Erasmus University Rotterdam

Erasmus School of Economics

MSc thesis program Economics and Business Economics, *Behavioural Economics*

Strategy Economics track

The impact of personality traits on investment behaviour during disruptive events:

A case of the Covid-19 pandemic in the Netherlands

Author: Joëlle van Wijk

470941

Supervisor: Saeed Badri

Second assessor: David Gonzalez Jimenez

Date: 17-07-2023

Abstract

In today's uncertain environment, caused by disruptive events, it is of great relevance to understand how investors behave in times of financial uncertainty and how personality traits influence their decisions. The aim of this research paper is to shed light on how personality traits influenced investment behaviour during the Covid-19 pandemic in the Netherlands. For this, data was collected through a survey, with a final sample size equal to 137 observations. To measure the Big Five personality traits (agreeableness, neuroticism, extraversion, openness to experience and conscientiousness) the Mini-IPIP scale was used. A scale was constructed, and validated through factor analysis, to measure investment behaviour. After running multiple linear regression models, and logistic regression models for robustness check, it was found that the effect of neuroticism and conscientiousness on investment behaviour during the Covid-19 pandemic is negative. Contrarily, the effect of openness to experience was found to be positive. For agreeableness, although not significant, a negative relation is suggested. Lastly, for extraversion no effects were found. The results of this study may be considered relevant for financials advisors, to develop personalized and optimal investment strategies, based on the client's individual characteristics. Moreover, the findings also add to the behavioural finance literature; whilst existing studies focus on the role of personality traits on investment behaviour during regular financial conditions, this study focuses on investment behaviour under uncertain financial periods.

Keywords: investment behaviour; personality traits; shareholders; Covid-19 pandemic; linear regression model; logistic regression model

Table of Contents

1. Introduction

It is no news that the world in which we live is highly uncertain. Nevertheless, recent disruptive events have caused this uncertainty to take a new dimension, evoking crisis on top of crisis and impacting individual's everyday lives (UN Human Development Report, 2022). Examples of such disruptive events are the Covid-19 pandemic, the Russian-Ukraine war and the several recent natural disasters, as for instance the earthquake in Turkey in 2023. Ultimately, these events create a sense of insecurity and fear in society, impacting one's behaviour and way of living. According to the UN Human Development Report (2022), 6 out of 7 people, worldwide, feel insecure and unsettled faced with the several recent crises. For this research, the focus will lie on the impact of the Covid-19 pandemic.

Due to the uncertain state of the world that resulted from the pandemic, financial markets became highly volatile and unpredictable (Zhang et al., 2020). Consequently, this also impacted households' financial decisions. Overall, individuals became more risk averse and demonstrated less trust in the economy (Yue et. al, 2020; Komalasari, 2020). Li et al. (2020) found that the pandemic increased the likelihood of saving for Chinese households, as opposed to investing. Overall, the uncertainty that arose on the financial markets resulting from the pandemic, caused a shift in investors decisions. However, the role that personality traits played in this behavioural change is something that remains unclear.

Existing research suggests that the extent to which individuals are able to deal with uncertainty and risk is heavily dependent on their personality (Mayfield et. al., 2008). Uncertainty orientation is a concept introduced by Sorrento and Short (1986), which refers to the individual's ability to cope with uncertainty and actually getting motivated by it, instead of scared. Hodson and Sorrentino (1999) found that curious individuals, who prefer change over routine are highly uncertain oriented, hence they can easily deal with uncertain situations. On the other hand, individuals who prefer structure and value planned behaviour, are less able to deal with uncertainty. Moreover, research also suggests that one of the factors influencing the decisions of investors are their personal traits, among other factors such as demographics and the environment in which they encounter themselves (Sadiq & Amna, 2019). Consequently, this challenges the traditional economic theories of rationality, proposing that investors make their decisions as fully rational individuals. It is found that, specially under situations characterized by high uncertainty, investors are prone to behave in an irrational manner (Rizvi & Fatima, 2014).

It is clear from existing studies that personality traits influence both investor's decisions and one's ability to deal with uncertainty. However, little research has been done on the impact

of uncertainty, resulting from disruptive events, on investor's behaviour, and how this change in behaviour is related to their personality traits. Hence, the following paper will address this gap in literature.

The aim of this research is to understand how personality traits influenced investment behaviour of individual shareholders, in the Netherlands, during the Covid-19 pandemic. For the purpose of this research, personality traits will be defined following the Big Five Factor Model by McCrae and Costa (2003). Specifically, the following traits will be considered: agreeableness, neuroticism, extraversion, openness to experience and conscientiousness. Ultimately, the following research question will be answered:

To what extent did the Big Five personality traits impact individual's investment behaviour during the Covid-19 pandemic, in the Netherlands?

Considering the environment in which we live today, characterized by uncertainty, it seems essential to understand the influence this has on investment decisions based on one's personality, in order to obtain a superior understating of the investor, so that better financial decisions can be made. Thence, the contribution of this research is practical for financial advisors and policymakers as it may guide them to develop appropriate investment strategies and measures based on how individuals react and act under uncertainty. Moreover, the scope of this study is relevant for the field of behavioural finance, as it explores how personal characteristics play a role in the financial decisions made by investors. Whilst most of existing research on personality traits and investment behaviour was studied under "normal" financial conditions, this present study adds to literature as it focuses specifically on financial uncertain times (Sadiq & Azad, 2019; Mayfield et al., 2008; Sharma et al., 2022; Sadiq & Amna, 2019).

This study in divided into 7 sections. Hereafter, an overview of existing literature and research is provided on personality traits and investment behaviour. Next, the research methods will be explained, followed by the data analysis and the results. Lastly, a discussion and conclusion covering the main findings is given.

2. Literature Review

2.1. Agreeableness and investment behaviour during the pandemic

Agreeableness relates to trusting, generous, kind, and polite individuals (McCrae & Costa, 2003; McCrae & John, 2006). In general, these individuals tend to have a positive and secure view over the world (Alhenawi & Yazdanparast, 2021). According to Agbaria and Mokh

(2022), agreeableness is a favourable personality trait to have when being faced with uncertainty, as individuals scoring high on this trait are overall, able to handle stressful situations caused by crisis.

Sadiq and Azad (2019), while studying how personality traits influenced investment behaviour, found that agreeableness positively influenced the short term investment intentions of individuals. This implies that agreeable individuals rather focus on their short term financial goals instead of being future oriented. Alhenawi and Yazdanparast's (2021) study showed how financial vulnerability, induced by the Covid-19 pandemic, impacted individual's investment decisions. Financial vulnerability is defined as the feeling of being powerless when faced with a financial crisis situation. It was found that individuals who felt more vulnerable during the pandemic, were less likely to invest in stock and bonds (Alhenawi & Yazdanparast, 2021). Moreover, it was also found that personality influenced this degree of vulnerability felt by individuals. Specifically, individuals scoring high on agreeableness were less likely to feel vulnerable during the pandemic, hence more likely to still invest.

Considering these findings in literature, it is expected that individuals scoring high on agreeableness did not significantly suffer from the stress and uncertainty resulting from the pandemic. In this trend, it is likely that their investment behaviour did not change as they are rather able to deal with uncertainty. Thence, the following is expected:

H1: *The pandemic had a positive impact on investment behaviour for individuals scoring high on agreeableness.*

2.2. Neuroticism and investment behaviour during the pandemic

Neurotic individuals are prone to be more worrying, vulnerable, and emotional (McCrae & Costa, 2003; McCrae & John, 2006). Overall, neuroticism is associated with having a rather pessimistic view and being risk averse (Alhenawi & Yazdanparast, 2021). Following this, it was found that individuals scoring high on neuroticism tend to overreact in environments of uncertainty and are less able to cope with stressful situations (Agbaria & Mokh, 2022).

Moreover, it is suggested that neuroticism has a negative influence on one's intention to invest (Sadiq & Azad, 2019). In contrast to the findings related to agreeableness, Alhenawi and Yazdanparast (2021) found that neurotic individuals were more likely to experience high feelings of vulnerability during the pandemic, implying that they were less likely to make new investments and some individuals even sold their current ones. Ergo, considering that individuals scoring high on neuroticism preferably avoid uncertainty and that they are more

likely to overreact in times of crisis, such as during the Covid-19 pandemic, the succeeding hypothesis is suggested:

H2: *The pandemic had a negative impact on investment behaviour for individuals scoring high on neuroticism.*

2.3. Extraversion and investment behaviour during the pandemic

Individuals characterized as being extraverted exhibit social, outgoing, and enthusiastic traits (McCrae & Costa, 2003; McCrae & John, 2006). Overall, extraverted individuals tend to be overconfident and overly positive. Consequently, they can also more easily deal with stressful and uncertain events (Agbaria & Mokh, 2022). This is also reflected in their financial decisions, as they are rather risk seeking and tend to frequently invest in the stock market (Mayfield et al., 2008). Moreover, the relation between extraversion and one's intention to invest was found to be positive (Sadiq & Azad, 2019). Although Alhenawi and Yazdanparast (2021) did not study the effect of extraversion, they found that introverted individuals were more inclined to feeling financially vulnerable during the Covid-19 pandemic. Thence, the opposite effect can be expected for extraverted individuals. Considering these findings in literature, suggesting that extraverted individuals are overall, capable to handle uncertainty and that their attitude towards investing is positive, the following is expected to be found:

H3: *The pandemic had a positive impact on investment behaviour for individuals scoring high on extraversion.*

2.4. Openness to experience and investment behaviour during the pandemic

Openness to experience is related to curiosity, creativity, and originality (McCrae & Costa, 2003; McCrae & John, 2006). In general, individuals scoring high on openness to experience are able to deal with stress in a positive way, by not letting themselves getting overwhelmed by it. These individuals are more risk seeking, which is also reflected in their financial behaviour as they tend to frequently invest in the financial markets (Sadiq & Azad, 2019). Despite the fact that no significant relation was found between openness to experience and financial vulnerability during the pandemic, individuals scoring high on this trait intended to continue to invest in stock and bonds in the post-pandemic era (Alhenawi & Yazdanparast, 2021). This suggests that the Covid-19 pandemic did not negatively impact their investment behaviour. Hence, the next effect is proposed:

H4: *The pandemic had a positive impact on investment behaviour for individuals scoring high on openness to experience.*

2.5. Conscientiousness and investment behaviour during the pandemic

Individuals that are conscientious are responsible, organized and task-oriented (McCrae & Costa, 2003; McCrae & John, 2006). They tend to make their decisions deliberately and carefully. This is also reflected in their capacity to deal with uncertainty, stress, and risk, as they do not let themselves get affected by it (Agbaria & Mokh, 2022). When looking into investment behaviour, the relation between conscientiousness and one's investment intention was found to be positive (Sadiq & Azad, 2019). Moreover, Sharma et al. (2022) suggest that individuals scoring high on conscientiousness tend to be overconfident in their investment decisions, implying they are more willing to take risk and invest more often. Consequently, considering the ability of conscientious individuals to handle unpredictable situations and their positive attitude towards investment intentions the following is expected:

H5: *The pandemic had a positive impact on investment behaviour for individuals scoring high on conscientiousness.*

3. Research Methods

3.1. Data Collection

To test the hypotheses mentioned above and ultimately, answer the research question, quantitative research was used. Specifically, a within-subject online survey was distributed via Qualtrics. The target sample consisted of individuals, above 18 years old, who resided in the Netherlands during and at least 1 year prior to the Covid-19 pandemic. Moreover, these individuals had to own shares during the pandemic in order to belong to the target sample.

The survey consisted of three parts; first, questions about the individual's investment behaviour during the Covid-19 pandemic were asked. The second part consisted of statements pretraining to the respondent's Big Five personality traits. Lastly, questions concerning demographic characteristics were asked. In order to be able to fill in the survey, respondents first had to answer two screening questions. The first question asked whether the participants owned shares/stocks during the Covid-19 pandemic. The second question asked if the respondents lived in the Netherlands during and at least one year prior to the pandemic. In case the responses to these questions were negative, the survey would end. This way, it could be made sure that only the individuals belonging to the target sample would be included in the

data analysis. The length of the questionnaire was approximately 5 minutes. Moreover, before distributing the survey the ethical check was completed and approved.

The survey was distributed among relatives, friends, social platforms (Facebook and LinkedIn), survey platforms (SurveySwap and SurveyStudents) and lastly, to the VEB-Beleggersvereniging. Moreover, a snowball effect was created as family and friends spread the survey further. In total, 199 responses were collected. After cleaning the data, the final sample size was equal to 137 observations.

3.2. Variables and Measurements

3.2.1. Investment Behaviour

The dependent variable in this research corresponds to the positive investment behaviour of individual shareholders, during the Covid-19 pandemic in the Netherlands. In order to measure this, 5 statements were given to the respondents, which had to be ranked on a 5 point Likert-scale ranging from "strongly disagree" to "strongly agree" (Table 1). Each statement described a decision that the investor may have taken during the pandemic.

Table 1: Items for Investment Behaviour.

Variable Name	*Statement*
avoid_risky_investments	"During the pandemic, I avoided risky investments more often than before."
monitored_investments	"During the pandemic, I monitored my investments more frequently than before."
invested_more	"During the pandemic, I invested more often in shares/stocks than I did before."
sold_investments	"During the pandemic, I sold my equity (shares/stocks) investments due to the uncertainty in the financial markets."
diversified_portfolio	"During the pandemic, I diversified my portfolio."

The statements corresponding to the variables *avoid_risky_investments, monitored_investments* and *sold_investments,* are considered to be related to negative investment behaviour (Table 1). The reason being that these reflect more anxious and reactive investment decisions amidst the financial market volatility caused by the Covid-19 pandemic (Kiruba & Vasantha, 2021). On the other hand, the statements matching the variables *invested_more* and *diversified_portfolio* are related to more confident and proactive investment decisions thence, these are associated with positive investment behaviour.

To assess the validity of this measure, a factor analysis was conducted in the statistical software STATA. When analysing the correlation coefficients between the variables corresponding to each statement (Table 2), the positive and significant coefficient between avoiding risky investments and selling shares suggests that individuals who were more risk averse during the pandemic were also more inclined to sell their investments. Besides, monitoring the investments frequently is also positively correlated with avoiding risky investments and selling shares more often, suggesting that these three behaviours are related to each other. The positive and significant coefficient between diversifying the portfolio and investing more often indicates that shareholders who diversified their portfolio also saw the pandemic as a good opportunity to invest more frequently than they did before. Fundamentally, these correlation coefficients support the fact that a distinguishment can be made between two types of investment decisions: anxious and reactive, identified by *avoid_risky_investments, monitored_investments* and *sold_investments* and confident and proactive, identified by *invested_more* and *diversified_portfolio.*

Interestingly, when further analysing the sign of the coefficients of monitoring the investments more frequently than before*,* these are negative for investing more and positive for diversifying the portfolio (Table 2). This may suggest that this statement does not fully capture the underlying construct that is intended to be measured, namely positive investment behaviour. A possible explanation for this is that all individual shareholders during times of financial uncertainty carefully follow how their investments are performing, regardless of whether they make reactive or proactive investment decisions.

Table 2: Correlation coefficients for the variables measuring investment behaviour.

Spearman's rank correlation coefficients

Variables	avoid risky investments	monitored_ investments	invested_ more	sold_ investments	diversified_ portfolio
avoid_risky_investments	-				
monitored_investments	0.176**	-			
invested_more	-0.630***	-0.062	-		
sold_investments	0.407***	0.218**	-0.213**	-	
diversified_portfolio	-0.211**	0.357***	0.349***	-0.012	-

***p≤0.01 **p≤0.05 *p≤0.1

Factor Analysis

In order to conduct the factor analysis, the variables corresponding to reactive/negative investment behaviour (*avoid_risky_investments, monitored_investments* and *sold_investments*) were recoded, with the intention of their values being consistent with the underlying construct being studied namely, positive investment behaviour. The principal component analysis extraction method was used to extract the factors. When observing the factor loadings, the loadings of all the variables are significantly close or above the threshold of 0.4 except for the variable *monitored_investments* (Appendix B). A low factor loading suggests that this variable is not strongly related to the underlying concept that the factor is measuring (Mooi et al., 2018).

Moreover, the Cronbach's Alpha was estimated to assess the internal consistency of this scale (Appendix C). A high coefficient indicates that the statements are measuring the same underlying construct; positive investment behaviour (Tavakol & Dennick, 2011). When including *monitored_investments* in the scale, the overall Cronbach's Alpha is equal to 0.57, which lies bellow the threshold of 0.7. Additionally, the value of the item rest correlation coefficient for *monitored_investments* is significantly low (0.0326) compared to the other variables (Appendix C). Ergo, this suggests that this variable is not well aligned with the other variables in this scale and is not strongly related to the underlying principle being studied.

Consequently, based on these results and with the ultimate goal of increasing the validity and reliability of this study, it was decided to take the variable *monitored_investments* out of the scale measuring positive investment behaviour. When performing the factor analysis without this variable, one can observe that the factor loadings for all items are above the threshold of 0.4 (Appendix B). Furthermore, the Kaiser-Meyer-Olkin (KMO) value is equal to 0.59, implying that this data is suited for factor analysis (Mooi et al., 2018). Lastly, the Cronbach's Alpha becomes 0.65. Although this value still lies bellow 0.7, this may be due to the small sample size and this issue will be further addressed in the discussion part in Section 6.

The resulting factor was labelled *investment_behaviour,* and this variable captures a measure of investment behaviour during the Covid-19 pandemic in the Netherlands for individual shareholders. The variable takes values ranging from -2.10 to 1.82. This variable will be analysed as a continuous and a binary variable. A higher value of this variable suggests a more positive investment behaviour, reflected by being more active in the financial markets and diversifying the portfolio. Contrarily, a lower score indicates propensity to exhibit negative investment behaviour during the pandemic, reflected on becoming risk averse and less active on the financial markets by selling the current investments.

3.2.2. Big Five personality traits

The independent variable is personality traits. Specifically, the Big Five personality traits were measured: *agreeableness, neuroticism, extraversion, openness to experience* and *conscientiousness.* For this, the validated Mini-IPIP (International Personality Item Pool-Five-Factor-Model) was used by Donnellan et al. (2006). For each personality trait, respondents were given 4 statements which they had to answer on a 5 point Likert-scale, going from "strongly disagree" to "strongly agree" (Table 3).

Table 3: Items for each of the Big Five personality traits.

Variable Name	*Statements*
Agreeableness	1. I sympathize with others' feelings. 2. I am not interested in other people's problems. 3. I feel others' emotions. 4. I am not really interested in others.
Neuroticism	1. I have frequent mood swings. 2. I am relaxed most of the time. 3. I get upset easily. 4. I seldom feel blue.
Extraversion	1. I am the life of the party. 2. I don't talk a lot. 3. I talk to a lot of different people. 4. I keep myself in the background.
Openness to experience	1. I have vivid imagination. 2. I am not interested in abstract ideas. 3. I have difficulty understanding abstract ideas. 4. I don't have a good imagination.
Conscientiousness	1. I get chores done right away. 2. I often forget to put things back in their proper place. 3. I like order. 4. I make a mess of things.

Note: To create the five independent variables, items 2 and 4 for Agreeableness, Neuroticism, Extraversion and Conscientiousness and items 2,3 and 4 for Openness to experience were recoded.

For each personality trait the average score was computed in order to create five independent variables. Each personality trait will be treated as a continuous variable, ranging from 1 to 5. In Table 4, the distributions of agreeableness, neuroticism, extraversion, openness to experience and conscientiousness can be found.

Table 4: Distribution of the independent variables.

Variables	Mean	Std. Deviation
Agreeableness	3.85	0.74
Neuroticism	2.29	0.87
Extraversion	3.60	0.86
Openness to Experience	3.85	0.81
Conscientiousness	3.94	0.75

3.2.3. Demographics

Previous research found that age, gender, nationality, education, income, and employment status are likely to influence one's investment behaviour (Dash, 2010; Fellner & Maciejovsky, 2007; Fares & Khamis, 2011; Rizvi & Fatima, 2015; Mak & IP, 2017). Hence, in order to be able to control for this, this demographic information was collected from the respondents. The questions had to be answered considering the situation during the Covid-19 pandemic. An outline of the questions can be found in Appendix A. The variables of *age, gender, nationality, education, income,* and *employment* will be treated as categorical variables. The respective categories for each variable can be found in Table 5.

The majority of the respondents (28%) were between 18 and 24 years old during the pandemic. Moreover, 50% was male. The nationalities of the participants in the survey were all from countries member of the European Union, with most of them being Dutch (85%). Regarding education and employment status, around 56% of the respondents had a master's University degree and were employed full-time. In Table 5, a full overview of the descriptive statistics of the sample concerning demographic characteristics can be found.

Table 5: Demographic characteristics of the sample.

Variable	*Percentage*
Age	
18-24	27.74%
25-34	24.82%
35-44	18.98%
45-54	15.33%
55-64	10.22%
65+	2.92%
Gender	
Male	50.36%
Female	46.72%
Prefer not to say	2.92%
Nationality	
Belgian	2.19%
British	0.73%
Dutch	84.67%
French	1.46%
German	4.38%
Portuguese	5.11%
Spanish	1.46%
Education	
Higher education	4.38%
Secondary vocational degree	0.73%
Applied university degree	12.41%
Bachelor university degree	24.82%
Master university degree	56.20%
PhD/Other higher education	1.46%
Yearly Income	
< € 15 000	29.20%
€15000 - €30000	8.76%
€30000 - €45000	18.98%
>€45000	35.04%
Prefer not to say	8.03%
Employment Status	
Employed full-time	56.93%
Employed part-time	10.95%
Unemployed	0.73%
Retired	2.92%
Student	25.55%
Prefer not to say	2.92%

4. Data Analysis

4.1. OLS Regression Model

Multiple linear regression models were ran in STATA, to examine the impact of each of the Big Five personality traits on the investment behaviour of individual shareholders during the Covid-19 pandemic in the Netherlands. The estimated models can be found in the equations 4.1.1., 4.1.2., 4.1.3., 4.1.4. and 4.1.5. Here, *investment behaviour*, the dependent variable, is regressed against *agreeableness, neuroticism, extraversion, openness to experience* and *conscientiousness* with *age*, *nationality*, *gender*, *education*, *income*, and *employment* as control variables.

Equation 4.1.1: OLS equation with Agreeableness as independent variable.

$$Investment\_Behaviour_i = \beta_0 + \beta_1 Agreeableness_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o} + \varepsilon_i$$

Equation 4.1.2: OLS equation with Neuroticism as independent variable.

$$Investment\_Behaviour_i = \beta_0 + \beta_1 Neuroticism_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o} + \varepsilon_i$$

Equation 4.1.3: OLS equation with Extraversion as independent variable.

$$Investment\_Behaviour_i = \beta_0 + \beta_1 Extraversion_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o} + \varepsilon_i$$

Equation 4.1.4: OLS equation with Openness to Experience as independent variable.

$$Investment\_Behaviour_i = \beta_0 + \beta_1 Openness\_to\_Experience_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_7 Employment_{i,o} + \varepsilon_i$$

Equation 4.1.5: OLS equation with Conscientiousness as independent variable.

$$Investment\_Behaviour_i = \beta_0 + \beta_1 Conscientiousness_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o} + \varepsilon_i$$

Where $Age_{i,j}$ refers to age *j* from individual *i,* with *i* belonging to a set of all individuals, *i*= {1, …, 137} and *j* belonging to the set *j*= {1: "18-24", 2: "25-34", 3: "35-44", 4: "45-54", 5: "55-64", 6: "65+"}, with nationality *k,* where *k* belongs to the set *k*= {1: "Belgian", 2: "British", 3: "Dutch", 4: "French", 5: "German", 6: "Portuguese", 7: "Spanish"}, with gender *l*, with *l* belonging to the set *l*= {1: "Male", 2: "Female", 3: "Prefer not to say"}, having education level *m,* where *m* belongs to *m*= {1: "Higher education", 2: "Secondary vocational degree", 3: "Applied university degree", 4: "Bachelor university degree", 5: "Master university

degree", 6: "PhD/Other higher education"}, with income level *n,* with *n* belonging to the set *n*= {1: "<€15000", 2: "€15000-€30000", 3: "€30000-€45000", 4: ">€45000", 5: "Prefer not to say"}, and lastly with employment status *o*, where *o* belongs to the set *o*= {1: "Employed full-time", 2: "Employed part-time", 3: "Unemployed", 4: "Retired", 5: "Student", 6: "Prefer not to say"}. Moreover, ε represents the unobserved error term, following a normal distribution with mean 0 and a variance equal to σ^2.

4.2. Robustness check: Logistic Regression Model

Additionally, a logistic regression model was used for the purpose of conducting a robustness check. By implementing a different model to analyse the data, the robustness of the findings of the OLS model can be verified, which strengthens the validity and reliability of the obtained results.

In order to apply this statistical model, the dependent variable *investment_behaviour* was transformed into a binary variable. Originally, the dependent variable was a continuous variable, with a minimum value equal to -2.10 and a maximum value of 1.83. Hence, in order to transform it into a dummy variable, the values ranging from -2.10 until 0 were recoded to 0. The values going from 0 to 1.83 were recoded to 1. Consequently, if the dummy variable for *investment_behaviour* is equal to 0 then the observed investment behaviour during the pandemic is likely to be more negative. The reasoning behind this is that it is assumed that the variable *investment_behaviour* takes negative values for individuals who exhibited more negative investment behaviour, reflected by avoiding risky investments and selling shares. On the other hand, it is assumed that *investment_behaviour* takes positive values for individuals who displayed positive investment behaviour, by investing more often and diversifying their portfolio. Thus, if the dependent variable takes value 1, the individual exhibited more positive and proactive investment behaviour during the Covid-19 pandemic.

In total, 5 different logit regression models were ran in STATA; one for each personality trait. Equations 4.2.1., 4.2.2., 4.2.3., 4.2.4. and 4.2.5. display the logit regressions for the different independent variables corresponding to the Big Five personality traits. The outcome variable, which can be found on the left hand side of the equations, is equal to the natural logarithm of the ratio of the probability of the dummy for *investment_behaviour* being 1 to the probability of the dummy for *investment_behaviour* being 0. On the right hand side of the equations, β_0 represents the intercept and β_1, β_2, β_3, β_4, β_5, β_6 and β_7 are the coefficients for the independent variables. Ultimately, with this model one is able to analyse the effect that

having a higher score on a certain personality trait has on the probability of the investment behaviour during the Covid-19 pandemic in the Netherlands being more positive.

Equation 4.2.1: Logit model equation with Agreeableness as independent variable.

$$Log\left(\frac{\Pr(Y=1)}{\Pr(Y=0)}\right) = \beta_0 + \beta_1 Agreeableness_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o}$$

Equation 4.2.2: Logit model equation with Neuroticism as independent variable.

$$Log\left(\frac{Pr(Y=1)}{Pr(Y=0)}\right) = \beta_0 + \beta_1 Neuroticism_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o}$$

Equation 4.2.3: Logit model equation with Extraversion as independent variable.

$$Log\left(\frac{\Pr(Y=1)}{\Pr(Y=0)}\right) = \beta_0 + \beta_1 Extraversion_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o}$$

Equation 4.2.4: Logit model equation with Openness to Experience as independent variable.

$$Log\left(\frac{\Pr(Y=1)}{\Pr(Y=0)}\right) = \beta_0 + \beta_1 Openness\_to\_Experience_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o}$$

Equation 4.2.5: Logit model equation with Conscientiousness as independent variable.

$$Log\left(\frac{\Pr(Y=1)}{\Pr(Y=0)}\right) = \beta_0 + \beta_1 Conscientiousness_i + \beta_2 Age_{i,j} + \beta_3 Nationality_{i,k} + \beta_4 Gender_{i,l} + \beta_5 Education_{i,m} + \beta_6 Income_{i,n} + \beta_7 Employment_{i,o}$$

Where $\text{Age}_{i,j}$ refers to age *j* from individual *i,* with *i* belonging to a set of all individuals, *i*= {1, …, 137} and *j* belonging to the set *j*= {1: "18-24", 2: "25-34", 3: "35-44", 4: "45-54", 5: "55-64", 6: "65+"}, with nationality *k,* where *k* belongs to the set *k*= {1: "Belgian", 2: "British", 3: "Dutch", 4: "French", 5: "German", 6: "Portuguese", 7: "Spanish"}, with gender *l*, with *l* belonging to the set *l*= {1: "Male", 2: "Female", 3: "Prefer not to say"}, having education level *m,* where *m* belongs to *m*= {1: "Higher education", 2: "Secondary vocational degree", 3: "Applied university degree", 4: "Bachelor university degree", 5: "Master university degree", 6: "PhD/Other higher education"}, with income level *n,* with *n* belonging to the set *n*= {1: "<€15000", 2: "€15000-€30000", 3: "€30000-€45000", 4: ">€45000", 5: "Prefer not to say"}, and lastly with employment status *o*, where *o* belongs to the set *o*= {1: "Employed full-

time", 2: "Employed part-time", 3: "Unemployed", 4: "Retired", 5: "Student", 6: "Prefer not to say"}.

Before running the regression models, a matrix with the correlation coefficients between the demographic variables and the variables of interest is presented in Table 6. Signs of multicollinearity between the independent variables may be recognized by high significant coefficients. However, in this case the correlation coefficients are rather low and not close to 1 thence, no issues of multicollinearity are suggested between the predictor variables.

Further, a significant positive association is found between extraversion, openness to experience and investment behaviour $(\rho = 0.176; p \leq 0.05)$ $(\rho = 0.395; p \leq 0.01)$, as proposed in literature (Sadiq & Azad, 2019). Contrarily, the association between investment behaviour and conscientiousness and neuroticism is found to be negative $(\rho = -0.274; p \leq 0.01)$ $(\rho = -0.256; p \leq 0.01)$. These findings suggest that individuals with higher neurotic and conscientious personality traits exhibited more negative investment behaviour during the pandemic.

Table 6: Correlation coefficients for the dependent and independent variables.

Spearman's rank correlation coefficients

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) investment_behaviour	-											
(2) extraversion	0.176**	-										
(3) agreeableness	-0.080	0.342***	-									
(4) conscientiousness	-0.274***	-0.050	-0.096	-								
(5) neuroticism	-0.256***	-0.270***	0.219*	-0.138	-							
(6) openness_to_experience	0.395***	0.522***	-0.001	0.048	-0.572***	-						
(7) age	-0.149*	-0.022	-0.177**	0.197**	-0.276***	0.208**	-					
(8) Nationality	-0.113	-0.041	0.101	-0.047	0.269***	-0.119	-0.246***	-				
(9) gender	-0.261***	-0.090	0.065	-0.139	0.330***	-0.305***	-0.224***	0.098	-			
(10) education	0.031	0.144*	-0.008	0.214***	-0.238***	0.308***	0.501***	0.033	-0.142*	-		
(11) income	0.004	-0.013	-0.311***	0.236***	-0.345***	0.202**	0.760***	-0.218**	-0.255***	0.450***	-	
(12) employment	-0.182*	-0.131	0.203**	-0.146*	0.176**	-0.257***	-0.406***	0.036	0.270***	-0.353***	-0.555***	-

***p≤0.01 **p≤0.05 *p≤0.1

5. Main Findings

5.1. Results of OLS Regression Model

In order to test the hypotheses of this research, OLS regression models were used. In these models, *investment behaviour* represents the outcome variable and *agreeableness*, *neuroticism, extraversion*, *openness to experience* and *conscientiousness* are the independent variables, as mentioned in Section 4.1. The output of the regression models can be found in Table 7. The R-squared value of these models ranges between 0.350 and 0.453, indicating a moderate explanatory power.

When analysing the regression coefficients, although not statistically significant, a negative relation is suggested between agreeableness and positive investment behaviour. Moreover, besides not being significant, the size of the coefficient for extraversion is extremely small and close to 0, indicating that this personality trait did not have a clear impact on investment behaviour during the Covid-19 pandemic in the Netherlands.

For the personality trait of neuroticism, the following conclusion can be made; scoring one point higher on this personality trait, decreased the positive investment behaviour during the Covid-19 pandemic in the Netherlands by 0.326 points, holding all else constant. This effect is statistically significant at a 1% significance level. Consequently, this implies that individuals who identify themselves as being more vulnerable, anxious, and worrying, were less likely to take new risks during the pandemic by means of making new investments and diversifying the portfolio and were more prone to avoid the uncertainties of the financial markets by selling their investments and becoming more risk averse.

On the other hand, individuals scoring higher on openness to experience showed more risk taking initiatives and activity on the financial markets. Specifically, for a shareholder scoring one point higher on openness to experience, the positive investment behaviour increased with 0.494 points, ceteris paribus. This effect is statistically significant at a 1% significance level. This result is in line with previous research, suggesting that individuals who are curious and open-minded are more risk seeking, which is translated to their investment behaviour by being active on the financial markets and investing often (Sadiq & Azad, 2019).

Lastly, the coefficient of conscientiousness suggests a negative relation between this personality trait and investment behaviour; scoring one point higher on conscientiousness decreased the positive investment behaviour for individual shareholders, during the pandemic, with 0.387 points, ceteris paribus. This effect is statistically significant at a 1% significance level. These findings imply that individuals who act carefully, are responsible and organized

became less financially active during the pandemic and did not take new risks by making more or new investments. Interestingly, this finding goes against what was previously found; that conscientious individuals tend to be rather overconfident in their investment decisions and are inclined to make investments frequently and face risks (Sharma et al., 2022).

Moreover, when interpreting the coefficients for the demographic variables age, gender and income, the findings are interesting. Specifically, the decreasing values of the coefficients suggest that the effect of age on positive investment behaviour becomes more negative as individuals get older. For individuals in the age category of 45-54, compared to individuals in the age category of 18-24, the positive investment behaviour decreased with 0.814 points, ceteris paribus. Being in the age category of 55-64, decreased the positive investment behaviour during the Covid-19 pandemic in the Netherlands, compared to being between 18 and 24 years old, with 1 point, holding all else constant. For individuals who were 65 years or above, this effect size is equal to a decrease of 1.405 points. These effects are all significant at a 10% significance level. For gender, the results indicate that being female, compared to being male, had a negative effect on the investment behaviour during the pandemic. Concretely, being female decreased the positive investment behaviour with 0.583 points, compared to being male, ceteris paribus. This effect is significant at a 1% significance level. Lastly, the relation between income and investment behaviour was found to be positive. Having an income during the pandemic between €15000-30000, compared to receiving less than €15000, increased the positive investment behaviour with 0.923 points, holding all else fixed. This effect is significant at a 1% significant level.

Table 7: OLS regression model output for investment behaviour.

Independent Variables	(1) Agreeableness	(2) Neuroticism	(3) Extraversion	(4) Openness To Experience	(5) Conscientiousness
Constant	0.395	0.739	-0.257	-1.533**	1.443*
	(0.925)	(0.695)	(0.850)	(0.704)	(0.832)
Agreeableness	-0.140				
	(0.128)				
Neuroticism		-0.326***			
		(0.118)			
Extraversion			0.0265		
			(0.119)		
Openness to Experience				0.494***	
				(0.122)	
Conscientiousness					-0.387***
					(0.108)
Age					
25-34	0.0772	0.287	0.103	0.0863	0.0156
	(0.419)	(0.411)	(0.405)	(0.384)	(0.327)
35-44	-0.0806	0.0635	-0.103	-0.207	-0.0934
	(0.471)	(0.451)	(0.457)	(0.435)	(0.390)
45-54	-0.814*	-0.588	-0.817*	-0.779*	-0.797*
	(0.490)	(0.476)	(0.482)	(0.478)	(0.414)
55-64	-0.999*	-0.713	-0.992*	-0.921*	-1.021**
	(0.534)	(0.511)	(0.528)	(0.526)	(0.453)
65+	-1.405*	-1.079	-1.524	-0.922	-1.398*
	(0.764)	(0.809)	(0.805)	(0.897)	(0.709)
Nationality					
British	0.429	0.780	0.504	1.163*	0.327
	(0.695)	(0.580)	(0.755)	(0.608)	(0.664)
Dutch	0.0245	-0.144	-0.0159	-0.245	-0.0180
	(0.615)	(0.481)	(0.662)	(0.522)	(0.589)
French	-1.594	-1.223	-1.442	-1.409**	-1.415
	(1.106)	(0.821)	(1.045)	(0.551)	(1.118)
German	0.250	0.266	0.196	0.136	0.147
	(0.713)	(0.547)	(0.739)	(0.575)	(0.682)
Portuguese	-0.592	-0.444	-0.553	-0.351	-0.658
	(0.648)	(0.487)	(0.686)	(0.535)	(0.620)
Spanish	-0.715	-0.723	-0.921	-1.177	-1.220
	(1.296)	(1.207)	(1.287)	(1.033)	(0.865)
Gender					
Female	-0.583***	-0.427*	-0.600***	-0.412**	-0.563***

	(0.211)	(0.221)	(0.215)	(0.201)	(0.205)
Prefer not to say	0.573	0.467	0.576	0.492	-0.0190
	(0.494)	(0.472)	(0.510)	(0.455)	(0.504)
Education					
Secondary vocational	1.250*	1.246*	1.149*	1.199	1.031
	(0.693)	(0.649)	(0.692)	(0.782)	(0.677)
Applied university	0.547	0.447	0.585	0.193	0.708
	(0.392)	(0.426)	(0.403)	(0.483)	(0.446)
Bachelor university	0.447	0.226	0.452	0.0989	0.396
	(0.352)	(0.401)	(0.376)	(0.438)	(0.404)
Master university	0.688	0.387	0.669	0.126	0.813*
	(0.409)	(0.457)	(0.430)	(0.498)	(0.451)
PhD/other higher educ.	1.197*	1.227*	1.253*	0.822	1.549**
	(0.618)	(0.720)	(0.678)	(0.774)	(0.658)
Income					
€15000-30000	0.923***	0.968***	0.901***	0.910**	0.584*
	(0.337)	(0.331)	(0.328)	(0.332)	(0.303)
€30000-45000	-0.160	-0.177	-0.101	-0.0885	-0.235
	(0.412)	(0.395)	(0.402)	(0.382)	(0.358)
>€45000	0.137	0.122	0.233	0.291	0.142
	(0.407)	(0.402)	(0.406)	(0.394)	(0.364)
Prefer not to say	-0.196	-0.222	-0.0568	0.0669	-0.0736
	(0.446)	(0.426)	(0.430)	(0.407)	(0.358)
Employment status					
Employed part-time	0.137	-0.0164	0.160	0.131	0.0489
	(0.312)	(0.325)	(0.334)	(0.316)	(0.346)
Unemployed	-0.700	-0.420	-0.536	-0.332	-0.310
	(0.628)	(0.658)	(0.657)	(0.705)	(0.659)
Retired	-0.0495	-0.328	0.0644	-0.336	0.0303
	(0.507)	(0.623)	(0.583)	(0.628)	(0.536)
Student	0.0900	0.223	0.109	0.0994	-0.0115
	(0.320)	(0.318)	(0.326)	(0.348)	(0.293)
Prefer not to say	-0.428	-0.494	-0.455	-0.660	-0.671
	(0.528)	(0.547)	(0.495)	(0.497)	(0.443)
Observations	137	137	137	137	137
R^2	0.357	0.396	0.350	0.453	0.409

Robust standard errors in parentheses
***p≤0.01 **p≤0.05 *p≤0.1

5.2. Results of Logistic Regression Model

In Table 8, the regression coefficients of the logit model are displayed. In Appendix D, the average marginal effects can be found. Here, the outcome variable is equal to investment behaviour, which was transformed into a binary variable in order to be able to apply the logit model. This model was used with the means of conducting a robustness check, to ultimately increase the validity of this study, by cross-checking the findings of the linear regression model in Section 5.1.

When analysing the coefficients, the ones for neuroticism and openness to experience were found to be significant. Specifically, on average, for an individual who scores one point higher on the neuroticism personality trait, the likelihood of exhibiting positive investment behaviour decreases with 18.1 percentage points, ceteris paribus. This effect is statistically significant at a 1% significance level. Considering openness to experience, on average, scoring one point higher on this personality trait increases the likelihood of displaying positive investment behaviour during the Covid-19 pandemic in the Netherlands with 19.4 percentage points, holding all else constant. This effect is statistically significant at a 1% significance level. Both of these findings are in line with the above discussed results (Section 5.1.), when implementing the OLS regression model

Interestingly, the sign of the coefficient of extraversion is negative, whilst with the OLS model this was positive. However, in line with what was found with the OLS model, the size of the coefficient is extremely close to 0, suggesting no effect of this personality trait on investment behaviour in the Netherlands, during the Covid-19 pandemic. Moreover, similarly with the OLS regression model, for agreeableness, the logit model suggests a negative association with positive investment behaviour, despite not significant. For conscientiousness, although not statistically significant, the negative sign of the coefficient proposes a negative association between this personality trait and investment behaviour, confirming the findings of OLS model.

Conclusively, the effects suggested by the linear regression model for neuroticism, openness to experience, agreeableness and conscientiousness on positive investment behaviour are not an artifact of using this particular estimation technique. The findings for these specific personality traits are aligned between the OLS and the logit model, implying that the relations found are robust, increasing the validity of the results and strengthening the drawn conclusions. For extraversion despite the signs of the coefficients not being aligned between the two models, they are not statistically significant and are remarkably close to 0, indicating that there may be

no substantial influence of extraversion on investment behaviour during the Covid-19 pandemic in the Netherlands.

Table 8: Logistic regression model output for investment behaviour.

Independent Variables	(1) Agreeableness	(2) Neuroticism	(3) Extraversion	(4) Openness to Experience	(5) Conscientiousness
Constant	0.417 (2.120)	3.508 (2.395)	0.171 (1.710)	-2.854 (1.877)	2.103 (2.301)
Agreeableness	-0.0948 (0.376)				
Neuroticism		-1.068** (0.454)			
Extraversion			-0.0468 (0.313)		
Openness to Experience				1.154** (0.464)	
Conscientiousness					-0.467 (0.331)
Age[1]					
25-34	1.902** (0.928)	2.478*** (0.950)	1.917** (0.936)	1.816** (0.973)	1.762** (0.895)
35-44	1.477 (1.105)	2.020 (1.107)	1.465* (1.101)	1.178 (1.150)	1.385 (1.076)
45-54	-0.683 (1.235)	0.0724 (1.238)	-0.702 (1.255)	-0.608 (1.270)	-0.667 (1.220)
55-64	-0.402 (1.309)	0.541 (1.314)	-0.430 (1.314)	-0.248 (1.414)	-0.485 (1.274)
Nationality[2]					
Dutch	0.0441 (1.154)	-0.729 (1.271)	0.00818 (1.126)	-0.728 (1.247)	-0.0804 (1.133)
German	0.610 (1.531)	0.532 (1.513)	0.546 (1.484)	0.271 (1.463)	0.397 (1.486)
Portuguese	-2.162* (1.241)	-2.171 (1.464)	-2.191* (1.256)	-2.215 (1.413)	-2.290 (1.244)
Spanish	-1.038 (1.799)	-0.979 (1.847)	-1.159 (1.717)	-2.169 (1.599)	-1.663 (1.576)
Gender					
Female	-1.488*** (0.544)	-1.042* (0.602)	-1.512*** (0.557)	-1.242** (0.545)	-1.466*** (0.553)

[1] Category *65+* was omitted due to too little observations

[2] Category *British* and *French* were omitted due to too little observations

Prefer not to say	-0.0713	-0.880	-0.0977	-0.557	-0.952
	(1.487)	(1.462)	(1.444)	(1.510)	(1.490)
Education[3]					
Applied university	0.386	0.0693	0.459	-0.457	0.524
	(1.249)	(1.852)	(1.254)	(1.921)	(1.356)
Bachelor university	-0.157	-1.044	-0.0869	-1.099	-0.231
	(1.121)	(1.886)	(1.180)	(1.865)	(1.282)
Master university	0.156	-0.844	0.211	-1.067	0.275
	(1.230)	(2.000)	(1.278)	(1.988)	(1.339)
Income					
€15000-30000	1.612*	1.829*	1.613*	1.614*	1.255
	(0.836)	(0.936)	(0.844)	(0.905)	(0.847)
€30000-45000	-0.584	-0.785	-0.546	-0.430	-0.613
	(0.951)	(0.976)	(0.948)	(0.974)	(0.922)
>€45000	-0.500	-0.978	-0.432	-0.448	-0.475
	(1.026)	(1.058)	(0.988)	(1.009)	(0.989)
Prefer not to say	-1.587	-2.233	-1.505	-1.237	-1.318
	(1.731)	(1.700)	(1.622)	(1.718)	(1.624)
Employment status[4]					
Employed part-time	0.362	-0.263	0.409	0.377	0.243
	(0.897)	(0.908)	(0.926)	(0.876)	(0.905)
Student	0.872	1.276	0.879	1.019	0.730
	(1.016)	(1.006)	(1.023)	(1.123)	(1.002)
Observations	124	124	124	124	124
Pseudo R^2	0.209	0.265	0.209	0.269	0.220

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

6. Discussion

The aim of this study is to understand the influence of personality traits on investment behaviour of individual shareholders, during the Covid-19 pandemic in the Netherlands. Ultimately, the following research question was answered: *To what extent did the Big Five personality traits impact individual's investment behaviour during the Covid-19 pandemic, in the Netherlands?*

Quantitative research was used to answer the above research question and data was collected through a survey. The questionnaire was distributed amongst individual shareholders, who lived in the Netherlands one year prior and during the Covid-19 pandemic. The final

[3] Category *Secondary vocational degree* and *PhD/other higher education* were omitted due to too little observations
[4] Category *Unemployed*, *Retired* and *Prefer not to say* were omitted due to too little observations

sample consisted of 137 observations. In order to measure investment behaviour, the dependent variable, a scale was developed which was validated through factor analysis. This scale consisted of four different items, each reflecting a financial decision that an investor may have taken during the pandemic. Moreover, to measure the independent variables corresponding to the Big Five personality traits (agreeableness, neuroticism, extraversion, openness to experience and conscientiousness) the Mini-IPIP scale was used. Lastly, age, gender, nationality, education, income, and employment status were used as control variables. To analyse the data, linear regression models were used. Additionally, logistic regression models were applied to conduct a robustness check and validate the findings. For the linear regression, investment behaviour was inserted as a continuous variable into the model. For the logistic regression model, this variable was transformed into a binary variable.

Although not significant, the results suggest a negative relation between agreeableness and investment behaviour during the Covid-19 pandemic. These findings go against what was stated in Hypothesis 1. Based on existing literature, which suggests a positive relation between agreeableness and capability of handling uncertainty and investment intention, it was expected that agreeable individuals would exhibit positive investment behaviour during the pandemic (Agbaria & Mokh, 2022; Sadiq & Azad, 2019). A possible explanation for this opposite effect that what was found is that, although it is proposed in literature that agreeable individuals are prone to have a positive and confident attitude when faced with stress and also tend to invest often during normal financial conditions, this may not apply to situations characterized by financial uncertainty. However, as these results were not significant further research is recommended to be able to make inferences about this relation.

For neuroticism, the findings of this research support Hypothesis 2; the pandemic had a negative impact on investment behaviour for individual shareholders scoring high on neuroticism ($\beta_1 = -0.326,\ p \leq 0.01$). Consequently, this implies that the anxiety and worriness that characterizes neurotic individuals was also translated to their investment decisions during the pandemic in the Netherlands. These individuals displayed higher tendency to avoid risky investments more often than before the pandemic, and to sell their investments. These results build on the existing evidence that the relation between neuroticism and investment intention, during normal financial times, is negative and that neurotic individuals are prone to overreact in situations characterized by uncertainty (Sadiq & Azad, 2019; Agbaria & Mokh, 2022).

With regards to extraversion, the size of the coefficient was found to be surprisingly close to 0, both with the linear and the logit regression model. This suggests that extraversion,

as a personality trait, did not influence the investment behaviour of individual shareholders in the Netherlands during the Covid-19 pandemic. Moreover, the sign of the coefficient varies between the OLS model and the logit model. Ergo, the results are inconclusive and Hypothesis 3 cannot be accepted nor rejected. Further research is recommended to explore the relation between extraversion and investment behaviour during financial uncertain times.

The findings of this study support Hypothesis 4; the effect of openness to experience on investment behaviour during the pandemic was found to be positive ($\beta_1 = 0.494, p \leq 0.01$). This implies that curious, intellectual, and creative individuals were confident and proactive in their investments decisions during the Covid-19 pandemic in the Netherlands. Additionally, this is in line with existing research proposing that individuals scoring high on openness to experience are risk seeking in their investment decisions and able to deal with uncertain situations (Sadiq & Azad, 2019). Ultimately, individuals scoring high on openness to experience do not display a different investment behaviour during financial uncertain times.

Lastly, the results of this research indicate that the effect of conscientiousness on investment behaviour during the pandemic is negative ($\beta_1 = -0.387$, $p \leq 0.01$). Although literature suggests that conscious individuals are rather confident in their investment decisions and inclined to take risks, they also tend to take careful and deliberate decisions (Sadiq & Azad, 2019; Rizvi and Fatima, 2015). Hence, whilst in times of normal financial conditions this personality trait is associated with risk seeking and overconfident investment behaviour, the findings of this present study suggest that when faced with volatile and unpredictable financial markets, they become more risk averse and less confident. Consequently, based on these findings, Hypothesis 5 is rejected.

Interesting findings were obtained for age and gender. For age, the decreasing size of the coefficient suggests that, as individuals got older, the effect on positive investment behaviour during the Covid-19 pandemic became more negative. This implies that older individuals were less likely to take financial risks by investing more and diversifying their portfolio. Instead, they avoided risky investments and were more inclined to sell their shares, faced with the uncertainty. This is in line with the findings of Brooks et al. (2018), who found that as investors get older, the willingness to take financial risk becomes smaller. Conclusively, this also applies to uncertain financial times. Regarding gender, the relation between being female and positive investment behaviour, compared to being male, was found to be negative. This indicates that females were less likely to engage in confident and active investment behaviour and were more prone to avoid risky investments and sell their shares during the pandemic. Ultimately, these results follow the findings by Fellner and Maciejovsky (2007),

who concluded that women overall engage less in the financial markets and are more risk averse.

This study faces several limitations; hence the results should be carefully interpreted. Firstly, the sample size is significantly small. Consequently, not all categories of the demographic variables could be estimated when using the logit regression model. Additionally, the small sample size may also be a possible justification for the Cronbach's Alpha for the measurement of investment behaviour to be bellow the threshold of 0.7. A coefficient smaller than 0.7 indicates rather low internal consistency of the items used to measure investment behaviour. Besides the restricted number of observations, the fact that the scale used to measure investment behaviour solely consists of four items may have also led to the low Cronbach's Alpha. Moreover, respondents answered the survey in the post-pandemic period. Hence, it may be the case that the way investment behaviour was measured induces recall bias. This implies that respondents do not accurately recall their investment behaviour before the pandemic, and how this changed during the pandemic. Ultimately, this type of bias may impact the validity and reliability of the results. Lastly, the generalizability of the results of this study are rather limited as they should only be analysed in the context of the Netherlands. The severity of the Covid-19 pandemic in the Netherlands differed with other countries. Thus, the impact the pandemic had on the financial markets in the Netherlands specifically may have influenced investment behaviour of individuals differently than in other countries.

In this present study, the coefficient for extraversion is significantly close to 0, suggesting no impact of this personality trait on investment behaviour. Nevertheless, existing studies propose a positive relation between extraversion and investment intention (Sadiq & Azad, 2019; Mayfield et al., 2008). It may be the case that the characteristics of this sample, or the measures implemented to assess investment behaviour influenced the results found for extraversion. Thence, it would be interesting for further research to study the relation between this specific personality trait and investment behaviour more in depth, to be able to draw meaningful conclusions. Moreover, as mentioned as a limitation, this study was conducted in the Netherlands. Besides, the sample consisted solely of individuals with nationality of a European Union country, and majority of the respondents were Dutch. Extending this research including a different sample, with more focus on cross-cultural individuals could provide interesting findings, as it would allow to assess whether the impact of personality traits on investment behaviour during the Covid-19 pandemic varies across cultures.

7. Conclusion

The findings of this study indicate that neuroticism and conscientiousness had a negative influence on investment behaviour during the Covid-19 pandemic for individual shareholders in the Netherlands. This effect was found to be positive for openness to experience. For agreeableness, a negative association is suggested with investment behaviour, although not significant. Regarding extraversion, no effect was found. Ultimately, this implies that neurotic and conscientious individuals, when faced with the uncertainty of the financial markets during the pandemic, revealed negative investment behaviour. This was shown by the fact that they were more likely to avoid risky investments than they used to before the pandemic and they were more inclined to sell their investments. Contrarily, they were less inclined to make new investments or to diversify their portfolio. Moreover, for individuals scoring high on openness to experience one can conclude that their investment strategy during the pandemic included diversifying their portfolio. They also considered the pandemic to be a good opportunity to make new investments, whilst they were not prone to sell their investments nor did they become more risk averse. Conclusively, openness to experience is related to positive investment behaviour, amidst financial uncertain times.

Overall, the findings of this research contribute to the behavioural finance stream, as it helps in understanding why individuals take certain financial decisions based on their personal characteristics. Behavioural finance focuses on explaining why financial decisions made by individuals do not follow the initial proposed rational decision making economic theories; instead, behavioural aspects influence these decisions, such as emotions and personality (Kapoor & Prosad, 2017). This study sheds light on how personality traits influence risk tolerance during uncertain times and how this impacts financial decisions, allowing for a deeper understanding of why the investor acts “irrationally”. Whilst for neuroticism and openness to experience the results are in line with what was found in literature regarding investment behaviour during normal financial conditions, this research provides novel results for conscientiousness. It shows that these individuals display different investment behaviour when faced with financial uncertain times. Not only does this contribute to existing literature on the relation between personality traits and investment behaviour, these findings may also be deemed relevant for the financial services industry. It may help with advising individual investors with the optimal personal investment strategy, during financial uncertain periods, based on their personality traits. Ultimately, by taking these individual differences into consideration, investment preferences and decisions can be better understood.

8. References

Agbaria, Q., & Mokh, A. A. (2022). Coping with Stress During the Coronavirus Outbreak: The Contribution of Big Five Personality Traits and Social Support. *International Journal of Mental Health and Addiction*, 20(3), 1854–1872.

Alhenawi, Y., & Yazdanparast, A. (2021). Households' intentions under financial vulnerability conditions: Is it likely for the COVID-19 pandemic to leave a permanent scar? *International Journal of Bank Marketing*, 40(3), 425–457.

Alsaifi, K., Al-Awadhi, A.M., Al-Awadhi, A., & Alhammadi S. (2020). Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. *Journal of Behavioural and Experimental Finance*, 27.

Baek, S., Mohanty, S.K., & Glambosky, M. (2020). COVID-19 and stock market volatility: An industry level analysis. *Finance Research Letters*, 37.

Brooks, C., Sangiorgi, I., Hillenbrand, C., & Money, K. (2018). Why are older investors less willing to take financial risks? *International Review of Financial Analysis,* 56, 52-72.

Dash, M. K. (2010). Factors Influencing Investment Decision of Generations in India:An Econometric Study. *International Journal of Busines Management and Economic Research,* 1(1), 15-26.

Donnellan, M. B., Oswald, F. L., Baird, B. M., & Lucas, R. E. (2006). The Mini-IPIP Scales: Tiny-yet-effective measures of the Big Five Factors of Personality. *Psychological Assessment*, 18(2), 192–203

Fares, A. R., & Khamis, F. (2011). Individual Investors' Stock Trading Behavior at Amman Stock Exchange. *International Journal of Economics and Finance*, 3.

Fellner, G., & Maciejovsky, B. (2007). Risk attitude and market behavior: Evidence from experimental asset markets. *Journal of Economic Psychology*, 28(3), 338–350.

Hodson, G., & Sorrentino, R. M. (1999). Uncertainty Orientation and the Big Five Personality Structure. *Journal of Research in Personality*, 33(2), 253–261.

Kapoor, S., & Prosad, J.M. (2017). Behavioural Finance: A Review. *Procedia Computer Science,* 122, 50-54.

Kiruba, A., & Shanmugam V. (2021). Determinants in Investment Behaviour during the Covid-19 Pandemic. *Indonesian Capital Market Review,* 13, 71-84.

Komalasari, F., Manik, L., & Ganiarto, E. (2021). The Change of Investment Behavior during Covid-19 Pandemic in Indonesia Stock Market. Proceedings of the 5th International Conference on Indonesian Social and Political Enquiries, ICISPE 2020, 9-10 October 2020, Semarang, Indonesia.

Li, J., Song, Q., Peng, C., & Wu, Y. (2020). COVID-19 Pandemic and Household Liquidity Constraints: Evidence from Micro Data. *Emerging Markets Finance and Trade*, 56(15), 3626–3634

Mak, M. K., & Ip, W. (2017). An exploratory study of investment behaviour of investors. *International Journal of Engineering Business Management*, 9.

Mayfield, C., Perdue, G., & Wooten, K. (2008). Investment management and personality type. *Financial Services Review*.

McCrae, R. R, & Costa, P.T. (2003). Personality in Adulthood: A Five-factor Theory Perspective. *The Guilford Press*, 2nd edition, 2-55.

McCrae, R. R, & John, O.P. (2006). An introduction to the Five-Factor Model and Its Applications. *Journal of Personality*, 60(2), 175-215.

McCrae, R. R., & Costa, P. T., Jr. (1997). Personality trait structure as a human universal. *American Psychologist*, 52(5), 509–516.

Mooi, E., Sarstedt, M. & Mooi-Reci, I. (2018). Principal Component and Factor Analysis. 265-311.

Pak, O., & Mahmood, M. (2015). Impact of personality on risk tolerance and investment decisions: A study on potential investors of Kazakhstan. *International Journal of Commerce and Management*, 25(4), 370–384.

Rizvi, S., & Fatima, A. (2015). Behavioral Finance: A Study of Correlation Between Personality Traits with the Investment Patterns in the Stock Market. In S. Chatterjee, N. P. Singh, D. P. Goyal, & N. Gupta (Eds.), Managing in Recovering Markets (pp. 143–155).

Sadiq, M., & Amna, H. (2019). Impact of Persoanlity Traits on Risk Tolerance and Investor's Decision Making. *International Journal of Applied Behavioural Economics,* 8(1).

Sadiq, M., & Azad, R. (2019). Impact of Personality Traits on Investment Intention: The Mediating Role of Risk Behaviour and the Moderating Role of Financial Literacy. *Journal of Finance & Economics Research*, 4, 1–18.

Sharma, D., Jain, R., Behl, A. & Tiwari, A.K. (2022). Investor personality as a predictor of investment intention- mediating role of overconfidence bias and financial literacy. *International Journal of Emerging Markets*.

Sorrentino, R. M., & Short, J.-A. C. (1986). Uncertainty orientation, motivation, and cognition. In Handbook of motivation and cognition: Foundations of social behavior (pp. 379–403). Guilford Press.

Tavakol, M., & Dennick, R. (2011). Making Sense of Cronbach's alpha. *International Journal Medical Education*. 2, 53-55.

Topcu, M., & Gulal, O.S. (2020). The impact of COVID-19 on emerging stock markets. *Finance Research Letters*, 36.

UN Human Development Report (2022). Uncertain times, unsettled lives. *Human Development Report.*

Yue, P., Korkmaz, A.G., & Zhou, H. (2020). Household Financial Decision Making Amidst the Covid-10 Pandemic. *Emerging Markets Finance and Trade*, 56(10), 2363-2377.

Zhang, D., Hu, M., & Ji, Q. (2020). Financial markets under the global pandemic of COVID-19. *Finance Research Letters*, 36, 101-528.

9. Appendix

Appendix A: *Outline of survey questions for demographic information.*

Age

What was your age during the pandemic?

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+

Nationality

What is your nationality?

Gender

What is your gender?

- Male
- Female
- Non-binary/third gender
- Prefer not to say

Education

What was your highest obtained education level during the Covid-19 pandemic?

- Primary education
- Higher education
- Secondary vocational degree (MBO)
- Applied university degree (HBO)
- Bachelor university degree (WO BSc)
- Master university degree (WO MSc)
- PhD/Other higher education

Income

What was your yearly income during the Covid-19 pandemic?

- Less than €15000
- Between €15000 and €30000
- Between €30000 and €45000
- More than €45000
- Prefer not to say

Employment status

What was your employment status during the Covid-19 pandemic?

- Employed full-time
- Employed part-time
- Unemployed
- Retired
- Student
- Prefer not to say

Appendix B: *Factor Analysis.*

	With monitored_investments		*Without monitored_investments*	
Variables	Factor Loading	KMO Values	Factor Loading	KMO Values
avoid_risky_investments	0.8747	0.5853	0.8560	0.5668
monitored_investments	0.2241	0.5184		
invested_more	0.8160	0.5833	0.8406	0.5727
sold_investments	0.6324	0.6803	0.5821	0.6493
diversified_ portfolio	0.3762	0.5549	0.4838	0.6289
Overall		0.5850		0.5862

Note: To extract the factors the principal component analysis method was used. Moreover, here we see the factor loadings and the KMO values for the factor analysis with and without monitoring investments more often. The threshold for an acceptable factor loading is considered to be 0.4. The threshold for KMO value is considered to be 0.5. When excluding monitoring investments, the factor loadings of the other variables become higher, which indicates that monitoring investments is not related to the underlying construct being measured.

Appendix C: *Cronbach's Alpha.*

	With monitored_investments	*Without monitored_investments*
Variables	Item-rest correlation	Item-rest correlation
avoid_risky_investments	0.6328	0.6
monitored_investments	0.0326	
invested_more	0.5544	0.5931
sold_investments	0.3693	0.3078
diversified_ portfolio	0.1236	0.2565
Cronbach's Alpha	0.57	0.65

Appendix D: *Average Marginal Effects for Logistic Regression Model.*

Independent variables	Average Marginal Effects Agreeableness	Average Marginal Effects Neuroticism	Average Marginal Effects Extraversion	Average Marginal Effects Openness to Experience	Average Marginal Effects Conscientiousness
Agreeableness	-0.0176				
	(0.0694)				
Neuroticism		-0.181***			
		(0.0671)			
Extraversion			-0.00868		
			(0.0579)		
Openness to Experience				0.194***	
				(0.0682)	
Conscientiousness					-0.0851
					(0.0586)
Age					
25-34	0.360**	0.427***	0.362**	0.321*	0.335**
	(0.160)	(0.129)	(0.161)	(0.169)	(0.161)
35-44	0.289	0.356**	0.287	0.218	0.271
	(0.199)	(0.161)	(0.199)	(0.205)	(0.199)
45-54	-0.123	0.0115	-0.126	-0.107	-0.121
	(0.221)	(0.197)	(0.224)	(0.226)	(0.221)
55-64	-0.0749	0.0907	-0.0801	-0.0452	-0.0902
	(0.242)	(0.220)	(0.243)	(0.257)	(0.234)
Nationality					
Dutch	0.00829	-0.122	0.00154	-0.121	-0.0150
	(0.217)	(0.209)	(0.212)	(0.204)	(0.211)
German	0.113	0.0815	0.101	0.0425	0.0730
	(0.278)	(0.234)	(0.271)	(0.230)	(0.271)
Portuguese	-0.344	-0.352	-0.350	-0.357	-0.363*
	(0.222)	(0.241)	(0.220)	(0.231)	(0.219)
Spanish	-0.187	-0.164	-0.208	-0.350	-0.284
	(0.318)	(0.310)	(0.300)	(0.248)	(0.261)
Gender					
Female	-0.282***	-0.183*	-0.286***	-0.217**	-0.274***
	(0.0909)	(0.104)	(0.0918)	(0.0888)	(0.0914)
Prefer not to say	-0.0125	-0.155	-0.0171	-0.0950	-0.177
	(0.263)	(0.263)	(0.256)	(0.269)	(0.292)
Education					
Applied university	0.0716	0.0108	0.0853	-0.0720	0.0955
	(0.232)	(0.291)	(0.233)	(0.289)	(0.248)
Bachelor university	-0.0292	-0.173	-0.0162	-0.179	-0.0420
	(0.209)	(0.289)	(0.220)	(0.276)	(0.234)
Master university	0.0292	-0.139	0.0394	-0.174	0.0504
	(0.229)	(0.308)	(0.238)	(0.295)	(0.245)
Income					
€15000-30000	0.254**	0.243*	0.257**	0.242*	0.206
	(0.127)	(0.126)	(0.128)	(0.131)	(0.136)
€30000-45000	-0.110	-0.133	-0.103	-0.0746	-0.113
	(0.175)	(0.159)	(0.176)	(0.168)	(0.167)
>€45000	-0.0939	-0.166	-0.0814	-0.0778	-0.0877
	(0.191)	(0.170)	(0.185)	(0.174)	(0.182)
Prefer not to say	-0.286	-0.364	-0.272	-0.212	-0.238
	(0.274)	(0.228)	(0.260)	(0.277)	(0.272)
Employment status					
Employed part-time	0.0648	-0.0430	0.0730	0.0611	0.0431
	(0.157)	(0.149)	(0.162)	(0.140)	(0.159)

Student	0.155 (0.166)	0.202 (0.137)	0.156 (0.167)	0.164 (0.166)	0.129 (0.168)
Observations	124	124	124	124	124

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$