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The effect of interest rates on traditional and cryptocurrency investments

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Abstract

This paper examines the effect of changes in the interest rate on the behaviour of traditional and cryptocurrency investors. To test whether an increase in the interest rate leads to a decrease in cryptocurrency investments and if this effect is greater for cryptocurrency investors than for traditional investors. In an experiment, participants were divided in a cryptocurrency and traditional asset group and were given four portfolio allocation decisions. Each portfolio allocation decision used a different interest rate and asked to allocate funds between savings against the interest rate and a risky assets, either Bitcoins or AEX stocks. The results display that a change in interest rate does not lead to a change in traditional and cryptocurrency investments. Therefore, there is no difference between traditional and cryptocurrency investors in their reaction on the change of interest rates.

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1 Introduction

At the 9th of June the European Central Bank announced that they aim to increase the interest rates with 25 basis points in July (European Central Bank, 2022b). With a high inflation in the euro zone the ECB already hinted at a stop in their purchasing program in early 2022 (European Central Bank, 2022a). When this happens, this means that the interest rate of the euro increases for the first time in more than ten years (*De Nederlandsche Bank*, 2022b). During these same times of low and negative interest rates cryptocurrency came to life. The first cryptocurrency Bitcoin has risen rapidly in both value and number of transactions in the last decade, and due to Bitcoins success, there are now in 2022 more than 10,000 different cryptocurrencies (*Nasdaq Data Link*, 2022a; *Statista*, 2022). The sudden rise of cryptocurrencies after the fall of interest rates in comparison to the much smaller growth in stocks gives the impression that there is a connection between the two (*De Nederlandsche Bank*, 2022a). Where investors are seeking the highest annual return in cryptocurrency, rather than in the traditional assets or risk-free savings. This raises the question whether interest rates affect cryptocurrency investments. If one compares the changes in Bitcoin transactions and the Dollar interest rate there is a significant positive effect of the interest rate on Bitcoin transactions (FRED, 1954; *Nasdaq Data Link*, 2022b).

Previous research already displays an effect of interest rates on traditional investments such as stocks and the negative correlation between interest rates and cryptocurrencies (Corbet et al., 2020; İçellioğlu & Öner, 2019; Li & Wang, 2017; Lian et al., 2019). The question asked in this paper is if the effect of interest rates on traditional assets can again be displayed, whether this is also the case for cryptocurrencies and if there is a difference in the effect of interest rates between traditional assets and cryptocurrencies?

By examining the effect of interest rates on cryptocurrency and traditional investments, this study aids in displaying what the extended effects are of monetary policy on investment decisions. Aiding both investors as well as regulators in predicting the effects of monetary policy on financial markets. With the knowledge that interest rates will rise in the near future, this study can make a contribution by making a prediction whether Bitcoin keeps its popularity or if the cryptocurrency bubble will burst. Adding to the clarification for the success of cryptocurrencies in the last decade. This study also shows whether there is a difference between Bitcoin and traditional investments

in their reaction to interest rates. This answers the question whether an increase in interest rates leads to a higher reduction of cryptocurrency investments than in the traditional stock investments.

The paper collected responses from 100 participants, who were distributed over a cryptocurrency group and a traditional asset group. The participants of both groups were then asked to make four investment allocation decisions, each with a different interest rate. The four investment decisions were displayed in random order for each participant. During the investment decisions the participants had to distribute a spare 1000 euro over savings against the interest rate or a risky investment. The risky investment for the cryptocurrency group was Bitcoin and for the traditional assets group the AEX stock market. The interest rates used was 4%, 2%, 0.25% and 0% to mimic the euro interest rate in the last decade since the rise of cryptocurrencies. Afterwards the participants were asked what their predictions were during the investment decisions for the annual return for the risky asset of their group, what their self-assessed risk attitude is, if they trust the financial system and if they invest in traditional assets or cryptocurrency in real life.

Although there is a difference in the means for the Bitcoin group when the interest rate changes, a rise in the interest rate has no significant effect on the Bitcoin investments. The traditional assets group while more conservative in their investment behaviour also shows no significant reaction to the interest rate. An interaction between the groups shows that there is no significant difference between the two groups regarding the effect of interest rates on their investing behaviour. The results show that self-assessment risk attitude, trust in the system and the participants age have a significant effect on the investment behaviour of the participants.

The remainder of the paper is structured as follows: The second section of the paper will include literature regarding interest rates and investing and will contain the hypothesis of the paper. Section three gives the methodology of the experiment. Section four consists out of the results and analysis of the experiment. Section five will conclude and includes a discussion.

2 Literature review

2.1 Traditional investments

Past research between interest rates and traditional assets proves that a decrease in interest rates leads to more risk taking (Lian et al., 2019; Ma & Zijlstra, 2018). In these studies, where participants had to make a decision between investing in stocks with different interest rates it appears that groups with lower interest rates allocate more of their portfolio to the riskier assets. Although this effect is smaller in the Netherlands than in the United States due to differences in risk attitude between the countries (Ma & Zijlstra, 2018). Risk averse investors may hedge the changes in the short term interest rate by investing in assets who are stable over a longer period of time, such as risk-free bonds (Campbell & Viceira, 2001). With a decrease in risk aversion, the percentage of risk-free bonds in a portfolio decreases and are replaced with a riskier asset such as stocks. Investors overestimate the growth of stocks, resulting in them over-predicting the return on stocks (Frazzini & Lamont, 2008).

One reason that explains this might be that the investors use reference points (Lian et al., 2019). Investors are used to a certain return and see a decreasing interest rate as a loss of return. Unwilling to accept that loss they increase their risky investments. Although this increases the overall risk of their portfolio, it does compensate for the decreasing interest rate. This is comparable with the reference points from prospect theory (Kahneman & Tversky, 1979). This is further supported if you allow participants to participate for multiple rounds with for each round a different interest rate. Now the participants play two rounds and are random divided into two groups with a low and a high interest rate and risky return (Lian et al., 2019). In the first round we see the same result as before where the participants in the lower interest rate group invest more in the risky asset. But then if another round is held in which the participants of the low and high interest rate groups are changed, the effect of the previous round is on the participant decision making. The participants who first saw the high interest rate and then the low interest rate invested more in the risky asset then their counterparts. A consequence of the presence of a reference point is that this may result in non-linearities. The same can be seen with financial institutions. Due to monetary policy having a direct influence on the financial system, research

has been done into the response of banks to changes in interest rates (Delis & Kouretas, 2011; Gambacorta, 2012; Maddaloni & Peydró, 2011). The banks react to the decreasing interest rate by taking more risk to acquire the desired yield. For instance, banks are slacking the standards for mortgages in case of low interest rates.

2.2 Cryptocurrency

The first cryptocurrency Bitcoin was initially proposed as an alternative currency (Nakamoto, 2008). Although while Bitcoin was meant as an alternative medium of exchange, it is argued that Bitcoins functions as a speculative investment because it is too volatile to be a medium of exchange (Baur & Dimpfl, 2021; Blau et al., 2021). Bitcoin is in fact more volatile than the traditional assets, such as the S&P 500 or Treasury bonds (Doumenis et al., 2021). This is confirmed by data of Bitcoin transactions, which shows that cryptocurrencies are almost entirely used by investors as an investment method (Baur et al., 2018; Baur & Dimpfl, 2021; Glaser et al., 2014; İçellioğlu & Öner, 2019). Although Bitcoin does not correlate with the movements of other assets such as stocks. While Blau et al (2021) finds that cryptocurrency is a save alternative investment in times of expected future high inflation such as gold is, Conlon et al (2021) only find that there is a positive correlation between Bitcoin and Ethereum on the one hand and inflation on the other during the early covid pandemic (Conlon et al., 2021). This gives the suggesting for Colon et al (2021) that there is most likely a third variable that had an effect on both Bitcoin prices and inflation during that time of economic uncertainty. According to the Taylor rule the interest rate should be increased to counter the effects of an increase in inflation (Taylor, 1993). Resulting in monetary policy having an influence on the expected inflation.

Literature shows a connection between risk attitude and cryptocurrency investments (Hackethal et al., 2019; Pelster et al., 2019). Cryptocurrency holders show to be less risk averse than other investors, watch their portfolio's more frequently and also do more often transactions (Hackethal et al., 2019). Cryptocurrency investors show to be risk-seeking on purpose (Pelster et al., 2019). Not only in cryptocurrency market are the cryptocurrency investors risk seeking, they show to be also more risk seeking in the stock market. Especially when the volatility in

cryptocurrency is low cryptocurrency traders increase their risk taking in the stock market (Pelster et al., 2019). Cryptocurrencies seem to be attracted to those with gambling problems, who also correlate with high risk taking in the stock market (Mills & Nower, 2019).

The United States Dollar interest rates in the long run and short run changes show to have a significant effect on Bitcoins (Corbet et al., 2020; İçellioğlu & Öner, 2019; Li & Wang, 2017). The long-run interest rate has a reverse effect on Bitcoin transactions, were a decrease in interest rates leads to an increase in Bitcoin transactions. Bitcoin have gradually become more attractive during the time when interest rates were decreasing. In order to compensate for the lower return on interest rates in line with their risk attitude. This might form an issue for cryptocurrency investors when the current low interest rates rise again. The fundamental and intrinsic value of Bitcoin is zero, meaning that the current value is solely a bubble (Cheah & Fry, 2015; Cheung et al., 2015). In the scenario that the interest rate increases and the transactions in Bitcoin decreases there will be pressure on the bubble. Previous partial bursting of the Bitcoin bubble were caused by changes happening in the Bitcoin market (Cheung et al., 2015). Furthermore, The presence of herding among cryptocurrency investors strengthens the effect of shocks in the cryptocurrency market (Bouri et al., 2019).

2.3 Interest rate and risk attitude

The mean-variance benchmark says that the investors should diversify in order to reduce their variance risk (Markowitz, 1952; Sharpe, 1964). The theory states that investors should remain rational and maximize their returns while acting risk averse. This also means that in the event that diversification between risky assets is not possible the investors should accept only more risk if he/she receives a higher return for it (Sharpe, 1964). However, not all return has risk tied to it. Sharpe (1964) calls the riskless rate of return the pure interest rate, which is paid in time. This pure interest rate is the same for all investors. The expected return of an investor is the combination of expected returns on the riskless return and investments in risky assets. While the expected return of the investor is 100%, the amount invested in the risk-free and risky asset does not need to be between zero and one hundred percentage. The investor may for instance borrow money in order to invest more than 100% into the risky asset. Mathematically, the allocation

between the risk-free and risky asset can be displayed by the capital allocation line (Sharpe, 1964, 1965):

$$E(R_c)=R_f+b*\sigma_c \quad (1)$$

Hereby $E(R_c)$ is the expected combined return of the returns of the risky and risk-free rate returns. The expected combined return is equal to the risk-free rate R_f, plus the risk premium or the Sharpe ratio b, times the combined standard deviation σ_c of the risky and risk-free asset. The risk-free rate is the return on risk-free assets, such as bonds, influenced by the interest rate. The risk premium consists out of the expected risky portfolio return $E(R_p)$ minus the risk-free rate and then divided by the risky portfolio standard deviation σ_p. This gives the risk premium equation of:

$$b=\frac{E(R_{p)}-R_f}{\sigma_p} \quad (2)$$

The combined standard deviation is the square root of the portfolio variance formula, between the risky and risk-free assets. Because the volatility of the risk-free asset is zero, only the weight times the volatility of the risky-asset remains. This gives the combined standard deviation of:

$$\sigma_c=w*\sigma_p \quad (3)$$

Inserting equation 2 and 3 into equation 1 gives:

$$E(R_c)=R_f+(\frac{E(R_{p)}-R_f}{\sigma_p})*w*\sigma_p \quad (4)$$

$$E(R_c)=R_f+w(E(R_p)-R_f) \quad (5)$$

Where w is the weight in the risky asset and the remainder 1-w is the weight of the risk-free asset. As displayed by the formula presented by Sharp (1964) of:

$$E(R_c)=(1-w)*R_f+w*E(R_p) \quad (6)$$

A change in the risk premium influences the allocation into the risky asset. If the interest rate increases and the return and volatility on the risky asset remains the same, the risk premium decreases. If the investor wants to keep the expected combined return the same, the investor must re-allocate more weight from the risky into the risk-free asset. For instance, when the expected portfolio return is 10.27%, the combined portfolio return is 8% and the risk-free rate is 4% and fill these into equation 5. The weight in the risky asset is 63.80%. When the interest rate than rises to 6%, the weight in the risky asset becomes 46.84%. This is a decrease of 16.96%. To display the difference between cryptocurrencies and traditional assets, the CAPM can be used (Merton, 1973; Perold, 2004):

$$E(R_p)=R_f+\beta(E(R_m)-R_f) \tag{7}$$

In the CAPM the risk is expressed by the beta β. The beta consist out of the volatility of the asset divided by the market volatility times the correlation ρ between the two volatilities. Displayed by:

$$\beta = \rho * \frac{\sigma_p}{\sigma_m} \tag{8}$$

In the CAPM the risk is expressed by the beta β. The beta consist out of the volatility of the asset divided by the market volatility times the correlation ρ between the two volatilities. The risk premium for the risky asset is the risky asset market return minus the risk-free rate times the beta. When the risk-free rate increases the risk premium decreases, this effect is greater when the beta is higher. Cryptocurrencies such as Bitcoin are more volatile than the traditional assets, resulting in a higher beta in the CAPM (Blau et al., 2021; Doumenis et al., 2021). This will give more dept to the effect of the change of interest rates, as the asset with the most volatility will be impacted the most. Although, the rho will likely also be low due to poor correlation between assets and Cryptocurrencies and this needs to be taken into account (Baur et al., 2018). Inserting the CAPM from equation 7 into the capital allocation line from equation 5 gives:

$$E(R_c)=R_f+w(R_f+\beta(E(R_m)-R_f)-R_f) \quad (9)$$

$$E(R_c)=R_f+w*\beta(E(R_m)-R_f) \quad (10)$$

Again, we take an expected market portfolio return of 10.27%, combined portfolio returns of 8% and a risk-free rate of 4% and fill these into equation 10. For the traditional assets we take a beta of 1 and for the cryptocurrency assets a riskier beta of 1.2. This gives the weights into the risky asset of 80% for the traditional assets and 67% for the cryptocurrencies. If we increase the interest rate again to 6% the weights into the risky asset for the traditional group becomes 67% and for the cryptocurrencies 33%. This is a decrease for the traditional assets of 13.33% and for the cryptocurrencies 34%.

Dohmen et al (2011) finds that the best prediction for their actual risk taking is by directly asking the participants to self-report their risk attitude (Dohmen et al., 2011). As participant behaviour in lab experiments corresponds to a previous survey question, where they were asked for a number on a ten-point risk attitude scale. Participants risk attitude and behaviour during the experiment changes based on if the experiment is incentivized. Research shows that participants perform better with simple tasks in questionnaires when they are incentivized (Camerer & Hogarth, 1999). Incentivized surveys also make sure participants don't decrease their quality based on the time of day (Arechar et al., 2017). A increase in the pay-out used in experiments leads to less risk neutral behaviour from the participants (Holt & Laury, 2002). To low incentives may have a counterproductive effect and may result in behaviour still different from real life (Gneezy et al., 2011).

2.4 Trust and Savings

In the paper of Nakamoto (2008) it is stated that Bitcoin removes the necessity for trust in a third party, what the paper calls a weakness (Nakamoto, 2008). With cryptocurrency, the trust in the system changes towards a trust in technology (Malherbe et al., 2019). This development occurred shortly after the 2008 financial crisis. The crisis had reduce trust in the system, which contributed to the change (Malherbe et al., 2019; Marella et al., 2020). How people look towards

the monetary system can even be influenced by changes in interest rates themselves (Albinowski et al., 2014).

While according to theory the increase in the interest rate should lead to an increase in individual savings, in reality it is more reforms that are linked to changes in monetary policy that influence savings (Giovannini, 1985). Directly changes in the interest rate have little to no effect on changes in savings. In most countries people do not even change their consumption in line with changes to interest rate. However, in the countries where there is a change in consumption, not only do they change their current consumption, but they will also adjust their expected future consumption to make use of the increased interest rate. In developing countries the interest rates do not have an effect on savings (Gupta, 1987).

2.5 Hypothesis

Previous research showed the effect of the interest rate on traditional investments, the first hypothesis is made to test this effect in this paper (Lian et al., 2019; Ma & Zijlstra, 2018). The capital allocation line in equation 4 displays that if expected return remains the same, an increase in interest rates must be compensated by a decrease in the risky investments (Sharpe, 1964, 1965). Previous research showed that traditional investments a decrease in interest rates is compensated by investors by investing more in risky investments with a higher return (Lian et al., 2019). This may be due to the new return of the investor's portfolio being below a reference point. Consequently, there will be a negative correlation between interest rates and amount invested in traditional assets. This gives the first hypothesis:

Hypothesis 1. Investors will decrease the amount invested into the traditional risky asset with an increase of the interest rate.

To see if a change in interest rates influences cryptocurrency investments, hypothesis 2 is made. Again, the capital allocation line can be used where Bitcoin replaces stocks as the risky asset. According to the capital allocation line in equation 4, if the parameters for expected return remain the same, with an increase in the interest rate the weight in the risky asset must decrease. Previous research already showed that there is a negative correlation between the interest rate

and Bitcoin investments (Corbet et al., 2020; İçellioğlu & Öner, 2019; Li & Wang, 2017). Alternatively, while not always the case, Bitcoin is used as a save investment method during times of expected high inflation (Blau et al., 2021; Conlon et al., 2021). When monetary policy counters the high inflation with an increase in interest rates this will reduce the expected future inflation and consequently reduce Bitcoin investments. This gives the second hypothesis:

Hypothesis 2. investors will decrease the amount invested into the Bitcoin risky asset with an increase of the interest rate.

Hypothesis 3 looks if there is an interaction between interest rates and the two groups. Cryptocurrencies are more volatile than traditional assets and will react more towards changes in the interest rate, as can be seen in the merger of the CAL and CAPM in equation 9 and 10 (Baur & Dimpfl, 2021; Blau et al., 2021). The nature of the risk attitude of the cryptocurrency investors in comparison to the stock investors also plays a roll. Cryptocurrency investors prove to be more risk seeking than the traditional investors and show herding behaviour (Bouri et al., 2019; Hackethal et al., 2019; Pelster et al., 2019). Increasing the effect of shocks on the cryptocurrency market. It is than expected that the change in interest rate will have a larger effect on cryptocurrencies than on traditional assets. Unlike traditional assets, cryptocurrencies have no fundamental or intrinsic values. (Cheah & Fry, 2015; Cheung et al., 2015). This makes the value of cryptocurrencies bubbles, dependent on speculations. The purely speculative nature of cryptocurrencies makes them more sensitive to market shocks than traditional assets. This gives the third hypothesis:

Hypothesis 3. The effect of an increase in the interest rate will be larger for the cryptocurrency investors than for the traditional asset investors.

3 Methodology

The participants were collected from the website Prolific on 14 April 2022 (*Prolific*, n.d.). There the participants participated against a fixed payment of 7.56-pound sterling per hour. It was predicted in advance that it would take the average participants five minutes to complete the survey. Based on that estimate, each participant received 0.63 GBP for filling in the survey. The

settings in Prolific were set up so that only people from the eurozone countries participated, because the currency used in the survey was the euro. The survey was made using Qualtrics software and is visible in appendix B and C (*Qualtrics XM*, n.d.).

The software randomly divided the participants into two groups of equal size. The first group having an investment opportunity in cryptocurrency while the second group has an investment opportunity in traditional assets. Bitcoin was chosen to serve as the cryptocurrency in the experiment. Bitcoin is used because it is a well-known cryptocurrency (Cheah & Fry, 2015). The second group has the opportunity to invest in the AEX stock market, what functions as a traditional asset. The AEX has been selected as it is a stock market in the eurozone. The Bitcoin and Stock investments functions as the risky investments while the interest rate functions as the risk-free investment. The survey closed after a total of 100 observations were collected. What means 50 for the Bitcoin decisions and 50 for the stock's decisions.

The participants of both groups have been put in the metaphorical situation in which they have a spare 1000 euro in their savings. They then had to decide how much of the amount they keep in their savings against the interest rate and how much they invest in their risky asset. In the questionnaire they could allocate an amount between 0 and 1000 euro with a slider to invest in the risky asset. The amount could only be in whole rounded euros, so it was not possible to invest, for instance 600 euro and 50 cents. The amount in savings had to be a positive number, which means that it was not possible to borrow money against the interest rate. Because the groups are randomly generated a participant may not had the preferred investment opportunity of their choice. In addition, someone who is in the cryptocurrency group could only invest in Bitcoin and had no opportunity to invest in the stock assets. The interest rates used in the survey were 4%, 2%, 0.25% and 0% for both the Bitcoin and stock investors. This means that each participant has seen four questions with these four interest rates, either with Bitcoins as risky investment or AEX stocks. The subjects saw only one question at a time, with the order of the interest rates for each participant being random. This means that the order in which the interest rates were presented was not fixed for each participant. These specific interest rates have been chosen to reflect the effect of interest rates over the past 13 years on crypto investments. Since 2008 the main refinancing operations rate has not exceeded 4%. The 4% interest rate corresponds with the

interest rate at the final day of 2008, the 2% interest rate for the final day of 2010, the 0.25% interest rate with the final day of 2015 and the 0% interest rate with the final day of 2020. In July 2022, the 0% interest rate will also again rise back to 0.25% (European Central Bank, 2022b)

After the four slider questions the participants were asked a few more questions for further analysis. The participants were asked what the annual return they had in mind for the risky asset when they filled in the slider questions. The participants were free to fill in any number, there is no maximum limit due to the real annual returns vary quite a bit. The cryptocurrency group could only fill this in for Bitcoins and the traditional assets group could only fill in the questions for the AEX stocks. Furthermore, by means of a 5-point Likert scale all the participants were asked if they trust their savings on their bank, in order to test the participant trust in the system. With one being the lowest amount of trust and five being the highest amount of trust the participants could answer with. The participants risk attitude was also asked through self-assessment with a 3-point Likert scale. With one being little risk taking and three a lot of risk taking. Finally, four control questions asked to all the participants if they do invest in the stock market in real life, hold cryptocurrency in real life, what their age is and their gender.

4 Data and analysis

4.1 Descriptive statistics

Observations of 114 participants were collected. This is more than 100 because the software allowed participants to finish the survey after closing for new participants. Twelve of the participants were removed because they decided not to invest for all four of the slider questions by either filling in zero or an insignificant amount smaller than ten euro[1]. From these non-investors, seven came from the Bitcoin group and five from the stock group. The observations were participants invested with lower interest rates but refrained from investing on higher interest rates are kept. Furthermore, two observations were removed due to the data being incomplete. This leads to a remaining 100 participants of which 48 belonged to the Bitcoin group and 52 belonged to the stock group. Each participant filled in the four allocation decisions,

[1] A regression including the non-investors and a regression removing maximum investors are included in appendix A.

resulting in 400 observations. For one of the remaining 100 participants, the given age of 220 has been removed and been replaced by the mean of the other 99 participants.

Table 1 displays the descriptive statistics of the Bitcoin and stock groups. The mean of all 400 investments is 327.70 euro. The mean of the Bitcoin investments was higher for all four Bitcoin investments than for the four stock investments, as is displayed in Figure 1. The Kolmogorov-Smirnov test shows that both groups are not normally distributed and that the traditional asset group is significantly lower distributed than the Bitcoin group. For the four-percentage interest rate the mean for the Bitcoin group was 301.94 euros and for the stock group 292.27 euros. For the two-percentage interest rate the mean for the Bitcoin group was 340.81 euros and for the stock group 295.25 euros. For the one quarter percentage interest rate the mean for the Bitcoin group was 394.92 euros and for the stock group 326.63 euros. For the zero-percentage interest rate the means decreased slightly instead of increasing. With the zero-percentage interest rate the mean of the Bitcoin group was 368.58 euros and 308.52 for the stock group. Notably, the interest rate with the highest mean in risky investments is not the lowest interest rate but the one quarter. From the four-percentage interest rate towards the one quarter percentage there is an increase in investments in the risky assets. Most risky investments were made below 550 euros or above 951 euros. For the investments above 951 euros most where 1000 euros the maximum amount one could invest in. The average age of the participants of the remaining 100 observations was slightly below 27, with the lowest age being 19 and highest 52. With a number of 70 males were in the majority of the participants while 28 of the participants were female and 2 non-binary.

Table 1: Descriptive Statistics

		Bitcoin investments (1)	Stock investments (2)
0% Interest rate		368.58 (300.89)	308.52 (292.99)
0.25% interest rate		394.92 (307.29)	326.63 (287.42)
2% interest rate		340.81 (268.08)	295.25 (236.77)
4% interest rate		301.94 (249.41)	292.27 (218.59)
Invests in stocks		15	16
Holds cryptocurrency		21	25
Risk attitude		2.42 (0.70)	2.58 (0.53)
Trust		3.90 (1.25)	4.04 (1.24)
Expected Annual Return		61.65 (158.35)	23.88 (46.95)
Age		27.02 (7.40)	26.60 (7.34)
Gender	Male	30	40
	Female	16	12
	Third	2	0
N		48	52

Note: the descriptive statistics of the data. In the table the mean and standard deviation of the four risky investments are displayed for the two groups. Below the interest rates are the number of participants investing in stocks and cryptocurrencies in real life. Followed by the mean and standard deviation of the risk attitude, trust in the system and expected annual return. The expected annual return is in percentages for Bitcoins and stocks. The data from age and gender are divided into the two groups. Age is given in numerical values while for gender the number of participants of each gender is displayed.

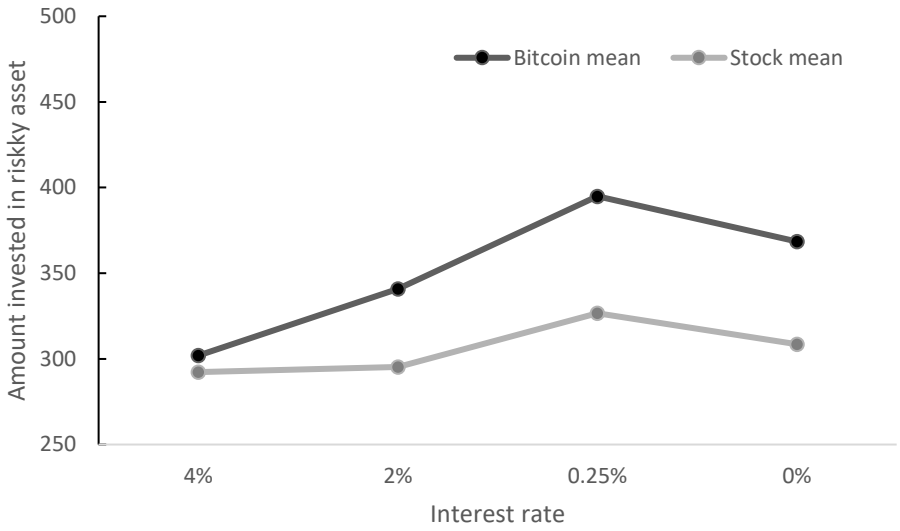

FIGURE 1: MEANS OF THE RISKY INVESTMENTS FOR BOTH BITCOIN AND STOCK

Notes: the figure displays the means of risky investments for all four interest rates for both the group investing in Bitcoins and the group investing in stocks. With the darker line representing the Bitcoin group and the lighter the stock group.

4.2 Regression Model

The dependent variable for both the cryptocurrency group and traditional investments group is the amount invested into the risky asset. The three main independent variables are the interest rate the participant saw, which of the two groups the participant was in, and an interaction between the first two. The interest rate is a categorical variable for the four different interest rates. With value zero for the 0% interest rate, value one for the 0.25% interest rate, value two for the 2% interest rate and value three for the 4% interest rate. To check if the participant was in the cryptocurrency group or in the traditional assets group, a dummy called Bitcoin group was made. Here the asset group is the baseline with value zero and the Bitcoin group has a value of one. In the regressions, the error term is clustered on the participants. Seven variables are made for the control variables. Starting with two dummies to test if the participants invest in stocks or hold cryptocurrency in real life. With zero being no and one being yes for both dummies. The expected annual return is given in numerical values. Risk assessment is displayed in three categorical values with one leaning towards risk averse and three leaning towards risk seeking. Trust in banks is displayed by a five-point categorical variable called Trust, with one having the

lowest trust and five the highest. Age is given in numeric values. For gender a categorical variable is made with male value 0, female value 1 and non-binary value 2. This gives the regression formula of:

$$RI_i=\beta_1+\beta_2 IR_i+\beta_3 DB_i+\beta_4 INT+\beta_5 X_i+\varepsilon_i \quad (11)$$

$$\beta_1 = \text{The constant} \quad (12)$$

$$RI_i = \text{The Amount in risky investments} \quad (13)$$

$$IR_i = \text{The variable for the interest rate condition} \quad (14)$$

$$DB_i = \text{The dummy for the Bitcoin group} \quad (15)$$

$$INT = IR_i * DB_i = \text{Interaction interest rate and dummy Bitcoin group} \quad (16)$$

$$X_i = \text{The control variables} \quad (17)$$

$$\varepsilon_i = \text{The clustered error term} \quad (18)$$

4.3 Robustness checks

A Cook's distance test is used to test for influential cases that may need to be removed. The test shows that none of the 400 risky investment observations need to be removed. A residual test shows that the residuals are normally distributed. When conducting a f test on the main regression the p-value can be accepted with a 99% significance level, meaning that the model contributes in explaining the factors of allocation in risky investments. To test if the population samples differ for the two groups a Wilcoxon rank-sum test is used. The test gives a value of 9% what is above the 5% significance level. This means we can't reject the zero hypothesis that the sample populations don't differ from each other.

The order in which the participants saw the different interest rates was randomized, what is not the scenario in real life. To check if this randomization had an influence on the results by acting as a reference point, as was displayed by Lian et al (2019), a new dummy was made (Lian et al., 2019). This dummy was coded for each risky investment zero, one, two or three corresponding to the order of interest rates that was presented to the participants. This dummy had no significant effect on the allocation into the risky asset and so consequently the randomization of questions has no negative effect on the study.

The participants are censored in investing by a minimum and maximum amount of zero and 1000 euro. To test if the censoring has an effect a Tobit regression is conducted and added to Table 2. Due to the chi-square p value of 0.00 the model fits significantly better. In the Tobit regression the coefficient of the dummy for the Bitcoin group increases in value, yet still remains unsignificant. This means that the minimum of 0 and maximum of 1000 euro did not limit the investors, especially the Bitcoin investors, from investing in their preferred investment amount.

A dummy is made to test the probability of investing for the participants, with 1 if invested and 0 otherwise. To see the predicted probability of investing, a probit regression is conducted with the dummy for probability of investing as the dependent variable of the main regression. In the probit regression the variable for the interest rate is significant for the 99% level and the coefficient is 0.35. When an OLS regression is conducted with the dummy probability of investing as the dependent variable the variable for the interest rate is significant for the 95% level and here the coefficient is 0.04. meaning that the predictions for investing based on the interest rate are higher than the actual investments. The dummy for the Bitcoin group is significant for the 90% level for both the OLS and probit regression. The coefficients are 0.09 for the OLS and 0.67 for the probit regression. Again, the predictions for investing based on the Bitcoin group are higher than the actual investments. Based on the predictions the differences between the traditional and Bitcoin groups should be even higher.

TABLE 2: REGRESSIONS

	Stock only (1)	Bitcoin only (2)	Excluding control variables (3)	Main regression (4)	Tobit regression (5)
Interest rate	-0.67 (0.508)	-1.63 (0.11)	-0.67 (0.51)	-0.66 (0.51)	-0.22 (0.82)
Bitcoin group			1.16 (0.25)	1.23 (0.22)	1.45 (0.15)
Interaction interest rate and Bitcoin group			-0.89 (0.38)	-0.88 (0.38)	-1.02 (0.31)
Invest in stock				1.00 (0.32)	0.95 (0.34)
Hold crypto				-0.24 (0.81)	-0.13 (0.90)
Risk attitude				2.83*** (0.01)	2.76*** (0)
Trust				-2.81*** (0)	-2.55** (0.01)
Expected annual return				1.19 (0.24)	1.26 (0.21)
Age				2.23** (0.03)	2.35** (0.02)
Gender				-0.86 (0.39)	-1.02 (0.311)
Constant	7.41*** (0)	8.58*** (0)	7.44*** (0)	0.42 (0.68)	-0.04 (0.97)
R2	0.001	0.01	0.01	0.2	0.02
N	208	192	400	400	400
Participants	52	48	100	100	100

Note: Regression with the results of the five studies with only stock investors, with only Bitcoin investors, a regression with both groups excluding control variables, the main regression and a Tobit regression of the main regression for the robustness check. For the Tobit regression 20 observations are censored on the minimum value of zero and 22 on the maximum value of 1000 euro. The number of observations is the total number of investment decisions made. In the first two studies the only variable used is the variable for the interest rate. The standard errors are clustered on the participants and are displayed below the number of observations.
*** p<0.01, **p<0.05, * p<0.1

4.4 The regression

To answer hypothesis 1 and 2 two regressions were conducted excluding the control variables and with the participants of the traditional asset and Bitcoin groups separate. The regression with only the stock investors for hypothesis 1 is visible in Table 2 beneath study 1. Here the variable for the interest rate has a negative coefficient of -8.01, meaning that less is invested on higher interest rates. The t value of -0.67 and a p value of 0.51. The p value is above the significance level and therefore not significant. Hereby the paper fails to accept hypothesis 1, that predicted that an increase in interest rates would lead to a decrease in traditional investments. This is contrary to the predictions based on the capital allocation line in equation 4 and previous literature that did find a negative correlation (Lian et al., 2019; Ma & Zijlstra, 2018). The regression with only the Bitcoin participants for hypothesis 2 is visible in Table 2 under study 2. The coefficient of the Bitcoin group for the interest variable is -25.40, which means that with higher interest rates less is invested in Bitcoins. The t value is -1.63 and the p value is 0.11. The value is higher than the alfa of 0.05 meaning that the dummy for the interest rate is not significant for Bitcoin investments. Hereby the paper fails to accept hypothesis 2, as an increase in interest rates does not lead to a decrease in Bitcoin investments. This is again contrary to the predictions based on the capital allocation line in equation 4 and previous literature that did find a negative correlation (İçellioğlu & Öner, 2019; Li & Wang, 2017). Something to note is that the small R-squared value must be taken into account here. For both the Bitcoin and stock only regressions, the R-squared values are so low that the explanatory power of the models is virtually zero.

The main regression combines the two groups and adds the control variables. In addition to the control variables the main regression includes the interest rates, the dummy for bitcoin group and the interaction between the two. The results are visible in Table 2 beneath study 4. The coefficient of the variable for the interest rate is -8.01. This means that as predicted with the higher interest rates there is less investment in the risky assets. The t-value of the interest rate is -0.66 and the p value is 0.51. The p value is higher than the alfa of 0.05, what consequently means that the variable for the interest rate is not significant. The coefficient for the dummy of the Bitcoin group is 70.67 Which means that the traditional asset group that invested in stocks invested less in the risky asset than the Bitcoin group. Here the t-value is 1.23 and the p value is

0.22. Consequently, the variable for the Bitcoin group is not significant. This means that although the Bitcoin group has invested more, the group itself is not the reason for the difference. To test hypothesis 3 if the effect of interest rates is smaller for stocks than for Bitcoin, an interaction term is created between the two variables. From the coefficients, it can be seen that with the increase of interest rates the Bitcoin group shows a larger decrease in risky investments than the stock group, what is also visible by looking at the means in Figure 1. The t value is -0.88 and the p value is 0.38. Due to the p value being above the significance level the variable is insignificant. Hereby the paper fails to accept hypothesis 3, meaning that there is no significant difference between the two groups in their reaction of changes in the interest rate. Again, the low value of the R-squared needs to be taken into consideration. Only 20% of the model can be explained by the explanatory variables.

4.5 Secondary analysis

The participants were asked whether they have ever invested in stocks and/or cryptocurrency in real life. Out of 100 participants, 31 have ever invested in the stock market and 46 have held cryptocurrency. The results are shown in Table 2 beneath study 4. Interesting to note is the difference in coefficients. The coefficient for the participants who invested in stocks in real life is 60.36 and -12.62 for those who hold cryptocurrency. This means that people who invest in assets in real life also invested more in risky assets in the experiment, while in real life cryptocurrency holders invested less in the experiment. While one would expect the opposite due to cryptocurrency holders being more risk-seeking than traditional investors (Hackethal et al., 2019; Pelster et al., 2019). The t-value of the stock investors is 1 with a p-value of 0.318. This is higher than the alfa of 0.05. The t and p values of the people who hold cryptocurrency are -0.24 and 0.809 respectively. Meaning that both variables are not significant. If two interaction terms are made between the dummies if one invests in stocks or hold crypto on the one side and the dummy for the Bitcoin group on the other, the reason for the difference between the two types of investors becomes clearer. Participants who only hold stock in real life invests more in both groups in the experiment, while the participants who only hold crypto in real life only invest more in the Bitcoin group and less in the stock group. This may be due to the fact that the participants

were not allowed to choose a group and were randomized into a group. As a result, cryptocurrency investors ended up with an asset they might not be comfortable investing in. Due to the number of dummies testing for multicollinearity is necessary. The presence of multicollinearity is tested with a bivariate matrix and variance inflation factor. The results of both show that there is no multicollinearity present.

The regression with the participant risk attitude can be seen in Table 2 under study 4. The mean of the dummy of the 100 participants is on 2.5 and with a maximum of three this means that the participants lean towards risk seeking[2]. The coefficient for the risk attitude is 101.08, which means that people who state that they are more willing to take risks also invest more into the risky assets. The t-value is 2.83 and with a p-value smaller than one hundred. Therefore, the effect of the risk attitude is significant for the 99% level. This is according to previous literature, which state that self-assessment predicts actual risk taking (Dohmen et al., 2011). Due to the increase in dummies with the risk attitude a test for multicollinearity is necessary. The bivariate matrix and variance inflation factor show that there is no multicollinearity present.

The results on whether the participants trusted their banks with their savings are displayed in Table 2 under study 4. The mean of the dummy for all 100 participants was 3.97. With the dummy boundaries between 1 and 5 the participants were leaning towards a high trust. The coefficient is -52.28 what means that the less trust people have in their bank with their savings the more they invest in the risky asset. The t-value is -2.81 and the p value is smaller than the 99% significance level, meaning that people's trust in banks has a significant effect on investments. While the traditional investors decreased their stock investments with low trust, the cryptocurrency investors with low trust increased their Bitcoin investments. This was expected for the Bitcoin group as Bitcoin investors with a low trust in the system try to replace it with trust in technology (Malherbe et al., 2019; Marella et al., 2020; Nakamoto, 2008). For these investors investing in Bitcoins goes beyond only monetary gains and therefore will not follow the prediction from the capital allocation line in equation 4.

[2] Some of the values of the dummy for risk assessment have been recoded to its nearest value due to its exceeding the maximum

The average real annual return between 2009 and 2021 was 805.27% for Bitcoin and 10.27% for the AEX stock (*De Nederlandsche Bank*, 2022a; *Nasdaq Data Link*, 2022a). In the survey, people underestimated the annual return for the Bitcoin and overestimated the annual return for the stock market, as can be seen in Table 1. The overestimation of the stock market was expected based on the literature (Frazzini & Lamont, 2008). Underestimating the Bitcoin was done by almost the entire sample population. Only one participant gave an expected annual return for Bitcoin above the actual annual return 805.27%. In the survey the mean expected annual return for Bitcoin was 61.65% and for stock 23.87%. The results on the questions what people expected the annual return to be when they filled in the slider questions is displayed in Table 2. The coefficient for the expected annual return is rather low at 0.32, which means that people only slightly increased their investments if they thought that the return was higher. The t-value is 1.19 with a p value of 0.34. The p value is higher than the 95% significance level, meaning that the expected annual return had no significant effect on the risky investments people made.

When an interaction term is made between the expected Annual Return and the dummy for the bitcoin group, the results show a clear difference between the groups. While for the stock group the coefficients are negative and significant for the 95% level, for the Bitcoin group the coefficients are positive and significant according to the 9% significance level. In other words, the participants invested in the risky assets according to the height of their expectations of the annual return. With for the Bitcoin group a higher expected annual return leading to higher investments in Bitcoins.

The coefficient for age is 7.29 what means that people with a higher age invested more in the risky assets. The t value is 2.22 and the p value is 0.03, which means that age is significant for the 95% level. The coefficient for gender is -32.84 and with a p value of 0.39, gender is not significant for the 95% level. In case of an interaction term between gender and the dummy for the Bitcoin group, one results stand out. Males invest more into the risky asset in both the Bitcoin group and stock group than females and non-binary.

5 Conclusion and Discussion

The paper looked at whether interest rates have an effect on the investing behaviour of cryptocurrency and traditional investors. In addition, whether cryptocurrency investors are more sensitive to interest rate changes than traditional investors. Based on the results, the paper fails to indicate an effect of the interest rate on the behaviour of cryptocurrency and traditional investors. An increase in the interest rate does not lead to lower investments in cryptocurrency and traditional assets. The results differ from previous research that does find an negative effect of interest rates on the risky assets (Corbet et al., 2020; İçellioğlu & Öner, 2019; Li & Wang, 2017; Lian et al., 2019; Ma & Zijlstra, 2018). Contrary to expectations, the paper can't than prove that the effect of the interest rate is greater for the Bitcoin group than for the stock group. Based on the results of this paper, when the interest rates rise in the near future, it will not lead to the bursting of the cryptocurrency bubble. The traditional assets will also be unaffected by a change in the interest rate. This gives the assurance of stability to both investors and regulators. The traditional and cryptocurrency investors, don't have to fear in the decrease in value of their assets by the change of interest rates. As for regulators, who stand on the point of increasing the interest rate, have to determine the effect of their policies on the financial market.

The self-assessed risk attitude and trust towards the financial system of the participants have a significant effect on investments into the risky asset. In accordance to previous literature, investors that have a low trust in the system invest more into Bitcoins, to replace the trust with a trust in technology (Malherbe et al., 2019; Marella et al., 2020). The participants that said that they are in real life investors of cryptocurrency and/or traditional assets did not invest significantly different than the other participants. Consequently, having non-real-life investors make the investment decisions had no effect on the insignificant results of the paper. The expected annual return of the participants had no significant effect on their investments in the risky assets.

Failure to repeat past research and to achieve the predicted results may be due to the limitations of the paper. The participants don't get the return on their portfolio from the survey as the scenario in the experiment is metaphorical. With the result that the participants are not incentivized to actually maximize their return in the survey. This is a disadvantage of this study,

as the participants may not put as much effort in the questions with the consequence that the results differ from real-life scenarios. Literature displays that participants show better results on the same task when incentivized (Arechar et al., 2017; Camerer & Hogarth, 1999; Holt & Laury, 2002). While the participants in this study do not receive payment based on performance, they did receive a standardized pay-out of 7.56-pound sterling per hour, what results in 0.63 pounds for completing the survey. To low incentives may also not lead the participants towards their real life behaviour that the experiment tries to capture. (Gneezy et al., 2011). It was predicted that cryptocurrency investors reduce their Bitcoin investments when interest rates rise to account for the reduction of expected future inflation (Blau et al., 2021; Conlon et al., 2021). In the experiment, participants were not directly confronted with changes in expected future inflation and as a result, may not have adjusted Bitcoin investments accordingly. The result that in real life cryptocurrency investors don't invest significantly more in the risky assets may come from the groups being randomly formed, resulting in real life cryptocurrency investors ending in the stock group where they are not comfortable. The minimum and maximum investing boundaries may have been chosen wrong. As previous research did worked with a different boundary than this paper, namely a maximum amount of 10,000 dollar (Lian et al., 2019). In this study, there was a considerable number of investors who had invested the maximum amount of 1000 euro.

Increasing this maximum boundary does not mean that the metaphorical spare 1000 euro the participants receive in the survey needs to be increased. With low interest rates investors may also be interested in borrowing money in order to invest more than the 1000 euro they start with. Based on the number of investors who invested the maximum amount this could be used in further research. Since the participants are assigned a group rather than choosing themselves, there investing behaviour might be abnormal due to being more conferrable with another asset. For future research an experiment with differential effects could be conducted where participants can choose between the risky assets. Future studies can take more different interest rates into account. This study used only fairly low interest rates and did not take negative interest rates into account, while there are negative interest rates at the moment in the eurozone. This study also does not take into account the difference between the interest rates of different currency markets. As in real life, investors have the opportunity to move savings abroad. In real life people's

trust in the financial system can change based on the interest rate, as people's trust changes based on monetary policy (Giovannini, 1985). The trust variable could be measured in an experiment per interest rate, instead of one number for all four interest rates. The self-assessment risk attitude variable should be extended towards a 10 point Falk risk attitudes question (Dohmen et al., 2011). In the experiment, the participants can't see each other's decisions and neither are their multiple rounds. In real life cryptocurrency investors react on each other what can result in the bursting of a cryptocurrency bubble (Cheah & Fry, 2015; Cheung et al., 2015). For further research the interaction of investors on each other and interest rates could be researched to see if an increase in interest rates will lead to a cryptocurrency burst.

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7 Appendix A: Non investors and maximum investors

TABLE 3: ROBUSTNESS CHECKS REGRESSIONS

	Main regression including non-investors (1)	Main regression excluding maximum investors (2)
Interest rate	-0.00 (1)	-0.66 (0.51)
Bitcoin group	0.30 (0.77)	1.12 (0.26)
Interaction interest rate and Bitcoin group	0.00 (1)	-0.91 (0.37)
Invest in stock	1.00 (0.32)	0.98 (0.33)
Hold crypto	-1.17 (0.25)	-0.37 (0.71)
Risk taking	2.77*** (0.01)	2.97*** (0)
trust	-1.69* (0.09)	-2.97*** (0)
Expected annual return	-1.28 (0.21)	-4.79*** (0)
Age	1.47 (0.15)	2.09** (0.04)
Gender	-0.44 (0.66)	0.14 (0.89)
Constant	0.05 (0.96)	0.66 (0.51)
R2	0.15	0.18
N	448	392
Participants	112	98

Note: The results of regressions including the removed participants and excluding maximum investors including the control variables.
*** p<0.01, **p<0.05, * p<0.1

Table 3 under study 1 shows the regression including the 11 participants removed for not investing. The effect of the variables for interest rate, Bitcoin group and the interaction between the two are considerable worse than in the main regression. The R-squared is lower than in the main regression. Age is no longer significant. Next a regression is conducted removing the two investors who invested the maximum amount of 1000 euro on all four investment questions, it is visible in Table 3 under study 2. There are little differences compared to the main regression. The expected annual return becomes significant for the 99% significance level and the R-squared value loses 2%.

8 Appendix B: The survey

The effect of interest rates on traditional and cryptocurrency investments

Start of Block: Introduction

Q1 Thank you for your interest in this study

The questionnaire is conducted as part of the master thesis of T. van Outvorst at Radboud University Nijmegen. The topic is the effect the heights of interest rates on investing.

You will be asked how much of 1000 euro you have spare in your savings you are willing to invest. There are no right or wrong answers. I am interested in your preferences.

The experiment will take approximately 5 minutes

The data obtained in the questionnaire will be used for research purposes only. The data collected is completely anonymous and cannot be traced back to individual participants.

Participation in this study is completely voluntary. You are free to stop participation during any point in the experiment without having to give reason.

If you have any comments or questions regarding the study, you can contact the researcher T. van Outvorst at tijn.vanoutvorst@ru.nl

- ○ I agree with the above and wish to proceed to the experiment (1)
- ○ I do not agree with the above and don't want to proceed to the experiment (2)

End of Block: Introduction

Start of Block: Bitcoin investments

Q4 You have an amount of 1000 euro spare in your savings and you consider investing it in Bitcoins or keeping it in your savings against an interest rate of 4%

How much of the thousand euro will you invest in Bitcoins?

0 100 200 300 400 500 600 700 800 900 1000

Amount invested in Bitcoins ()	

Q18 You have an amount of 1000 euro spare in your savings and you consider investing it in Bitcoins or keeping it in your savings against an interest rate of 2%

How much of the thousand euro will you invest in Bitcoins?

0 100 200 300 400 500 600 700 800 900 1000

Amount invested in Bitcoins ()	

Q19 You have an amount of 1000 euro spare in your savings and you consider investing it in Bitcoins or keeping it in your savings against an interest rate of 0.25%

How much of the thousand euro will you invest in Bitcoins?

0 100 200 300 400 500 600 700 800 900 1000

Amount invested in Bitcoins ()	

Q20 You have an amount of 1000 euro spare in your savings and you consider investing it in Bitcoins or keeping it in your savings against an interest rate of 0%

How much of the thousand euro will you invest in Bitcoins?

0 100 200 300 400 500 600 700 800 900 1000

Amount invested in Bitcoins ()

End of Block: Bitcoin investments

Start of Block: Traditional investments

Q9 You have an amount of 1000 euro spare in your savings and you consider investing it in AEX(Amsterdam stock market) or keeping it in your savings against an interest rate of 4%.

How much of the thousand euro will you invest in Stocks?

0 100 200 300 400 500 600 700 800 900 1000

Amount invested in Stocks ()

Q21 You have an amount of 1000 euro spare in your savings and you consider investing it in AEX(Amsterdam stock market) or keeping it in your savings against an interest rate of 2%.

How much of the thousand euro will you invest in Stocks?

0 100 200 300 400 500 600 700 800 900 1000

Amount invested in Stocks ()

Q22 You have an amount of 1000 euro spare in your savings and you consider investing it in AEX(Amsterdam stock market) or keeping it in your savings against an interest rate of 0.25%.

How much of the thousand euro will you invest in Stocks?

0 100 200 300 400 500 600 700 800 900 1000

Amount invested in Stocks ()

Q23 You have an amount of 1000 euro spare in your savings and you consider investing it in AEX(Amsterdam stock market) or keeping it in your savings against an interest rate of 0%.

How much of the thousand euro will you invest in Stocks?

0 100 200 300 400 500 600 700 800 900 1000

Amount invested in Stocks ()

End of Block: Traditional investments

Start of Block: Bitcoin expectations

Q26 What do you expect that the annual return is for Bitcoin?
Please give a number in percentages

End of Block: Bitcoin expectations

Start of Block: Stock expectations

Q27 What do you expect that the annual return is for the AEX stock market?
Please give a number in percentages

End of Block: Stock expectations

Start of Block: Other analysis

Q15 Do you trust your bank with your savings and future interest rates?

- Definitely not (1)
- Probably not (2)
- Might or might not (3)
- Probably yes (4)
- Definitely yes (5)

Q24 How willing are you in taking risks?

- A little (6)
- A moderate amount (7)
- A lot (8)

End of Block: Other analysis

Start of Block: control questions

Q13 Do you invest in the stock market?

- No (1)
- Yes (2)

Q14 Do you have or have you held cryptocurrency?

- ○ No (1)
- ○ Yes (2)

Q16 what is your age?

_____

Q17 What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

End of Block: control questions

Start of Block: Prolific URL

Q28 The Prolific URL:

Q29 https://app.prolific.co/submissions/complete?cc=53AC08AF

End of Block: Prolific URL

9 Appendix C: The flow of the survey

Block: Introduction (1 Question)

Branch: New Branch
If
If Thank you for your interest in this study The questionnaire is conducted as part of the master th... I do not agree with the above and don't want to proceed to the experiment Is Selected

EndSurvey:

Branch: New Branch
If
If Thank you for your interest in this study The questionnaire is conducted as part of the master th... I agree with the above and wish to proceed to the experiment Is Selected

BlockRandomizer: 1 - Evenly Present Elements

Standard: Bitcoin investments (4 Questions)
Standard: Traditional investments (4 Questions)

Branch: New Branch
If
If You have an amount of 1000 euro spare in your savings and you cosider investing it in Bitcoins or... Amount invested in Bitcoins Is Not Empty

Standard: Bitcoin expectations (1 Question)

Branch: New Branch
If
If You have an amount of 1000 euro spare in your savings and you cosider investing it in AEX(Amsterd... Amount invested in Stocks Is Not Empty

Standard: Stock expectations (1 Question)

Standard: Other analysis (2 Questions)
Standard: control questions (4 Questions)
Standard: Prolific URL (2 Questions)

EndSurvey:

Page Break