



<input type="checkbox"/>	Bachelor's thesis
<input checked="" type="checkbox"/>	Master's thesis
<input type="checkbox"/>	Licentiate's thesis
<input type="checkbox"/>	Doctor's thesis

Subject	International Business	Date	30.8.2021
Author(s)	Jussi-Petteri Hiillos	Number of pages	88 + appendices
Title	Explaining investment decisions towards cryptocurrencies		
Supervisor(s)	D.Sc. Niina Nummela, D.Sc. Riikka Harikkala-Laihininen		

**Abstract**

Interest towards cryptocurrencies has grown significantly over the last years when people and institutions have started to treat them more as an investable asset class. However, as an asset class, cryptocurrencies are often seen as controversial because of the high volatility, speculation and lack of universally accepted regulation. Even though, the research around cryptocurrencies has increased significantly during the past years, the research around cryptocurrency investors has not achieved notable interest among the academics. Thus, the purpose of this study is to shed light on to that unsolved issue by studying the factors that may have contributed to the past investment decision towards cryptocurrencies. The main factors that were selected for answering the main research question include investment motives, financial risk tolerance and behavioral biases in investment decision making. Behavioral biases that were selected for this study include overconfidence, herding, familiarity/home bias and mental accounting. In addition, background variables and previous investment decisions are used for providing additional explanations for the investment decisions.

This study is quantitative by its nature and chosen research method is quantitative web survey. The target population is Finnish speaking retail investors and sample size 872 responses. The results from the empirical part indicate that motives in general do not explain the investment decision towards cryptocurrencies but instead there are other unknown motives that do. Higher financial risk tolerance score was found to be a significant predictor of positive investment decision towards cryptocurrencies. However, based on the results behavioural biases in investment decision making did not explain the investment decision towards cryptocurrencies. From the background variables, only gender (male), investment experience (2-5 years) and average time horizon (1-5 years) had significant impact on the positive investment decision towards cryptocurrencies. Furthermore, cryptocurrency investors were found to have had significantly more likely investments in listed stocks, ETFs, currencies, commodities, derivatives and other investments during the previous year prior to the data collection. On the other hand, cryptocurrency investors had invested significantly less likely to investment funds.

Key words	Financial risk tolerance, behavioral biases, investment motives, investment decision making, cryptocurrencies
-----------	---







<input type="checkbox"/>	Kandidaatintutkielma
<input checked="" type="checkbox"/>	Pro gradu-tutkielma
<input type="checkbox"/>	Lisensiaatintutkielma
<input type="checkbox"/>	Väitöskirja

Oppiaine	Kansainvälinen liiketoiminta	Päivämäärä	30.8.2021
Tekijä	Jussi-Petteri Hiillos	Sivumäärä	88 + liitteet
Otsikko	Explaining investment decisions towards cryptocurrencies		
Ohjaajat	D.Sc. Niina Nummela, D.Sc. Riikka Harikkala-Laihin		

#### Tiivistelmä

Kiinnostus kryptovaluuttoja kohtaan on kasvanut merkittävästi viime vuosina, kun ihmiset ja instituutiot ovat alkaneet kohdella niitä enemmän sijoituskelpoisena omaisuusluokkana. Omaisuusluokkana kryptovaluuttoja pidetään kuitenkin usein kiistanalaisina suuren volatiliiteetin, keinottelun ja yleisesti hyväksytyn sääntelyn puutteen vuoksi. Vaikka kryptovaluuttoihin kohdistunut tutkimus on lisääntynyt merkittävästi viime vuosina, kryptovaluuttasijoittajia koskeva tutkimus ei ole saavuttanut merkittävää kiinnostusta tutkijoiden keskuudessa. Näin ollen tämän tutkimuksen tarkoituksena on valottaa tätä ratkaisematonta asiaa tutkimalla tekijöitä, jotka ovat saattaneet vaikuttaa aiempiin sijoituspäätöksiin kryptovaluuttojen osalta. Tärkeimmät päätutkimuskysymyksen selittämiseksi valitut tekijät ovat sijoitusmotiivit, taloudellinen riskinsietokyky ja behavioraaliset harhat sijoittajan päätöksenteossa. Tähän tutkimukseen valittuja behavioraalisia harhoja ovat liika itsevarmuus, laumakäyttäytyminen, tuttuuden harhat ja mentaalitilinpito. Lisäksi sijoituspäätöksiä tutkitaan taustamuuttujien ja aiempien sijoituspäätösten avulla. Tämä tutkimus on luonteeltaan määrällinen ja valittu tutkimusmenetelmä on kvantitatiivinen verkkokysely. Kohderyhmänä ovat suomenkieliset yksityissijoittajat ja otoskoko 872 vastausta. Empiirisen osan tulokset osoittavat, että motiivit eivät yleisesti selitä sijoituspäätöksiä kryptovaluuttoihin, vaan on muita tuntemattomia motiiveja, jotka selittävät. Korkeamman taloudellisen riskinsietokyvyn todettiin ennustavan merkittävästi positiivista sijoituspäätöstä kryptovaluuttoja kohtaan. Toisaalta taas sijoituspäätöksissä läsnä olevien behavioraalisten harhojen perusteella ei kuitenkaan voida selittää sijoituspäätöksiä kryptovaluuttoja kohtaan. Taustamuuttujista vain sukupuoli (mies), sijoittajankokemuksella (2–5 vuotta) ja keskimääräisellä sijoitus aikajänteellä (1–5 vuotta) oli merkittävä vaikutus positiiviseen sijoituspäätökseen kryptovaluuttojen osalta. Lisäksi kryptovaluuttasijoittajilla todettiin olevan huomattavasti todennäköisemmin sijoituksia pörssi osakkeisiin, ETF-rahastoihin, valuuttoihin, hyödykkeisiin, johdannaisiin ja muihin sijoituksiin tiedonkeruuta edeltävänä vuonna. Toisaalta kryptovaluuttasijoittajat olivat sijoittaneet huomattavasti epätodennäköisemmin rahastoihin.

Avainsanat	Taloudellinen riskinsietokyky, behavioraaliset harhat, sijoitusmotiivit, sijoittajan päätöksenteko, kryptovaluutat
------------	--







**UNIVERSITY  
OF TURKU**

Turku School of  
Economics

# **EXPLAINING INVESTMENT DECISIONS TOWARDS CRYPTOCURRENCIES**

Master's Thesis  
in International Business

Author:  
Jussi-Petteri Hiillos

Supervisors:  
D.Sc. Niina Nummela  
D.Sc. Riikka Harikkala-Laihin

30.8.2021  
Turku

The originality of this thesis has been checked in accordance with the University of Turku quality assurance system using the Turnitin OriginalityCheck service.

## Table of contents

1	INTRODUCTION .....	11
1.1	Background for the study .....	11
1.2	Bitcoin as an investment .....	13
1.3	Problem setting and structure of the study .....	15
2	INVESTMENT MOTIVES AND FINANCIAL RISK TOLERANCE.....	17
2.1	Motives for investing .....	17
2.2	Financial risk tolerance .....	21
3	BEHAVIOURAL BIASES IN INVESTMENT DECISION MAKING.....	25
3.1	Background of behavioral finance .....	25
3.2	Overconfidence .....	26
3.3	Herding.....	27
3.4	Familiarity/home bias.....	29
3.5	Mental accounting.....	31
3.6	Theoretical framework .....	33
4	METHODOLOGY .....	36
4.1	Research approach.....	36
4.2	Survey research .....	37
4.3	Constructing the questionnaire.....	38
4.4	Measure development .....	40
4.5	Data collection.....	42
4.6	Reliability and validity .....	43
5	RESULTS.....	46
5.1	Descriptive analysis and chi-squared tests.....	46
5.2	Logistic regression analysis .....	60
6	CONCLUSIONS .....	67
6.1	Discussion of findings.....	67
6.2	Managerial implications.....	72
6.3	Limitations and suggestions for future research .....	72
7	SUMMARY.....	74

REFERENCES.....	76
APPENDIX 1 QUESTIONNAIRE.....	89
APPENDIX 2 QUESTIONNAIRE IN ENGLISH .....	97
APPENDIX 3 ORIGINAL MEASURES .....	101
APPENDIX 4 CORRELATION MATRIX.....	103
APPENDIX 5 LOGISTIC REGRESSION RESULTS FOR FRT AND GENDER.....	104

### **List of figures**

Figure 1 Bitcoin price history from October 2013 to May 2021 .....	14
Figure 2 Behavioral biases in investment decision making.....	25
Figure 3 Research framework.....	34



## List of tables

Table 1 Motives for saving .....	17
Table 2 The reliability values of constructs .....	44
Table 3 Gender versus investment decision.....	46
Table 4 Age versus investment decision.....	47
Table 5 Education versus investment decision .....	48
Table 6 Professional status versus investment decision.....	50
Table 7 Income versus investment decision.....	52
Table 8 Total investments/savings versus investment decision.....	53
Table 9 Investing experience versus investment decision .....	54
Table 10 Average investment horizon versus investment decision .....	56
Table 11 Asset class choices versus investment decision.....	57
Table 12 Investment/saving motives versus investment decision.....	59
Table 13 Logistic regression results for financial risk tolerance .....	61
Table 14 Logistic regression results for overconfidence .....	62
Table 15 Logistic regression results for herding.....	62
Table 16 Logistic regression results for mental accounting.....	63
Table 17 Multivariate logistic regression results for FRT and OC .....	64
Table 18 Hypotheses and results.....	67



# 1 INTRODUCTION

## 1.1 Background for the study

Traditional finance assumes that investors are rational in their investment decision making and markets work accordingly. Behavioral finance again challenges this assumption by acknowledging the fact that investors are affected by numerous biases in their investment decision making which causes them to behave irrationally (Ricciardi & Simon 2000; Barberis & Thaler 2005). The irrational investment behavior leads to investment decisions that are not optimal from the wealth maximizing standpoint and furthermore creates inefficiencies in the markets such as price bubbles. (Ricciardi & Simon 2000). In addition, there are also many other factors that have been shown to affect investment decision making which include investment/saving motives and even more importantly, financial risk tolerance (Xiao & Andersson 1997, 348; Corter & Chen 2006, 376; Grable 2008, 4; Kimball et al 2008, 1035).

Bitcoin and other cryptocurrencies have gained lot of attention during the past few years and investor number and infrastructure have both grown significantly (Phillip et al 2018, 6-9; Statista 2021b). The rationality of cryptocurrency investors has been discussed in the media and Bitcoin has even been questioned by economists (Wolff-Mann 2018). However, according to the researcher's best knowledge it seems that there are hardly any comprehensive studies available regarding the factors that could explain the investment decision towards cryptocurrencies even though the research and interest towards cryptocurrencies in general has grown significantly during the last years (Corbet et al 2018). For example, the presence of herding in the cryptocurrency markets has already been well documented similarly as it has been documented in the stock market already long time ago (Khuntia & Pattanayak 2018, 28; Leclair 2018; Poyser 2018). Furthermore, cryptocurrencies are interesting asset class as they are still relatively new and face scrutiny for being speculative and in addition lack internationally accepted regulation (Barnes 2018, 15; Phillip et al 2018, 6-9).

Therefore, this study is curious to know which factors explain investment decisions towards cryptocurrencies and tries to achieve this by comparing those who have invested in cryptocurrencies to investors who have made the opposite decision towards the same asset class. Even though, motives towards investing, risk tolerance and behavioral biases in investment decision making have all been studied comprehensively on investors, all three of them are not usually if ever included in the same study which makes this study's approach a bit different and challenging. Moreover, particular investment decisions are

not usually at the core of the research as previous studies have focused more on the factors that explain the variables selected for this study such as financial risk tolerance, investment motives and behavioral biases. For instance, based on the current research, we know for example that retirement is the most common investing/saving motive and that men are more likely to take higher risk than women (Grable 2000; Harris et al 2002). Men are also on average more overconfident than women and therefore tend to trade more frequently which again has been shown to decrease returns on average (Odean 1999; Grinblatt & Keloharju 2009). What is also clear is that herding is connected to unhealthy price movements and investors do not diversify their portfolios according to the level suggested by modern portfolio theory because of the mental accounting and home bias (Markowitz 1952; Tesar & Werner 1995; Bikhchandani & Sharma 2000, 290; Shefrin & Statham 2000, 142; Rockenbach 2004, 514). Thus, this study aims to provide new insights into the existing literature by comparing investors based on their past investment decision towards cryptocurrencies in terms of investment motives, financial risk tolerance, behavioral biases and background variables. The behavioral biases that were selected for this study include overconfidence, herding, familiarity/home bias and mental accounting since they were seen as the most promising ones to explain investment decisions towards cryptocurrencies.

Even though, this study is interested about cryptocurrencies as an asset class, Bitcoin is used as an example of cryptocurrencies in the discussions as it is the leading and by far the largest cryptocurrency and has therefore also the biggest impact on financial markets (Phillip et al 2018, 6; Coinmarketcap 2021). The purpose is not to disregard other cryptocurrencies by any means but involving them extensively in the discussions is just not possible because of the scope of this research and fundamental differences in many cases. However, most importantly the core of this research is in the investment decision making, not in the Bitcoin/cryptocurrencies. It is also important to note that the investors who are called cryptocurrency investors in this study can invest broadly across different asset classes and the division into two groups was simply made based on their past positive or negative investment decision towards cryptocurrencies.

The findings of this study can be considered valuable for many stakeholders such as investors and financial service providers because the knowledge about cryptocurrency investors and the factors that explain the decision to invest in that particular asset class will help us to better understand the phenomenon around cryptocurrencies which is international and very current. The study also adds knowledge on the existing theories of behavioral finance, financial risk tolerance and investment/saving motives which still have not been researched to their full potential and therefore the findings are also applicable in the broader context.

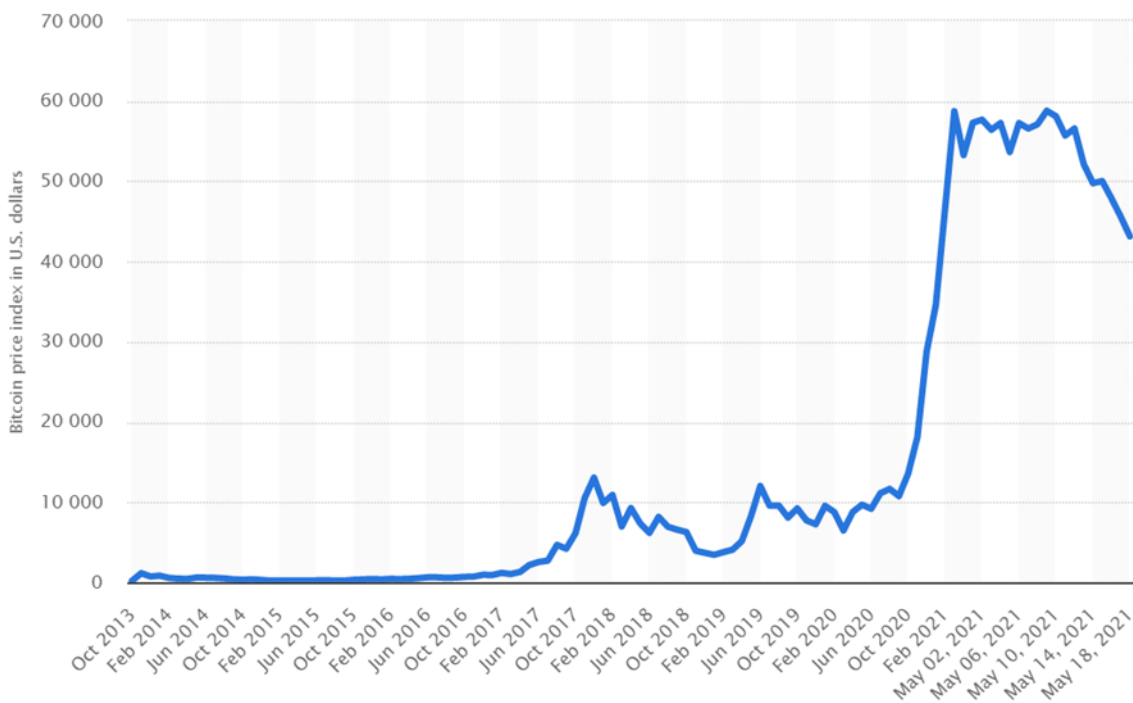
## 1.2 Bitcoin as an investment

Bitcoin was launched in 2009 by anonymous group of developers called Satoshi Nakamoto. Bitcoin is the first and by far the biggest and most well-known cryptocurrency that still dominates the markets even though there are now also other important cryptocurrencies such as Ethereum and XRP (Nakamoto 2008; Böhme et al 2015, 213; Baur et al 2018a,1; Coinmarketcap 2021). According to Nakamoto (2008) Bitcoin intends to serve as a peer-to-peer version of electronic cash that allows online payments to be made directly between the two parties without going through a third party. Despite Bitcoin's initial purpose to serve as medium of exchange, it can also be considered as an asset. Furthermore, based on the current research it seems that Bitcoin is being used more often for investment purposes rather than for making transactions and therefore it should be treated more as a speculative asset (Glaser et al 2014, 13; Baur et al 2018b, 16).

Bitcoin is however vastly different asset compared to any other asset classes (Glaser et al 2014a; Dyhrberg 2016; Baur et al 2018b). For example, when compared to stocks, Bitcoin does not produce any value in a sense that there is no company behind it that would sell services or products. Bitcoin is also different from gold as Bitcoin cannot be used in any production processes that would give it additional value (Ciaian et al 2016, 1803). There is also no central bank or government behind Bitcoin so comparing it to fiat currencies like USD or Euro is difficult as it does not have the feature of interest rate and furthermore the price of Bitcoin is based purely on speculation between the seller and buyer (Glaser et al 2014a, 5).

Even though Bitcoin is different compared to stocks, fiat currencies and gold, it shares some similarities between the latter two. What is currently considered as money can be defined to have three main functions: medium of exchange, unit of account and store of value. It can be argued that Bitcoin satisfies somehow the first criteria, since it is being accepted by increasing number of merchants (Yermack 2013, 2). However, bitcoin does not currently work as unite of account because of the high volatility (Henriques & Sadorsky 2018, 3). Historically, Bitcoin has served as a store of value in a sense that its value has increased significantly over the years (see figure 1). However, it needs to be remembered that the road has been very volatile and therefore holding it can be kept as a risky move and therefore it is difficult to consider it as a store of value (Yermack 2013, 14-15; Coinmarketcap 2021). Bitcoin has also often been compared to gold because of the scarcity as the supply is finite and not controlled by government (Baur et al 2018b, 3; Dyhrberg 2016). Both gold and Bitcoin are also minable, although in different ways (Baur et al 2018b, 3). Some of the pros of Bitcoin compared to gold could be that it is easier to transfer and store as it is in electronic form (Nakamoto 2008). Cons again are that Bitcoin

cannot be used in any production processes which would give it additional value and also the high energy expenditure of the network has received lot of criticism even though Bitcoin consumes less than half of the energy what the gold mining does (Ciaian et al 2016, 1803; McCook 2021). There has also been lot of scams and criminal action around Bitcoin and other cryptocurrencies because of the lack international standards for regulation (Barnes 2018, 15).



**Figure 1 Bitcoin price history from October 2013 to May 2021 (Statista 2021c)**

Despite the high risk and return characteristics of Bitcoin it has also other properties as an investment. It has been shown for example that Bitcoin's correlation with other asset classes is very low which can give it hedging capabilities or it can possibly act as a weak safe haven in economic turmoil (Dyhrberg 2016; Baur et al 2018, 7). However, researcher's own conclusion is that because Bitcoin is very volatile asset and there is also not enough historical data to state that Bitcoin would for example be a safe haven, it should not be considered as such yet if ever. It could however be argued that Bitcoin can be used as a hedge and therefore uncorrelation with other asset classes could be important factor for cryptocurrency investors since they have chosen to include such an asset in their investment portfolio.

The exact number of Bitcoin/cryptocurrency investors is unknown but the number of blockchain users have been estimated to be over 70 million in early 2021 which is roughly

two times more than in 2019 (Statista 2021b). The typical profile of Bitcoin and cryptocurrency investors is not well-researched. However, a survey of more than 1000 Americans found out that young men who earn more than 75 000 dollars are the most likely people to have invested in cryptocurrencies. The survey also documented that the uncertainty is the most associated feeling towards cryptocurrencies. Also risk-taking was the most common trait among cryptocurrency investors while playing safe was the most associated trait among those who had not invested in cryptocurrencies (Clovr 2018). Pelster et al (2019) analysed the trading behaviour of more than 96 000 investors and found out that cryptocurrency investors are risk seeking and interestingly increase their stock trading and leverage as well after they have entered the cryptocurrency market.

Bitcoin has impressed with strong returns since its introduction (see figure 1). The price of a single Bitcoin was around 200 dollars in late 2013 and has since gone up significantly. Furthermore, the price of Bitcoin has moved in cycles and not a long ago in April 2021 reached its all-time highs when the price of a single Bitcoin soared to roughly 63 000dollars. However, the price has been in deep decline since then and it remains to be seen if this is another replication of Bitcoin's past cycles (Coinmarketcap 2021). It could however be concluded that Bitcoin is a very interesting asset and considering its growth there has to be certain factors that explain why so many investors have decided to participate in that market.

### 1.3 Problem setting and structure of the study

The purpose of this study is to compare investors based on their past positive or negative investment decision towards cryptocurrencies in order to find out the factors that explain and do not explain the decision to invest in cryptocurrencies. Therefore, the main research question for the study is: **Which factors contribute to the investment decision towards cryptocurrencies?** In order to provide answers for the main research question the following sub-questions for the study were developed:

- **How investment/saving motives explain the investment decision towards cryptocurrencies?**
- **Does Financial risk tolerance predict the investment decision towards cryptocurrencies?**
- **Do behavioral biases predict the investment decision towards cryptocurrencies?**
- **How background variables explain the investment decision towards cryptocurrencies?**

Motives towards investing, financial risk tolerance and behavioural biases can be considered to be at the core of this research. According to the researcher's best knowledge previous studies have not used the same mixture of themes and variables before and therefore, it is a new challenge combine all of them into the same study. Behavioural biases that are at particular interest in this study include overconfidence, herding, familiarity/home bias and mental accounting. In the theoretical discussions, background variables do not have a separate section, but their impact on the investment decision making is discussed in relation to the other factors.

This is a quantitative study on Finnish investors and the data were collected from the investing related Facebook group with over 60 000 members at that time. The structure of the study is based on the normal structure for academic research. The study begins with introduction chapter that includes discussions about Bitcoin as an investment in order to make sure that the reader understands the characteristics of the biggest and most well-known cryptocurrency. Chapter 2 will present the theories and former research related to investment motives and financial risk tolerance. Chapter 3 again discusses about the theories and studies related to the behavioural biases in investment decision making. Each of the biases (overconfidence, herding, familiarity/ home bias and mental accounting) selected for this study are discussed separately in detail. The chapter 3 also presents the theoretical framework for the study including hypotheses. In chapter 4, the methodology of the study is presented. The chapter will first introduce the research approach for the study and after that, presents the survey research and how questionnaire was being constructed and data collected. The chapter then continues with measures used in the study and in the end reliability and validity will be discussed. In chapter 5, the results of the empirical part of the study will be presented and analysed. Chapter 6 again discusses about the findings of the study based on empirical and theoretical parts and then continues to managerial implications and finally discusses about the limitations of the study and future research opportunities. Finally, chapter 7 includes the summary of the whole research.



## 2 INVESTMENT MOTIVES AND FINANCIAL RISK TOLERANCE

### 2.1 Motives for investing

Investing is a form of saving which represents a decision to hold back from spending money or to increase asset accumulation for the future financial goals. There are both economic and psychological explanations for saving (Canova et al 2005, Fisher & Montalto 2010). Keynes (1936) was the first to introduce motives for saving. In the Book: *The General Theory of Employment, Interest and Money* (1936) he identified 8 motives for individuals to hold back from spending their money. The eight motives (see table 1) identified are called Precaution, Foresight, Calculation, Improvement, Independence, Enterprise, Pride and Avarice (Keynes 1936, 74).

**Table 1 Motives for saving (Keynes 1936)**

Motive:	Definition:
Precaution	To build up a reserve against unforeseen contingencies
Foresight	To provide for an anticipated future relation between the income and the needs of the individual or his family different from that which exists in the present, as, for example, in relation to old age, family education, or the maintenance of dependents
Calculation	To enjoy interest and appreciation, i.e. because a larger real consumption at a later date is preferred to a smaller immediate consumption
Improvement	To enjoy a gradually increasing expenditure, since it gratifies a common instinct to look forward to a gradually improving standard of life rather than the contrary, even though the capacity for enjoyment may be diminishing
Independence	To enjoy a sense of independence and the power to do things, though without a clear idea or definite intention of specific action
Enterprise	To secure a masse de manoeuvre to carry out speculative or business projects
Pride	To bequeath a fortune
Avarice	To satisfy pure miserliness, i.e. unreasonable but insistent inhibitions against acts of expenditure as such

Later Browning & Lusardi (1996) added one additional motive to the Keynes work, which was the downpayment motive, what basically means that the motive for investing or saving is to accumulate deposits to buy a house or car. Other eight motives identified by Keynes (1936) remained as the same except that some of the names had been reproduced and for example, the foresight motive was called the life-cycle motive (Browning & Lusardi 1996, 1). However, it is important to understand that the motives identified by Keynes (1936) and later by Browning and Lusardi (1996) do not apply to every individual

and the purpose for investing/saving can change over time and furthermore many of the motives are complementary to each other (Fisher & Montalto 2010; Browning & Lusardi 1996). Keynes (1936) also argued that the rate of saving does not depend on the motives as it will only depend on the favourability of the rate of interest for investment including the effect of marginal efficiency of capital. However, in the end it is well known that the main motivational factor for why people invest is to increase financial wealth (Lewis 2000, 331; Rani 2012, 1164).

Several models for saving have been proposed. For example, according to economic theories such as life-cycle hypothesis by Modigliani and Brumberg (1954) people save for retirement as they do not earn income anymore at that stage of life. Friedman (1957) extended the life cycle hypothesis by introducing permanent income hypothesis which added a bequest motive. Saving for precautionary reasons was again first proposed by Leland (1968). Some of the explanations provided for precautionary saving are that if the knowledge of future income is risky it can lead to precautionary saving by decreased consumption and increased accumulation of wealth (Kennickell & Lusardi 2004; Carroll & Kimball 2006). The problem with these economic models are however that they only focus on one selected motive and treat different motives as interchangeable (Horioka & Watabe 1997, 538; Xiao & Andersson 1997, 335).

Fortunately, there are numerous studies that have researched the different saving/invest motives that people can have (Canova et al 2005, 22). Horioka and Watanabe (1997) for example, analysed motives for household saving in Japan and found out that the retirement was the most important saving motive followed by housing, peace of mind, illness and education. Surprisingly, the bequest motive was only ninth most important. The high importance of retirement, peace of mind and illness as a motive towards saving seems similar with the life-cycle model. The study also documented that age has an impact on the saving behaviour as people saved for motives that are relevant for their current life stage (Horioka & Watabe 1997, 548-549).

Harris et al (2002) did a similar study where they researched the saving determinants of Australian households. They documented that retirement was the most common reason for saving followed by holidays, rainy days, investing for a house and pay off debt. The bequest motive was found again to be one of the least important motives for saving. They also studied how saving motives differ based on age and income. For the youngest group in the study (18 to 24) holidays and buying durables and investing in home were the three most common saving motives. Retirement was only fifth important motive for the youngest group. In contrast for the oldest group (65+) the rainy days was the most important motive and it was followed by retirement and holidays. Not surprisingly, investing in home or durables were not that important for this age group. Not saving was

also most common for the oldest age group (Harris et al 2002, 209). The results indicate the impact of current life stage for saving motives as the importance varies between age groups. The income of the households had also impact and for the low-income households (less than 20 000\$ annually) saving for rainy days (precautionary reasons) was the most common motive which was followed by retirement and holiday. Not saving was also most common for the low-income households. For the wealthiest households (60 000\$ and over annually) the retirement was the most popular motive followed by holidays and investing in home. The results reveal that the income (higher) and age (lower) increase the likelihood of saving and both income and age have an impact on saving motives which could both be factors that have an impact on past investment decision towards cryptocurrencies.

According to the study conducted by Finanssiala (2019) on Finnish households, the five most important motives towards saving were as a reserve fund or for a bad day, for retirement, for home purchase, buying durables and for bequest. The study also documented that time horizon for saving increases by age and younger people aged (25 or less) save more for durables while older people aged (45-64) save more for retirement (Finanssiala 2019, 19). Based on the motives defined by Keynes (1936) and Browning & Lusardi (1996) the three most important saving motives for Finnish households would then be precaution, foresight and downpayment. The results on Finnish households seem to be quite consistent with the results on Japanese and Australian investors, because precautionary reasons and retirement were the most important saving motives and the impact of age on investing motives was also well documented (Horioka & Watabe 1997; Harris et al 2004; Finanssiala 2019).

One of the important factors that seems to be left out from the work of Keynes (1936) and Browning & Lusardi (1996) is the importance of time horizon for investing as it can be used to predict the saving behaviour. A study conducted by Fisher and Montalto (2010) documented that people with long time horizon for saving such as retirement are more likely to save more regularly than those whose time horizon for saving is shorter. Time horizon for investing could therefore also play a role in investment decisions even though this study does not gather data on how regularly people invest.

What could still be added to the previous discussion on investment motives is Thaler and Shefrin's (1988) behavioural life-cycle theory which is an enrichment of traditional life-cycle theory, but it considers also mental accounting, framing and self-control. According to the behavioural life-cycle theory, wealth is divided into three different mental accounts: current income, current assets and future income (Thaler and Shefrin 1988, 609). In simple terms, dividing wealth into different mental accounts means that people have different goals for different investments and therefore they are also treated

differently. Xiao and Andersson (1997) found evidence for the life-cycle theory when they investigated why consumers hold different assets on a particular level. They based their work on the Maslow's (1954) hierarchy theory, new consumer demand theory by Lancaster (1966) and prospect theory by Kahneman and Tversky (1979). They found out that for example savings in bonds and stocks are used for "growth needs" and saving and retirement accounts are used to meet "security needs". Checking accounts again are used to meet "survival needs". The study also documented that when the financial resources increase people try to achieve higher needs such as the growth need (Xiao & Andersson 1997, 348).

Based on the studies discussed earlier, it is evident that people can have different motives for holding different assets because particular asset can be considered to be suitable for fulfilling a certain financial need. For example, Bitcoin could be used for growth needs or security needs depending on how the investors feels about its characteristics as an investment and therefore the overall saving motives of those who have invested in cryptocurrencies could be different to those who have not and therefore motives towards investing could play a significant role in the past investment decision towards cryptocurrencies. Also based on the previous studies: age, wealth and time horizon for investing seem to all have an impact on the investing motives and therefore they can also be important factors. This study acknowledges the fact that people can have multiple motives for investing and saving and therefore allows respondents to choose from the predetermined list of alternatives the motives that best apply to them. Even though many of the motives at interest in this study belong to the ones identified by Keynes (1936) (see table 1) or Browning and Lusardi (1996) the study will not classify them according to their work because it is better for the researcher, respondents and reader to have a clear list of motives that are easier to identify. Instead, this study is interested about the impact of motives that were used in the Finanssiuala (2019) study.

In addition to motives, financial risk tolerance is also very important part of the investment decision making as it has implications on investment selection and investor behaviour. Prospect theory developed by Kahneman and Tversky in 1979 is a central part of explaining decision making under risk from alternative perspective to expected utility theory which assumes that investors are rational and therefore try to maximize their expected utility from the different choices available for them (Kahneman & Tversky 1979, 263; Levy 1992, 171-173). Prospect theory is considered as a descriptive model for explaining financial decisions under risk and loss aversion is a central part of the theory.

Loss aversion means that investors are more sensitive to financial losses than gains and generally are risk averse when potential gains are expected and risk seeking when there is a situation where losses seem more potential (Ricciardi & Simon 2000,5; Barberis et al 2001, 3).

## **2.2 Financial risk tolerance**

“The possibility of a loss” is a common definition of risk in the dictionaries. In economics and business risks are often described as “opportunities whose returns are not guaranteed” (Yates, 1992, 4). The financial risk tolerance again is related to the amount of uncertainty that person is willing to take when making financial decisions (Grable 2000, 625). Uncertainty is a major component of risk because if the outcome is guaranteed there is no risk and therefore risk exists always when the outcome is not assured (Yates 1992, 4). The third essential element of risk in addition to loss and uncertainty is the significance of losses (Yates 1992, 23).

Risk tolerance has important implications on investing as it affects the investment behavior in a way that those who have higher risk tolerance tend to invest more aggressively and hold riskier investment portfolios as well (Corter & Chen 2006, 376; Grable 2008, 4; Kimball et al 2008, 1035). Risk tolerance can also be used for determining the optimal asset allocation for the investor. For example, investor who has high risk tolerance should hold higher percentage of stocks while someone who is more risk averse should invest more into fixed income assets and have less stock holdings. Various tests have been developed for determining the right asset allocation for investor’s risk tolerance but, it has been noted that some of the suggested asset allocations that risk tolerance tests can propose may be biased towards services or products and that there are also big variations between the scores of different tests (Grable & Lytton 1999, 165; Ricciardi & Rice 2014, 333).

The effect of demographic and socioeconomic variables on financial risk tolerance has been documented by many studies. It seems to be agreed that income, age, gender, education and profession have all impact on risk tolerance. Grable (2000) studied about financial risk tolerance and documented that respondents who were male, older, married, had higher income and education or professional status had also higher risk tolerance compared to others. Also, people who had higher financial knowledge and higher expectations were more risk tolerant than others in the study (Grable 2000, 628). Quite similarly Corter and Chen (2006) found out that investors who were more experienced exhibited higher risk tolerant attitudes and behaviours since their portfolios were also

riskier compared to other investors. Grable and Joo (2004) again reported that factors which were significantly related to higher risk tolerance were higher education, income, financial knowledge, self-esteem and net worth. However, being married decreased the risk tolerance which is the opposite of what was documented in the Grable's (2000) study. Sung and Hanna (1996) did a similar study where they investigated the factors related to household risk tolerance. They documented that risk tolerance was highest for male headed households while couples had second highest risk tolerance and female headed households had the lowest risk tolerance. The effect of education was also documented, and results suggested that risk tolerance increases with education like in the previously discussed studies. Among many other factors, the study documented also that those who were self-employed had significantly higher risk tolerance (Sung & Hanna 1996, 13-17). However, Wang and Hanna (1997) investigated the effect of age on financial risk tolerance and as opposed to many other studies concluded that higher age does indeed increase financial risk tolerance as proportion of investments in risky assets increases by age. Seems that the way age impacts risk tolerance is not universally accepted since studies have reported different results as for example, Yao et al (2011) documented that risk tolerance decreases when people get older. It is also well known that personality has an impact on financial risk tolerance. For instance, sensation-seeking and extroversion are known to increase financial risk tolerance (Harlow & Brown 1990 ,61).

The market condition can also have a significant impact on financial risk tolerance as well. Yao et al (2004) used six Survey of Consumer Finances datasets and investigated the changes in the financial risk tolerance between the years 1983 and 2001. They documented that risk tolerance scores were higher during the times that stock market was doing well and lower when the stock market was performing badly (Yao et al 2004, 262-263). This is something that needs to be taken into consideration in the findings of this study as financial markets were in turmoil during the data collection period.

Investing involves lot of factors that can result into risks and some of those risks are also asset class specific. For example, some of the risks that bond holders have to face are interest rate risk and credit risk while stock investors need to deal with higher volatility. Stocks have generally performed better than bonds but are viewed as riskier choice because of the volatility and for example if the company files for bankruptcy the stockholders are the once who are paid last whereas the bond holders are paid before as they are the creditors (Peterson 2012; Greiner 2013). Some of the risks related to cryptocurrencies are that they are highly speculative, volatile, difficult to valuate and in addition unlike gold cannot be used in any production purposes (Ciaian et al 2016, 1803; Henriques & Sadorsky 2018, 3; Phillip et al 2018, 3).

Today there are also a lot of ways to identify, measure, monitor and mitigate risks such as: portfolio standard deviation, systematic risk, idiosyncratic risk, Sharpe ratio and percent value at risk (Greiner 2013, 68). In addition, diversification is an important and effective way to reduce risk in the whole investment portfolio (Yates 1992, 112). Harry Markowitz (1952) introduced the modern portfolio theory (MPT) which is one of the most well-known theories for diversification. According to MPT, an investor should construct their portfolio in a way that it provides the best expected return for the level of risk desired. There are three characteristics that investors should consider if they want to diversify according to MPT. First, investors need to know the expected return of the investment and secondly the level of risk of each investment which can be measured by standard deviation of returns. The third characteristic needed for implementing the MPT is correlation of each investment towards others (Markowitz 1952). However, MPT has received criticism because the expected return, risk and correlation are based on expected values and are therefore only expectations about the future based on the past performance. Also, the model does not consider why the asset has performed on a given level in the past. Also, MPT does not consider the impact of human behaviour (Otuteye & Siddiquee 2017). Post-Modern Portfolio Theory (PMPT) was introduced in 1993 by Brian M. Rom and Kathleen Ferguson in order to correct the flaws of the MPT which according to them are the methods used for measuring expected return and risk. The difference of PMPT compared to MPT in portfolio optimization is that PMPT uses downside risk instead of mean variance analysis which is used to measure risk in MPT (Rom & Ferguson 1993, 352-353). The downside risk and asymmetrical return distribution is considered to offer investors more freedom and accuracy compared to the symmetrical risk of MPT (Rom & Ferguson 1993, 354). However, it can also be argued that the same problems are also present with PMPT as the construction of portfolio is based on past performance and therefore only predicts the future based on history.

However, despite the importance of risk and return it seems that they are not always the factors that a typical investor considers the most. According to Finanssiala (2019) risk and return aspects of the investment are only third and fourth most important factors when choosing investments. Instead, safety and effortlessness were the two most important factors for Finnish households when making investment decisions. What is also interesting is that domesticity of investment is equally as important as return. (Finanssiala 2019, 20). Based on the results it could be argued that Finnish investors are cautious and do not construct their portfolios according to MPT or PMPT since if they would, the risk and return would be the most important factors. Furthermore, the importance of domesticity can indicate that investors do not diversify to the foreign markets which is a sign of home/familiarity bias which will be discussed later in this study.

Cryptocurrencies in general can be considered as high volatility assets and therefore both the risks and opportunities are high (Corbet et al 2018). Furthermore, when investor decides to invest in Bitcoin for example, he/she needs to be ready for big changes in price over short and long time period and therefore, it could be assumed that investors who have decided to participate in cryptocurrency markets have on average higher risk tolerance than the investors who have decided not to participate because cryptocurrencies have proven to be the most volatile asset class. However, it is not that straightforward to say that cryptocurrency investors would be more risk seeking as the asset allocation plays a major role. For instance, a risk averse investor could invest only 1% of the total investment portfolio to cryptocurrencies and still keep the total volatility of the investment portfolio low. This study aims to find out and compare the differences in financial risk tolerance between those who have invested in cryptocurrencies and those who have decided not to find out whether or not financial risk tolerance is a significant predictor of past investment decision towards cryptocurrencies.

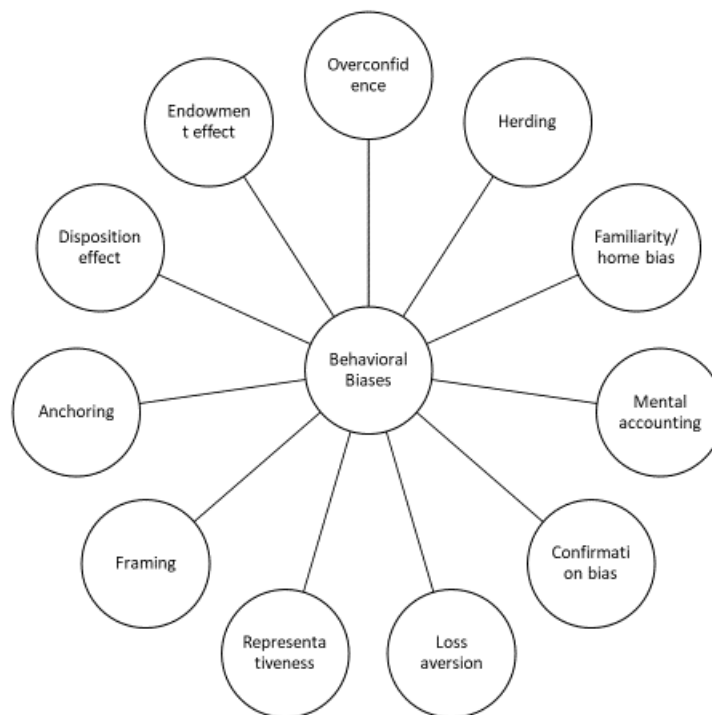
As it has been so far discussed, both motives for investing and risk tolerance have impact on the investment decisions. In addition, investors tend to also behave irrationally because their decision-making process is affected by numerous behavioural biases which leads to investment decisions that are not made based on rational behaviour (Kumar & Goyal 2015, 89). Some of the most common behavioural biases that affect investors are overconfidence, herding, familiarity/home bias and mental accounting. These four biases are also at particular interest in this study and will be discussed in the next chapter.



### 3 BEHAVIOURAL BIASES IN INVESTMENT DECISION MAKING

#### 3.1 Background of behavioral finance

Behavioral finance is relatively new approach to explain financial markets and an alternative for traditional finance which is based on assumption that investors and markets work in efficient and rational way (Madaan & Singh 2019, 55-56). Behavioral finance aims to explain market behavior and investment decision making from alternative perspective which acknowledges that investors are affected by psychological and sociological factors that often causes them to behave irrationally (Ricciardi & Simon 2000, 2). The prospect theory which was already discussed in the previous chapter in relation to risk is also essential part of behavioral finance (Ricciardi & Simon 2000, 5; Madaan & Singh 2019, 56). According to the prospect theory, investors are affected by psychological biases in the event of uncertainty and for example, tend to underestimate high-probabilities and overweight small probabilities which often result in wrong investment decisions (Kahneman & Tversky 1979; Ricciardi & Simon 2000, 5).



**Figure 2 Behavioral biases in investment decision making**

Studies on behavioral finance have documented the presence of numerous biases and anomalies in the investment decision making (Ricciardi & Simon 2000; Barberis & Thaler 2005; Madaan & Singh 2019). Out of the many behavioral biases and anomalies (see figure 2) this study focuses on overconfidence, herding, familiarity/home bias and mental accounting as they were found to be most interesting and relevant by the researcher for this study.

### **3.2 Overconfidence**

Overconfidence in investing means that the investors ignore the risks and become too confident about their skills and knowledge towards investing (Kumar & Goyal 2015, 90). The overconfidence comes from the illusion of knowledge which means that the investors tend to think that the more information they have the more accurate their forecasts will be and therefore better investment decision could be made (Peterson & Pitz 1998). This is however not the case usually because the confidence can increase at the faster rate than prediction accuracy which became evident in the experiments conducted by Hall et al (2007). What kind of information is being used and how experienced the investor is, also matters. For example, inexperienced investors will make better decisions if they use filtered information instead of unfiltered while experienced investor can benefit from the use of unfiltered information (Elliott et al 2008).

Previous success has also been linked to overconfident investment behaviour. Hilary and Menzly (2006) found out that when analysts had been performing well, they are more likely to make errors in the following earning predictions since they become more overconfident than the analysts who had not been as successful in their previous predictions. They also found out that overconfidence is short-term phenomenon and the level of it is linked to length of the success period (Hilary & Menzly 2006, 495-499).

It has also been well documented that overconfident people trade more frequently than others (Odean 1999; Glaser & Weber 2007; Grinblatt & Keloharju 2009). What has also been proven is that gender affects the level of trading as men tend to trade more frequently than women because they are more prone towards overconfidence (Barber & Odean 2001). The excessive trading has however been shown to decrease returns and therefore overconfidence will most often work against investor (Odean 1999; Barber & Odean 2000). For example, Barber and Odean (2000) analysed 78 000 household accounts and found out that the group who traded the most had the turnover rate of more than 250% per year and earned on average 11.4% net return per year while the households with the lowest turnover rate of 2.4% earned 18.5% per year which was the most of the five groups

in the study. The average household had the 16.4% net annual return and turnover rate of 75% while the market return was 17.9% (Barber & Odean 2000, 773-774). The gross returns for all the groups were nevertheless very close, around 18% and the reason why those who trade the most earned the least is the commission costs and the tendency to buy stocks that perform poorly compared to the stocks that were sold (Barber & Odean 2000, 799-801). Moreover, online trading has been proven to increase trading and overconfident behaviour. Odean and Barber (2002) investigated the behaviour of investors who changed from phone-based trading to online trading and found out that investors trade more frequently and are more speculative than before which resulted in lower returns that were also about 3% less than the market return. The study also reported that young wealthy men were most likely to trade online (Odean & Barber 2002, 463). There are also other studies that have found similar results. Choi et al (2002) investigated the how the opportunity to switch to web-based trading system on corporate 401(K) plans affected the trading. They found that trading activity doubled, and again young wealthy males were most likely to move to online based trading channel (Choi et al 2002, 399).

Overconfidence has also been proven to increase risk taking (Barber & Odean 2000; Nasic & Weber 2010). For example, in the study conducted by Barber and Odean (2000) they found out that the group that had the highest turnover bought small growth company stocks that had high -beta compared to stocks invested by the lowest turnover group which indicates higher risk taking among investors who trade more frequently (Odean & Barber, 2000, 792).

Since cryptocurrency markets are open 24/7 which allows investors to also trade more often, it could potentially lead to higher trading activity among cryptocurrency investors. Also based on the current knowledge on cryptocurrency investor profiles, trading and overconfidence it could be possible that cryptocurrency investors are more overconfident than the people who do not invest in cryptocurrencies since cryptocurrencies are very volatile assets that can lure overconfident investors to participate. As this study aims to investigate the impact of overconfidence on the investment decision towards cryptocurrencies, the objective is to measure how both groups view their own investment decision making in terms of their attitude towards knowledge, past success and other investors.

### **3.3 Herding**

In investment decision making herding is described as a situation where investors start to behave irrationally by imitating the opinions and decisions of other people while making

investment decisions (Kumar & Goyal 2015, 90). The herd forms when there are lot of investors who start to behave in a same way and for example rush to buy a particular stock based on the news and behaviour of others (Fernandez et al 2011, 8-9). Herding can however be described as both rational and irrational action. For example, rational herding can be the result of correlated information, reputation cost and payoff externalities while irrational herding is caused by fad, information cascades and positive-feedback trading (Devenow & Welch 1996, 606; Fernandez et al 2011, 9; Li et al 2017, 174).

It has been reported that retail investors are more prone towards herd behaviour than institutional investors and furthermore, their herding behaviour is also more irrational as they are not as well informed (Nofsinger & Sias 1999, 2293; Lee et al 2003, 21). Furthermore, Li et al (2017) documented that both institutional and retail investors follow closely how others in the market act, but individual investors rely more on public information and trade less selectively than better informed institutional investors as they are affected more by the market sentiment.

There are many reasons that causes investors to herd (Kumar & Goyal 2015, 90). Prechter and Parker (2007) proposed that when investors are not sure about the valuation it causes them to herd. Fernandez et al (2011) found out in the study that informational limitations together with feeling of uncertainty causes investors to trust more on the actions of others and therefore they start herding. Kultti and Miettinen (2006) again found out that if the information cost about the predecessor's actions is free, people will act according to a herd behaviour while when the information is expensive people will act based on their own knowledge.

Is has also been well documented that herd behaviour is one of the causes for economic bubbles and crashes which are made of unhealthy price movements and valuations that are not rationally justified (Devenow & welch 1996, 604-605; Bikhchandani & Sharma 2000, 290). Some of the best examples of herd behaviour in the financial markets include the internet bubble between the late 1990s and early 2000s and the more recent cryptocurrency bubble in 2017-2018 (Singh 2013; Corbet et al 2018; Leclair 2018). For example, the price of single bitcoin on the 1<sup>st</sup> of January 2017 was about 960 dollars and soared to 19 000 dollars in the December that year before it collapsed to below 4000 dollars in 2018. As has been discussed earlier in the study, cryptocurrencies are in the midst of new cycle and it remains to be seen where the prices will settle in the future (coinmarketcap, 2021).

Numerous studies have documented that herding is also present in cryptocurrency markets (Khuntia & Pattanayak 2018, 28; Leclair 2018; Poyser 2018). In addition, news, social media channels and discussion forums play a big role in the herding behaviour of investors. Tetlock (2007) found out that high level of optimism or pessimism in the news

lead to higher trading levels even though they did not provide any fundamental information. Barber and Odean (2008) again showed that individual investors display attention-based buying behaviour as they buy more likely stocks that are in the news. Furthermore, Antweiler and Frank (2004) studied how the internet forums affect the stock prices. They found out that messaging activity has an impact on trading volume and volatility as higher messaging activity is linked to greater trading volume and volatility. Similarly, also the price and trading level of Bitcoin has been shown to be impacted by the social-media sentiment and news (Glaser et al 2014b; Georgoula et al 2015; Ciaian et al 2016; Mai et al 2018; Poyser 2018). For example, Mai et al (2018) found that positive and negative forum posts about the Bitcoin results in a higher or lower price in the next day. Glaser et al (2014) also showed that media coverage has major impact on Bitcoin's volatility. Leclair (2018) in contrast found out that many news are not statistically significant but instead he documented the impact of price movements on the level of herding.

Since investors may find it difficult to value cryptocurrencies correctly as it is based mostly on speculation it could be possible that cryptocurrency investors are more prone towards herding behaviour since they have to rely more on the opinions of others mostly via news and social-media channels when making investment decisions (Poyser 2018, 6). Also, according to the survey conducted by Clovr (2018) uncertainty is the most associated feeling towards cryptocurrencies which can also contribute towards herding behaviour as uncertainty and information limitations are factors that cause investors to herd (Fernandez et al 2011, 24). This study is particularly interested to measure and compare how much cryptocurrency and non-cryptocurrency investors rely on other people in their investment decision making process by asking them to answer to the series of statements that aim to measure herding behaviour.

### **3.4 Familiarity/home bias**

Home and familiarity bias in investment decision making refers to the behavior where investors prefer to invest in domestic and familiar securities instead of assets that are foreign and less familiar to them (Huberman 2001, 661; Kumar & Goyal 2015, 91). Home/familiarity bias are problematic for the investors because it causes them to invest far more to their home country and to the companies that are familiar to them than what they should and therefore leads to under-diversified portfolios (French & Poterba 1991; Tesar & Werner 1995; Huberman 2001). The MPT advises investors to diversify and the benefits of internationally diversified portfolios have been well documented and the

benefits occur mainly due to the reduced risk-expected return profile (Markowitz 1952; French & Poterba 1991; Tesar & Werner 1995; Driessen & Laeven 2007).

French and Poterba (1991) estimated that U.S investors hold 94% of their equity investments domestically while for the Japanese and British investors the numbers were 98% and 82%. They also suggest that investors from each country expect their home country's returns to be more than the returns of other countries. A more recent study conducted by Scott et al (2016) based their data on the IMF's Coordinated Portfolio Investment Survey (2014) and found out that on average investors have home bias as they tend to invest more domestically than what the market-cap weighing is. For example, U.S. investors invested 79% to their home county while U.S equities accounted 51% of the total world equity market. For the United Kingdom and Japan, the numbers were 26% and 55 % invested domestically while the world market share of UK's and Japan's equities were both 7.2 %.

The home/familiarity bias are also present when investors choose their domestic or international investments. For instance, Grinblatt and Keloharju (2001) documented that Finnish investors are more likely to invest in companies that are close to them, use the same language and have CEOs of same cultural origin. They also discovered that Finns who have Swedish as the first language are more likely to invest in companies that publish their annual reports also in Swedish. It has also been found that when investors decide to invest abroad, they buy stocks of familiar foreign companies. Kang and Stulz (1997) found out that foreign investors like to invest in large Japanese companies and from the small companies those that had high exports were more popular among the foreign investors. Similarly, Dahlquist and Robertsson (2001) documented that large Swedish companies are in favour of non-Swedish investors. Ke et al (2010) again analysed US equity holdings of foreign based mutual funds and found out that managers prefer to invest in US companies that are present in their home countries which indicates the presence of home/familiarity biases in their investment decision making.

Several different reasons for not diversifying internationally have been proposed in previous studies. Rational explanations usually include transaction costs, imperfect competition, information asymmetries and information costs (Coval & Moskowitz 1999; Ahearne et al 2004; Martin & Ray 2004). The behavioral explanation for home bias includes the previously discussed familiarity (Kang & Stulz 1997; Grinblatt & Keloharju 2001; Huberman 2001). Other explanations such as patriotism has been presented by Morse and Shive (2006). However, there are no universally accepted explanations for home bias (Kumar & Goyal 2014, 91). A Swedish study conducted by Karlsson and Norden (2007) studied the relationship between individual characteristics and the likelihood of home bias. They found out that the most prone individuals for home bias

are older men who are not familiar with risky investments and are not considered to be wealthy.

As has been mentioned in the previous chapters, based on the current knowledge regarding cryptocurrency investors, they are on average risk seeking young wealthy men and therefore based on this knowledge they should not be the most familiarity/home biased group of investors (Clovr 2018; Pelster et al 2019). For example, as Bitcoin is global asset that does not correlate heavily with other major asset classes, it could be possible that cryptocurrency investors are on average less prone to familiarity/home biases since they have chosen to invest “abroad”. This study is interested about the degree of familiarity/home biases among cryptocurrency and non-cryptocurrency investors and therefore aims to measure and compare familiarity bias among the two groups by mapping their attitude towards investing internationally and in well-known companies.

### **3.5 Mental accounting**

In investing, mental accounting refers to the tendency of investors to treat their investments separately and not as a whole (Rockenbach 2004, 513-514; Grinblatt & Han 2005, 312). Mental accounting is a feature of prospect theory which suggests that people do not always make their choices based on rationality under risk as expected utility theory states (Kahneman & Tversky 1979; Shefrin & Statham 2000, 142). However, the concept of mental accounting can be considered to be first introduced by Richard Thaler in 1985 in the article *Mental accounting and consumer choice* where he showed how mental accounting affects consumer choices often in unexpected and irrational ways (Thaler 1985). Generally mental accounting can be considered as an accounting system of individuals and it is being used to organize, evaluate and keep track of their financial actions (Thaler 1999, 183). However, because of the topic of this study the focus is on the impact that mental accounting has on investment decision making.

It is well known that people tend to construct mental accounts for different investments and therefore they do not consider different components of their portfolio as one account which leads to the situation where investors do not diversify and build their portfolios as they should according to modern portfolio theory (Markowitz 1952; Shefrin & Statham 2000, 142; Rockenbach 2004, 514). However, according to the behavioural portfolio theory by Shefrin and Statham (2000) investors can have a single mental account portfolio where they consider their investments as a whole or alternatively investors can have multiple mental accounts. Those investors who do not consider their portfolio as one mental account tend to form separate mental accounts for different investment goals, and

they choose their investments for these mental accounts based on how well they fit the risk and return aspirations of each mental account. For example, people often have both low and high aspirations which means that they want to avoid poverty, but they also want to have a chance to get rich and therefore they choose investments for each mental account based on how appropriate they are for fulfilling that goal (Shefrin & Statham 2000, 141-143). The effects of mental accounting can have negative impact on the investment portfolio because it may cause investors to take more risk in relation to expected return as they do not consider the correlation of the investments (Clarke et al 1994, 17-18). Some of the benefits of mental accounting again are usually related to implementation of spending rules and simplification of financial decisions (Zhang & Sussman 2018, 4-5).

Consistent with behavioural portfolio theory, other studies have also documented the effect of mental accounting in portfolio building. Rockenbach (2002) studied investment behaviour involving financial options and found out that investors form mental accounts for both safe and risky investments. Investors associated bonds to the safe account whereas risky assets like stocks and options are connected to the separate mental account (Rockenbach 2004, 523). Choi et al (2007) also documented the presence of mental accounting when investors make their investment decisions. They studied a company that changed its 401 (K) matching rules. Before the change the employees chose their own contribution allocation and the company chose the match allocation which consisted only employer stock. After the change, the employees chose both their own contribution allocation and the match allocation made by the company (Choi et al 2007, 3). The results of the study revealed that employees did not consider the whole 401(k) plan as one account because they wanted to invest about the same amount to employer stock but because of the matching rule change the total holdings of employer's stock were very different (Choi et al 2007).

Mental accounting impacts investors also in other ways. Lim (2006) documented that when investors sell losing stocks, they tend to sell multiple stocks at the same time while selling multiple winning stocks at the same time is not as common. Grinblatt and Han (2005) argue that disposition effect, which is considered as a tendency to sell winning stocks to soon and hold on the losing stocks too long can be explained by prospect theory and mental accounting. Reason for disposition effect is that depending on the stock's performance (loss or gain) investors tend to treat them separately and can therefore be either risk averse or risk loving towards them (Grinblatt & Han 2005, 312). In the markets the prospect theory and mental accounting results in the stock prices that are not based on fundamental values as stocks that have been performing well in past tend to be undervalued and past losers overvalued (Grinblatt & Han 2005, 314).

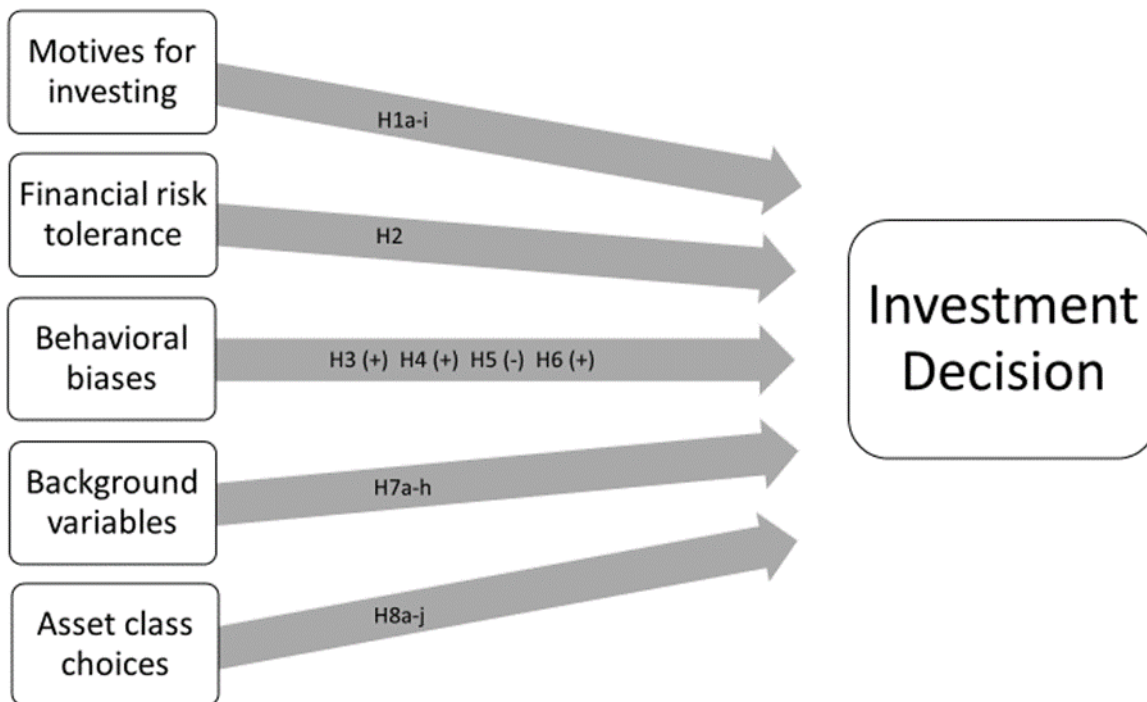


It could be possible that cryptocurrency investors are more prone towards mental accounting if cryptocurrencies have been chosen to full fill the “get rich” goal of investing. However, if the decision to invest in cryptocurrencies is based on benefits that can be achieved through diversification it could be a sign of orthodox portfolio constructions and therefore indicate that cryptocurrency investors are actually less prone towards mental accounting. This study aims to catch a glimpse on how much cryptocurrency and non-cryptocurrency investors consider their other investments when making investment decisions. The focus is on the mental accounts solely as disposition effect was not included in the measuring process.

### **3.6 Theoretical framework**

Chapter two covered the theories related to investment motives and financial risk tolerance while chapter three presented the behavioral biases used for explaining and comparing investment decision making between the cryptocurrency and non-cryptocurrency investors. The theoretical framework and hypotheses based on the discussed theories are presented next.

**Figure 3 Research framework**



Based on literature review it could be assumed that there are differences between those investors who have made the decision to purchase cryptocurrencies in the past and those investors who have made the opposite decision. Therefore, the investment decision towards cryptocurrencies could be explained and based on the literature review and researcher's assumptions the following hypotheses are proposed:

- **H1a-i: Motives for investing explain the investment decision towards cryptocurrencies in terms of a) education, b) home purchase, c) bequest, d) reserve fund, e) renovation, f) retirement, g) holiday, h) durables and i) other purposes.**
- **H2: Cryptocurrency investors have higher risk tolerance**
- **H3. Cryptocurrency investors are more prone towards overconfidence**
- **H4: Cryptocurrency investors are more prone towards herding**
- **H5: Cryptocurrency investors are less prone towards familiarity/home bias**
- **H6: Cryptocurrency investors are more prone towards mental accounting**
- **H7a-h: Background variables explain the investment decision towards cryptocurrencies in terms of a) gender, b) age, c) education, d) professional status, e) income, f) total savings, g) investing experience and h) investment horizon.**

- **H8a-j Other investment decisions explain the investment decision towards cryptocurrencies in terms of a) deposits, b) listed stocks, c) investment funds, d) ETFs, e) bonds, f) properties, g) currencies, h) commodities, i) derivatives and j) other investments.**

Since there is hardly any previous research around the issue, it could be possible that the proposed results are different from the final ones which in the end is the reason why this study is conducted as it is unknown at this stage how cryptocurrency and non-cryptocurrency investors differ and what factors contribute to the decision to invest in cryptocurrencies. As can be seen from figure 2, the investment decision functions as the dependent variable while motives for investing, financial risk tolerance, behavioral biases, background variables and previous asset class choices work as independent variables for explaining the investment decision towards cryptocurrencies. Each of the proposed hypotheses are developed for answering a specific research question, except H8 is used as a supportive hypothesis for answering the questions regarding motives for investing, financial risk tolerance and mental accounting.

## 4 METHODOLOGY

### 4.1 Research approach

Choosing the correct research approach is vital for the research project and the researcher has to make a decision out of the three different research approaches: quantitative, qualitative and mixed methods based on which is the most suitable approach for the given research subject. This study uses quantitative research approach or in other words positivistic paradigm in the social sciences, which is interested about the causes and facts of the social phenomena. According to the positivistic beliefs, human behaviour should be studied the same ways as in the natural sciences and is based on the assumption that social reality is independent of the one of observer's (Collins & Hussey 2003, 52). Features of the quantitative research approach include large samples with precise and specific data, generalization, artificial settings and hypothesis testing (Collins & Hussey 2003, 55; Bryman & Bell 2007, 425-426). Some of the criticism towards quantitative research includes for example the view that social world should not be studied with models from natural science (Bryman & Bell 2007, 177).

Out of the three different research approaches, the quantitative approach was chosen for this study as it was found to be the most suitable option for comparing the factors that have an impact on investment decision making because of multiple reasons. Firstly, in terms of epistemological and ontological orientation, this research is positivistic and objective which are associated to the quantitative research. Also, the study aims at testing a theory rather than creating one and has therefore a deductive approach that is more common for quantitative research (Collins & Hussey 2003, 55; Bryman & Bell 2007, 28). Secondly, this study is interested about the causes of social phenomena and their relative importance and therefore quantitative approach will most likely be a better choice (Bryman & Bell 2007, 33). Thirdly, in order to draw generalizations from the data, the sample size has to be large enough and therefore quantitative research is the only logical approach in this case as it enables effective collection and analysis of large amounts of data (Collins & Hussey 2003, 55; Bryman & Bell 2007, 426). However, it needs to be clarified that this study is not aiming to generalize the results to the whole world because of the sampling strategy which will be discussed later. Quantitative research can be used to explain, describe, explore, compare or predict (Vilkka 2007, 19). This research is both comparative and explanatory by its nature since the purpose is to compare those who have invested in cryptocurrencies to those who have not in order to explain investment decision towards cryptocurrencies.

## 4.2 Survey research

Gathering data on individuals has a very long history and the first documented census happened more than 4000 years ago in China (Andres 2012, 4-5). Survey research is one of the quantitative research methods that can be used for gathering numerical data from the respondents and is the chosen research method for this study (Bryman & Bell 2007; Andres 2012). According to Leeuw et al (2008) the idea of the survey is relatively simple as it basically involves identifying a specific group of people that is at interest and gathering data from some of them in order to gain understanding on what the group does or thinks. There are many different definitions of what is regarded as a survey but in general a survey can be considered as a research strategy where quantitative information is collected from quite large sample of population to produce statistics that allow researcher to generalize about the whole population (Leeuw et al 2008, 2; Andres 2012, 9-10). However, sometimes the whole population can be easily accessible, and in that case a smaller sample does not need to be drawn from the whole population (Andres 2012, 10). In case of this study, smaller sample had to be taken from the target population as the whole population was not accessible.

Survey research can be considered as umbrella term as there are various different formats for gathering information which all have their advantages and disadvantages. (Andres 2012, 45). The two basic ways for collecting the data can be divided to those with and interviewer and to those that are self-administered (Leeuw et al 2008, 113; Anders 2012, 47). The common advantages of self-administered surveys over interviewer administered surveys are the possibility for respondents to complete the survey on their chosen time which can lead to better accuracy as the respondents are able use more time and when needed check important records such as total income that could be related to the questionnaire. Moreover, gathering information on topics that are sensitive is usually more effective on self-administered questionnaires as the respondents do not have to give information directly to the interviewer (Bryman & Bell 2007, 241-242; Anders 2012, 47). Self-administered surveys can also be built to be more complex and have more similar questions (Anders 2012, 47). Self-administered questionnaires are also cheaper and quicker to distribute which can be a decisive factor (Bryman & Bell 2007, 241). On the other hand, the disadvantages of self-administered surveys are that there is no interviewer who could help in the answering process or ensure that the open-ended questions are answered properly. Furthermore, there is no guarantee that the questions are answered by the intended respondent in self-administered surveys and also some respondents might have difficulties to complete surveys on their own due to limited literacy for example (Bryman & Bell 2007,242-243; Anders 2012, 47-53). Furthermore, with unrestricted self-

administered surveys there is a risk of multiple completions and therefore there is possibility that the sample is nonrepresentative of the population (Leeuw et al 2008, 266-267).

This study uses self-administered web survey as a mode for data collection because it fits well to the scope of this study. Web survey was found to be the most effective way to gather data from the target population, since the sample was taken from a Facebook group and therefore the best way to reach the target population was to use self-administered web survey. Furthermore, the minimal cost and time it takes to gather sufficient sample sizes of the target population and the ease of analysing the data which is already in the electronic form was seen as a major benefit for this study. The risk of multiple completions was considered low as there was no incentive for respondents to do so. The design of the questionnaire was also kept simple in order to avoid misunderstandings.

### **4.3 Constructing the questionnaire**

Questionnaire development is at the heart of survey research and the researcher needs to use common sense and experience to develop a series of questions that utilizes the advantages and minimizes the disadvantages (Rea & Parker 2005, 30). Before designing the questions, the researcher needs to know enough about the subject and bear the audience in mind in order to produce valid and interesting questions for knowledgeable respondents (Collins & Hussey 2003, 177-178). In this research the knowledge regarding the topic was attained from literature review and other previous studies regarding the topic.

Questionnaires can consist different types of questions. Open-ended questions can be used to gather personal responses and opinions, closed questions again may be used to gather respondent's answer for predetermined list of alternative responses (Collins & Hussey 2003, 179). Rating scales such as the Likert scale can also be used to obtain opinions in a numerical way with more flexibility than simple "yes" or "no" answers (Collins & Hussey 2003, 184). In this study only closed questions and Likert scales were used to obtain the needed information from the respondents. All the questions were mandatory to answer because all the questions were necessary for the study. As the purpose of this research is to compare two groups of investors, the closed questions facilitate this purpose with uniformity which allows direct data entry from questionnaire to analysis program. Furthermore, sensitive issues such as questions relating to income can be better addressed with closed questions. Also, as the questionnaire was self-administered the fixed list of answers makes it quicker and easier to fill. There are

however some drawbacks related to use of closed questions such as the possibility that respondent is not sure about the best answer or does not understand the question and therefore the answer may be selected without thoughtful consideration (Rea & Parker 2005, 42-44).

The closed questions were used in the first twelve questions of the questionnaire (see appendix 2). The first two questions of the questionnaire which asked about whether or not the respondent invests his/her own money and the question about the gender were both two-way questions. The first question was also used for filtering and if the respondent answered “No” to that question he or she was screened out of the rest of the questionnaire (Rea & Parker 2005, 39). Also, the question eleven asking about the past investment decision towards cryptocurrencies was dichotomous in order to divide respondents into two groups for the analysis. Furthermore, multiple-choice questions were used in questions asking about age, education, professional status, income, size of total investment, investing experience, asset classes, investment horizon and motives for investing/saving. In questions nine and twelve the respondents were asked to choose as many alternatives that apply to them whereas in the rest of the multiple choice questions respondents were asked to choose only one alternative. In addition, in questions where it was not possible to cover all possible answers the “other” answer was given as an alternative.

The Likert scales were used in rest of the questions which were constructs. The questionnaire had five different constructs which were financial risk tolerance, Overconfidence, Herding, Familiarity and Mental accounting. A 5-point Likert scale where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree was selected as a measurement for all constructs even though some of the studies from where the constructs were taken had originally 4 or 7 point-Likert scales. The five-point Likert scale was used for measuring all five constructs because of analytical reasons and simplicity for the respondents. The reason for using already developed constructs and scales was that they had already been tested and validated by previous studies. The constructs were also translated into a Finnish language as the target population was Finnish investors. In the translation process some words had to be changed in order to fit the questions exactly to the purposes of this study. For instance, in the herding construct developed by Baker et al (2019) the “Stock market” specific questions were replaced to concern financial markets in general as some of the respondents might have not ever bought stocks and this study did not focus only on stock market.

The length of the questionnaire was kept as concise as possible in order to gain a good response rate as too long or complex questionnaires can result in a reluctance to complete the survey (Rea & Parker 2005, 46). Question order is also vital part of questionnaire and

therefore the question order followed the theme of the research and for example Likert-scale questions were left to the end of the questionnaire for better clarity and flow (Andres 2012, 86). It is important to give clear instructions for the questionnaire at the beginning which informs the respondents about the purpose of research, who is conducting it and possible concerns that respondents might have (Rea & Parker 2005, 32-33). The questionnaire used in this study had the introductory statement at the beginning (see appendix 1) which addressed the issues stated above.

Furthermore, being ethical is very important part of the research and researcher needs to consider about the possible ethical issues beforehand that are related to the whole process. Important issues to consider are related to anonymity, informed consent, dignity and publications (Collins & Hussey 2003, 37-39). Confidentiality and anonymity in this study was ensured by making sure that only necessary information regarding investment decisions are collected and by leaving out all the personal information that could be linked to the respondents. The General Data Protection Regulation (GDPR) was carefully examined in order to make sure that no personal data was going to be collected (European Commission 2021). In addition, potential participants were informed about the purpose of the research and who is conducting it in addition to it being anonymous and voluntary. Dignity again was ensured by making sure that the respondents were treated equally and rightfully throughout the whole process and that no harm is caused to others. Research results were also not falsified, and the researcher treated both groups used for comparisons equally (Collins & Hussey 2003, 37-39).

Before the questionnaire is deployed to the respondents it should be first piloted in order to ensure that the questions and whole survey instrument works well (Bryman & Bell 2007, 273). The piloting process should test several components of the survey: quality of the questions, clarity, response categories, scales, instructions and layout (Andres 2012, 86-87). The piloting process was conducted by sending the link to the survey for 6 people representing the target population and the feedback provided by them was used for fixing the questionnaire to its final form. The questionnaire was already in good form before the piloting and only small issues related to wording emerged from the testing process. The average response time was about 5 minutes which was well acceptable.

#### **4.4 Measure development**

Concepts represent the points around which research is conducted and are therefore the building blocks of theory. Concepts need to be measured in order for them to be used in



quantitative research. After the concepts have been measured, it is possible to form dependent and independent variables which can again be used for explanation. Measurement is important because it allows researcher to delineate differences between people by providing a tool for making such distinctions. Measurement also provides the foundation for more precise analysis such as logistic regression analysis used in this study (Bryman & Bell 2007, 157-158).

The operationalization of constructs depends on whether the study uses open-ended or closed-ended questions and can therefore take different forms. As this study uses closed questions for measuring background concepts and motives for investing, the job for the researcher was to convert them into measurable entities, also called variables (Andres 2012, 33). The background variables that were selected for this study based on literature review included gender, age, education, professional status, income, size of total investments, investing experience and investment horizon. Additionally, motives for investing and previous investment decisions towards different asset classes were measured similarly with close-ended questions.

As it was discussed previously in chapter 4.3 rating scales were used for measuring financial risk tolerance (FRT), overconfidence (OC), herding (HE), familiarity (FA) and mental accounting (MA). All of the scales used for measuring those constructs were chosen from previous studies because they had already been validated and used. However, finding previously tested scales proved to be difficult because of the limited research around the area of this study but in the end five adequate scales were found that measure the constructs used in this study. The FRT scale is based on the one developed by Grable & Joo (2004) while OC and F scales were selected from the study conducted by Alrabadi et al (2018). HE and MA scales again were taken from Baker et al (2019) study. Some adjustments such as language were however made which were discussed previously in chapter 4.3. The scales in their original form can be viewed from Appendix 3. In all the studies from where the scales were taken the internal reliability was measured with Cronbach's alpha and all of the scales had above 0.7 alphas which can be considered to be acceptable (Bryman & Bell 2007, 164). The Cronbach's alphas were 0.8 for FRT scale, 0.85 for OC scale, 0.889 for HE scale, 0.8 for F scale and 0.786 for MA scale (Grable & Joo 2004, 82; Alrabadi et al 2018, 80; Baker et al 2019, 48-40). Even though all of the used measures were found to be adequate enough to be used in this study, it is not guaranteed that they will provide the same consistency as some modifications were made and the study is conducted on Finnish investors.

## 4.5 Data collection

In a positivistic study, selecting a sample is a fundamental part of the research. A sample consists some members of the population from where it is drawn from (Collins & Hussey 2003, 155). In this research the population is the retail investors. However, to achieve more realistic and workable population for the purposes of this study, the target population needs to be defined and for this study it is Finnish retail investors (Andres 2012, 93).

All sampling approaches can be argued to start from a non-probabilistic perspective as decisions have to be made on topic, location, demographic make-up, cost and time available for conducting the study. Even though non-probabilistic sampling is usually discouraged, it might be the only feasible option for sampling strategy (Andres 2012, 96). For example, Leeuw et al (2008) argues that nonprobability web surveys are not scientific and do not represent any population. However, if the sample is selected carefully and the process is documented well the non-probabilistic sampling strategies can generate findings that are transferable to other studies (Andres 2012, 97).

A convenience sample is a sample that is easily accessible for the researcher (Bryman & Bell 2007, 197; Andres 2012, 97). There are occasions when it is acceptable to use convenience sampling strategy. For example, when a convenience sample presents very good opportunity to gather data and that opportunity is too good to be missed it can be feasible to use convenience sampling. Furthermore, A convenience sample can be appropriate if the sample is right for the study purpose (Andres 2012, 96-98). There are however still problems with generalization, but it could still provide meaningful information for future research (Bryman & Bell 2007, 198).

Since this study aims at comparing cryptocurrency investors to investors who have not invested in cryptocurrencies the major difficulty was to find a sample that represents the population under study as there were no records of those investor who had invested in cryptocurrencies. Because of the previously stated issue it was found to be too difficult to find a sampling frame which is a record of the population from where the whole sample is drawn (Collins & Hussey 2003, 155). Instead, this study adopted a convenience sampling strategy. In this study, investing related Facebook group where the discussions were in Finnish language was used as a sample since it provided easy and affordable access to over 60 000 people at a time who were seen to represent the target population of this study based on topics of the group and discussions taking place inside the group. The opportunity to use that particular Facebook group as sample was simply too good to be missed and therefore it was chosen for this research. The questionnaire was published

in Finnish language and included filtering question at the beginning to draw out those who were not eligible for this study.

The appropriate sample size can vary but in the end is a question about the accuracy of results and how confident the researcher wants to be about the answer (Collins & Hussey 2003, 158). However, it can be stated that usually when sample size increases the sampling error decreases. Furthermore, unlike it is often assumed, the absolute size of the sample is more important than the relative size. Non-response needs to be taken into consideration as well when deciding sample size as not everyone is willing to participate in the survey and therefore the researcher has to consider what the possible respond rate will be (Bryman & Bell 2007, 194-196). Since this study aimed at comparing two investor groups with statistical methods it was critical to get enough responses from both groups. The goal was to get at least 100 responses from both cryptocurrency and non-cryptocurrency investors and therefore the sample size needed to be large because of expected high non-response rate and it was also unknown of how many investors had actually invested in cryptocurrencies. The link to the questionnaire was therefore delivered to the investing related Facebook group with over 60 000 people. The questionnaire got 888 responses from which 873 were eligible for the study. However, one response had to be removed due to missing information because of unknown technical issues and therefore the total sample size turned out to be respectable 872 from which 134 reported to have invested in cryptocurrencies which was enough for comparative analysis.

The actual data collection took place between 4<sup>th</sup> and 9<sup>th</sup> of April in 2020 so the questionnaire was open for five days. The link to the survey with background information was posted to the Facebook group on Saturday morning as the researcher thought it would be a good timing as people have more free time on Saturday to fill up questionnaires and people are also on a better mood to do so. Saturday is also a day when exchanges apart from cryptocurrency exchanges are not open so there was less traffic inside the Facebook group which meant that the questionnaire post stayed discoverable for longer time.

## **4.6 Reliability and validity**

For quantitative research it is crucial to know whether or not the measures are valid and reliable representations of the concepts they are intended to measure (Bryman & Bell 2007, 162). Reliability is one aspect of the credibility of the findings, and it is concerned about the consistency of findings. If the results can be repeated by any other researcher the study can be considered as reliable (Collins & Hussey, 2003, 58). The reliability of this study can be measured with either stability or internal reliability. Stability of measure

refers to the situation where measure is first administered and later readministered to the same group. If the correlation is high the measure is stable and vice versa. The most common way of testing stability is test-retest method (Bryman & Bell 2007, 162-163). However, because of the lack of resources, the stability of the measures was not tested in this study. Internal reliability again is concerned about whether or not the multiple-indicator measures are consistent as there is a possibility that indicators do not relate to same thing and in that case lack coherence. Cronbach's alpha is common way to test internal reliability and the alphas were also calculated for the multiple-indicator scales (see table 2) used in this study (Bryman & Bell 2007, 163-164).

**Table 2 The reliability values of constructs**

Construct	Number of items	Cronbach's alpha
Financial risk tolerance (FRT)	5	0,572
Overconfidence (OC)	2 (4)	0,586 (0,363)
Herding (HE)	5	0,625
Familiarity (FA)	2 (3)	0,404 (0,346)
Mental accounting (MA)	3	0,583

As can be seen from table 2, all of the Cronbach's alphas were unfortunately below 0.7 which is often considered to be a good level (Bryman & Bell 2007, 164). Despite the fact that the coefficients were slightly lower than what was expected, the researcher decided to accept all constructs except FA construct for further analysis. As can be viewed from table 2, some of the items had to be removed in order to improve internal reliability but only significant improvements were made with OC scale and therefore FA scale was not accepted for further analysis as it had simply too low (0.404) alpha. Since the Cronbach's alphas for rest of the constructs were between 0.572 and 0,625 the internal reliability can be considered to be acceptable. It is important to remind that there is no universally agreed way for interpreting Cronbach's alpha values and for example, values between 0.572 and 0.625 have been described as both "acceptable" and "sufficient" (Taber 2018). Also, it is possible that a small increase in the number of items would have produced higher alphas.

Validity is another aspect of the credibility of the findings, and it refers to how well the findings represent what is really happening (Collins & Hussey 2003, 58). Moreover, measurement validity is about how accurately the measure of a concept really measures that particular concept (Bryman & Bell 2007, 164). In addition, validity can also be divided into internal, external, and ecological validity. Internal validity relates mostly on the causality and is therefore concerned about the causal relationship between variables.

External validity on the other hand is concerned about whether or not the results of the study can be generalized further. Ecological validity in turn is interested about how the study findings are applicable to natural everyday social settings (Bryman & Bell 2007, 41-42). The external validity of the findings of this study may be limited because of the non-probabilistic sampling, but since the respondents had the opportunity to complete the questionnaire in their own natural-setting where they also make investment decisions, it is justified to argue that the findings are ecologically valid which can be considered to be more realistic and workable way of generalization than arguing that the results would generalize to the whole world (Bryman & Bell 2007, 42; Andres 2012, 119). Ecological validity can also be seen to improve the internal validity of the findings together with carefully selected measures and methods for analysis.

The measurement validity on the other hand can be evaluated with different types of validity such as face validity, predictive validity, construct validity, concurrent validity and convergent validity (Bryman & Bell 2007, 164-165). In this study, the most important way to ensure the validity of the measures was to use previously proven and tested measures that are known to measure the concept at interest. Furthermore, the theoretical section of the research worked as a foundation for selecting and approving those measures which further increase the validity of the research. However, since the measures were modified slightly and questionnaire had other close-ended questions, the face validity and more importantly content and construct validity were ensured by consulting experts in the field (Taherdoost 2016, 29-30).

## 5 RESULTS

### 5.1 Descriptive analysis and chi-squared tests

The descriptive statistics of the research are presented in this chapter and relating hypotheses are tested. The results are shown based on total count of collected data and based on respondents past negative or positive investment decision towards cryptocurrencies. The chosen descriptive analysis method is crosstabulation and chi-squared test is used for testing the statistical significance.

**Table 3 Gender versus investment decision**

Crosstab		Have you ever invested in Bitcoin or other cryptocurrencies?		
		Yes	No	Total
Gender Male	Count	108	432	540
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	80.6%	58.5%	61.9%
Female	Count	26	306	332
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	19.4%	41.5%	38.1%
Total	Count	134	738	872
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	100.0%	100.0%	100.0%
Pearson Chi-Square	$\chi^2 = 22.482$ ; $df=1$ ; $p < 0,00$			

As can be observed from table 3 62 % of the total (n=872) respondents were men and 38 % women. The results also reveal that men had invested in cryptocurrencies more likely than women as 81 % of the total (n=134) respondents who reported to have invested in cryptocurrencies are men whereas only 19% are women. The impact of gender is statistically significant ( $\chi^2 = 22.482$ ;  $df=1$ ;  $p < 0,001$ ) which indicates that men are significantly more likely to have invested in cryptocurrencies than women and therefore the null hypothesis can be rejected. This result did not come as a surprise since men are known to invest more often to cryptocurrencies and risky assets in general as they are more overconfident and have bigger appetite for risk (Grable 2000; Barber & Odean 2001; Clovr 2018).

**Table 4 Age versus investment decision**

Crosstab		Have you ever invested in Bitcoin or other cryptocurrencies?		
		Yes	No	Total
Age Under 30	Count	66	291	357
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	49.3%	39.4%	40.9%
30-40	Count	38	206	244
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	28.4%	27.9%	28.0%
41-50	Count	18	118	136
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	13.4%	16.0%	15.6%
51-64	Count	8	103	111
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	6.0%	14.0%	12.7%
65 or older	Count	4	20	24
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	3.0%	2.7%	2.8%
Total	Count	134	738	872
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	100.0%	100.0%	100.0%
Pearson Chi-Square	$\chi^2 = 8.870^a$ ; df=4; p=0,064			

The age of the respondents was also asked, and the questionnaire consisted five age groups which can be seen from the table 4. The modal class is the under 30 age group which includes 41 % of the respondents. Moreover, 28 % of the respondents reported to be between 20 and 30 years old, 15 % between 41 and 50 years, 13 % between 51 and 64 and finally 3 % 65 or older. Again, those who had invested in cryptocurrencies were compared to those who had not, and the results show that cryptocurrency investors are slightly younger as their relative share is higher (49 %) in the under 30 group compared to the share of 39 % for non-cryptocurrency investors. In the 51-64 group the relative share of cryptocurrency investors was again a lot less (6 %) compared to the share of 14 % for non-cryptocurrency investors. There are no notable differences in the other age groups between cryptocurrency and non-cryptocurrency investors.

Table 4 also presents the crosstabulation of age and past investment decision towards cryptocurrencies. The Chi-square test result indicates that there is no statistically significant relationship ( $\chi^2 = 8.870^a$ ; df=4; p=0,064) between age and investment decision towards cryptocurrencies and therefore the null hypothesis can be accepted.

Apart from the fact that age does not explain investment decision to cryptocurrencies significantly, it is not surprising that roughly half of the cryptocurrency investors are under 30 as young investors are most likely more active at picking up new investment trends than older investors. In addition, the survey conducted by Clovr (2018) found out that cryptocurrency investors are most often relatively young.

**Table 5 Education versus investment decision**

Crosstab

		Have you ever invested in Bitcoin or other cryptocurrencies?		
		Yes	No	Total
Education	Comprehensive school	Count 2	9	11
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	1.5%	1.2%	1.3%
Vocational college	Count	17	74	91
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	12.7%	10.0%	10.4%
Upper secondary school	Count	22	111	133
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	16.4%	15.0%	15.3%
Lower university degree	Count	45	271	316
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	33.6%	36.7%	36.2%
Higher university degree	Count	41	249	290
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	30.6%	33.7%	33.3%
Licentiate or doctor	Count	3	11	14
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	2.2%	1.5%	1.6%
Something else	Count	4	13	17
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	3.0%	1.8%	1.9%
Total	Count	134	738	872
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	100.0%	100.0%	100.0%
Pearson Chi-Square		Invalid result		



The respondents were also asked about their highest education level. Table 5 shows the highest level of education the respondents had. The education level with most respondents (36 %) was the lower university degree which was followed by higher university degree (33 %) and upper secondary school (15 %). Those who reported to have invested in cryptocurrencies were slightly less educated when compared to those who had not ever invested in cryptocurrencies as their relative share in university level education was 67 % compared to 73 % for non-cryptocurrency investors. The complete results can be seen from table 5.

Results of the Chi-square test were invalid and therefore not reported. However, the fact that investors who had invested in cryptocurrencies were little less educated was little unexpected as studies have documented that, investors with higher educational level tend to have higher risk tolerance and invest to riskier assets (Sung & Hanna 1996, 13-17; Grable & Joo 2004).

**Table 6 Professional status versus investment decision**

			Have you ever invested in Bitcoin or other cryptocurrencies?		Total
			Yes	No	
Professional status	Manager	Count	9	45	54
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	6.7%	6.1%	6.2%
	Upper white-collar worker	Count	38	192	230
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	28.4%	26.0%	26.4%
	White-collar worker	Count	19	104	123
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	14.2%	14.1%	14.1%
	Employee	Count	23	149	172
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	17.2%	20.2%	19.7%
	Entrepreneur or self-employed	Count	14	47	61
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	10.4%	6.4%	7.0%
	Farmer-entrepreneur	Count	1	1	2
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	0.7%	0.1%	0.2%
	Student	Count	17	138	155
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	12.7%	18.7%	17.8%
	Retired	Count	6	33	39
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	4.5%	4.5%	4.5%
	Stay-at-home mum or dad	Count	2	6	8
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	1.5%	0.8%	0.9%
	Unemployed	Count	3	11	14
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	2.2%	1.5%	1.6%
	Other	Count	2	12	14
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	1.5%	1.6%	1.6%
Total		Count	134	738	872
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	100.0%	100.0%	100.0%
Pearson Chi-Square		Invalid result			

The professional status was also in the interest of this study. The results can be seen from table 6 and based on the results the most general professional status (26%) was upper white-collar worker. 20% of the respondents reported employee as their professional status making it the second highest class. A little bit less (18%) reported to be students and 14 % of the respondents were lower white-collar workers. Entrepreneurs or self-

employed accounted 7% of the respondents. Only 6% of the respondents had managerial status and 4% were retired. The share of unemployed respondents was 2% and similarly (2%) was the share of respondents with other professional statuses. Furthermore, stay-at-home mums or dads accounted 1% of the answers whereas the share of farmer-entrepreneurs was less than 1 %. Based on the results it seems that in general there were no major differences between cryptocurrency and non-cryptocurrency investors. However, there were a few exceptions as the share of entrepreneurs or self-employed respondents was higher (10%) among cryptocurrency investors compared to the share of 6 % for those who had never invested in cryptocurrencies. Also, cryptocurrency investors were less likely to be students as their share was 13% whereas 19% of the non-cryptocurrency investors were students. The share of cryptocurrency investors among employees was also slightly less (17%) compared 20% for non-cryptocurrency investors.

Results of the chi-square were unfortunately invalid and therefore not reported. Even though, the distribution of answers were quite even and no big differences were found, except that cryptocurrency investors seem to be entrepreneurs or self-employed much more likely and reason for this could be that higher risk tolerance has been linked to self-employed people (Sung & Hanna 1996, 13-17).

**Table 7 Income versus investment decision**

		Have you ever invested in Bitcoin or other cryptocurrencies?		
		Yes	No	Total
Income Under 20 000 euros	Count	24	151	175
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	17.9%	20.5%	20.1%
20 000-39 999 euros	Count	43	266	309
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	32.1%	36.0%	35.4%
40 000-59 999 euros	Count	36	182	218
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	26.9%	24.7%	25.0%
60 000-79 999 euros	Count	16	77	93
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	11.9%	10.4%	10.7%
80 000-100 000 euros	Count	7	30	37
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	5.2%	4.1%	4.2%
Over 100 000 euros	Count	8	32	40
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	6.0%	4.3%	4.6%
Total	Count	134	738	872
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	100.0%	100.0%	100.0%
Pearson Chi-Square	$\chi^2 = 2.349^a$ ; df=5; p=0,799			

The total net income per year was also asked from the respondents. As table 7 illustrates, a little over one third (35 %) of the respondents had the annual income between 20 000 and 39 999 euros which was also the modal class. Respectively, 25 % of the respondents reported to earn between 40 000 and 59 999 euros and 20 % had the total annual income under 20 000 euros. Over 100 000 euros income group counted only 5 % of the respondents. Based on results there was quite little differences between cryptocurrency investors and non-cryptocurrency investors in terms of income, but it could however be said that cryptocurrency investors seem to earn a little bit more as their relative share is higher among those who reported to earn 40 000 euros or more. The complete results can be seen from table 7.

According to the chi-square test, the results were not statistically significant ( $\chi^2 = 2.349^a$ ; df=5; p=0,799) indicating that there is no significant relationship between income and investment decision towards cryptocurrencies and therefore the null

hypothesis can be accepted. Despite that result was not significant, it could be argued that again higher risk tolerance explains the reason why relative share of cryptocurrency investors is higher among those who earn 40 000 euros or more (Grable & Joo 2004, 82).

**Table 8 Total investments/savings versus investment decision**

			Have you ever invested in Bitcoin or other cryptocurrencies?		
			Yes	No	Total
Total investments/savings	Under 5000 euros	Count % within Have you ever invested in Bitcoin or other cryptocurrencies?	14 10.4%	112 15.2%	126 14.4%
	5000-19 999 euros	Count % within Have you ever invested in Bitcoin or other cryptocurrencies?	44 32.8%	217 29.4%	261 29.9%
	20 000-49 999 euros	Count % within Have you ever invested in Bitcoin or other cryptocurrencies?	23 17.2%	132 17.9%	155 17.8%
	50 000-99 999 euros	Count % within Have you ever invested in Bitcoin or other cryptocurrencies?	20 14.9%	92 12.5%	112 12.8%
	100 000-249 999 euros	Count % within Have you ever invested in Bitcoin or other cryptocurrencies?	16 11.9%	84 11.4%	100 11.5%
	250 000-500 000 euros	Count % within Have you ever invested in Bitcoin or other cryptocurrencies?	8 6.0%	55 7.5%	63 7.2%
	Over 500 000 euros	Count % within Have you ever invested in Bitcoin or other cryptocurrencies?	9 6.7%	46 6.2%	55 6.3%
Total		Count % within Have you ever invested in Bitcoin or other cryptocurrencies?	134 100.0%	738 100.0%	872 100.0%
Pearson Chi-Square		$\chi^2 = 3.186^a$ ; df=6; p=0,785			

In addition to income, the size of total savings/investments was asked from the respondents and results are shown in table 8. Almost one third (30 %) reported to have

total savings worth of 5000-19 999 euros which is also the modal class. Furthermore, 18 % reported to have total savings worth of 20 000-49 999 euros, 14 % under 5000 euros, 13 % 50 000-99 999 euros, 12 % 100 000-249 999 euros, 7 % 250 000-500 000 euros and finally 6 % over 500 000 euros. Based on the comparison between cryptocurrency and non-cryptocurrency investors there were hardly any differences in terms of their total savings/investment amount. The complete results can be seen from table 8.

Based on the chi-square test there was no statistically significant relationship ( $\chi^2 = 3.186^a$ ;  $df=6$ ;  $p=0,785$ ) between total savings/investments and past investment decision towards cryptocurrencies and therefore the null hypothesis is accepted. Even though the answers were distributed quite evenly, the share of cryptocurrency investors among respondents who had 50 000 or more total savings was little bit more (39,5%) compared to 37,6 % for those who had not invested in cryptocurrencies. Possible explanation for this could again be higher risk tolerance as investors with higher net-worth have been reported to be more risk tolerant and invest accordingly (Grable & Joo 2004, 82).

**Table 9 Investing experience versus investment decision**

Crosstab

		Have you ever invested in Bitcoin or other cryptocurrencies?			
		Yes	No	Total	
Investing experience	Under two years	Count	19	181	200
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	14.2%	24.5%	22.9%
	2-5 years	Count	50	200	250
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	37.3%	27.1%	28.7%
	5-10 years	Count	35	163	198
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	26.1%	22.1%	22.7%
	Over 10 years	Count	30	194	224
		% within Have you ever invested in Bitcoin or other cryptocurrencies?	22.4%	26.3%	25.7%
Total	Count	134	738	872	
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	100.0%	100.0%	100.0%	
Pearson Chi-Square	$\chi^2 = 10.903^a$ ; $df=3$ ; $p=0,012$				

In addition, the respondents were also asked about their experience on investing and the results can be seen from figure 9. The answers were distributed quite evenly and the

most (28 %) of the respondents reported to have 2-5 years of experience on investing. Moreover, 28 % of the respondents answered to have over 10 years of investment experience, 23 % between 5 and 10 years and similarly 23 % under two years. Between the cryptocurrency and non-cryptocurrency investors there were notable differences in two of the four groups. 14 % of the cryptocurrency investors reported to have under two years of investing experience whereas the number was 25 % for the non-cryptocurrency investors. In contrast to previous, 37 % of the cryptocurrency investors had investing experience of 2 to 5 years while 27 % of non-cryptocurrency investors reported to have that same experience.

Table 9 also presents the chi-square test and based on the result there was statistically significant relationship ( $\chi^2 = 10.903^a$ ;  $df=3$ ;  $p=0,012$ ) between investing experience and investment decision towards cryptocurrencies and therefore the null hypothesis can be rejected. It seems that having 2-5 years of experience on investing significantly increases the likelihood to invest in cryptocurrencies. This is interesting finding as for example Corter and Chen (2006) have documented that higher experience increases risk tolerance. Other possible explanation could be that many of the cryptocurrency investors started their investing career in previous cryptocurrency bull market in 2017-2018 and have therefore ended in that group.

**Table 10 Average investment horizon versus investment decision**

		Have you ever invested in Bitcoin or other cryptocurrencies?		
		Yes	No	Total
Average investment horizon	Under one year	Count 1	12	13
		% within Have you ever invested in Bitcoin or other cryptocurrencies? 0.7%	1.6%	1.5%
	1-5 years	Count 21	46	67
		% within Have you ever invested in Bitcoin or other cryptocurrencies? 15.7%	6.2%	7.7%
5-10 years	Count	28	159	187
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	20.9%	21.5%	21.4%
Over 10 years	Count	84	521	605
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	62.7%	70.6%	69.4%
Total	Count	134	738	872
	% within Have you ever invested in Bitcoin or other cryptocurrencies?	100.0%	100.0%	100.0%
Pearson Chi-Square		$\chi^2 = 14.783^a$ ; df=3; p=0,002		

Average investment horizon was also one of the questions that was asked from the respondents. Table 10 presents the results and as can be seen, majority (69 %) of the respondents had average investment horizon of over 10 years. Respondents with the average investment horizon between 5 and 10 years accounted 21% of the total results, 1-5 years 8 % and lastly those who had average investment horizon under one year 2 %. Again, those who had invested in cryptocurrencies were compared against those who had not. Based on the results it seems that there are some differences in the average investment horizon as in 1 to 5 years group the relative share of cryptocurrency investors was 15 % against 6 % for those who had not invested in cryptocurrencies. In the under one year group however the relative share of cryptocurrency investors was 1 % compared to 2 % for non-cryptocurrency investors. The relative share of cryptocurrency investors in over 10 years group was 63 % against 71 % for non-cryptocurrency investors. There was no difference in the 5 to 10 years group.

Table 10 also presents the result of chi- square test of investment horizon and investment decision towards cryptocurrencies and based on the result the relationship was statistically significant ( $\chi^2 = 14.783^a$ ; df=3; p=0,002) and therefore the null hypothesis can be rejected. Is difficult to argue why cryptocurrency investors have the average time horizon of 1-5 years more often than those who have not invested in cryptocurrencies.



One explanation could be that as cryptocurrencies have moved in cycles of roughly 3-4 years the investors are waiting about the next bull run.

Based on the impact of background variables on the past investment decision towards cryptocurrencies, the hypotheses regarding gender, investing experience and average investment horizon were accepted.

- **H7a,g and h Background variables explain the investment decision towards cryptocurrencies in terms of a) gender, g) investing experience and h) investment horizon. -> *Supported*.**

On the other hand, age, education, professional status, income or total saving had no significant impact on past investment decision towards cryptocurrencies and therefore the hypotheses regarding those variables were rejected.

- **H7b,c,d,e and f Background variables explain the investment decision towards cryptocurrencies in terms of b) age, c) education, d) professional status, e) income and f) total savings. -> *Not supported*.**

**Table 11 Asset class choices versus investment decision**

		Have you ever invested in Bitcoin or other cryptocurrencies?				
		Yes		No		
		Count	Column N %	Count	Column N %	p-value
Asset class choices	Deposits	81	60.4%	435	58.9%	0,744
	Listed stocks	124	92.5%	629	85.2%	0,023
	Investment Funds	93	69.4%	587	79.5%	0,009
	ETFs	75	56.0%	281	38.1%	<0,001
	Bonds	10	7.5%	40	5.4%	0,349
	Properties (e.g.apartments and forest)	55	41.0%	287	38.9%	0,638
	Currencies	26	19.4%	19	2.6%	<0,001
	Commodities (e.g. gold and oil)	23	17.2%	38	5.1%	<0,001
	Derivatives	35	26.1%	58	7.9%	<0,001
	Other investments	43	32.1%	98	13.3%	<0,001

The respondents were asked about the different investment assets that they had owned/have had savings during the past year. Table 11 presents the results, but in this

case, it is important to note that the columns do not sum to 100% as in previous tests because this question allowed multiple answers to be selected. Also because of this reason, the chi-square test was performed individually for each asset class.

Based on the results listed stocks were the most popular investment asset among the respondents as 86 % reported to have owned them during the past year. Investment funds accounted the second largest share (78%) followed by deposits (59%), ETFs (41%) and properties (39%). The least popular asset class was currencies as only 5 % reported to have owned them during the past year. Bonds (6%) were only slightly more popular than currencies while 7 % had owned commodities, 11% derivatives and 16% other investments. According to the results, there were differences in the asset class choices between the cryptocurrency and non-cryptocurrency investors. Major differences can be found in ETFs, currencies, commodities, derivatives and other investments as the relative share of cryptocurrency investors was a lot higher in those asset classes. In other asset classes the differences were not as notable. However, investment fund was the only asset class where the relative share of non-cryptocurrency investors was higher.

Table 11 presents the results of chi-square tests (p-value) and based on them the cryptocurrency investors were significantly more likely to have invested in listed stocks ( $p=0,023$ ), ETFs ( $p<0,001$ ), currencies ( $p<0,001$ ), commodities ( $p<0,001$ ), derivatives ( $p<0,001$ ) and other investments ( $p<0,001$ ). Furthermore, cryptocurrency investors were significantly less likely to have invested in investment funds ( $p=0,009$ ). Deposits ( $p=0,744$ ) and bonds ( $p=0,349$ ) did not explain the decision to invest in cryptocurrencies as the relationship was not statistically significant ( $p\text{-value} > 0,05$ ). As deposits, bonds and properties did not significantly explain the past investment decision towards cryptocurrencies hypotheses regarding them had to be rejected whereas hypotheses regarding listed stocks, currencies, commodities, derivatives, other investments and investment funds were accepted.

- **H8b,c,d,g,h,i,j Other investment decisions explain the investment decision towards cryptocurrencies in terms of b) listed stocks, c) investment funds, d) ETFs, g) currencies, h) commodities, i) derivatives and j) other investments. -> *Supported.***
- **H8a,e,f Other investment decisions explain the investment decision towards cryptocurrencies in terms of a) deposits, e) bonds and f) properties. -> *Not supported.***

Based on the results it is evident that those investors who had invested in cryptocurrencies invest more actively to other asset classes as well. However, the reason

for why bonds, deposits or properties did not explain the decision to invest in cryptocurrencies could be low volatility compared to the ones that did significantly explain the decision. Therefore, higher risk tolerance could again be a potential reason for this result. Other potential reasons could be diversification and broader knowledge regarding different asset classes. However, it is interesting that cryptocurrency investors invested significantly less likely to investment funds and possible reason for it could be that trading with them is more difficult than with ETFs for example.

**Table 12 Investment/saving motives versus investment decision**

		Have you ever invested in Bitcoin or other cryptocurrencies?				
		Yes		No		
		Count	Column N %	Count	Column N %	p-value p
Motives for saving	Education	4	3.0%	47	6.4%	0,125
	Home purchase	41	30.6%	227	30.8%	0,970
	Bequest	20	14.9%	126	17.1%	0,540
	Reserve fund or for a bad day	102	76.1%	548	74.3%	0,649
	Renovation	6	4.5%	65	8.8%	0,092
	Retirement	104	77.6%	565	76.6%	0,791
	Holiday	19	14.2%	151	20.5%	0,091
	Buying durables	28	20.9%	131	17.8%	0,386
	Other purposes	53	39.6%	213	28.9%	0,013

Lastly, respondents were asked about their motives towards saving/investing. Again, it is important to remind that the columns do not sum to 100% because this question allowed multiple answers to be selected. Also, similarly because of this reason, the chi-square test was performed individually for each motive. Based on the answers that can be viewed or calculated from table 12, the most (77%) reported to save for retirement and almost as many respondents (75%) answered to save also for reserve fund or for a bad day. 31% of the respondents reported to save for home purchase and similarly 31% for other purposes. Little bit less than one in five (19%) reported to save for holidays and a bit less (18%) for durables. Bequest as a saving motive counted 17% of the respondents whereas the number for renovation was 8% and for education only 6% which made it the least popular motive for saving. Based on the comparison between cryptocurrency and non-cryptocurrency investors there were no major differences. However, cryptocurrency investors seem to save more for other purposes as the number was 40% for cryptocurrency investors against 29% for those who have not invested in cryptocurrencies. Saving for

durables was also a bit more popular saving motive for cryptocurrency investors while education, bequest, renovation and holiday were more popular saving motives among non-cryptocurrency investors.

Based on the chi-square tests (p-value) those who had invested in cryptocurrencies were significantly more likely to have other purposes ( $p=0,013$ ) as a saving motive. However, there were no statistically significant relationship between education ( $p=0,125$ ), home purchase ( $p=0,970$ ), bequest ( $p=0,540$ ), reserve fund or for a bad day ( $p=0,649$ ), renovation ( $p=0,092$ ), retirement ( $p=0,791$ ), holiday ( $p=0,091$ ) and durables ( $p=0,386$ ) as investing/saving motive and past investment decision towards cryptocurrencies. As only other purposes had significant impact on the past investment decision towards cryptocurrencies, all other hypotheses regarding motives had to be rejected.

- **H1a-h Motives for investing explain the investment decision towards cryptocurrencies in terms of a) education, b) home purchase, c) bequest, d) reserve funds, e) renovation, f) retirement, g) holiday and h) durables. -> *Not supported***
- **H1i Motives for investing explain the investment decision towards cryptocurrencies in terms of i) other purposes. -> *Supported***

As “other purposes” as motive for investing was the only one that significantly explained the decision to invest in cryptocurrencies it is hard to find explanations for it since those other motives are unknown. Nonetheless, it could be possible that those unknown motives are related to some specific financial need such as “get rich” motive as certain assets are sometimes selected for achieving a specific financial goal (Shefrin & Statham 2000, 141-143). Since cryptocurrencies in general have huge price movements, they could be attractive for investors with high aspirations.

## 5.2 Logistic regression analysis

The results of logistic regression analysis are presented in this chapter. Logistic regression analysis was chosen because the dependent variable (investment decision towards cryptocurrencies) is dichotomous meaning that there is only two possible outcomes “Yes” or “No”. With logistic regression it is possible to predict or explain an outcome based on the values of independent variables (IBM, 2021). From the five constructs, financial risk tolerance, overconfidence, herding and mental accounting were

acceptable for the logistic regression analysis as familiarity (FA) construct had too low Cronbach alpha (0,404) that it was not acceptable to involve it in the analysis. Even though FRT, OC and MA constructs had slightly below 0,6 Cronbach's alphas they were still accepted for the logistic regression analysis. The dependent variable for the logistic regression analysis was the past investment decision towards cryptocurrencies which is dichotomous variable meaning that there is only two possible outcomes and in this case either "Yes" or "No" answer which indicate whether or not the respondent had previously invested in cryptocurrencies. The respondents who had invested in Bitcoin or other cryptocurrencies were selected as a basis for the models as it is more practical to discuss the result in that way. In addition, the item scores for FRT scale were reversed as originally lower scores indicated higher risk tolerance because the instrument worked to the opposite direction compared to the rest of the scales.

The univariate analyses were conducted first for all four covariates in order to find out those that are or might be important predictors. The cut-off value for potentially significant covariates to be included in the multivariate model was p-value < 0.25 as the p-value < 0.05 can potentially fail to identify covariates that are important (Bursac et al 2008, 2).

**Table 13 Logistic regression results for financial risk tolerance**

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 <sup>a</sup> FRT	.465	.163	8.099	1	.004	1.591	1.156	2.192
Constant	-3.463	.634	29.872	1	.000	.031		
Cox & Snell R Square = 0.01			Nagelkerke R Square = 0.017					
Hosmer-Lemeshow Test = 0.503								
Overall percentage = 84.6								

Table 13 presents the results of first univariate logistic regression analysis where financial risk tolerance (FRT) construct was selected to predict the past investment decision towards cryptocurrencies. Based on the results, financial risk tolerance significantly (p-value =0.004) predicts the decision to invest in cryptocurrencies and therefore the null hypothesis can be rejected. Having higher financial risk tolerance increases the likelihood to invest in cryptocurrencies in a way that one point increase on FRT construct increases the odds of being a cryptocurrency investor by 59,1 % with a 95% CI of 1.156-2.192. The model is able to explain 1 - 1.7% of the variance and goodness of fit (Hosmer-Lemeshow test) tells that the model is good fit of the data as p-

value = 0.503 is greater than 0.05 cut-off level. The model was able to correctly predict the outcome for 84.6 % of the cases. The financial risk tolerance construct was selected for the multivariate analysis as the p-value is less than the cut-off level (P-value < 0.25) used for selecting potentially important variables.

**Table 14 Logistic regression results for overconfidence**

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 <sup>a</sup> OC	.218	.114	3.623	1	.057	1.243	.994	1.555
Constant	-2.293	.328	48.882	1	.000	.101		
Cox & Snell R Square = 0.004			Nagelkerke R Square = 0.007					
Hosmer-Lemeshow Test = 0.418								
Overall percentage = 84.6								

The results of second univariate logistic regression analysis are shown in table 14. In this model the overconfidence (OC) construct was selected to predict the past investment decision towards cryptocurrencies. Based on results, overconfidence did not significantly predict the decision to invest in cryptocurrencies (p-value =0.057) and therefore based only on the univariate analysis the null hypothesis can be accepted. The model is able to explain 0.4 – 0.7 % of the variance and based on goodness of fit test the model fits the data well as the p-value is 0.418. Similarly with the previous analysis, the model was able to correctly predict the outcome for 84.6 % of the cases. The overconfidence construct was also selected for the multivariate analysis as the p-value is less than the cut-off level (P-value < 0.25) used for selecting potentially important variables.

**Table 15 Logistic regression results for herding**

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 <sup>a</sup> HE	-.008	.127	.004	1	.948	.992	.774	1.271
Constant	-1.685	.339	24.695	1	.000	.185		
Cox & Snell R Square = 0.000			Nagelkerke R Square = 0.000					
Hosmer-Lemeshow Test = 0.332								
Overall percentage = 84.6								

Table 15 presents the results of third univariate logistic regression analysis where Herding (HE) construct was chosen to predict respondent's past investment decision towards cryptocurrencies. The results indicate clearly that the herding construct does not significantly predict the past investment decision towards cryptocurrencies as the p-value is 0.948 which is highly above the cut-off level of p-value  $< 0.05$  for significance and means that the null hypothesis can be accepted. The model can explain zero percent of the variance. The model is however good fit to the data as Hosmer-Lemeshow test is 0.332. Again, the model was able to correctly predict the outcome for 84.6 % of the cases. The herding construct was not selected for the multivariate analysis as the p-value is greater than the cut-off level (P-value  $< 0.25$ ) used for selecting important variables.

**Table 16 Logistic regression results for mental accounting**

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 <sup>a</sup> MA	.010	.106	.009	1	.923	1.010	.820	1.245
Constant	-1.739	.357	23.796	1	.000	.176		
Cox & Snell R Square = 0.000			Nagelkerke R Square = 0.000					
Hosmer-Lemeshow Test = 0.038								
Overall percentage = 84.6								

Table 16 shows the results of fourth univariate logistic regression that includes Mental Accounting (MA) construct as an independent variable to predict past investment decision towards cryptocurrencies. According to the results, mental accounting construct score does not significantly predict the past investment decision towards cryptocurrencies (p-value = 0.923) as the p-value is greater than cut-off level of 0.05 for significance and therefore the null hypothesis can be accepted. Also, the model is not able to explain any (0 %) of the variance and the goodness of fit (Hosmer-Lemeshow test) indicates that the model is not good fit to the data as p-value is 0.038 which is less than 0.05. The model predicted the outcome correctly for 84.6 % of the cases. The mental accounting construct is not selected for the multivariate analysis as the p-value is greater than the cut-off level (P-value  $< 0.25$ ) used for selecting the important variables.

**Table 17 Multivariate logistic regression results for FRT and OC**

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 <sup>a</sup> FRT	.421	.166	6.460	1	.011	1.524	1.101	2.109
OC	.161	.117	1.903	1	.168	1.175	.934	1.478
Constant	-3.734	.664	31.622	1	.000	.024		
Cox & Snell R Square = 0.012			Nagelkerke R Square = 0.02					
Hosmer-Lemeshow Test = 0.126								
Overall percentage = 84.6								

Table 17 presents the results of multivariate logistic regression analysis which includes previously chosen FRT and OC constructs as predicting variables. Based on the results of multivariate logistic regression it can be concluded that financial risk tolerance is independently associated with the outcome as it remains as a significant (p-value = 0.011) predictor of past investment decision towards cryptocurrencies. However, the model also verifies that overconfidence does not significantly (p-value = 0.168) predict the past investment decision towards cryptocurrencies and therefore the only statistically significant variable is the financial risk tolerance construct. FRT and OC are significantly positively correlated (see appendix 4) but the correlation is weak (.189) so there was no issues with multicollinearity. The two variables in the model explain quite small amount of the variance 1.2 – 2% but the model fits well to the data as the result of Hosmer-Lemeshow test is 0.126 which is greater than 0.05 cut-off level. Similarly, to the univariate analyses the model predicted the outcome correctly for 84.6 % of the cases. Based on the model the null hypothesis for financial risk tolerance can remain rejected and null hypothesis for overconfidence accepted.

As financial risk tolerance was found to be the only predictive factor of the past investment decision towards cryptocurrencies, the hypothesis regarding it was accepted.

- **H2 Cryptocurrency investors have higher risk tolerance. -> Supported.**



However, because overconfidence, herding or mental accounting did not significantly predict the past investment decision towards cryptocurrencies the hypotheses regarding those variables were rejected.

- **H3 Cryptocurrency investors are more prone towards overconfidence. -> *Not supported.***
- **H4 Cryptocurrency investors are more prone towards herding. -> *Not supported.***
- **H6 Cryptocurrency investors are more prone towards mental accounting. -> *Not supported.***

Results of the logistic regression analysis revealed that higher risk tolerance score is a significant predictor of positive investment decision towards cryptocurrencies. This result is in line with what was hypothesized by the researcher. Furthermore, this provides support for the earlier results and reflections since it has been well documented by multiple studies that background variables have impact on financial risk tolerance (Grable 2000; Grable & Joo 2004; Corter & Chen 2006). Especially, gender (male) could be a reason for why cryptocurrency investors have higher risk tolerance as 80% of the respondents who reported to have invested in cryptocurrencies were male and the relationship was statistically significant. Therefore, the researcher decided to test the relationship of gender and financial risk tolerance scores (see appendix 5) and found out that higher financial risk tolerance scores are indeed significantly ( $p < 0.001$ ) related to male gender. On the other hand, most of the variables that have been reported to be significantly related to higher risk tolerance by previous studies did not explain the decision to invest in cryptocurrencies according to the results of this study. Results for the herding and mental accounting constructs were not that surprising as the impact of background variables towards them as predictors are relatively unknown. It also seems that even though cryptocurrencies are speculative, cryptocurrency investors do not rely more heavily on the decisions of other investors when compared to those who have not invested in cryptocurrencies. This however does not mean that there would not be herding behavior in the cryptocurrency markets as for example, a study conducted by Leclair (2018) documented the presence of it.

However, the fact that overconfidence did not significantly explain the decision to invest in cryptocurrencies was interesting as for example gender (male) has been linked to higher overconfidence (Barber & Odean 2001). Previous studies have also documented that overconfidence and risk-taking go hand in hand and therefore it is little unexpected that overconfidence was not a significant predictor as significant positive relationship was

also found in this study (Barber & Odean 2000; Nasic & Weber 2010). Possible explanation for this could be that even though investors who have invested in cryptocurrencies seek more risk, they are able to estimate and treat it correctly and can therefore keep their emotions in check.

## 6 CONCLUSIONS

### 6.1 Discussion of findings

The research questions of the study will be answered in this chapter based on the literature review and results obtained from empirical part of the study. The results and hypotheses are summarized in the table 18 below which shows the factors that did or did not contribute to the investment decision towards cryptocurrencies.

**Table 18 Hypotheses and results**

<b>Hypothesis</b>	<b>Variable/Construct</b>	<b>Result</b>
H1a	Education	Not supported
H1b	Home purchase	Not supported
H1c	Bequest	Not supported
H1d	Reserve fund	Not supported
H1e	Renovation	Not supported
H1f	Retirement	Not supported
H1g	Holiday	Not supported
H1h	Durables	Not supported
H1i	Other purposes	Supported +
H2	Financial risk tolerance (higher)	Supported +
H3	Overconfidence	Not supported
H4	Herding	Not supported
H5	Familiarity	Excluded from analysis
H6	Mental accounting	Not supported
H7a	Gender (male)	Supported +
H7b	Age	Not supported
H7c	Education	Not supported
H7d	Professional status	Not supported
H7e	Income	Not supported
H7f	Total savings	Not supported
H7g	Investing experience (2-5 years)	Supported +
H7h	Investment horizon (1-5 years)	Supported +
H8a	Deposits	Not supported
H8b	Listed stocks	Supported +
H8c	Investment funds	Supported –
H8d	ETFs	Supported +
H8e	Bonds	Not supported
H8f	Properties	Not supported
H8g	Currencies	Supported +
H8h	Commodities	Supported +
H8i	Derivates	Supported +
H8j	Other investments	Supported +

Hypotheses H1a-i were directly developed for answering the first sub-question of the study: **How investment/saving motives explain the investment decision towards cryptocurrencies?** Furthermore, hypotheses H8a-j were developed for additional support for answering that question. As can be seen for table 18, the first hypothesis: *H1a-I Motives for investing explain the investment decision towards cryptocurrencies* could only be partially supported as other purposes (H1i) as a motive had the only significant impact on past investment decision towards cryptocurrencies. Other motives towards investing, education (H1a), home purchase (H1b), bequest (H1c), reserve fund (H1d), renovation (H1e), retirement (H1f), holiday (H1g) and durables (H1h) had no significant relationship on past investment decision towards cryptocurrencies. If we consider the results that can be seen from previously presented table 12 and compare them to the previous studies conducted on motives for saving by Horioka and Watanabe (1997), Harris et al (2002) and Finansialia (2019) the hierarchy of motives are quite similar for both cryptocurrency and non-cryptocurrency investors as the ones reported in those three studies. However, the reason why having other purposes as a saving motives significantly increased the likelihood of positive investment decision towards cryptocurrencies is difficult to answer as the “other purposes” are unknown and therefore an educated guess can only be made. As was discussed in chapter two, Xiao and Andersson (1997) found out that different assets may be used for fulfilling a certain financial need. Also, in chapter three it was discussed how people tend to form mental accounts for different investments and some assets can be specially selected for getting rich or to avoid poverty (Shefrin & Statham 2000, 141-143). Therefore, it could be assumed that cryptocurrencies are used for achieving a special financial need which is common for the cryptocurrency investors. Because of the high risk and reward characteristics of most cryptocurrencies the need is most likely related to “get rich” goal which again is directly related to main motivational factor for investing – to increase financial wealth (Lewis 2000, 331; Rani 2012, 1164). Although, the “answer” is only an educated guess and further research needs to be made, the answer could be further supported with the fact that those who had invested in cryptocurrencies had also invested significantly more likely to the assets such as listed stocks (H8b), ETFs (H8d), currencies (H8g), commodities (H8h), derivatives (H8i) and other investments (H8j) and significantly less likely to investment funds (H8c) which could indicate that motives for investing are different between cryptocurrency and non-cryptocurrency investors since they choose to invest more broadly across different asset classes. However, in the end it is safe to say that the motives for investing are quite similar for the most part between cryptocurrency and non-cryptocurrency investors and therefore motives explain the decision to invest in cryptocurrencies only narrowly.

The second hypothesis of the study (H2) proposed that cryptocurrency investors have higher risk tolerance than those who had not invested in cryptocurrencies, and it was the main hypothesis for answering the second sub-question: **Does Financial risk tolerance predict the investment decision towards cryptocurrencies?** Based on logistic regression analysis H2 was supported and therefore higher financial risk tolerance score is a significant predictor of the positive investment decision towards cryptocurrencies.

The result is not surprising as based on literature review it was already clear that those who have higher risk tolerance tend to hold riskier assets as well (Corter & Chen 2006, 376; Grable 2008, 4; Kimball et al 2008, 1035). The findings can also be further supported with the results for hypotheses (H8a-j) as cryptocurrency investors had invested significantly more likely to assets that can be considered to be somewhat riskier than the ones where there was no significant relationship because of the volatility. In addition, it has been well documented that background variables have an impact on financial risk tolerance. Variables that have been reported to be significantly related to higher risk tolerance include age, gender (male), income (higher), education (higher), professional status (higher), investing experience (higher) and net worth (Grable 2000; Grable & Joo 2004; Corter & Chen 2006). From the background variables known to affect risk tolerance, only gender (male) and investing experience had significant impact on the positive past investment decision towards cryptocurrencies. The relationship of financial risk tolerance and gender was also tested with logistic regression analysis and the results confirmed that higher financial risk tolerance scores are significantly related to male gender. However, the impact of investing experience was different compared to previous studies in a sense that those who had the investing experience between 2-5 years were significantly more likely to have invested in cryptocurrencies. On the other hand, age, education, professional status, income or total savings did not have significant impact on past investment decision towards cryptocurrencies and therefore it could be concluded that in the case of cryptocurrency investors, background variables possibly explain the higher risk tolerance only partially and further research is needed. The market condition has also been documented to impact risk tolerance in a way that in bear markets risk tolerance scores are lower and in the bull markets higher (Yao et al 2004, 262-263). However, since pretty much the whole world was in turmoil at the time of the data collection because of the Covid-19 the differences in financial risk tolerance can't be explained with differences in market conditions.

Hypotheses (H3, H4, H5 and H6) were all related to the third sub-question: **Do behavioral biases predict the investment decision towards cryptocurrencies?** The H3 proposed that cryptocurrency investors are more prone towards overconfidence which however proved not to be the case as there was no significant relationship between being

more overconfident and past investment decision towards cryptocurrencies and therefore H3 was not supported. This result was little bit unexpected as for example male gender has been linked to higher overconfidence (Barber & Odean 2001). Furthermore, the result is interesting as previous studies have reported that overconfidence leads to higher risk taking (Barber & Odean 2000; Nasic & Weber 2010).

There was also no significant relationship between herding behavior and past investment decision towards cryptocurrencies and therefore H4 was also not supported. Unfortunately, the study was unable to obtain results for familiarity/ home bias due to low Cronbach's alpha of the FA construct and therefore H5 had to be rejected from the analysis. In the H6 it was proposed that cryptocurrency investors are more prone towards mental accounting but again this proved to be wrong assumption as there was no significant relationship and therefore H6 was not supported either. As there were no significant relationship between behavioral biases and past investment decision towards cryptocurrencies, it can be concluded that based on the results of this study cryptocurrency investors are not more prone towards behavioral biases in investment decision making and therefore selected behavioral biases do not predict the investment decision towards cryptocurrencies. However, as only four of the many behavioral biases were studied and as there were also small issues with the reliability of the scales, further research is needed on the topic.

The hypotheses (H7a-h) concerned the impact of background variables have on past investment decision towards cryptocurrencies and based on the results it is possible to answer to the fourth sub-question: **How background variables explain the investment decision towards cryptocurrencies?** As can be seen from table 18, gender (H7a), investing experience (H7g) and investment horizon (H7h) were all significantly related to the positive past investment decision towards cryptocurrencies. On the contrary, age (H7b), education (H7c), professional status (H7d), income (H7e) and total savings (H7f) were not significantly related to past investment decision towards cryptocurrencies. The possible impact of gender and investing experience on financial risk tolerance was already discussed so it will not be discussed any further here. Even though, the previous research around cryptocurrency investors is limited, the study conducted by Clovr (2018) documented that typical cryptocurrency investors were young men with higher income. In this study, income or age did not however explain significantly about the decision to invest in cryptocurrencies even though the relative share of cryptocurrency investors was higher (49%) against (39%) for non-cryptocurrency investors in the below 30 age group. Investors who had the investing experience of 2-5 years had invested significantly more likely to cryptocurrencies and the reason for that could be that previous bull market was in 2017-2018 which could have been the time when many of those investors started their

investing career (Coinmarketcap 2021). Investors with average investment horizon (1-5 years) were also significantly more likely to have invested in cryptocurrencies which could indicate that cryptocurrency investors despite their background, do not trade excessively but rather invest in short to medium time frame. Also, the relative share of cryptocurrency investors who had average investment horizon less than one year was lower (0.7 %) compared to the relative share of 1.6 % for those who had not invested in cryptocurrencies. There could also be other reasons for educated cryptocurrency investors to have average investment horizon between 1-5 years such as Bitcoin's halving and market cycles in cryptocurrencies. In the end it could be concluded that in terms of background variables, cryptocurrency investors and non-cryptocurrency investors are quite similar and only factors that explain the past investment decision towards cryptocurrencies are gender, investing experience and average investment horizon.

Now when all four of the sub-questions have been answered it is possible to provide answers for the main research question: **Which factors contribute to the past investment decision towards cryptocurrencies?** The results of the empirical part of the research clearly demonstrated that there are factors that have a significant impact on the investment decision towards cryptocurrencies. Factors that had significant positive impact on the past investment decision towards cryptocurrencies were other purposes as a motive towards investing, financial risk tolerance scores (higher), gender (male), investing experience (2-5 years), average investment horizon (1-5 years). Furthermore, other investment decisions had also impact and if the investor have had investments during the past year prior to data collection in listed stocks, ETFs, currencies, commodities, derivatives or other investments he/she would have also invested significantly more likely to cryptocurrencies. On the other hand, there was only one factor that had significant negative impact on the past investment decision towards cryptocurrencies and that factor was investment funds. The impact of other factors included in this study were not supported which was against what was expected by the researcher. It could also be said that no evidence was found that cryptocurrency investors would be more irrational or rational in their investment decision making when compared to investors who have chosen not to invest in cryptocurrencies and therefore positive investment decision towards cryptocurrencies cannot be explained with behavioral biases that were included in this study.

## **6.2 Managerial implications**

Based on the findings of the study few managerial implications could be made for financial service providers and investors in general. First of all, since cryptocurrencies for the most part are highly volatile assets and higher financial risk tolerance significantly explained the decision to invest in cryptocurrencies, portfolio managers and investors should pay close attention to the suitability of cryptocurrencies for the investment portfolios they manage. Understanding of the financial risk tolerance and overall volatility of the portfolio will help in determining the suitability and right asset allocation levels (Grable & Lytton 1999).

Service providers who are offering or marketing cryptocurrencies or related products such as cryptocurrency ETF/ETNs could benefit from the knowledge that average cryptocurrency investor in Finland based on this study is below 30 years old male who earns between 20 000 and 60 000 euros and has 5000 – 50 000 euros to invest and in addition allocates money significantly more likely to various asset classes such as derivatives and commodities. Also, as only 20% of the women have ever invested in cryptocurrencies there is lot of achievable potential in that market as there is also in age groups above 30 and higher income/ total wealth groups. Financial service providers should also consider the behavioral aspects of investing in the design and marketing process of cryptocurrencies in the same detail as with other products (Shefrin & Statman 1993). It would be useful for service providers to attain knowledge on the needs of cryptocurrency investors as this study did not catch that information. It however became evident that there are “other motives” for investing that significantly explain the decision to invest in cryptocurrencies.

However, as the results obtained in this study and the methods used have some limitations that could be eliminated, they are therefore discussed next along with suggestions for future research.

## **6.3 Limitations and suggestions for future research**

Like in many other studies, this study had some limitations as well which should be addressed for future research. Firstly, as the present study used non-probabilistic sampling strategies because of the convenience reasons, there are issues with generalization as it cannot be guaranteed that the sample represented the target population of the study (Andres 2012, 96-97). Therefore, it is advisable to use probabilistic sampling



strategies in the future studies if possible as it would allow the findings to be generalized further to the whole population.

Secondly, this study had little issues with the reliability of the scales and even one of the scales (FA) had to be rejected from the analysis because of the low Cronbach's alpha. Even though, this study used previously proven scales for measuring financial risk tolerance and behavioral biases in investment decision making, in future studies those scales should be revised and tested further to improve both reliability and validity of those measures. However, if the researcher of the future studies has more resources it could be possible to study behavioral biases and risk tolerance in more detail by having a view only access to the brokerage accounts of the research participants. As this study only focused on four of the many behavioral biases in investment decision making, it would be advisable to include other behavioral biases in future studies as well. Furthermore, there are most likely also other factors that may have had an impact on the past investment decision towards cryptocurrencies in addition the ones selected for this study and therefore future studies should consider adding other variables as well.

It would also be interesting to see what factors contribute towards some other investment decisions such as the decision to purchase meme stocks which according to researcher's knowledge has been a trend lately. Other potential future research topic could be to investigate how investment decision making differs between different generations, for example Generation X vs Generation Z. After all, there is still lot of research to be made in how investors behave and make decisions in constantly changing financial markets.

## 7 SUMMARY

The purpose of this study was to investigate the factors that have contributed to the past investment decision towards cryptocurrencies. The results were obtained by comparing Finnish investors who had prior to this study at some point invested in cryptocurrencies to those who had not ever invested in that asset class. Factors that were selected to act as independent variables included investment motives, financial risk tolerance, behavioral biases in investment decision making, background variables and previous investment decision towards different asset classes.

The study discussed about investing motives from various perspectives and acknowledged the fact that investors can have various motives for holding back from spending their money as different investments may have been chosen to fulfill specific financial goals. Financial risk tolerance was also discussed and the impact it has on investment decisions and asset class choices was of particular interest. Behavioral biases that were selected for studying the differences between the two groups of investors included overconfidence, herding, familiarity/home bias and mental accounting. Each of the biases were discussed separately and their impact on the investment decision making was at the core of this research. Background variables and previous investment decisions towards other asset classes were selected to provide supportive information for the past investment decision towards cryptocurrencies.

The data for the study was collected from an investing related Facebook group and the sample size turned out to be 872 responses. The study was a quantitative web survey and crosstabulation, Chi-square test and logistic regression were used as data analysis methods. The measures that were selected for this study had previously been used in other studies and were found to be valid. Unfortunately, the scale intended to measure familiarity/home bias had to be rejected because of reliability reasons as it had a simply too low Cronbach's alpha which was used as a test to assess the reliability of the scales.

The findings of this study were that in general investing motives did not explain the past investment decision towards cryptocurrencies, except that those who had invested in cryptocurrencies had significantly more likely "other reasons" for investing and therefore the researcher speculated that cryptocurrencies could be chosen to fulfill a certain financial need such as the need to get rich. Higher financial risk tolerance scores were found to be a significant predictor of positive investment decision towards cryptocurrencies and therefore it could be concluded that cryptocurrency investors are more risk seeking. On the other hand, behavioural biases were not found to be significant predictors of the investment decision towards cryptocurrencies and based on this finding cryptocurrency investors were seen as equally rational/irrational in their investment decision making.

From the background variables included in this study only gender (male), investing experience (2-5 years) and average investment horizon (1-5 years) had significant impact on the past positive investment decision towards cryptocurrencies. Those who had previously invested in cryptocurrencies were found to invest more broadly across different asset classes and during one year prior to the data collection have had significantly more likely investments in listed stocks, ETFs, currencies, commodities, derivatives and other investments. However, investment funds were significantly associated to the past negative investment decision towards cryptocurrencies.

This study has demonstrated that there are multiple factors that explain the investment decisions towards cryptocurrencies. Moreover, in constantly changing financial markets with new trends that come along with the new generation of investors, this study can act as a “new” approach to explain investment decisions towards different assets classes.

## REFERENCES

- Ahearne, A. G., Grier, W. L., & Warnock, F. E. (2004). Information costs and home bias: an analysis of US holdings of foreign equities. *Journal of international economics*, 62(2), 313-336.
- Andres, L. (2012). *Designing and doing survey research*. Sage, London.
- Antweiler, W., & Frank, M. Z. (2004). Is all that talk just noise? The information content of internet stock message boards. *The Journal of Finance*, 59(3), 1259-1294.
- Alrabadi, D. W. H., Al-Abdallah, S. Y., & Aljarayesh, N. I. A. (2018). Behavioral biases and investment performance: Does gender matter? Evidence from Amman Stock Exchange. *Jordan Journal of Economic Sciences*, 5(1), 77-92.
- Arnold, G. (2010). *"The financial times guide to investing"*. 2nd ed. Financial times Prentice Hall Pearson.
- Barber, B. M., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *The Quarterly journal of Economics*, 116(1), 261-292.
- Barber, B. M., & Odean, T. (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. *The Journal of Finance*, 55(2), 773-806.
- Barber, B. M., & Odean, T. (2002). Online investors: do the slow die first? *The Review of Financial Studies*, 15(2), 455-488.
- Barberis, N., Huang, M., & Santos, T. (2001). Prospect theory and asset prices. *The Quarterly Journal of Economics*, 116(1), 1-53.

Barberis, N., & Thaler, R. (2005). *A survey of behavioral finance* (pp. 1-76). Princeton University Press.

Baker, H.K., Kumar, S., Goyal, N. and Gaur, V. (2019), "How financial literacy and demographic variables relate to behavioral biases", *Managerial Finance*, Vol. 45 No. 1, 124-146.

Barnes, P. (2019). Crypto Currency and its Susceptibility to Speculative Bubbles, Manipulation, Scams and Fraud. *Journal Of Advanced Studies In Finance*, 9(2), 60-77.

Baur, D. G., Dimpfl, T., & Kuck, K. (2018a). Bitcoin, gold and the US dollar—A replication and extension. *Finance Research Letters*, 25, 103-110.

Baur, D. G., Hong, K., & Lee, A. (2018b). Bitcoin: Medium of exchange or speculative assets? *Journal of International Financial Markets, Institutions and Money*, 54, 177-189.

Bikhchandani, S., & Sharma, S. (2000). Herd behavior in financial markets. *IMF Staff papers*, 47(3), 279-310.

Browning, M., & Lusardi, A. (1996). Household Saving: Micro Theories and Micro Facts. *Journal of Economic literature*, 34(4), 1797-1855

Bryman, A, Bell, E. (2007). *Business research methods*. Oxford University Press, New York.

Bursac, Z., Gauss, C. H., Williams, D. K., & Hosmer, D. W. (2008). Purposeful selection of variables in logistic regression. *Source code for biology and medicine*, 3(1), 17.

Böhme, R., Christin, N., Edelman, B., & Moore, T. (2015). Bitcoin: Economics, Technology, and Governance. *Journal of Economic Perspectives*, 29(2), 213-38.

- Canova, L., Rattazzi, A. M. M., & Webley, P. (2005). The hierarchical structure of saving motives. *Journal of Economic Psychology*, 26(1), 21-34.
- Carroll, C. D., & Kimball, M. S. (2006). Precautionary saving and precautionary wealth (No. 2006/02). CFS Working Paper.
- Choi, J. J., Laibson, D., & Metrick, A. (2002). How does the Internet affect trading? Evidence from investor behavior in 401 (k) plans. *Journal of Financial Economics*, 64(3), 397-421.
- Choi, J. J., Laibson, D., & Madrian, B. C. (2007). Mental Accounting in Portfolio Choice: Evidence from a Flypaper Effect.
- Ciaian, P., Rajcaniova, M., & Kancs, D. A. (2016). The economics of BitCoin price formation. *Applied Economics*, 48(19), 1799-1815.
- Clarke, R. G., Krase, S., & Statman, M. (1994). Tracking Errors, Regret, and Tactical Asset Allocation. *The Journal of Portfolio Management*, 20(3), 16-24.
- Clovr. (2018). Emotional market: How do American feel about cryptocurrency? <<https://www.clovr.com/page/emotional-currency/>>, retrieved 18.1.2020
- Coinmarketcap (2021). Today's Cryptocurrency Prices by Market Cap. <<https://coinmarketcap.com/>>, retrieved 25.05.2020
- Collins, J., & Hussey, R. (2003). *Business Research: a practical guide for undergraduate and postgraduate students*. Palgrave Macmillan, New York.
- Corbet, S., Lucey, B., Urquhart, A., & Yarovaya, L. (2019). Cryptocurrencies as a financial asset: A systematic analysis. *International Review of Financial Analysis*, 62 182-199.
- Corter, J. E., & Chen, Y. J. (2006). Do Investment Risk Tolerance Attitudes Predict Portfolio Risk? *Journal of Business and Psychology*, 3(20), 369-381.

- Coval, J. D., & Moskowitz, T. J. (1999). Home bias at home: Local equity preference in domestic portfolios. *The Journal of Finance*, 54(6), 2045-2073.
- Dahlquist, M., & Robertsson, G. (2001). Direct foreign ownership, institutional investors, and firm characteristics. *Journal of Financial Economics*, 59(3), 413-440.
- Devenow, A., & Welch, I. (1996). Rational herding in financial economics. *European Economic Review*, 40(3-5), 603-615.
- Driessen, J., & Laeven, L. (2007). International portfolio diversification benefits: Cross-country evidence from a local perspective. *Journal of Banking & Finance*, 31(6), 1693-1712.
- Dyhrberg, A. H. (2016). Hedging capabilities of bitcoin. Is it the virtual gold? *Finance Research Letters*, 16, 139-144.
- Elliott, W. B., Hodge, F. D., & Jackson, K. E. (2008). The association between nonprofessional investors' information choices and their portfolio returns: The importance of investing experience. *Contemporary Accounting Research*, 25(2), 473-498.
- European Commission. (2021). Data protection in the EU. <  
[https://ec.europa.eu/info/law/law-topic/data-protection/data-protection-eu\\_en](https://ec.europa.eu/info/law/law-topic/data-protection/data-protection-eu_en)>, retrieved, 1.7.2021.
- Fernández, B., Garcia-Merino, T., Mayoral, R., Santos, V., & Vallelado, E. (2011). Herding, information uncertainty and investors' cognitive profile. *Qualitative Research in Financial Markets*, 3(1), 7-33.
- Finanssiala (2019) Säästäminen, luotonkäyttö ja maksutavat. Tekstiraportti 2019.<  
[https://www.finanssiala.fi/wp-content/uploads/2019/04/SLM-2019\\_Tutkimusraportti.pdf](https://www.finanssiala.fi/wp-content/uploads/2019/04/SLM-2019_Tutkimusraportti.pdf)>, retrieved 1.12.2020.
- Fisher, P. J., & Montalto, C. P. (2010). Effect of saving motives and horizon on saving behaviors. *Journal of Economic Psychology*, 31(1), 92-105.

- Friedman, M. (1957). The permanent income hypothesis. A theory of the consumption function, 20-37.
- French, K. R., & Poterba, J. M. (1991). Investor Diversification and International Equity Markets. *The American Economic Review*, 81(2), 222-226.
- Georgoula, I., Pournarakis, D., Bilanakos, C., Sotiropoulos, D., & Giaglis, G. M. (2015). Using Time-Series and Sentiment Analysis to Detect the Determinants of Bitcoin Prices (Working Paper). <<https://ssrn.com/abstract=2607167>>, retrieved 1.3.2021.
- Glaser, M., & Weber, M. (2007). Overconfidence and trading volume. *The Geneva Risk and Insurance Review*, 32(1), 1-36.
- Glaser, F., Zimmermann, K., Haferkorn, M., Weber, M.C. and Siering, M. (2014a). Bitcoin - Asset or Currency? Revealing Users' Hidden Intentions. In: Proceedings of the twenty-second European conference on information systems, Recanati Business School, Tel Aviv University, Tel Aviv.
- Glaser, F., Haferkorn, M., Weber, M. C., & Zimmermann, K. (2014b). How to price a digital currency? empirical insights on the influence of media coverage on the bitcoin bubble. Empirical Insights on the Influence of Media Coverage on the Bitcoin
- Grable, J. E. (2000). Financial risk tolerance and additional factors that affect risk taking in everyday money matters. *Journal of Business and Psychology*, 14(4), 625-630.
- Grable, J. E. (2008). *Risk tolerance*. In Handbook of consumer finance research (pp. 3-19). Springer, New York, NY.
- Grable, J., & Lytton, R. H. (1999). Financial risk tolerance revisited: the development of a risk assessment instrument. *Financial Services Review*, 8(3), 163-181.



- Grable, J. E., & Joo, S. H. (2004). Environmental and biophysical factors associated with financial risk tolerance. *Journal of Financial Counseling and Planning*, 15(1).
- Greiner, S. (2013). *Investment risk and uncertainty: advanced risk awareness techniques for the intelligent investor*. John Wiley & Sons, Hoboken.
- Grinblatt, M., & Han, B. (2005). Prospect theory, mental accounting, and momentum. *Journal of Financial Economics*, 78(2), 311-339.
- Grinblatt, M., & Keloharju, M. (2001). How distance, language, and culture influence stockholdings and trades. *The Journal of Finance*, 56(3), 1053-1073.
- Grinblatt, M., & Keloharju, M. (2009). Sensation seeking, overconfidence, and trading activity. *The Journal of Finance*, 64(2), 549-578.
- Hall, C. C., Ariss, L., & Todorov, A. (2007). The illusion of knowledge: When more information reduces accuracy and increases confidence. *Organizational Behavior and Human Decision Processes*, 103(2), 277-290.
- Harlow, W. V., & Brown, K. C. (1990). Understanding and assessing financial risk tolerance: a biological perspective. *Financial Analysts Journal*, 46(6), 50-62.
- Harris, M. N., Loundes, J., & Webster, E. (2002). Determinants of household saving in Australia. *Economic Record*, 78(241), 207-223.
- Henriques, I., & Sadorsky, P. (2018). Can bitcoin replace gold in an investment portfolio? *Journal of Risk and Financial Management*, 11(3), 48.
- Hilary, G., & Menzly, L. (2006). Does past success lead analysts to become overconfident? *Management Science*, 52(4), 489-500.
- Horioka, C. Y., & Watanabe, W. (1997). Why do people save? A micro-analysis of motives for household saving in Japan. *The Economic Journal*, 107(442), 537-552.

- Huberman, G. (2001). Familiarity breeds investment. *The Review of Financial Studies*, 14(3), 659-680.
- IBM (2021). Logistic Regression. <<https://www.ibm.com/docs/en/spss-statistics/24.0.0?topic=option-logistic-regression>>, retrieved 20.08.2021.
- Kahneman, D., & Tversky, A. (1979). Prospect theory. *Econometrica*, 47(2), 263-292.
- Karlsson, A., & Nordén, L. (2007). Home sweet home: Home bias and international diversification among individual investors. *Journal of Banking & Finance*, 31(2), 317-333.
- Kang, J. K., & Stulz, R. M. (1997). Why is there a home bias? An analysis of foreign portfolio equity ownership in Japan. *Journal of Financial Economics*, 46(1), 3-28.
- Ke, D., Ng, L., & Wang, Q. (2010). Home bias in foreign investment decisions. *Journal of International Business Studies*, 41(6), 960-979.
- Kennickell, A., & Lusardi, A. (2004). Disentangling the importance of the precautionary saving mode. National Bureau of Economic Research. Working paper No. 10888, November 2004.
- Keynes, J. M. (1936). *The General Theory of Employment Interest and Money*. Macmillan Press Ltd, London.
- Khuntia, S., & Pattanayak, J. K. (2018). Adaptive market hypothesis and evolving predictability of bitcoin. *Economics Letters*, 167, 26-28.
- Kimball, M. S., Sahm, C. R., & Shapiro, M. D. (2008). Imputing risk tolerance from survey responses. *Journal of the American statistical Association*, 103(483), 1028-1038.
- Kumar, S., & Goyal, N. (2015). Behavioural biases in investment decision making—a systematic literature review. *Qualitative Research in Financial Markets*, 7(1), 88-108.

- Kultti, K., & Miettinen, P. (2006). Herding with costly information. *International Game Theory Review*, 8(01), 21-31.
- Lancaster, K. (1966). A New Approach to Consumer Theory. *Journal of Political Economy*, 74(2), 132-157
- Leland, H. E. (1968). Saving and Uncertainty: The Precautionary Demand for Saving. *The Quarterly Journal of Economics*, 82(3), 465-473.
- Leclair, E.M., 2018. Herding in the cryptocurrency market. Econ 5029 final research. Carleton University, Canada.
- Lee, Y. T., Liu, Y. J., Roll, R., & Subrahmanyam, A. (2003). Order Imbalances and Market Efficiency: Evidence from the Taiwan Stock Exchange. *Order*, 1.
- Lewis, Alan. (2000). A focus group study of the motivation to invest: ‘ethical/green’ and ‘ordinary’ investors compared. *The Journal of Socio-Economics*, Volume 30, Issue 4, July–August 2001, Pages 331-341
- Levy, J. S. (1992). An introduction to prospect theory. *Political psychology*, 13(2), 171-186.
- De Leeuw, E. D., Hox, J. J., & Dillman, D. A. (2008). *The International Handbook of Survey Methodology*. Erlbaum/Taylor & Francis.
- Li, W., Rhee, G., & Wang, S. S. (2017). Differences in herding: Individual vs. institutional investors. *Pacific-Basin Finance Journal*, 45, 174-185.
- Lim, S. (2006). Do Investors Integrate Losses and Segregate Gains? Mental Accounting and Investor Trading Decisions. *The Journal of Business*, 79(5), 2539-2574.
- McCook, H. (2021). A Comparison Of Bitcoin’s Environmental Impact With That Of Gold And Banking. Nasdaq. < <https://www.nasdaq.com/articles/a-comparison-of-bitcoins-environmental-impact-with-that-of-gold-and-banking-2021-05-04>>, retrieved 23.05.2020

- Madaan, G., & Singh, S. (2019). An analysis of behavioral biases in investment decision-making. *International Journal of Financial Research*, 10(4), 55-67.
- Mai, F., Shan, Z., Bai, Q., Wang, X., & Chiang, R. H. (2018). How does social media impact Bitcoin value? A test of the silent majority hypothesis. *Journal of Management Information Systems*, 35(1), 19-52.
- Markowitz, H.M. (1952). Portfolio Selection. *The Journal of Finance*. 7 (1): 77–91
- Martin, P., & Rey, H. (2004). Financial super-markets: size matters for asset trade. *Journal of international Economics*, 64(2), 335-361.
- Modigliani, F., & Brumberg, R. (1954). Utility analysis and the consumption function: An interpretation of cross-section data. In *Post-Keynesian Economics*. Ed. K. Kurihara. New Brunswick, NJ: Rutgers University Press: 388–436.
- Morse, A., & Shive, S. (2006). Patriotism in Your Portfolio. *Journal of Financial Markets*, 14, 411-440.
- Nakamoto, Satoshi. 2008. Bitcoin: A Peer-to-Peer Electronic Cash System. <[https://bitcoin.org/ en/bitcoin-paper](https://bitcoin.org/en/bitcoin-paper)>, retrieved 15 .11. 2019.
- Nofsinger, J. R. (2011). *The psychology of investing* (4th ed.). Prentice Hall, Boston.
- Nofsinger, J. R., & Sias, R. W. (1999). Herding and feedback trading by institutional and individual investors. *The Journal of Finance*, 54(6), 2263-2295.
- Nosić, A., & Weber, M. (2010). How riskily do I invest? The role of risk attitudes, risk perceptions, and overconfidence. *Decision Analysis*, 7(3), 282-301.
- Otuteye, E., & Siddiquee, M. (2017). A Critique of Modern Portfolio Theory and Asset Pricing Models Based on Behavioral Insights from Benjamin Graham's Value Investing Paradigm. *Faculty of Management*, University of New Brunswick.

- Odean, T. (1999). Do investors trade too much? *American Economic Review*, 89(5), 1279-1298.
- Pelster, M., Breitmayer, B., & Hasso, T. (2019). Are cryptocurrency traders pioneers or just risk-seekers? Evidence from brokerage accounts. *Economics Letters*, 182, 98-100.
- Peterson, D., & Pitz, G. (1988). Confidence, Uncertainty, and the Use of Information. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 14(1), 85-92.
- Peterson, S. (2012). *Investment theory and risk management*. N.J: Wiley, Hoboken.
- Prechter Jr, R. R., & Parker, W. D. (2007). The financial/economic dichotomy in social behavioral dynamics: the socioeconomic perspective. *The Journal of Behavioral Finance*, 8(2), 84-108.
- Phillip, A., Chan, J. S., & Peiris, S. (2018). A new look at cryptocurrencies. *Economics Letters*, 163, 6-9.
- Poyser, O. (2018). Herding behavior in cryptocurrency markets. Working paper, Department of Applied Economics, Autonomous University of Barcelona.
- Rani, A. (2012). The modern portfolio theory as an investment decision tool. *International Journal of Management Research and Reviews*, 2(7), 1164.
- Rea, L. M., & Parker, R. A. (2005). *Designing and conducting survey research: A comprehensive guide*. John Wiley & Sons, San Francisco.
- Ricciardi, V., & Simon, H. K. (2000). What is behavioral finance? *Business, Education & Technology Journal*, 2(2), 1-9.

- Ricciardi, V., & Rice, D. (2014). *Risk Perception and Risk Tolerance*. In H. Kent Baker and Victor Ricciardi (eds.) *Investor Behavior—The Psychology of Financial Planning and Investment*, 327–345. NJ: John Wiley & Sons, Hoboken.
- Rockenbach, B. (2004). The behavioral relevance of mental accounting for the pricing of financial options. *Journal of Economic Behavior & Organization*, 53(4), 513-527.
- Rom, B. M. & Ferguson, K. (1993) Post-Modern Portfolio Theory Comes of Age. *Journal of Investing*, 3(3), 11-17.
- Scott, B. J., Balsamo, J., McShane, K. N., & Tasopoulos, C. (2016). *The global case for strategic asset allocation and an examination of home bias*. Vanguard research. < <https://global.vanguard.com/documents/strategic-asset-allocation-tlr.pdf>>, retrieved 02.03.2021.
- Shefrin, H. M., & Thaler, R. H. (1988). The behavioral life-cycle hypothesis. *Economic Inquiry*, 26(4), 609-643.
- Shefrin, H., & Statman, M. (1993). Behavioral aspects of the design and marketing of financial products. *Financial Management*, 22(2), 123-135.
- Shefrin, H., & Statman, M. (2000). Behavioral portfolio theory. *Journal of Financial and Quantitative Analysis*, 35(2), 127-151.
- Singh, V. (2013). Did institutions herd during the internet bubble? *Review of Quantitative Finance and Accounting*, 41(3), 513-534.
- Statista (2021a). Number of cryptocurrencies worldwide from 2013 to 2021. < <https://www.statista.com/statistics/863917/number-crypto-coins-tokens/>>, retrieved 20.05.2021
- Statista (2021b). Number of Blockchain wallet users worldwide from November 2011 to May 18, 2021. < <https://www.statista.com/statistics/647374/worldwide-blockchain-wallet-users/>>, retrieved 20.05.2021

- Statista (2021c). Bitcoin price from October 2013 to May 21, 2021. < <https://www.statista.com/statistics/326707/bitcoin-price-index/#statisticContainer>>, retrieved 21.05.2021
- Sung, J., & Hanna, S. D. (1996). Factors related to risk tolerance. *Financial Counseling and Planning*, 7, 11-20.
- Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48(6), 1273-1296.
- Taherdoost, H. (2016). Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. How to test the validation of a questionnaire/survey in a research. *International Journal of Academic Research in Management*. 5(3) (2016) 28-36.
- Tesar, L. L., & Werner, I. M. (1995). Home bias and high turnover. *Journal of International Money and Finance*, 14(4), 467-492.
- Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of Finance*, 62(3), 1139-1168.
- Thaler, R. (1985). Mental accounting and consumer choice. *Marketing Science*, 4(3), 199-214.
- Thaler, R. H. (1999). Mental accounting matters. *Journal of Behavioral Decision Making*, 12(3), 183-206.
- Vilkka, H. (2007) *Tutki ja mittaa: määrällisen tutkimuksen perusteet*. Gummerus Kirjapaino Oy, Jyväskylä.
- Wolff-Mann, E. (2018). 'Only good for drug dealers': More Nobel prize winners snub bitcoin. < <https://finance.yahoo.com/news/good-drug-dealers-nobel-prize-winners-snob-bitcoin-184903784.html>>, retrieved 10.4.2020

- Xiao, J. J., & Anderson, J. G. (1997). Hierarchical financial needs reflected by household financial asset shares. *Journal of Family and Economic Issues*, 18(4), 333-355.
- Yao, R., Sharpe, D. L., & Wang, F. (2011). Decomposing the age effect on risk tolerance. *The Journal of Socio-Economics*, 40(6), 879-887.
- Yates, J. (1992). *Risk-taking behavior*. John Wiley & Sons, Chichester.
- Yermack, D. (2013). Is Bitcoin a real currency? An economic appraisal. Working Paper 19747. National Bureau of economic research.
- Zhang, C. Y., & Sussman, A. B. (2018). Perspectives on mental accounting: An exploration of budgeting and investing. *Financial Planning Review*, 1(1-2), e1011.



## APPENDIX 1 QUESTIONNAIRE

### Pro gradu kysely sijoittamisesta

Hei arvoisa vastaaja,

Tämä kysely on osa Pro gradu tutkielmaani Turun kauppakorkeakoulussa, jonka aiheena on sijoittajakäyttäytyminen. Kysely on tarkoitettu vain niille jotka sijoittavat itse omia varojaan. Kyselyyn vastaaminen vie noin 5 minuuttia. Vastaaminen on täysin vapaaehtoista, anonyymia ja luottamuksellista eikä osallistujien tietoja käytetä missään muualla kuin tässä tutkimuksessa. Vastausten analysoinnissa vastauksia voidaan tarkastella eri kysymysten mahdollistamien vastaajaryhmien avulla, mutta yksittäistä vastaajaa tai hänen mielipidettään ei kyselyn raportoinnissa voi tunnistaa. Tutkimusdata tuhoetaan sen jälkeen, kun tutkimus on saatu päätökseen. Kiitos kaikille vastanneille, osallistumisenne on erittäin tärkeää.

Lisätietoa kyselystä antaa,

Jussi-Petteri Hiillos

jphiil@utu.fi

**1. Sijoitatko itse omia varojasi? \***

- Kyllä
- En

**2. Mikä on sukupuolesi? \***

- Mies
- Nainen

**3. Mikä on ikäsi? Valitse ikäryhmä johon kuulut. \***

- alle 30
- 30-40
- 41-50
- 51-64
- 65 tai yli

**4. Mikä on koulutuksesi? Valitse korkein suorittamasi koulutusaste. \***

Peruskoulu

---

- Ammattikoulu  
 Lukio/Ylioppilas  
 Alempi korkeakoulututkinto  
 Ylempi korkeakoulututkinto  
 Tutkijakoulutus (lisensiaatti, tohtori).  
 Jokin muu

**5. Mikä on ammattiryhmä johon katsotte lähinnä kuuluvanne? Valitkaa yksi vaihtoehto. \***

- Johtavassa asemassa toisen palveluksessa  
 Ylempi toimihenkilö  
 Alempi toimihenkilö  
 Työntekijä  
 Yrittäjä tai yksityinen ammatinharjoittaja  
 Maatalousyrittäjä  
 Opiskelija  
 Eläkeläinen  
 Kotiäiti tai koti-isä  
 Työtön  
 Muu

**6. Paljonko kaikki yhteenlasketut nettotulosi ovat vuodessa? Valitse paras arvio. \***

- Alle 20 000 euroa
- 20 000-39 999 euroa
- 40 000-59 999 euroa
- 60 000-79 999 euroa
- 80 000-100 000 euroa
- Yli 100 000 euroa

**7. Kuinka suuri on sijoitusvarallisuutesi? Valitse paras arvio. \***

- 
- Alle 5000 euroa
  - 5000-19 999 euroa
  - 20 000-49 999 euroa
  - 50 000-99 999 euroa
  - 100 000-249 999 euroa
  - 250 000-500 000 euroa
  - Yli 500 000 euroa

**8. Kuinka pitkä kokemus sinulla on sijoittamisesta? Valitse paras arvio. \***

- Alle kaksi vuotta
- 2-5 vuotta
- 5-10 vuotta
- Yli 10 vuotta

**9. Missä seuraavista sinulla on ollut sijoituksia/säästöjä viimeisen vuoden aikana? Valitse kaikki ne vaihtoehdot, joissa sinulla on ollut sijoituksia/säästöjä viimeisen vuoden aikana. \***

- Talletukset
- Pörssiosakkeet
- Rahastot
- ETF-Rahastot
- Joukkovelkakirjat
- Kiinteistöt (esim asunnot ja metsä)
- Valuutat
- Hyödykkeet (esim kulta ja öljy)
- Johdannaiset
- Muut sijoitukset

**10. Mikä on keskimääräinen sijoitushorisonttisi? Valitse paras arvio.**

\*

- Alle vuosi

- 
- 1-5 vuotta
  - 5-10 vuotta
  - Yli 10 vuotta

**11. Oletko koskaan sijoittanut Bitcoinin tai muihin virtuaalivaluuttoihin? \***

- Kyllä
- En

**12. Mitä varten sijoitat/säästät? Valitse kaikki ne vaihtoehdot, joihin aiot käyttää sijoituksia/säästöjä. \***

- Opiskeluun
- Asunnon hankintaa varten
- Perinnöksi
- Vararahastoksi tai pahanpäivänvaralle
- Remonttiin
- Eläkeajoja varten
- Lomamatkaan
- Erilaisten kulutustavaroiden hankkimiseksi
- Muut käyttötarkoitukset

**13. Ota kantaa seuraaviin väittämiin, jotka koskevat sijoittamista. Valitse mielipidettäsi parhaiten vastaava vaihtoehto. (1=Täysin eri mieltä, 2=Jokseenkin eri mieltä, 3=Neutraali, 4=Jokseenkin samaa mieltä, 5=Täysin samaa mieltä). \***

	1 Täysin eri mieltä	2 Jokseenkin eri mieltä	3 Neutraali	4 Jokseenkin samaa mieltä	5 Täysin samaa mieltä
Sijoittamista on liian vaikeaa ymmärtää *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minusta tuntuu varmemmalta laittaa rahat pankkitilille kuin osakemarkkinoille. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1 Täysin eri mieltä	2 Jokseenkin eri mieltä	3 Neutraali	4 Jokseenkin samaa mieltä	5 Täysin samaa mieltä
Kun ajattelen sanaa "riski" tulee termi "tappio" mieleeni välittömästi. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rahan tekeminen osakkeilla ja joukkovelkakirjoilla perustuu onneen. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sijoittamisessa turvallisuus on tuottoja tärkeämpää. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**14. Ota kantaa seuraaviin väittämiin, jotka koskevat sijoittamista. Valitse mielipidettäsi parhaiten vastaava vaihtoehto. (1=Täysin eri mieltä, 2=Jokseenkin eri mieltä, 3=Neutraali, 4=Jokseenkin samaa mieltä, 5=Täysin samaa mieltä). \***

	1 Täysin eri mieltä	2 Jokseenkin eri mieltä	3 Neutraali	4 Jokseenkin samaa mieltä	5 Täysin samaa mieltä
Tunnen että keskimäärin pystyn ennustamaan sijoituskohteiden tulevaisuuden hinnat paremmin kuin muut. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Koen sijoitus menestykseni johtuvan tiedosta ja ymmärryksestäni markkinoita kohtaan. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Otan vastuun sijoitusteni hoidosta ja luotan omiin päätöksiini. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Luulen että muiden sijoittajien mielipiteiden jakaminen vähentäisi menestys mahdollisuksiani. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**15. Ota kantaa seuraaviin väittämiin, jotka koskevat sijoittamista. Valitse mielipidettäsi parhaiten vastaava vaihtoehto. (1=Täysin eri mieltä, 2=Jokseenkin eri mieltä, 3=Neutraali, 4=Jokseenkin samaa mieltä, 5=Täysin samaa mieltä). \***

	1 Täysin eri mieltä	2 Jokseenkin eri mieltä	3 Neutraali	4 Jokseenkin samaa mieltä	5 Täysin samaa mieltä
Kysyn harvoin mielipidettä muilta ennen kuin ostan tai myyn sijoituskohteita. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1 Täysin eri mieltä	2 Jokseenkin eri mieltä	3 Neutraali	4 Jokseenkin samaa mieltä	5 Täysin samaa mieltä
Muiden sijoittajien osto tai myynti päätöksillä on vaikutusta sijoituspäätöksiini. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reagoin yleensä nopeasti muiden sijoittajien mielipiteiden muutoksiin ja seuraan heidän reaktiotaan sijoitusmarkkinoilla. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kysyn mielipidettä muilta (perhe, ystävät tai kollegat) ennen sijoituksen ostoa/myyntiä. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seuraan sosiaalista mediaa ennen kuin myyn tai ostan sijoituksia. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**16. Ota kantaa seuraaviin väittämiin, jotka koskevat sijoittamista. Valitse mielipidettäsi parhaiten vastaava vaihtoehto. (1=Täysin eri mieltä, 2=Jokseenkin eri mieltä, 3=Neutraali, 4=Jokseenkin samaa mieltä, 5=Täysin samaa mieltä). \***

	1 Täysin eri mieltä	2 Jokseenkin eri mieltä	3 Neutraali	4 Jokseenkin samaa mieltä	5 Täysin samaa mieltä
Suosin sijoittamista hyvin tunnettuihin yrityksiin, joilla on laaja media näkyvyys. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Suosin paikallisia sijoituskohteita, kansainvälisen hajauttamisen sijaan. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Suosin sijoittamista yrityksiin, joiden historia ja johto ovat minulle tuttuja. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. Ota kantaa seuraaviin väittämiin, jotka koskevat sijoittamista. Valitse mielipidettäsi parhaiten vastaava vaihtoehto. (1=Täysin eri mieltä, 2=Jokseenkin eri mieltä, 3=Neutraali, 4=Jokseenkin samaa mieltä, 5=Täysin samaa mieltä). \*

	1 Täysin eri mieltä	2 Jokseenkin eri mieltä	3 Neutraali	4 Jokseenkin samaa mieltä	5 Täysin samaa mieltä
Sijoitukseni osakkeeseen A ei vaikuta sijoituspäätökseeni osakkeeseen B. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1 Täysin eri mieltä	2 Jokseenkin eri mieltä	3 Neutraali	4 Jokseenkin samaa mieltä	5 Täysin samaa mieltä
Päätökselläni ostaa talo tai kultaa ei ole vaikutusta sijoituksiini muilla markkinoilla. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minulla on tapana kohdella jokaista sijoituskohdetta portfoliossani erillisenä. *	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## APPENDIX 2 QUESTIONNAIRE IN ENGLISH

Hi, dear respondent, this survey is part of my master's thesis at the Turku School of Economics regarding investment behaviour. The survey is only intended for those who invest their own funds themselves. It takes about 5 minutes to answer the questionnaire. Responding is entirely voluntary, anonymous and confidential, and the data is not used anywhere else than in this study. When analyzing answers, answers can be viewed using groups of respondents enabled by different questions, but the individual respondent or their opinion cannot be identified in the reporting of the survey. The research data will be destroyed after the study has been completed. Thank you for all the respondents, your participation is very important.

For further information on the survey, please contact

Jussi-Petteri Hiillos

[jphiil@utu.fi](mailto:jphiil@utu.fi)

1. Do you invest your own funds? \*

- Yes
- No

2. What is your gender? \*

- Male
- Female

3. What is your age? Select the age group you belong to. \*

- Under 30
- 30-40
- 41-50
- 50-64
- 65 or over

4. What is your education? Select the highest level of education you have completed. \*

- Comprehensive school
- Vocational college
- Upper secondary school
- Lower university degree
- Higher university degree
- Licentiate or doctor
- Something else

5. What is the occupational group you consider closest to yours? Pick one option. \*

- Manager
- Upper-white collar worker
- Lower-white collar worker
- Employee
- Entrepreneur or self-employed
- Farmer-entrepreneur
- Student
- Retired
- Stay-at-home mum or dad
- Unemployed
- Other

6. How much is all your total net income per year? Select the best estimate. \*

- Under 20 000 euros
- 20 000 – 39 999 euros
- 40 000 – 59 999 euros
- 60 000 – 79 999 euros
- 80 000 – 100 000 euros
- Over 100 000 euros

7. How large is your investment net-worth? Select the best estimate. \*

- Under 5000 euros
- 5000 – 19 999 euros
- 20 000 – 49 999 euros
- 50 000 – 99 999 euros
- 100 000 – 249 999 euros
- 250 000 – 500 000 euros
- Over 500 000 euros

8. How long is your experience on investing? Select the best estimate. \*

- Under two years
- 2 – 5 years
- 5 – 10 years
- Over 10 years

9. Which of the following have you had investments/savings in the past year? Choose all options where you have had investments/savings in the past year. \*

- Deposits
- Listed stocks
- Investment funds
- ETFs

- Bonds
- Properties (e.g. apartments and forest)
- Currencies
- Commodities (e.g gold and oil)
- Derivatives
- Other investments

10. What is your average investment horizon? Select the best estimate. \*

- Under one year
- 1 – 5 years
- 5 – 10 years
- Over 10 years

11. Have you ever invested in Bitcoin or other cryptocurrencies? \*

- Yes
- No

12. For what do you invest/save for? Select all the options for which you plan to use investments/savings. \*

- Education
- Home purchase
- Bequest
- Reserve fund or for a bad day
- Renovation
- Retirement
- Holiday
- Durables
- Other purposes

13. Consider the following statements regarding investing. Choose the best alternative for your opinion. (. (1=Completely disagree, 2=Somewhat disagree, 3=Neutral, 4=Somewhat agree, 5= Completely agree).

- Investing is too difficult to understand
- I am more comfortable putting my money in a bank account than in the stock market.
- When I think of the word “risk” the term “loss” comes to mind immediately
- Making money in stocks and bonds is based on luck.
- In terms of investing, safety is more important than returns.

14. Consider the following statements regarding investing. Choose the best alternative for your opinion. (. (1=Completely disagree, 2=Somewhat disagree, 3=Neutral, 4=Somewhat agree, 5= Completely agree).

- I feel that I can, on average, predict future share prices better than others.
- I attribute my investment success to my knowledge and understanding of the stock market.
- I take the responsibility of managing my portfolio and I trust my decisions.
- I think that sharing others' opinions would decrease my success opportunities.

15. Consider the following statements regarding investing. Choose the best alternative for your opinion. (. (1=Completely disagree, 2=Somewhat disagree, 3=Neutral, 4=Somewhat agree, 5= Completely agree).

- I rarely consult others before making investment purchases or sales
- Other investors' decisions of buying and selling investments have impact on my investment decisions.
- I usually react quickly to the changes of other investors' decisions and follow their reactions in the market.
- I consult others (family, friends or colleagues) before purchasing/selling investments.
- I follow social media before making purchase/sale of investments.

16. Consider the following statements regarding investing. Choose the best alternative for your opinion. (. (1=Completely disagree, 2=Somewhat disagree, 3=Neutral, 4=Somewhat agree, 5= Completely agree).

- I prefer to invest in the well-known companies that have wider media coverage
- I prefer to invest locally instead of diversifying internationally.
- I prefer to invest in the companies which I know their history and management.

17. Consider the following statements regarding investing. Choose the best alternative for your opinion. (. (1=Completely disagree, 2=Somewhat disagree, 3=Neutral, 4=Somewhat agree, 5= Completely agree).

- My investment in stock A does not affect my investment decision in stock B.
- My decision to buy gold or a house does not affect my investment in other markets.
- I tend to treat each element of my investment portfolio separately.

### APPENDIX 3 ORIGINAL MEASURES

Constructs	Measures	Sources
Financial Risk Tolerance (FRT)	<p>FRT1: Investing is too difficult to understand</p> <p>FRT2: I am more comfortable putting my money in a bank account than in the stock market.</p> <p>FRT3: When I think of the word “risk” the term “loss” comes to mind immediately</p> <p>FRT4: Making money in stocks and bonds is based on luck. F</p> <p>FRT5: In terms of investing, safety is more important than returns.</p>	<p>Grable, J. E., &amp; Joo, S. H. (2004). Environmental and biophysical factors associated with financial risk tolerance. <i>Journal of Financial Counseling and Planning</i>, 15(1).</p>
Overconfidence (OC)	<p>OC1: I feel that I can, on average, predict future share prices better than others.</p> <p>OC2: I attribute my investment success to my knowledge and understanding of the stock market.</p> <p>OC3: I take the responsibility of managing my portfolio and I trust my decisions.</p> <p>OC4: I think that sharing others’ opinions would decrease my success opportunities.</p>	<p>Alrabadi, D. W. H., Al-Abdallah, S. Y., &amp; Aljarayesh, N. I. A. (2018). Behavioral biases and investment performance: Does gender matter? Evidence from Amman Stock Exchange. <i>Jordan Journal of Economic Sciences</i>, 5(1), 77-92.</p>
Herding (H)	<p>H1: I rarely consult others before making stock purchases or sales</p> <p>H2: Other investors' decisions of buying and selling stocks have impact on my investment decisions.</p> <p>H3: I usually react quickly to the changes of other investors' decisions and follow their reactions to the stock market.</p>	<p>Baker, H. K., Kumar, S., Goyal, N., &amp; Gaur, V. (2019). How financial literacy and demographic variables relate to behavioral biases. <i>Managerial Finance</i>.</p>

	<p>H4: I consult others (family, friends or colleagues) before making stock purchased.</p> <p>H5: I follow social blogs/ forums before making stock purchase/sale.</p>	
Familiarity (FA)	<p>F1: I prefer to invest in the well-known companies that have wider media coverage</p> <p>F2: I prefer to invest locally and not to diversify my portfolio internationally.</p> <p>F3: I prefer to invest in the companies which I know their history and management.</p>	<p>Alrabadi, D. W. H., Al-Abdallah, S. Y., &amp; Aljarayesh, N. I. A. (2018). Behavioral biases and investment performance: Does gender matter? Evidence from Amman Stock Exchange. <i>Jordan Journal of Economic Sciences</i>, 5(1), 77-92.</p>
Mental accounting (MA)	<p>MA1: My investment in stock A does not affect my investment decision in stock B.</p> <p>MA2: My decision to buy gold or a house does not affect my investment in stock market.</p> <p>MA3: I tend to treat each element of my investment portfolio separately.</p>	<p>Baker, H. K., Kumar, S., Goyal, N., &amp; Gaur, V. (2019). How financial literacy and demographic variables relate to behavioral biases. <i>Managerial Finance</i>.</p>

## APPENDIX 4 CORRELATION MATRIX

### Correlations

		FRT	OC	HE	MA
FRT	Pearson Correlation	1	.189**	-.231**	.018
	Sig. (2-tailed)		.000	.000	.588
	N	872	872	872	872
OC	Pearson Correlation	.189**	1	.048	-.010
	Sig. (2-tailed)	.000		.159	.774
	N	872	872	872	872
HE	Pearson Correlation	-.231**	.048	1	-.075*
	Sig. (2-tailed)	.000	.159		.028
	N	872	872	872	872
MA	Pearson Correlation	.018	-.010	-.075*	1
	Sig. (2-tailed)	.588	.774	.028	
	N	872	872	872	872

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

**APPENDIX 5 LOGISTIC REGRESSION RESULTS FOR FRT  
AND GENDER**

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	FRT	.588	.119	24.541	1	.000	1.800
	Constant	-1.838	.284	41.848	1	.000	.159

a. Variable(s) entered on step 1: FRT.