | . | . | . |
| | (.) | (.) | (.) | (.) | (.) | (.) |
| ln_weighttminus1 | 0.940*** | 0.952*** | 0.969*** | 0.976*** | 0.901*** | 0.975*** |
| | (56.811) | (59.189) | (51.334) | (89.000) | (24.419) | (55.170) |
| ln_grossreturn | 0.718*** | 0.123 | 0.024** | 0.029 | -0.003 | -0.016 |
| | (7.482) | (0.653) | (2.501) | (1.266) | (0.120) | (0.708) |
| Constant | -0.400*** | -0.299*** | -0.086** | -0.068*** | -0.201** | -0.010 |
| | (4.847) | (3.439) | (2.226) | (2.827) | (2.301) | (0.288) |
| | | | | | | |
| Observations | 235 | 254 | 320 | 384 | 160 | 192 |
| R-squared | 0.932 | 0.935 | 0.904 | 0.969 | 0.862 | 0.960 |

| | | | | | |
|---|---|---|---|---|---|
| Adj. R-squared | 0.931<br>0.960 | 0.934 | 0.903 | 0.968 | 0.860 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Based on the robustness checks of the natural logarithm-regressions it seems as though different age groups have coped with the financial crisis of 2008 differently. All findings are statistically significant based on the p-value.

Ln-regressions (AH, AL) seem to imply that the elderly have rebalanced towards a greater risky share based on the coefficient value prior to the crisis, from 0.901 to 0.975 after the financial crisis of 2008. On the other hand, ln-regressions (Z, AD) show how the middle-aged (working age) held their investments in risky shares relatively constant, from 0.969 before the crisis to 0.976 after the financial crisis. Lastly, ln-regressions (R, V) shows how the young seem to have marginally increased their investments in risky shares prior to and after the financial crisis of 2008 based on the coefficient values, changed from 0.940 to 0.952.

### *4.3.6 How those with income below 300 000 SEK (below-average income level) coped with the financial crisis*

**Before: Robustness checks (AN) After: Robustness check (AR)**

| Name: | AN | AR |
|---|---|---|
| VARIABLES (dependent) | weight | weight |
| weight | . | . |
| | (.) | (.) |
| weighttminus1 | 0.246* | 0.160* |
| | (1.809) | (1.845) |
| grossreturn | 0.008* | 0.002*** |
| | (1.718) | (3.071) |
| Constant | -0.007 | -0.002** |
| | (1.569) | (2.291) |
| Observations | 44 | 48 |
| R-squared | 0.154 | 0.089 |
| Adj. R-squared | 0.112 | 0.048 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From the robustness checks (AN, AR) of the normal regression it cannot be concluded that the previous time periods return on risky shares has had a significant effect on how those with below-average income invest in risky shares based on the insignificant p-values of the independent variables. Only the gross-return variable after the financial crisis of regression (AR) was statistically significant and since no other regression was statistically significant no substantial conclusions can be drawn.

### *4.3.7 How those with income between 300 000 to 800 000 SEK (above-average income level) coped with the financial crisis*

**Before: Normal regression (AU) Robustness check (AV) After: Normal regression (AY) Robustness check (AZ)**

| Name: | AU | AV | AY | AZ |
|---|---|---|---|---|
| VARIABLES (dependent) | weight | weight | weight | weight |
| weight | . | . | . | . |
| | (.) | (.) | (.) | (.) |
| weighttminus1 | 0.880*** | 0.880*** | 0.888*** | 0.888*** |
| | (18.373) | (17.534) | (12.402) | (12.536) |
| grossreturn | 0.000*** | 0.000*** | 0.003 | 0.003 |
| | (178.741) | (1,088.943) | (0.480) | (0.938) |
| Constant | -0.000** | -0.000** | -0.003 | -0.003 |
| | (2.552) | (2.565) | (0.459) | (0.882) |
| Observations | 54 | 54 | 47 | 47 |
| R-squared | 0.998 | 0.998 | 0.778 | 0.778 |
| Adj. R-squared | 0.998 | 0.998 | 0.768 | 0.768 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From the normal regressions (AU, AY) and the robustness checks (AV, AZ) it may be inferred that above-average income earners do not seem to rebalanced their investments in risky shares based on the previous weight invested when comparing the data from before and after the financial crisis of 2008. These findings are based on the coefficient values, which have remained relatively constant prior to and after the crisis. The results are statistically significant based on the p-value.

Regressions (AU, AV) as compared to regressions (AY, AZ) show how above-average income earners have coped with the financial crisis of 2008. Based on the coefficient values for the previous weight invested in risky shares, from which may be inferred how the current investments in risky shares will be. The regression (AV, AZ) results show that the coefficient value remains relatively constant before and after the crisis. Therefore, it seems as though those above-average income earners did not rebalance their risky share portfolio based on their previous weight invested in risky shares. The gross-return variable, which is the previous return on risky shares, does not determine the current weight invested in risky shares because it is statistically insignificant based on the p-value.

### *4.3.8 How those with income above 800 000 SEK (high-income earners) coped with the financial crisis*

**Before: Normal regression (BC) Robustness check (BD) After: Normal regression (BG) Robustness check (BH)**

| Name: | BC | BD | BG | BH |
|---|---|---|---|---|
| VARIABLES (dependent) | weight | weight | weight | weight |
| weight | . | . | . | . |
| | (.) | (.) | (.) | (.) |
| weighttminus1 | 0.543*** | 0.543*** | 0.889*** | 0.889*** |
| | (8.638) | (7.076) | (11.960) | (12.324) |
| grossreturn | 0.299*** | 0.299*** | -0.004** | -0.004 |
| | (6.819) | (5.081) | (2.055) | (1.033) |
| Constant | -0.299*** | -0.299*** | 0.004** | 0.004 |
| | (6.789) | (5.066) | (2.096) | (1.076) |
| Observations | 33 | 33 | 36 | 36 |
| R-squared | 0.883 | 0.883 | 0.817 | 0.817 |
| Adj. R-squared | 0.875 | 0.875 | 0.805 | 0.805 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The normal regressions (BC, BG) and the robustness checks (BD, BH) show how high-income earners have invested in risky shares before and after the financial crisis of 2008. Based on the coefficient values of the previous weight invested in risky shares prior to and after the crisis, the results imply that high-income earner have rebalanced towards a greater risky share. The coefficient value increases from 0.542 before the crisis to 0.889 after the crisis of 2008 in the case of the normal regressions (BC, BG).

Furthermore, the gross-return variable on risky shares in the normal regression (BC, BG) is significant based on the p-value. The coefficient value decreases from 0.299 to -0.004 after the crisis of 2008. From the findings, it may be inferred high-income earners decrease their weight invested in risky shares based on the previous return from risky shares. However, the robustness check (BH) yields an insignificant result when scrutinising the gross-return variable based on the p-value.

### 4.3.9 Cross-sectional comparison between different income levels

Based on the regression results it seems as though different income levels have coped with the financial crisis in very different ways. More precisely, below-average income earners have increased their investments in risky shares based on their previous weight in risky shares, from a relatively low level. Above-average income earners seem to not have rebalanced their amount invested in risky shares based on their previous weight invested in risky shares. Lastly, high-income earners seem to have rebalanced towards a greater investment in risky shares based on their previous weight in risky shares. Thus, there have been three diametrically different ways of dealing with the financial crisis of 2008.

# 5. Analysis

*This chapter initially discusses the relationship of the results in the previous chapter relates to the framework of theory presented in chapter 3. It is discussed and analysed whether or not it is possible to draw certain conclusions and different theories are presented and debated.*

## 5.1 Analysis of the graphed results

### 5.1.1 Direct holdings in Swedish stocks and risky mutual funds

When analysing Figure 4 and 5 illustrating how Swedish households have changed their investments held in stocks and risky mutual funds during the given time period, it may be discerned that the direct holdings in stocks and the amount held in risky mutual funds follow one another to some extent. This might have to do with the fact that Swedish households use mutual funds to diversify their investments in risky shares, as suggested by Calvet, Campbell and Sodini (2007).

### 5.1.2 Return on risky shares

Figure 6, which graphs the return on risky shares using Swedish stocks as a proxy for the risky portfolio, provides an understanding of how returns have fluctuated through the years. As is to be expected, the dot-com bubble of 2000 and the financial crisis of 2008 brought Swedish households severe negative returns on risky shares. In 2001 and 2002, households lost 20% of their market value in risky shares and in 2008, more than 30%. Moreover, the correlation between cash holdings and return on risky shares is -0.265. This means that an increase in cash holdings decreases the return on risky shares, from which it might be inferred that the stock market is somewhat driven by liquidity which is consistent with The Riksbank (2014b).

The years 2001-2003 were characterised by a bear market and we can see that investors' returns on risky shares were negative in Figure 6. In addition, they decreased their direct holdings in stock, as seen in Figure 4.

Furthermore, 1996-2000 saw a bull market as may be inferred from the fact that direct ownership in stocks increased yearly but also that the returns on stock were especially high in 1997 and well over 10 % in both 1998 and 2000 while 1999 returned just under 10 % as seen in Figure 6. However, after rain comes sunshine. After the crash of 2000 had made many households leave the market or rebalance out of the stock market, direct holdings finally started to pick up again in 2004 as seen in Figure 4. This bull market ended in the financial crises of 2008, where households lost roughly 35% of their money on the stock market. From the year 2008 and 2014, there is a slightly positive trend in the increase of direct holdings in stocks amongst Swedish households as seen in Figure 4. However, the trend line is not as steep as between the year 2003 and 2007, which might indicate that the general risk preferences among Swedish households remained lower after the crisis. These findings may possibly be consistent with the disposition effect, since Swedish households on an aggregate level have suffered a negative return of 34.5 % on risky shares in 2008 as seen in Figure 6 and many households decided to rebalance out of risky shares as seen from Figure 4.

Between the year 2009 and 2014, it is hard to determine whether there is a bull market right now, if one were to only factor in return as determinant. However, if we look at direct ownership in stocks in Figure 4, one might say that we are right now in a bull market since ownership has steadily increased on a per annum basis.

### 5.1.3 Cash holdings excluding and including money market funds

Analysing Figure 7 illustrating Swedish households' cash holdings excluding money market funds, there appears to be no negative correlation between cash holdings and return on risky shares (direct holdings in stocks) between 1996 and 2000. From 2004 and 2007 Swedish households' cash holdings are almost constant. However, from 2008 and 2014, a negative correlation between cash holdings and return on risky shares may be observed. Moreover, the fact that the pattern is inconsistent the first couple of years from 1996 and 2000 affect the correlation and makes it weaker and therefore there seem only to be a slight negative correlation between return on risky shares and cash holdings of Swedish households.

Figure 8 shows how Swedish households have invested in money market funds together with their amount held in cash. This graph is slightly more detailed than Figure 7 but does not disprove the observation that between 1996 and 2000 cash holdings and money market funds investments by Swedish households do not appear to have a negative correlation with return on risky shares. From 2001 to 2003 cash holdings including money market funds appear to be roughly constant, while from 2004 to 2007, there seem to be a negative trend with regard to Swedish households' investments in risky shares. This is consistent with the claim that a high return on risky shares will make households divest from risk-free assets such as cash holdings and money market funds and invest instead in the stock market, which is consistent with The Riksbank (2014b). The negative relationship between Swedish households' investments in risky shares (seen in Figure 4) and in cash holdings including money market funds (as seen in figure 8) may also be observed when scrutinizing the years 2004 through 2007.

### 5.1.4 Percentage invested in different market exchanges

Analysing the results in Figure 9, which illustrates how the holdings of listed stocks have changed between the different exchanges, may yield deeper insights into the changes of general risk preferences of Swedish households. The holdings at different lists are shown in percentage terms for year 2001 through year 2014. Comparisons of the earlier A and O list with the newer Large-, Mid- and Small-Cap lists are hard to make due to the different classifications as explained in the section regarding their differences in section 3.6.5.

Figure 9 shows a slight fluctuation in the percentage invested in Large Cap between 2007 and 2014. However, it always represents over 80% of Swedish households' investments in risky shares. Investments in Mid Cap also remain close to constant between 2007 and 2014. However, upon close examination, it is possible to discern a significant decrease in Swedish households' investment in Large Cap in percentage term between 2008 and 2009. The same is true of Mid Cap, Small Cap, First North and Aktietorget. This behaviour is consistent with the claim that if returns on risky shares perform poorly, households decide to balance out of the stock market and into cash holdings or money market funds (or other risk-free assets). These findings are consistent with the utility theory because different individuals have a specific amount of risk appetite with which they feel comfortable but also the findings of Calvet, Campbell and Sodini (2007). .

## 5.2 Analysis of the regression results

### 5.2.1 Swedish households' portfolio rebalancing of risky shares and its implications

We are aware that the results and conclusions presented only provide a partial picture of the manner in which different age groups and income levels as well as Swedish households on an aggregate level invest in risky shares based on their previous return and previous weight in risky shares. This is because we do not investigate how they have invested their retirement savings, which is an important part of Swedish households' investments in risky share portfolios.

Furthermore, the fact that we use stocks as a proxy for investments in risky shares, as mentioned in the method section in this thesis, also contributes to this partiality.

Moreover, we are aware that risky shares only constitute a part of the risky share portfolio and that the risky share portfolio is a part of the complete portfolio as mentioned earlier in this thesis. In this way, using risky shares as a proxy for investments in the risky share portfolio decreases the validity of the report, because the use of stocks as a proxy implies the assumption that all individual stocks are homogenous risky investments, which we know de facto not to be true, because different companies have different, heterogeneous firm-specific risks and investors have heterogeneous expectations according to Levy and Levy (1997).

Finally, besides from firm-specific risk, there are also transparency and legal risks between different stock quotations such as between Large Cap, Mid Cap and Small Cap, First North, et cetera.

### 5.2.2 The regressions and interpretations

In most of the regressions, the coefficient values for the gross-return variable and the previous weight invested in risky shares, which determines the weight invested in risky shares, are positive as seen in Appendix 2. If we infer these results on a long-term basis, this would mean that, on an aggregate level based on previous return on risky shares and the previous time periods weight in risky shares, the current weight in risky shares would increase ad infinitum. These results are inconsistent with Calvet, Campbell, Sodini (2009) as they receive negative coefficient values. In this thesis, only a few coefficient values became negative out of a vast amount of regressions.

This might have to do with the fact that Calvet, Campbell, Sodini (2009) have access to more detailed information about how Swedish households rebalance their investments in risky shares. In our regressions, there seem to be relatively homogenous returns on risky shares and only when scrutinising the $99^{th}$, $99{,}5^{th}$ and

99,9th percentile does there seem to be heterogeneous returns amongst Swedish households. However, these households are so few and the majority of Swedish households in our dataset receive homogenous returns from risky shares, so the OLS regression model is most likely unable to detect greater variances in the dataset, which therefore, yields results from the regressions, which suggest that there is very low rebalancing of risky shares. Nevertheless, we know that there should be heterogeneous returns amongst Swedish households as seen in the Calvet, Campbell, Sodini (2009). However, the findings in this thesis cannot support that households have had heterogeneous return because the dataset is on an aggregate level. This slightly decreases the validity of the thesis since we have the entire Swedish households' investments in risky shares in the dataset.

Moreover, our dataset does not show any passive rebalancing of risky shares between different time periods, as mentioned in the result section. Furthermore, whether Swedish households, different age groups and income levels have short positions in risky shares cannot be shown, because the dataset is situated on an aggregate level and does not contain such information. However, we know that Swedish households, different age groups and income levels in fact do have short positions and that some households do rebalance passively, as shown in Calvet, Campbell and Sodini (2009). This notion does decrease the validity of our report somewhat, as we would have needed more detailed data to replicate the results of Calvet, Campbell and Sodini (2009).

Furthermore, the partiality of this thesis lowers its validity somewhat with regard to how Swedish households, age groups and income levels have rebalanced their investments in risky shares from 2001 through 2014, but also how they have coped with the financial crisis of 2008. However, the results of the GMM regressions, regarding how Swedish households have rebalanced their investments in risky shares based on the return from risky shares and of the previous time periods weight in risky shares are significant, and the endogenous variable is not used in the regression, which increases the validity when it comes to research question number one.

Furthermore, a majority of the regressions, which may be found in Appendix 2, have very high $R^2$ –values. This is an interesting observation, because the regression model only features two independent variables, i.e. gross return and the weight invested in risky shares of the previous time period, which determines the weight invested in risky shares today. Even so, we know that other factors also determine the current weight invested in risky shares, such as wealth and education level, as discussed in the theory section.

### 5.2.3 Different age groups and income levels coping with the financial crises

It is tempting to conclude that there is a change in risky preference between different age groups and income levels. However, this observation is not conclusive since we only have the data prior to and after the crisis, from 2001 through 2014, on the basis of which to draw such a conclusion. We do not have a solid ”baseline” as to how different age groups or income levels have invested in risky shares in the long run. Much more data over longer time periods would be required to make such claims regarding how different age groups and income levels have rebalanced their investments in risky shares prior to and after the financial crisis of 2008.

However, the data do allow for the conclusion that different age groups and income levels coped differently with the crisis of 2008. The young rebalance towards a greater risky share, albeit from a relatively low level as seen from regressions (O, P, S, T). Meanwhile the middle-aged (working age) seem to remain on a relatively constant level of investment in risky shares based on their previous weight in risky shares as seen from regressions (W, X, AA, AB). Furthermore, the elderly seem to have increased their investment in risky shares based on their previous weight in risky shares based on regressions (AE, AF, AI, AJ). The same pattern emerges in how different income levels changed their investments before and after the crisis. Therefore, we are certain that there is a correlation between income levels and age groups, which on an intuitive level makes sense because higher income often comes with greater age. However, the finding that the elderly seem to rebalance towards a greater risky share investment is inconsistent with Pålsson (1996), as it seems that risk aversion for the elderly seems to decrease. However, these results are consistent with Ameriks and Zelders (2004), as our results imply that the elderly rebalance towards a greater risky share investment based on the previous weight in risky shares.

Moreover, the finding that high-income earners rebalance towards a greater risky share based on their previous weight invested in risky shares, is consistent with the utility theory and with the observation that relative risk aversion decreases with increased wealth, as mentioned in the theory section.

Furthermore, we are unable to conclude how below-average income earners have invested in risky shares before and after the financial crisis of 2008. This might have to do with the fact that we only had 44 and 48 observations in regressions (AN, AR). Moreover, the findings of Calvet, Campbell, Sodini (2007) suggest that households who are not financially sophisticated do not generally participate in the risky share market.

The results also point in the direction that high-income earners rebalance their portfolio faster and to a greater extent than do other income levels, which is apparent from regressions (R, V, AD, AH, AL) using the natural logarithm, as these immediately yields the change in percentage terms. This might indicate that high-income earners are more financially sophisticated. These findings are consistent with those of Calvet, Campbell and Sodini (2009).

### 5.3 Different stock listings and the disposition effect

We have not been able to show whether different age groups and income levels are subject to the disposition effect. However, a tendency may be discerned that suggest that Swedish households on an aggregate level have rebalanced towards a larger amount invested in the Small-Cap list based on Figure 9 from the Large-Cap list between 2008 and 2009. If this tendency could be corroborated it would be consistent with the disposition effect of Kahneman and Tversky (1979). This would in turn imply that Swedish households on an aggregate level rebalance from Large Cap to Small Cap in the face of losses in order to take on excessive risks and with the, hopefully, realise higher returns.

# 6. Conclusion

The thesis can concludes that Swedish households on an aggregate level rebalance their investments in risky shares based on the previous period's weight invested in risky shares as well as on the gross return on risky shares. However, Swedish households' rebalancing based on gross return and previous weight invested in risky shares has positive coefficient values.

Above-average income and high-income earners rebalance their risky share portfolio to a greater extent than do below-average income earners. High-income earners rebalance their risky share portfolio more rapidly than other income categories do, which suggests a higher level of financial sophistication. The results regarding rebalancing of investments in risky shares by below-average income earners are inconclusive.

The regression results imply that different age groups have dealt with the financial crisis of 2008 in different ways. The elderly seem to have rebalanced towards a greater risky share, whereas middle-aged (working age) held their investments in risky shares relatively constant and the young seem to have marginally increased their investments in risky shares.

We see some tendencies of the disposition effect for Swedish households on an aggregate level between different stock listings based on the empirical data presented in this thesis. However, this finding has yet to be corroborated by statistical analysis.

## Recommendations for further research

The authors of this thesis think that the field of households finance would benefit from an exploration of how Swedish households have rebalanced between different market exchanges in greater depth than in Figure 9 in this thesis by means of statistical analysis. It would also be interesting to take into account other factors that determine investments in risky shares, such as educational level and gender. Finally, further studies comparing different crises with one another could by carried out based on the results of this thesis.

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# Appendix 1- Method of moment and generalised method of moments

*This appendix gives a brief introduction to method of moments (MM) before moving on to generalised method of moments (GMM). The appendix is built solely on Nielsen's (2005) publishing in Econometrics 2 "Generalized method of moments estimation".*

**Method of moments (MM)**
Data is extrapolated from a population, which implies certain assumptions regarding the underlying population, such as a normal distribution and variance, which in mathematical terms is expressed as follows: $X \sim N(\mu, \sigma^2)$

Because the underlying population is normally distributed as seen from assumption 1.) and 2.) Certain properties of that population also referred to, as moments are known.

**Properties of a normally distributed population**

Assumption 1.) $E(x) = \mu$
Assumption 2.)$Var(x) = \sigma^2$ can also be written as $E[(x-\mu)^2] = \sigma^2$

Assumptions 1.) and 2.) is used in order to yield the corresponding properties for the sample taken, using sample-analogues.

**Sample-analogous properties from a normally distributed population**

Condition 1.) Sample mean is the expected value of x, which is formulated in the following manner: $\frac{1}{N}\sum_{i=1}^{N} x_i = \hat{\mu}$

Condition 2.) The expected variance in the sample is formulated in the following way:

$\frac{1}{N}\sum_{i=1}^{N}(x_i - \hat{\mu})^2 = \widehat{\sigma^2}$

Since two equations have been given and two are unknown the solutions will be exact. In mathematical terms the generic parameter is denoted as $\theta$ and the true value is $\theta_0$. Since there exists a unique solution $\theta = \theta_0$.

**Generalised method of moments (GMM)**

Moreover, the skewness within the population is expected to be zero, which is formulated, in mathematical terms as: Assumption 3.) $E[(x-\mu)^3] = 0$

Curtosis within the population is also expected to be zero and is expressed in mathematical terms as: Assumption 4.) $E[(x-\mu)^4] = 3\sigma^4$

**Analogues- sample conditions are formulated based on the properties from the normally distributed population**

Condition 3.) in sample analogues- terms is: $\frac{1}{N}\sum_{i=1}^{N}(x_i - \hat{\mu})^3 = 0$

Condition 4.) in sample-analogues terms is: $\frac{1}{N}\sum_{i=1}^{N}(x_i - \hat{\mu})^4 = \widehat{3\sigma^4}$

Thus, there exist four moment conditions (M) but only two parameters (K), which one is trying to estimate. For GMM the moments conditions exceed the parameters and is expressed mathematically in the following way: $GMM: M > K$. Therefore, the solution is not going to be exact which means that $\theta$ is different from $\theta_0$ as compared to MM where an exact solution can be calculated.

**GMM-linear regression model**

Consider the linear regression model $y_t = x_t'\beta_0 + \varepsilon_t,\ t = 1, 2, 3 \dots, T$
Where $x_t$ is a $K \times 1$ vector of independent variables, and is assumed that it represents the conditional exception that there is a relationship between the dependent and independent variable, and the error term is expected to be zero.

However, if there exists endogeneity, which means that, some of the variables in $x_t$ are correletaed with the error term or other variables in the regression model OLS will be inconsistent due to endogenity. Therefore, one writes the partioned regression model: $y_t = x_{1t}'\gamma_0 + x_{2t}'\delta_0 + \varepsilon_t$ where the $K_1$variables in $x_{1t}$ are predetermined while the $K_2 = K - K_1$ variables in $x_{2t}$ are endogenous which implies that:

$$E[x_{1t}\varepsilon_t] = 0 \quad (K_1 \times 1)$$

$$E[x_{2t}\varepsilon_t] \neq 0 \quad (K_2 \times 1)$$

However, if one assumes that there exists $K_2$ new variables $z_{2t}$ that is correlated with $x_{2t}$ but uncorrelated with the error term: $E[z_{2t}\varepsilon_t] = 0$

One uses the new variables $z_{2t}$ instead of the endogenous variable $x_{2t}$, which implies that $z_{2t}$ is an instrument for $x_{2t}$ while the predetermined variables are instruments for themselves. Trough using internal instrumental variables GMM regressions is able to exhume the endogeneity from the regression model.

## Appendix 2

Name A **Percentiles**

| **Variable** | **Observations** | **Percentiles** | **Centiles** | **95 % confidence interval** | |
|---|---|---|---|---|---|
| Weight | 1854 | 75 | .18325 | .171436 | .194 |
| | | 90 | .259 | .2523965 | .266 |
| | | 95 | .30225 | .288 | .3147698 |
| | | 97 | .34005 | .319 | .376 |
| | | 98 | .3858 | .3553076 | .4061351 |
| | | 99 | .42135 | .4012207 | .4390509 |
| | | 99,5 | .4479 | .425 | .4622008 |
| | | 99,9 | .48645 | .4578484 | .495* |
| Weighttminus1 | 1728 | | **Centiles** | **95 % confidence interval** | |
| | | 75 | .183 | .17 | .1935491 |
| | | 90 | .259 | .2528824 | .266 |
| | | 95 | .30255 | .287926 | .314441 |
| | | 97 | .33639 | .3183085 | .3766188 |
| | | 98 | .38484 | .3456316 | .4027661 |
| | | 99 | .41871 | .4002723 | .4318559 |
| | | 99,5 | .441775 | .4218816 | .4564358 |
| | | 99,9 | .481149 | .455721 | .495* |
| Gross return | 1854 | | **Centiles** | **95 % confidence interval** | |
| | | 75 | 1.234677 | 1.217255 | 1.249645 |
| | | 90 | 2.050794 | 1.739722 | 2.936877 |
| | | 95 | 7.490754 | 5.606167 | 9.219724 |
| | | 97 | 12.20123 | 9.623724 | 14.45494 |
| | | 98 | 15.02771 | 13.1829 | 17.71094 |
| | | 99 | 23.68351 | 16.96561 | 32.20642 |
| | | 99,5 | 33.18906 | 25.59226 | 42.59555 |
| | | 99,9 | 85.18449 | 40.67301 | 247.5332* |
| ln_weight | 1825 | | **Centiles** | **95 % confidence interval** | |
| | | 75 | -1.684704 | -1.744377 | -1.624552 |
| | | 90 | -1.347074 | -1.372415 | -1.324259 |
| | | 95 | -1.194022 | -1.239372 | -1.154794 |
| | | 97 | -1.072302 | -1.142449 | -.9686596 |
| | | 98 | -.9457402 | -1.030992 | -.8982709 |
| | | 99 | -.8622336 | -.9116203 | -.8198917 |
| | | 99,5 | -.8018957 | -.8553346 | -.7712303 |
| | | 99,9 | -.7200552 | -.7807607 | -.7031975* |
| ln_weighttminus1 | 1703 | | **Centiles** | **95 % confidence interval** | |
| | | 75 | -1.687399 | -1.7487 | -1.629641 |
| | | 90 | -1.347074 | -1.372201 | -1.32396 |
| | | 95 | -1.194022 | -1.244795 | -1.151622 |
| | | 97 | -1.082822 | -1.142564 | -.9660277 |
| | | 98 | -.9523335 | -1.051111 | -.9056712 |
| | | 99 | -.8699799 | -.9138376 | -.8390676 |
| | | 99,5 | -.8155568 | -.8616642 | -.7833354 |
| | | 99,9 | -.730752 | -.7857412 | -.7031975* |
| ln_gross return | 1854 | | **Centiles** | **95 % confidence interval** | |
| | | 75 | .2108093 | .1965985 | .2228595 |
| | | 90 | .7182262 | .5537251 | 1.077346 |
| | | 95 | 2.013628 | 1.723867 | 2.221331 |
| | | 97 | 2.501537 | 2.264222 | 2.671007 |
| | | 98 | 2.709895 | 2.578911 | 2.874171 |
| | | 99 | 3.164384 | 2.831115 | 3.472115 |
| | | 99,5 | 3.502215 | 3.242218 | 3.751455 |
| | | 99,9 | 4.265702 | 3.705552 | 5.511545* |

* Lower (upper) confidence limit held at minimum (maximum) of sample

Name B **Grubbs´test**

Variable: weight (0/1 variable recording which observations are outliers: grubbs_weight
0 outliers.

Variable: weighttminus1 (0/1 variable recording which observations are outliers:
grubbs_weighttminus1
(126 missing values generated)
0 outliers.

| | All Swedish households´rebalancing of risky shares from 2001 through 2014 | | | | All Swedish households´rebalancing of risky shares before the financial crisis of 2008 | | | |
|---|---|---|---|---|---|---|---|---|
| | Normal regression | Robustness check | ln_regression | Robustness check | Normal regression | Robustness check | ln_regression | Robustness check |
| Name | C | D | E | F | G | H | I | J |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight | weight | weight | ln_weight | ln_weight |
| weight | . | . | | | . | . | | |
| | (.) | (.) | | | (.) | (.) | | |
| weighttminus1 | 0.959*** | 0.959*** | | | 0.968*** | 0.968*** | | |
| | (147.509) | (82.999) | | | (96.866) | (57.256) | | |
| grossreturn | 0.001*** | 0.001*** | | | 0.000*** | 0.000*** | | |
| | (7.841) | (2.587) | | | (4.297) | (6.062) | | |
| ln_weight | | | . | . | | | . | . |
| | | | (.) | (.) | | | (.) | (.) |
| ln_weighttminus1 | | | 0.944*** | 0.944*** | | | 0.978*** | 0.978*** |
| | | | (127.387) | (57.420) | | | (146.015) | (58.755) |
| ln_grossreturn | | | 0.178*** | 0.178*** | | | 0.088*** | 0.088 |
| | | | (9.225) | (3.971) | | | (6.028) | (1.510) |
| Constant | 0.003*** | 0.003*** | -0.235*** | -0.235*** | 0.002 | 0.002* | -0.108*** | -0.108 |
| | (2.848) | (3.082) | (8.457) | (4.266) | (1.450) | (1.757) | (4.268) | (1.611) |
| Observations | 1,728 | 1,728 | 1,687 | 1,687 | 720 | 720 | 715 | 715 |
| R-squared | 0.928 | 0.928 | 0.914 | 0.914 | 0.930 | 0.930 | 0.971 | 0.971 |
| Adj. R-squared | 0.928 | 0.928 | 0.914 | 0.914 | 0.930 | 0.930 | 0.971 | 0.971 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**All Swedish households´rebalancing of risky shares after the financial crisis of 2008**

| | Normal regression | Robustness check | ln_regression | Robustness check |
|---|---|---|---|---|
| Name | K | L | M | N |
| | (9) | (10) | (11) | (12) |
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight |
| weight | . | . | | |
| | (.) | (.) | | |
| weighttminus1 | 0.981*** | 0.981*** | | |
| | (180.299) | (105.622) | | |
| grossreturn | 0.001*** | 0.001* | | |
| | (3.173) | (1.860) | | |
| ln_weight | | | . | . |
| | | | (.) | (.) |
| ln_weighttminus1 | | | 1.002*** | 1.002*** |
| | | | (277.860) | (215.825) |
| ln_grossreturn | | | 0.019 | 0.019 |
| | | | (1.136) | (1.075) |
| Constant | 0.001 | 0.001** | -0.006 | -0.006 |
| | (1.610) | (2.035) | (0.487) | (0.516) |
| Observations | 864 | 864 | 830 | 830 |
| R-squared | 0.975 | 0.975 | 0.990 | 0.990 |
| Adj. R-squared | 0.975 | 0.975 | 0.990 | 0.990 |

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

| | How young rebalanced their risky shares prior to the financial crisis of 2008 | | | | How young rebalanced their risky shares after the financial crisis of 2008 | | | |
|---|---|---|---|---|---|---|---|---|
| | Normal regression | Robustness check | ln_regression | Robustness check | Normal regression | Robustness check | ln_regression | Robustness check |
| Name | O | P | Q | R | S | T | U | V |
| | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) |
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight | weight | weight | ln_weight | ln_weight |
| weight | . | . | | | . | . | | |
| | (.) | (.) | | | (.) | (.) | | |
| weighttminus1 | 0.622*** | 0.622*** | | | 0.893*** | 0.893*** | | |
| | (18.405) | (2.882) | | | (48.128) | (24.966) | | |
| grossreturn | 0.000*** | 0.000*** | | | 0.000 | 0.000 | | |
| | (17.141) | (57.958) | | | (0.357) | (0.233) | | |
| ln_weight | | | . | . | | | . | . |
| | | | (.) | (.) | | | (.) | (.) |
| ln_weighttminus1 | | | 0.940*** | 0.940*** | | | 0.952*** | 0.952*** |
| | | | (54.443) | (56.811) | | | (59.464) | (59.189) |
| ln_grossreturn | | | 0.718*** | 0.718*** | | | 0.123 | 0.123 |
| | | | (14.435) | (7.482) | | | (0.689) | (0.653) |
| Constant | 0.003*** | 0.003 | -0.400*** | -0.400*** | 0.000 | 0.000 | -0.299*** | -0.299*** |
| | (5.294) | (1.369) | (4.397) | (4.847) | (0.137) | (0.092) | (3.417) | (3.439) |
| Observations | 240 | 240 | 235 | 235 | 288 | 288 | 254 | 254 |
| R-squared | 0.717 | 0.717 | 0.932 | 0.932 | 0.892 | 0.892 | 0.935 | 0.935 |
| Adj. R-squared | 0.714 | 0.714 | 0.931 | 0.931 | 0.891 | 0.891 | 0.934 | 0.934 |

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

| | **How middle-aged rebalanced their risky shares before the financial crisis of 2008** | | | | **How middle-aged rebalanced their risky shares after the financial crisis of 2008** | | | |
|---|---|---|---|---|---|---|---|---|
| | Normal regression | Robustness check | ln_regression | Robustness check | Normal regression | Robustness check | ln_regression | Robustness check |
| Name | W | X | Y | Z | AA | AB | AC | AD |
| | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) |
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight | weight | weight | ln_weight | ln_weight |
| weight | . | . | | | . | . | | |
| | (.) | (.) | | | (.) | (.) | | |
| weighttminus1 | 0.947*** | 0.947*** | | | 0.945*** | 0.945*** | | |
| | (44.149) | (31.034) | | | (85.385) | (53.648) | | |
| grossreturn | 0.001** | 0.001** | | | 0.001*** | 0.001** | | |
| | (2.107) | (2.395) | | | (3.165) | (2.397) | | |
| ln_weight | | | . | . | | | . | . |
| | | | (.) | (.) | | | (.) | (.) |
| ln_weighttminus1 | | | 0.969*** | 0.969*** | | | 0.976*** | 0.976*** |
| | | | (53.103) | (51.334) | | | (105.870) | (89.000) |
| ln_grossreturn | | | 0.024** | 0.024** | | | 0.029** | 0.029 |
| | | | (2.014) | (2.501) | | | (2.125) | (1.266) |
| Constant | 0.006 | 0.006 | -0.086** | -0.086** | 0.005** | 0.005** | -0.068*** | -0.068*** |
| | (1.374) | (1.407) | (2.341) | (2.226) | (2.359) | (2.307) | (3.347) | (2.827) |
| Observations | 320 | 320 | 320 | 320 | 384 | 384 | 384 | 384 |
| R-squared | 0.868 | 0.868 | 0.904 | 0.904 | 0.951 | 0.951 | 0.969 | 0.969 |
| Adj. R-squared | 0.867 | 0.867 | 0.903 | 0.903 | 0.950 | 0.950 | 0.968 | 0.968 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

| | **How elderly rebalanced their risky shares before the financial crisis of 2008** | | | | **How elderly rebalanced their risky shares after the financial crisis of 2008** | | | |
|---|---|---|---|---|---|---|---|---|
| | Normal regression | Robustness check | ln_regression | Robustness check | Normal regression | Robustness check | ln_regression | Robustness check |
| Name | AE | AF | AG | AH | AI | AJ | AK | AL |
| | (29) | (30) | (31) | (32) | (33) | (34) | (35) | (36) |
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight | weight | weight | ln_weight | ln_weight |
| weight | . | . | | | . | . | | |
| | (.) | (.) | | | (.) | (.) | | |
| weighttminus1 | 0.893*** | 0.893*** | | | 1.001*** | 1.001*** | | |
| | (25.357) | (21.026) | | | (59.414) | (54.507) | | |
| grossreturn | 0.000 | 0.000 | | | -0.000 | -0.000 | | |
| | (0.918) | (0.960) | | | (0.340) | (0.994) | | |
| ln_weight | | | . | . | | | . | . |
| | | | (.) | (.) | | | (.) | (.) |
| ln_weighttminus1 | | | 0.901*** | 0.901*** | | | 0.975*** | 0.975*** |
| | | | (31.054) | (24.419) | | | (66.129) | (55.170) |
| ln_grossreturn | | | -0.003 | -0.003 | | | -0.016 | -0.016 |
| | | | (0.114) | (0.120) | | | (0.877) | (0.708) |
| Constant | 0.013*** | 0.013*** | -0.201*** | -0.201** | 0.005* | 0.005** | -0.010 | -0.010 |
| | (3.054) | (3.203) | (2.691) | (2.301) | (1.768) | (2.043) | (0.317) | (0.288) |
| Observations | 160 | 160 | 160 | 160 | 192 | 192 | 192 | 192 |
| R-squared | 0.808 | 0.808 | 0.862 | 0.862 | 0.950 | 0.950 | 0.960 | 0.960 |
| Adj. R-squared | 0.805 | 0.805 | 0.860 | 0.860 | 0.950 | 0.950 | 0.960 | 0.960 |

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

| | How those with below average income rebalanced their risky shares before the financial crisis of 2008 | | | | How those with below average income rebalanced their risky shares after the financial crisis of 2008 | | | |
|---|---|---|---|---|---|---|---|---|
| | Normal regression | Robustness check | ln_regression | Robustness check | Normal regression | Robustness check | ln_regression | Robustness check |
| Name | AM | AN | AO | AP | AQ | AR | AS | AT |
| | (37) | (38) | (39) | (40) | (41) | (42) | (43) | (44) |
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight | weight | weight | ln_weight | ln_weight |
| weight | . | . | | | . | . | | |
| | (.) | (.) | | | (.) | (.) | | |
| weighttminus1 | 0.246 | 0.246* | | | 0.160* | 0.160* | | |
| | (1.012) | (1.809) | | | (1.920) | (1.845) | | |
| grossreturn | 0.008** | 0.008* | | | 0.002 | 0.002*** | | |
| | (2.496) | (1.718) | | | (0.788) | (3.071) | | |
| ln_weight | | | . | . | | | . | . |
| | | | (.) | (.) | | | (.) | (.) |
| ln_weighttminus1 | | | 0.055 | 0.055* | | | -0.015 | -0.015 |
| | | | (0.870) | (1.960) | | | (0.189) | (0.962) |
| ln_grossreturn | | | 4.404*** | 4.404** | | | -0.085 | -0.085 |
| | | | (3.338) | (2.396) | | | (0.090) | (0.621) |
| Constant | -0.007** | -0.007 | -6.509*** | -6.509*** | -0.002 | -0.002** | -6.983*** | -6.983*** |
| | (2.252) | (1.569) | (14.788) | (30.033) | (0.615) | (2.291) | (13.176) | (89.754) |
| Observations | 44 | 44 | 33 | 33 | 48 | 48 | 28 | 28 |
| R-squared | 0.154 | 0.154 | 0.271 | 0.271 | 0.089 | 0.089 | 0.002 | 0.002 |
| Adj. R-squared | 0.112 | 0.112 | 0.223 | 0.223 | 0.048 | 0.048 | -0.078 | -0.078 |

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

| | How those with above average income rebalanced their risky shares before the financial crisis of 2008 | | | | How those with above average income rebalanced their risky shares after the financial crisis of 2008 | | | |
|---|---|---|---|---|---|---|---|---|
| | Normal regression | Robustness check | ln_regression | Robustness check | Normal regression | Robustness check | ln_regression | Robustness check |
| Name | AU | AV | AW | AX | AY | AZ | BA | BB |
| | (45) | (46) | (47) | (48) | (49) | (50) | (51) | (52) |
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight | weight | weight | ln_weight | ln_weight |
| weight | . | . | | | . | . | | |
| | (.) | (.) | | | (.) | (.) | | |
| weighttminus1 | 0.880*** | 0.880*** | | | 0.888*** | 0.888*** | | |
| | (18.373) | (17.534) | | | (12.402) | (12.536) | | |
| grossreturn | 0.000*** | 0.000*** | | | 0.003 | 0.003 | | |
| | (178.741) | (1,088.943) | | | (0.480) | (0.938) | | |
| ln_weight | | | . | . | | | . | . |
| | | | (.) | (.) | | | (.) | (.) |
| ln_weighttminus1 | | | 0.851*** | 0.851*** | | | 0.943*** | 0.943*** |
| | | | (11.565) | (15.137) | | | (3.819) | (3.982) |
| ln_grossreturn | | | 0.843*** | 0.843*** | | | 6.246 | 6.246 |
| | | | (14.727) | (73.644) | | | (0.608) | (0.869) |
| Constant | -0.000** | -0.000** | -1.044** | -1.044*** | -0.003 | -0.003 | -0.527 | -0.527 |
| | (2.552) | (2.565) | (2.239) | (2.916) | (0.459) | (0.882) | (0.331) | (0.376) |
| Observations | 54 | 54 | 52 | 52 | 47 | 47 | 43 | 43 |
| R-squared | 0.998 | 0.998 | 0.862 | 0.862 | 0.778 | 0.778 | 0.268 | 0.268 |
| Adj. R-squared | 0.998 | 0.998 | 0.857 | 0.857 | 0.768 | 0.768 | 0.232 | 0.232 |

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

| | **How high income earners rebalanced their risky shares before the financial crisis of 2008** | | | | **How high income earners rebalanced their risky shares after the financial crisis of 2008** | | | |
|---|---|---|---|---|---|---|---|---|
| | Normal regression | Robustness check | ln_regression | Robustness check | Normal regression | Robustness check | ln_regression | Robustness check |
| Name | BC | BD | BE | BF | BG | BH | BI | BJ |
| | (53) | (54) | (55) | (56) | (57) | (58) | (59) | (60) |
| VARIABLES (dependent) | weight | weight | ln_weight | ln_weight | weight | weight | ln_weight | ln_weight |
| weight | . | . | | | . | . | | |
| | (.) | (.) | | | (.) | (.) | | |
| weighttminus1 | 0.543*** | 0.543*** | | | 0.889*** | 0.889*** | | |
| | (8.638) | (7.076) | | | (11.960) | (12.324) | | |
| grossreturn | 0.299*** | 0.299*** | | | -0.004** | -0.004 | | |
| | (6.819) | (5.081) | | | (2.055) | (1.033) | | |
| ln_weight | | | . | . | | | . | . |
| | | | (.) | (.) | | | (.) | (.) |
| ln_weighttminus1 | | | 0.641*** | 0.641*** | | | 0.930*** | 0.930*** |
| | | | (10.917) | (14.033) | | | (11.862) | (11.459) |
| ln_grossreturn | | | 55.170*** | 55.170*** | | | -0.744 | -0.744 |
| | | | (6.775) | (6.891) | | | (1.439) | (0.916) |
| Constant | -0.299*** | -0.299*** | -2.247*** | -2.247*** | 0.004** | 0.004 | -0.450 | -0.450 |
| | (6.789) | (5.066) | (6.778) | (8.830) | (2.096) | (1.076) | (1.071) | (1.068) |
| Observations | 33 | 33 | 33 | 33 | 36 | 36 | 36 | 36 |
| R-squared | 0.883 | 0.883 | 0.908 | 0.908 | 0.817 | 0.817 | 0.812 | 0.812 |
| Adj. R-squared | 0.875 | 0.875 | 0.902 | 0.902 | 0.805 | 0.805 | 0.801 | 0.801 |

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

| | GMM-regression of All Swedish households' rebalancing of risky shares from 2001 through 2014 | Robustness check of GMM-regression | Robustness check GMM-regression with clustering of years | Endogenity test | Testing for heteroskedasticity | Testing ln_regression for heteroskedasitcity | GMM-regression of the ln_regression (all Swedish households) |
|---|---|---|---|---|---|---|---|
| Name | BK | BL | BM | BN | BO | BP | BQ |
| | 61 | 62 | 63 | 64 | 65 | 66 | 67 |
| VARIABLES (dependent) | weight | weight | weight | weight | ln_weight | ln_weight | ln_weight |
| weight | . | . | . | . | | | |
| | (.) | (.) | (.) | (.) | | | |
| weighttminus1 | 0.920*** | 0.920*** | 0.441 | 0.959*** | | | |
| | (0.503) | (0.460) | (0.312) | (147.509) | | | |
| grossreturn | 0.009** | 0.009** | 0.074 | 0.001*** | | | |
| | (0.589) | (0.521) | (0.372) | (7.841) | | | |
| ln_weight | | | | | . | . | . |
| | | | | | (.) | (.) | (.) |
| ln_weighttminus1 | | | | | 0.944*** | 0.853*** | 0.853*** |
| | | | | | (127.387) | (30.073) | (30.073) |
| ln_grossreturn | | | | | 0.178*** | 1.167*** | 1.167*** |
| | | | | | (9.225) | (4.174) | (4.174) |
| Constant | (-0.104** | (-0.104** | -0.104 | 0.003*** | -0.235*** | -0.829*** | -0.829*** |
| | (0.536) | (0.476) | (0.358) | (2.848) | (8.457) | (4.804) | (4.804) |
| Observations | 1,728 | 1,728 | 1,728 | 1,728 | 1,687 | 1,687 | 1,687 |
| R-squared | 0.593 | 0.593 | | 0.928 | 0.914 | 0.779 | 0.779 |
| Adj. R-squared | e(r2_a) | e(r2_a) | e(r2_a) | 0.928 | 0.914 | 0.779 | 0.779 |

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1