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# Risk perception of cryptocurrency investments

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**Abstract**

This master's thesis investigates differences in risk perception between investing in cryptocurrencies and stocks, as well as some possible explanations for a difference. An online experimental survey was conducted using Amazon Mechanical Turks as participants. The results showed that participants perceive cryptocurrency as riskier than stocks, expect the same returns from cryptocurrencies and stocks, and have higher investment propensity with stocks. Confidence in market returns, owning cryptocurrency, and age do not seem to have an impact on the difference in risk perception between cryptocurrency and stocks.

# 1 Introduction

In March 2022 the Dutch Authority of Financial Markets (AFM) decided to start giving lessons on vocational colleges (MBO's) throughout the country about investing in cryptocurrencies. They noticed that young students were encouraged by social media influencers to invest in cryptocurrencies, without proper knowledge of the risks involved. This led to students underestimating risks, making ill-informed decisions, and essentially gambling away their money on the cryptocurrency market (NOS, 2022). One could ask the question why students in the Netherlands are drawn towards investing in cryptocurrencies, and not stocks for example. Do they understand cryptocurrencies better than other investment options? Do they expect more profit from cryptocurrencies than from stocks? Which other factors drive their investment behavior? This master's thesis investigates the difference in risk perception between investing in cryptocurrencies and investing in stocks, as well as some possible explanations for a possible difference.

This master's thesis aims to research differences in risk perception based on whether an investment is framed as a cryptocurrency or as a stock. The goal of this research is to extend the literature on framing and financial decision making, financial risk perception, and cryptocurrency. The research question that follows is: Is there a difference in perceived risk between investing in cryptocurrency and investing in stocks? Furthermore, this research attempts to find possible explanations for a possible difference in risk perception. The following secondary questions were asked in order to try to explain a difference in risk perception between cryptocurrency and stocks:

- Is there a difference in expected return based on whether an investment is framed as cryptocurrency or stock?
- Is there a difference in investment propensity based on whether an investment is framed as cryptocurrency or stock?
- Is there a link between confidence in market returns for either cryptocurrencies or stocks and perceived risk of the corresponding investment?
- Do participants who own or have owned cryptocurrency perceive it as less risky?
- Are younger people more optimistic about cryptocurrency?

The first three questions (starting from the research question) test traditional finance insights. It is often assumed that investors require more (less) return for increased (decreased) risk. Both factors influence investment propensity, higher risk lowering investment propensity, and higher return increasing investment propensity (e.g., Fama, 1968; Ghysels, 2005).

The fourth question also stems from the literature, but indirectly. It has been shown that higher confidence leads to more risk taking (Siegrist et al., 2005; Doran et al., 2010). This increased risk taking could be caused by decreased risk perception, which will be tested in this master's thesis.

The fifth question has an intuitive origin. It could be the case that people who own cryptocurrency perceive it as less risky, explaining why they would invest in it. If people who own cryptocurrency do not perceive it as less risky compared to people who don't own cryptocurrency, the investment behavior has to be caused by other variables.

The final question stems from the AFM's decision to give lessons about cryptocurrency on MBO's (NOS, 2022). The decision to inform young people about cryptocurrency indicates that young people have more problems with investing in cryptocurrency, which might be caused by a difference in risk perception or expected return. Hasso et al. (2019) also found that young people are more drawn to cryptocurrency.

Although originally designed as a decentralized online payment system, cryptocurrency has become a popular asset for investors speculating on price changes (Lu, 2018). While there are plenty of studies about cryptocurrencies and its risks, including its high volatility (e.g., Chuen et al., 2019; Liu & Tsyvinski, 2020; Yi et al., 2018), the perceived risk of it is usually overlooked. Building on the relatively new body of literature regarding financial risk perception, this master's thesis aims to extend the literature on financial risk perception to cryptocurrencies. It should be noted that this research looks at cryptocurrency as an investment, not as a currency intended for transactions.

Traditional finance literature focusses on the historical volatility of returns to describe the risk of an asset (e.g., Markowitz, 1952; Cuthbertson & Nitzsche, 2004). For example, portfolio theory uses historical volatility of returns as the primary risk indicator and describes assets without any volatility of returns as 'risk-free' (Bodie et al., 2018). Another example is Value at Risk, a popular risk assessment tool that is widely used in the industry. This number indicates the amount of value

that one is at risk of losing over a certain period of time and with a certain probability. Again, this number is calculated using historical volatility of returns (McDonald, 2013).

Other academics paid attention to risk aversion and concluded that individuals dislike risk and tend to avoid it (Sharpe, 1964; Tversky & Kahneman, 1985). However, this describes people's attitude towards risks, and not how risk is actually perceived by individuals.

In the field of finance, risk perception seems to predict investment behavior more accurately than volatility (Zeisberger, 2020). Which is why recently risk perception has come into the spotlight, where the perception of risk and the drivers behind it are studied. Studies have found that loss probability is the main predictor for perceived risk, and that volatility, skewness, and kurtosis of returns also play a role in the perception of risk (sources: Holzmeister et al., 2019; Zeisberger, 2020). Since the focus of this research lies on differences in perceived risk between investing in cryptocurrencies and stocks, it was important to ensure that differences in perceived risk that arise due to the factors mentioned above were accounted for. This ensured that only the effect of framing an asset as either a cryptocurrency or a stock on risk perception was investigated.

Tversky and Kahneman (1985; Kahneman & Tversky, 2013) showed that decisions regarding monetary outcomes are often not rational but are largely influenced by how a choice is presented. This phenomenon is called framing. For example, when faced with losing money, participants often picked different options compared to when they were faced with winning money. Weber and Zuchel (2005) showed that people react differently when they have to make an investment decision compared to making a gambling decision, even if the options are essentially the same. They showed that risk taking increases more after a loss than after a gain in investment decisions, and risk taking increased more after a gain than after a loss in gambling decisions. Liberman et al. (2004) displayed a similar effect in an experiment where a prisoner's dilemma was framed either as a community game or as a Wall Street game. Participants were much more likely to cooperate if the game was framed as a community game. This showed that the framing of a choice has impact on the decisions that people make. Other forms of presentation, such as color, can also have effects on financial risk perception and behavior. People exposed to the color red tend to estimate higher probability of losing money, and people exposed to the color green tend to

estimate the probability of gaining money to be higher (Bazley et al., 2021; Kliger & Gilad, 2012). These examples show that the framing of options regarding monetary decisions has an impact on the choices people make, even if the very same options are given. It is possible that framing a risk assessment question and an investment decision as a cryptocurrency results in a different outcome than framing it as a stock.

This research attempts to extend the existing literature on financial risk perception, framing and financial decision making, and cryptocurrency. As mentioned before, risk perception is a relatively new field of research within finance and has gotten little attention compared to risk preferences (Zeisberger, 2020). Besides extending the financial literature regarding risk perception and framing, this work also aims to provide insights into the area of cryptocurrencies and the subjective beliefs about it. Another aim of this research, apart from its academic contribution, is to provide practical insights into risk perception of cryptocurrency investments. These insights could be used by the AFM or other institutions to better understand consumer behavior in order to create appropriate regulations and provide helpful information to the public.

# 2 Methodology

## 2.1 Operationalization

As mentioned before, the research question of this master's thesis is: Is there a difference in perceived risk between investing in cryptocurrency and investing in stocks? To answer this question, an experimental survey was carried out. The entire survey can be found in appendix 1.

An experimental survey was chosen so that questions could be asked that were specifically made to answer the research questions of this master's thesis. By creating a new dataset aimed specifically at this research instead of relying on external data, construct validity is increased. Another advantage of an online survey is that the synthetic setting provides a high internal validity. Furthermore, gathering new data on the topic of financial risk perception helps this academic field develop and gain new insights.

During this survey, participants were shown probabilities of profit (60%) and loss (40%) for two identical investments with a time horizon of one year. The investments were labelled as a cryptocurrency and a stock, these were the two treatments. Participants received both the cryptocurrency and stock treatments, in randomized order to prevent any possible effects that might have arisen due to a specific ordering. Administering both treatments to participants made it possible to conduct within-subject tests. After being presented with a treatment, the participants were asked three main questions. The first question was: How risky do you perceive the investment to be? This question was answered on a seven-point Likert scale where 1 stands for extremely risky, and 7 stands for extremely safe. This question was used to answer the research question. The second question was: How much profit would you expect from this investment over one year? The answer options were five categories of percentage returns (see appendix 1). This question inquires to the return that people expect from the cryptocurrency or stock investment. The third question was: Imagine you are endowed $1,000, how much of this money would you invest in the investment described above? This question directly asked about the investment propensity of the participant.

Before answering these main questions, participants are asked several control questions. These control questions were fairly simple such that most participants should be able to correctly

answer them. These questions functioned as an understanding check to ensure that people would understand the probabilities that were given in the treatments. The control questions also filtered out people who randomly selected answers without reading the questions. The control questions were multiple-choice questions. When answering randomly, there was a 6.25% chance to pass the control questions due to luck. If the participant got one or more of the control questions wrong, the main questions for both treatments were skipped, and the participant continued with the next section of the survey.

The next section of the survey contained general questions. These general questions were used for secondary analysis and include questions about, for example, owning cryptocurrencies/stocks and general market expectations. Participants were also asked about some demographic statistics that might influence risk perception. These questions pertained to age, gender, and location (Savage, 1993). These general and demographic questions did not incorporate treatments and were in the same order for every participant.

## 2.2 Data collection and analysis

For data collection, participants were recruited from Amazon Mechanical Turk (MTurk). This is a website that allows people to answer online surveys, among other things, for a small payment (Amazon Mechanical Turk, n.d.). Goodman et al. (2013) found that behavior of MTurk participants in experiments is very similar to other populations that are often used in experiments. The survey itself was created in Qualtrics.

The MTurk sample contained 125 participants, 90 of which were male and 35 were female. The mean age of the sample was 39 years, and 119 out of the 125 participants were located in North America. 97 out of 125 participants passed the control questions and subsequently answered the treatment questions, the others only answered the general questions.

## 2.3 Hypotheses

To answer the research question and the secondary questions, the following hypothesis were formulated and tested:

- Hypothesis 1: Perceived risk is higher for the cryptocurrency treatment than for the stock treatment.
- Hypothesis 2: Participants expect higher return with the cryptocurrency treatment than with the stock treatment.
- Hypothesis 3: Investment propensity is higher for the stock treatment than for the cryptocurrency treatment.
- Hypothesis 4: Participants who have higher confidence in their expectations of market returns perceive less risk for the corresponding investment.
- Hypothesis 5: Participants who own or have owned cryptocurrency perceive cryptocurrency as less risky than stocks.
- Hypothesis 6: Younger people perceive lower risk, expect higher return, and have higher investment propensity with the cryptocurrency treatment compared to the stock treatment.

The first hypothesis directly answers the research question. The other hypotheses aim to give insight into possible explanations for the results of the first hypothesis. Different statistical tests were used to test the hypotheses, for each test an alpha of 0.05 was used to indicate a significant result.

# 3 Results

## 3.1 Hypothesis 1: Perceived risk is higher for the cryptocurrency treatment than for the stock treatment.

To test this hypothesis, a paired-samples t-test was carried out. When testing the assumptions, it was found that the distributions of both groups were not normal. The Shapiro-Wilk normality test and visual inspection of plots showed that the variables of both cryptocurrency risk perception and stock risk perception were not normally distributed. The Skewness and kurtosis tests for normality showed that both variables have a skewed distribution. Since the skewness of both variables is similar, this is not an issue.

The t-test (table 1) resulted in a significant result, but not by much (p=0.015). Risk perception was measured on a seven-point Likert-scale where 1 indicated low risk perception and 7 indicated high risk perception. The average score for the cryptocurrency investment was 5.577, and for the stock investment was 5.433. The difference between the means was only 0.144.

**Paired t test : crypto_risk stock_risk**

| | obs | Mean1 | Mean2 | dif | St Err | t value | p value |
|---|---|---|---|---|---|---|---|
| crypto risk – stock risk | 97 | 5.577 | 5.433 | .144 | .059 | 2.45 | .015 |

TABLE 1: T-TEST OF RISK PERCEPTION FOR CRYPTOCURRENCY AND STOCK TREATMENT

To combat nonnormality, both variables were transformed. This transformation was done by squaring the values of the observations. Based on the Shapiro-Wilk normality test, we cannot reject the hypothesis that both transformed variables are normally distributed. A paired-sample t-test (table 2) showed that the means of perceived cryptocurrency risk and perceived stock risk were significantly different (p=0.007). The mean risk perception score for the cryptocurrency investment was 32.567, and 30.794 for the stock investment. These scores should be interpreted carefully since the variables were transformed.

**Paired t test : crypto_risk2 stock_risk2**

| | obs | Mean1 | Mean2 | dif | St Err | t value | p value |
|---|---|---|---|---|---|---|---|
| crypto risk2 – stock risk2 | 97 | 32.567 | 30.794 | 1.773 | .652 | 2.7 | .007 |

TABLE 2: T-TEST OF RISK PERCEPTION FOR CRYPTOCURRENCY AND STOCK TREATMENT, TRANSFORMED

The hypothesis that perceived risk is higher for cryptocurrency than for stock cannot be rejected based both of these tests.

### 3.2 Hypothesis 2: Participants expect higher return with the cryptocurrency treatment than with the stock treatment.

This hypothesis stems from the traditional finance insight that risk should be compensated by reward. Since cryptocurrency is riskier in the traditional sense (Chuen et al., 2019), people should expect higher returns. Because ordinal data was gathered for this question, a t-test was not suitable. Instead, the non-parametric Wilcoxon signed-rank test was used (table 3). No significant difference was found between expected returns for the cryptocurrency and expected returns for the stock (p=0.252).

Wilcoxon signed-rank test

| Sign | Obs | Sum ranks | Expected |
|---|---|---|---|
| Positive | 24 | 1839 | 1558 |
| Negative | 17 | 1277 | 1558 |
| Zero | 55 | 1540 | 1540 |
| All | 96 | 4656 | 4656 |

Unadjusted variance 74884.00
Adjustment for ties -411.25
Adjustment for zeros -14245.00

Adjusted variance 60227.75

H0: crypto_profit = stock_profit
z = 1.145
Prob > z = 0.2522
Exact prob = 0.2523

TABLE 3: WILCOXON SIGNED-RANK TEST FOR EXPECTED RETURN OF CRYPTOCURRENCY AND STOCK TREATMENTS

Based on the outcome of the test, the hypothesis that participants expect higher return on cryptocurrencies than on stocks is rejected.

### 3.3 Hypothesis 3: Investment propensity is higher for the stock treatment than for the cryptocurrency treatment.

Based on the higher perceived risk of the cryptocurrency investment compared to the stock investment, combined with the knowledge that there was no significant difference between expected return, the hypothesis was that investment propensity is higher for the stock than for the cryptocurrency. To test this hypothesis, a paired-samples t-test was used (table 4). Inspection of the plots and a skewness and kurtosis test revealed that the data is positively skewed. Carrying out a t-test without transformations resulted in a significant difference where people invest more in the stock with a difference in means of $39.83 (p=0.003). The mean investment for the cryptocurrency was roughly $193, and the mean investment for the stock was roughly $233.

**Paired t test : crypto_invest stock_invest**

| | obs | Mean1 | Mean2 | dif | St Err | t value | p value |
|---|---|---|---|---|---|---|---|
| crypto invest – stock invest | 97 | 192.846 | 232.670 | -39.825 | 13.01 | -3.05 | .003 |

TABLE 4: T-TEST OF INVESTMENT PROPENSITY FOR CRYPTOCURRENCY AND STOCK TREATMENTS

Next, a Box-Cox transformation was used to get rid of the skewness of the distributions. A paired-samples t-test with the transformed variables (table 5) resulted in a very significant difference (p=0.000). The means of investment propensity for the cryptocurrency and the stock were 19.912 and 25.397 respectively. However, these values are difficult to interpret due to the transformation since they no longer signify amount of dollars that participants would invest.

**Paired t test : bc_crypto_invest bc_stock_invest**

| | obs | Mean1 | Mean2 | dif | St Err | t value | p value |
|---|---|---|---|---|---|---|---|
| bc_crypto_invest – bc_stock_invest | 70 | 19.912 | 25.396 | -5.485 | .705 | -7.8 | 0 |

TABLE 5: T-TEST OF INVESTMENT PROPENSITY FOR CRYPTOCURRENCY AND STOCK TREATMENTS, TRANSFORMED

Alternatively, a Wilcoxon signed ranks test (table 6) can be used due to the violation of the normality assumption. This also resulted in a significant difference in investment propensity between the cryptocurrency and the stock (p=0.018).

Wilcoxon signed-rank test

| Sign | Obs | Sum ranks | Expected |
|---|---|---|---|
| Positive | 25 | 1453 | 2096 |
| Negative | 39 | 2739 | 2096 |
| Zero | 33 | 561 | 561 |
| All | 97 | 4753 | 4753 |

Unadjusted variance 77236.25
Adjustment for ties -5.50
Adjustment for zeros -3132.25

Adjusted variance 74098.50

H0: crypto_invest = stock_invest
z = -2.362
Prob > z = 0.0182
Exact prob = 0.0177

TABLE 6: WILCOXON SIGNED-RANK TEST OF INVESTMENT PROPENSITY FOR CRYPTOCURRENCY AND STOCK TREATMENTS

According to these results, the hypothesis that investment propensity is higher for the stock than for the cryptocurrency cannot be rejected.

### 3.4 Hypothesis 4: Participants who have higher confidence in their expectations of market returns perceive less risk for the corresponding investment.

In this section it is tested whether people who have higher confidence in their expectations for market returns also perceive less risk in the specific corresponding investments and subsequently have a higher investment propensity.

The linear regression between perceived risk of the cryptocurrency investment and confidence in cryptocurrency market return expectation (table 7) showed no significant result (p=0.491), a very weak coefficient (0.045), and a very low R-squared (0.005). The correlation matrix showed a correlation of 0.071 between the two.

**Linear regression**

| crypto_risk | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| gen_conf_crypto | .045 | .064 | 0.69 | .491 | -.083 | .173 | |
| Constant | 5.411 | .266 | 20.37 | 0 | 4.884 | 5.938 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 5.573 | SD dependent var | 1.220 |
| R-squared | 0.005 | Number of obs | 96 |
| F-test | 0.478 | Prob > F | 0.491 |
| Akaike crit. (AIC) | 313.186 | Bayesian crit. (BIC) | 318.315 |

*** p<.01, ** p<.05, * p<.1*

TABLE 7: LINEAR REGRESSION OF CRYPTOCURRENCY TREATMENT RISK PERCEPTION AND CONFIDENCE IN CRYPTOCURRENCY MARKET RETURNS

The linear regression was repeated with the transformed cryptocurrency risk perception variable that was also used to test hypothesis 1 (table 8). This resulted in a slightly higher coefficient of 0.332, which is due to squaring of the values. However, this result was not significant (p=0.621), the R-squared was low (0.003) and the correlation matrix showed a correlation of 0.051.

**Linear regression**

| crypto_risk2 | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| gen_conf_crypto | .332 | .669 | 0.50 | .621 | -.997 | 1.661 | |
| Constant | 31.324 | 2.758 | 11.36 | 0 | 25.849 | 36.8 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 32.531 | SD dependent var | 12.656 |
| R-squared | 0.003 | Number of obs | 96 |
| F-test | 0.246 | Prob > F | 0.621 |
| Akaike crit. (AIC) | 762.497 | Bayesian crit. (BIC) | 767.626 |

*** p<.01, ** p<.05, * p<.1*

TABLE 8: LINEAR REGRESSION OF TRANSFORMED CRYPTOCURRENCY TREATMENT RISK PERCEPTION AND CONFIDENCE IN CRYPTOCURRENCY MARKET RETURNS

A similar result arose when running a linear regression between perceived risk of the stock investment and confidence in stock market return expectation (table 9). There was no significant result (p=0.590), the coefficient was very small (0.039), and the R-squared was minimal (0.003). The correlation matrix showed a correlation of 0.056.

**Linear regression**

| stock_risk | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| gen_conf_stock | .039 | .072 | 0.54 | .59 | -.104 | .181 | |
| Constant | 5.267 | .318 | 16.56 | 0 | 4.635 | 5.899 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 5.427 | SD dependent var | 1.140 |
| R-squared | 0.003 | Number of obs | 96 |
| F-test | 0.293 | Prob > F | 0.590 |
| Akaike crit. (AIC) | 300.311 | Bayesian crit. (BIC) | 305.440 |

*** p<.01, ** p<.05, * p<.1*

TABLE 9: LINEAR REGRESSION OF STOCK TREATMENT RISK PERCEPTION AND CONFIDENCE IN STOCK MARKET RETURNS

This linear regression was repeated with the transformation of the variable for stock risk perception that was also used to test hypothesis 1 (table 10). Again, this resulted in a higher coefficient (0.338), which is due to squaring of the variable values. This result was not significant (p=0.638), the R-squared was low (0.002), and the correlation matrix showed a correlation of only 0.049.

**Linear regression**

| stock_risk2 | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| gen_conf_stock | .338 | .716 | 0.47 | .638 | -1.083 | 1.76 | |
| Constant | 29.344 | 3.175 | 9.24 | 0 | 23.039 | 35.648 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 30.740 | SD dependent var | 11.376 |
| R-squared | 0.002 | Number of obs | 96 |
| F-test | 0.223 | Prob > F | 0.638 |
| Akaike crit. (AIC) | 742.054 | Bayesian crit. (BIC) | 747.183 |

*** p<.01, ** p<.05, * p<.1*

TABLE 10: LINEAR REGRESSION OF TRANSFORMED STOCK TREATMENT RISK PERCEPTION AND CONFIDENCE IN STOCK MARKET RETURNS

As for the relationship between confidence and investment propensity, the tests also found no significant results. Running a linear regression between investment propensity for the cryptocurrency against confidence in cryptocurrency market return (table 11) resulted in a nonsignificant outcome (p=0.854), a low coefficient (-1.926), and a low R-squared (0.000). The correlation matrix showed a correlation of -0.019.

**Linear regression**

| crypto_invest | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| gen_conf_crypto | -1.926 | 10.411 | -0.18 | .854 | -22.598 | 18.746 | |
| Constant | 197.667 | 42.888 | 4.61 | 0 | 112.513 | 282.821 | *** |
| Mean dependent var | | 190.667 | SD dependent var | | | 196.600 | |
| R-squared | | 0.000 | Number of obs | | | 96 | |
| F-test | | 0.034 | Prob > F | | | 0.854 | |
| Akaike crit. (AIC) | | 1289.381 | Bayesian crit. (BIC) | | | 1294.510 | |

*** p<.01, ** p<.05, * p<.1

TABLE 11: REGRESSION OF CRYPTOCURRENCY TREATMENT INVESTMENT PROPENSITY AND CONFIDENCE IN CRYPTOCURRENCY MARKET RETURNS

When repeating the linear regression with a Box-Cox transformation on the variable for cryptocurrency investment propensity to get rid of skewness (table 12), the results remained similar. Again, there was no significant result (p=0.703), the coefficient was low (-0.193), and the R-squared was low (0.002). The correlation matrix showed a correlation of -0.046.

**Linear regression**

| bc_crypto_invest | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| gen_conf_crypto | -.193 | .503 | -0.38 | .703 | -1.195 | .81 | |
| Constant | 20.365 | 2.015 | 10.11 | 0 | 16.346 | 24.385 | *** |
| Mean dependent var | | 19.668 | SD dependent var | | | 7.251 | |
| R-squared | | 0.002 | Number of obs | | | 71 | |
| F-test | | 0.147 | Prob > F | | | 0.703 | |
| Akaike crit. (AIC) | | 485.660 | Bayesian crit. (BIC) | | | 490.186 | |

*** p<.01, ** p<.05, * p<.1

TABLE 12: LINEAR REGRESSION OF TRANSFORMED CRYPTOCURRENCY INVESTMENT PROPENSITY AND CONFIDENCE IN CRYPTOCURRENCY MARKET RETURNS

When regressing investment propensity for the stock against confidence in expectation of stock market return (table 13), there were no significant results (p=0.180), the coefficient was low (-16.898), and the R-squared small (0.019). The correlation matrix showed a correlation of -0.138.

**Linear regression**

| stock_invest | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| gen_conf_stock | -16.898 | 12.512 | -1.35 | .18 | -41.74 | 7.944 | |
| Constant | 299.591 | 55.485 | 5.40 | 0 | 189.424 | 409.758 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 229.885 | SD dependent var | 200.462 |
| R-squared | 0.019 | Number of obs | 96 |
| F-test | 1.824 | Prob > F | 0.180 |
| Akaike crit. (AIC) | 1291.305 | Bayesian crit. (BIC) | 1296.434 |

*** p<.01, ** p<.05, * p<.1*

TABLE 13: LINEAR REGRESSION OF STOCK TREATMENT INVESTMENT PROPENSITY AND CONFIDENCE IN STOCK MARKET RETURNS

A Box-Cox transformation was used for the variable for stock investment propensity to address skewness of the distribution. A linear regression using this transformed variable (table 14) provided no significant result (p=0.193), a low coefficient (-0.863), and a low R-squared (0.021). The correlation matrix showed a correlation of -0.146.

**Linear regression**

| bc_stock_invest | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| gen_conf_stock | -.863 | .657 | -1.31 | .193 | -2.172 | .445 | |
| Constant | 27.95 | 2.893 | 9.66 | 0 | 22.191 | 33.709 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 24.400 | SD dependent var | 9.339 |
| R-squared | 0.021 | Number of obs | 81 |
| F-test | 1.725 | Prob > F | 0.193 |
| Akaike crit. (AIC) | 593.059 | Bayesian crit. (BIC) | 597.847 |

*** p<.01, ** p<.05, * p<.1*

TABLE 14: LINEAR REGRESSION OF TRANSFORMED STOCK TREATMENT INVESTMENT PROPENSITY AND CONFIDENCE IN STOCK MARKET RETURNS

A paired-samples t-test was used to check whether there was a difference between confidence in cryptocurrency market returns and confidence in stock market returns (table 15). This t-test indicated a significant difference (p=0.001), with a mean score of 3.795 for confidence in the cryptocurrency market expectations, and a mean score of 4.385 for confidence in the stock market expectations. Confidence was measured on a seven-point Likert-scale where 1 indicated no confidence and 7 indicated full confidence in expectations. Based on the results, the hypothesis that there is no difference between the two is rejected.

**Paired t test : gen_conf_crypto gen_conf_stock**

| | obs | Mean1 | Mean2 | dif | St Err | t value | p value |
|---|---|---|---|---|---|---|---|
| Gen_conf_crypto – gen_conf_stock | 122 | 3.795 | 4.385 | -.59 | .166 | -3.55 | .001 |

TABLE 15: T-TEST OF CONFIDENCE IN CRYPTOCURRENCY MARKET RETURNS AND CONFIDENCE IN STOCK MARKET RETURNS

In short, no relationships were found between confidence in market returns and perceived risk of specific investments. Based on the results, the hypothesis that participants who have higher confidence in their expectations of market returns perceive less risk for the corresponding investment is rejected.

## 3.5 Hypothesis 5: Participants who own or have owned cryptocurrency perceive cryptocurrency as less risky than stocks.

To test this hypothesis, two tests were carried out. First, it was investigated whether there was a link between which participants thought was riskier in general, cryptocurrency or stocks, and whether participants owned or had owned cryptocurrency. Pearson's Chi squared test (table 16) did not show a significant result here (p=0.213). However, this might be due to the small sample size of this survey. Only 16 out of the 125 participants stated that they thought stocks were riskier than cryptocurrency.

**Tabulation of gen_risk gen_own_crypto**

| do you think crypto or stocks is riskier? | do you own crypto? | | |
|---|---|---|---|
| | yes | no | Total |
| Cryptocurrency | 64 | 45 | 109 |
| Stocks | 12 | 4 | 16 |
| Total | 76 | 49 | 125 |

Pearson Chi2 = 1.55 Prob = 0.2128

TABLE 16: RISK PREFERENCE AND CRYPTOCURRENCY OWNERSHIP, CHI-SQUARED TEST

Second, it was investigated whether people perceived the specific cryptocurrency investment as more or less risky based on whether they owned or had owned cryptocurrency using a t-test (table 17). The mean score for risk perception of cryptocurrency for participants who owned or had owned cryptocurrency was 5.518, and the mean score for risk perception of

cryptocurrency for participants who did not or had not owned cryptocurrency was 5.659. This difference was not significant (p=0.576).

**Two-sample t test with equal variances**

| | obs1 | obs2 | mean yes | mean no | dif | St Err | t value | p value |
|---|---|---|---|---|---|---|---|---|
| crypto risk by gen~1 | 56 | 41 | 5.518 | 5.659 | -.141 | .251 | -.55 | .576 |

TABLE 17: T-TEST OF CRYPTOCURRENCY TREATMENT RISK PERCEPTION, BASED ON OWNERSHIP

Subsequently, a t-test was carried out using the transformed cryptocurrency risk perception variable that was also used to test hypothesis 1 (table 18). While people who owned or had owned cryptocurrency perceived the cryptocurrency investment as slightly less risky, the result was not significant (p=0.224). Means for perceived risk of cryptocurrency investment were 31.732 and 33.708 for participants who owned and participants who had not owned cryptocurrency, respectively. However, these means are difficult to interpret due to the transformation. Again, this result may be influenced by the small sample size of the survey.

**Two-sample t test with equal variances**

| | obs1 | obs2 | Mean1 | Mean2 | dif | St Err | t value | p value |
|---|---|---|---|---|---|---|---|---|
| crypto risk2 by ge~ | 56 | 41 | 31.732 | 33.708 | -1.975 | 2.595 | -.75 | .449 |

TABLE 18: T-TEST OF TRANSFORMED CRYPTOCURRENCY TREATMENT RISK PERCEPTION, BASED ON OWNERSHIP

Based on these results, the hypothesis that participants who own or have owned cryptocurrency perceive cryptocurrency as less risky is rejected.

## 3.6 Hypothesis 6: Younger people perceive lower risk, expect higher return, and have higher investment propensity with the cryptocurrency treatment compared to the stock treatment.

Since the variable age was not normally distributed, and no viable transformation was found, nonparametric tests were used to test this hypothesis.

A nonparametric series regression was used to test for a relationship between age and risk perception of the cryptocurrency investment (table 19). No significant effect was found (p=0.244) and the effect of age on risk perception was only 0.028.

Computing approximating function
Minimizing cross-validation criterion
Iteration 0: Cross-validation criterion = 19.43578
Computing average derivatives
Cubic B-spline estimation Number of obs = 97
Criterion: cross-validation Number of knots = 1

| | | Robust | | | | | |
|---|---|---|---|---|---|---|---|
| crypto_risk | Effect | std. err. | z | P>z | [95% | Conf. | Interval] |
| dem_age | 0.028 | 0.024 | 1.170 | 0.244 | -0.019 | | 0.074 |

Note: Effect estimates are averages of derivatives.

TABLE 19: NONPARAMETRIC SERIES REGRESSION OF AGE AND CRYPTOCURRENCY TREATMENT RISK PERCEPTION

To test for a relationship between age and expected return of the cryptocurrency investment, a logistic regression was used since expected return is measured as a categorical variable in this survey (table 20). Again, no significant result was found (p=0.359) and the pseudo R-squared was very close to zero (pseudo R-squared=0.003).

**Ordered logistic regression**

| crypto_profit | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| dem_age | -.013 | .014 | -0.92 | .359 | -.041 | .015 | |
| cut1 | -3.254 | .722 | .b | .b | -4.669 | -1.839 | |
| cut2 | -1.485 | .624 | .b | .b | -2.708 | -.262 | |
| cut3 | -.509 | .611 | .b | .b | -1.707 | .689 | |
| cut4 | .891 | .62 | .b | .b | -.325 | 2.107 | |

| | | | |
|---|---|---|---|
| Mean dependent var | 3.351 | SD dependent var | 1.199 |
| Pseudo r-squared | 0.003 | Number of obs | 97 |
| Chi-square | 0.847 | Prob > chi2 | 0.357 |
| Akaike crit. (AIC) | 304.078 | Bayesian crit. (BIC) | 316.952 |

*** p<.01, ** p<.05, * p<.1

TABLE 20: ORDERED LOGISTIC REGRESSION OF AGE AND CRYPTOCURRENCY TREATMENT EXPECTED RETURN

To test for a relationship between age and investment propensity for the cryptocurrency investment, a nonparametric series regression was used (table 21). The effect was small (-1.707) and no significant results were found (p=0.639).

Computing approximating function
Minimizing cross-validation criterion
Iteration 0: Cross-validation criterion = 250637.6
Computing average derivatives
Cubic B-spline estimation Number of obs = 97
Criterion: cross-validation Number of knots = 1

| | Effect | Robust std. err. | z | P>z | [95% | Conf. | Interval] |
|---|---|---|---|---|---|---|---|
| crypto_inv~t | | | | | | | |
| dem_age | -1.707 | 3.642 | -0.470 | 0.639 | -8.846 | | 5.432 |

Note: Effect estimates are averages of derivatives.

TABLE 21: NONPARAMETRIC SERIES REGRESSION OF AGE AND CRYPTOCURRENCY TREATMENT INVESTMENT PROPENSITY

Based on these results, the hypothesis that younger people perceive lower risk for cryptocurrency, expect higher return from cryptocurrency, and have higher investment propensity for cryptocurrency, was rejected. However, this result should be interpreted carefully since the distribution of age was not normal. The 25$^{th}$ and 75$^{th}$ percentiles corresponded to 30 and 43 years respectively.

# 4 Conclusion

In this section the research questions will be answered, as well as the secondary questions. Furthermore, the theoretical implications of the results will be discussed, as well as the methodology of the research.

## 4.1 Answering the research questions

The research question was: Is there a difference in perceived risk between investing in cryptocurrency and investing in stocks? In order to answer this question and the secondary questions, an experimental survey was carried out.

The first question was: Is there a difference in perceived risk between investing in cryptocurrency and investing in stocks? The hypothesis was that perceived risk would be higher for the cryptocurrency treatment than for the stock treatment. This was tested with two paired samples t-test which both resulted in a significant but small difference in risk perception between the two treatments. The cryptocurrency investment was deemed more risky by participants. Subsequently, the hypothesis can not be rejected based on these results.

The second question was: Is there a difference in expected return based on whether an investment is framed as cryptocurrency or stock? The hypothesis was that participants would expect higher return with the cryptocurrency treatment compared to the stock treatment. A non-parametric Wilcoxon signed ranks test was carried out to test this hypothesis. No significant difference was found between the treatments and the hypothesis was rejected.

The third question was: Is there a difference in investment propensity based on whether an investment is framed as cryptocurrency or stock? The hypothesis was that participants would have higher investment propensity in the stock treatment compared to the cryptocurrency treatment. Two paired samples t-tests were carried out to test this hypothesis. Both tests showed a significant difference between the treatments. When endowed with $1,000, participants would on average invest roughly $40 more in the stock treatment. Based on these results, the hypothesis could not be rejected.

The fourth question was: Is there a link between confidence in market returns for either cryptocurrencies or stocks and perceived risk of the corresponding investment? The hypothesis was that participants who have higher confidence in their expectations of market returns perceive less risk for the corresponding investment. Four linear regressions were carried out to see whether confidence in market returns influenced perceived risk of the corresponding investments. No significant results were found. Four additional linear regressions were carried out to investigate a possible link between confidence in market returns and investment propensity for the corresponding investments. Again, no significant results were found. Finally, a t-test was used to see whether there was a difference between confidence in cryptocurrency market returns and confidence in stock market returns. This t-test showed that participants had significantly more confidence in their stock market return expectations. Based on these results, the hypothesis was rejected.

The fifth question was: Do participants who own or have owned cryptocurrency perceive it as less risky? The hypothesis was that participants who owned or had owned cryptocurrency perceived cryptocurrency as less risky. First, a chi-squared test was used to see whether there was a link between which participants thought was riskier in general, cryptocurrency or stocks, and participants owning or having owned cryptocurrency. No significant result was found. However, this should be interpreted carefully due to the small number of participants who declared that they thought stocks were riskier. Second, two t-tests were carried out to see whether owning cryptocurrency had impact on the risk perception of the specific investments (treatments). No significant difference was found and the means of risk perception for the two treatments were very similar. Based on these results, the hypothesis was rejected.

The sixth question was: Are younger people more optimistic about cryptocurrency? The hypothesis was that younger people perceive lower risk for cryptocurrency, expect higher return from cryptocurrency, and have higher investment propensity for cryptocurrency. Due to the nonnormal distribution of age in this population, nonparametric tests were required. To test the effect of age on risk perception, a nonparametric series regression was used. The effect was small and not statistically significant. To test the effect of age on expected return, a logistic regression was used. No significant effect was found. To test the effect of age on investment propensity, a

nonparametric series regression was used. Again, the effect was very small and statistically insignificant. Based on these results, the hypothesis was rejected. However, due to the distribution of age in the sample, these results should be carefully interpreted and might benefit from further research.

In short, this experimental survey has shown that cryptocurrency investments are perceived as more risky than stock investments. This is accompanied by a higher investment propensity in stocks. However, based on the results we cannot state that the difference in risk perception is linked to expected return, confidence in market return expectations, owning cryptocurrency, or age.

## 4.2 Discussion

### 4.2.1 Theoretical reflection

In this section, the results will be linked to and compared with the existing literature, and opportunities for further research will be provided.

Following the first three questions, it can be concluded that participants perceive higher risk with cryptocurrency, do not expect more return on cryptocurrency, and have lower investment propensity for cryptocurrency, when compared to stocks. This is in line with traditional finance literature where an investor requires more reward for more risk. Since there is additional perceived risk, but no additional expected return, the investment propensity is lower for the cryptocurrency. These findings suggest that risk can be replaced by risk perception in traditional models. However, further research is required to determine if these two are interchangeable in other contexts.

Increased confidence was not found to have impact on risk perception. This suggests that increased confidence increases risk taking via risk aversion or another variable. Not via decreasing risk perception, as was hypothesized in this master's thesis. Further research could help to provide insights into the link between confidence and risk taking.

No link was found between owning cryptocurrency and risk perception of cryptocurrency. This result implies that people who invest in cryptocurrency do not invest in it because they perceive it as less risky, but because of other reasons. On the other hand, it was also not found that people

who invest in cryptocurrency are more aware of the higher risk of cryptocurrency. Further research is required due to the small sample size of this survey. Further research can also help to provide possible explanations as to why people invest in cryptocurrencies, since it does not seem to be due to lower perceived risk.

Age was not found to have an effect on risk perception, expected return, or investment propensity for the cryptocurrency treatment. This implies that opinions don't significantly differ between age groups. Due to the distribution of age in the sample of this survey, further research is required to strongly confirm or deny this conclusion. The AFM and other institutions can use the results of this research to better inform the public and warn about risky investments.

### 4.2.2 Methodological reflection

In this section, the methodology of this research will be discussed in order to assess its strengths and weaknesses.

Construct validity refers to how well a test measures what you intend to measure. The statistical methods chosen adequately measured possible effects within the gathered data. The questions were formulated to be as clear as possible and leave no room for interpretation. However, construct validity could be improved by repeating the survey with an increased sample size. It is possible that existing relationships were not found due to the smaller sample size. The control questions also influenced the sample size. 27 out of 125 participants did not pass the control questions and were subsequently excluded from the treatments and the corresponding questions. This fact might indicate that the control questions were too difficult or not worded properly. If this survey is to be repeated, reworking the control questions would likely improve the sample size, and thus construct validity. Another factor that may have impacted construct validity is the fact that participants received both treatments. This could have caused participants to change their answers in the second treatment in order to be consistent with the first treatment or to show their preference for one of the two types of investments. It was only after receiving the data that I realized that Qualtrics does not include the order in which participants received treatments. This meant that it was not possible to check whether there would have been different results if only the first treatment that participants received was used for analysis.

Internal validity refers to whether any causal relationships that were tested were not influenced by other factors. In this research multiple possible explanations for the difference in risk perception between perceived cryptocurrency and stock risk were investigated. There is always the possibility of missing variables. However, since this experimental survey was carried out in a controlled and synthetic environment (online survey), this is not likely to be an issue. It is difficult however, to state which was causality goes. For example, let's say there is a link between confidence in return expectations and perceived risk. In this case it is difficult to say whether perceived risk influences confidence, or confidence influences perceived risk.

External validity refers to the extent to which results of a study can be generalized to a broader context. While the synthetic setting of the survey was very helpful in controlling for variables, it decreases the external validity. An answer to a question about a hypothetical investment without further information may not translate entirely to real world investment decisions. Furthermore, demographics of the sample might decrease generalizability. In the sample, 90 out of 125 participants were male (72%), 50% of participants were between the age of 30 and 43, and 95% of participants were from North America. Further research could focus on different demographics and/or more heterogenous samples. It should be noted however, that Goodman et al. (2013) found that behavior of MTurk participants in experiments is very similar to other populations that are often used in experiments. This means that the sample is still useful, although further research with more heterogenous samples can improve the body of literature.

Reliability refers to the extent to which results of a study can be reproduced. Since this experiment was an online survey, it can be easily repeated. One could copy the questions and answer options from the appendix and distribute the survey on MTurk or another platform. One would expect that repeating the exact same survey would give very similar results.

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# Appendix 1 – Survey

### Introduction

Thank you for participating in this survey. The data collected with this survey will be used for a research project. In this survey several questions will be asked about your preferences and beliefs regarding investments. Participation is voluntary and there are no risks attached. All data will be anonymized. Please answer honestly, there are no wrong answers. First, a couple questions will be asked to ensure you understand the provided information. Click the arrow-button at the bottom to participate.

### Control questions

Investment X has 80% chance of profit and 20% chance of loss over one year. Is the chance of profit or loss higher?

- The chance of profit is higher
- The chance of loss is higher
- The chance of profit and loss are equal
- The information given does not provide an answer

Investment X has 80% chance of profit and 20% chance of loss over one year. Given this information, can you say with certainty whether you will win or lose?

- Yes
- No

Investment X has 80% chance of profit and 20% chance of loss over one year. Investment Y has 50% chance of profit and 50% chance of loss over one year. Which investment has a higher chance to earn profit over one year?

- Investment X
- Investment Y

### Crypto treatment

An investment in a certain cryptocurrency has 60% chance of profit, and 40% chance of loss over one year. How risky do you perceive the investment to be?

- Extremely safe

- Moderately safe
- Slightly safe
- Neutral
- Slightly risky
- Moderately riskey
- Extremely risky

How much profit would you expect from this investment over one year?

- Less that 0% (loss)
- 0%-5%
- 6%-10%
- 11%-20%
- More than 20%

Imagine you are endowed $1,000, how much of this money would you invest in the cryptocurrency described above?

- Slider from 0 to 1000

**Stock treatment**

An investment in a certain Stock has 60% chance of profit, and 40% chance of loss over one year. How risky do you perceive the investment to be?

- Extremely safe
- Moderately safe
- Slightly safe
- Neutral
- Slightly risky
- Moderately riskey
- Extremely risky

How much profit would you expect from this investment over one year?

- Less that 0% (loss)
- 0%-5%
- 6%-10%
- 11%-20%
- More than 20%

Imagine you are endowed $1,000, how much of this money would you invest in the Stock described above?

- Slider from 0 to 1000

**General questions**

The following questions do not pertain to the specific investments from before. They inquire into your general beliefs and preferences. Again, there are no wrong answers.

Which do you think is riskier, investing in cryptocurrency or investing in stocks?

- Cryptocurrency
- Stocks

Which investment would you expect to earn more profit, cryptocurrency or stocks?

- Cryptocurrency
- Stocks

If you were provided with money to invest, would you rather invest it in cryptocurrency or stocks?

- Cryptocurrency
- Stocks

How much return would you expect for the entire stock market over the next year?

- Less that 0% (loss)
- 0%-5%
- 6%-10%
- 11%-20%
- More than 20%

How confident are you in your expectation for stock market returns over the next year? (1 being not confident at all, 7 being perfectly confident)

- 1
- …
- 7

How much return would you expect for the entire cryptocurrency market over the next year?

- Less that 0% (loss)
- 0%-5%
- 6%-10%
- 11%-20%
- More than 20%

How confident are you in your expectation for cryptocurrency market returns over the next year? (1 being not confident at all, 7 being perfectly confident)

- 1
- …
- 7

Do you own, or have you owned cryptocurrency?

- Yes
- No
- Don't want to say

Do you own, or have you owned stocks?

- Yes
- No
- Don't want to say

How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? (1 being unwilling to take risks, and 7 being fully prepared to take risks)

- 1
- …
- 7

**Demographics**

What is your age in year?

- (type in answer, only numbers between 0 and 99 allowed)

What is your gender?

- Male
- Female
- Other

Where do you live?

- North America
- South America
- Europe
- Africa
- Asia

- Australia

**End of survey**

We thank you for your time spent taking this survey. Your response has been recorded.