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Loss aversion, overconfidence and familiarity affecting Dutch individual investors

Sander Vriezekolk
430840

Supervisor: Amar Soebhag
Second assessor: Jan Lemmen

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1. Introduction

Traditional finance models try to get an understanding of financial markets by assuming that investors are completely rational and that markets are efficient (Thaler, 2005). Investors are assumed to be rational when they make decisions that result in the highest expected utility for themselves. These traditional finance models, based on the Efficient Market Hypothesis (EMH), were considered to be a true representation of reality for a long time. However, the predictions made by these traditional models are not consistent with the data. The EMH suggests that investors cannot beat the market consistently, because all information is already priced in the security. Nevertheless, it appeared to be possible to consistently beat the market. This was shown by Warren Buffett significantly outperforming the market and Keynes having a similar stock market performance using a very similar investment strategy. Buffett also discussed a group of investors that all followed the same philosophy and were able to significantly outperform the market (Buffett, 1984). This means that we cannot use these models to understand trading behaviour of individual investors in stock markets.

Behavioural finance is a new approach that sets out to challenge these assumptions of rationality by using models in which investors are not completely rational. Behavioural finance implies that investors in general behave in a different way than these traditional models predict. However, to make valid predictions, these models need to specify the form or irrationality. To do this, behavioural economists usually turn to psychological evidence on biases when individuals form beliefs, preferences or when individuals make decisions. One of these biases is loss aversion. Loss aversion states that value is evaluated based on a reference point (Kahneman and Tversky, 1991). Lots of researchers have found a way to apply loss aversion to explain inconsistencies in security prices predicted by the EMH (Benartzi and Thaler, 1995) (Kahneman, 2011). Another well-known bias is overconfidence. Research showed that overconfident individuals have a far too narrow confidence interval assigned to their estimates and overconfidence also causes miscalibration in estimating probabilities (Fischhoff et al, 1977). Familiarity bias has been characterized as a preference to invest in what is familiar. These familiar options often result in less favourable outcomes (French and Poterba, 1991). Despite information on these biases being readily available, these biases remain to be an issue to investors' stock performance.

In this thesis I will be using behavioural finance theories and models as well as a questionnaire (see Appendix) to investigate the existence of loss aversion, overconfidence and familiarity bias amongst Dutch individual investors using a new sample. Behavioural finance has only been discovered for a relatively short period of time, which makes existing literature discussing the effect of these biases on a variety of markets still limited. Furthermore, this research will be done with a completely new dataset.

This results into the following research question:

Do behavioural biases significantly deteriorate Dutch individual investors' investment decisions?

I will answer this question by analysing the sample data. The behavioural biases include loss aversion, overconfidence, and familiarity bias. Firstly, loss aversion will be tested using a heads or tails lottery and a few choices under risk. I found significant evidence of loss aversion being present amongst the respondents and the results from the choices under risk are in line with the predictions of the fourfold pattern.

Secondly, overconfidence was measured by asking respondents to rate their skills compared to general people and asking them what the main reason for their successes or failures were. There was significant evidence of overconfidence amongst investors, while there was no significant evidence for overconfidence amongst non-investors. Furthermore, a large proportion of investors blame failure on circumstances and ascribe their successes to their own abilities. I also found evidence of male investors being significantly more overconfident than female investors.

The presence of the familiarity bias was tested by asking respondents how familiar they are with certain companies and how likely they are to invest in these companies. The results show a very significant relationship between familiarity and likelihood to invest in a certain company. Previous literature discussed in section 2 shows that individuals suffering from these biases have significantly lower returns. These previous findings in combination with my results suggest that behavioural biases do indeed significantly deteriorate investment decisions from Dutch individual investors.

Section 2 will review previous work on loss aversion, overconfidence, and familiarity bias. In this section I will also formulate the hypotheses used to answer the research question. Afterwards, in section 3, this thesis will continue with a description of the data and methodology. The results will be discussed in section 4. Finally, there will be a conclusion to answer the research question with the help of the hypotheses as well as a discussion of the limitations in section 5.

2. Literature Review

This section will define the behavioural biases loss aversion, overconfidence and the familiarity bias and will elaborate on the effect of these biases on investment decisions. Each subsection concludes with a hypothesis development that will help answer the main research question.

Traditional economic frameworks assume that investors are rational and that they process all available information resulting in stocks being priced correctly. This means that securities should be priced according to the quality of their underlying fundamentals (MacGregor et al, 2000). This is in line with the Efficient Markets Hypothesis (EMH), which is a popular view mentioned by Eugene Fama. In his 1970 paper, Fama categorized efficiency tests into weak form, semi-strong form, and strong form. The weak form suggests that security prices reflect all past data. The semi-strong form suggests that all public information is incorporated into the price of the security. Finally, the strong form suggests that all information, both public and private, is incorporated into the price of the security and that there is no information left that can give an investor an advantage. The theories that form the EMH are that investors are rational and thus securities are valued rationally, every investor takes all available information into account before making a decision and investors always act out of self-interest (Fama, 1970).

However, behavioural finance argues that strategies to correct mispricing caused by irrational investors can be risky and costly, leaving the mispricing to remain (Barberis and Thaler, 2003). Individuals make suboptimal decisions because they use inferences and heuristics to come to a decision more quickly without researching and taking in all available information (Kahneman, 2011). Behavioural finance is informed by three aspects of psychology which explain individual investors' behaviour (De Bondt et al, 2010). These aspects are cognitive psychology, which focuses on individuals making calculations to

maximize their wealth, social psychology, which focuses on accepting an individuals' acts and emotional responses, which focuses on the decision-making process. Mispricing caused by irrational investors can often not be corrected by rational investors, but it has not yet been determined what causes these investors to act irrationally in the first place. This irrational behaviour can be explained using experimental evidence from financial markets on systematic biases that emerge when investors form beliefs.

The following subsections will elaborate on what psychologists have identified as biases in how people in general, and consequently individual investors, form beliefs.

2.1 Loss Aversion

Prospect theory is a behavioural model which shows the decision-making process of individuals faces with alternatives that involve risk and uncertainty. One of the main features in the prospect theory by Kahneman and Tversky is the aversion to realizing losses. The key elements of the prospect theory are that the value function is defined relative to some reference point, the gain and loss functions have diminishing sensitivity and that the value function is steeper for losses (Kahneman and Tversky, 1979). This means that losses have a bigger negative impact on the utility of an individual than equivalent gains have a positive impact, known as loss aversion. As a result of their experiments, Kahneman and Tversky represented this value function as a two-part power function:

Formula 2.1. Value function

$$v(x) = \begin{cases} x^{\alpha} & if\ x \geq 0 \\ -\lambda(-x)^{\beta} & if\ x \leq 0 \end{cases}$$

Where α represents risk preference for gains, β for losses and λ is the coefficient that shows the degree of loss aversion. Empirical evidence performed by Kahneman and Tversky has shown that the estimate of this coefficient is typically somewhere around 2, which means that the impact of a loss is twice as big as the impact of a gain (Tversky and Kahneman, 1991).

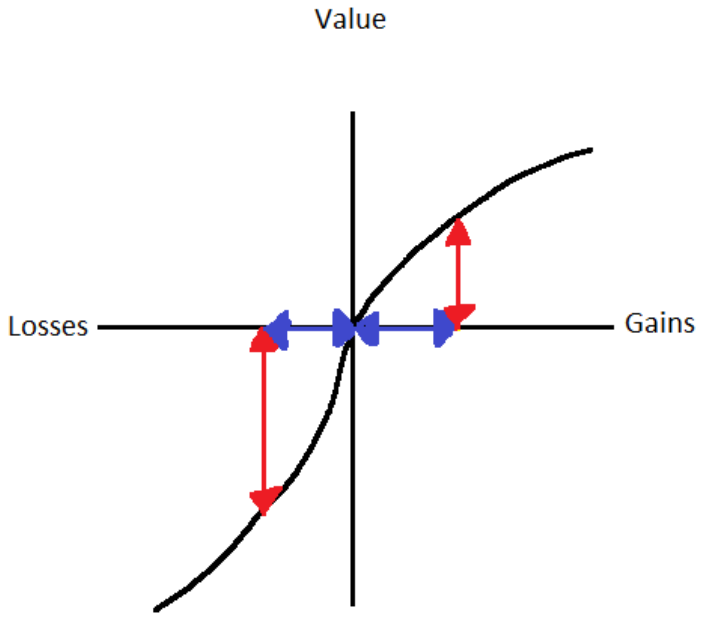

Figure 2.1. S-shaped value function

Richard Peterson related this to investors in the stock market is his book; Inside the investor's brain: the power of mind over money. He shows that people who are very risk averse could even have a λ of 6 or higher, while good investors have a low λ that is slightly higher than 1. Peterson argues that these investors know that you must see it as a series of games with favourable odds for long term profits. This shows the existence of a dynamic aspect of loss aversion. The degree of loss aversion can be different depending on previous gains or losses (Thaler and Johnson, 1990). A loss becomes less painful if it comes after a gain, because the loss can be cushioned by that previous gain. Additionally, that same loss can also become more painful if it comes after a previous loss (Barberis and Huang, 2001).

Another important aspect is myopic loss aversion. Investors that show myopic loss aversion are willing to accept more risk if they evaluate their investment performance less frequently (Thaler, Tversky, Kahneman and Schwartz, 1997). Secondly, risky assets become more attractive to investors who intend to hold the asset for a long time (Benartzi and Thaler, 1995). Benartzi and Thaler showed that investors employed more conservative investment strategies when they looked at the performance more frequently. This combination of loss aversion and a short evaluation period is referred to a myopic loss aversion.

Myopic loss aversion can be seen in stock markets in a way that investors sell winning stocks too early and hold on to losing stocks for too long (Kahneman and Tversky, 1979). This has been confirmed by later studies and has been labelled as the disposition effect, which also includes mental accounting (Shefrin and Statman, 1985). Mental accounting states that

investors make a separate mental account for every gamble and ignore that there is a possible interaction between gambles (Thaler, 1985). Another reason Shefrin and Statman give for the existence of this phenomenon is that investors are not willing to realize a loss, because that would prove that their judgement was wrong. This implies that investors would even be willing to hold on to a losing stock even if the chance of breaking even again is less than 50 percent.

Some studies differ in the way they describe and calculate loss aversion. Based on previous literature I expect λ to be somewhere around 2. This prediction is consistent with experiments conducted by Kahneman and Tversky. I will use the same definition for loss aversion.

Formula 2.2. Loss aversion definition

$$-\frac{U(-1)}{U(1)}$$

The loss in utility from losing money is divided by the gain in utility from gaining money.

After analysing previous literature on loss aversion, I constructed the first hypothesis.

Hypothesis 1: Loss aversion significantly deteriorates Dutch individual investors' investment decisions

2.2 Overconfidence

Overconfidence is a psychological cognitive bias that affects a person's decision-making behaviour. It can also be described as a miscalibration that will lead to an underestimation of fluctuations in stock prices. Overconfidence is reinforced by self-attribution, which states that investors praise themselves for success and blame failure on external factors (Wolosin et al, 1973). Overconfidence can be the cause of a wide range of investment errors and can even make practiced investors susceptible to fraud (Pressman, 1998). Investors are willing to accept high risks because they believe they have the ability to control it. A consequence of overconfidence is that investor's confidence intervals are far too narrow when making estimations.

Rational investing models predict only a little amount of trading. Nevertheless, the trading volume on stock exchanges is very high. Overconfidence is the most logical behavioural explanation for this phenomenon because overconfident investors trade more than rational investors (Odean, 1998). Investors think they have strong information, but in reality this information does not justify any trading actions (Barberis and Thaler, 2003). This theory suggests that overconfident investors will trade more often. If we also consider that there are transaction costs involved, overconfident investors are expected to earn lower returns. This is consistent with the study performed by Barber and Odean (2000). They found that the annual returns of the most active investors were quite a bit lower than the market return.

Psychological research has shown evidence of men being more overconfident than women (Lundeberg et al, 1994). Overconfidence is most prominent for difficult tasks such as making forecasts with low probabilities in the area of finance (Firschhoff et al, 1977). As we have already seen, overconfidence will lead to excessive trading and lower returns. Barber and Odean (2001) build on this previous evidence and confirm that men trade more and will on average earn lower returns.

Other literature on overconfidence suggests that being overconfident is not necessarily bad. A certain degree of overconfidence can have a positive effect (Goel and Thakor, 2008; Hackbarth, 2009). However, these studies discuss managerial overconfidence and CEO overconfidence, while this thesis only looks at individual investors.

Previous literature suggests a relationship between overconfidence and an individual investors' investment performance, which results in my second hypothesis.

Hypothesis 2: Overconfidence significantly deteriorates Dutch individual investors' investment decisions

2.3 Familiarity Bias

It has been recognised by several studies that decision making under uncertainty depends on psychological factors such as familiarity. Familiarity suggests that people use simplified strategies when making complex decisions by comparing how easy it is to recall certain events to overcome information processing limitations (Fiske and Taylor, 1991). Decision making depends on the way uncertainty arises, which is called source dependence (Fox and Tversky, 1995).

Fox and Tversky (1995) showed that people prefer to bet on risks from which the source of uncertainty is more familiar, which also applies to the stock market and portfolio selection. This prejudice towards the familiar and the mistrust of the unfamiliar results in investors preferring to invest in securities that are familiar to them (Huberman, 2001). Aspara and Tikkanen (2008) have the idea that the tendency to invest in a company is related to their attitudes toward that company and their tendency to buy the products of that company. This means that individuals invest in the shares of companies based on the experiences they had with the company's products. When new companies emerge with new products investors can not rely on previous experiences. Rogers (2003) proposed an adaption model which tests whether consumers intend to use a new product. This model identifies five characteristics of new products: complexity, compatibility, trialability, observability and relative advantage. These are not actual characteristics of the product, but how they are perceives by consumers.

Bulipopova et al (2014) related the impact of familiarity bias on individual investors being reluctant to realize losses. They found that investors who hold familiar assets are more than twice as reluctant to realize losses. This is in line with the disposition of holding on to losing stocks for too long and selling winning stocks too early (Kahneman and Tversky, 1979).

Literature on familiarity bias suggests that there is a relationship between familiarity and investment behaviour, which leads to my final hypothesis.

Hypothesis 3: Familiarity significantly deteriorates Dutch individual investors' investment decisions

3. Methodology

3.1 **Sample Selection**

I have designed an online questionnaire in Qualtrics to collect responses from a sample of Dutch individual investors. The aim of this questionnaire is to replicate the procedures and results of previous studies on loss aversion, overconfidence, and familiarity. However, this study focuses on Dutch individual investors. I used a convenience sampling technique by sharing the questionnaire on social media and asking people to spread it further to collect responses. Questionnaires that were not filled in completely and questionnaires filled in by individuals that do not live in the Netherlands have been removed from the sample. The final sample consists of 196 individuals. Of this number of individuals 61% (n = 120) were male and 39% (n = 76) were female respondents. 70% (n = 138) of the respondents have invested before and 30% (n = 58) have not invested before as seen in Table 3.1. The mean age of the respondents is 31.3 years and the median age is 26.5 years. The youngest respondent is 18 years old and the oldest respondent is 72 years old. All 196 respondents were living in the Netherlands.

The hypotheses that were based on existing theories will be investigated through empirical evidence. Descriptive statistics will be used to summarize the data and establish a relationship between the behavioural biases and the respondents. The relationship between the behavioural biases and individual investment behaviour will be analysed by correlation and regression analysis.

Table 3.1. Gender by investing experience cross tabulation

	Investing Experience		
Gender	***Yes***	***No***	***Total***
Male			
Count	97	23	120
% within Gender	80.83%	19.17%	100%
% within Investing Experience	70.29%	39.66%	61.22%
Female			
Count	41	35	76
% within Gender	53.95%	46.05%	100%
% within Investing Experience	29.71%	60.34%	38.78%
Total			
Count	138	58	196
% within Gender	70.41%	29.59%	100%
% within Investing Experience	100%	100%	100%

3.2 Measuring Loss Aversion

To investigate the connection between loss aversion and investment decisions I asked participants to indicate whether they are willing to take part in heads or tails lotteries. Respondents are loss averse if they are not willing to take part in lotteries with a positive expected value. The lotteries that have a positive expected value are the lotteries where you can win more than you can lose (e.g. Heads: you WIN €50 or Tails: you LOSE €30). The degree of loss aversion can differ for each respondent and depends on the point where participants change their answers from yes to no. For this part I will be measuring aggregate loss aversion.

Kahneman and Tversky observed that individuals facing choices leading to gains are risk-averse and individuals facing choices leading to losses are risk-seeking, which is contrary to the expected utility theory. This leads to the fourfold pattern of risk attitudes where individuals show risk-averse behaviour for high probabilities of gains and low probabilities of losses and risk-seeking behaviour for low probabilities of gains and high probabilities of losses. This part of the prospect theory will be tested by letting respondents choose between a risky option and a safe option for both the gains and loss domain. If respondents prefer the

option of winning €1000 with a probability of 5% over winning €50 guaranteed in the gains domain and prefer the option of losing €50 guaranteed over losing €1000 with a probability of 5%, then the findings will be in line with the fourfold pattern.

Maurice Allais showed with the Allais paradox that an individual's observed choices are inconsistent with the expected utility theory. The Expected utility theory suggests that individuals who choose option A for question 12 will also choose option A for question 13 and individuals who choose option B for question 12 will also choose option B for question 13. These two questions will try to confirm the observations by Allais. Allais showed that the questions can be rewritten in such a way that shows both questions are the same using a utility function. Preferring option A over option B in question 12 suggests:

$$1U(€200) > 0.89U(€200) + 0.1U(€1000) + 0.01U(€0)$$

The equation for preference of option B over option A in question 13 can be rewritten as follows:

1. $0.89U(€0) + 0.11U(€200) < 0.9U(€0) + 0.1U(€1000)$
2. $0.11U(€200) < 0.01U(€0) + 0.1U(€1000)$
3. $1U(€200) - 0.89U(€200) < 0.01U(€0) + 0.1U(€1000)$
4. $1U(€200) < 0.89U(€200) + 0.1U(€1000) + 0.01U(€0)$

This is a violation of the independence axiom, which is one of the axioms of rationality. The independence axiom states that given three lotteries, A, B and C, A is preferred to B if and only if αA + (1-α)C is preferred to αB + (1-α)C, where $0 < \alpha < 1$.

3.3 Measuring Overconfidence

To test whether the respondents are overconfident I asked them to rate their investment skills compared to other individuals in general. For this I used a 5-point Likert scale. Overconfidence was measured separately for individuals that have invested before and individuals that have never invested before, because individuals that have never invested before are more likely to answer that they are worse than average which will skew the data. When significantly more respondents answer that they are *much better* or *slightly better* compared to *slightly worse or much worse* this is an indication of overconfidence amongst those respondents. I also asked them whether they think they can beat the market when investing. If significantly more respondents answer *yes* to this question, this is another indication of overconfidence.

Related to overconfidence is self-attribution bias. This is a tendency for individuals to attribute success to their own abilities and blaming losses on circumstances out of their control. This can lead to an increase in overconfidence (Miller and Ross, 1975). The first and second option of questions 4.A and 4.B refer to the respondent's own skills and the third and fourth option refer to circumstances out of their control. There is an indication of this self-attribution bias if significantly more respondents choose the options that refer to their own skills when they earn money and choose the options that refer to circumstances out of their control when they lose money with an investment.

3.4 Measuring Familiarity Bias

To test whether the respondents suffer from familiarity bias I asked them how familiar they are with certain companies listed in the AEX index and how likely they are to invest in these companies. To control for size I selected two companies with a high market capitalisation compared to the other listed companies (Unilever and Prosus), two companies with a low market capitalisation (Aegon and ASM International) and two companies whose market capitalisation is somewhere in the middle. This will be done using a 5-point Likert scale. There will be evidence of the existence of familiarity bias amongst the respondents when they are significantly more likely to invest in companies that they are more familiar with.

4. Results

4.1 Loss Aversion

The first test of loss aversion were the heads or tails lotteries. Respondents had to indicate whether they were willing to participate in heads or tails lotteries with a 50% chance to win €50 and a 50% chance to lose an increasing amount of money starting at €0 and going up to €70 in steps of €10. The results of these lotteries can be seen in Table 4.1.

Table 4.1. Heads or tails lottery outcomes

Heads or Tails Lottery	***Accept***	***Reject***	***Acceptance %***
Win €50 or Lose €0	196	0	100.00
Win €50 or Lose €10	190	6	96.94
Win €50 or Lose €20	149	47	76.02
Win €50 or Lose €30	97	99	49.49
Win €50 or Lose €40	53	143	27.04
Win €50 or Lose €50	12	184	6.12
Win €50 or Lose €60	1	195	0.51
Win €50 or Lose €70	0	196	0.00

According to the expected utility theory every participant should be willing to take part in lotteries with a positive expected value. However, these findings show that even a loss of €10 made some respondents unwilling to participate and more than half of the respondents were unwilling to participate at a loss of €30. Almost 73% of all respondents rejected lotteries with a positive expected value, which is a good indication for the presence of loss aversion amongst these respondents. Figure 4.1 shows the different lotteries in the gains domain and their acceptance percentages. This function is concave which is consistent with the prospect theory by Kahneman and Tversky.

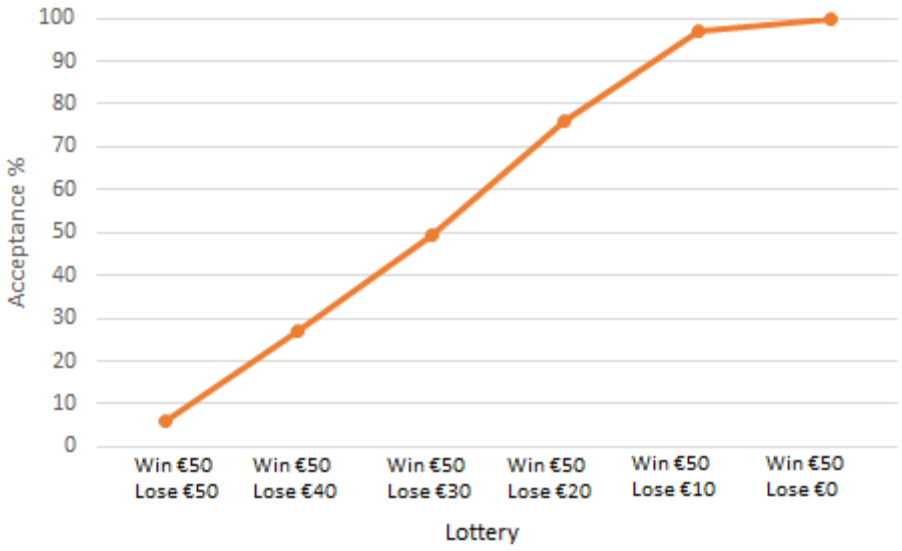

Figure 4.1. Representation of concave value function in the domain of gains

The fourfold pattern suggests that individuals are risk-averse for high probabilities of gains and low probabilities of losses and risk-seeking for low probabilities of gains and high probabilities of losses. This was tested with a few questions where respondents had to choose between options with a certain degree of risk and a certain option. The results in Table 4.2 show that almost 55% of the respondents were risk-seeking when they had to choose between an option with a large amount of risk and a certain option in question 8. This is in line with the predictions of the fourfold pattern. Questions 9, 10 and 11 show even more compelling evidence of respondents choosing the option predicted by the fourfold pattern. These results further enhance the findings of loss aversion being present amongst these respondents suggested by the heads or tails lotteries.

Table 4.2. Fourfold pattern

Options of fourfold pattern		
Question 8	***Count***	***% of Total***
A. Win €1000 with a probability of 5%	107	54.59
B. Win €50 guaranteed	89	45.51
Question 9		
A. Win €1000 with a probability of 95%	16	8.16
B. Win €950 guaranteed	180	91.84
Question 10		
A. Lose €1000 with a probability of 5%	50	25.51
B. Lose €50 guaranteed	146	74.49
Question 11		
A. Lose €1000 with a probability of 95%	186	94.90
B. Lose €950 guaranteed	10	5.10

The final questions tested whether respondents complied to the independence axiom, which is one of the axioms of rationality. This independence axiom suggests that rational individuals who pick option A for question 12 will also pick option A for question 13 and vice versa. However, the Allais paradox shows that the observed choices are inconsistent with this independence axiom. Since both questions are the same it would be interesting to test how many respondents violate the independence axiom. These results can be seen in Table 4.3. Almost 53% of the respondence violate the independence axiom which means that these respondents can have preference reversals when investing. However, these findings do not show a significant preference reversal ($p = 0.475$).

Table 4.3. Respondents violating the independence axiom

Violation	***Yes***	***No***
Count	103	93
% of Total	52.55	47.45

4.2 Overconfidence

A chi-square analysis was used to test the existence of overconfidence amongst respondents in general and afterwards across gender. This chi-square analysis tests whether the differences between the observed and expected counts are significantly different. Psychological research has already shown evidence of men being more overconfident than women (Lundeberg et al, 1994).

The first question about overconfidence asked respondents to rate their investing skills compared to other people. The observed counts are shown in Table 4.4. The expected count for each of the answers is 27.6 for investors and 11.6 for non-investors. The chi-square test for investor count suggests that there is a very significant difference between the observed and expected count ($p = 0.000$). Looking at table 4.4, it can be seen that this is mostly due to the large amount of investors that think they are *somewhat above average* and the small amount of investors that think they are *somewhat below average* or even *far below* average. Amongst the investors, almost 90% think they are average or better than average. The chi-square test also shows a very significant difference between observed and expected count for non-investors ($p = 0.000$). However, the reason for this significance is opposite to that of investors. Over 91% of all non-investors think they are average or worse than average.

Table 4.4. Respondents rating their investing skills

Investing Skill			
	Investor Count	***Non-Investor Count***	***Total Count***
Far above average	29	0	29
Somewhat above average	52	5	57
Average	43	19	62
Somewhat below average	9	14	23
Far below average	5	20	25
Total	138	58	196

These findings are consistent with the findings of the next question. When investors were asked whether they would beat the market, 84% answered yes compared to 50% of all non-investors. Using a chi-squared analysis, the differences between the observed counts and expected counts amongst investors were significant (p = .000). This provides further evidence of investors being overconfident. Using a chi-square analysis for non-investors we find that the observed and expected counts are the same, so we find no evidence of overconfidence amongst non-investors.

Table 4.5. Respondents confidence in beating the market

Beat the Market	***Investor Count***	***Non-Investor Count***	***Total Count***
Yes, definitely	46	1	47
Yes, I have some confidence	71	28	99
No, I have no confidence	21	29	50
Total	138	58	196

Table 3.1 shows that there are 97 males with investing experience and only 41 females with investing experience. Since overconfident investors trade more than rational investors (Odean, 1998), this would suggest that male individual investors are more overconfident than female individual investors. A proportion test was used to see whether the difference in experience between male and female investors is significant. The test shows that the difference is very significant (p = .000). Then a chi-squared test was applied on investing skills based on gender to further show the difference between male and female investors (see Table 4.6). The results show that there is a significant difference between male and female investors (p = .000). Using a proportion test, it became clear that this significance was mainly caused by the difference in males and females that rated their investment skills as *somewhat above average* and *far above average*. These results do suggest that there is a significant difference in overconfidence between male and female investors.

Table 4.6. Gender by investing skills cross tabulation

			Investing Skills			
Gender	***Far below average***	***Somewhat below average***	***Average***	***Somewhat above average***	***Far above average***	***Total***
Male						
Count	1	5	22	43	26	97
Expected Count	3.51	6.33	30.22	36.55	20.38	97.00
% within Gender	1.03	5.15	22.68	44.33	26.80	100.00
% within Skills	20.00	55.56	51.16	82.69	89.66	70.29
Female						
Count	4	4	21	9	3	41
Expected Count	1.49	2.67	12.78	15.45	8.62	41.00
% within Gender	9.76	9.76	51.22	21.95	7.32	100.00
% within Skills	80.00	44.44	48.84	17.31	10.34	29.71
Total						
Count	5	9	43	52	29	138
Expected Count	5.00	9.00	43.00	52.00	29.00	138.00
% within Gender	3.62	6.52	31.16	37.68	21.01	100.00
% within Skills	100.00	100.00	100.00	100.00	100.00	100.00

The presence of self-attribution bias amongst investors also suggests overconfidence (Miller and Ross, 1975). Investors were asked to indicate what the mean reason for their success or failure in investing is. The results can be seen in Table 4.7. These results show that most respondents think the main reasons for their success are their research and their own skills. However, in the domain of failure most respondents think the main reason for their failure is just bad luck. Furthermore, out of the 34 investors that think they are skilled investors, 88% blame their failure on circumstances and only 12% blame it on themself. These findings are in line with several other studies on self-attribution bias and are a good indication of overconfidence according to Miller and Ross.

Table 4.7. Reason for success by reason for failure cross tabulation

			Failure		
Success	***Someone else's advice was wrong***	***Bad luck***	***I did not do enough research***	***I am not a skilled investor***	***Total***
Someone else gave me advice					
Count	13	5	5	2	25
% within Success	52.00	20.00	20.00	8.00	100.00
% within Failure	56.52	7.35	12.20	33.33	18.12
Luck					
Count	1	10	3	2	16
% within Success	6.25	62.50	18.75	12.50	100.00
% within Failure	4.35	14.71	7.32	33.33	11.59
I did a lot of good research					
Count	8	24	30	1	63
% within Success	12.70	38.10	47.62	1.59	100.00
% within Failure	34.78	35.29	73.17	16.67	45.65
I am a skilled investor					
Count	1	29	3	1	34
% within Success	2.94	85.29	8.82	2.94	100.00
% within Failure	4.35	42.65	7.32	16.67	24.64
Total					
Count	23	68	41	6	138
% within Success	16.67	49.28	29.71	4.35	100.00
% within Failure	100.00	100.00	100.00	100.00	100.00

4.3 Familiarity Bias

The Spearman's rank correlation test was used to test the presence of familiarity bias amongst the respondents. This measures the strength and direction of correlation between two variables measured on an ordinal scale like the 5-point Likert scale. All the variables have a monotonic relationship, which is one of the assumptions needed to use Spearman's rank correlation test.

Table 7.1 shows all the correlations between the familiarity of a company and an investor's likelihood to invest in that company. Adyen has the highest correlation coefficient of 0.8002. All the correlations are highly significant ($p = 0.0000$). These results suggest that the more familiar a respondent is with a company, the more likely this respondent is to invest in that company. These findings are consistent with several other studies on familiarity. This prejudice towards the familiar and the mistrust of the unfamiliar results in investors preferring to invest in securities that are familiar to them (Huberman, 2001).

5. Conclusion

The goal of this thesis was to shed some light on the question whether behavioural biases deteriorate investment decisions, specifically amongst Dutch individual investors. The results from the heads or tails lotteries showed the presence of loss aversion. Plotting the acceptance percentages even showed a similar concave value function as predicted by the prospect theory of Kahneman and Tversky. Further evidence showed that respondents were risk-averse for high probabilities of gains and low probabilities of losses and risk-seeking for low probabilities of gains and high probabilities of losses, which is in line with the fourfold pattern. However, there was not enough evidence to show that respondents violated the independence axiom. Nevertheless, I think there is sufficient evidence to conclude that loss aversion is present amongst Dutch individual investors. Previous literature has already shown that loss aversion can be seen in stock markets in a way that investors sell winning stocks too early and hold on to losing stocks for too long (Kahneman and Tversky, 1979). The presence of loss aversion in combination with previous findings on the disposition effect do suggest that loss aversion significantly deteriorates Dutch individual investors' investment decisions.

Results on overconfidence show that most investors consider themselves to be better than average, while non-investors consider themselves to be worse than average. This suggests that investors are indeed overconfident. These findings were reinforced with the

results on self-attribution, where 88% of all investors that said they were skilled investors blamed their failure on circumstances. There was also significant evidence of male investors being more overconfident than female investors. Male investors were significantly more likely to rate their investment skills above average compared to female investors. Previous literature already found that overconfidence can be the cause of a wide range of investment errors (Pressman, 1998). Overconfident investors are also expected to earn lower returns (Barber and Odean, 2000). Given these results, it can be said that overconfidence does significantly deteriorate investment decisions made by Dutch individual investors.

The presence of the familiarity bias has been tested by asking respondents how familiar they were with certain companies and how likely they were to invest in those companies. All companies were listed in the AEX index. The results show a significant correlation between familiarity and likelihood to invest for all companies. Adyen had the highest correlation with a correlation of 0.8002. These results suggest that the respondents were significantly more likely to invest in companies they were familiar with. Previous literature on familiarity shows that investors who hold familiar assets are more than twice as reluctant to realize losses (Bulipopova et al, 2014). This is in line with the disposition effect in loss aversion. This suggests that familiarity does significantly deteriorate investment decisions.

Evidence of all three biases being present amongst Dutch individual investors has been found. Each of these biases has their own negative impact on investment decisions which has been shown by previous literature. This does suggest that behavioural biases do significantly deteriorate investment decisions made by Dutch individual investors. However, the results could have some implications, because not all respondents have invested before. This has been tested separately for overconfidence, but not for loss aversion and familiarity. Therefore, it would also be interesting to test these biases on a sample of experienced Dutch individual investors.

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7. Appendix

Questionnaire

What is your gender?	Male/Female/Other
How old are you?	……..
Which country do you live in?	The Netherlands/Other

Question 1

Have you ever made an investment? Yes/No

Question 2

How would you rate your investing skills compared to other people?

Much better…Slightly better…Average…Slightly worse…Much worse

Question 3

If you were to make an investment, do you have confidence that you would beat the market?

1. *Yes, definitely*
2. *Yes, I have some confidence*
3. *No, I have no confidence*

Question 4.A

When you earn money with an investment, what is the reason for that?

1. *I am a skilled investor*
2. *I did good research*
3. *Luck*
4. *Someone else gave me advice*

Question 4.B

When you lose money with an investment, what is the reason for that?

1. *I am not a skilled investor*
2. *I did not do enough research*
3. *Bad luck*
4. *Someone else's advice was wrong*

Question 5

How familiar are you with the following companies?

Very familiar…Quite familiar…Know a little…Heard of it…Never heard of it

Question 6

How likely are you to buy shares in the different companies?

Very likely…Quite likely…I don't know…Probably not…Definitely not

Question 7

Are you willing to take part in the following lotteries?

Heads	***Tails***	
You WIN €50	*You LOSE €0*	*Yes/No*
You WIN €50	*You LOSE €10*	*Yes/No*
You WIN €50	*You LOSE €20*	*Yes/No*
You WIN €50	*You LOSE €30*	*Yes/No*
You WIN €50	*You LOSE €40*	*Yes/No*
You WIN €50	*You LOSE €50*	*Yes/No*
You WIN €50	*You LOSE €60*	*Yes/No*
You WIN €50	*You LOSE €70*	*Yes/No*

Question 8

Option A

Win €1000 with a probability of 5% or €0 otherwise

Option B

Win €50 guaranteed

Question 9

Option A

Win €1000 with a probability of 95% or €0 otherwise

Option B

Win €950 guaranteed

Question 10

Option A

Lose €1000 with a probability of 95% or €0 otherwise

Option B

Lose €950 guaranteed

Question 11

Option A

Lose €1000 with a probability of 5% or €0 otherwise

Option B

Lose €50 guaranteed

Question 12

Option A

Win €200 guaranteed

Option B

Win €200 with a probability of 89%

Win €1000 with a probability of 10%

Win €0 with a probability of 1%

Question 13

Option A

Win €200 with a probability of 11%

Win €0 with a probability of 89%

Option B

Win €1000 with a probability of 10%

Win €0 with a probability of 90%

Table 7.1. Non-parametric correlations between familiarity and likelihood to invest for each company

	Likelihood to Invest					
Familiarity	***Unilever***	***Prosus***	***Philips***	***Adyen***	***Aegon***	***ASM International***
Unilever						
Correlation	0.2886	-	-	-	-	-
Sig. (2-tailed)	0.0000	-	-	-	-	-
Prosus						
Correlation	-	0.6925	-	-	-	-
Sig. (2-tailed)	-	0.0000	-	-	-	-
Philips						
Correlation	-	-	0.3014	-	-	-
Sig. (2-tailed)	-	-	0.0000	-	-	-
Adyen						
Correlation	-	-	-	0.8002	-	-
Sig. (2-tailed)	-	-	-	0.0000	-	-
Aegon						
Correlation	-	-	-	-	0.5202	-
Sig. (2-tailed)	-	-	-	-	0.0000	-
ASM International						
Correlation	-	-	-	-	-	0.7704
Sig. (2-tailed)	-	-	-	-	-	0.0000