
# Relationships between bank customers' risk attitudes and their balance sheets

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**Abstract:**

This paper analyzes relationships between Swedish bank customers' risk appetite and their financial assets and debt, controlling for demographic, socio-economic, financial and educational variables including financial literacy. We use subjective risk measures, i.e. risk tolerance and risk preference, as well as an objective risk measure, i.e. relating customers' saving deposits to more risky stocks and mutual funds as a share of total financial assets. Bank customers with high risk appetite have significantly more financial assets compared with those with medium and low risk appetite. The subjective risk measures show that those with high risk appetite have significantly higher debt than those with low risk appetite. The objective risk measure shows the opposite. The paper concludes that it is important to use several measures of risk. Also, policy makers and banks need to measure bank customers' risk appetite in a more systematic and transparent way, in order to improve both the banks' and their customers' risk management, and not less importantly, to decrease macroeconomic risks.

Keywords: Household saving, debt, risk attitudes

JEL Codes: D12 D14 E58 G21

## 1. Introduction

Households in the advanced economies have generally become more leveraged over the last decades, although there has been some deleveraging in crisis-struck countries since 2008. In countries where house prices continue to rise, households are getting even more leveraged with subsequent concern raised by central banks and other policy makers. Most analyses relating debt to risk taking refer to systemic risks, intermediaries and to the possible costs to society from financial crises as a consequence of too much risk and credit taking (see e.g. Dynan and Kohn, 2007; Brunnermeier and Oehmke, 2012). During the same period, household holdings of risky assets as a share of total wealth have increased. Given the balance sheet recessions experienced in many countries, individuals' financial decisions seem to have become more relevant at a macroeconomic level (Riksbank, 2011). This calls for empirical studies on variables such as risk attitudes, self-control, overconfidence, and financial literacy as explanations for household debt and wealth.

There are studies that include a focus on the relationships between risk attitudes and debt on the household or investor level (Brown et al., 2013; Daly et al., 2010; Dynan and Kohn, 2007; Nagano and Yeom, 2014), and also the relationships between risk attitudes and wealth, in particular in relation to investor participation on asset markets (Calvet and Sodini, 2014; Guiso et al., 2002; Chaulk et al., 2003; Fan and Xiao, 2006; Grable et al., 2004; Hallahan et al., 2004; Yao et al., 2004). However, to some extent, there are limitations in these previous studies in various ways, i.e., there is limited access to objective data on individuals' balance sheets, or there is a lack of data on relevant and updated risk attitudes including both subjective and objective measures, or there are limited possibilities to control for demographic, socio-economic and financial variables, including, e.g., education and financial literacy.

The objective of this study is therefore to analyze the relationships between three measures of risk attitudes and bank customers' balance sheets, including their total debt and their financial assets. The data used is bank register data covering some 90,000 Swedish bank customers, and a survey to the same customers to combine the objective data with subjective measures (with a response rate of approx. 16,000 customers). Given this bank's similar structure as the other three major Swedish commercial banks, the sample used in this study is regarded as representative for Swedish bank customers in general.

This paper intends to contribute in the following way: By comparing three risk attitude measures (two subjective and one objective measure), and relating these to objectively measured private balance sheets, i.e., total debt and financial assets, the study intends to give a more holistic picture than previous research. This study will also control for demographic, socio-economic, financial and educational variables, including the bank customers' financial literacy.

Limitations include a lack of time-series data, since both the bank-register data and the survey data is cross-sectional data. There is thereby a difficulty to establish causality, a problem which is aggravated by having many other factors outside this study explaining the dependent variables. This study does not include real wealth. However, there are data on whether or not the customers are homeowners and have mortgages, and these data are used as important control variables. Since data on assets relating to real estate are missing at this point in time, this paper will not analyze net worth. In future research, we will try to add data on real wealth in terms of housing to make the picture of household balance sheets complete. However, given the continued risk of building-up of financial bubbles, it is reasonable to analyze risk in relation to bank customers' financial balance sheets; hence, this is the main focus in this study.

The structure of the paper is as follows: The next section covers the determinants of household debt and financial assets from a macroeconomic and a microeconomic perspective. It also provides a linkage to risk, including a theoretic background of risk attitudes and various methods to measure them. The third section explains the data and the methodology in more detail. The fourth section presents the results, and in the last section, conclusions are discussed and set in a macroeconomic and policy-oriented context.

## 2. Theoretical background

### 2.1 Determinants of household balance sheets and linkages to risk attitudes

Macroeconomic and microeconomic determinants regarding household debt and financial assets are discussed below. Previous research linking balance sheet components to risk attitudes will be reviewed.

#### 2.1.1 Household debt

Finocchiaro et al. (in Riksbank, 2011), discuss what it is that drives household debt. They start with the permanent income/life-cycle model (Ando and Modigliani (1963) and Friedman (1957), which focus on lower real interest rates, increasing future incomes, changes in demographics and diminished uncertainty. In particular, they point to the rise in house prices since more than 80 percent of Sweden's household debt is made up of mortgages. They also bring in behavioral factors in their conceptual model, such as self-control, financial literacy, overconfidence and financial mistakes. Dynan and Kohn (2011) draw the conclusion that changes in interest rates, income growth and changing preferences only partially can explain the increase in household indebtedness, and find rising house prices and financial innovation to be crucial factors in the case of the United States.

Turinetti and Zhuang, 2011, show results from an empirical study using US data, and find that the unemployment rate, the interest rate, the disposable income per capita, the share of retiring population and educational attainment are negatively associated with household debt, while housing prices, consumer confidence and the share of the working-age population are positively related to household borrowing.

In the case of Sweden, Finocchiaro et al. (in Riksbank, 2011) point to the highly regulated housing market which has contributed to a mismatch between demand and supply for housing and also to a low level of new housing construction. Furthermore, there are some important differences in the credit market which may mitigate the effects of excessive borrowing. Another issue is the high savings rate, which may indicate that Swedish households do not refinance their mortgages for consumption purposes. In Sweden, fiscal stimulation (from lower property tax and relatively high interest rate deductability) and low financial literacy may also have increased household indebtedness over the two past decades.

Moving to behavioral factors, relatively little research has focused on the relationship between risk attitudes and household debt, compared to the relationship between risk attitudes and saving (Brown et al., 2013). Investors who are risk averse are in general more cautious with their saving to prevent losses. In addition, they may save to self-insure against uncertainty. Acquiring debt increases consumption with repayments made in the future, and as these are generally financed from household income; thus, the attitudes toward risk will be important in the decision to acquire debt. The hypothesis is that the more risk averse an individual is, the lower will be the debt if there is a risk that the repayments cannot be done in the future. Brown et al., 2013, find an inverse association between risk aversion and the level of debt at the household level. They use the 1996 PSID Survey from University of Michigan, with questions that are in line with Barsky et al. (1997), and focus on hypothetical gambles with respect to lifetime income. They then use this measure for data available on debt in the PSID up to 2007. This time gap seems problematic since financial decisions could have changed due to age, children, career, etc. Furthermore, the data on secured and unsecure debt is subjective since the heads of the household themselves have to add up their debts, and could thus be associated with reliability problems. Even so, their result show that a one standard deviation increase in the cardinal risk attitudes (i.e., more risk averse) reduces total debt by 15.3 percentage points.

Another study that focuses on risk attitudes as a predictor of debt is Daly et al. (2010). They use an Irish sample of 2000 students (web survey), thus limiting the representativeness to the student community. Students have to add up their debts, including the ones to parents which may be less risky and are likely to have lower borrowing costs. Only 58 percent of the students had some

form of debt, and 26 percent owed money to their parents. The risk measure was limited to one question, following research from Dohmen et al. (2009) who find this question to be a robust measure of risk behavior: “How do you see yourself: Are you generally a person who is fully willing to take risks or do you try to avoid taking risks? Please indicate on a scale of 0-10, how willing you are to take risks in general, where 0 indicates “unwilling to take risks” and 10 indicates “fully prepared to take risks”. The mean in the study of risk willingness is 6.78. Dale et al. (2010) find the marginal effect of higher risk-attitude (a one-unit increase) to increase debt by 4.17 percent of the mean sample, and when controlled for age and gender this increases to 4.25 percent. On the basis of the studies referred to above, the hypothesis in this study is that customers with a high risk tolerance will have higher debt than other customers controlling for demographics, socio-economic and financial factors as well as education and financial literacy.

### 2.1.2 Household financial assets

The permanent income/life-cycle model (Ando and Modigliani, 1963) is also a good starting point for determining saving and building up of financial assets, as well as the accumulated savings. The basic formula suggests a number of reasons for changes in savings: changes in wealth, in current income, in expected income, in the discount rate and in life expectancy, as well as changes in family composition and the government’s taxes/central bank’s monetary policy (Wärneryd, 1999, see page. 301). Wärneryd points to the need to include social and psychological changes as well. In particular he summarizes 6 psychological concepts used by early economists in their discussions on saving, which to some extent are becoming more in focus in modern research: 1) the desire for effective accumulation and improvement, 2) the role of thrifty habits, 3) self-control and willpower as determinants of thrift, 4) uncertainty of or about the future and the role of expectations, 5) selective perception and limited cognitive capacity, and 6) time horizon and attitude toward the future.

Brown and Taylor (2008), analyzing three countries (Germany, Great Britain and the US), find that financial assets increase with age and income. In addition, households with married heads and employed heads of households have on average higher financial assets. Reporting good health is also positively related to financial assets, as well as household size. The education level was significantly positive only for Great Britain, while in Germany and the US, there was no clear pattern relating education and wealth. This study did not include financial literacy or risk attitudes.

Cadak and Wilkins (2009) review determinants of household risky asset holdings in Australia, and find labour income uncertainty and poor health reducing risky assets, as well as credit constraints. A positive age gradient is identified also for risky assets, and home-ownership also

increases risky asset holdings – likely to be affected by the access to cheaper mortgage-backed credit. An important role is played by financial awareness and knowledge in determining risky assets. As expected, being risk averse significantly reduces the risky asset ratio for all households, employed households and retired households.

A significant number of studies report high financial risk tolerance for individuals in high income and wealth categories (Chaulk et al., 2003; Fan and Xiao, 2006; Grable et al., 2004; Hallahan et al., 2004; Yao et al., 2004). Guiso and Paiella (2008) find risk aversion to be a decreasing function of endowment (thus rejecting constant *absolute* risk aversion (CARA), and estimate the elasticity of risk aversion to consumption at about 0.7, below the unitary value predicted by constant *relative* risk aversion (CRRA). They focus on the curvature more than the sign of the relationship and find risk tolerance to be a concave function of wealth. Gollier, in Guiso et al. (2002), concludes that wealthier people own more risky assets (under decreasing absolute risk aversion), and they invest a larger share of their wealth in risky assets (under decreasing relative risk aversion). Also Calvet and Sodini (2014) find that financial wealth has a strong positive impact on the risky share, thus, focusing on the measured impact of financial wealth on risk-taking. Using Swedish twins, they also find that the sensitivity of risk-taking to financial wealth is highly heterogeneous across households. Brunnermeier and Nagel (2008), on the other hand, find constant risk aversion and inertia after changes in wealth. While taking into consideration the challenges of establishing causality, the hypothesis in this study is that customers with high risk tolerance, and a higher share of risky assets as part of their wealth, also will have higher wealth than other customers controlling for demographics, socio-economic and financial factors as well as education and financial literacy.

### 2.2 Measures of risk attitudes

Studies referred to here and elsewhere use various instruments to measure individual risk attitudes. Some of them are objective in nature, e.g., measuring risky asset holdings as a share of total assets. Others are subjective, e.g., asking individuals how risk willing they are, how much risk they would like to take to get a certain return, or whether or not they would prefer participating in a lottery compared to receiving a lower but certain amount.

As referred to above, Dale et al. (2010) follows Dohmen et al. (2009) using a single question on how risk willing a person is. Guiso and Paiella (2008) asks a hypothetical question in personal interviews that the individual should regard as a real one: “You are offered an opportunity of acquiring a security permitting you, with the same probability, either to gain 10 million lire (5,000 euro), or to lose all the capital invested. What is the most you are prepared to pay for this security?” Since the question was regarded as complicated, only a 42 percent agreed to answer.

Loomes and Pogrebna (2014) argue that it is unsafe to expect that one or two questions of any kind can provide a reliable measure at the individual level since most individuals exhibit a good deal of variability in their responses to questions intended to elicit their risk attitudes. Ideally, one should use several different questions and/or at least two different procedures to check the sensitivity of the risk attitude parameter they generate.

As Campbell (2006) points out, predictions on the relationship between wealth and risk attitude may be different for different risk aversion measures and utility functions. It is therefore important to name the measures of risk attitudes in a coherent way. In several studies (Yao et al., 2004; Yao et al., 2011, Finke and Huston, 2003), the term risk tolerance is used regardless if the measure is based on a lottery or on questions about risk and return preferences. Hunter (2002), and Roszkowski and Davey (2010) differ between risk tolerance and risk perception in the following way: While risk perception answers how risky an investor views an investment, risk tolerance answers how likely it is for an investor to make an investment given a certain level of risk.

Our first measure is based on lottery choices and reflects risk tolerance (see e.g., Wärneryd, 1996). In its simplest form, the individual makes a choice between two alternatives of the form *(v, p)* where *p* is the probability to win, *v* is an amount of money and *1-p* is the probability to win nothing. The expected utility of such alternatives is *pu (v) + (1-p)u(0) where u* is the utility function for money. The individual is assumed to select the alternative with the greatest expected value. The general assumption in economics is that people are risk averse, defined as a preference for a sure outcome over a prospect with an equal or greater expected value. "Risk aversion is defined as a preference for a sure outcome over a prospect with an equal or greater expected value… Risk seeking is exhibited if a prospect is preferred to a sure outcome with equal or greater expected value" (Wärneryd, 1999, p.234. referring to Tversky and Fox, 1995, p.269).

It is also possible to measure risk attitudes by asking people about their appetite for risk. The American Survey of Consumer Finances (SCF), used by many American academics, poses the following questions: Which of the statements on this page comes closest to the amount of financial risk that you and your (spouse/partner) are willing to take when you save or make investments?[1]

1) Take substantial financial risks expecting to earn substantial returns
2) Take above average financial risks expecting to earn above average returns
3) Take average financial risks expecting to earn average returns
4) Not willing to take any financial risks

Our second measure is similar to these questions, seeking to find the individual's preference as regards their view on their preferred exchange between risk and return. These two measures are

[1] Note that the option "Take below average financial risk expecting to earn below average return" is not available.

subjective dependent on the answers on hypothetical choices, which can have an impact on validity of the method and generalizability of the results. As Kahneman and Tversky (1979) phrase it: "The use of method relies on the assumption that people often know how they would behave in actual situations of choice, and on the further assumption that the subjects have no special reason to disguise their true preferences."

The third measure used in this study is therefore an objective measure of risk attitudes. Relating the risky assets to total financial assets gives a picture of a certain investor's tolerance for risk. However, his or her investment strategy may have been influenced by advisors, or by other factors, thereby also contributing to measurement errors in the analysis. Thus, there are pros and cons towards all measures of risk attitudes. Being transparent on the measure used is important, not least since risk tolerance seems to be a more stable concept over time, whereas risk perception and risk preferences changes more easily for example due to an economic shock (Roszkowski and Davey, 2010). Analyzing risk in an objective manner, by relating risky assets to total assets, and match with the Swedish Twin Registry, Cesarini, et al. (2010) find that approximately 25 percent of individual variation in portfolio risk is due to genetic variation. Hanna and Chen (1997) find that risk tolerance also as a subjective attribute tends to be a genetic predisposition. Others, such as Cordell (2001) argue that risk tolerance can vary over time as it is influenced by exogenous factors such as major life experiences.

There appears to be significant agreement among research studies that financial risk tolerance is statistically related to a number of demographic and socio-economic factors such as gender, age, income, wealth, education and occupation (see Van der Venter et al., 2012, for a more extensive review). In focus for this study are investors' financial assets and debt in relation to their risk attitudes. Causality is difficult to establish. While an individual's increased willingness to tolerate financial risk could be driven by a greater ability to take on more risk due to a higher level of disposable income or higher wealth, it may also be that the level of an individual's financial risk tolerance influences his or her earning potential (Van der Venter et al., 2012).

## 3. Data and methodology

Bank register data of 90,520 randomly sampled bank customers from one of Sweden's largest commercial banks representing a population of 2,254,420 bank customers aged 18 and over is used as cross-sectional data. Given the large customer size of the bank, its broad geographical coverage, and its similar structure as other major commercial banks in Sweden, the sample of customers was assumed to be representative of Swedish bank customers in general.

This data is combined with answers received from a questionnaire sent out to the same sample of customers. The survey was undertaken in April-May, 2013, while the bank register data used is from March, 2013. The bank register data provided us with information on age, gender, geographical location, mortgage, financial information on debt and assets, and the respondent's annual net income. The survey data provided us with information on family status, home ownership, risk attitudes, education and financial literacy. Only customers having the bank in question as their main bank were included, in order to minimize the problem of customers having financial assets and liabilities in other banks. Couples analyzed could have divided their total debt and assets unevenly, and this will not be reflected in this study. However, since Swedish couples are taxed as individuals, the problem is likely to be less severe than in many other countries.

The response rate of 18 percent (16,050 customers) calls for an analysis of a possible selection bias.[2] In Table 1, differences between the overall sample and the data for the responders of the survey are shown. Responders were in general older, had higher financial assets and liabilities, lived more often in large cities, and were more often women. Therefore, we used a Heckman two-step selection model to check for selection bias. This assured us that bias is not present in this study since lambda is not a significant variable, and no difference was found in the results between the ordinary OLS regression model and the two-step selection model for the independent variable in focus, i.e., risk attitude on bank customers' balance sheets.

The methodology chosen is an OLS regression model with risk attitudes as independent variable and the bank customer's total debt (mortgage debt and other debt) as dependent variable (and the bank customer's financial wealth as dependent variable). By adding demographics, financial and economic data, as well as education and financial literacy, the impact of risk attitudes on debt/financial assets is moderated by these control variables. Thus, four models in total are presented for each of the two dependent variables, with Model 4 containing all independent variables.

In Sweden, a major part of the household's total debt is made up of mortgage. In table 2, the difference in total debt between bank customers with and without mortgage is shown. Excluding mortgages, bank customers have on average SEK 32,700 (about 3,520 Euro) in debt, while mortgages on average amount to just over SEK 658,300 (about 70,870 Euro). Bank customers, if they are homeowners, often increase their mortgages instead of taking up commercial loans when buying a new car, as well as when financing a long and expensive holiday. On average, the responders had a total debt amounting to SEK 321,734 (about 34,600 Euro). Customers living outside the major cities own their homes to a larger extent, while there is a possibility to rent apartments in the cities.

[2] The responders did not answer all the questions, and therefore the four models presented below have between 11893 and 14160 observations.

Despite the high and rising property prices driving debt in the largest cities, the average amount of debt is thus lower in the cities in this sample. The higher the education, the higher the financial literacy, and the higher the income bank customers earn the higher the total debt they owe to the bank. From Table 1, it is also possible to note that without correction for other variables, the more appetite for risk the bank customer has in subjective terms, the higher is her or his total debt, and the more appetite for risk, the higher is her or his financial wealth.

As discussed in Section 2, there are several methods possible to use when analyzing risk attitudes. In this study, we use three methods where the focus is on financial decisions: i) *risk tolerance* according to a hypothetic gamble involving getting money from a lottery versus choosing a lower certain amount, ii) *risk preference* according to customers' subjective views on their exchange between risk and possible return on savings, and iii) *objective risk* according to the share of risky assets in the financial asset holdings portfolio.

Using the first method, risk tolerance was tested by asking the respondents to choose between receiving an amount of money with total certainty or participating in a lottery:

*1. I choose either to get 1000 kronor with 100 % probability, or take part in a lottery and get 2000 kronor with 40 % probability (and nothing with 60 % probability).*

*2. I choose either to get 1000 kronor with 100 % probability, or take part in a lottery and get 2000 kronor with 60 % probability (and nothing with 40 % probability).*

The respondents were coded the following way:

- High risk: answers lottery in both cases
- Medium risk: answers 1000 kronor in the first case, and lottery in the second case
- Low risk: answers 1000 kronor in both cases

In Table 1, the distribution between these three types of risk attitudes as measured by risk tolerance is shown. The majority of bank customers take low risks (68.6%), followed by medium risk (23.1%) and those who take high risk (8.6%). Men are more risk seeking according to our survey, since 10.8% of the men take relatively high risks while this applies only to 6.6 % of the women.

Using the second method, risk preference is tested by responding to the survey. A variable of high, medium and low risk perception will be built up from three questions raised, with a Likert type scale 1 (=Totally disagree) to 7 (=Totally agree):

- I would like to increase risk since the return is too low
- I think one has to take risk in order to gain something
- I think it is reasonable to lose parts of my saving if the chance to get a good return is great

**Table 1: Summary statistics**

| Variable | Description | Total Sample | Responders | Low Risk T | Medium Risk T | High Risk T | Low Risk P | Medium Risk P | High Risk P | Low ObjRisk | Med ObjRisk | High ObjRisk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Number | 90516 | 16050 | 10491 | 3543 | 1328 | 3764 | 7711 | 4102 | 5402 | 5199 | 5461 |
| Total Debt | SEK | 274869 | 321734 | 275218 | 421560 | 512730 | 169078 | 300614 | 524995 | 306527 | 358801 | 301444 |
| Financial Assets | SEK | 317146 | 498161 | 468248 | 535870 | 579568 | 347491 | 463881 | 697856 | 215495 | 548369 | 730484 |
| **Age** | Frequency, percent | | | | | | | | | | | |
| 18-24 | | 9,46 | 4,40 | 4,39 | 5,31 | 3,01 | 3,75 | 5,23 | 3,36 | 7,90 | 3,10 | 2,18 |
| 25-34 | | 16,11 | 9,22 | 8,70 | 11,90 | 9,34 | 6,11 | 10,56 | 9,92 | 12,74 | 9,96 | 5,03 |
| 35-54 | | 33,03 | 26,75 | 24,33 | 34,19 | 34,21 | 20,01 | 27,58 | 32,79 | 23,23 | 28,47 | 28,61 |
| 55-64 | | 16,80 | 22,26 | 22,28 | 21,90 | 26,45 | 21,09 | 22,81 | 22,99 | 19,16 | 23,45 | 24,21 |
| 65-74 | | 14,50 | 24,19 | 25,64 | 20,12 | 19,82 | 28,56 | 22,90 | 22,35 | 23,36 | 23,04 | 26,10 |
| 75--> | | 10,10 | 13,17 | 14,66 | 6,58 | 7,16 | 20,48 | 10,92 | 8,58 | 13,61 | 11,98 | 13,87 |
| **Gender** | Male=1 Female=0 | 0,4910 | 0,4776 | 0,4436 | 0,5372 | 0,6006 | 0,3488 | 0,4586 | 0,5250 | 0,4987 | 0,46344 | 0,4697 |
| **Family status** | Frequency, percent | | | | | | | | | | | |
| Single | | | 22,77 | 23,60 | 19,80 | 19,03 | 27,73 | 21,77 | 18,99 | 24,61 | 21,43 | 22,22 |
| Single w.children | | | 3,58 | 3,59 | 3,87 | 3,20 | 3,25 | 3,96 | 3,31 | 3,61 | 3,68 | 3,54 |
| Couple w/o children | | | 28,94 | 30,23 | 24,65 | 28,47 | 31,94 | 28,39 | 27,23 | 31,69 | 27,10 | 27,98 |
| Couple w children | | | 42,87 | 40,66 | 49,62 | 48,32 | 35,25 | 43,83 | 49,09 | 37,20 | 46,56 | 44,94 |
| Other | | | 1,85 | 1,91 | 2,06 | 0,98 | 1,83 | 2,06 | 1,38 | 2,98 | 1,23 | 1,32 |
| **Large city** | The four largest cities=1, rest=0 | 0,7953 | 0,8208 | 0,8317 | 0,7957 | 0,7822 | 0,8491 | 0,8256 | 0,7804 | 0,8016 | 0,8296 | 0,8315 |
| **Homeowner** | Homeowner=1 | | 0,7159 | 0,7079 | 0,7482 | 0,7515 | 0,7827 | 0,7299 | 0,6671 | 0,6296 | 0,7565 | 0,7627 |
| **Mortgage** | Mortgage=1 | 0,3903 | 0,4620 | 0,4397 | 0,5222 | 0,5539 | 0,3945 | 0,4758 | 0,5171 | 0,4023 | 0,5095 | 0,4748 |
| **Income** | Annual net income, SEK | 168903 | 193666 | 183795 | 219466 | 224197 | 165026 | 195525 | 222671 | 175763 | 219689 | 186584 |
| **Education** | Frequency, percent | | | | | | | | | | | |
| No finalized education | | | 9,14 | 9,88 | 4,69 | 8,59 | 14,86 | 7,38 | 6,21 | 10,85 | 8,19 | 8,37 |
| Pre-gymnasium | | | 11,60 | 12,93 | 7,89 | 8,59 | 16,67 | 10,37 | 8,95 | 12,35 | 10,57 | 11,86 |
| Gymnasium | | | 26,85 | 26,58 | 28,25 | 28,57 | 25,01 | 27,63 | 27,12 | 26,58 | 27,17 | 26,82 |
| Higher education < 3yrs | | | 20,25 | 20,21 | 20,47 | 20,40 | 18,37 | 21,43 | 20,27 | 19,22 | 20,41 | 21,10 |
| Higher education >= 3 yrs | | | 32,16 | 30,40 | 38,70 | 33,86 | 25,10 | 33,19 | 37,44 | 31,00 | 33,66 | 31,86 |
| **Financial Literacy** | Frequency, percent | | | | | | | | | | | |
| 0 | 0/6 answer right | | 20,42 | 23,16 | 12,68 | 13,74 | 34,74 | 18,37 | 9,22 | 28,89 | 16,17 | 16,14 |
| 1 | 1/6 answer right | | 22,85 | 24,05 | 20,04 | 22,32 | 26,09 | 24,93 | 16,39 | 20,98 | 23,75 | 23,84 |
| 2 | 2/6 answers right | | 16,94 | 16,99 | 16,80 | 17,42 | 16,47 | 18,19 | 15,42 | 15,65 | 18,06 | 17,12 |
| 3 | 3/6 answers right | | 14,39 | 13,77 | 15,62 | 15,70 | 11,43 | 14,64 | 16,88 | 12,67 | 15,38 | 15,14 |
| 4 | 4/6 answers right | | 11,51 | 10,77 | 14,04 | 12,76 | 6,90 | 11,70 | 15,76 | 9,62 | 13,02 | 11,95 |
| 5 | 5/6 answers right | | 8,39 | 7,06 | 12,23 | 9,98 | 3,26 | 7,84 | 14,46 | 7,32 | 8,20 | 9,63 |
| 6 | 6/6 answers right | | 5,50 | 4,19 | 8,60 | 8,09 | 1,12 | 4,31 | 11,87 | 4,88 | 5,42 | 6,17 |

**Table 2: Summary statistics, focusing on total debt and financial assets**

| Variable | Description | Total Debt | Fin. Assets |
|---|---|---|---|
| Observations | Number | 16050 | 16050 |
| | | | |
| **Overall** | | 321734 | 498161 |
| | | | |
| **Age** | | | |
| 18-24 | | 22957 | 85914 |
| 25-34 | | 309450 | 135118 |
| 35-54 | | 532052 | 304728 |
| 55-64 | | 391946 | 568753 |
| 65-74 | | 213273 | 717078 |
| 75--> | | 83557 | 769097 |
| | | | |
| **Gender** | Male | 395927 | 577792 |
| | Female | 158083 | 425313 |
| | | | |
| **Family status** | | | |
| Single | | 179023 | 578382 |
| Single w.children | | 456775 | 317838 |
| Couple w/o children | | 235531 | 532900 |
| Couple w children | | 464308 | 464361 |
| Other | | 74198 | 217997 |
| | | | |
| **Large city** | The four largest cities | 261594 | 490045 |
| | The rest | 597219 | 535336 |
| | | | |
| **Homeowner** | Homeowner | 407328 | 555110 |
| | Otherwise | 108569 | 354577 |
| | | | |
| **Mortgage** | Mortgage | 658317 | 380373 |
| | Otherwise | 32706 | 599307 |
| | | | |
| **Education** | | | |
| No finalized education | | 126713 | 540814 |
| Pre-gymnasium | | 166645 | 528130 |
| Gymnasium | | 296315 | 418520 |
| Higher education < 3yrs | | 347152 | 483914 |
| Higher education >= 3 yrs | | 460343 | 559171 |
| | | | |
| **Financial Literacy** | | | |
| 0 | 0/6 answer right | 148070 | 286197 |
| 1 | 1/6 answer right | 241474 | 374214 |
| 2 | 2/6 answers right | 298992 | 443480 |
| 3 | 3/6 answers right | 413653 | 532660 |
| 4 | 4/6 answers right | 444264 | 653942 |
| 5 | 5/6 answers right | 520171 | 852861 |
| 6 | 6/6 answers right | 733841 | 1025979 |

A confirmatory factor analysis (CFA), see Table 3, was done in order to evaluate the measure of the independent variables, providing a test for unidimensionality (Gerbing and Anderson, 1988). The factor loadings are at or above 0.5, as suggested by Bollen (1989). Item reliability (R2) measures show values above the recommended 0.5 (Bollen, 1989), except for the first statement where R2 is lower. However, composite reliability for the construct is high, exceeding the recommended level of 0.70 (Hair et al., 1998). Average variance extracted is above 0.5 (Fornell and Larcker, 1981). The high reliability is due to very small indicator measurement errors. The score of the construct varies between -1.975 and 2.796 with a mean of 0.0672. In Table 1, the construct has been divided into three types: low (<-1), medium (-1 to 1) and high (>1).

**Table 3: Result of confirmatory factor analysis and reliability measures**

| Risk Preference<br>Construct/indicator | Factor<br>Loading | Measurement<br>Error | z value | Item<br>Reliability (R2) | Composite<br>Reliability | AVE |
|---|---|---|---|---|---|---|
| | | | | | 1.00 | 0.99 |
| I would like to increase risk since the return is too low | 0.50 | 0.0070192 | 71.69 | 0.25 | | |
| I think one has to take risk in order to gain something | 0.81 | 0.0063819 | 126.88 | 0.66 | | |
| I think it is reasonable to lose parts of my savings if the chance to get a good return is great | 0.83 | 0.0064062 | 130.19 | 0.70 | | |

Using the third method, objective risk is measured by relating the deposits in saving accounts to the total investment volume. If data had been provided, we would have liked to divide the mutual funds into different risk classes, but unfortunately they will now be treated as risky, in line with shares. The number 0 means that there are no risky assets in the bank customer's portfolio, only deposits in saving accounts, while 1 means that the whole portfolio consists of mutual funds and share, and no deposits. The mean for the sample is 0.339.

The other independent variables are explained in Table 1 and 2, except for Financial Literacy. Six questions were asked (see Appendix A5), and respondents were asked to give spontaneous answers, and instead of trying to look up the answer, respond "I Don't Know". About 20% did not have any right answers, and 60% had 2 right answers or less. About 25% had 4 right answers or more, and only 5.5% had all answers right. Bank customers with a stronger appetite for risk had more answers right compared to those with low appetite for risk.

## 4. Results

Four models, representing four stages of regressions are provided for each risk attitude measure (i.e., risk tolerance, risk preference and objective risk) and each component of the balance sheet (total debt and financial assets). The regression with risk tolerance is provided in tables 4-5, while the regressions with risk preference and objective risk are presented in appendix A1 – A4. Results for both components of the balance sheet and all three risk measures are presented in table 6.

Risk tolerance explains less than 1 percent of total debt in model 1, as presented in table 4. Still, not controlling for other variables, bank customers with medium and high risk appetite have significantly higher debt than customers with low risk. In model 2, demographic variables are added, such as age, gender, family status and geographical location. These factors explain 7.6 percent of total debt. Customers with medium and high risk appetite are still more indebted than the low risk customers, although to a lesser extent than in model 1. In model 3, financial and socio-economic variables, such as the sum of financial assets, being a homeowner, having a mortgage, and customers' net annual income, are added, which results in a $R^2$ of 14.3 percent. Customers with medium risk are barely more indebted than the customers with low risk appetite, at the significance level of 0.10 (p=0.099), but high risk customers are significantly more indebted than the low risk ones (p=0.001).

In model 4, all variables are included, i.e., education levels and financial literacy according to our questionnaire. These two variables add little to the explanation of total debt ($R^2$ is 14.6 percent), but they change the way risk tolerance affect total debt. There is no longer a significant difference between the customers with medium risk and the ones with low risk in terms of their debt levels, when controlling for all variables. However, high risk customers are still significantly more indebted than the ones with low risk appetite (p=0.002), and the amount is SEK 91,787 (about 9,900 Euro), which is equal to 28.5 percent of the mean total debt of survey responders.

In model 4, the other independent variables affect debt in the following way. The age group of 35-54 is significantly more indebted than the youngest bank customers (18-24), and the oldest two groups are significantly less indebted than the youngest. Men are more indebted than women, and singles with children are more indebted than singles, while those who live in a couple-relationship with children are less indebted than singles. Those who live in large cities are less indebted than those living in less urbanized areas. More households in cities rent their housing, and this explains the difference. For those who actually own real estate, and have a mortgage, debt levels are generally higher in the cities where house prices are higher. As can be expected, homeowners and customers with mortgages are more indebted than the other customers. Somewhat surprisingly, there is no significant relationship between financial assets and total debt. On the other hand, the higher the income a customer has, the higher the debt. In terms of education, many older (and less indebted) customers have lower formal education than the younger. There is a significant relationship between those that have higher education of three years or longer and their debt. The same is applicable to financial literacy. The more right answers the bank customer gave in our survey (at least starting from 3/6 right or more), the higher debt he or she has.

## Table 4: OLS regressions on Total Debt with focus on Risk Tolerance

| Variables | Description | Risk only | | Model 1+Demographic | | Model 2+Financials | | Model 3 + Skills | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Model 1** | | **Model 2** | | **Model 3** | | **Model 4** | |
| | | Coefficients | t-stat | Coefficients | t-stat | Coefficients | t-stat | Coefficients | t-stat |
| **Intercept** | | **288432** | **27,01** | **190117** | **5,90** | **81741** | **2,48** | **81783** | **2,17** |
| **Risk tolerance** | cf. Group 1= low risk tolerance | | | | | | | | |
| 2 | 2= medium risk tolerance | **157218** | **8,67** | **67122** | **3,37** | **30308** | **1,65** | 8045 | 0,39 |
| 3 | 3= high risk tolerance | **247653** | **8,47** | **132527** | **4,27** | **91380** | **3,27** | **91787** | **3,09** |
| **Age** | cf. Group 18-24 | | | | | | | | |
| 25-34 | | | | **184052** | **7,54** | 24157 | 1,16 | -5325 | -0,24 |
| 35-54 | | | | **367334** | **15,69** | **53705** | **2,70** | **40687** | **1,97** |
| 55-64 | | | | **268959** | **9,42** | -36885 | -1,04 | -50735 | -1,42 |
| 65-74 | | | | **111244** | **5,90** | **-105232** | **-5,58** | **-138436** | **-6,37** |
| 75--> | | | | 13473 | 0,75 | **-99069** | **-5,02** | **-119263** | **-5,30** |
| **Gender** | Male=1 Female=0 | | | **284422** | **15,89** | **228906** | **10,92** | **211004** | **10,11** |
| **Family status** | cf. Group Singles | | | | | | | | |
| Single w.children | | | | **141495** | **4,17** | **79588** | **2,78** | **84294** | **2,83** |
| Couple w.children | | | | **37703** | **2,84** | **-42495** | **-3,70** | **-54760** | **-4,40** |
| Couple w/o children | | | | **172830** | **8,75** | 19143 | 0,89 | 11757 | 0,54 |
| Other | | | | -23492 | -0,66 | 6312 | 0,20 | 13538 | 0,39 |
| **Large city** | The four largest cities=1, rest=0 | | | **-365872** | **-10,92** | **-305604** | **-9,36** | **-285989** | **-8,80** |
| **Homeowner** | Homeowner=1 | | | | | **89128** | **5,21** | **81425** | **4,81** |
| **Mortgage** | Mortgage=1 | | | | | **505677** | **20,2** | **510253** | **18,93** |
| **Financial assets** | Sum of all fin.assets in bank register | | | | | 0,0175 | 1,35 | 0,0058 | 0,49 |
| **Income** | Annual net income | | | | | **0,4804** | **4,24** | **0,2951** | **2,44** |
| **Education** | cf. No finalized education | | | | | | | | |
| Pre-gymnasium | | | | | | | | 14546 | 0,94 |
| Gymnasium | | | | | | | | **-34484** | **-2,17** |
| Higher education < 3yrs | | | | | | | | 40493 | 1,22 |
| Higher education >= 3 yrs | | | | | | | | **83186** | **4,02** |
| **Financial Literacy** | cf. 0 answers right | | | | | | | | |
| 1 | 1/6 answer right | | | | | | | **-20978** | **-1,71** |
| 2 | 2/6 answers right | | | | | | | 4343 | 0,28 |
| 3 | 3/6 answers right | | | | | | | **72087** | **3,84** |
| 4 | 4/6 answers right | | | | | | | **99734** | **1,99** |
| 5 | 5/6 answers right | | | | | | | **140616** | **5,13** |
| 6 | 6/6 answers right | | | | | | | **338793** | **4,36** |
| Regression | | 60,44 | | 119,5 | | 235,81 | | 144,56 | |
| F-statistic | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-square | | 0,0077 | | 0,0761 | | 0,1426 | | 0,1456 | |
| Number of observations | | 14160 | | 12947 | | 12947 | | 11893 | |

In A1, the four models regarding risk preference and total debt is presented. All the independent variables behave in a similar manner as in table 4. In model 3, the difference between customers with medium and low risk appetite is more significant (p=0.011). In model 4, the magnitude of the increase in total debt for high risk customers is larger, i.e., at SEK 132,834 (about 14,310 Euro), which is 41.3 percent of the mean total debt for responders.

In A2, the four models regarding objective risk and total debt is presented. Bank customers with a high share of risky assets, compared to total financial assets, have not a significantly higher debt than customers with low risk appetite as can be seen in model 1. However, those with medium risk appetite are significantly more indebted than the low risk customers. In model 4, both those with medium and high risk appetite are significantly less indebted than the ones with low risk. Bank customers with a high share of deposits in saving accounts in their total financial assets, and perhaps with low absolute holdings of mutual funds and shares, have significantly higher debt. High debt leads to a need to pay interest, and to some extent amortization, thus the requirement for cash holdings may be higher. Customers with high risk appetite have 22.0 percent lower debt than the low risk customers, according to the objective risk measure.

Moving on to financial assets and the relationship with risk attitudes, table 5 shows the relationship between risk tolerance and financial assets. In model 1, bank customers with medium risk, and even more so, with high risk appetite have higher financial assets than those with low risk appetite. However, risk tolerance is not an important explanatory variable for financial assets. By adding demographic variables, $R^2$ increases to 5.8 percent, and the magnitude and significance of risk tolerance increase. In model 3, also financials and homeownership are added, increasing $R^2$ to 9.2 percent. When also education and financial literacy have been added in model 4, the model explains still only 11.9 percent of the variation in financial assets. Throughout all models, the higher the bank customers' tolerance of risk, the higher the financial assets. In model 4, the customers with high risk appetite has 26.0 percent higher financial assets compared to the one with low risk appetite (SEK 129,359 (about 13,900 Euro) out of the responders' mean of SEK 498,161 (about 53,675 Euro).

Among the other independent variables, the regression results are as expected. The older the customers, the higher are their financial assets. Singles have the highest financial assets, compared to other family status groups. Those with the highest education, and the best scores on our financial literacy test, have the highest amount of financial assets. Those living in the largest four cities have significantly lower financial assets compared to the rest of customers. Interestingly, when controlling for all factors included here (i.e., in model 4), men have significantly higher financial assets compared to women only when risk tolerance and objective risk are used as risk attitude measures, while this is not the case when instead risk preference is used.

## Table 5: OLS regressions on Financial Assets with focus on Risk Tolerance

| Variables | Description | Risk only | | Model 1+Demographics | | Model 2+Financials | | Model 3 + Skills | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Model 1** | | **Model 2** | | **Model 3** | | **Model 4** | |
| | | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| **Intercept** | | **478631** | **52,13** | **165945** | **4,47** | 42233 | 1,14 | **-100658** | **-2,25** |
| **Risk tolerance** | cf. 1= low risk tolerance | | | | | | | | |
| 2 | 2= medium risk tolerance | **79936** | **3,32** | **145519** | **5,68** | **132252** | **5,17** | **81191** | **2,97** |
| 3 | 3= high risk tolerance | **114998** | **2,49** | **153964** | **3,13** | **147940** | **2,96** | **129359** | **2,50** |
| **Age** | cf. Group 18-24 | | | | | | | | |
| 25-34 | | | | **43895** | **2,96** | 22852 | 1,14 | -6121 | -0,25 |
| 35-54 | | | | **220546** | **11,37** | **171555** | **6,35** | **165500** | **5,39** |
| 55-64 | | | | **513379** | **21,27** | **440291** | **16,45** | **436184** | **14,01** |
| 65-74 | | | | **680809** | **19,93** | **574815** | **14,71** | **565850** | **11,79** |
| 75--> | | | | **687099** | **20,75** | **544798** | **16,17** | **579834** | **14,61** |
| **Gender** | Male=1 Female=0 | | | **110851** | **6,05** | **101059** | **5,42** | **37854** | **2,28** |
| **Family status** | cf. Singles | | | | | | | | |
| Single w.children | | | | **-105483** | **-2,63** | **-117011** | **-2,99** | **-97274** | **-2,35** |
| Couple w.children | | | | **-105775** | **-3,23** | **-124862** | **-3,92** | **-126127** | **-3,85** |
| Couple w/o children | | | | **-83656** | **-2,79** | **-109626** | **-3,70** | **-118121** | **-3,84** |
| Other | | | | -54725 | -1,52 | **-170708** | **-4,44** | **-137614** | **-3,49** |
| **Large city** | The four largest cities=1, rest=0 | | | **-132191** | **-3,68** | **-121112** | **-3,45** | **-81516** | **-2,37** |
| **Homeowner** | Homeowner=1 | | | | | **365620** | **-3,45** | **311293** | **9,87** |
| **Mortgage** | Mortgage=1 | | | | | **-414521** | **12,95** | **-401866** | **-14,32** |
| **Total Debt** | Sum of all outstanding loans in bank register | | | | | 0,0203 | 1,08 | 0,0062 | 0,42 |
| **Income** | Annual net income | | | | | **0,5962** | **3,86** | **0,4289** | **2,61** |
| **Education** | cf. No finalized education | | | | | | | | |
| Pre-gymnasium | | | | | | | | -8063 | -0,25 |
| Gymnasium | | | | | | | | **87585** | **2,44** |
| Higher education < 3yrs | | | | | | | | **54856** | **1,65** |
| Higher education >= 3 yrs | | | | | | | | **142645** | **3,75** |
| **Financial Literacy** | cf. 0 answers right | | | | | | | | |
| 1 | 1/6 answer right | | | | | | | **72338** | **2,89** |
| 2 | 2/6 answers right | | | | | | | **110952** | **3,88** |
| 3 | 3/6 answers right | | | | | | | **169039** | **5,21** |
| 4 | 4/6 answers right | | | | | | | **269147** | **6,40** |
| 5 | 5/6 answers right | | | | | | | **377844** | **7,81** |
| 6 | 6/6 answers right | | | | | | | **695643** | **6,80** |
| Regression | | 8,04 | | 132,37 | | 101,42 | | 65,82 | |
| F-statistic | | 0,0003 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-square | | 0,0016 | | 0,0582 | | 0,0917 | | 0,1186 | |
| Number of observations | | 14160 | | 12947 | | 12947 | | 11893 | |

Using risk preference as is shown in A3, the picture is similar to risk tolerance, although the magnitude and significance levels are higher. In model 4, being a customer with high risk appetite increases financial assets by SEK 253,748 (about 27,340 Euro), i.e., 50.9 percent of the responders' mean financial assets. Being a customer with medium risk appetite increases financial assets by 20.7 percent compared to the customer with low risk appetite.

The effects are even larger when using objective risk as shown in A4. Being a high risk customer increases financial assets by 91.0 percent, and being a medium risk customer increases financial assets by 55.5 percent compared to the low risk customers. Those who hold mutual funds and shares are generally wealthier than those that have only deposits in their saving accounts.

**Table 6: OLS regressions on household balance sheets – with all risk attitude measures**

| | **Total Debt** | | **Financial Assets** | |
|---|---|---|---|---|
| | Coefficients | t-stat | Coefficients | t-stat |
| **Risk Tolerance** | | | | |
| cf. Low risk | | | | |
| Medium risk | 8045 | 0,39 | **81191** | **2,97** |
| High risk | **91787** | **3,09** | **129359** | **2,50** |
| | | | | |
| **Risk Preference** | | | | |
| cf. Low risk | | | | |
| Medium risk | 6793 | 0,61 | **102990** | **4,47** |
| High risk | **132834** | **5,32** | **253748** | **7,17** |
| | | | | |
| **Objective Risk** | | | | |
| cf. Low risk | | | | |
| Medium risk | **-52369** | **-2,43** | **276652** | **14,68** |
| High risk | **-70768** | **-2,44** | **453448** | **20,71** |
| Mean for responders | 321734 | | 498161 | |
| P10 for responders | 0 | | 12157 | |
| P90 for responders | 1079902 | | 1183000 | |

## 5. Discussion and Conclusions

This study concludes that there is a relationship between bank customers' risk appetite and their balance sheets. Those who take on more risk seem to have higher financial assets and also higher debt.

When using this study's three measures of risk attitudes, i.e., subjective risk tolerance, subjective risk preference and objective risk appetite, we find significantly higher financial assets for

bank customers who tolerate or prefer high risk, compared with those who prefer medium or low risk. Similarly, bank customers with medium risk appetite have significantly higher financial assets compared with those who have low risk appetite. The fourth and final model in our regressions controls for demographic, socio-economic, financial and educational variables, including the customers' financial literacy.

The results are in line with our hypothesis based on earlier studies (Chaulk et al., 2003; Fan and Xiao, 2004; Hallahan et al., 2004; Yao et al., 2004) which find that customers with a high risk tolerance have higher wealth. However, as Gollier, in Guiso et al., 2002, argue, wealthier people own more risky assets and invest a larger share of their wealth in risky assets, and it is difficult to establish causality. Also Calvet and Sodini (2014) refer to the impact of wealth on risk-taking, whereas Brunnermeier and Nagel (2008) find constant risk aversion and inertia after fluctuations in wealth.

Using the same risk measures, the picture is less clear when analyzing bank customers' debt. Both subjective measures of risk tolerance and risk preference show that bank customers with high risk appetite have significantly higher debt than those with low risk appetite. On the other hand, objective risk, which is measured by relating saving deposits and the more risky stocks and mutual funds to total assets, show that bank customers have less debt the more risk seeking the customer is. One reason could be the need to hold non-risky assets in order to be able to pay debt service. Finding better ways to measure objective risk, e.g., by being able to divide the customers' mutual funds into more or less risky assets could help to spread more light on this finding.

The results regarding the relationship between subjective risk and debt are in line with our hypothesis based on the argument that acquiring debt increases consumption with repayments made in the future. However, there is a risk that these repayments cannot be made, hence will customers with low risk appetite acquire less debt.

Analyzing the other independent variables, being a homeowner and having a mortgage are the main reasons for taking on more debt. In future research, it is important to add data on real estate assets in order to analyze the balance sheet as a whole.

There is some comfort in finding that the bank customers with the highest financial literacy and education take on more debt compared to those with the lowest capabilities. Similarly, those who take on more debt have higher income as well. Even so, many customers – especially those with mortgages – have low financial assets in Sweden. Therefore, they are vulnerable if the labor market weakens at the same time as debt service requirements tighten.

Policy implications include increasing the awareness of the importance of measuring bank customers' risk appetite with a broad set of methods including objective as well as subjective measures, both as a way for the bank to understand their customers' context of saving and borrowing, and as a way for the customers to understand their own risk management (see e.g.

Campbell and Cocco, 2003 for a discussion on household risk management in the American context). Debt perceptions tend to differ across individuals depending on the economic situation, and several non-financial factors such as personality traits (Keese, 2012), and also financial literacy (Lusardi and Tufano, 2009). Measuring customers' risk needs to be done in a more systematic and transparent way. Customers with higher risk appetite will take on more debt compared to those with lower risk appetite. This may also mean that more risk seeking customers manage their debt in a riskier way, e.g. with more adjustable interest rates and less amortization. They may also choose riskier assets in their wealth management. Increasing the bank's and the customer's transparency regarding risk, as well as providing a more strategic management, is also a way to decrease macroeconomic risks, thus alleviating the burden of central banks and financial supervisory institutions.

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## APPENDICES

### A1. OLS regression on Total Debt with focus on Risk Preference

| Variables | Description | Risk only | | Model 1+Demographics | | Model 2+Financials | | Model 3 + Skills | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Model 1** | | **Model 2** | | **Model 3** | | **Model 4** | |
| | | Coefficients | t-stat | Coefficients | t-stat | Coefficients | t-stat | Coefficients | t-stat |
| **Intercept** | | **174765** | **25,30** | **137780** | **4,47** | **54635** | **1,76** | **77102** | **2,10** |
| **Risk tolerance** | cf. 1= Low Risk Preference | | | | | | | | |
| 2 | 2= Medium Risk Preference | **139970** | **13,55** | **57581** | **5,48** | **24483** | **2,54** | 6793 | 0,61 |
| 3 | 3= High Risk Preference | **384295** | **13,71** | **227763** | **8,91** | **175228** | **6,74** | **132834** | **5,32** |
| **Age** | cf. Group 18-24 | | | | | | | | |
| 25-34 | | | | **177491** | **7,35** | 24111 | 1,18 | -2796 | -0,13 |
| 35-54 | | | | **361084** | **15,15** | **60401** | **3,11** | **47852** | **2,35** |
| 55-64 | | | | **269292** | **9,84** | -21559 | -0,61 | -35795 | -0,98 |
| 65-74 | | | | **110933** | **6,19** | **-90083** | **-5,18** | **-122753** | **-6,15** |
| 75--> | | | | **282243** | **1,66** | **-75146** | **-4,33** | **-101704** | **-5,01** |
| **Gender** | Male=1 Female=0 | | | **255682** | **18,18** | **205053** | **12,16** | **199430** | **11,14** |
| **Family status** | cf. Group Singles | | | | | | | | |
| Single w.children | | | | **133834** | **4,01** | **74993** | **2,64** | **78840** | **2,67** |
| Couple w.children | | | | **33232** | **2,61** | **-44898** | **-4,07** | **-55325** | **-4,60** |
| Couple w/o children | | | | **163636** | **8,89** | 15094 | 0,74 | 9615 | 0,46 |
| Other | | | | -21291 | -0,64 | 10448 | 0,34 | 19924 | 0,57 |
| **Large city** | The four largest cities=1, rest=0 | | | **-354604** | **-11,20** | **-297676** | **-9,62** | **-282598** | **-9,03** |
| **Homeowner** | Homeowner=1 | | | | | **77348** | **5,12** | **74642** | **4,74** |
| **Mortgage** | Mortgage=1 | | | | | **502703** | **20,5** | **509011** | **19,21** |
| **Financial assets** | Sum of all fin.assets in bank register | | | | | 0,0094 | 0,83 | 0,0022 | 0,20 |
| **Income** | Annual net income | | | | | **0,4514** | **3,99** | **0,2884** | **2,40** |
| **Education** | cf. No finalized education | | | | | | | | |
| Pre-gymnasium | | | | | | | | 5340 | 0,36 |
| Gymnasium | | | | | | | | **-40104** | **-2,57** |
| Higher education < 3yrs | | | | | | | | 32039 | 1,01 |
| Higher education >= 3 yrs | | | | | | | | **75580** | **3,79** |
| **Financial Literacy** | cf. 0 answers right | | | | | | | | |
| 1 | 1/6 answer right | | | | | | | **-26343** | **-2,14** |
| 2 | 2/6 answers right | | | | | | | -9098 | -0,56 |
| 3 | 3/6 answers right | | | | | | | **49540** | **2,58** |
| 4 | 4/6 answers right | | | | | | | **71818** | **1,57** |
| 5 | 5/6 answers right | | | | | | | **104246** | **3,66** |
| 6 | 6/6 answers right | | | | | | | **285094** | **3,92** |
| Regression | | 159,5 | | 120,5 | | 243,4 | | 147,6 | |
| F-statistic | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-square | | 0,0204 | | 0,0825 | | 0,1485 | | 0,1491 | |
| Number of observations | | 14824 | | 13518 | | 13518 | | 11893 | |

## A2. OLS regression on Total Debt with focus on Objective Risk

| Variables | Description | Risk only | | Model 1+Demographics | | Model 2+Financials | | Model 3 + Skills | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Model 1** | | **Model 2** | | **Model 3** | | **Model 4** | |
| | | Coefficients | t-stat | Coefficients | t-stat | Coefficients | t-stat | Coefficients | t-stat |
| **Intercept** | | **323092** | **21,85** | **212504** | **6,24** | **110969** | **3,19** | **109126** | **2,82** |
| **Risk tolerance** | cf. 1= Low Objective Risk | | | | | | | | |
| 2 | 2= Medium Objective Risk | **46434** | **2,59** | 13748 | 0,72 | **-45750** | **-2,26** | **-52369** | **-2,43** |
| 3 | 3= High Objective Risk | 412 | 0,02 | -23062 | -0,99 | **-60640** | **-2,26** | **-70768** | **-2,44** |
| **Age** | cf. Group 18-24 | | | | | | | | |
| 25-34 | | | | **186929** | **7,91** | 32852 | 1,61 | 3965 | 0,18 |
| 35-54 | | | | **376855** | **15,97** | **74407** | **3,79** | **62420** | **2,99** |
| 55-64 | | | | **275098** | **9,65** | -18844 | -0,54 | -30401 | -0,84 |
| 65-74 | | | | **107311** | **5,83** | **-95570** | **-5,69** | **-125514** | **-6,29** |
| 75--> | | | | 8189 | 0,47 | **-91255** | **-5,27** | **-106753** | **-5,18** |
| **Gender** | Male=1 Female=0 | | | **290248** | **17,81** | **227065** | **11,72** | **209265** | **10,76** |
| **Family status** | cf. Group Singles | | | | | | | | |
| Single w.children | | | | **132377** | **4,00** | **71785** | **2,58** | **76974** | **2,65** |
| Couple w.children | | | | **36888** | **2,9** | **-44812** | **-4,09** | **-57040** | **-4,77** |
| Couple w/o children | | | | **171176** | **8,97** | 17604 | 0,85 | 9158 | 0,44 |
| Other | | | | -26175 | -0,77 | 3542 | 0,11 | 12545 | 0,37 |
| **Large city** | The four largest cities=1, rest=0 | | | **-364871** | **-11,41** | **-301256** | **-9,79** | **-282542** | **-9,17** |
| **Homeowner** | Homeowner=1 | | | | | **93412** | **5,70** | **84838** | **5,1** |
| **Mortgage** | Mortgage=1 | | | | | **505043** | **20,68** | **511030** | **19,37** |
| **Financial assets** | Sum of all fin.assets in bank register | | | | | 0,0215 | 1,61 | 0,0109 | 0,86 |
| **Income** | Annual net income | | | | | **0,4834** | **4,38** | **0,3010** | **2,55** |
| **Education** | cf. No finalized education | | | | | | | | |
| Pre-gymnasium | | | | | | | | 7269 | 0,49 |
| Gymnasium | | | | | | | | **-36628** | **-2,36** |
| Higher education < 3yrs | | | | | | | | 35527 | 1,15 |
| Higher education >= 3 yrs | | | | | | | | **77259** | **3,89** |
| **Financial Literacy** | cf. 0 answers right | | | | | | | | |
| 1 | 1/6 answer right | | | | | | | -11507 | -0,94 |
| 2 | 2/6 answers right | | | | | | | 10424 | 0,67 |
| 3 | 3/6 answers right | | | | | | | **76597** | **4,17** |
| 4 | 4/6 answers right | | | | | | | **103060** | **2,17** |
| 5 | 5/6 answers right | | | | | | | **146013** | **5,4** |
| 6 | 6/6 answers right | | | | | | | **339908** | **4,48** |
| Regression | | 4,79 | | 122,06 | | 242,44 | | 147,7 | |
| F-statistic | | 0,0083 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-square | | 0,0005 | | 0,0759 | | 0,1446 | | 0,1472 | |
| Number of observations | | 14824 | | 13518 | | 13518 | | 12325 | |

## A3. OLS regression on Financial Assets with focus on Risk Preference

| Variables | Description | Risk only | | Model 1+Demographics | | Model 2+Financials | | Model 3 + Skills | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Model 1** | | **Model 2** | | **Model 3** | | **Model 4** | |
| | | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| **Intercept** | | **375178** | **25,33** | 20390 | 0,51 | **-77309** | **-1,88** | **-151215** | **-3,42** |
| **Risk tolerance** | cf. 1= Low Risk Preference | | | | | | | | |
| 2 | 2= Medium Risk Preference | **100593** | **5,55** | **179849** | **8,8** | **158299** | **8,01** | **102990** | **4,47** |
| 3 | 3= High Risk Preference | **350415** | **12,31** | **417570** | **13,05** | **377241** | **12,64** | **253748** | **7,17** |
| **Age** | cf. Group 18-24 | | | | | | | | |
| 25-34 | | | | **37043** | **2,18** | 23872 | 1,13 | -5309 | -0,22 |
| 35-54 | | | | **213392** | **10,3** | **177470** | **6,49** | **168796** | **5,68** |
| 55-64 | | | | **516642** | **20,89** | **454987** | **17,05** | **447564** | **15,09** |
| 65-74 | | | | **696165** | **21,14** | **598977** | **16,30** | **583805** | **13,29** |
| 75--> | | | | **738012** | **21,46** | **605410** | **17,97** | **609245** | **16,68** |
| **Gender** | Male=1 Female=0 | | | **69121** | **3,53** | **68761** | **3,43** | 25665 | 1,45 |
| **Family status** | cf. Group Singles | | | | | | | | |
| Single w.children | | | | **-91439** | **-2,28** | **-99262** | **-2,53** | **-94727** | **-2,35** |
| Couple w.children | | | | **-116380** | **-3,72** | **-131714** | **-4,30** | **-131436** | **-4,14** |
| Couple w/o children | | | | **-91990** | **-3,20** | **-110993** | **-3,87** | **-115134** | **-3,84** |
| Other | | | | -31192 | -0,73 | **-139935** | **-3,17** | **-132164** | **-3,40** |
| **Large city** | The four largest cities=1, rest=0 | | | **-114111** | **-3,29** | **-110527** | **-3,24** | **-70426** | **-2,11** |
| **Homeowner** | Homeowner=1 | | | | | **347193** | **13,16** | **296313** | **9,89** |
| **Mortgage** | Mortgage=1 | | | | | **-403263** | **-15,21** | **-391432** | **-14,27** |
| **Income** | Annual net income | | | | | **0,5512** | **3,71** | **0,4117** | **2,58** |
| **Education** | cf. No finalized education | | | | | | | | |
| Pre-gymnasium | | | | | | | | -26767 | -0,84 |
| Gymnasium | | | | | | | | **66944** | **1,90** |
| Higher education < 3yrs | | | | | | | | 34865 | 1,04 |
| Higher education >= 3 yrs | | | | | | | | **122920** | **3,29** |
| **Financial Literacy** | cf. 0 answers right | | | | | | | | |
| 1 | 1/6 answer right | | | | | | | **63598** | **2,50** |
| 2 | 2/6 answers right | | | | | | | **89925** | **3,11** |
| 3 | 3/6 answers right | | | | | | | **142818** | **4,21** |
| 4 | 4/6 answers right | | | | | | | **227034** | **5,32** |
| 5 | 5/6 answers right | | | | | | | **354432** | **6,64** |
| 6 | 6/6 answers right | | | | | | | **626138** | **5,98** |
| Regression | | 75,80 | | 130,29 | | 101,10 | | 67,37 | |
| F-statistic | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-square | | 0,0145 | | 0,0705 | | 0,1003 | | 0,1203 | |
| Number of observations | | 14824 | | 13518 | | 13518 | | 12325 | |

## A4. OLS regression on Financial Assets with focus on Objective Risk

| Variables | Description | Risk only | | Model 1+Demographics | | Model 2+Financials | | Model 3 + Skills | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Model 1** | | **Model 2** | | **Model 3** | | **Model 4** | |
| | | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat | Coefficient | t-stat |
| **Intercept** | | **218538** | **33,44** | 44387 | 1,18 | **-66398** | **-1,75** | **-154938** | **-3,54** |
| **Risk tolerance** | cf. 1= Low Objective Risk | | | | | | | | |
| 2 | 2= Medium Objective Risk | **330080** | **19,89** | **324932** | **18,45** | **299332** | **16,36** | **276652** | **14,68** |
| 3 | 3= High Objective Risk | **540293** | **25,72** | **510227** | **23,35** | **492362** | **23,48** | **453448** | **20,71** |
| **Age** | cf. Group 18-24 | | | | | | | | |
| 25-34 | | | | 5761 | 0,33 | -6737 | -0,32 | -38310 | -1,58 |
| 35-54 | | | | **94222** | **4,43** | **64062** | **2,32** | **63555** | **2,07** |
| 55-64 | | | | **374179** | **15,52** | **324740** | **12,24** | **331319** | **11,01** |
| 65-74 | | | | **541316** | **17,66** | **461482** | **12,99** | **461850** | **10,62** |
| 75--> | | | | **558240** | **17,75** | **446402** | **13,96** | **472382** | **12,76** |
| **Gender** | Male=1 Female=0 | | | **144423** | **7,86** | **131435** | **6,79** | **69344** | **4,12** |
| **Family status** | cf. Group Singles | | | | | | | | |
| Single w.children | | | | **-90223** | **-2,24** | **-98900** | **-2,51** | **-95015** | **-2,35** |
| Couple w.children | | | | **-103718** | **-3,36** | **-115273** | **-3,82** | **-115239** | **-3,70** |
| Couple w/o children | | | | **-89455** | **-3,11** | **-103643** | **-3,65** | **-107808** | **-3,63** |
| Other | | | | -47590 | -1,14 | **-144550** | **-3,34** | **-128451** | **-3,36** |
| **Large city** | The four largest cities=1, rest=0 | | | **-144129** | **-4,11** | **-132103** | **-3,83** | **-86539** | **-2,59** |
| **Homeowner** | Homeowner=1 | | | | | **310683** | **11,79** | **263954** | **8,63** |
| **Mortgage** | Mortgage=1 | | | | | **-408515** | **-14,71** | **-392671** | **-14,12** |
| **Total Debt** | Sum of all outstanding loans in bank register | | | | | 0,0259 | 1,12 | 0,0120 | 0,67 |
| **Income** | Annual net income | | | | | **0,6035** | **4,03** | **0,4336** | **2,70** |
| **Education** | cf. No finalized education | | | | | | | | |
| Pre-gymnasium | | | | | | | | -35595 | 1,35 |
| Gymnasium | | | | | | | | 52538 | 1,53 |
| Higher education < 3yrs | | | | | | | | 26893 | 0,82 |
| Higher education >= 3 yrs | | | | | | | | **115273** | **3,15** |
| **Financial Literacy** | cf. 0 answers right | | | | | | | | |
| 1 | 1/6 answer right | | | | | | | 33191 | 1,35 |
| 2 | 2/6 answers right | | | | | | | 74612 | 2,76 |
| 3 | 3/6 answers right | | | | | | | **130029** | **4,19** |
| 4 | 4/6 answers right | | | | | | | **221016** | **5,52** |
| 5 | 5/6 answers right | | | | | | | **356114** | **7,18** |
| 6 | 6/6 answers right | | | | | | | **642840** | **6,53** |
| Regression | | 473,09 | | 139,49 | | 109,73 | | 72,67 | |
| F-statistic | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-square | | 0,0416 | | 0,0886 | | 0,1188 | | 0,1416 | |
| Number of observations | | 14824 | | 13518 | | 13518 | | 12325 | |

**A5. Questionnaire related to financial literacy**

How high is the Riksbank's inflation target?

□1.0% □2.0% □3.0% □Do not know

If there is a risk that inflation will exceed the inflation target, what should the Riksbank do?

□ Lower the repo rate □ Raise the repo rate □ Do nothing □ Do not know

If the nominal interest rate is 5% and the expected inflation is 2%, how high will the real interest rate be (approximately)?

□ 2.5% □ 3.0% □ 7.0 % □ Do not know

A savings product where you will receive a guaranteed amount at maturity, and the return follows the equity market, is called:

□ Equity fund □ Hedge fund □ Equity-linked security □ Do not know

Mutual funds have different risk levels; which of these mutual fund types is generally viewed as having the highest risk?

□ Balanced fund □ Bond fund □ Equity fund □ Do not know

The definition of the P/E-ratio is:

□ Price per share divided by earning per share

□ Price per share divided by own capital per share

□ Price per share divided by the sales per share

□ Do not know

| # of right answers | Frequency | Percent | Cum. |
|---|---|---|---|
| 0 | 3002 | 20.42 | 20.42 |
| 1 | 3360 | 22.85 | 43.27 |
| 2 | 2490 | 16.94 | 60.21 |
| 3 | 2116 | 14.39 | 74.60 |
| 4 | 1693 | 11.51 | 86.11 |
| 5 | 1234 | 8.39 | 94.50 |
| 6 | 808 | 5.50 | 100.00 |
| Total | 14703 | 100.00 | |