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# The Effect of the Financial Crisis of 2008 on Swedish Household Portfolios

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## **Abstract**

The aim of this thesis is to examine whether Swedish households have changed the composition of their portfolio as a consequence of the financial crisis and to investigate whether they have become more reluctant to invest in the financial markets. To examine how the Swedish household portfolios have changed over time, risk measures such as standard deviation and beta will be used as well as performance measures such as the Sharpe ratio, Treynor ratio and Jensen's alpha. Furthermore, regressions will be made in order to determine whether the financial assets show a significant trend and whether wealth can predict asset allocation within the Swedish household portfolios. The results indicate that there is a significant change of the weights within the portfolio for all the assets, except for foreign shares. In addition, wealth fluctuations do appear to have predictive power over asset allocation, which strengthens the idea that households react as a response to market turbulence. At the same time, Swedish households did not de-risk their portfolios after the crisis and thus, it can be concluded that they have accepted the increment of the risk taken. In addition, the analysis of the performance of the portfolio indicates that there is not a significant change of the portfolio performance after the crisis of 2008.

*Keywords: asset allocation, financial assets, financial crisis, household portfolios*

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# **Introduction**

## **Purpose and contribution**

The aim of this thesis is to gain further insight on the capital allocation choices of Swedish households before and after the financial crisis, as well as during the past twelve years. The thesis contributes to the body of research on capital allocation choices by Swedish households by focusing on how the composition of financial assets within the household portfolios has changed over time as well as on the performance of the portfolios. The latest data available ranging from April 2005 to September 2016 are used for the analysis. For the current purposes, only financial liquid assets are included in the definition of the Swedish household portfolios. The assets are restricted to currency, bank deposits, bonds, Swedish listed shares, foreign shares, equity funds and bond and money market funds.

## **Background**

During the past decades, the financial markets have suffered from an increased liberalisation, product innovation and international integration. These developments have led to a greater participation of households in the financial markets through pension funds, mutual funds and an increasing stock participation. (Guiso et al., 2010). The financial market has rapidly grown during the past decade, and the use of Internet has increased its importance both for the economy and individuals (Economides, 2001). Additionally, the financial crisis in 2008 had a major impact on households in Sweden. As the international demand for goods and services weakened and the unemployment increased, Swedish households restricted their consumption and increased their savings. (Statistiska Centralbyrån, 2009). Half a decade later, in 2015, the Swedish Riksbank decided to set the repo rate below zero in order to reach the inflation target (Riksbank, 2015c). All of these events might have had an impact on how households allocate their wealth. If households tend to stay away from the equity market or other markets, due to the experience of the financial crisis, it might have an impact on future investments and, in the long run, on the whole Swedish economy.

By examining how the savings allocation in Swedish households is distributed, it is possible to design policy decisions in line with our findings. Moreover, shedding light on how the financial crisis in 2008 affected Swedish households is important for better tackling future crises. For these reasons, the topic of household investments has become relevant in the latest period of time (Ramb and Scharnagl, 2011).

## **Research question**

This thesis addresses the question of whether Swedish households have changed the composition of their portfolio between the years 2005 and 2016. More specifically, the purpose is to investigate whether Swedish households have become more reluctant to invest in certain financial assets due to the financial crisis and whether their portfolios have changed along with it, or rather, whether Swedish households have become less risk averse and accepted the risks that comes with the participation in the financial market. Beyond this, the financial crisis brought fluctuations to wealth as well as changes in performance of the portfolios and its effects will be investigated.

## *Hypotheses*

$H_1$ : The proportions within the portfolio have changed over time

$H_2$ : Wealth fluctuations predict the allocation of financial assets in the household portfolios

$H_3$ : Swedish households have de-risked their portfolios as a consequence of the financial crisis

$H_4$ : The performance of household portfolios has improved after the financial crisis

## **Limitation**

Given the data are presented aggregately, the present study cannot account for households' characteristics - such as gender, age, income, and education - that might have affected the composition of their individual portfolios.

## **Thesis outline**

After this introductory remarks, the thesis is structured as follows. The second section presents previous studies about the effects of financial crises on household portfolios and risk taking. Then, the third section discusses the data and methodology used in this thesis. The fourth section contains the results and their analysis. In the last section, the conclusion is presented.

## Literature Review

This section reviews previous research that analyses household portfolio selection, risk-taking attitudes and the effects of economic shocks. A series of studies have examined the composition of Swedish household portfolios and their results suggest that the proportion of risky investments within the portfolios has increased over time.

A study conducted by Ynesta (2008) found that the percentage of shares and other equity, except mutual fund shares, of total financial assets increased from 1995 until 2006 in Swedish households. There was also a substantial drop in holdings of currency and deposits between 1995 and 2000 as stock markets showed a strong performance in that period. Nevertheless, the share of currency and deposits increased in the following period of 2000-2005, after the burst of the dotcom bubble. Ynesta moreover states that the holdings of shares vary across the OECD and depend significantly on the performance and development of the stock market. Furthermore, Swedish households have also increased their holdings of mutual funds, of total financial assets, from 1995 to 2006.

Hoffmann's and colleagues' (2013) recent study analysed the perception of Dutch investors and their behaviour under the financial crisis in 2008-2009. They studied whether an experienced higher risk than the expected makes the investors reduce the risk of their portfolios. They concluded that this was not even the case under the peak of the crisis. The portfolios of the investors have significant higher standard deviations than the market volatility, even when the market volatility decreased during 2008. What is more, the account volatility - i.e. the sum of the investment portfolio and cash - reached its highest level, suggesting that the investors did not try to reduce portfolio risk by shifting from risky investments to cash during the financial crisis. Moreover, under the crisis, the perception and the level of risk tolerance increased causing investors to choose portfolios with higher risk. This behaviour may be explained by the changes of investors' perceptions regarding risk and inertia. The level of risk tolerance recovered after the financial crisis along with the risk perception.

In a yearly bulletin issued by the American Federal Reserve (2000), Engen and Lehnert state that investments in equity funds have not changed significantly after times of market turbulence. The movement of the investments from equity funds to other types of funds in times of dropping asset prices have lasted only temporary. Furthermore, the increasing volatility of

equity assets have not slowed down equity fund flows and their reactions have become progressively smaller over time.

At the same time, other studies have found that households change the composition of their portfolios as well as the level of risk taken as a consequence of financial crises. Their results indicate that there was a decrease on the level of risk that the portfolios offered. Ramb and Scharnagl (2011) found that households in Germany have decreased their holdings of stocks since the financial crisis and the dotcom bubble. The financial crisis in 2008 resulted in an increase in preference for more liquid assets and a decrease in preference for risky assets. As a consequence, the overall holdings of shares have decreased in German household portfolios while savings deposits have showed a rising trend. Simultaneously, mutual funds have increased in popularity as a result of the demand for risk diversification. Furthermore, the proportions of financial assets in German households have been very volatile during the past 50 years.

Hjort and Husein (2016) found similar results in their bachelor thesis, where they state that Swedish household portfolios have high ratios of capital invested in risky assets and not in bonds and in money market funds. The portfolio also shows that investors choose by far to invest in bank deposits and in securities with the lowest amount of risk. In addition, the investors take high rates of risk and are less risk averse when it comes to reallocate the investments from risk-free assets to risky ones.

Investigating whether wealth fluctuations affect household portfolio allocation, Brunnermeier and Nagel (2008) did not, however, find a positive effect of liquid wealth changes on risky asset allocation which can be explained by inertia. As the authors reason, this thus implies that households are slow rebalancing their portfolios. Even when allowing for slow adjustment, there were no indications of an impact of liquid wealth changes on risky asset shares. The effect of inertia was even big when testing for big capital gain or losses which can be interpreted as households face rebalancing costs and as a consequence they do not pay attention to their portfolio allocation. When there are changes on liquid wealth, they result on changes in the riskless assets within the portfolio.

Other studies, have found that the effect of economic shocks can last for a long period of time, even decades. Malmendier and Nagel (2011) examined whether the macroeconomic

experiences of individuals have an effect on the risk taking using data ranging from 1960 to 2007. They found that risk taking of American households is strongly related to the actual return. Households that experienced higher stock returns are more likely to take more financial risk and allocate a higher proportion of their investments in this kind of asset. According to their results, when an individual experience the effect of an economic crash, the effect can last for a long period of time. The study estimates that the effect of the financial crisis in 2008 will affect the behaviour of investors for decades, disappearing firstly after almost three decades. In addition, households tend to be more influenced by more recent returns than former ones. The evidence provided indicates that macroeconomic experiences have an impact on risk taking at the microeconomic level as well as in the aggregate level and thus, affecting asset prices. According to their results, the negative relationship between actual volatility and share allocation to stocks is not statistically significant.

In a similar study, Bucciol and Stuefer (2012) show that under the financial crisis approximately 80 percent of the population had doubled the magnitude of their risk tolerance indicator in 2009 due to the significant increase of the risk exposure that they experienced at that time. The authors argue that the shift may be explained by the worsening of the market performance at that time. Moreover, they did not found a consistent effect of the experienced volatility on households' risk taking decisions.

In addition, Bucciol and Miniaci (2011) showed that the changes in a portfolio can be small due to market imperfections such as minimum investment requirements and transaction costs. Moreover, Stulz (1981) state that there are still barriers to international investment which makes it costly for domestic investors to hold foreign assets. Ahearne et al. (2004) claim that one of these barriers is information asymmetry that results in investors tending to invest in stocks and companies that they are familiar with, while the shares they are not familiar with are perceived as very risky. The authors call this tendency "home bias", which means that investments are more often made in domestic assets than in foreign assets. Bergström et al. (1993) stated that domestic investors pay a premium for investing in foreign assets which makes foreign investments less attractive. This in turn results in less diversified and home biased portfolios with little diversification benefits.



Another research made by Calvet and colleagues (2007) shows that a large fraction Swedish households hold well diversified portfolios which is achieved through international diversification that is offered by mutual funds sold by domestic banks. The authors also find that cash and mutual funds seems to dominate shares in the portfolio. Furthermore, the largest share of financial assets in the household portfolios is mutual funds.

Finally, van Rooij, Lusardi and Alessie (2011) show that many households have limited financial literacy. For example, many of the respondents in the survey did not know the difference between stocks and bonds and the basic concept of diversification. Moreover, the study suggested that financial literacy affects the financial decision making. The study was based on data from 2,000 Dutch households and the survey was conducted over the Internet. Glaser's and Weber's (2007) study indicates as well that investors do not have a good understanding of the actual return of their portfolios, and thus tend not to update their behaviour to act accordingly to their past experience.

## Theoretical Framework

Since the interest here lies in investigating the finance of Swedish households, the thesis is based on models within financial economics. Therefore, this section will focus on the theory, models and risk measurements that are relevant for the current research aims.

### Capital Allocation

When optimizing capital allocation, it is desirable to work with the capital allocation line with the steepest slope. This was first suggested by Sharpe (1966), who stated that the optimal portfolio should be the one where the reward-to-variability ratio or the Sharpe ratio is the steepest. A steeper slope indicates a greater expected return in correspondence to volatility and is therefore the best portfolio.

### Capital Asset Pricing Model

This model was developed by Sharpe (1964), Lintner (1965) and Mossin (1966) and addresses the relationship between the risk of an asset and its expected return. According to the theory, all investors hold identical risky portfolios. The capital asset pricing model includes beta in the model which measures the contribution of the individual assets variance to the market portfolio. (Bodie et al., 2014 p. 292-299).

### Standard Deviation

The standard deviation is a measurement of total risk and variability. It measures how much the data deviates from the expected mean (Cortinas and Black, 2012). Thus, the higher the volatility the higher the uncertainty of outcomes. A limitation of this measure of risk is that it treats all deviations from the expected mean in the same way and cannot distinguish between good and bad outcomes (Bodie et al., 2014 p. 129).

$$\sigma = \sqrt{\text{var}} = \sqrt{\frac{\sum(x_{it}-\bar{x})^2}{N}} \quad (1)$$

$x_{it}$  = return at time  $t$

$\bar{x}$  = the average arithmetic return

$N$  = number of observations

### Beta

Beta measures the variance of an asset that cannot be diversified away, i.e. the systematic risk of an asset. A positive beta means that the asset moves in the same direction as the market,

whereas a negative beta indicates that the asset moves in the opposite direction of the market. A beta above 1 is considered to be aggressive due to sensitivity to market swings, whereas a beta below 1 is considered to be defensive due to less sensitivity to market swings. (Bodie et al., 2014 p. 297).

$$\beta_i = \frac{\text{cov}(r_i, r_M)}{\sigma_M^2} \quad (2)$$

$\sigma^2 = \text{variance}$

### Jensen's alpha

Jensen's alpha was first developed by Jensen (1968) and is a measure of how much the return of a portfolio deviates from the predicted return of the capital asset pricing model. A portfolio with a positive alpha earns an excess return compared to the market's and is thus undervalued. By contrast, a portfolio with a negative alpha indicates that it is overvalued and that it underperforms the market. (Bodie et al., 2014 p. 840). The limitation of Jensen's alpha is that it is most appropriate "when the portfolio is a subportfolio of many" (Bodie et al., 2014 p. 870).

$$\alpha_p = \bar{r}_p - [\bar{r}_f + \beta_p(\bar{r}_M - \bar{r}_f)] \quad (3)$$

$\bar{r}_p = \text{mean return on the portfolio}$

$r_f = \text{risk-free rate}$

$\beta_p = \text{beta of the portfolio}$

$r_M = \text{market return}$

### Sharpe Ratio

The Sharpe ratio is a measure developed by Sharpe (1966) that is commonly used for evaluating portfolio performance according to a mean-variance framework. The ratio measures the level of excess return over the risk free rate per additional unit of risk that the investor is exposed to (Hodges et al., 1997). Ceteris paribus, the higher the ratio the better the performance of the asset/portfolio (Grable and Chatterjee, 2014). The ratio is computed as follows:

$$SR = \frac{\bar{r}_p - \bar{r}_f}{\sigma_p} \quad (4)$$

$\bar{r}_p = \text{return of the asset}$

$r_f = \text{risk free rate}$

$\sigma_p = \text{standard deviation of the asset}$

In times of recession, when negative excess returns are presented, the Sharpe Ratio provides biased results which it makes necessary to use a modification of the ratio (Israelsen, 2005). The modified Sharpe Ratio is computed as follows:

$$SR'_i = \frac{ER_i}{\left(\frac{ER_i}{\sigma_i \text{abs}ER_i}\right)} \quad (5)$$

$SR'_i$  = modified Sharpe Ratio

$ER_i$  = excess return of the asset/ portfolio

$\text{abs}ER_i$  = absolute value of excess return

$\sigma_i$  = standard deviation of the asset/ portfolio

### Treynor Ratio

Treynor (1965) developed this ratio that measures the relationship between the excess return and the systematic risk of an asset or a portfolio. The limitation of this measurement is that the ratio is most suitable to use when the portfolio “represents one subportfolio of many” (Bodie et al., 2014 p. 870). The Treynor ratio is computed as follows:

$$T_p = \frac{\bar{r}_p - \bar{r}_f}{\beta_p} \quad (6)$$

$r_f$  = risk free rate

$\beta_p$  = systematic risk

When facing negative excess returns, the same adjustment that is needed for the Sharpe ratio is required for the Treynor ratio. The only difference between those two is the use of beta in the denominator of the Treynor ratio (Grable and Chatterjee, 2014). The adjusted Treynor ratio is computed as follows:

$$T'_p = \frac{ER_i}{\left(\frac{ER_i}{\beta_i \text{abs}ER_i}\right)} \quad (7)$$

$ER_i$  = Excess return of the asset/portfolio

$\beta_i$  = systematic risk

## **Data**

The structure of the dataset is time series with weekly frequency during the examination period starting in April 2005 until September 2016 with a total number of 595 observations. The data used for the composition of the financial portfolios is presented in quarterly form for the same time period. The collected data contain historical returns of the 1-month Swedish Treasury Bill, the OMXSGI, OMRXTBOND, OMRXMM and Morningstar EAA Fund Equity Sweden Indexes. The dataset is collected using the following databases: Bloomberg, Nasdaq Nordic and Morningstar Direct.

Information regarding the allocation of Swedish savings and wealth is obtained from the Swedish Financial Supervisory Authority statement “Savings Barometer”. The information provided is used to construct the proportions of each kind of asset within the portfolio for each year. Since the data is available in quarterly form, it is necessary to calculate the yearly mean of the weights for each year to construct the portfolio. The assets that compose household portfolios are restricted to currency, bank deposits, bonds, Swedish listed shares, foreign shares and equity funds as well as bond and money market funds.

### **Swedish listed shares**

The market return of Swedish listed shares is proxied by the OMXSGI, an index that reflects the trend of all the listed shares on the Stockholm Stock Exchange and their dividends that are reinvested in the market (Nasdaq Nordic, 2016).

### **Foreign Shares**

The return offered by the foreign shares is approximated by using an “All Country World Index” from Morgan Stanley Capital International (Calvet et al., 2007). The index reflects the performance of large and mid cap equity across 23 developed markets (MSCI World Index, 2016) and was retrieved from Bloomberg.

### **Bank Deposits and Currency**

Bank deposits are assumed to be risk-free as well currency holdings, given that the deposits are guaranteed by the Swedish state with an amount up to 950 000 SEK per person and institution (Riksgälden, 2016a). The proxy for the risk-free rate is the 1-month Swedish Treasury Bill (Calvet et al., 2007) and will be retrieved from Riksbank.se.

## **Bonds**

The index OMRXTBOND is included in Nasdaq family indexes that are created with the purpose of reflecting the development of a passively managed portfolio composed by liquid Swedish interest bearing securities. In particular, this index reflects the development of nominal treasury bonds and is used as a proxy for the value of the treasury bonds within the portfolio (Nasdaq Nordic, 2010).

## **Funds**

There is a sectioning between equity funds and money market funds. The money market funds will be approximated by the OMRX money market index, the OMRXMM. This index is related to nominal treasury bonds and treasury bills with a maturity of less than one year. (NASDAQ OMX Nordic, 2016). The equity funds will be proxied with a Swedish equity index retrieved from Morningstar Direct called EAA Fund Swedish Equity, and the data will be retrieved on a monthly basis.

## **Limitations of the data**

In the MSCI World Index, Sweden is included as one of the developed markets the index is invested in. As it is a proxy for foreign shares, Swedish listed shares should not be included and there will be double counting. The assumption that the investments made by the MSCI World Index in the Swedish market are small is made and is assumed not to affect the results. In addition, it seems unlikely that every household that invest in foreign shares are as diversified as the MSCI World Index and limits their investments to the 23 markets which are included. The same is valid for Swedish listed shares. It seems unlikely that Swedish household individual portfolios contains Swedish listed shares that are as diversified as the OMXSGL. However, it is plausible that Swedish household portfolios on aggregated level are as diversified as OMXSGL. The limitation of the EAA Fund Swedish Equity index is that the returns can only be obtained on a monthly basis.

## Methodology

A financial portfolio composed by liquid financial assets will need to be constructed for each year with start in April 2005 until September 2016. Liquid assets can be defined as the sum of stock holdings, bonds, mutual fund holdings (including equity funds and bond and money market funds) plus holdings of currency and bank deposits (Malmendier and Nagel, 2011). In addition, risky assets will be defined as the sum of bonds, Swedish listed shares, foreign shares, equity funds and bond and money market funds (Brunnermeier and Nagel, 2008).

The portfolio will exclude real estate, human capital, labour income and derivatives due to the measurement challenges that it would impose our calculations. Moreover, pension funds will need to be excluded from the calculations, given that they are usually invested in mutual funds (Calvet et al., 2007). We assume that these omissions will not affect the accuracy of our results. Other categories that are excluded from the portfolio are “other funds”, as it is problematic to approximate the returns of this investments as well as “unlisted shares”, since it is not possible to calculate the actual returns. Furthermore, national debts savings were removed due to phasing out of this kind of savings since 2015 (Riksgälden, 2016b).

The composition of the yearly financial portfolio for Swedish households is done by first examining the allocation of different assets within household portfolios and by calculating the proportion of each category. The share of different assets will therefore be presented as a percentage, and will together add up to 100 percent. In addition, short-selling is not allowed, all share values being positive. Afterwards, the average historical return provided by the different capital assets within the financial portfolios as well as their variance and standard deviation are calculated. The return of different assets will contribute to the yearly portfolio return depending on the proportion of the certain asset. The covariance between the assets will be taken into consideration. The risk measurements which will be used are standard deviation and beta.

In order to examine how the portfolio weights have changed between 2005 and 2016, the development of the financial assets within the portfolio will be presented. Correlation rates are also calculated with the purpose of examining the relationship between the capital assets within the portfolios as well as the volatility of the weights, in order to analyse which kind of asset is subject to more changes throughout this time period.

### **Econometric model specification**

A regression is conducted with the aim of examining whether there is a positive or negative trend of the time series regarding the proportions of the different capital assets within the portfolios. The regression conducted reads as:

$$(2.1) \quad \text{Financial Asset} = \beta_{0_t} + \beta_{1_t} \text{Year} + \varepsilon_t$$

In addition, the effect of wealth fluctuations on the weights of the financial assets are examined statistically through regressions following the methodology used in Brunnermeier and Nagel (2008). The variable “*LTotal Portfolio*” is the logarithm of the level of wealth, which will capture the percentage change of wealth through the examination period. The dependent variable will be the “*LFinancial Asset*” which is the logarithm of the yearly percentage change of the weights of the portfolio. The regression model is the following:

$$(2.2) \quad \text{LFinancial Asset} = \beta_{0_t} + \beta_{1_t} \text{LTotal Portfolio} + \beta_{2_t} \text{Year} + \varepsilon_t$$

Moreover, to observe whether the financial crisis significantly affected the risk and average return offered by household portfolios as well as the performance measures, different dummy variables need to be included. The assumption that the financial crisis lasted between 2008 and 2009 is made (Elmér et al., 2012). The dummy variables included in the models are the following: (1) “*Before Crisis*”, which takes the value of 1 between the years 2005-2007, (2) the dummy variable “*Crisis 2008*”, which takes the value of 1 in 2008, (3) the dummy variable “*Crisis 2009*” which takes the value of 1 in 2009 and (4) the dummy variable “*After Crisis*”, which takes the value of 1 covering the period of 2010 until 2016. In addition, two interaction terms will be included in order to capture whether there has been a trend within the specific time periods and not just a permanent jump of the level. The first interaction term will be equal to the multiplication of the dummy variable “*Before Crisis*” and the variable “*Year*” and the second one will be equal to the multiplication of the dummy variable “*After Crisis*” and the variable “*Year*”. The effect of the financial crisis will be controlled by including the dummy variables “*Crisis 2008*” and “*Crisis 2009*”.

To determine whether the average return of the portfolio shows a time trend before the financial crisis, the following econometric model will be used:



$$(2.3) \text{ Average Return} = \beta_{0t} + \beta_{1t} \text{ Year} + \beta_{2t} \text{ After Crisis} + \beta_{3t} (\text{Year} * \text{After Crisis}) + \beta_{4t} \text{ Crisis 2008} + \beta_{5t} \text{ Crisis 2009} + \varepsilon_t$$

The coefficient  $\beta_{1t}$  is the coefficient that accounts for the trend before the crisis. The same model will be modified and used for the examination of the trend after the crisis. The modified model that will be conducted is the following:

$$(2.4) \text{ Average Return} = \beta_{0t} + \beta_{1t} \text{ Year} + \beta_{2t} \text{ Before Crisis} + \beta_{3t} (\text{Year} * \text{Before Crisis}) + \beta_{4t} \text{ Crisis 2008} + \beta_{5t} \text{ Crisis 2009} + \varepsilon_t$$

As well as with the previous model, the coefficient  $\beta_{1t}$  is the coefficient that determine whether there is a time trend after the crisis.

In addition, the same model will be applied in order to identify the effect of the financial crisis on the risk taken by households and to determine whether they actually de-risk their financial portfolios as a response to the market turbulence. The dependent variable  $y_t$  will be the beta values of the portfolios as well the value of the standard deviation. The model 2.5 will be used to examine the trend before the crisis, taking into account the coefficient  $\beta_{1t}$  and the model 2.6 for the examination of the period after the crisis. The regressions that will be conducted are the following:

$$(2.5) \ y_t = \beta_{0t} + \beta_{1t} \text{ Year} + \beta_{2t} \text{ After Crisis} + \beta_{3t} (\text{Year} * \text{After Crisis}) + \beta_{4t} \text{ Crisis 2008} + \beta_{5t} \text{ Crisis 2009} + \varepsilon_t$$

$$(2.6) \ y_t = \beta_{0t} + \beta_{1t} \text{ Year} + \beta_{2t} \text{ Before Crisis} + \beta_{3t} (\text{Year} * \text{Before Crisis}) + \beta_{4t} \text{ Crisis 2008} + \beta_{5t} \text{ Crisis 2009} + \varepsilon_t$$

Lastly, several risk-adjusted performance measures such as the Sharpe ratio, Treynor ratio and Jensen's alpha will enable the comparison of the yearly portfolios over time. When the average yearly excess return is negative, the modified Sharpe ratio and Treynor ratio will be calculated. To obtain these ratios, the value of beta will also be calculated and to calculate Jensen's alpha,

the usage of the capital asset pricing model is required. In addition, several regressions will be run in order to determine whether there has been a change of the performance measures and whether there is a significant effect of the crisis on them. The models 2.5 and 2.6 will be conducted again where  $y_t$  represents the Sharpe ratio, Treynor ratio and Jensen's alpha.

When the predictor variables have unequal spread of variances, heteroscedasticity is said to have occurred (Porter and Gujarati, 2009 p. 65). To correct for heteroscedasticity, robust standard errors are used in all of the regressions conducted (Porter and Gujarati, 2009 p. 391).

## **Results and Analysis**

In this section, we firstly present how the composition of the Swedish household portfolios has changed over time. Then, we present the results of whether wealth fluctuations predict the allocation of financial assets in the household portfolios and whether there have been any changes in the risk taken by Swedish households. Finally, the last section presents the results of the performance examination.

### **Composition of the portfolios**

This section presents the results on the weights of each financial asset that compose the financial portfolio as well the results of the regressions.

As presented in table 1 below, the proportion of Swedish listed shares within the financial portfolio exhibits a reduction from 29.5 percent towards 21.9 percent in 2005 and 2008 respectively. Nevertheless, the share of this asset started to recover again in 2010, and nowadays the proportion of Swedish listed shares in the household portfolios is equal to 24.4 percent. Taking the whole period into account, the evolution of the investment in Swedish listed shares shows a decreasing phase from 2005 to 2016. This finding does not appear consistent with the findings of Ynesta (2008), who found that the proportion of shares and other equity increased in Sweden through the period 1995-2005, even after the burst of the dotcom bubble in 2000. In contrast, our finding is in line with Ramb's and Scharnagl's (2011) study, which showed that German households decreased their overall holdings of stocks after times of financial instability. In addition, the decrease in shares since the financial crisis without a total recovering may be consistent with Malmendier and Nagel (2011), who indicated that when an individual investor experiences the effect of an economic crash, its effect can prevail for a very long time.

Regarding the weight of foreign shares, it has been rather stable under the last twelve years, although it has decreased from 4.1 percent to 3.1 percent in 2005 and 2016 respectively. The development of foreign shares shows the same pattern as Swedish listed shares, where the investments decreased during the financial crisis, and recovered afterwards without reaching the same level as before the crisis. The stable development of investments in foreign shares is consistent with the findings of Bergström (1993). The author claim that the foreign market is less attractive to domestic investors due to the premium they have to pay on foreign assets resulting in "home biased" portfolios. Ahearne et al. (2004) come to similar conclusions stating that domestic investors are "home biased" due to information asymmetry which makes foreign

assets perceived as riskier due to unfamiliarity. This results in less investments being made in the foreign market and thus, less diversified portfolios. Finally, as Bucciol and Miniaci (2011) state, the absence of a trend in foreign shares might be explained by transaction cost and other market imperfections resulting in small changes in portfolios, even during a financial crisis.

**Table 1**

Portfolio weights

Year	Financial Assets						
	Currency	Bank Deposits	Swedish Shares*	Foreign Shares	Equity Funds	B. & M.M. Funds**	Bonds
2005	0.048	0.372	0.295	0.041	0.187	0.011	0.046
2006	0.043	0.374	0.304	0.037	0.186	0.010	0.045
2007	0.039	0.391	0.295	0.034	0.175	0.008	0.058
2008	0.044	0.496	0.219	0.029	0.131	0.011	0.071
2009	0.043	0.512	0.219	0.027	0.121	0.011	0.067
2010	0.038	0.485	0.355	0.027	0.131	0.009	0.055
2011	0.036	0.543	0.218	0.027	0.123	0.009	0.044
2012	0.034	0.576	0.198	0.028	0.115	0.009	0.040
2013	0.030	0.566	0.213	0.030	0.117	0.008	0.036
2014	0.025	0.537	0.224	0.032	0.119	0.030	0.033
2015	0.022	0.529	0.240	0.034	0.116	0.031	0.029
2016	0.018	0.550	0.244	0.031	0.105	0.026	0.027

\* Swedish Listed Shares

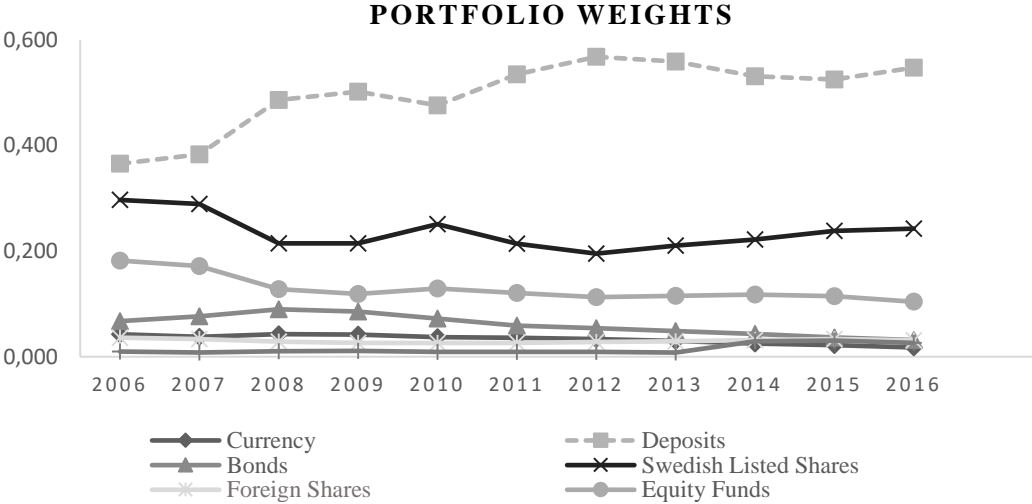
\*\* Bond and Money Market Funds

Notes: Presented are the portfolio weights of each asset within the financial portfolio during the examination period April 2005-September 2016.

At the same time, the share of bank deposits has experienced a clear increase between the years 2007 and 2016, increasing from 39.1 percent to 55.0 percent respectively. Moreover, the amount of currency held by households remained quite stable after the crisis being around 3-5 percent, but reaching its lowest peak of 1.75 percent in 2016, which can be explained by the less frequent use of cash in the Swedish society under the last years (Segendorf and Wilbe, 2014). These findings are thus in line with Ynesta's (2008) and Ramb's and Scharnagl's (2011), where households increased the share of bank deposits after times of financial instability, choosing less risky financial assets.

In 2005, the share of bonds within the financial portfolio was equal to 4.6 percent. Until the financial crisis, the value of the share increased vastly reaching its peak of 7.1 percent in 2008. However, since the following year, the share of bonds in the household portfolios has steadily decreased and is in 2016 approximately 3 percent of the total portfolio, without fully recovering the level reached before the financial crisis.

**Diagram 1**



Notes: Presented are the development of each financial asset that compose the portfolios between April 2005 - September 2016.

Furthermore, the weight of equity funds in the financial portfolio has experienced some fluctuations over time. It shows a notable decrease under the financial crisis, with a reduction from 18.7 percent in 2005 to 12.1 percent in 2009. The investment levels started to improve right after the crisis, but during the last two years, it showed a decreasing tendency again and is currently on a level of 10.5 percent. These findings are partially in line with the report issued by the American Federal Reserve, where Engen and Lehnert (2000) suggested that, in times of financial instability, the amount invested in equity funds decreases only temporarily to start to recover again. However, almost after a decade, the increased was not enough for reaching the same levels as prior to the crisis, thus contradicting their statement that investments in equity funds have not slowed down.

Finally, the share of bond and money market funds has experienced minor fluctuations during the examination period with an increase from 1.1 percent in 2005 to 2.6 percent in 2016. The proportion invested in this assets reached its lowest peak in 2013 but experienced a slow increase in the years that followed.

**Table 2**

Weight trends

	Regression Output	
	Coefficient	Sign of the trend
Currency	-0.0025**	Negative
Bank Deposits	0.0173**	Positive
Bonds	-0.0028*	Negative
Swedish Listed Shares	-0.0061*	Negative
Foreign Shares	-0.0004	-
Equity Funds	-0.0070**	Negative
Bond and Money Market Funds	0.0016*	Positive

\*Statistically significant at 5% level

\*\*Statistically significant at 1% level

Notes: Presented are the regression outputs of the regressions run, where the dependent variable were the financial assets on time. All regressions are made with robust standard errors.

When examining the development of the weights in relation to time, we use inferential statistics to test whether there has been a time trend of the weights within the financial portfolios. The various regressions run indicate that all of the financial assets show a time trend except for foreign shares. As previously mentioned this result is in line with previous research that states that foreign shares are less attractive for domestic investors due to market imperfections such as transaction costs and a tendency to perceive foreign investments as riskier. The assets that show a positive time trend are bank deposits as well as bond and money market funds. These results are consistent with Ramb and Scharnagl (2011), and one may interpret them as suggesting that Swedish households have a preference for less risky assets during the past twelve years. On the other hand, the financial assets that show a negative time trend are currency, Swedish listed shares, equity funds and bonds. The last two named, usually contribute with an increment of the level of risk of a portfolio, not been the case for currency. The desire of reducing the weight of risky assets can be a consequence of an increase in risk aversion by investors, whereas the negative trend in currency holdings can partly be explained by the overall decrease in usage of cash in society (Segendorf and Wilbe, 2014). These results are, however, not completely in line with the findings of Ynesta (2008), since the decrease of the share of Swedish listed shares within the portfolios is statistically significant in contrast to her findings of increasing weight values of shares. At the same time, our findings align with her findings of decreasing share of currency within the portfolio.

The table of correlations between different financial assets of the portfolio (see Appendix table 8) shows that the highest degree of correlation is the one between bond and currency, with a

positive correlation of 0.89. The lowest correlation is the one between equity funds and bank deposit with a correlation of -0.97. The lowest covariance between the proportions of the portfolio (see table 9 in Appendix) was between Swedish listed shares and bank deposits.

When examining how the proportions of financial assets in the household portfolios have changed over time, bank deposits turned out to have the highest standard deviation which is equal to 7.4 percent (see table 10 in Appendix). The financial asset that shows the lowest standard deviation is foreign shares with a value of 0.44 percent. Bank deposits is therefore the asset in the household portfolios that has fluctuated the most over the period between 2005 and 2016. Foreign shares, on the other hand, is the asset which has fluctuated the least during the same period. The fluctuation of bank deposits might be explained by the financial crisis in 2008 which resulted in an increase of investments in this kind of asset because it was experienced to be safer than other forms of savings. The amount saved in bank deposits had decreased during many years before the crisis and the rapid increase in 2008 can explain the high value of its variance. The low volatility in the holdings of foreign shares might be explained by high transaction costs which results in unchanged holdings, even during a financial crisis (Buccioli and Miniaci, 2011).

These findings indicate that the first hypothesis - i.e. the proportions within the portfolio have changed over time - is true for currency, bank deposits, bonds, Swedish listed shares, equity funds and bond and money market funds. However, the hypothesis is rejected for foreign shares.

### **Wealth and weights**

The results of the regressions that examine the effect of liquid wealth changes on asset allocation within the household portfolios show that the fluctuations of total wealth have predictive power regarding the allocation of investments in certain capital assets.

As reported in table 3 below, the results indicate that fluctuations of wealth have predictive power regarding the allocation of investments in currency, bank deposits, Swedish listed shares, foreign shares and equity funds. Meanwhile, wealth fluctuations have no predictive power on the allocation of bonds and bond and money market funds in the household portfolios. In addition, wealth has predictive power over risky assets shares. These results are not totally consistent with the findings of Brunnermeier and Nagel (2008), where no positive effect of liquid wealth on risky asset shares was found. Yet, the percentage change of wealth has no

predictive power regarding the allocation of bonds and bond and money market funds, which can be classified as risky assets, according to Brunnermeier and Nagel (2008). A possible explanation for this outcome may be inertia, implying that households are slow regarding the rebalancing of the portfolios as a result of changes in wealth. On the other hand, the allocation of other capital assets is sensitive to changes in wealth, meaning that households might not be as slow rebalancing their portfolios as the study of Brunnermeier and Nagel (2008) suggested. A possible explanation for the discordance of the results may be that the study conducted by Brunnermeier and Nagel (2008) was made before the financial crisis of 2008. The magnitude of the last crisis might have had a bigger impact on investors when the world economy suffered the crisis and not just one sector or region according to Malmendier and Nagel (2011).

**Table 3**

Wealth and asset allocation output

<i>Financial Asset</i>	<i>Coefficient</i>	<i>R-squared</i>
Currency	-1.58351**	0.9708
Bank Deposits	-1.23928**	0.9430
Swedish Listed Shares	1.61543**	0.8656
Foreign Shares	1.18823**	0.4515
Equity Funds	1.17392**	0.9188
B. and M. Market Funds	2.87997	0.5540
Bonds	-1.21288	0.6463
Risky Share	1.28051**	0.9403

\*Significant at 5% level

\*\* Significant at 1% level

*Notes: Presented are the STATA outputs of the regressions made of the logarithm of the weights on the logarithm of the portfolio levels. The data ranges from 2005 to 2016. All regressions are made with robust standard errors. Risky shares are defined as the sum of bonds, Swedish listed shares, foreign shares, equity funds and bond and money market funds.*

Conclusively, the second hypothesis - i.e. wealth fluctuations predict the allocation of financial assets in the household portfolios - is rejected for bonds and bond and money market funds, and is true for the rest of the aforementioned capital assets.

### **De-risk of portfolio**

When examining statistically whether the portfolios' risk have changed over time, our results suggest that there is a significant change in the household portfolios beta under the crisis. However, the change is not significant for the period before and after the crisis. During the years of the financial crisis, there has been a reduction of the risk of the household portfolios, as displayed in table 4, with a decreasing beta of 0.302 in 2005 to 0.241 in 2016. The highest beta value observed is equal to 0.313 in 2006. The greatest change occurred between the years 2007 and 2008 when beta decreased from 0.303 to 0.222 and has not fully recovered since then. This might be explained by the increase of bank deposits in the household portfolios which are



of almost no risk, in combination with a decrease in proportion of the holdings of Swedish listed shares.

**Table 4**  
Portfolio Characteristics

Year	Average Return	Risk Measures	
		Standard Deviation	Beta
2005	0.19287	0.03468	0.30204
2006	0.13889	0.04901	0.31390
2007	0.00981	0.05736	0.30331
2008	-0.11443	0.08336	0.22286
2009	0.17731	0.05779	0.21799
2010	0.10610	0.04589	0.24926
2011	-0.02926	0.06102	0.22531
2012	0.06604	0.03049	0.19644
2013	0.09446	0.02815	0.22096
2014	0.06155	0.03131	0.23271
2015	0.03370	0.04278	0.24979
2016	0.03324	0.03868	0.24117

*Notes: Presented are the portfolio characteristics covering the examination period of April 2005 to September 2016. The average returns are average weekly returns.*

As displayed in table 5, the coefficient of the variable “Year” ( $\beta_{1t}$ ) indicate that there has been a reduction of beta during the financial crisis, being the coefficient negative. There is not an indication of a trend neither before nor after the crisis, based on the fact that the coefficients are not significant. The decrease of the beta values during the financial crisis might be interpreted as if households have lowered their expectations of the financial markets or they become more pessimistic, trying to lower the covariance with market returns. These findings are consistent with Malmendier’s and Nagel’s study (2011), which showed that the financial crisis of 2008 affected the level of risk taken by investors, which effect can last for a long period of time, even decades. Swedish households might also become more sensitive to risk and as a result to this, decreased their portfolio beta. The econometric model conducted shows a value of R-squared that equals 87.35 percent implying that the model explains much of the variation of the beta value during this time period.

As displayed in table 4 above, at the beginning of the examination period, there is an increment of the amount of risk taken, increasing from 0.03468 to 0.05736 in 2005 and 2007 respectively. The highest value of the standard deviation is observed in 2008, when the amount of risk increases to 0.08336. The increment of risk can be a consequence of the rising standard deviation of the different capital assets in times of financial turbulence. Already in 2009, the amount of risk starts to decrease until 2011, when the amount of risk increases reaching similar levels as in 2007. A year later, the amount of risk starts to decrease again until 2015, when there

is a slight increase in the level. As the results of Bucciol and Stuefer (2012) indicate, there was an increase of the risk tolerance of the investors during the financial crisis which may be a plausible explanation for the fact that investors accepted higher amounts of risk.

The results from the regressions made of the standard deviation including the dummy variables, show a significant increase of the standard deviation before the financial crisis in 2008. Furthermore, during the years of the crisis, the standard deviation further increased in 2008 only to decrease slightly in 2009. These results are partially in line with the results of Hoffman and colleagues (2013), which showed that Dutch investors did not de-risk their portfolios even under the financial crisis, which is also seen for Swedish investors under 2008. The period after the crisis shows a decrease of the standard deviation but the coefficient is not significant.

**Table 5**  
Regression output before the crisis

	<i>Risk measures</i>			<i>Performance Measures</i>		
	<i>Average return</i>	<i>Standard Deviation</i>	<i>Beta</i>	<i>Sharpe Ratio</i>	<i>Treynor Ratio</i>	<i>Jensen's Alpha</i>
Year	-0.00160***	0.00157***	-0.00071	-0.32180***	-0.00519***	0.00071***
Year*Aftercrisis	0.00155***	-0.00186***	0.00308	0.31455***	0.00493***	-0.00070***
Aftercrisis	-3.10507***	3.72477***	-6.26829	-0.69268**	-0.00939	0.00167
Crisis2008	-0.00115*	0.00189***	-0.08469***	0.32723***	0.00413**	0.00052**
Crisis2009	0.00593***	-0.00322***	-0.08902***	1.03046***	0.02403***	-0.00269***
R <sup>2</sup>	0.8423	0.7620	0.8735	0.7591	0.8093	0.8805

\* Statistically significant at 10% level  
 \*\* Statistically significant at 5% level  
 \*\*\* Statistically significant at 1% level

Notes: All regressions are made with robust standard errors.

**Table 6**  
Regression output after the crisis

	<i>Risk Measures</i>			<i>Performance Measures</i>		
	<i>Average return</i>	<i>Standard Deviation</i>	<i>Beta</i>	<i>Sharpe Ratio</i>	<i>Treynor Ratio</i>	<i>Jensen's Alpha</i>
Year	-0.00006	-0.00028	0.00237	-0.00724	-0.00026	0.000005
Year*Beforecrisis	-0.00155***	0.00186***	-0.00308	-0.31455***	-0.00493***	0.00071***
Beforecrisis	3.10507***	-3.72477***	6.26829	0.69268**	0.00939	-0.00167
Crisis2008	-0.00359**	0.00463*	0.00352	-0.23830	-0.00621	0.00167**
Crisis2009	0.00195	0.00136	-0.00389	0.15037	0.00876*	-0.00084
R <sup>2</sup>	0.8423	0.7620	0.8735	0.7591	0.8093	0.8805

\* Statistically significant at 10% level  
 \*\* Statistically significant at 5% level  
 \*\*\* Statistically significant at 1% level

Notes: All regressions are made with robust standard errors.

Thus, the third null hypothesis - i.e. households have de-risked their portfolios- is partially true depending on which measure of risk is taken into account. Looking at the beta values, there is a significant de-risk of the Swedish household financial portfolios only during the financial crisis. The coefficients indicate that there has been a reduction of the covariance with the market, certainly due to more pessimistic beliefs about the future market performance during those years. In contrast, if the standard deviation is the risk measure that takes into account, there is a significant de-risk of their portfolios during the crisis, in 2009, as an indication of more precautionous investors. As seen in the table above, there is not a significant trend after the crisis regardless of which risk measure is taken into account. However, as previously discussed in the theory section, the standard deviation is not the most appropriate measure of portfolio risk and thus, the reader should be careful drawing conclusions from the standard deviation analysis made in this study.

### **Performance of the portfolio**

In terms of the average return of the portfolio, there is a significant negative trend before the financial crisis which might indicate that the average return of the Swedish household portfolios has decreased under this time period as well as under 2008. As displayed in table 5 above, the average return of the portfolio tended to decrease before the crisis until 2008, when the estimated average return is approximately 0.1 percent. In 2008, the average return becomes negative due to the financial instability of both the Swedish and the world economy, but the results show a fast recovery in 2009. During the years that follow, there is an improvement until 2011, when the average return is negative again due to the European insecurity about how to deal with the European debt crisis and especially the Greek crisis (European Central Bank, 2011). Under the two following years, the average return shows a positive increment that stops in 2014, when the average return starts to decrease again. The reason might be the increasing investments in bank deposits, which at the time, offered negative returns, deteriorating the return of household portfolios. However, the results of the regression indicate that there is not a significant time trend regarding the historical average return of the portfolio after the financial crisis. These findings are consistent with Glaser's and Weber's study (2007), which results showed that investors have not a good knowledge about the actual return of their portfolios. Therefore, investors tend not to change their behaviour in relation to their past experience.

If examine the value of the Sharpe ratio that is displayed in table 7, the ratio reached its highest value at the beginning of the examination period in 2005, under an economic upturn, with a value equal to 0.64. However, the value of the ratio shows a declining tendency until 2008, showing negative values two consecutive years. Already in 2009, the performance of the portfolio started to improve under a short period of time, worsening again in 2011, with a value equal to -0.000008. The downturn in 2011 can be explained by the insecurity about how the European Union was going to manage the European debt crisis (European Central Bank, 2011). During the following two years, the value of the ratio increases until 2013, its highest peak since the crisis, which might be explained by the high return and decline in volatility which both the European and American market experienced (European Central Bank, 2014). Already in 2014, the value of the Sharpe ratio decreases reaching its lowest peak after the crisis in 2015. The results of the regression conducted shows a significant negative trend in the Sharpe ratio before the crisis until 2007 as well as under the years of the crisis, when the Sharpe ratio shows a significant positive trend. However, the regression does not show a significant trend after the crisis indicating that the ratio has not improved even under an economic upturn. A plausible explanation is that the average return of the portfolios has worsened certainly due to an increment of the share invested in bank deposits when the risk-free rates became negative. In addition, the decrease of the average return occurs simultaneously as the decrease of the standard deviation causing an off-setting effect on the performance measure.

When we examine the values of the Treynor ratio, the same development is observed. The value started with its highest value under the whole period, which was equal to 0.01025. In 2007, the value turned negative as well as the value of the Sharpe ratio did and stays also negative in 2008. The following recovery only lasted one year, and the ratio started to deteriorate until 2011, with a negative value of -0.00020. Under the following two years, the ratio shows a positive increment reaching its highest peak after the crisis. But started immediately to worsen again as the value of the Sharpe ratio did. Presumably, the reason is the same: a shift of investments into bank deposits, which offered negative interest rates. Lastly, when examining the Treynor ratio, there is a significant negative trend in the performance of the portfolios before the crisis, and as with the Sharpe ratio, the regression also indicates that the Treynor ratio showed a positive trend during the years of the crisis. In addition, there is no significant time trend during the years that followed the crisis certainly due to the offsetting effect of decreasing average return as well as decreasing beta.

As displayed in the table below, the estimated alphas of the portfolio are negative under the whole examination period, except for the following years: 2007, 2008 and in 2011. This suggests that the portfolio have underperformed the market during almost the whole examination period. In contrast, the estimated alphas are positive under the years where the average return of the portfolio showed negative values, indicating that the portfolio earns an excess return when it is compared to the market. A plausible explanation for this may be the shift of investments from risky assets to safer kinds of financial assets as bank deposits. When examining the development of Jensen's alpha, table 5 and 6 indicate that there has been a positive trend before the crisis that continues under 2008. Nevertheless, the trend becomes negative in 2009 when the average return is positive again. As with the other two performance measures previously analysed, the regression conducted does not show a time trend after the financial crisis.

**Table 7**

Performance of the portfolio

Year	Performance measures		
	Sharpe Ratio	Treynor Ratio	Jensen's Alpha
2005	0.64358	0.01024	-0.00122
2006	0.30540	0.00661	-0.00075
2007	-0.000004*	-0.00014**	0.00020
2008	-0.000035*	-0.00068**	0.00135
2009	0.381397	0.01402	-0.00115
2010	0.289950	0.00740	-0.00066
2011	-0.000008*	-0.00020**	0.00033
2012	0.227126	0.00489	-0.00039
2013	0.397364	0.00702	-0.00051
2014	0.244353	0.00455	-0.00038
2015	0.116906	0.00278	-0.00018
2016	0.138657	0.00308	-0.00027

\* Adjusted Sharpe ratio

\*\* Adjusted Treynor ratio

Notes: Presented are the performance measures of the household portfolios on a yearly basis, during the examination period April 2005 - September 2016.

All of the regressions conducted on the performance measures showed high values of R-squared (see tables 5 and 6), ranging between 75.91 and 88.05 percent, implying that the econometric models explain much of the variability of the values of the performance measures. However, the model cannot account for all of the variation.

These findings, indicate that the fourth hypothesis - i.e. the performance of the portfolio has improved after the crisis- is rejected, as there is not a significant improvement or worsening of the portfolio performance after the financial crisis. Yet, the regressions conducted show a negative time trend before the crisis regarding Sharpe ratio and Treynor ratio and a significant improvement under the crisis. The lack of improvement in the performance after the crisis can be a consequence of the negative repo rate that may deteriorate the average return of the portfolios under 2015 and 2016 as displayed in table 4, but the regressions conducted cannot determine changes for these years as they are not included as dummy variables and are therefore included in the time period called "*After Crisis*". As mentioned before, the decrease of the average return, in combination with the decrease of beta and the standard deviation results in an offsetting effect that prevent the performance from improving under the period that followed the financial crisis.

## **Conclusion**

The main purpose of this thesis was to investigate portfolio allocation choices of Swedish households and to examine the performance of the portfolios, as well the evolution of the weights of each financial asset that compose the portfolio. The data consists of time series with weekly frequency from April 2005 until September 2016.

The findings of this thesis indicate that there has indeed been a significant change of the proportions of the financial assets within the portfolios, except for foreign shares. Bank deposits had experienced an increase, whereas Swedish listed shares experienced a decrease which can be interpreted as if households have become reluctant to hold risk. The holdings of bonds, currency and equity funds decreased while bond and money market funds experienced a small increase. Nevertheless, this conclusion cannot be applied to investments made in other kinds of financial assets that were not included in the present study.

The examination of the effect of wealth on asset allocation, suggests that changes in wealth do have a significant impact on the percentage change of weights of financial assets, except for bonds and bonds and money market funds. These results are not consistent with Brunnermeier's and Nagel's study (2008), which did not find a positive effect of wealth on the share of risky assets. This finding may be related to the magnitude of the last financial crisis, which may have had a bigger impact on investors lasting for a long period of time according to Malmendier and Nagel (2011).

The examination of whether households de-risked their portfolios showed consistent results. Looking at the beta value, Swedish households de-risked the portfolio during the financial crisis which may be a consequence of pessimistic beliefs about the future market performance. If standard deviation is taken into account, there is also a significant de-risk of the portfolio during the crisis but only in 2009. However, there is not a significant trend after the financial crisis regardless of which risk measure that is taken into account. The reason might be related to changes of the perception of risk, which makes investors accept higher amounts of risk and inertia. When examining the performance of the portfolios, there is no indications that the performance has changed after the financial crisis which suggests that there is neither a significant improvement nor deterioration of the way households allocate their investments since the financial crisis of 2008.

Since this study is based on aggregated data, a suggestion for further research is to conduct studies based on data assembled about individual portfolio allocation, in order to determine which households' characteristics may have an incidence on household portfolio allocation in time of crisis. This may be helpful for authorities for developing policies in line with these findings, and encourage a greater participation of households in the financial markets.



## References

- Ahearne, A. G., Grier, W. L. & Warnock, F. E. (2004). Information costs and home bias: an analysis of US holdings of foreign equities. *Journal of International Economics*, 62 (2), pp. 313-336.
- Andelid Hjort, I. & Husein, S. (2016). All Or Nothing - A study of Optimal Investment Behavior with Regards to Risk and Return. Bachelor Thesis. Department of Economics. Gothenburg: School of Business, Economics and Law at the University of Gothenburg.  
[https://gupea.ub.gu.se/bitstream/2077/44951/1/gupea\\_2077\\_44951\\_1.pdf](https://gupea.ub.gu.se/bitstream/2077/44951/1/gupea_2077_44951_1.pdf)
- Bergström, C., Rydqvist, K. & Sellin, P. (1993). Asset pricing with in- and outflow constraints: theory and empirical evidence from Sweden. *Journal of Business Finance & Accounting*, 20 (6), pp. 865-879.
- Bodie, Z., Kane, A. & Marcus A. J. (2014). Investments. Tenth Global Edition. Berkshire: McGraw-Hill.
- Brunnermeier, M. & Nagel, S. (2008). Do Wealth Fluctuations Generate Time-Varying Risk Aversion? Micro- Evidence on Individuals' Asset Allocation. *The American Economic Review*, 98 (3), pp. 713-736.
- Buccioli, A. & Miniaci, R. (2011). Household Portfolios and Implicit Risk Preference. *The Review of Economics and Statistics*, 93 (4), pp. 1235-1250.
- Buccioli, A. & Stuefer, M. (2012). Measuring Household Financial Risk. *The Journal of Wealth Management*, 15 (3), pp. 20-29.
- Calvet, L. E., Campbell, J. Y. & Sodini, P. (2007). Down or Out: Assessing the Welfare Costs of Household Investment Mistakes. *Journal of Political Economy*, 115 (5), pp. 707-747.
- Cortinhas, C. Black, K. (2012). Statistics for Business and Economics. First European Edition. John Wiley and Sons.
- Economides, N. (2001). The Impact of the Internet on Financial Markets. *Journal of Financial Transformation*, 1 (1), pp. 8-13.
- Elmér, H., Guibourg, G., Kjellberg, D. & Nessén, M. (2012). Riksbankens penningpolitiska åtgärder under finanskrisen - utvärdering och lärdomar. (Rapport 2012:3). Stockholm: Riksbanken
- Engen, E. M. & Lehnert, A. (2000). *Mutual Funds and the U.S. Equity Market*. (Report 86:12) St. Louis: Federal Reserve Bank.

European Central Bank. (2011). *Monthly Bulletin September* (Report 2011:9). Frankfurt am Main: European Central Bank. <https://www.ecb.europa.eu/pub/pdf/mobu/mb201109en.pdf>

European Central Bank. (2014) *Annual Report 2013*. Frankfurt am Main: European Central Bank. <https://www.ecb.europa.eu/pub/pdf/annrep/ar2013en.pdf>

Glaser, M. & Weber, M. (2007). Why inexperienced investors do not learn: They do not know their past portfolio performance. *Finance Research Letters*, 4 (4), pp. 203-216.

Grable, J. E. & Chatterjee, S. (2014). The Sharpe Ratio and Negative Excess Returns: The Problem and Solution. *Journal of Financial Service Professionals*, 68 (3), pp. 12-13.

Guiso, L., Haliassos, M. & Japelli, T. (2002). Household portfolios: An international comparison, in: Guiso, L., Haliassos, M. & Japelli, T. (Eds.): *Household portfolios*, The MIT Press, Cambridge.

Gujarati, D. & Porter, D. (2009). *Basic Econometrics*. 5<sup>th</sup> International Edition. New York: McGraw-Hill.

Hodges, C. W. & Taylor W. R. L. (1997). Stocks, Bonds, the Sharpe Ratio, and the Investment Horizon. *Financial Analysts Journal*, 53 (6), pp. 74-80.

Hoffmann, A. O. I., Post, T. & Pennings, J. M. E. (2013). Individual investor perceptions and behaviour during the financial crisis. *Journal of Banking & Finance*, 37(1), pp. 60-74.

Israelsen, C. L. (2005). A refinement to the Sharpe Ratio and Information Ratio. *Journal of Asset Management*, 5 (3), pp. 423-427.

Jensen, M. (1968). The Performance of Mutual Funds in the Period 1945-1964. *The Journal of Finance*, 23 (2), pp. 389-416.

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics*, 47 (1), pp. 13-37.

Malmendier, U. & Nagel, S. (2011). Depression Babies: Do Macroeconomic Experiences Affect Risk Taking? *The Quarterly Journal of Economics*, 126 (6), pp. 373-416.

Mossin, J. (1966). Equilibrium in a Capital Asset Market. *Econometrica*, 34 (4), pp. 768-783.

Ramb, F. & Scharnagl, M. (2011). *Households' Portfolio Structure in Germany- Analysis of Financial Accounts Data 1959-2009* (Report 1335) Frankfurt am Main. European Central Bank.

<https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1355.pdf?b4728d4b2e7c5ba40adc0f25450595d6>

Segendorff, B. & Wilbe, A. (2014). Ekonomiska kommentarer: Har kontanter någon framtid som lagligt betalningsmedel? (Rapport 9:2014). Stockholm: Riksbanken.

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance*, 19 (3), pp. 425-442.

Sharpe, W. F. (1966). Mutual Fund Performance. *The Journal of Business*, 39 (1), pp. 119-138.

Stulz, R. (1981). On the Effects of Barriers to International Investment. *The journal of finance*, 36 (4), pp. 923-934.

Treynor, J. L. (1965). How to Rate Management of Investment Funds. *Harvard Business Review*, 43 (1), pp. 63-75.

Van Rooij, M., Lusardi, A. & Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics*, 101 (2), pp. 449-472.

Ynesta, I. (2008). Households' Wealth Composition Across OECD Countries and Financial Risks Borne by Households. *OECD Journal: Financial Market Trends*, 2008 (2), pp. 273-297.

#### Websites:

MSCI World Index. (2016). MSCI World Index (USD)

<https://www.msci.com/documents/10199/178e6643-6ae6-47b9-82be-e1fc565ededb> [2016-11-16]

NASDAQ OMX Nordic (2016). OMX Stockholm.

<https://indexes.nasdaqomx.com/Index/Overview/OMXSGI> [2016-11-16]

NASDAQ Nordic (2010). Rules for the Construction and Maintenance of the OMX indexes.

[https://indexes.nasdaqomx.com/docs/Methodology\\_OMRX.pdf](https://indexes.nasdaqomx.com/docs/Methodology_OMRX.pdf) [2016-11-17]

Riksbank (2015a). Riksbank cuts repo rate to minus ten per cent, buys government bonds for SEK 10 billion and is prepared to do more at short notice.

<http://www.riksbank.se/en/Press-and-published/Press-Releases/2015/Riksbank-cuts-repo-rate-to-010-per-cent-buys-government-bonds-for-SEK-10-billion/>

Riksbank (2015b). Swedish market rates

<http://www.riksbank.se/en/Interest-and-exchange-rates/Explanation-of-the-series/Swedish-market-rates/> [2016-12-18]

Riksbank (2015c). Riksbankschef Stefan Ingves, vad innebär beslutet om negativ reporänta? <http://www.riksbank.se/sv/Fragor-och-svar/Penningpolitik/Riksbankschef-Stefan-Ingves-vad-innebar-beslutet-om-negativ-reporanta/> [2016-12-26]

Riksgälden (2016a) Insättningsgarantin. [https://www.riksgalden.se/sv/Insattningssgarantin/Om\\_Insattningssgarantin/Sa-fungerar-insattningssgarantin/](https://www.riksgalden.se/sv/Insattningssgarantin/Om_Insattningssgarantin/Sa-fungerar-insattningssgarantin/) [2016-12-18]

Riksgälden (2016b). Riksgäldsspar. <https://www.riksgalden.se/sv/spara/Riksgaldsspar/> [2016-12-18]

Statics Sweden (2016). Savings barometer. <http://www.scb.se/fm0105-en/> [2016- 11- 12]

Statistiska Centralbyrån. (2009). Sveriges ekonomi - statistiskt perspektiv. [http://www.scb.se/grupp/teman/sveriges\\_ekonomi/\\_dokument/sverigesekonomikv408.pdf](http://www.scb.se/grupp/teman/sveriges_ekonomi/_dokument/sverigesekonomikv408.pdf) [2016-12-11]

#### *Databases:*

Morningstar. (2016) *Morningstar Direct*. Available at: Subscription Service. (Accessed: December 15<sup>th</sup> 2016).

Nasdaq. (2016) *Nasdaq Nordic* (Online). Available at: <http://www.nasdaqomxnordic.com/index> (Accessed: December 10th 2016).

Bloomberg. (2016). *Bloomberg*. Available at: Subscription Service. (Accessed: December 12th 2016).

# Appendix

**Table 8**

Correlation Matrix of Financial Assets

	Financial Assets						
	Currency	Bank Deposits	Bonds	Swedish Shares	Foreign shares	Equity Funds	B. & M.M. Funds
Currency	-						
Bank Deposits	-0.67591	-					
Bonds	0.88970	-0.52528	-				
Swedish Listed Shares	0.33809	-0.91034	0.18019	-			
Foreign Shares	0.14964	-0.69004	-0.13742	0.76080	-		
Equity Funds	0.68395	-0.97329	0.46218	0.87620	0.72774	-	
B. & M.M. Funds	0.77465	0.33993	0.70677	0.09238	0.20600	0.41120	-

Notes: Presented are the correlation rates between the financial assets that compose the portfolio during the examination period April 2005- September 2016.

**Table 9**

Covariance Matrix of Financial Assets

	Financial Assets						
	Currency	Bank Deposits	Bonds	Swedish Shares	Foreign Shares	Equity Funds	B. & M.M. Funds
Currency	7.73E-05	-0.00043	0.00014	9.88E-05	5.33E-06	0.00016	-5.76E-05
Bank Deposits	-0.00043	0.00518	-0.00068	-0.00218	-0.00020	-0.00190	0.000207
Bonds	0.00014	-0.00068	0.00032	0.00011	-1E-05	0.00023	-0.000107
Swedish Listed Shares	9.88E-05	-0.00218	0.00011	0.00110	0.00010	0.00079	-2.59E-05
Foreign Shares	5.33E-06	-0.00020	-1E-05	0.00010	1.64E-05	8E-05	7.05E-06
Equity Funds	0.00016	-0.00190	0.00023	0.00079	8E-05	0.00074	-9.43E-05
Bond and Money Market Funds	-5.76E-05	0.00021	-0.00011	-2.59E-05	7.05E-06	-9.43E-05	7.14E-05

Notes: Presented are the Covariance Values between the financial assets covering the examination period of April 2005- September 2016.

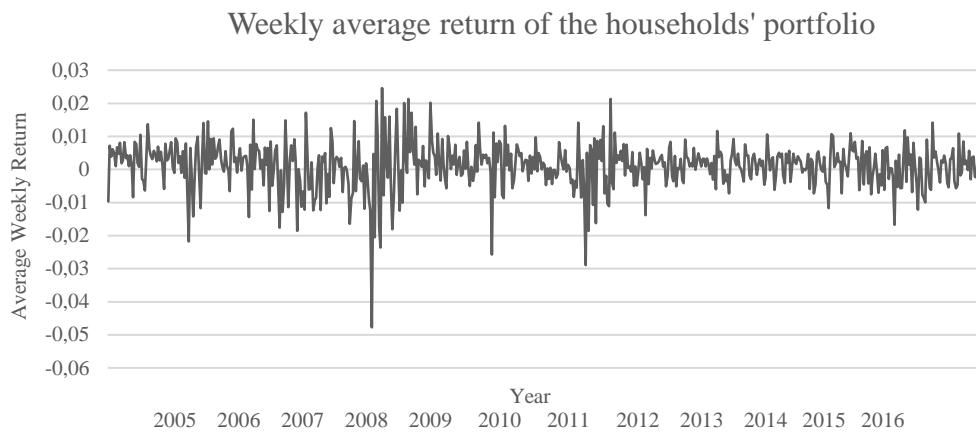
**Table 10**

Standard deviations of the weights

Financial Assets	Standard deviation
Bank Deposits	0.07444
Swedish Listed Shares	0.03607
Bonds	0.01438
Foreign shares	0.00436
Equity Funds	0.02953
Bonds and money market funds	0.00886
Currency	0.00952

Notes: Presented are the standard deviation values of the financial assets that compose the financial portfolio from April 2005- September 2016.

## Diagram 2



*Notes: The graph shows the weekly average return of the Swedish households' portfolio during the period April 2005 to September 2016.*