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Risk tolerance and financial market participation

Bachelor's thesis

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I hereby declare that I have compiled the thesis/paper independently

and all works, important standpoints and data by other authors

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has not been previously presented for grading.

The document length is 8314 words from the introduction to the end of the conclusion.

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ABSTRACT

This thesis investigates the association between of risk tolerance and prior assets performance, and financial market participation. More specifically this study looks at how these factors are linked to participation in the markets for six different financial assests and to portfolio allocation decisions. The study relies on the online survey data resulted in 71 responses.The results suggest that prior performance of an assets has an impact on the allocation of the individuals porfolio allocation. Specifically, stocks and noble metals having the strongest association with prior performance compared to other asset classes, indicating that they are more sensitive to be influenced of prior performance.

Keywords: Risk tolerance, Prior asset performance, Financial markets participation

INTRODUCTION

Investing has gained more and more attention in the recent years. COVID-19 and other phenomenons has presented unusual events in the financial sectors that have gained peoples attention. It is widely known that the stock market has been profitable in the long run and yet some choose not to participate. Therefore understading investors decisions about participation in specific markets remains relevant and the answers could be important to investors, policy makers and financial advisors. level of risk tolerance is important when determining decisions in different areas of the financial markets.

This thesis will examine how risk tolerance and prior asset performance affects the investement behaviour of individuals, including participation in six different financial assets (stocks, bonds, real estate, noble metals, ETFs, and crypto) and portfolio allocation, specifically, the share of total portfolio invested in each asset class. Even though the topic of risk tolerance and market participation has been widely studied before, this study aims to find relationships between risk tolerance and portfolio allocations. During the Covid-19, especially stocks and cryptocurrencies has been one of the popular topics in the financial markets.

Risk tolerance plays an important role in financial markets. More risk taking can possibly mean bigger losses, but also larger profits (Finke and Huston, 2003). When it comes to financial planning, it is clear that most of the time the investor wants to maximize the returns and minimize the risks. People consider risk differently and therefore the allocation of protfolios are, in many cases, a lot different from each other. There are many different ways to measure risk, but the most common way to do that is through a series of questions via a questionnaire.

The opposite of risk tolerance is usually seen risk aversion. Risk aversion can be defined as tendency to avoid risk (Khaw et al., 2020) . This can be sometimes be a reason for to not participate in the stock markets. People with more risk tolerance usually purchase more stocks and other similar instruments. Risk averse investors usually hold less volatile instruments, such as, cash or government bonds. For example, a study by Hariharan (2000) found that higher risk tolerance lowers the chances of holding risk-free assets.

The main research questions for this study are:

1. Does individual's risk tolerance and prior experience impact their portfolio allocation?

2. How does risk tolerance impact portfolio allocation decisions among individuals?

Based on prior literature and the research aim two main hypotheses were developed.

The hypotheses are as follows:

1. There is a positive association between individuas' risk tolerance and participation in financial assets market.

2. There is a positive association between prior performance of an asset and investor's allocation to the specific asset.

To answer the research questions, an online survey was made to collect data from respondents. The questions in the survey ranged from risk tolerance, different asset performance, market participation and some other relevant factors. Based on the results got from the survey, a total of 24 regressions were made and the data was analyzed to examine the relationships between variables. The findings provided some insights and gave answers to our research questions.

The thesis is structured into several sections. The introduction provides some information about the research questions and the subject. Literature review gives an overview of the previous relevant literature. The methodology section gives a detailed description of how the research was made and data collection methods. The results section presents the findings made from original regressions and gives insights from additional robustness tests. The discussion section interprets the results and makes some recommendations for future research. The conclusion summarizes the findings and discusses about the hypotheses. Lastly the reference lists the sources used in this thesis.

1. Literature review

For the literature review, I will build an overview of financial stock market participation and what it means to be a part of the financial markets. Other parts gives an overview of risk tolerance and risk aversion.

1.1.   Risk tolerance

Risk tolerance is a complex subject. Risk tolerance measures persons ability handle risk and could measure, for example, the potential loss an investor is willing to manage in their portoflio for a potential winnings. There are a variety of factors that are related to risk tolerance. Prior literature has found that such as age, income, gender, education and marital statuts has a major impact on risk taking. For example, study by Grable and Joo (2004) found that marital status, income and financial knowledge are heavily related to financial risk tolerance. In addition, Hallahan et al., (2004) found similar results, with wealth, gender and income being associated with financial risk tolerance.

Age as factor usually has a negative effect on risk tolerance. Meaning older people does not want take as much risk as younger generation. Yao et al. (2011) concluded the reasons being shorter investmert horizon since every year shortens the horizon, which means that potential losses might do more damage compared to a longer horizon, where the market volatility is not necessarily as meaningful as it in shorter periods of time. In addition Yao et al. (2011) stated that there may be a increased chance when investors are closing to retirement, rather than building wealth, they want to preserve it by switching the weight from more risker instruments to less risker ones to, for example, government bonds.

Sung and Hanna (1997) examined through a survey the factors of risk tolerance. The study investigated what effects does different variables had on risk tolerance. Theses variables included, for example education and income. They found that education had an 43% effect on those who did

not graduate from high school, and those who did had an 54% effect. People who went to college and did not graduate had an 62% and those who graduated college 71%. In other words, risk tolerance was poitively associated with higher education. Similarly, Sung and Hanna (1997) investigated the effects of non-investemt income. The study found that non-investment income was correlated positively to risk tolerance. For example, level of 50 000 dollars of non-investment income, there was a 60% of chance of being risk tolerant.

Yao and Hanna (2005) measured the effect of marital status on risk tolerance. The results of the study was that overall, men were more willing to take substantial risk or any risk at all and for example, in marriage, females were less likely to take high finanical risk compared to males, 15% and 23,4%. In addition, a study by Grable (2000) also states, that married people are more risk tolerant in comparison to single ones.

1.2. Financial market participation

Nowadays there are many ways to participate in the financial markets. There are many kinds of markets. A marketplace where dealing takes place, such as the stock market, forex market, bond market, derivatives market, and others, can be referred to as a financial market. Stock market is a common way to participate in the financial markets since it is open to everyone. A stock gives an ownership in a specific company. An investor may buy and sell these stocks as many times as they want or keep them a longer period. The freedom of selling and buying the stocks makes the markets relatively volatile compared to other markets. The stock market is risky but possibly profitable in the long run.

There are many different factors that influences one's participation into the financial markets. Investors who are less risk tolerant usually are not participating in the financial markets as much as those who are risk tolerant. Mishra (2018) found that people who are more risk tolerant are more likely to participate in the stock markets when compared to those who are less risk tolerant.

Financial literacy is correlated heavily with stock market participation. According to van Rooij et al. (2011) people with little understanding about the financial markets have a low likelihood of participating in the stock market. In addition, a study by Hermansson and Jonsson (2021) concluded that financial literacy is positively associated with risk tolerance. The complexity in the

financial markets can make the average investor misunderstand different products. Financial well-being is usually when a state of financial freedom is achieved, free from financial stress (Mishra 2018). Education plays a significant role in participation in the stock market. Bernheim and Garrett (2003) Found that people with more financial education in the work place or in high school are more likely to save more. In addtion, Lusardi and Mitchell (2007) stated in their study that people with lower financial literacy does not plan for retirment as well as people with higher financial literacy and in result of that, they accumulate less wealth. Also, mistakes in the financial markets are frequently made in the age group which are showing the lowest amount of financial literacy, the young and eldery (Agarwal, S., Driscoll, J. C., Gabaix, X., & Laibson, D., 2008).

1.3. Risk tolerance and Prior experience

Prior experience on portfolio allocation and risk tolerance has been widely studied in the fiel of finance and economics. Nevertheless, some of the insights of behavioural science, like the prospect theory can provide helpful frameworks for the process of the decision making of individual investors.

When individuals' assets perfom well they could be more likely to invest more in to the assets in the future. The reasons for this phenomenom could be explained with various theories. For example, a study by (Kaustia, M., & Knüpfe, 2008), where they examined IPOs in Finland, found that larger returns in the previous IPO indicates that there is a greater likelihood in participating for future IPOs. In addition they state that their results are in line with the reinforcement theory, which means that personal experiences has great effects on individuals behaviour. The findings underlines the importance of recognizing investor experiences and how they might affect their participation in the future. Positive experiences in the financial markets can be one of the reasons why the likelihood of investing increases in the future.

The prospect theory was first formulated by Kahneman and Tversky in 1979. The prospect theory explains that losses and gains are viewed differently from each other. The theory posits that individuals, when facing potential losses, tend to exhibit risk seeking behaviour and when it comes to potential gains they tend to be risk averse (Levy, 1992). Moreover, individuals care more about losses than they do about winnings, thus individuals make decisions based on perceived gains and

not perceived losses. In addtion, the theory highlights the role of heuristics and different cognitive biases in the individuals decision making under risk and uncertainty. Heuritics allows individuals make decisions and judgements more quickly and efficiently and it tries to make the decision that satisfies rather than making the best possible decision (Gigerenzer, 2008). This can lead to errors and some biases in decision-making, especially when people are trusting them too much or are ignoring other relevant information. Heuristic can be effecrtive and powerful tool for decision-making. However, it is important to know that potential biases and other limitations could affect the decisions heavily.

Overall the prospect theory can offer relevant information about the concept of risk tolerance and help to understand the relationship between risk toleance, prior experience and portfolio allocation.

1.4.   Relationship between risk tolerance and investment choices

One of the perspective of the relationship between risk tolerance and investent choices is the expected utility theory. The utility theory proposes that the investors decision to invest in a specific asset is based upon the expected utility of the asset. By weighing the weighted average of all potential results under specific conditions, the expected utility is determined. However, there are considerations that have challenged the expected utility theory. For example, Prospect theory suggest, as said before, that there are other more more valuable things to consider that maximizing utility. Prospect theory allows individuals to choose possible outcomes that does not necessarily maximise their utility since they place other variables above utility (Tejvan Pettinger, 2019).

Previous stuidies suggest that people with high risk tolerance are more likely to own and invest in higher risk instruments, such as, stocks. People with lower risk tolerance held more assets with lower risk, for example, government bonds and cash. Studies such as (Guiso et al., 2008) showed that invididuals with higher risk tolerance are more likely to have larger portion of their investments in stocks, which is consireded to be an risky asset. In addition, people with lower risk tolerance had larger portion in cash.

Overconfidence can be defined as one's ability to do a task far more better than actually is cabable. There can be significant effects with overconfidence in financial decision making. Overconfidence could see themselves far more capable of handling risk than they actually are. This can lead to

taking more risk than than the individuals are financially able to take. Overconfidence is associated with higher levels of risk tolerance. Yao and Rabbani (2021) Conducted a study and found that overconfident individuals are exposing their portfolios to more risk. The higher the risk tolerance the higher the share of reported overconfident individuals in the segment of their studies. Furhermore, Barber and Odean (2001) found that men are more prone to overconfidence than women. Overconfident people overestimate their knowelge on the financial markets and therefore does not get the expected returns. In addition Xia et al. (2014) conducted a study and found that overconfident people are more likely to participate in the stock market by 20%.

1.5. Hypothesis Development

The behaviour of investors in the financial markets differ from each other quite significantly. There are various factors. The allocation of individuals portfolios are correlated with risk tolerance. Investment behivour can be somewhat explained through assesment of indviduals risk preferences.

The aim of this thesis is to study does both risk tolerance and prior experience have an affect on the individuals portfolio allocation. There are numerous variables that has impacts on the individuals market participation and in their portfolio allocation. Previous studies states that the higher the risk tolerance the more likely they are associated with more risky investments, such as, stocks and cryptocurrencies. For example, Mishra (2018) stated that more risk tolerant individuals has a greater possibility in participating in the financial markets. Moreover, there are various factors that are related to risk tolerance. Hallahan et al., (2004) concluded that wealth, income and gender are associated with financial risk tolerance. In addition, Kaustia, M., & Knüpfe (2008) argued that individuals who made more profits from previous IPOs were more likely to participate into future IPOs.

Based on the literature review and the research questions the following hypotheses were developed:

1. There is a positive association between individuas' risk tolerance and financial market participation.

2. There is a positive association between prior performance of an asset and investor's allocation to the specific asset.

2. Data and methodology

2.1. Data

The data for this thesis was collected from through distributed questionnaires in English. The questions used were closed-ended questions for making the analysis more clearer to interpret. The questions of the survey was divided into four parts. The first part included basic information about the participant, including gender, age, education and income levels. The second section contained questions about stock market participation and how the possible portfolio is allocated. The last section included questions about risk tolerance and how the participants possible investments has performed in the last 3 years. For this study the questionniare was distributed via social media and via e-mail in Finland. In three days the questionnaire got 71 responses.

The survey was made to be simple and short in order to get as much answers as possible. The approximate time to take the survey was four minutes. The qestions were mostly self designed and, with some taken from previously conducted studies.

The survey consisted of 14 main questions and 13 sub questions. The first section had four questions going over the participants socio-economic characteristics of the participants. These quesitons were gender, age, education and income levels. In the income level question the participant had the option to choose between the scale of 1-10 on how would they describe their household income level. 1 being very low and 10 being very high. The reason for this kind of scale is that some people may be hesitant to anwer question about their income and therefore skip the question entirely. Also, the goal was to get as many answers as possible.

The second part consisted of market participation and portfolio allocation. The participants were asked "Do you have investments?" with options being Bonds, ETF's, Real Estate, Noble metals, Stocks, Crypto, Other and no investments. After answering, there were follow up-questions of what % of the participants savings were invested in the specific assets with a scale of 0-10, where zero being no investment in the asset and ten being 100% of savings invested in the asset. There

are some limitations with this kind of method of collecting data. Some of the respondents may not think that, for example, keeping money in a 0% interest savings account as an investment. Therefore some of the total percentages of savings does not equal to 100%.

The third part of the survey consisted of questions about risk and how knowledgeable do they consider yourself when it comes to investing. First the participants were asked how comfortable they are with taking risk. The scale was 1-10, with one being not comfortable at all and ten being extremely comfortable. After that question about how much financial risk are you willing to take in order to achieve higher investment returns was asked, with one being no financial risk and ten being high financial risk. Next two questions measures how the participant considers their knowledge about investing and have they ever worked with a financial advisor.

The fourth part consisted questions about questions about the participant confidence in their ability to manage their own personal finances, how would they compare their investment skills to other investors and how do they feel their investments have been perfomed in the last three years. If they did not have the specific asset they simply put zero as an answer and ten if the asset had perfomed better than average. The final two questions were "how optimistic are you about your investments in the future" and "how much are you willing to pay for a lottery ticket with a 50/50 chance to win 1000 dollars. For the last question the aim was to get an overview of the participants risk preference. The participant was asked to write the answer in a text box.

The questionnaire is provided in Appendix 1.

2.2. Methods

The methods used in this thesis are quantitative research methods to analyze the data that were received from the survey. Because having to dependant variables, a total of 24 regressions were made. We can determine what type of influence our independent variables have on market paricipation and allocation using cross-sectional regression.

Gretl was used to determine which variables may have an impact on two dependent variables. The variables in question was owning a certain asset and the percentage of saving in each asset. The

first variable if the participant owns a asset was binary so a logit binary model was run. For the other dependent variable OLS regression model was run.

The software used for the regressions in this study was Gretl. In this study, there are three levels of statistical significance: 1%, 5% and 10%; thus, if the p-value of the independent variable is less than of these three values, the independent variable is statistically significant.

The measurement of risk is measured similarly to the way the European Central Bank's Household Finance and Consumption survey where the risk prefences are measured via self reporting. The difference being that ECB uses 4 levels as answers and in our survey we are using 10 levels as answers.

2.3. Descriptive statistics

Table 1.

Variable	Frequency	Mean
Gender	71	0,52
Age		34,42
Participation	61	
Less than high school	3	
High school degree	13	
Bachelor's degree	33	
Master's degree	20	
PhD	1	
Assets:		
Bonds	6	
ETF's	15	
Noble metals	9	
Stocks	42	
Crypto	11	
Other	22	
No investments	10	
Income	69	5,8
Risk taking		5,56
Financial risk		5,34
Knowledge		4,87
Professional advise:		
Yes	12	
No	59	

Confidence	6,52
Optimism	5,7
Lottery	214,5

2.3.1. Socio-economic characteristics

The first part of the survey collected data from the respondents socio-economic characteristics. Table 2 representes the respondents' age and gender. Of the 71 respondents in the study 52% (n=37) were male and 48% (n=34) were female. The age group of the participants ranged from 22 to 87 years with a mean age of 34,4 years. The majority of the participants were in the age range between 18-25 (36%, n=26), second being the age group 49 and over (31%, n=22), third being the age group between 26-33 with (22.5%, n=16). The fourth largest sample was the ages between 41-48 (5.6% n=4) and the smallest group being group 34-40 had (4%, n=3).

Table 2: Survey Data.

		18-25	26-33	34-40	41-48	49 and over
Gender	Female	10	11	2	1	10
	Male	16	5	1	3	12
Total						71

Source: author

Figure 1 shows the distribution of the level of education in the survey data. Most of the respondents reported having bachelor's or master's degree. The least number of reported answers was PhD with 1,4% (n=1). High school of equivalent was reported having 18.3% (n=13) answers. 48% (n=34) reported having bachelor's degree and 28.2% (n=20) had completed master's degree. The distribution of the education level differed slightly by gender. Two of the reported "Less than high school diploma were females and one was male. Higher proportion of females reported High School degree or equivalent with 61.5% (n=8) and 38.5% (n=5) being males in the category. In bachelor's degree a quite significant difference was seen with 39% of being females and 61% being males. A total of 11 females and 9 males reported their level of education being master's degree and 1 male reported their education level being PhD. The education levels are heavily centred around between bachelor's and master's degree levels of education.

Figure 1: Respondents' education
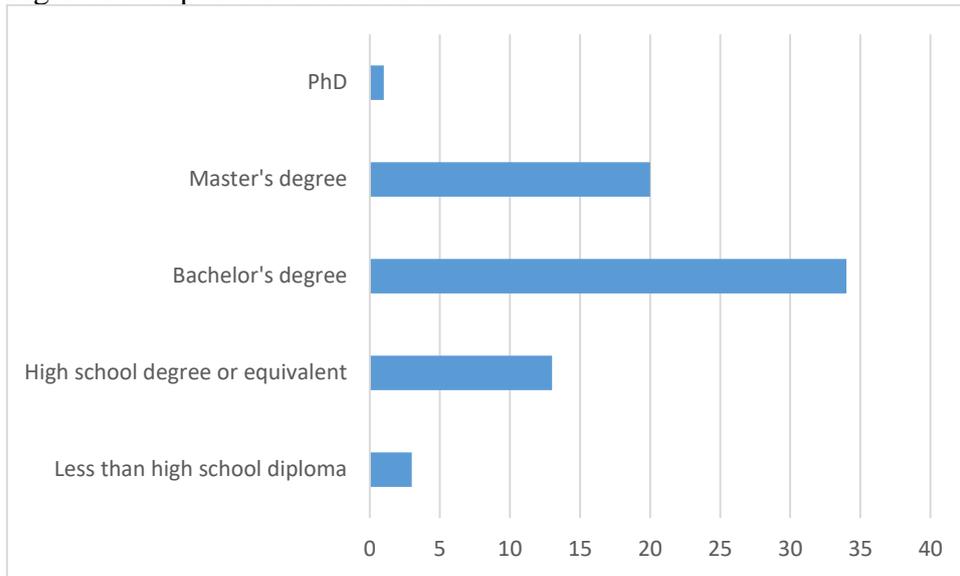
Source: author

The income question in the questionnaire was optional. The reason for that was that people could be reluctant to answer questions about their income level. The decision was also making the options for the question to range between 1-10, one being very low and ten being very high. The downside of this kind of scale is that it does not give accurate data of the respondent's income level. Also, the use of verbal options rather than numerical could introduce subjectivity, as some respondents may see the scale different from each other and therefore give slightly different answers. Despite making the options in that way not all the respondents answered to the question. However, a total of 66 answers were gathered and majority (21%, n=15) of the respondents who answered to the income question, answered their income level to be 5 in the scale of 1-10. 75% (n=50) answered between five and eight. Although the scale has some limitations the mean of the income levels is 5.8, which indicates that the respondent's income is slightly above average.

2.3.2 Market participation and allocation

The second section of the survey consisted questions about the market participation and portfolio allocation. Market participation was measured by asking the participant what kind of investments they have or if they did not have any investments they simply put "no investments". The options for the question was, Bonds, ETF's, Real Estate, Noble Metals, Stocks, Crypto, Other and no investment. The participant had the choice to choose multiple options. 86% (n=61) of the

respondents reported having some sort of investment, while 14.1% (n=10) did not have any investments.

When looking at the allocation of the investments, we can see in figure 2 that between the options described, stocks, as expected, were clearly the most common option with 59.2% (n=42) reported owing stocks. The least owned investment was bonds with 8.5% (n=6). The second most owned asset was Real Estate with 35.2% (n=25). The third most held asset was Other 31% (n=22). This means that most of the participant had investments outside of the assets mentioned in the options. The rest of the options were held by significantly less people.

In terms of allocation, the asset of the largest porportion of savings allocated was "Real Estate" with an average of 56.4% savings allocated. The people who had stocks in their investment portofolio had in average 42.5% of savings invested in them. These groups, like every other, includes everybody who had selected the specific asset in the options to the question "Do you have investements?". The least amount of savings allocated was "Crypto" with only 18.2% of savings allocated in average when owing them.

Figure 2: Respondents' investments
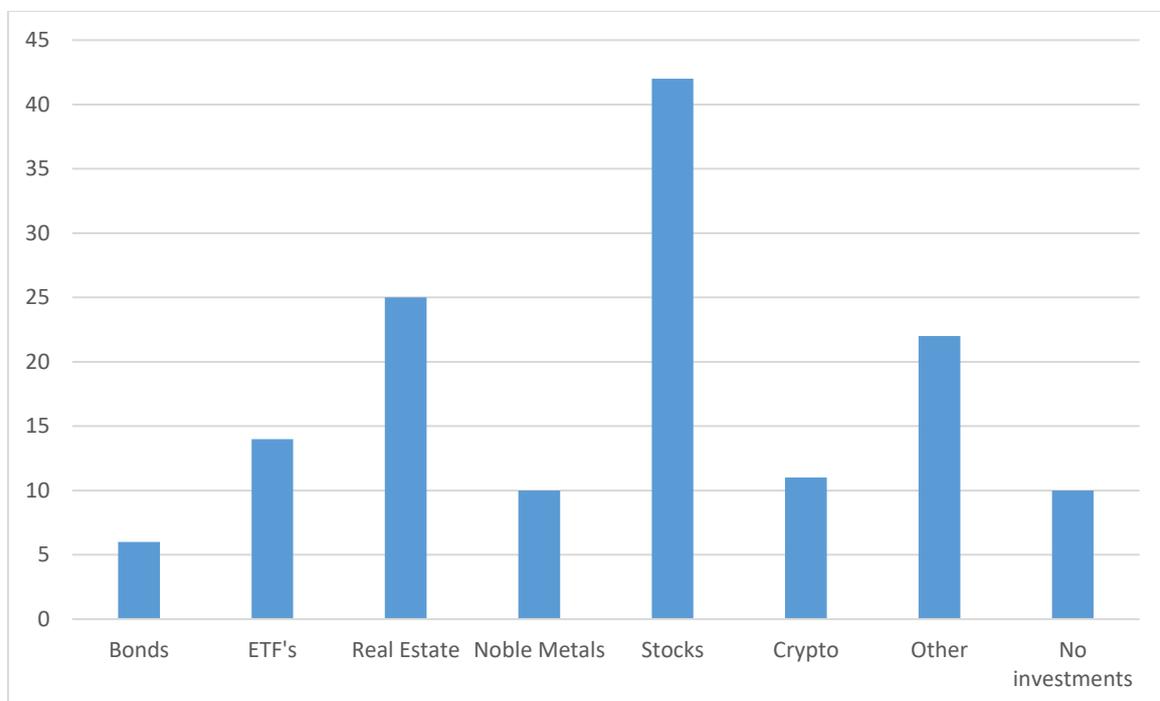
Source: author

2.3.3 Risk and confidence

In this study, "risk takers" are those individuals who exhibit a willingness to undertake relatively severe risks in order to get higher returns, Risk-neutral, on the other hand, is considered to be individual who engages in risk-taking activites, but they more than often are calculated and their portofiolio is well balanced with some risky assets and some less riskier assets. In contrast, risk averse individuals wants to avoid and minimize risk altogether.

For the third section of the questionnaire the respondents were asked about risk and how knowledgeable they consider themselves when it comes to investing. The first risk question "How comfortable are you with taking risk" had a scale between one to ten, one being not comfortable at all and ten extremely comfortable. The mean of all the respondents was 5.56 and the question for "how much financial risk are you willing to take in order to achieve higher investment returns?" the mean was 5.4. We can also see what was seen in previous literature, people who had stocks in their portfolio were more comfortable with taking risk with a mean of 6.2. People with higher risk tolerance are more likely to be holding stocks and other assets that are considered more riskier.

When answering risk questions it is important to keep in mind that in this case they are self-assesment. People may have different perceptions about risk and therefore people may give different reasonings to their answers.

Figure 3. Risk and confidence
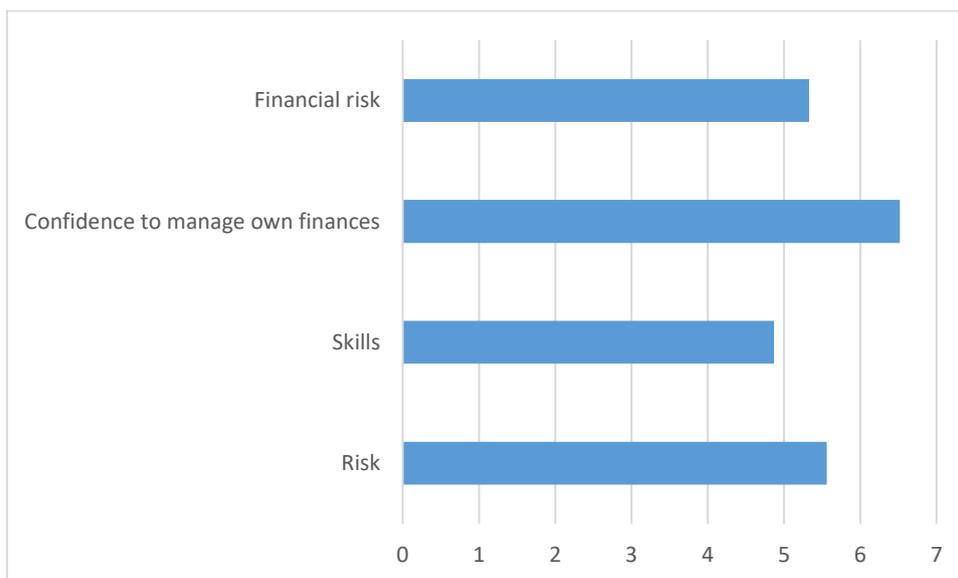
Source: author

On average the respondents answered to be below average in the question about skills. The mean of all answers was 4.8, which could indicate that people are not that confident in their skill in when it comes to investing. For the knowledge question, mean among respondents were 4.87 in a scale of one to ten. The mean for confidence of the ability to manage your own finance was 6.5, indicating that individuals reported, on average, moderate confidence in their ability to manage their own finances.

The last questions "How much are you willing to pay for a lottery ticket with a 50/50 chance to win 1000 dollars?" goal was to assess the participants willingness to take financial risk and the potential of gaining information about the participants risk preferences and attitudes in the field of financial decision making. The aim was to understand how the individuals values potential gain compared to the cost. In this case the potential win was 1000 dollars and therefore if a participant answered 500 the expected value would equal to zero. A total of 69 answers were sufficient enough to be in the calculations. One answer "I don't play the lottery" was treated as zero and therefore was included in the calulations. The other two answers that not included in the calculations were "2500" and "2000". The average of the answers was 171.3 and the median was 100. The maximum was 500 and minimum was 0. The participants reported 10 times that they would be willing to pay up to 100 dollars for the ticket.

2.3.4 Prior perfomance and optimism

Participants were asked how do they feel their investments has performed in the last three years on a scale from 1 (worse than average) to 10 (better than average). The participant was asked to put 0 if they did not have investments in that specific asset. In figure 4, we can see that the participants reported that the best perfoming asset was "Noble Metals" with the mean of 7.4. However, it is important to note that nobel metals was among the lowest the owned assets just after bonds. In general the respondents reported having average performance. The minimum across all the assets was one and maximum ten, indicating a variety of observations on the sample's investing performance.

Figure 4. Investment performance
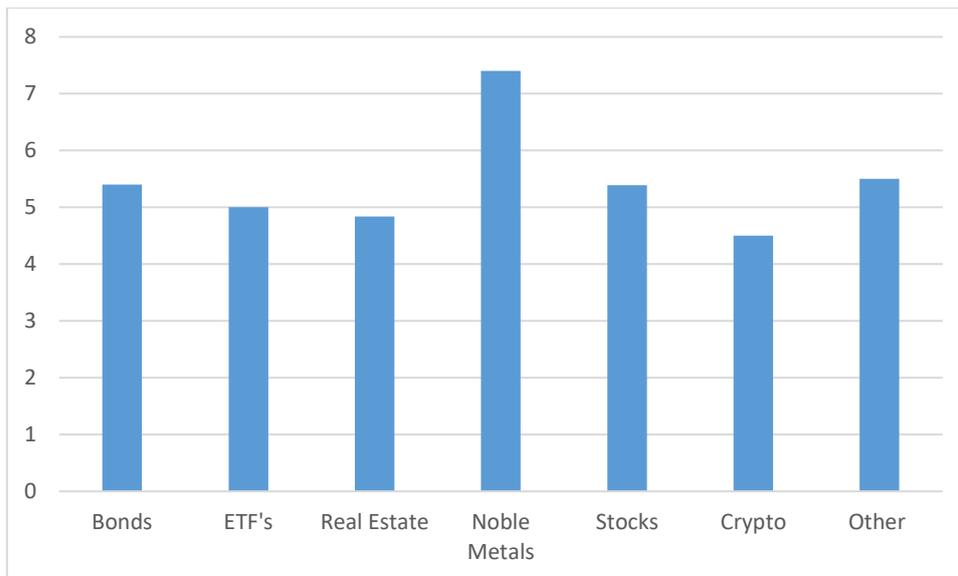
Source: author

A similar scale was to use to assess the respondents optimism about their investments in the future. Zero being no investments and ten being very positive. Only the people who reported having investments were considered eligible to answer this question. The average between all respondents was 5.7.

3. Empirical results

3.1. Results

The regression results are presented in Table 3 and Table 4. The observations for this study totaled to 71. For this study, two dependant variables were used in order to test the hypotheses. For both dependent variables six models were made. First dependent variable was if a individual owns a certain asset. For model 1 the dependent variable was *has_stocks*, meaning they either owned stocks or not. For model 2 *has bonds*, for model 3 *has_ETF*, for model 4 *has_RealEstate* for model 5 *has_NobleMetals* and for model 6 *has_crypto*. For the model 5 the independent variable *advise* was dropped since there was no enough observations between the dependent variable and advise. Each of the variables a model was made with the main key variables of interest, which were, *gender, age, income, education, advise, optimisim* and *financial risk.*

For the second dependant variable of the study is the percentage of savings allocated in each specific asset. In this case they were named, *savings_stocks* in model 7, *savings_bonds_* in model 8, *savings_ETF* in model 9, *savings_RealEstate* in model 10, *savings_NobleMetals* in model 11 and *savings_crytpo* in model 12. In addition to the first six models, the key main variables of interest were, *gender, age, income, education, advise, optimism, financial risk, performance of the asset* and the relationship between the performance and the risk levels of the individuals. The relationship was calculated as the level of financial risk times the perfomance of the asset.

The first models were made using logistic regression. The second models were made with using OLS regression. For both models *Education* was recoded as a binary variable. If the education variable were 1 (less than high school) or 2 (high school or equivalent) then the binary variable equals 0. If it is 3 (bachelor's degree), 4 (master's degree) or 5 (PhD) then the binary variable equaled 1.

In the regression tables the levels of significance are indicated with stars. 1% is ***, 5% is marked with ** and 10% with *. In the models the stars are marked after both, odds and standard error, if there are significance found in that independent variable. The bottom rows are the number of observations and the adjusted R-squared.

Table 3. Regression results

Variable	Model 1 Stocks Coef	St.Err	Model 2 Bonds Coef.	St.Err	Model 3 Etf's Coef.	St.Err	Model 4 RE Coef.	St.Err	Model 5 NM Coef.	St.Err	Model 6 Crypto Coef.	St.Err
const	−8.754	4.372 **	−5.322	5.970	−4.151	5.078	−13.57	3.907 ***	-10,05	5.337 *	−10.88	7.990
Gender	0.541	0.718	1.069	1.389	−0.500	0.758	0.598	1.055	-0,404	1.198	1.813	1.099 *
Age	0.349	0.224	−0.168	0.303	0.097	0.278	0.262	0.203	0,009	0.227	0.279	0.427
Age2	−0.004	0.003	0.001	0.003	−0.001	0.003	−0.002	0.002	0,001	0.002	−0.005	0.005
Income	−0.126	0.256	0.471	0.484	−0.048	0.268	1.540	0.591 ***	1,214	0.501 **	0.365	0.326
Education	0.386	0.794	−0.869	1.334	0.186	0.925	−2.240	1.296 *	0,226	1.338	−2.976	1.210 **
Advise	−2.062	0.970 **	1.643	1.219	1.083	0.807	0.136	1.205			0.093	1.160
Optimism	0.711	0.221 ***	−0.047	0.346	0.309	0.211	−0.235	0.348	-0,808	0.358 **	0.387	0.295
Financial risk	−0.059	0.183	0.462	0.329	−0.038	0.200	−0.282	0.300	0,233	0.257	0.380	0.235
N	71		71		71		71		71		71	
Adj. R2	12.7%		-19.3%		-13.7%		43.7%		15.9%		8.9%	

Source: Author

Table 4. Regression results

Variable	Model 7 Stocks Coeff	St.Err	Model 8 Bonds Coeff	St.Err	Model 9 Etf's Coeff	St.Err	Model 10 RE Coeff	St.Err	Model 11 NM Coeff	St.Err	Model 12 Crypto Coeff	St.Err
Const	−0,807	1,890	0,762	0,520	1,434	1,164	−1,924	1,751	−0,312	0,479	0,191	0,454
Gender	0,003	(0,535	0,376	0,143 **	−0,406	0,316	−0,386	0,428	−0,332	0,130 **	−0,019	0,130
Age	0,037	0,108	−0,042	0,029	−0,068	0,065	0,029	0,096	0,045	0,027	−0,010	0,026
Age2	-0,000	0,001	0,000	0,000	0,001	0,001	0,000	0,001	−0,001	0,000 *	0,000	0,000
Income	0,055	0,184	0,102	0,050 **	0,067	0,111	0,294	0,151 *	−0,107	0,048 **	−0,044	0,044
Education	0,109	0,620	−0,201	0,168	−0,043	0,373	0,181	0,502	−0,010	0,156	0,264	0,162
Advise	−1,196	0,692 *	0,488	0,191 **	0,938	0,408 **	−0,160	0,555	0,066	0,170	0,085	0,156
Optimism	0,039	0,143	−0,124	0,036 ***	−0,049	0,080	−0,112	0,109	0,041	0,033	0,007	0,031
Financial risk	0,009	0,164	0,019	0,036	0,013	0,080	0,067	0,116	0,020	0,034	−0,007	0,034
Per_stocks	0,619	0,235 **										
Per_stocks_risk	0,021	0,037										
Per_bonds			−0,528	0,090 ***								
Per_bonds_risk			0,136	0,014 ***								
Per_ETF					0,139	0,229						
Per_ETF_risk					0,068	0,038 *						
Per_RE							1,169	0,206 ***				
Per_RE_risk							−0,071	0,036 *				
Per_NM									0,357	0,053 ***		
Per_NM_risk									0,009	0,009		
Per_Cryp											−0,307	0,075 ***
Per Cryp_risk											0,121	0,012 ***
N	71		71		71		71		71		71	
Adj. R2	60.5%		80.5%		54.3%		74.9%		81.4%		80.9%	

In the model 1 we can see the highest level of significance in the variables optimism and advise, with 1% and 5%. The results suggest that individuals that have sought advise are less likely to own stocks. For the variable optimism the results suggest that people that are more optimistic are also more likely to own stocks. For our data it does not seem there is any significance in gender or other socio-economic characteristics as previous studies have shown.

For the model 2, there are no levels or significance, we can see that the adjusted r-squared is negative and therefore suggests that the model is not a good fit for the data. Also, for the model 3 the data does not perform well and does not give good information.

For the model 4 where the dependent variable was if a person has real estate or not, we can see two variables with level of significance. The variables, income, and education were statistically significant at levels 1% and 10%. The results suggest that higher income and education levels are more likely to own real estate.

For the model 5 the variable advise was dropped since there were not any observations in between the dependent variable *has_NobleMetals*, meaning in all of the cases where the respondent reported having noble metals, they also reported that they have not sought financial advise. The model suggests that income and optimism have levels of significance at 5% for both. For income the results suggest that people with higher income are more likely to own noble metals. For optimism it seems that people who are less optimistic are more likely to own noble metals. The adjusted r-squared was modest with 15.9%, which indicates that for this kind of data, it is a relatively good model for the data.

In model 6, where the dependent variable is if a person has cryptocurrencies or not, suggests that the only variables with levels of significance are education and gender, with 5% and 10%. The coefficient being 1.813 for gender, meaning that men are more likely to own cryptocurrencies than women. For education we can see that people with lower education levels are more likely to own cryptocurrencies than those with higher levels of education.

In table 4 we can see the additional models where the dependent variable was savings of a specific asset, the dependent variables are in the same order as in the first six models. For the model 7 the dependent variable is *savings stocks*. In addition to the first six models two independent variables

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were added. The performance of the asset in question and *Per_stock_risk,* which measures the relationship between financial risk and the performance of the asset.

In model 7 the variables with level of significance were advise and the performance of stock, with 10% and 5%. The results suggest that people who have sought advise are less likely to own stocks. These are similar results we got from the model 1, where people with financial advise were less likely to own stocks. The coefficient of the variable performance of stocks is 0,619, meaning that people who had better performance of their stocks has more savings allocated to stocks. When we look at model 9, we can see that for the dependent variable *savings_ETF* the advise is also significant at 5% level. This could indicate that people who have had professional financial advise has allocated their savings in ETF's rather than stocks.

For model 8 we can see the most variables with levels of significance. *Gender, Income, Advise, Optimism, Performance_bonds and Per_bonds_risk*, also the adjusted r-squared is 80.5%. Gender, income and advise were statistically significant at level 5%. The results suggest that men are more likely to have more of their share of savings allocated in bonds than women and people with higher income are more likely to have more of their share savings in bonds as well as the people with financial advise. Optimism, performance of stocks and *per_bond_risk* was significant at 1% levels. For optimism and performance of bonds the coefficients are negative, meaning that more optimistic people have less of their share savings allocated in bonds. The same can be seen in the performance of bonds, where the results show that there is a negative relationship between the independent and dependent variable.

In model 9, where the dependent variable is savings in ETF, the results suggest, as mentioned earlier, that advise show levels of significance at 5%. This indicates that people who had financial advise has a more of their share of savings allocated in ETF's. Also the performance of ETF's was significant at a 10% level.

For model 10, income, *per_realestate* and the *per_RE_risk* showed significance at 10%, 1% and 10% levels. For income the data shows that people with higher income have more of their share of savings allocated to real estate. The performance of real estate is also positively associated with dependent variable. People who reported better performances have more of their share savings allocated in real estate. The relationship between risk and performance of real estate is negatively associated with the share of savings invested in the asset.

For model 11, gender, *age2*, income and performance of noble metals showed significance at levels 5%, 10%, 5% and 1%. It is also worth noting that age had a p-value of 10,03%. Income shows a coefficient of −0.107, which indicates that when income increases the share of savings in noble metals decreases. The performance of noble metals is positively associated with the share of savings.

In model 12, we can only see that the performance and the *per_risk* is statistically significant with 1% level. However, education has a p-value of 10,77%. The results indicate that people with higher education are more likely to have more of their savings allocated in cryptocurrencies.

3.2. Robustness tests

This section covers additional regressions to test the robustness of the results. To test the robustness total of 12 models were made. For the logit regression models *financial risk* was removed and *lottery* variable was added, and for the OLS regression model financial risk was also removed and lottery added. In addtion per_stocks_risk2 was added and per_stocks_risk was removed. These models aim to make sure that the findings made in the earlier models are not too sensitive if the variables are changed and therefore can strengthen the validity of our original results.

The original results and the robustness tests are somewhat similar to each other. Therefore we can say that some of the models are trustworthy. Also, Some of the results corresponds with previous studies. For example, income, as well as education, is often statistically significance in our models when it comes to the dependent variable.

Table 4 and table 5 represents the robustness results. In the first model, age is the only variable that become statistically significant. I estimated that the advise variable would become statistically insignificant. Since advise was negatively correlated with stocks, the original theory was that people who got professional financial advise would have invested in ETF's instead of stocks. This did not happen in the robustness tests and we could see similar results than in the first regression models.

For the Models 2 and 3, there are no relevant changes. The adjusted R-squared ratios remained in similar numbers, and therefore the models are not a good fit for the data that was used in these regressions. For model 4, we can see similar results. All the same variables remained statistically significant. Also, the adjusted R-squared was 42.8%. For model 5, optimism was not statistically significant. One of the reasons for this could be the size of the sample. Small sample size could be a reason for the changes. The model 6 we see the same result happen for optimism.

Lottery variable was not statistically significant in any of the models. This suggests that there are not have a significant effect on any of the dependent variables.

For the models 7-12, we can see larger changes than we saw in the first six models. First of all the adjusted R-squared ratios were changed relatively significantly in models 8 and 12. The variable advise in these models become statistically insignificant in model 7 and got stronger in model 8. This indicates that effect of advise got stronger in model 8 and that people who got adivse has larger portions of savings allocated in bonds. In addition, income and the performance of bonds got statistically insignificant.

For model 9 advise was statistically insignificant and the performance and risk was significant at a 1% level. For model 10, there are similarities in the results. Income and the performance stayed significant. For model 11, we see similar results than in the original models. Age become statistically significant, and the other variables that were significant stayed that way. For model 12 education become significant.

Table 5. Regression results

Variable	Model 1 Stocks Coef.	St.Err	Model 2 Bonds Coef.	St.Err	Model 3 Etf's Coef.	St.Err	Model 4 RE Coef.	St.Err	Model 5 NM Coef.	St.Err	Model 6 Crypto Coef.	St.Err
const	−9.496	4.480 **	−6.003	5.761	−4.005	4.912	−13.43	3.812 ***	−9.126	5.883*	−9.421	7.501
Gender	0.596	0.716	1.405	1.314	−0.501	0.748	0.511	1.032	−0.460	1.262	2.229	1.093 **
Age	0.373	0.221 *	−0.060	0.271	0.084	0.267	0.219	0.178	0.126	0.257	0.257	0.409
Age2	−0.004	0.003 *	0.000	0.003	−0.001	0.003	−0.001	0.002	0,001	0.002	−0.004	0.005
Income	−0.169	0.261	0.511	0.466	−0.058	0.262	1.576	0.599 ***	0.933	0.565 *	0.473	0.337
Education	0.479	0.799	−0.581	1.292	0.189	0.925	−2.454	1.309 *	0.019	1.606	−2.579	1.120*
Advise	−2.170	1.020 **	1.424	1.148	1.082	0.805	0.176	1.214			0.054	1.139
Optimism	0.783	0.220 ***	0.198	0.325	0.302	0.193	−0.431	0.312	-0.457	0.342	0.483	0.281 *
Lottery	−0.001	0.001	−0.001	0.002	−0.000	0.001	0.000	0.001	−0.027	0.018	−0.002	0.235
N	71		71		71		71		71		71	
Adj. R2	14.8%		-22.6%		-13.6%		42.8%		25%		5.9%	

Source: Author

Table 6. Regression results

Variable	Model 1 Stocks Coeff	St.Err	Model 2 Bonds Coeff	St.Err	Model 3 Etf's Coeff	St.Err	Model 4 RE Coeff	St.Err	Model 5 NM Coeff	St.Err	Model 6 Crypto Coeff	St.Err
Const	−1.007	1,880	0.654	0.860	0.325	1.056	−1.484	1.696	−0.370	0.476	−0.049	0.724
Gender	−0.069	(0.519	0.408	0.234 *	−0.362	0.285	−0.283	0.425	−0.332	0,130 **	−0.010	0.200
Age	0.051	0.104	−0.042	0.047	−0.045	0.058	0.037	0.091	0.052	0.026 *	−0.005	0.040
Age2	-0,000	0,001	0,000	0,000	0.000	0,001	0,000	0,001	−0,001	0,000 **	0,000	0,000
Income	0.027	0,184	0.059	0.083	0.060	0.101	0.310	0,151 **	−0.102	0,048 **	−0.074	0.069
Education	0.179	0.602	0.055	0.275	0.296	0.340	0.091	0.506	−0.075	0.157	0.519	0.252 **
Advise	−0.980	0.708	0.946	0.305 ***	0.593	0.387	−0.447	0.564	0.065	0.171	0.218	0.245
Optimism	0.044	0.139	−0.071	0.057	0.015	0.069	−0.121	0.106	0.044	0.030	0.034	0.045
Lottery	0,000	0,001	0.000	0.000	0.000	0.000	−0.001	0.001	0.000	0.000	−0.000	0.000
Per_stocks	0.669	0.124 ***										
Per_stocks_risk2	0.000	0.000										
Per_bonds			0.250	0.067 ***								
Per_bonds_risk2			0.000	0.000								
Per_ETF					0.751	0.083 ***						
Per_ETF_risk2					−0.001	0.000 ***						
Per_RE							0.727	0.111 ***				
Per_RE_risk2							0.000	0.000				
Per_NM									0.415	0.029 ***		
Per_NM_risk2									−0.001	0.001		
Per_Cryp											0.179	0.067 **
Per Cryp_risk2											0.000	0.000 ***
N	71		71		71		71		71		71	
Adj. R2	61%		46.7%		61.7%		74.8%		81.2%		53.4%	

3.3. Discussion

For this section, I will talk more about the results and some of the limitations of this study as well as give some suggestions for future research.

Some of the results was similar to previous findings, but not all. For the models 1-6, the results were more align with the robustness test than models 7-12. Previous research suggests that people who are more tolerant with risk also invests in more riskier assets, such as, stocks or cryptocurrencies. In our results, risk was not associated with our dependent variables. For stocks we could only see advise and optimisim be significant. The original theory with the advise variable was that people who did not get advise would have then invested in ETF's, since the correlation seemed somewhat odd, but this was not the case. For real estate it was estimated that the more the reported income was the more likely the person was invested in real estate. We can see from the regression results that this was the case. Surprisingly gender was only significant in cryptocurrencies. Men were more likely to invest in this assets class. It is know from previous studies that men are usually more risk tolerant than women. Since cryptocurrencies are consireded to be highly risky asset, this would then be in accordance with that.

The share of savings dependent variable gave some interesting answers as well. Some of the previous research suggest that older people might have more savings in less riskier assets, such as, bonds or ETF's. In our regression results age was not significant in any of the dependent variables. However, we can see that advise was negatively associated with stocks and positively with ETF's. This indicates that the people who got advise were more likely to have larger portion invested in ETF's. The performance of the asset was significant in all the models. However, for bonds and cryptocurrencies the effect was negative, but in the robustness tests they were positive. Therefore the results are not conclusive between these two assets. Also worth mentioning that larger income did not always mean larger portions of invested in an asset.

As said before, the robustness test were more in aling with the first set of models 1-6. When it comes to models 7-12 there were more differencies and therefore the models 7-12 are not as trustwothy as models 1-6.

Also worth mentioning that when interpreting results for real estate, it is important to keep in mind that real estate is much more difficult to trade when compared to, for example, stocks. This could mean that the feedback from past performance and share of savings that are allocated to real estate could take a longer time. Therefore the questions about the performance of real estate could have some limitations.

Some of the limitations for this study, and also important to take into account is the of the sample size. For this study some of the results that does not comply with previous research might be explained with the small sample size. Also, when the sample size is relatively small the results may not be representative of the entire population and therefore give different results than previous research. To ensure the validity of future research it is important to consider the the sample size and to make sure that it is sufficiently large one. This would increase the statistical power and could make the estimations more precise.

Conclusion

The main aim of this thesis was to examine the relationship between risk tolerance and prior performance and its effect on allocation and market participation. In addtition to the socio-economic characterics, the main key variables of interest for this study was all the variables that measured risk and prior asset performance.

The main question for this study was:

1. Does individual's risk tolerance and prior experience impact their portfolio allocation?

2. How does risk tolerance impact portfolio allocation decisions among individuals?

The hypothesis was made from the questions and the research aim.

1. There is a positive association between individuas' risk tolerance and participation in financial assets market

2. There is a positive association between prior performance of an asset and investor's allocation to the specific asset

After conducting the empirical results of the study, not all of the models provide sufficient answers and did not align with prevous research. For the first hypothesis we can determine that the data did not provide enough evidence and therefore it is rejected. Since risk taking was not statistically significant in any of the models 1-6. However is important to see that prior performance had an influence on the allocation of the asset, therefore the second hypothesis is not rejected.

It is important to take into account the limitations of the study. Firstly, one of the main limitations of the study was the small sample size used for the regressions. As a result, some of the findings may not be representative of the larger population. This also limits the statistical power of the study and therefore could be potentially have an affect on detecting relationships or effect accurately.

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APPENDICES

Appendix 1. Questionnaire and variables

Variable	Description	Answer option
Age	Age	Text box
Gender	Gender	Choice male/female/other/prefer not to say
Education	Question about the participants education	Choice between less than high school/high school degree or equivalent/bachelor's degree/master's degree/PhD
Income	Question about the participants income level	Scale between 1-10. 1 being very low and 10 being very high
Participation	Question what assets the participant owns	Choice between bonds, ETF's, Real Estate, Noble metals, Stocks, Crypto, other and no investments
Savings	Question how many % the participants savings are allocated in the assets they own	Scale between 0-10, 0 being 0% and 10 being 100%.
Risk taking	Question how comfortable are you with taking risk	Scale between 1-10, where 1 is not comfortable at all and 10 being very comfortable.
Finacial risk	Question how much financial risk the participant is willing to take in order to achieve higher investment returns	Scale between 1-10, 1 being no financial risk and 10 being high financial risk.
Knowledge	Question how knowledgeable the participant considers themselves when it comes to investing	Scale between 1-10, 1 being not knowledgeable at all and 10 being very knowledgeable.

Advice	Question how the participant worked with a professional financial advisor	Options between Yes and No.
Confidence	Question about the participants confidence to ability their personal finances	Scale between 1-10, 1 being not confident at all and 10 being very c onfidence
Skills	Question how would the participants rate their investment skills compared to the average investor	Scale between 1-10, 1 being not as good as average and 10 being better than average.
Performance	Question how the participant feel their investments has performed in the past 3 yerars in the assets they own	Scale 0-10, 0 being no investment in the asset and 10 being better than average. The participants were asked to put 0 if they did not have any investments in the asset
Optimism	Question how optimistic the participant is about their investments in the future	Scale between 0-10, 0 being no investments and 10 being very positive. The participants were asked to put 0 if they did not have any investments.
Lottery	Question how much the participant is willing to pay for a lottery ticket with a 50/50 chance of winning a 1000 dollars.	Text box, where the participant was asked to state their answer.

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