An Empirical Study About Young People's Risk Preferences and Determinants Affecting them

A study performed on students from the School of Business, Economics, & Law at the University of Gothenburg

Bachelor's Thesis in Finance and Economics

School of Business, Economics, and Law at the University of Gothenburg

EFI 303

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Spring term - 2022

Abstract

In this report, the aim was to investigate what determinants or associations may affect an individual's choice when facing different risk-related prospectus. Through surveys based on previous literature, a study on a sample of 119 respondents, containing students from the School of Business, Economics, and Law in Gothenburg was done. The survey focused on different individuals' determinants and associations. Cognitive abilities, financial literacy, numerical ability and personal traits like gender, age and demographics were studied. All the questions that were asked in the survey have been collected from prior studies created by well-renowned authors.

The results from the paper were rather vague regarding the characteristics of interest. Most of them turned out to be insignificant in explaining the dependent variables, but there were still significant results. The data showed that both the CRT-score and financial literacy could be correlated with risk attitude. Men tend to be less risk averse compared to women, and that older people take less risks in general. These findings were in line with prior research.

Keywords: Risk attitude * Behavioural finance * CRT * Financial literacy * Numerical ability * Risk-aversion

Acknowledgements

We would like to express our gratitude to our supervisor Oben K. Bayrak for his expertise and guiding throughout the process. We also would like to thank our fellow student for continuous feedback and support.

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1. Introduction

This chapter will provide a brief background to the thesis, this is then followed with a problem formulation, purpose of the study and two research questions. There will also be a discussion of the thesis´ limitations and a short description of its structure.

There are several different theories and factors that try to explain why one individual is more willing to take a risk than other people are. A number of studies have been published in this area and according to them, there are some determinants and associations that have a greater impact than others.

The concept of risk aversion is a fundamental part of explaining why some individuals choose safer, but with low-interest returns, instead of high-interest returns which also implies higher risk. A risk-averse individual tends to, for example, rather stick with a sure gain of money rather than gamble in a lottery with an outcome of the same expected value. The opposite is an individual who yearns to take risks, a so-called risk-seeker. Moreover, according to this theory, there are also individuals that are indifferent regarding exposing themself to risks or not, referred to as risk-neutral (Berk & DeMarzo 2017).

Some examples of determinants are mentioned by the articles published; one is how good individuals' financial literacy is. Almenberg and Widmark (2011) have done research in the area where they focused on both individuals' numeracy skills and their financial literacy. The study was conducted in Sweden and concluded that many respondents had issues with simple mathematical problems and that their understanding of financial literacy was poor. This, according to the paper, might be related to the individuals' risk preferences, where it later emerges that the levels of numeracy and financial literacy are higher among those who are more willing to take risks.

Another recurring factor that several articles proclaim has an impact, is how well individuals' cognitive abilities are. Dohmen et al. (2018) executed a study of 1,000 individuals' cognitive abilities. The focus was also regarding how cognitive abilities affected their patience and their risk preferences. Their research proclaims that cognitive ability is associated with risk-taking behaviour in various contexts, for example within lotteries, where an individual with a high cognitive ability measured by the CRT-test, tends to act more risk-seeking in advantageous situations.

Furthermore, there are also personal variables that might affect people's risk preferences such as age, gender, parental occupation, and even height. At first glance, these might seem irrelevant when discussing risk, but previous research seems to point out that they could be significant. Dohmen et al. (2011) conducted a paper including these determinants and found that they had a significant impact on people's willingness to take risks. For example, the report showed correlations between being a woman and risk aversion. This makes it interesting for the thesis to investigate this even further on another sample.

1.1 Problem formulation

Understanding the dynamics of risk attitudes is important for policy design and other relevant contexts (Dohmen et al. 2011). The dynamics involve the associations and underlying factors related to risk attitude such as cognitive abilities and personal traits. The thesis tried to find whether one could explain the risk attitude[1] of an individual. Today there is no consensus why an individual reason in a certain way and how individual's risk attitudes are formed.

The investing and trading patterns have been through a lot of changes during the recent years, and one of them is that online stockbrokers have increased considerably (Fitzgerald, 2020). Due to this, there will arguably be a greater demand for understanding how risk attitudes work, and there are several reasons. One example, people now presumably make more decisions on their own, compared to before where more of the financial activities went through professional brokers. This might lead to a lack of understanding of how individuals' reason which could make the industry vulnerable.

1.2 Purpose

The main question and purpose of the thesis would thus be to examine the effect of some determinants and associations. The main focus was on the level of individuals cognitive abilities; financial literacy and numerical ability, with the aim to study if they have any influence individually or together on people's risk attitude, and if so, to what extent. Moreover, the intention was to study whether other more personal determinants have any impact at all on the individuals risk attitudes.

[1] Risk attitude and Risk preference is to be seen as the same during the paper.

1.3 Research questions

With the purpose of the thesis and previous literature in mind, two research questions have been formulated. The first one is connected to the three different abilities discussed in the purpose: cognitive abilities, financial literacy, and numerical abilities.

I) Do cognitive abilities, financial literacy and/or numerical ability have a correlation with the risk attitude of an individual?

There are multiple theories that could support why this was a relevant question to study further. Prior studies have shown that these determinants influenced the risk attitudes of individuals. It was found that individuals with a higher cognitive ability relative to its peers, tend to be more risk-taking in advantageous situations. (Frederick, 2005) Regarding financial literacy, prior studies proclaimed results in a similar direction. People with a higher financial literacy tend to participate more in financial markets than its peers with lower financial literacy. This might be connected to risk-taking, which makes the determinant interesting for further studies. (Lusardi et al., 2014) The last studied determinant, numerical ability has in previous literature been shown to have a correlation with mortgage defaults (Gerardi, Goette & Meier, 2013). These topics combined created an interest for further investigations on these determinants, on a new sample.

II) Do personal traits like gender, age, height, study programme, parental occupation and/or previous life events have a correlation with the risk attitude of an individual?

The second research question was of a more general type, it was about personal attributes and how they might influence an individual's risk preference. All these determinants have been discussed in prior studies. Determinants and associations could affect the risk attitudes of individuals. This made it natural to conduct further research on them as they were also rather easy to collect data from. Furthermore, the study explained that depending on what determinant being discussed, the correlation with risk attitudes could be going in different directions. The associations, gender, and height, have in prior studies been positively correlated with risk-seeking. Age has also previously been proven to have an effect, but in the opposite direction. This was the reason that these determinants acted as a base for the second research question in this paper. (Dohmen et al., 2011) The other associations in this research question were not

taken from any previous literature but they were included to gain new insight in estimating the risk attitude of individuals.

1.4 Limitations

One of the major limitations for this thesis was the potential lack of respondents. The sample that was investigated were only university students, enrolled at Gothenburg School of Business, Economics, and Law. This made the sample smaller than what normally is desired when doing similar studies in this field. The small sample also created a lack of diversity within the respondents, mostly since all of them were students. The age span was rather small, they all study similar subjects and many of them have the same socio-economic conditions due to being students. In a perfect world, it would therefore have been of interest to have a bigger, more representative sample, but, due to time- and financial constraints this was not possible to do in this case.

Another limitation might be the choice of determinants and associations. The determinants studied in the report are not totally comprehensive and could therefore not individually explain how risk attitudes work. It would have been desired to be able to study even more determinants, since there could in theory be unlimited factors that affect risk attitudes. Unfortunately, this was not feasible due to the conditions discussed above. There could be a risk of endogeneity in the regression models, since there were variables that were omitted. Moreover, there were also a few limitations and risks regarding the choice of method in this thesis, these are more thoroughly explained and discussed in the method, more precisely in section 3.3.

1.5 Structure of the thesis

The thesis contains several different sections. The second section explains and highlights some key theories and some previous literature in the theoretical framework that the reader needs to bear in mind when reading the discussion later but to also understand why the research questions are relevant. Some theories like ‘Expected Utility Theory’ and ‘Dual Process Theory' are included to create an understanding for the reader.

While the ‘Cognitive Reflection Test’ for example, contains both the theory behind it, and the previous findings that correlates with risk attitude. This is followed by the third section where the thesis explains how the survey was developed and what possibilities and risks the method of choice contains. The fourth section, ‘Data’, presents the sample and the distributions of the

respondents. Here the characteristics of the sample are presented, followed by some further descriptive statistics from the surveys. The fifth section explains the expected results, and this is followed by the actual findings in section six. The results will be shown through both regression spreadsheets and a more verbal interpretation of the numbers. The final section, the seventh, a thorough discussion regarding the findings was conducted.

2. Theoretical Framework

This chapter will provide an overview of prior studies and theories regarding the subject. It will go through theories in detail and discuss the outcomes of previous studies, for example how the discussed determinants and associations have influenced risk attitudes before.

2.1. Expected Utility Theory

The Expected Utility Theory is a well-known and recognized concept to assess why individuals choose their respective prospects. The concept tells us that people should instead of only looking at the Expected Value (EV) of a prospect instead see the Expected Utility (EU). The theory is useful as a tool for analysis, especially in situations where individuals must make speculative decisions. The concept is widely used and standard in economic modelling, but the theory has been questioned and is proven to be violated in psychological experiments. New theories have been made to try to explain these violations, but the theory is still being used today. The function of the theory shows if the individual is a risk seeker or risk-averse. The weighted sum of adding the respective utility values of payoffs is multiplied by their probabilities $U(p) = \Sigma\, u(x_k)p_k$ (Chen, 2019). Furthermore, the value of U depends on the values of u which differ between individuals and tells us whether that person is attracted or not to risk. This is shown in graphs below, wherein figure 1, the function of a risk-averse individual is shown, in figure 2, a risk-neutral individual is portrayed and finally in figure 3, a risk-seeking individuals' function is graphed.

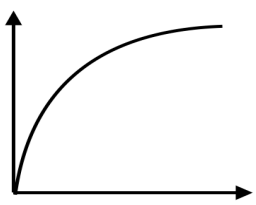

Figure 1Risk-averse individual

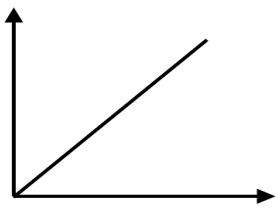

Figure 2 Risk-neutral individual

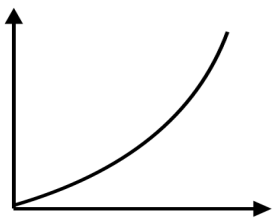

Figure 3 Risk-seeking individual

2.2. Prospect Theory

A paper presented, at that time, a new model called 'Prospect Theory' which captured the experimental evidence on risk-taking and how people violate the expected utility theory. This model is still today one of the most used ways to explain how people view risk in different settings. The prospect theory tells us that even if the expected values of two prospects are the same, people will more likely choose sure gain in a positive domain and speculate in a loss domain. This phenomenon is thoroughly discussed in this theory, and it has given rise to 4 effects on which the theory is largely based upon. (Kahneman & Tversky, 1979)

The first one is the so-called reflection effect. This effect projects how an individual tends to change their risk preferences depending on context. For example, when an individual is facing a loss for sure, he/she is more likely to gamble, even though it could make the loss even bigger, than if the same individual were to face a sure win. In the win scenario, the individual would most likely not gamble and instead act more risk-averse. This effect is described in the graph in figure 4 below. (Kahneman & Tversky, 1979)

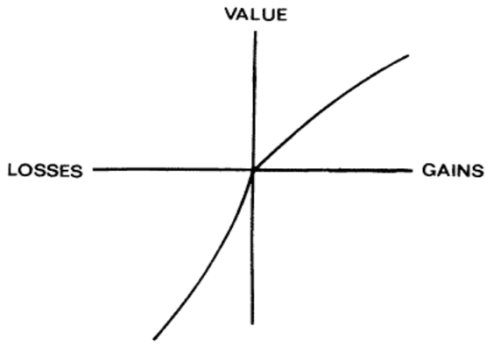

Figure 4 Graph of the reflection effect - (Kahneman & Tversky, 1979)

Additionally, the Isolation effect is a second major effect discussed within the theory. This effect works in a way that when for example an individual is faced with several similar alternatives, for example different investment opportunities, the individual tends to ignore all the components that are similar between the prospects and focus on the things that differ. As a result of this, the individuals' conclusions may vary depending on how the options were framed. (Kahneman & Tversky, 1979)

Furthermore, another major effect is one called Reference dependence. This part of the theory is important and implies that people tend to evaluate offers differently depending on what reference points they have from before. This could in theory lead to different perspectives on prospects, depending on the individual's experience.

The last effect is the so-called Loss aversion, this acts as a base for the reflection effect, and it implies that people fear losses more than missing out on gains, or as it is stated in the theory 'Losses loom larger than gains'. (Kahneman & Tversky, 1979)

2.3. Dual-Process Theory

Researchers have proposed that there are two distinct cognitive systems underlying the reasoning of individuals. It contains system 1 which is shared with animals and in evolutionary terms, an old cognitive system. It is a set of autonomous subsystems that include both innate input modules and domain-specific knowledge acquired by a domain-general learning mechanism. System 2 is distinctively a human trait and is evolutionary younger. This system allows for more abstract reasoning and hypothetical thinking.

The idea that humankind has two systems is an old one and has been around for as long as philosophers and psychologists have been writing about human nature. The dual-process theory has been proven and in some examples like the ‘Belief box-effect' or the ‘Wason selection task’ there is evidence of system 1 and 2 in individuals' reasoning. The same can and has been applied to people's judgment and decision-making. The Dual Process Theory is the foundation that the ‘Cognitive Reflection Test’ is based upon and is one way to assess how individuals' risk preference is explained. (Evans, 2003)

2.4. Cognitive Reflection Test (CRT)

CRT is, as mentioned above, a test that was founded and designed from the so-called ‘Dual-Process Theory’. Frederick (2005) states that the test is designed in a way to challenge the respondents' respective cognitive systems, the questions are formulated to at first glance feel simple, and relatively unpretentious, but with deeper analysis much more complex than originally thought. This is addressed in the article, and it reads as follows:

A bat and a ball cost $1.10. The bat costs $1.00 more than the ball. How much does the ball cost?

If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

Depending on which system dominates for the person answering, the answers will probably differ, Frederick says. An individual with a stronger system 1, will with high probability think that the question looks simpler than it is and answers 10 cents, rather than the correct answer of 5 cents. The question was also designed in such an easy way that one will likely choose to answer either 10 or 5 cents, rather than something else. With that, the test can be used to create an understanding of an individual's cognitive ability and what system dominates the individuals' mindset.

According to the theory, CRT provides false but intuitive answers to the questions, and this is supported by several facts. First, the wrong answers to the questions are positive intuitive numbers like 10, 100 and 24. Secondly, previous research has shown through interviews with respondents that even those who provided the correct answer, they first considered the false alternative. Third, the respondents who said 10 cents believed that 92% of all respondents would get the first question right, compared to 62% estimated by those who answered 5 cents. Even if both estimations are largely overestimated, it shows that those who answered wrong believed that the question was too easy to get wrong, while the others saw the difficulties with the question. The scores for the universities are presented, and they show the results in the following figure 5. The limitations for their study are presented in the footnote. (Frederick, 2005).

CRT Scores, by Location

		Percentage scoring 0, 1, 2 or 3				
Locations at which data were collected	*Mean CRT score*	*"Low" 0*	*1*	*2*	*"High" 3*	*N =*
Massachusetts Institute of Technology	2.18	7%	16%	30%	48%	61
Princeton University	1.63	18%	27%	28%	26%	121
Boston fireworks display[a]	1.53	24%	24%	26%	26%	195
Carnegie Mellon University	1.51	25%	25%	25%	25%	746
Harvard University[b]	1.43	20%	37%	24%	20%	51
University of Michigan: Ann Arbor	1.18	31%	33%	23%	14%	1267
Web-based studies[c]	1.10	39%	25%	22%	13%	525
Bowling Green University	0.87	50%	25%	13%	12%	52
University of Michigan: Dearborn	0.83	51%	22%	21%	6%	154
Michigan State University	0.79	49%	29%	16%	6%	118
University of Toledo	0.57	64%	21%	10%	5%	138
Overall	1.24	33%	28%	23%	17%	3428

Figure 5 Overview over CRT scores from different samples (Frederick, 2005).[2]

Risk Seeking Behavior among Low and High CRT Groups

	Percentage choosing riskier option	*CRT group*		
Item	*Certain gains vs. Higher expected value gambles*	*Low*	*High*	*Stat. Signif.*
a	$1,000 for sure or a 90% chance of $5,000	$52\%_{280}$	$74\%_{225}$	$p < 0.0001$
b	$100 for sure or a 90% chance of $500	$56\%_{95}$	$78\%_{92}$	$p < 0.01$
c	$1,000 for sure or a 75% chance of $4,000	$37\%_{264}$	$57\%_{102}$	$p < 0.001$
d	$100 for sure or a 75% chance of $200	$19\%_{843}$	$38\%_{475}$	$p < 0.0001$
e	$100 for sure or a 75% chance of $150	$10\%_{217}$	$34\%_{94}$	$p < 0.0001$
f	$100 for sure or a 50% chance of $300	$47\%_{68}$	$75\%_{20}$	$p < 0.05$
g	$500 for sure or a 15% chance of $1,000,000	$31\%_{341}$	$60\%_{135}$	$p < 0.0001$
h	$100 for sure or a 3% chance of $7,000	$8\%_{139}$	$21\%_{70}$	$p < 0.01$

Figure 6 CRT scores related to risk-taking. (Frederick, 2005)

2 [a] Respondents in this study were people picnicking along the banks of the Charles River prior to the July 4th fireworks display. Their ages ranged from 15 to 63, with a mean of 24. Many of the younger participants were presumably students at a college in the Boston or Cambridge area.

[b] The participants in this study were all members of a student choir group, which was predominantly female. Unlike the other locations in which the numbers of men and women were comparable, 42 of 51 participants in this study were women.

[c] These were participants in two online studies, consisting of both college students and others whose email addresses were obtained from online retailers.

Furthermore, the same article examines whether an individual's cognitive level might be linked to its risk-taking and it appears that individuals with a higher CRT-score tend to be more risk-taking in situations where the expected value is higher.

In figure 6, findings from the study were presented. The numbers in figure 6 shows the share of each group that chose the gamble alternative above the safe option. It shows that individuals with high[3] CRT-score were choosing the riskier option compared to the low CRT group in all different prospectuses. The individuals that were intermediate in their score fell between the extreme groups on whatever dependent variable that was measured thus it was only presented with the extremes to simplify the exposition of their findings. (Frederick, 2005)

2.5. Financial literacy

The 'Big Three' is a recognized theory and type of questionnaire for measuring individuals' financial literacy in a simple and efficient way. This is also the principle behind the questionnaire. Its goal is to be simple, relevant, and have the capacity to be used as a comparison tool between respondents. The questionnaire is based, as the name suggests, on three different areas of finance. The idea is to test an individual's understanding of interest compounding, understanding of inflation, and understanding of risk diversification (Lusardi & Mitchell, 2008, 2011, 2014).

Priors' studies of financial literacy, have shown that financial illiteracy is widespread, measured with the 'Big three'. This phenomenon also occurs in developed countries and there are certain groups that are worse than others. The studies proclaim that young and elderly people have lower levels of financial literacy compared to other groups in society.

Surveys have been sent out in a lot of countries and they are summarized in the paper. Results from a couple of countries are summarized in figure 7, and it is rather clear that it is rare for respondents to answer all questions correctly. Some would also argue that the numbers seem surprisingly low, mostly since all the countries are rather developed (Lusardi & Mitchell, 2008, 2011, 2014).

[3] A high CRT-score refers to 3, a low as 0 and intermediate 1 or 2

COMPARATIVE STATISTICS ON RESPONSES TO FINANCIAL LITERACY QUESTIONS AROUND THE WORLD

			Interest rate		Inflation		Risk Diversification				
Authors	Country	Year of data	Correct	DK	Correct	DK	Correct	DK	All 3 correct	At least 1 don't know	Number of Observations
Lusardi and Mitchell (2011d)	USA	2009	64.9%	13.5%	64.3%	14.2%	51.8%	33.7%	30.2%	42.4%	1,488
Alessie, VanRooij, and Lusardi (2011)	Netherlands	2010	84.8%	8.9%	76.9%	13.5%	51.9%	33.2%	44.8%	37.6%	1,665
Bucher-Koenen and Lusardi (2011)	Germany	2009	82.4%	11.0%	78.4%	17.0%	61.8%	32.3%	53.2%	37.0%	1,059
Sekita (2011)	Japan	2010	70.5%	12.5%	58.8%	28.6%	39.5%	56.1%	27.0%	61.5%	5,268
Agnew, Bateman, and Thorp (2013)	Australia	2012	83.1%	6.4%	69.3%	13.0%	54.7%	37.6%	42.7%	41.3%	1,024
Crossan, Feslier, and Hurnard (2011)	N. Zealand	2009	86.0%	4.0%	81.0%	5.0%	27.0%	2.0%*	24.0%*	7.0%	850
Brown and Graf (2013)	Switzerland	2011	79.3%	2.8%*	78.4%	4.2%*	73.5%*	13.0%*	50.1%*	16.9%*	1,500
Fornero and Monticone (2011)	Italy	2007	40.0%*	28.2%*	59.3%*	30.7%*	52.2%*	33.7%*	24.9%*	44.9%*	3,992
Almenberg and Säve-Söderbergh (2011)	Sweden	2010	35.2%*	15.6%*	59.5%	16.5%	68.4%	18.4%	21.4%*	34.7%*	1,302
Arrondel, Debbich, and Savignac (2013)	France	2011	48.0%*	11.5%*	61.2%	21.3%	66.8%*	14.6*	30.9%*	33.4%*	3,616
Klapper and Panos (2011)	Russia	2009	36.3%*	32.9%*	50.8%*	26.1%*	12.8%*	35.4%*	3.7%*	53.7%*	1,366
Beckmann (2013)	Romania	2011	41.3%	34.4%	31.8%*	40.4%*	14.7%	63.5%	3.8%*	75.5%*	1,030

Note: * indicates questions that have slightly different wording than the baseline financial literacy questions enumerated in the text.

Figure 7 Previous results of financial literacy (Lusardi and Mitchell, 2008, 2011, 2014).

Further research from the same authors proclaims that people with a high level of financial literacy tend to accumulate more wealth than others, which according to the paper might indicate different views on risk. At the same time, the paper claims that it is hard to establish a causal relationship between economic behaviour and financial literacy which is important to keep in mind while working with these numbers. There is a strong correlation between many financial behaviours and financial literacy, but due to for example, endogeneity problems in prior studies, it has been hard to establish the above-mentioned relationship (Lusardi & Mitchell, 2008, 2011, 2014).

Moreover, their study also claims that they have found that the more numerate & financial literacy, the higher the possibilities are that people participate in financial markets. This might be interpreted as that a higher financial literacy might correlate with higher risk-taking. There are also results that show a correlation between financial mistakes and low financial literacy, and all this together makes it an interesting topic for further studies in this paper. (Lusardi & Mitchell, 2008, 2011, 2014).

2.6. Numerical ability

It was presented that low numerical ability is correlated with mortgage defaults. This implies that if you have a lower numerical ability then you are more likely to default on your loans. The researchers used the 'Big five', a set of mathematical questions that investigates whether the agents can solve basic concepts such as calculations with percentage and division. The report uses this to create an index of the respondents where they later compared that to the risk preference of the individual. (Gerardi, Goette & Meier, 2013)

The index and the questions for the 'Big five' originate from a paper called: *"Understanding pensions: Cognitive function, numerical ability, and retirement saving"* (2007) written by Banks & Oldfield.

3. Method

This chapter provides information regarding how the survey was constructed and potential risks with doing a survey. The questionnaire is presented in the appendix, in table 7. In addition to this, there is also a brief description of why a survey still is a good choice of method. Furthermore, there will be a presentation of the econometric models used and the variables that were investigated.

This report was based on data produced through surveys. The survey was built around several experimental risk issues, to create an idea of the respondent's risk preferences. In addition to how individuals choose to act in the specific risk issue, a number of control questions were also asked where the level of the respondents' cognitive, numerical, and financial abilities was tested. The idea of the process was to make out which type the individuals were, risk-averse or risk-seeking. Then based on this try to figure out what determinants correlated with these preferences. The survey was conducted by students at the School of Business, Economics, and Law at the University of Gothenburg. In other words, it was a form of quantitative research that was conducted with the aim of obtaining a large amount of data, which then was quantified and used to draw conclusions using OLS.

The wording and the type of language that was used in the paper can be considered in some cases to be slightly advanced, mainly because a lot of technical terms and other economic terminology were used frequently. This means that individuals without financial knowledge or interest may have found it difficult to comprehend what was written in the text. However, it was reasonable to maintain this linguistic level when writing about these topics and therefore it was assumed that the reader had at least basic economic knowledge, alternatively an interest in the topic.

3.1. Structure of the survey

The survey was divided into five main chapters, all focusing on different areas of the respondent. The first chapter focused on general information like gender and age, etc. The second chapter was the one that focused on the risk preference of the respondent. The answers from this part of the survey later became the dependent variables which were estimated in the regression analysis with the answers from the other chapters. The third chapter was the first one to be completely committed to estimating one variable. This structure characterized the remaining part of the questionnaire where estimations of the CRT, financial literacy, and numerical ability, of the respondents were performed.

The size of the survey was 24 questions. The questions had a range from stating the age of the respondents to made-up scenarios where the respondents had to read and make decisions within their answers. Regarding the time frame of the questionnaire, it should have been possible to complete the survey in 'about' 10 minutes, and the way the questions were formulated varies and thus also the answers that were expected. Most of the questionnaire was answered with multiple choice answers while several the questions had a more open character, where the respondent was required to think individually and give numerical answers.

3.2. Design of the survey

When producing the questions used in the report's questionnaire, inspiration was taken from several previously recognized studies. This was to create legitimacy to the survey on which this report was based, but also to create clarity in how the questions were to be interpreted and used when drawing conclusions. For both the questions regarding risk preferences and the ones regarding all determinants, careful considerations have been made to create as comprehensible questions as possible. This was to reduce the risk of misunderstandings, and achieve as fair a result as possible, without an excessive amount of noise, etc.

3.2.1. Questions regarding risk preferences

These were the main questions of the survey since this was the area of interest in this study. Further on in the paper, these questions did act as a base for the creation of the dependent variables that later were used in the OLS regressions.

The first question, with the goal to evaluate the respondents' risk preferences, was characterized by being general in its design. By Dohmen et al. (2011) an almost identical question was used which also was an inspiration to the question used in this survey.

There were small differences in wording since the original question could have been a bit hard to interpret for people without economical education. The purpose of the question was to allow the respondent to individually assess their own risk appetite in general, without any given context. The same article, then showed that there were links between different determinants such as gender and age, and level of risk on the self-assessment question. This was the reason why the question was also used in this thesis to be able to further study this phenomenon on a new sample. Regarding this question it is important to keep in mind, since this question was asked first in the survey, it could create a form of anchoring bias over the later question in the survey. This could affect their answers to further questions. (Chen, 2019).

One example of anchoring bias, in this case, could be the following: Suppose respondents believe that they are 'risk-lovers' in the self-assessment question, then there was a risk that the respondents tried to keep that image later as well, and this will be considered. Furthermore, there was still a deal of interest in trying to find out whether a person's perception of their risk appetite differs from whether the respondent is exposed to different risks in different contexts. There was also a point in starting with this question because in comparison with the upcoming questions it can be considered easier to understand and, in this way, may make the respondent get into the right mindset for the questions further on.

The second risk-related question of the survey was a further development of the first risk-assessment question. The question was based on the same principles, i.e., the respondent was asked to do a self-assessment of their risk appetite, but unlike the first question, respondents were asked to assess themselves in different contexts.

Therefore, the question structure implied that the respondent indicated on a scale between 1-10, how much risk they were likely to take in different contexts. The different contexts were for example, when driving a car, while playing sports, or with their health.

Moreover, inspiration for the question was as previously collected from the article 'I*ndividual Risk Attitudes'*, written by Dohmen et al. (2011). Although, some changes were made to make the question more comprehensible. One example of the changes was that in the original question, the respondent was informed that people tend to think differently regarding risk, depending on the context. This information was decided to not be included in the final question, since it could create a bias for the respondents because they might feel forced to think in a certain way due to the former instructions. Furthermore, the wording was also changed to make it easier for the respondent with less economic knowledge to comprehend the question.

The next question that the respondents faced in the survey originates from the same paper as mentioned above but aimed for another type of answer. The question created a scenario for the respondent to take a lottery into consideration, where the respondent had a sure gain of SEK 1,000,000 but had the possibility to re-gamble and double the money or lose half of it. So, the aim of the question was to try to find out how people thought in situations with a sure gain, were they risk-averse or not? Moreover, the question was taken straight from a questionnaire used in the paper: *Individual risk attitudes: measurement, determinants, and behavioral consequences* written by Dohmen et al. (2011) except for a few changes. The currency used in the question had been changed to SEK to make it easier to interpret since the sample was mostly Swedish.

The final question with the aim to address respondents' risk preferences was a probability equivalence question, within lotteries. Inspiration for this question was taken from the paper: *Estimating risk attitudes using lotteries: A large sample approach*, Donkers et al. (2001) It proclaimed that the goal of the question was to derive how people's risk preferences tend to change if their initial wealth changes. The question was asked through three questions that are formulated identically, with the difference that the respondents had different initial gains in the different scenarios, ranging from SEK 1,000 to SEK 25,000. Respondents were then asked to state how much probability they require for future winnings, to gamble the money again.

A respondent who required a higher probability of winning the new lottery, was, therefore, more risk-averse in this case. In their paper they saw that people tend to be more risk-averse when having a higher initial gain, this was interesting to study further and try to understand if there were certain types of respondents who think that way. This question was also true to its original formulation except that the currency has been changed from Dutch Guilder to SEK. A conversion using hold data has been made to keep the same levels of wealth as in the previous research, with inflation not taken into consideration.

3.2.2. Questions regarding determinants

The goal of the thesis was as mentioned before to try to understand what determinants may affect university students' risk preferences. When the choice of determinants was made, much research was done on previous literature here as well. The determinants chosen are strongly inspired by previous research, as these have been proven and as previously discussed used in established papers. This probably contributes to more reliable conclusions from the statistics, and since the questions have been used before, misunderstandings are likely to decrease due to formulation mistakes, etc.

In the background segments of the survey, questions regarding age, gender, and height were asked. These questions were asked in a paper written by Dohmen et al. (2011). Since it was found that all these variables could affect the preference it feels natural to include them. The other questions aimed to find out which study programme the respondents were currently in, which occupation their parents or caregiver have or had, and finally if they have ever been in an accident.

The question regarding respondents' study programme will be interesting to evaluate and see whether risk preferences differ between students with different career choices. Usually, wealth is an important variable that could affect the preference regarding risks. Since the sample only contained students, the wealth variable will not be as efficient as we assume that students on average have the same income. Therefore, it was more interesting to see which type of household they came from. In the survey, the options ranged from different sectors that their parents or caregivers work or have worked in. The reason it was asked about sectors instead of wealth was mainly that it is often hard to estimate the wealth or income of someone other than

yourself and since it was not known which environment the respondents would answer the question in, thus not creating a stigma to reveal the income of others.

Lastly in this section, it was asked if the respondents had ever been involved in any serious accident. The idea behind this question was to see if one's experience could influence how one perceives risk-taking. The three different options were ‘No’ or 'Yes' with the need for medical care or not. One could argue that someone that has been involved in an accident with the need for medical care might be more careful and therefore be less willing to take risks. At the same time, it is likely that someone who answered no was more risk-averse and as a result, never been involved in an accident in the first place.

Cognitive reflection tests or CRT are a widely used questionnaire to estimate an individual's ability to handle cognitive processing – specifically the tendency to suppress an incorrect, intuitive answer and come to a more deliberate, correct answer (Frederick, 2005). The CRT in the survey has been slightly modified. Currency has been changed from dollar to SEK in the first question to create coherence throughout the survey with the other questions. These three questions have no time limit. As mentioned earlier this was not possible to achieve with a Google form so the respondents have theoretically infinite time to complete them, which is rather unfortunate

The financial literacy chapter contained three simple and straightforward questions. The questions have been inspired from the work of Lusardi and Mitchell (2008, 2011, 2014), where they explained that the question asked needs to be easy, and understandable. The focus in the questions was as discussed in the theoretical framework interest compounding, inflation, and risk diversification. The only change to these questions was that the currency used was changed from USD to SEK, this to make them more comprehensible, otherwise they were like their originals.

Numerical ability in this survey was used to get an idea of how easily the respondents handled numbers and simple mathematical problems. The reason for using this was that previous research had pointed out that individuals with lower scores also performed worse in the mortgage market. The research did not imply that lower numerical ability individuals select worse initial contracts but instead that their behaviour made them more likely to default. This

behaviour could be more risky choices or a lower understanding of percentage (Gerardi, Goette & Meier, 2013).

It was therefore important for the thesis to discuss whether individuals were either more risk-averse, risk loving, or simply had different views and understanding of probability outcomes. In all these cases' numerical ability felt important as a variable of interest, which was the reason it was included.

3.3. Risks of conducting a survey

One major risk of collecting data in the way that was done in this report, through a survey, is that the actual 'experiments' and situations that the respondents are faced with were not in a controlled environment. In ordinary cases, when testing and examining similar things in economics, one usually uses controlled experiments[4]. For example, in the form of a respondent choosing to invest in an experimental company, using experimental currency etc. Unfortunately, due to a lack of time and financial resources, an uncontrolled survey was conducted in this study instead.

Furthermore, in the survey respondents were asked to evaluate how they think they would act in different potential risk scenarios. Thus, they conduct subjective evaluations of themselves. With this comes the risk that people were not honest, or maybe did not know how they might have acted in a specific situation.

People may think they would act in a certain way, but their actions may differ. Whether these types of questions tend to result in an overestimation of the respondents' risk aversion since there is a response mode bias[5] that could occur. Respondents had to give up money to participate in the lottery. All of these are risks that must be considered when drawing conclusions later and with these risks in mind, one must try to analyze the sample in the best possible way. Given a large sample, it is still likely that the survey gives a relatively accurate picture. (Donkers et al., 2001)

[4] The respondents, for example, are exposed to scenarios where some type of action is required
[5] Response bias (also called survey bias) is the tendency of a person to answer questions on a survey untruthfully or misleadingly (Response Bias: Definition and Examples, 2022).

Another risk with collecting data this way was that there was a possibility that respondents have encountered these questions in some other context before. CRT-tests, for example, are not uncommon for people to encounter during their studies. It was therefore important to keep this in mind when studying the results of the survey.

If people had encountered these issues before, there was a risk that they were familiar with the classic pitfalls that exist, for example in the CRT-test. Most of the students at the School of Business, Economics, and Law, are studying subjects that one can assume gives them knowledge within financial literacy and numerical ability. This have been problematic since it resulted in disproportionally high scores on these tests, the sample was not totally representative. So, when analysing the survey, it is important to take these possibilities into account.

One more risk to consider in this case is that a CRT, financial literacy, and numerical ability will probably differ depending on the time the respondent has to answer. There was no possibility with the tools available to time that part specifically in the survey, which must be seen as a shortcoming and could make the data less reliable. This risk was recurring in the tests regarding financial literacy and numerical ability as well. Given unlimited time, the respondent might ask a friend or browse the web for answers which could make the result false and therefore unreliable.

Moreover, since the survey was emailed to the respondents, there was a risk of non-responses in our sample. The main problem with non-responses in a survey is that the number of respondents will be fewer than planned. Due to this, there was a problem since this could create uncertainty regarding the randomness of the sample, which results in poorer precision while drawing conclusions. It is therefore important to keep this in mind while working with the data to reduce the risk of misleading results.

Furthermore, there have been studies that have shown that there are certain groups of people who tend to answer surveys overall and certain groups who do not. This could create a form of bias in the data. People with higher education and of younger age are positively correlated with answering surveys. Moreover, the paper also discusses whether gender has an impact on how likely it is that an individual will respond to a survey. Women tend to respond to a greater extent than men on surveys, no matter what type of survey it concerns. (Smith, 2008)

Additionally, the sample that was used in this paper will not be exposed to the risks mentioned in the section above at the same level as many other samples tend to be. This is because the sample was drawn from university students, who are studying and in general, are young.

The one factor that is brought up in Smith´s article (2008), that may have an impact on the response rate in this paper´s sample is gender. This will be considered since the survey will investigate the respondents' gender as a factor for the *risk evaluation*, and from there it will be possible to correct for data that is disproportionate and take this into consideration. One more thing that is not mentioned by Smith but could be relevant in this case is whether there could be differences in response rates between different study programmes.

Moreover, another risk with collecting data the way it was done for this paper is that most of the respondents do not answer in their first language. Answering questions in languages other than your first language may lead to various forms of misunderstandings and misinterpretations. With the goal to avoid such problems with the data, the questions used have been formulated in a basic and simple way, for example, more difficult technical terms have been omitted. In addition to this, it can be assumed that students, i.e., the respondents in the sample used, probably have good knowledge of English, as much of the literature read in their studies is in English and in some cases also the teaching. Overall, this potential problem will probably exist, as there will always be some misunderstandings, but for most of the respondents, there should not be any problems.

The final risk that was considered is the fact that the survey, compared to other surveys conducted through a mailing to fellow students, is a rather extensive one. The different pilot respondents showed a wide variety between to complete the survey. The time to complete it could range between 3 to 20 minutes. It is hard to conclude what the effect of this range could impose on the results, but some risk factors are to be discussed. Answers from an individual with fast completion times could argue that they found the questions easy, the instructions clear and taught that to answer the survey was unproblematic.

However, it could also be seen that the same individual didn't take all the instructions into account, rushed through the answers, and just gave random answers to complete the survey in less time. The same, but opposite risk also applies to an individual that took a lot of time to complete the survey. In this case, they might have reviewed their answers, taken time to fully

understand the questions, and presented well-founded responses. It is also likely that they found the survey to be boring, hard to understand, and with more time spent on the survey, taking less taught into their answers.

The effect of the different response times cannot be predicted. It is hard to adjust the possible data fault that could occur. A draw with the possibility to win 1,000 SEK was promised to create an increased incentive to take the survey even though it is rather extensive.

This was believed to make it more attractive for students to answer the survey, however, it did not give an incentive to take the survey with greater care. The risk that students will not answer the survey with utmost care and attention will always be present when conducting an uncontrolled survey.

3.4. Conducting a survey

The previous chapter explained the process of creating, and what limitations that might occur with a survey. Even if there were obstacles with this type of methodology, Falk et al. (2016) explains that a survey in fact represents a reliable method of choice. In the article they compared a survey against incentivized experiments where they measured actual behavior in a controlled environment. This is referred to as the 'gold standard' for eliciting preferences. The problem, as they explain, is that this method is expensive and time consuming, compared to a survey which contains low costs to capture a high sample.

Falk et al. (2016) found that the survey they did, had the same qualitative measurement regarding risk preferences as the incentivized experiments done by Dohmen et al. (2011) where they had a representative sample of German adults. Furthermore, they conclude that the correlations between the survey measure and the experiment are virtually the same.

It is therefore based on this research, safe to assume that conducting a survey still could yield good results with an accurate measure. The possibilities and limitations of a survey should always be borne in mind when analysing the results and conducting the discussion.

3.5. Statistical methods

Independent variable	Acronyms	Description of the independent variable	Measurement unit	Expected sign RE - Amount / AVGPRO
Gender	GEN	Gender of the respondent	Female = 0, Male = 1	+/-
Height	HEIG	The height of the respondent	In cm	+/-
Age	AGE	Age of the respondent	In years	-/+
Study programme	STPRO	The current study-programme for the respondent	Economics & BA = 1, Law = 2, Logistics = 3, SMIL = 4, Social Science = 5, Other = 0	?
No private sector	NOPR	The occupation of the respondent's parents/caregiver, testing the effect if none of them working in private sector	Yes = 1, No = 0	-/+
Accident hospitalized	ACH	Experienced an accident, leading to medical care	Yes = 1, No = 0	+/-
Accident – no medical care	ACNM	Experienced an accident, without medical care	Yes = 1, No = 0	+/-
CRT - score	CRT	The respondent score in the CRT assessment	In numbers, ranging from 0 to 3	+/-
Financial Literacy	FL	The respondent score in the financial literacy assessment	In numbers, ranging from 0 to 3	+/-
Numerical Ability	NA	The respondent score in the numerical ability assessment	In numbers, ranging from 0 to 5	+/-

Table 1 List of independent variables

The thoughts behind the econometric variables were to study all three risk attitude questions that were asked in the survey. Then two different regression-models were run on each variable, to answer the different research questions. The first model represents the first question of interest with CRT, financial literacy, and numerical ability in mind. The second model represents the research question regarding personal traits effect on risk attitudes. All variables will be reviewed from three different significance levels: 1%, 5% and 10%.

Dependent variable	Acronyms	Description of the independent variable
Risk Evaluation	RE	The self-assessed risk attitude the respondent answered
Amount Gambled	AMOUNT	The amount that the respondent chose to gamble in the hypothetical reinvestment opportunity
Average Probability	AVGPRO	The average required probability of a win to participate in the lotteries

Table 2 List of dependent variables

The Econometric Models:

Model 1 $RE = \beta_0+\beta_1\text{CRT}+\beta_2\text{FL}+\beta_3\text{NA}+U$

Equation 1 – Model 1 RE

Model 2 $RE = \beta_0+\beta_1\text{GEN}+\beta_2\text{HEIG}+\beta_3\text{AGE}+\beta_4\text{STPRO}+\beta_5\text{NOPR}+\beta_6\text{ACH}+\beta_7\text{ACNM}+U$

Equation 2 – Model 2 RE

The variable RE is constructed from the first question in the survey regarding risk attitudes. The question that was asked was a type of self-assessment, where respondents were asked on a scale from 0 - 10 how likely they were to take risks. So, this variable represented how the respondents evaluated themselves, then the aim was to find determinants and associations that could have affected that evaluation. There were also other similar questions in the survey, where the respondent was asked to do a self-assessment on the same topic, but within different contexts. Regressions were run on these variables but gave no further insight and have therefore been omitted. These questions are still to some extent described in the descriptive statistics later in the thesis, section 4.3.

Model 1 *AMOUNT*: $\beta_0+\beta_1\text{CRT}+\beta_2\text{FL}+\beta_3\text{NA}+U$

Equation 3 – Model 1 Amount

Model 2 AMOUNT = $\beta_0+\beta_1\text{GEN}+\beta_2\text{HEIG}+\beta_3\text{AGE}+\beta_4\text{STPRO}+\beta_5\text{NOPR}+\beta_6\text{ACH}+\beta_7\text{ACNM}+U$

Equation 4 – Model 2 Amount

In this regression, the independent variable was created from the question regarding how much respondents were willing to reinvest, from their previous winnings. So, the variable was the literal amount the respondents chose to reinvest, it is not an average in that sense. The higher the amount invested, indicated a less risk-averse individual according to prior studies where this question was used.

Model 1 *AVGPRO* = $\beta_0+\beta_1\text{CRT}+\beta_2\text{FL}+\beta_3\text{NA}+U$

Equation 5 - Model 1 Average probability

Model 2 *AVGPRO* = $\beta_0+\beta_1\text{GEN}+\beta_2\text{HEIG}+\beta_3\text{AGE}+\beta_4\text{STPRO}+\beta_5\text{NOPR}+\beta_6\text{ACH}+\beta_7\text{ACNM}+U$

Equation 6 - Model 2 Average probability

The independent variable, *avgpro* was constructed from the answers in the lottery question, where respondents were asked about what probability they required to participate in the lottery. Since this question was asked with three different initial winnings, it felt rewarding to create an average of the respondent's probability requirements, this to make it easier to run an understandable regression. But some discussion will be done regarding the original question as well below.

4. Data

To begin this section, a short presentation of the sample will be conducted. This is followed by the distribution of the respondents and the descriptive statistics where means, SD and other metrics will be presented of the variables. Furthermore, there will be some figures that show how the different personal trait variables correlated with the different risk questions. A complete table with all metrics will be included in the appendix, see figure B. Only the most relevant numbers will be brought up in the upcoming section.

4.1. The sample

The population that was examined was university students at the School of Business, Economics and Law at the University of Gothenburg, with majors in economics and other socially oriented subjects. This population was chosen since it was interesting to study how the young people view risk, but also what it was that affects their risk attitude.

When doing quantitative research, it is important to work for a random selection. In this case, the selection was as random as possible, given the conditions. There were no selection criteria depending on which program the respondent is studying, but instead, all students were welcome to answer and participate and the programme was rather seen as an independent variable. To further ensure randomness the survey was distributed as an electric version through email. As the survey was conducted on students, there was access to all email addresses of the students who were registered for these programmes.

4.2. Distribution of the respondents

The sample that finally was conducted consisted of 119 respondents and of these, about 54% were men. As described in the previous section, the respondents were students at Gothenburg school of business economics and law, and most of the respondents were enrolled at the Economics and business administration programme, with over 50% here as well. Regarding the occupation of the respondents' parents/caregivers, which also was asked in the survey, it was a predominance, over 44% employed, of individuals working in the private sector.

4.3. Descriptive Statistics

To begin with, one variable was not of interest to divide between *gender* or study programmes. This variable was based on the question whether respondents had been in a serious accident or not. The data showed that over 20% of the respondents had been in such a serious accident that medical care was needed. However, the vast majority, over 60%, had not been in any serious accidents at all. How this relates to respondents' risk attitudes will be investigated further on in the result section, when inference is performed.

Starting with the variables regarding the demographics of the respondents, there were some major differences in the answers. With the variable *gender* in mind, the data showed that men were more likely to take risks on average in all different contexts that were asked. In the more general risk assessment question, men evaluated their own risk attitude to be on average 5.73 on a scale from one to ten, this in comparison with women who differed, who on average answered 4.11 on the same question. The standard deviation for men was 2.01 and for women 2.19. These differences were proven to be significant at 1% level when conducting a t-test[6]. Continuing with a further analysis in the question with the different contexts, the data showed that both men and women were most likely to take risks in leisure and sport - situations and most risk-averse while driving with the average score of 3 and 2.3 respectively.

Over to the questions regarding the gambling scenarios. Here the trend was the same, Men were more likely to do the gamble in question 10. On average they wanted to participate more frequently than women, and they did also on average contribute with a bigger bet, SEK 365,322, in comparison with women who on average made up a bet of SEK 271,429. The standard deviation in the answers for men was equal to SEK 301,579 and for women SEK 217,184, which could be interpreted as some fluctuations, which most likely is due to some answers being more extreme and refers to either no participation or full out gamble. A t-test[7] showed that these findings were significant at a 5% level.

In the upcoming three questions, regarding different initial winnings and the required probability to do a re-gamble, men are less risk-averse in all the three scenarios. In the scenario with initial winnings of SEK 1,000, men on average required a probability of 26.02% compared to women who, on average, required 39.75%.

[6] See appendix STATA output 13 T-test RE by GEN
[7] See appendix STATA output 14 T-test Amount by GEN

In this part of the question, the differences on average between men and women were the largest, when the initial winnings increased, the differences between the genders decreased but men were still less risk-averse in all cases. In the total average probability men required 41.61% & while women required 52.44%, proven[8] at a 5% significance level.

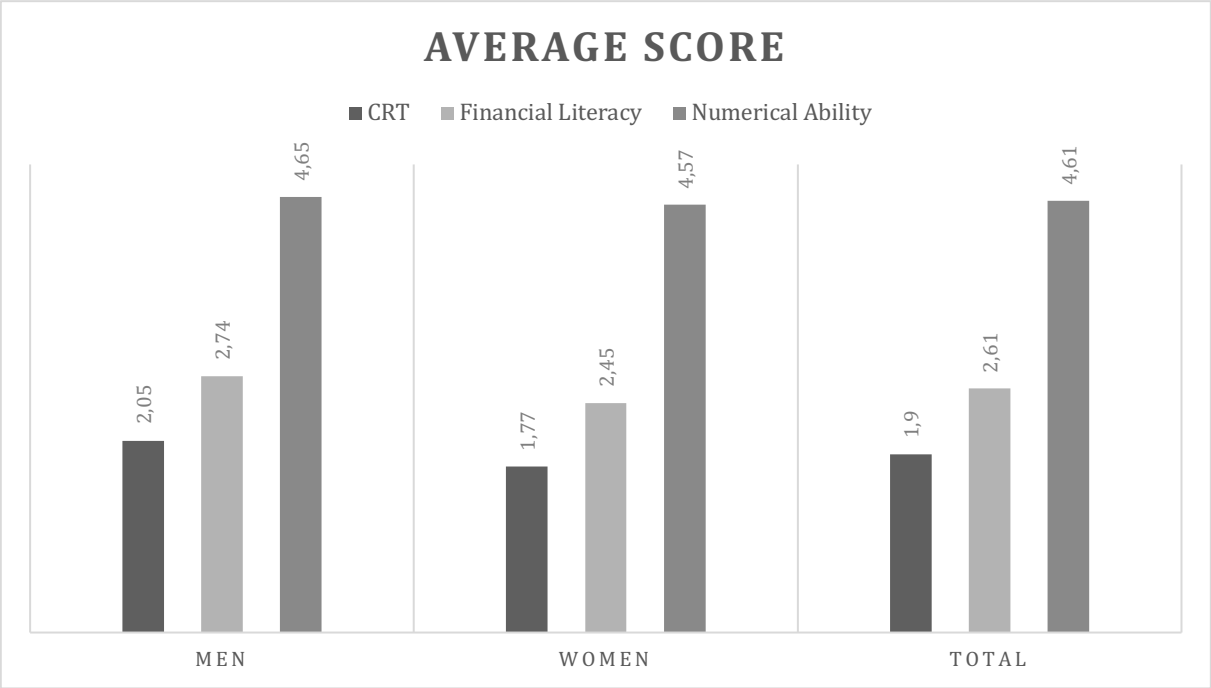

Figure 8 Average CRT, FL & NA score in the survey, between men, women and in total

Figure 8 presents the average score that the respondents got on the CRT, financial literacy and numerical ability questions divided by *gender*, followed by a total presentation of the mean scores overall in the sample. The averages were similar between the genders, but the data showed that men on average in this sample out-perform women in all categories, even though there are only minor marginals. The only variable where the difference was proven between men and women to be significant was the financial literacy at a 5% level.[9]

Additionally, the standard deviations are not presented in the figure, but they are rather small. The overall standard deviation in the CRT answers, for both genders, is 1.08. For the financial literacy it is smaller, 0.64 and for the numerical ability 0.65. The respondents were on average most accurate with the numerical ability questions and performed the worst with the CRT questions, and this was identical for both men and women.

[8] See appendix STATA output 15 T-test AVGPRO by GEN
[9] See appendix STATA output 17 T-test FL by GEN

Programme distribution	Economics & Business Administration	Logistics	Law	SMIL	Social Science & Economic History	Other	Total
Frequency	63	10	17	7	4	18	119
%	52.94	8.40	14.29	5.88	3.36	15.13	100%

Table 3 Programme distribution

In table 3, the distribution between the different programmes is shown. Most of the respondents were studying at the Economics & Business administration programme followed by the category Other[10]. Continuing with the same question regarding *risk evaluation* and *amount* gambled.

Figure 9 presents the findings regarding how the individuals from different study programs evaluate their risk attitude. The figure shows the mean in every context from all programs. As shown, there are no clear trends between the different programmes in risk attitudes. Some programmes were on average more likely to take risks in a specific scenario, but less likely to take risks on average in other scenarios.

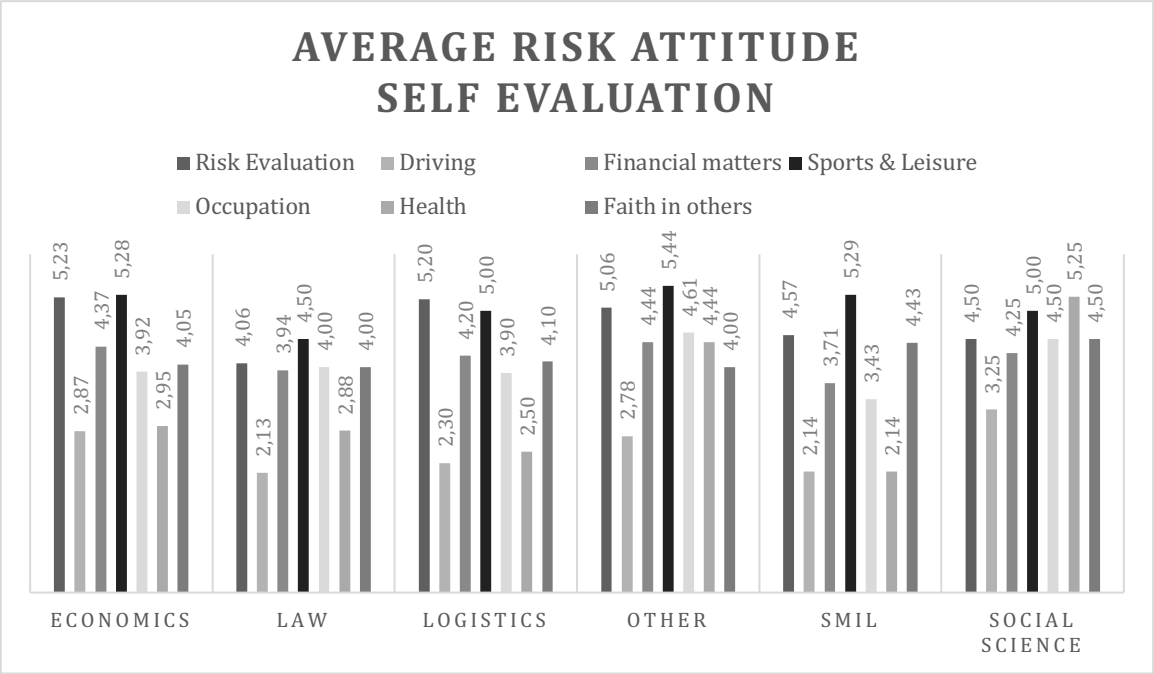

Figure 9 Average risk attitude - self evaluation

[10] Students enrolled at the Gothenburg school of Business, Economics, and Law, but not studying a specific programme

In question 10, the average *amount* gambled did differ between the programmes. People studying in the Social Science & Economic History programme were more willing to gamble than all other programmes, followed by the logistics students. To keep in mind here, the respondents who studied at the Social Science programme were rather small in comparison with the other groups and this will be discussed further on. Regarding the questions 11-13, there were no clear differences on average between the programmes, more than that the programmes on average became more risk-averse, given the higher initial winnings.

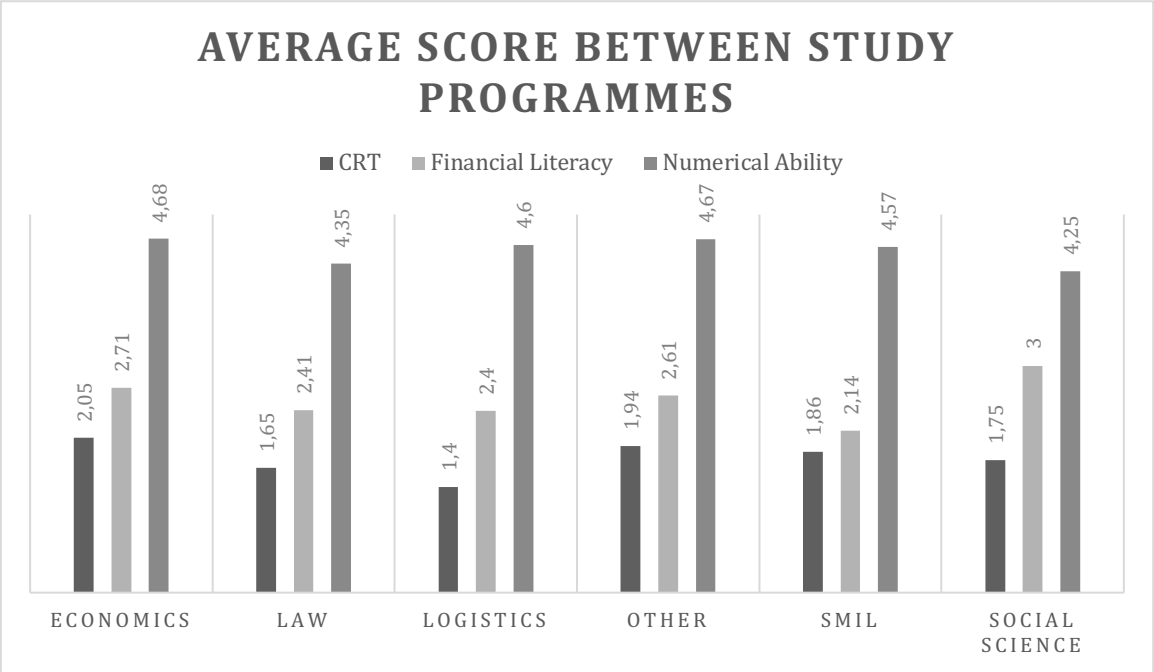

Figure 10 Average score between study programmes

Figure 10 presents the average score from each study programme. It was found that the scores across the programmes are somewhat similar with little difference between them. One notable thing to point out is that no programme on average scored higher on all tests.

The standard deviations across the programmes are similar and the only two things that stands out is that Social Science & Economic History has a standard deviation of zero on the financial literacy since all four respondents answered 3 out of 3. And that Law receives twice as big of standard deviation compared to Economics and Business Administration in financial literacy, showing a difference between the knowledge of the two study programmes.

5. Expected Results

This chapter will provide a short overview of our expectations of the results, supported with prior findings. The is also a discussion regarding the risks of conducting survey and how we thought they would influence the results.

The expected results from this study are based and derived from earlier research and assumptions. It is expected that most of the determinants and associations will play an impact on the risk preferences of individuals. With numerical ability and financial literacy in mind, they might be correlated and therefore not have a separated influence on the risk preference. Furthermore, it is believed that students from a financial educational background probably will express a higher level of risk-seeking than other students with other likewise determinants. This assumption is based on the Dunder-Kruger effect where people with some to low ability overestimate their ability to predict the outcome (Duignan, 2019), something we expect Economics and Business Administration students to represent.

Another factor that we could see affects the risk preferences is whether the individual is a man or not. It is expected that men are less risk-averse than the other genders which is an assumption based on research that has been made in other fields showing the same outcomes. Regarding respondents' cognitive abilities, it is believed that a higher CRT-score will be positively correlated with risk-seeking behaviour. Since the study is performed through a survey, and with all the risks mentioned about doing research using this method considered, it is not likely to see as strong correlations as previous studies have shown though. Furthermore, it was believed that if the individual had been in a serious accident, they might express a higher level of risk aversion compared to its peers.

Additionally, it is believed, concerning the risks mentioned in the data and method chapters, that there will be a higher response rate from women. Moreover, it's possible that there will be an excess of answers from students studying economics and business administration since the topic is mostly related to their studies, compared to for example people studying law. A noise in the data is expected, mostly since the survey is extensive which probably and unfortunately makes the respondents less likely to take it seriously, this was also discussed in the upper sections of the paper. The incentive programme for the survey will hopefully attract more respondents but not affect the quality in their answers. Regarding the response rate, the aim is to receive around 150 answers, to get a more representative sample.

6. Results

This section provides the empirical outcome from the above discussed regression models. Multiple regression models were run to determine whether there are any correlations and/or causal relationships between the determinants and the different risk questions. In addition to the OLS regression, an ordinal probit regression was run for the RE variable, since that data is ordinal, no significant changes were shown compared the OLS, these results will be viewable in the appendix in the summary of regression outputs.

6.1. Model 1

Independent Variables	Dependent variables[11]		
	Risk Evaluation	Amount	Average probability
Adjusted R	0.0276	0.0271	0.0138
Cognitive reflection test (CRT)	-0.1230 (0.555)	-26921.91 (0.282)	-4.4030* (0.053)
Financial literacy	0.8417** (0.016)	100314.4** (0.016)	0.3341 (0.928)
Numerical ability	0.0908 (0.777)	16296.93 (0.672)	-0.5319 (0.879)
No. of observations	119	119	119
Constant	2.5723 (0.111)	32824.9 (0.864)	56.7392*** (0.001)

Table 4 Model 1 – OLS

Starting with model one, a regression on the respondents' self-assessed *risk evaluation* (RE) was run. The adjusted R^2 was rather low in this model, and there was only one independent variable that was significant. This is to be expected due to the limitations of the thesis.

[11] * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

The variables *CRT* and *numerical ability* did not explain why a respondent chose a certain risk attitude-level. This was in contradiction with the expected results since the previous studies shown significant correlations between *CRT* variable and one's risk attitude.

One potential reason why this was the case, could be that the sample scored significantly higher on average than previous universities and with a low standard deviation. With uniform scores, difficulties of estimating the dependent variables occur. The variable *financial literacy* was positively correlated with the *risk evaluation*. On a 5% significance level it was shown that for each score the respondent got on the *financial literacy*-test, their estimated risk attitude increased with 0.84 units, on a scale from 0-10, this supported the expected results.

The other regression that was run in this model was on the *amount* that the respondents chose to gamble. In this model neither *CRT* nor *numerical ability* were significant. The adjusted R^2 was rather low, which indicated that the model poorly explained the independent variable. Although, the variable *financial literacy* was significant at the 5% level and showed a positive relationship with the *amount* gambled. According to the model, a one-point higher score on the *financial literacy* questions, would imply that you gamble SEK 100,314 more.

The final regression was conducted on the *average probability* that was required by the respondents to participate in the lotteries. The R^2 value was once again low, so this model also explained the independent variable poorly. In this case the results were a bit different compared to the previous regressions run in this model. The variable *financial literacy* was no longer significant, neither was the variable *numerical ability*.

CRT is significant at the 10% level in this regression and has a negative relationship with the *average required probability.* For each point in the *CRT*-test, the respondents required on average a lower probability of 4.4030%, which in other word means that a higher *CRT* might indicate that you are less risk-averse. That *CRT* estimated a lower required a lower *average probability* was in line with our expectations, although it was surprising that it was not shown in the previous regressions.

6.2. Model 2

Independent Variables	Dependent variables		
	Risk Evaluation	Amount	Average probability
Adjusted R^2	0.1358	0.0211	0.0814
Gender	1.0983* (0.056)	49808.02 (0.492)	-11.7960* (0.064)
Age	-0.0589 (0.106)	-8198.739* (0.078)	0.8944** (0.028)
Height	0.0266 (0.354)	2582.111 (0.481)	0.0006 (0.998)
Studying Economic	-0.2961 (0.0605)	-40548.06 (0.579)	1.8139 (0.775)
Studying Logistics	-0.0614 (0.942)	8443.995 (0.938)	11.4384 (0.225)
Studying Law	-0.4288 (0.562)	-65657.4 (0.486)	5.0071 (0.542)
Studying Social Science	-0.3809 (0.748)	79562.85 (0.598)	-12.956 (0.325)
Studying SMIL	-0.6158 (0.515)	-39093.7 (0.746)	7.5526 (0.472)
No parent/caregiver in private sector	0.1662 (0.704)	-76077.13 (0.175)	9.9691** (0.042)
Accident- Hospitalized	1.2569** (0.015)	96364.17 (0.140)	5.1698 (0.362)
Accident - No medical care	0.7784 (0.150)	60306.27 (0.380)	4.4023 (0.462)

No. of observations	119	119	119
Constant	0.9945 (0.842)	66583.91 (0.917)	22.9365 (0.679)

Table 5 Model 2 - OLS. P- values within the parentheses.

When running the second model the goal was to firstly include all variables that according to the research questions were intended to be used. As shown from the table 5, lots of variables lacked significance. This might be since the model did not estimate the independent variables as desired. The adjusted R^2 was also rather low in all this model, which led to the decision to omit some variables, since they did not add any significant value to the model. The variable *height* showed a strong correlation[12] with *gender*, which was the main reason this variable was omitted to avoid multicollinearity.

Therefore, a more suitable model was created for the purpose where several variables were omitted. The goal was to reach as high adjusted R^2 as possible, mostly since this shows how well the variables explain the response variables, but also since this measure penalizes for variables that do not have any explanatory value. Due to this fact, no further interpretation was made on this model.

Independent Variables	Dependent Variables		
	Risk Evaluation	Amount	Average probability
Adjusted R^2	0.1767	0.0542	0.1037
Gender	1.4854*** (0.000)	88025.33* (0.080)	-19.5279*** (0.010)
Age	-0.0570* (0.10)	-8161.754* (0.067)	0.1207** (0.024)
Accident-Hospitalized	1.3250*** (0.007)	97376.02 (0.120)	-

[12] See STATA output 10 - Correlation test

Accident - No medical care	0.7979 (0.123)	59666.31 (0.375)	-
No Parent/Caregiver in Private Sector	-	-70583.46 (0.184)	9.2650** (0.044)
No. of observations	119	119	119
Constant	5.1851*** (0.000)	467367.2*** (0.000)	27.6683*** (0.006)

Table 6 Model 2 - OLS (Alternated)

The alternated model above was created with the goal to explain the independent variables in a more efficient way compared to the original version. As shown in table 6, all variables regarding study programme were omitted in addition to the previously mentioned variable *height*. Furthermore, smaller adjustments were made within the model, where some variables were omitted when estimating different response variables, as shown in the table.

Starting with the regression on the dependent variable *risk evaluation*, with the goal to estimate how people view their own risk attitudes, there were some interesting results. *Gender* had an increasing effect at 1% significance level on the individual's view of their risk attitude and *age* has also an effect, but in the opposite direction at 10 % significance level.

The data also showed that people who had been *hospitalized* due to an *accident*, tend to view themselves as more risky people relative to their peers, this at 5% significance level. The result in the literature supports that both *gender* and *age* affected the *risk evaluation* in their respective direction. While these variables were in line with our expectations, the variable *accident-hospitalized* was surprising compared to our prior beliefs.

The next variable, the *amount* gambled. There were not as many significant values here as in the first regression run, but *gender* and *age* are still significant at 10% at explaining how people made their choice. If you identify yourself as a man, you are expected to gamble more money than if you identified yourself as a woman. There was supporting evidence in this data that implies being older, you are expected to act more risk-averse. The variables regarding previous *accidents* are not significant in this regression. Even in this case, the significant results were in line with previous research and our own beliefs.

Moreover, the last regression that was run in this model, was on the *average probability* required to gamble in the lottery. According to the regression data, the variable *gender* was negatively correlated with the *average probability* required and estimates a more risk seeking individual, significant at the 1% level. This was shown since men on average required less probability of winning to participate in the lottery. Regarding the variable *age*, there were similar results here. At a 5% significance level it was shown that older people tend to be more risk-averse according to this data, since they required a higher probability to participate. In the regression, it was also tested whether having a parent/caregiver working in the private sector had any effect on your reasoning. The data showed at a significant level of 5%, that participants with no parents/caregiver working in the private sector, required on average higher probability to participate in the given lottery, which indicates a higher level of risk aversion.

7. Discussion

The final chapter contains the discussion and conclusion based on the findings in our study. Firstly, a discussion was derived from the results and was then later compared to the previous literature. The limitations are once more mentioned in this chapter in terms of how they might have affected the data. Furthermore, careful conclusions are drawn considering the determinants and associations.

Based on the described results above we found that there was vague evidence regarding what affected the risk attitudes for students at Gothenburg school of Business, Economics, and Law. In some cases, there were correlations pointing in some direction, but in other contexts there were no significant correlations at all. When reviewing the data, some independent variables had unproportionate high scores compared to previous literature.

CRT-score in our sample could be reasonable, but compared to the previous study, the score is notably higher than for almost all universities, including both Harvard and Princeton. *Financial literacy* had a rather high mean, but it was to be expected since the questions refers to the same expertise that the sample should possess. Finally, the mean of *numerical ability* is extremely high, in other words, 95 % of the respondents scored 4 or 5 out of 5 in this questionnaire. These scores due to some extent explain the rather noisy data retrieved from these variables. The vast majority got both similar and rather high scores. It created difficulties for us to analyse the results since potential trends were difficult to interpret, due to the uniform answers. All this

was most likely because of the choice of sample, since students in this field, tend to have good knowledge in these areas.

The coefficients from the regressions were to some extent in line with the previous findings in the literature. Nonetheless, almost all independent determinants are non-significant in the original models which resulted in no or poor correlations. Changes were made to try to fit better models, measured mostly with adjusted-R^2, where previously non-significant determinants were omitted. The first model showed that *CRT* was significant when estimating the *average probability* required and had a negative coefficient which was in line with the previous findings in the literature. A negative coefficient implied that the individuals required less probability of a win in the lotteries, showing that students with higher *CRT*-score were less risk-averse than its peers.

When estimating the other dependent variables in this model the *CRT*-coefficients were negative, leaning toward predicting a more risk-averse behaviour, although the variables were not significant in either of the other regressions. So, the conclusion here would be that *CRT* could explain an individual's risk attitude in contexts regarding lotteries, but not overall risk attitudes, due to its insignificance.

The findings in *financial literacy* were in line with the previous literature when estimating the *risk evaluation* and the chosen *amount*. The positive coefficient retrieved tells us that a higher *financial literacy* implies less risk-averse attitude. In the mentioned regression the *financial literacy* variable was significant in estimating dependent variables, with an exception for the *avgpro* variable. The scores regarding the *financial literacy* questions were as discussed rather high and uniform on average, but compared to the score with the *numerical ability*, which also were high, *financial literacy* still estimates the dependent variables in a significant way. It is hard to determine why *financial literacy* in that case matters, and *numerical ability* does not. *Numerical ability* in the sample couldn't estimate either of the dependent variables in a significant way and thus the only conclusion to be drawn regarding *numerical ability* is that it has no effect on the sample's risk attitude.

The first version of the second regression model including all independent variables was worse than expected, in both terms of adjusted-R^2 and significance level, although it was included

due to transparency. Considering how poor estimates the model predicted no further analysis was done. Notably, no conclusion can be made based on the different *study programmes*, this could be due to a skewed sample where economics and business administration students were highly overrepresented. The alternated model with less variables included did better than the previous one in terms of adjusted-R^2 and significance. From this model it could be concluded that *gender* and *age* had a significant impact on all dependent variables while other variables like *accident* history and *parental occupation* showed an effect in some cases.

Some limitations with the choice of method that we discussed in the earlier sections have plausibly occurred in our sample. The risks of conducting an extensive survey have likely made an effect in the way that some respondents have not carefully considered their answer, thus not reflecting their actual attitude in some questions. This claim was made because the data was in some cases found inconsistent when reviewing answers from individuals.

One example of this is where the same respondent both answered a 0 in financial risk taking but willing to gamble the full SEK 1,000,000 in the other question. It felt like some respondents were hasted to complete the survey quickly to get a chance of winning the incentive prize, this might have led the inconsistency of the answers. Additionally, one more reason to this, could have been due to that the survey was rather extensive, making respondents lose attention throughout the survey.

Furthermore, the high scores discussed earlier regarding the *CRT*, *financial literacy* and *numerical ability* questions could be due to the potential fact that some respondents had encountered these questions before, cheated or a sample with good knowledge regarding the questions. This was mentioned in the method section as a limitation and is something that was not possible to control for in our case.

It was shown through the regressions that there were possible correlations between risk attitudes and the determinants in isolated cases. *Gender*, *CRT*, *financial literacy,* and *accident - hospitalized* did estimate the risk attitudes, all estimating a more risk-seeking behaviour. In the other direction, the variables *age* and *no parent in the private sector* showed negative correlations with risk-seeking behaviour. The fact that the variable *age* has a negative correlation is supported by previous literature and with the premise that 'private sector' yields

higher income, then the *no parent in the private sector* variable´s effect is reasonable as well in this case.

8. Further research

For a more comprehensive study it would have been desired to do some changes compared to our report. In an ideal situation, with the results in hand, it would have been desired to collect the data using a different method. While conducting a survey has been proven to work relatively well in collecting information. One could argue that collecting data using experiments in controlled environments would be a more suitable way. This method would give the data more credibility since respondents would not be able to cheat, have more incentive to not haste their answers. Respondent would thus not only assess themselves but instead act depending on the given hypothetical situations. This would further decrease the risk of response mode bias in the answers.

9. Conclusion

To conclude, no strong claims or general conclusions should be drawn with these results in mind regarding all the determinants´ effect since there were no clear overall correlations for all the determinants. The only two variables that were significant in estimating all dependent variables were *gender* and *age* so the conclusion from this study would thus be that it is plausible to believe that on one hand, being a man implies that you are less risk-averse and on the other hand, being old implies that you most likely have a higher level of risk aversion.

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11. Appendix

Gender
Man Woman Other Prefer not to say

Age _____

Height _____

Which program do you currently study?
Economics & Business Administration Logistics Law
Social Science & Economic History SMIL Other

Occupation (Present or previous) of Parent or Caregiver (1)
Private Sector Public Sector Self-employment
Unemployed Not applicable

Occupation (Present or previous) of Parent or Caregiver (2)
Private Sector Public Sector Self-employment
Unemployed Not applicable

Have you ever been involved in a serious accident?
No Yes – Hospitalized Yes - No need for medical care

Second chapter
How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?
Please tick a box on the scale, where the value 0 means: "Avoiding risks" and the value 10 means: "Seeking risks ". Number 5 implies that you are risk neutral. You can use the values in between to make your estimate.
(Avoiding risks) 0 1 2 3 4 5 6 7 8 9 10 (Seeking risks)

How would you rate your willingness to take risks in the following areas?
(*Please note that the range goes from 0 to 10 in this question*)
Please tick a box on the scale, where the value 0 means: "Avoiding risks" and the value 10 means: "Seeking risks ". Number 5 implies that you are risk neutral. You can use the values in between to make your estimate.
While driving? In financial matters? During leisure & Sport?
In your occupation? With your health? Your faith in other people?
0 1 2 3 4 5 6 7 8 9 10

Please consider what you would do in the following situation: Imagine that you had won 1.000.000 SEK in the lottery. Almost immediately after you collect the winnings, you receive the following financial offer from a reputable bank, the conditions of which are as follows: There is the chance to double the money within two years. It is equally possible that you could lose half of the amount invested. You have the opportunity to invest the full amount, part of the amount or reject the offer. What share of your lottery winnings would you be prepared to invest in this financially risky, yet lucrative Investment?
1,000,000 800,000 600,000
400,000 200,000 I would not participate

Imagine you have won 1.000 SEK in a game. You can now choose between keeping that amount, or having a lottery ticket with a certain chance to win a prize of 100.000 SEK. How high would that chance to win 100.000 SEK have to be such that you would prefer the lottery ticket to keeping the 1.000 SEK that you had already won? I would prefer the lottery ticket if the chance to win the first prize would be at least.....?
Please answer between 0 - 100. The answer reflects your required probability of winning the 100.000 SEK.

_____

Imagine you have won 5.000 SEK in a game. You can now choose between keeping that amount, or having a lottery ticket with a certain chance to win a prize of 100.000 SEK. How high would that chance to win 100.000 SEK have to be such that you would prefer the lottery ticket to keeping the 1.000 SEK that you had already won? I would prefer the lottery ticket if the chance to win the first prize would be at least.....?
Please answer between 0 - 100. The answer reflects your required probability of winning the 100.000 SEK.

_____

Imagine you have won 25.000 SEK in a game. You can now choose between keeping that amount, or having a lottery ticket with a certain chance to win a prize of 100.000 SEK.
How high would that chance to win 100.000 SEK have to be such that you would prefer the lottery ticket to keeping the 1.000 SEK that you had already won?
I would prefer the lottery ticket if the chance to win the first prize would be at least.....?
Please answer between 0 - 100. The answer reflects your required probability of winning the 100.000 SEK.

_____

Third chapter
In a sale, a shop is selling all items at half price. Before the sale, a sofa costs 3.000 SEK. How much will it cost in the sale?

_____
If the chance of getting a disease is 10%, how many people out of 1.000 would be expected to get the disease?

_____
A secondhand car dealer is selling a car for 60.000 SEK. This is two-thirds of what it costs new. How much did the car cost new?

_____
If 5 people all have the winning numbers in the lottery and the prize is 2 million SEK, how much will each of them get?

_____
Suppose say you have 2.000 SEK in a savings account.
The account earns ten per cent interest per year. How much will you have in the account at the end of two years?

_____

Fourth chapter
A bat and a ball cost 1,10 SEK (1 krona & 10 öre) in total. The bat costs 1 SEK more than the ball. How much does the ball cost?

_____
If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

_____
In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

_____

Fifth chapter
Suppose you had 1.000 SEK in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?
More than 1.020 SEK Exactly 1.020 SEK Less than 1.020 SEK
Do not know Decline to answer

Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?
More than today Exactly the same Less than today
Do not know Decline to answer

Please tell me whether this statement is true or false. 'Buying a single company's stock usually provides a safer return than a stock mutual fund'.
True False
Do not know Decline to answer

Table 7 Questionnaire

Dependent Variables	N	Mean	SD	Median	Maximum	Minimum	
Risk preference - Overall	119	4,95	2,24	5,00	9,00	0,00	
Risk preference - Driving	119	2,67	2,14	2,00	8,00	0,00	
Risk preference - Financial	119	4,26	2,29	4,00	8,00	0,00	
Risk preference - Sports	119	5,16	2,45	5,00	10,00	0,00	
Risk preference - Occupation	119	3,96	2,26	4,00	10,00	0,00	
Risk preference - Health	119	3,15	2,23	3,00	9,00	0,00	
Risk preference - Faith	119	4,05	2,31	4,00	10,00	0,00	
Ammount of money invested - lottery	119	318067,23	268449,02	200000,00	1000000,00	0,00	
% with SEK 1000	119	32,47	26,24	25,00	100,00	1,00	
% with SEK 5000	119	42,47	27,14	40,00	100,00	5,00	
% with SEK 25000	119	65,38	23,58	70,00	100,00	10,00	
Independent Variables	N	Mean	SD	Median	Maximum	Minimum	
CRT Score	119	1,90	1,08	2	3	0	
Numerical Ability Score	119	4,61	0,65	5	5	1	
Financial Literacy Score	119	2,61	0,64	3	3	0	
Height	119	175,51	9,78	175	200	152	
Age	119	24,96	5,50	23	56	18	
Gender distribution	Men	Women	Other				
Numbers	62	56	1				
In percentage	52,10	47,06	0,84	100,00			
Parental Occupation - For both	Public Sector	Private Sector	Unemployed	Self employed	Not applicable		
Numbers	88	107	7	22	14		
In percentage	36,97	44,96	2,94	9,24	5,88	100,00	
Accident question	Yes - hospitalized	Yes - no need for n	No				
Numbers	25	20	74				
In percentage	21,01	16,81	62,18	100,00			
Programme distribution	Economics & Business Adr	Logistics	Law	SMIL	Social Science & E	Other	
Numbers	63	10	17	7	4	18	
In percentage	52,94	8,40	14,29	5,88	3,36	15,13	100,00

Table 8 Summary of statistics

```
. reg RE CRT FL NA

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(3, 115)       =      2.12
       Model |  31.0863204         3  10.3621068   Prob > F        =    0.1018
    Residual |  562.611159       115  4.89227094   R-squared       =    0.0524
-------------+----------------------------------   Adj R-squared   =    0.0276
       Total |  593.697479       118  5.03133457   Root MSE        =    2.2118

------------------------------------------------------------------------------
          RE | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         CRT |  -.1229874   .2078882    -0.59   0.555    -.5347738     .288799
          FL |    .841655   .3427531     2.46   0.016     .1627271    1.520583
          NA |    .090833   .3205524     0.28   0.777    -.5441196    .7257855
       _cons |   2.572316    1.60085     1.61   0.111    -.5986585    5.743291
------------------------------------------------------------------------------
```

STATA output 1 - Model 1 RE

```
. oprobit RE CRT NA FL

Iteration 0:   log likelihood = -247.97052
Iteration 1:   log likelihood = -244.92182
Iteration 2:   log likelihood =  -244.9217
Iteration 3:   log likelihood =  -244.9217

Ordered probit regression                          Number of obs =    119
                                                   LR chi2(3)    =   6.10
                                                   Prob > chi2   = 0.1070
Log likelihood = -244.9217                         Pseudo R2     = 0.0123

------------------------------------------------------------------------------
          RE | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
         CRT |  -.0435811   .0961382    -0.45   0.650    -.2320086    .1448463
          NA |   .0372648   .1476359     0.25   0.801    -.2520962    .3266258
          FL |   .3805441   .1597576     2.38   0.017     .0674248    .6936633
------------------------------------------------------------------------------
```

STATA output 2 - Oprobit 1 RE

```
reg Amount CRT FL NA

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(3, 115)       =      2.09
       Model |  4.4066e+11         3  1.4689e+11   Prob > F        =    0.1047
    Residual |  8.0630e+12       115  7.0113e+10   R-squared       =    0.0518
-------------+----------------------------------   Adj R-squared   =    0.0271
       Total |  8.5037e+12       118  7.2065e+10   Root MSE        =    2.6e+05

------------------------------------------------------------------------------
      Amount | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         CRT |  -26921.91   24887.07    -1.08   0.282    -76218.41    22374.59
          FL |   100314.4   41032.26     2.44   0.016     19037.41    181591.4
          NA |   16296.93   38374.53     0.42   0.672    -59715.62    92309.48
       _cons |    32824.9   191643.7     0.17   0.864    -346784.4    412434.2
------------------------------------------------------------------------------
```

STATA output 3 - Model 1 Amount

```
reg AVGPRO CRT FL NA

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(3, 115)       =      1.55
       Model |  2670.43252         3  890.144174   Prob > F        =    0.2053
    Residual |  66024.7271       115  574.128062   R-squared       =    0.0389
-------------+----------------------------------   Adj R-squared   =    0.0138
       Total |  68695.1597       118   582.16237   Root MSE        =    23.961

------------------------------------------------------------------------------
      AVGPRO | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         CRT |  -4.402996   2.252054    -1.96   0.053    -8.863882    .0578905
          FL |   .3340726   3.713048     0.09   0.928     -7.02076    7.688905
          NA |  -.5318615   3.472547    -0.15   0.879    -7.410308    6.346585
       _cons |   56.73928   17.34202     3.27   0.001     22.38808    91.09048
```

STATA output 4 - Model 1 AVGPRO

```
. reg RE GEN AGE HEIG STPROE STPROLO STPROLA STPROSS STPROSM NOPR ACH ACNM

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(11, 107)      =      2.69
       Model |  128.455408        11  11.6777643   Prob > F        =    0.0044
    Residual |  465.242071       107  4.34805674   R-squared       =    0.2164
-------------+----------------------------------   Adj R-squared   =    0.1358
       Total |  593.697479       118  5.03133457   Root MSE        =    2.0852

------------------------------------------------------------------------------
          RE | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         GEN |   1.098277   .5676956     1.93   0.056     -.027113    2.223668
         AGE |  -.0589336   .0361969    -1.63   0.106    -.1306896    .0128224
        HEIG |   .0266612   .0286348     0.93   0.354    -.0301041    .0834264
      STPROE |  -.2961421   .5714426    -0.52   0.605     -1.42896    .8366762
     STPROLO |  -.0614278   .8442195    -0.07   0.942    -1.734995    1.612139
     STPROLA |  -.4287758   .7378085    -0.58   0.562    -1.891395    1.033843
     STPROSS |   -.380889   1.180621    -0.32   0.748    -2.721333    1.959555
     STPROSM |  -.6157688   .9434063    -0.65   0.515    -2.485962    1.254424
        NOPR |   .1662375   .4370146     0.38   0.704    -.7000931    1.032568
         ACH |   1.256921    .509309     2.47   0.015     .2472748    2.266566
        ACNM |   .7784149   .5372331     1.45   0.150     -.286587    1.843417
       _cons |   .9945128   4.990078     0.20   0.842    -8.897735    10.88676
```

STATA output 5 - Model 2 RE

```
. oprobit RE GEN AGE HEIG STPROE STPROLO STPROLA STPROSS STPROSM NOPR ACH ACNM

Iteration 0:   log likelihood = -247.97052
Iteration 1:   log likelihood = -232.72102
Iteration 2:   log likelihood = -232.69284
Iteration 3:   log likelihood = -232.69281
Iteration 4:   log likelihood = -232.69281

Ordered probit regression                       Number of obs =    119
                                                LR chi2(11)   =  30.56
                                                Prob > chi2   = 0.0013
Log likelihood = -232.69281                     Pseudo R2     = 0.0616

------------------------------------------------------------------------------
          RE | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
         GEN |   .4984033   .2810115     1.77   0.076     -.052369    1.049176
         AGE |  -.0310732   .0179166    -1.73   0.083    -.0661892    .0040427
        HEIG |   .0161563   .0141558     1.14   0.254    -.0115885    .0439011
      STPROE |  -.1062376   .2802596    -0.38   0.705    -.6555364    .4430611
     STPROLO |   .1301281   .4199008     0.31   0.757    -.6928624    .9531186
     STPROLA |  -.1978261    .360971    -0.55   0.584    -.9053164    .5096641
     STPROSS |  -.1533022   .5830471    -0.26   0.793    -1.296054    .9894491
     STPROSM |  -.3430149   .4612689    -0.74   0.457    -1.247085    .5610556
        NOPR |   .0716875   .2143463     0.33   0.738    -.3484236    .4917985
         ACH |   .7208639   .2553126     2.82   0.005     .2204604    1.221267
        ACNM |   .4502376   .2658906     1.69   0.090    -.0708984    .9713736
```

STATA output 6 - Oprobit 2 RE

```
. reg Amount GEN AGE HEIG STPROE STPROLO STPROLA STPROSS STPROSM NOPR ACH ACNM

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(11, 107)      =      1.23
       Model |  9.5524e+11        11  8.6840e+10   Prob > F        =    0.2757
    Residual |  7.5484e+12       107  7.0546e+10   R-squared       =    0.1123
-------------+----------------------------------   Adj R-squared   =    0.0211
       Total |  8.5037e+12       118  7.2065e+10   Root MSE        =    2.7e+05

------------------------------------------------------------------------------
      Amount | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         GEN |   49808.02   72310.96     0.69   0.492    -93540.01    193156.1
         AGE |  -8198.739    4610.62    -1.78   0.078    -17338.76    941.2785
        HEIG |   2582.111     3647.4     0.71   0.481    -4648.434    9812.656
      STPROE |  -40548.06   72788.23    -0.56   0.579    -184842.2    103746.1
     STPROLO |   8443.995   107533.5     0.08   0.938    -204728.7    221616.7
     STPROLA |   -65657.4   93979.29    -0.70   0.486    -251960.4    120645.6
     STPROSS |   79562.85   150383.1     0.53   0.598    -218554.2    377679.9
     STPROSM |   -39093.7   120167.6    -0.33   0.746    -277311.9    199124.5
        NOPR |  -76077.13    55665.3    -1.37   0.175    -186427.1    34272.83
         ACH |   96364.17   64873.89     1.49   0.140    -32240.75    224969.1
        ACNM |   60306.27   68430.75     0.88   0.380    -75349.71    195962.3
       _cons |   66583.91   635617.6     0.10   0.917     -1193454     1326622
```

STATA output 7 - Model 2 Amount

```
. reg AVGPRO GEN AGE HEIG STPROE STPROLO STPROLA STPROSS STPROSM NOPR ACH ACNM

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(11, 107)      =      1.95
       Model |  11473.4592        11  1043.04175   Prob > F        =    0.0407
    Residual |  57221.7004       107  534.782247   R-squared       =    0.1670
-------------+----------------------------------   Adj R-squared   =    0.0814
       Total |  68695.1597       118   582.16237   Root MSE        =    23.125

------------------------------------------------------------------------------
      AVGPRO | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         GEN |  -11.79599    6.29588    -1.87   0.064    -24.27683    .6848622
         AGE |   .8944162   .4014317     2.23   0.028     .0986246    1.690208
        HEIG |   .0006473   .3175673     0.00   0.998    -.6288928    .6301874
      STPROE |    1.81386   6.337434     0.29   0.775    -10.74937    14.37708
     STPROLO |   11.43837   9.362596     1.22   0.225    -7.121888    29.99862
     STPROLA |   5.007104   8.182472     0.61   0.542    -11.21369     21.2279
     STPROSS |    -12.956   13.09337    -0.99   0.325    -38.91208    13.00008
     STPROSM |   7.552642    10.4626     0.72   0.472    -13.18824    28.29353
        NOPR |   9.969098   4.846597     2.06   0.042     .3612851    19.57691
         ACH |   5.169784   5.648359     0.92   0.362    -6.027428      16.367
        ACNM |   4.402305   5.958043     0.74   0.462     -7.40882    16.21343
       _cons |   22.93652   55.34116     0.41   0.679    -86.77086    132.6439
```

STATA output 8 - Model 2 AVGPRO

```
. reg RE GEN AGE ACH ACNM

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(4, 114)       =      7.33
       Model |  121.457295         4  30.3643237   Prob > F        =    0.0000
    Residual |  472.240184       114  4.14245776   R-squared       =    0.2046
-------------+----------------------------------   Adj R-squared   =    0.1767
       Total |  593.697479       118  5.03133457   Root MSE        =    2.0353

------------------------------------------------------------------------------
          RE | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         GEN |   1.485382   .3874753     3.83   0.000     .7177961    2.252967
         AGE |  -.0569697   .0343712    -1.66   0.100    -.1250588    .0111195
         ACH |   1.324956   .4851098     2.73   0.007     .3639568    2.285954
        ACNM |   .7978505   .5140276     1.55   0.123    -.2204341    1.816135
       _cons |   5.185087   .8814446     5.88   0.000     3.438952    6.931222
```

STATA output 9 - Alternated RE

```
. reg Amount GEN AGE ACH ACNM NOPR

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(5, 113)       =      2.35
       Model |  8.0204e+11         5  1.6041e+11   Prob > F        =    0.0450
    Residual |  7.7016e+12       113  6.8156e+10   R-squared       =    0.0943
-------------+----------------------------------   Adj R-squared   =    0.0542
       Total |  8.5037e+12       118  7.2065e+10   Root MSE        =    2.6e+05

------------------------------------------------------------------------------
      Amount | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         GEN |   88025.33   49832.27     1.77   0.080    -10701.38      186752
         AGE |  -8161.754   4415.066    -1.85   0.067     -16908.8     585.289
         ACH |   97376.02   62236.81     1.56   0.120    -25926.33    220678.4
        ACNM |   59666.31   66974.15     0.89   0.375    -73021.55    192354.2
        NOPR |  -70583.46   52796.44    -1.34   0.184    -175182.7    34015.82
       _cons |   467367.2   113519.8     4.12   0.000       242464    692270.4
------------------------------------------------------------------------------
```

STATA output 10 - Alternated Amount

```
. reg AVGPRO GEN AGE NOPR

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(3, 115)       =      5.55
       Model |  8691.39824         3  2897.13275   Prob > F        =    0.0014
    Residual |  60003.7614       115  521.771838   R-squared       =    0.1265
-------------+----------------------------------   Adj R-squared   =    0.1037
       Total |  68695.1597       118   582.16237   Root MSE        =    22.842

------------------------------------------------------------------------------
      AVGPRO | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         GEN |  -11.14497   4.232093    -2.63   0.010    -19.52794   -2.762012
         AGE |   .8837211    .385184     2.29   0.024     .1207457    1.646696
        NOPR |   9.265032   4.546942     2.04   0.044     .2584158    18.27165
       _cons |   27.66832   9.897097     2.80   0.006      8.06408    47.27257
------------------------------------------------------------------------------
```

STATA output 11 - Alternated AVGPRO

```
. corr HEIG GEN
(obs=119)

             |     HEIG      GEN
-------------+------------------
        HEIG |   1.0000
         GEN |   0.7030   1.0000
```

STATA output 12 - Correlation test

```
. ttest RE, by(GEN)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	57	4.105263	.2904972	2.193206	3.523327	4.687199
1	62	5.725806	.2552146	2.009562	5.215473	6.23614
Combined	119	4.94958	.2056213	2.243064	4.542394	5.356766
diff		-1.620543	.3852555		-2.383522	-.857565

```
    diff = mean(0) - mean(1)                                      t =  -4.2064
H0: diff = 0                                     Degrees of freedom =      117

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0001          Pr(T > t) = 1.0000
```

STATA output 13 - T-test RE by GEN

```
. ttest Amount, by(GEN)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	57	266666.7	28903.67	218217.9	208765.7	324567.7
1	62	365322.6	38300.57	301579	288735.9	441909.3
Combined	119	318067.2	24608.68	268449	269335.3	366799.1
diff		-98655.91	48622.89		-194951	-2360.831

```
    diff = mean(0) - mean(1)                                      t =  -2.0290
H0: diff = 0                                     Degrees of freedom =      117

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0224         Pr(|T| > |t|) = 0.0447          Pr(T > t) = 0.9776
```

STATA output 14 - T-test Amount by GEN

```
. ttest AVGPRO, by(GEN)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	57	52.4386	2.881757	21.75679	46.66574	58.21145
1	62	41.6129	3.199134	25.19	35.21584	48.00997
Combined	119	46.79832	2.211814	24.12804	42.41833	51.17831
diff		10.82569	4.332316		2.245767	19.40562

```
    diff = mean(0) - mean(1)                                      t =   2.4988
H0: diff = 0                                     Degrees of freedom =      117

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9931         Pr(|T| > |t|) = 0.0138          Pr(T > t) = 0.0069
```

STATA output 15 - T-test AVGPRO by GEN

```
. ttest CRT, by(GEN)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	57	1.736842	.1449361	1.094243	1.4465	2.027184
1	62	2.048387	.1329553	1.046891	1.782527	2.314248
Combined	119	1.89916	.098699	1.076678	1.703709	2.09461
diff		-.311545	.1963133		-.7003332	.0772432

```
    diff = mean(0) - mean(1)                                      t =  -1.5870
H0: diff = 0                                     Degrees of freedom =      117

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0576         Pr(|T| > |t|) = 0.1152          Pr(T > t) = 0.9424
```

STATA output 16 - T-test CRT by GEN

```
. ttest FL, by(GEN)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	57	2.45614	.1003446	.7575849	2.255126	2.657155
1	62	2.741935	.0605609	.4768573	2.620836	2.863035
Combined	119	2.605042	.0587319	.6406893	2.488737	2.721347
diff		-.2857951	.1150746		-.5136944	-.0578958

```
    diff = mean(0) - mean(1)                                      t =  -2.4836
H0: diff = 0                                     Degrees of freedom =      117

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0072         Pr(|T| > |t|) = 0.0144          Pr(T > t) = 0.9928
```

STATA output 17 - T-test FL by GEN

```
. ttest NA, by(GEN)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	57	4.561404	.0792254	.5981383	4.402696	4.720111
1	62	4.645161	.0893504	.7035455	4.466494	4.823828
Combined	119	4.605042	.0599322	.6537828	4.48636	4.723724
diff		-.0837578	.1202328		-.3218725	.154357

```
    diff = mean(0) - mean(1)                                      t =  -0.6966
H0: diff = 0                                     Degrees of freedom =      117

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2437         Pr(|T| > |t|) = 0.4874          Pr(T > t) = 0.7563
```

STATA output 18 - T-test NA by GEN