

# The Influence of Personality Traits on Households' Financial Risk Tolerance and Financial Behaviour

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## Abstract

Using a large sample that can represent the Dutch population, this article mainly studies the determinants of financial risk tolerance. I propose that the big five personality traits are the potential factors that can explain differences in financial risk tolerance among individuals. Furthermore, this article examines the effect of personality traits on the actual financial behaviour of households through financial risk tolerance. I find that all the big five personality traits including extraversion, agreeableness, conscientiousness, emotional stability and intellect significantly predict financial risk tolerance. Additionally, these personality traits as instrumental variables can also indirectly predict the financial behaviour of households.

**JEL: D10, D14, D19**

## Keywords

Personal finance, household economics, financial behaviour, personality traits

Adapted from Grable (2000) and Finke and Huston (2003), financial risk tolerance (FRT) expresses the maximum amount of uncertainty that someone is willing to accept when making a financial decision. FRT can also be considered as an attitude towards risk and is the other side of the coin of risk aversion (Hallahan, Faff, & McKenzie, 2003). To assess FRT, three main methods are used: observing actual investment behaviour, observing choices in experiments and creating scores from questionnaires (Faff, Mulino, & Chai, 2008).

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The literature shows a significant relation between FRT and actual financial behaviour. Haliassos and Bertaut (1995) show that higher FRT is associated with higher stock holding. Similarly, Finke and Huston (2003) find that those who are willing to take financial risk have a higher percentage of stock ownership than those who are risk averse. This concurs with the finding of Hariharan, Chapman and Domian (2000) that people with higher risk tolerance tend to invest in stocks, but they avoid investing in risk-free assets Treasury Bill (T-Bill). Corter and Chen (2006) find that the correlation between risk tolerance questionnaire (RTQ) and risky investing behaviour is positive as the participants who have high score on RTQ hold more risky asset classes in their portfolios. The relation between FRT and risky investments can also be found in retirement investments, where the significance of the relationship consistently holds in many previous studies (Jacobs-Lawson & Hershey, 2005).

As FRT can significantly affect the actual financial behaviour of a household, researchers have been trying to explore its determinants. Demographic variables have been intensively studied and many findings followed a consensus that younger age, male gender, being single and higher income were associated with higher risk tolerance as reviewed in Grable (2000) and Sulaiman (2012). However, the performance of some demographic determinants seems to be inconsistent from time to time. For instance, older individuals are expected to be more risk averse. However, some studies reveal a reverse relationship. Sulaiman (2012) finds in his survey that the older the participants, the more financial risk tolerant they are. This finding also occurs when Wang and Hanna (1997) use the ratio of risky assets to total wealth as risk tolerance measure. They find that risk tolerance has a positive relation with age. In addition, not only does this age-factor reversal occurs, but some studies have failed to prove that age is a significant factor for risk tolerance (see Hallahan, Faff, & McKenzie, 2004). This raises the question of whether there are omitted variables that further explain FRT.

The power of personality traits has been used in behavioural predictions across areas, such as consumer behaviour and organizational behaviour, but less so in the financial context. Personality traits have facets that could cover a wide range of behaviour across domains, including risk preferences and risk taking. Current financial research has started to study the relationship between psychological factors, including personality traits and financial behaviour. Many studies have focused on the big five personality traits. For instance, it has been found that those who are extraverts tend to have lower savings (Brandstätter, 1996; Nyhus & Webley, 2001; Wärneryd, 1996). The reasons for the lower savings can be attributed to, for instance, time-discounting problems because consuming now is preferred to consuming later. Additionally, the lifestyles of extraverts may also distract them from savings (Brandstatter & Guth, 2000). Extraversion has the dimension (facet) of socialization, and socializing behaviour may reduce savings since socializing means partying, visiting the homes of others or going out for nightlife. These activities inevitably incur costs and finally may become an obstacle to the patience needed to save (Nyhus & Webley, 2001). Similar to extraversion, neuroticism (low emotional stability) is another personality trait that is negatively related to savings (Brandstatter, 1996; Nyhus & Webley, 2001). One possible

reason why neurotic persons save less is that they tend to have a problem of delayed or temporal consumption (Brandstatter & Guth, 2000) that could result in compulsive spending and become a burden on savings for the future. Conscientiousness influences savings in contrast to the two traits already mentioned. Conscientiousness is characterized by the facets of patience and planning. Findings show that savings attitude is positively correlated with conscientiousness (Brandstatter, 1996). In addition to savings, conscientious people also tend to have less serious debt problems (Nyhus & Webley, 2001). Mayfield, Perdue and Wooten (2008) empirically find that openness is positively related to long-term investment. Their study hypothesized that those who are open to experience tend to manage financial matters well because they have a high level of intellectual expression. Regular socializing, as is the case with extraverts, can also be related to investing behaviour. Meeting and talking to people will encourage individuals to learn from their peers about the market's attractive returns, which may encourage their participation in the stock market (Hong, Kubik, & Stein, 2001; Kaustia & Knüpfer, 2012). Delavande, Rohwedder and Willis (2008) also explain how people can obtain financial information through conversation as 'somebody who has a personality suited to and a facility of learning by asking others is also likely to find it easier to acquire additional financial knowledge than a person who is afraid of asking and has to work out everything on his own'.

Since previous studies have already found a direct relationship between personality traits and financial behaviour, this research will instead study the underlying reasons. I analyse the relationship between FRT and personality traits. To derive hypotheses, this research relies on risk-taking consistency across domains. Later, I also investigate the relation between FRT and actual financial behaviour where I add personality traits as instrumental variables.

### *Domain Consistency of Risk Preferences*

One important question debated in risk research is: Are risk preferences consistent across domains or domain-specific? Cross-domain consistency refers to people who have the same pattern of risk preferences and risky behaviour across different domains. In contrast, a domain-specific risk preference refers to those who may take risk in one domain but not in another domain. Soane and Chmiel (2005) stated that both notions are possible in theory and practice. A supporting theory for the domain-specific type can refer to, for example, information-framing and prospect theory (Tversky & Kahneman, 1986). For the cross-domain type, 'relatively stable risk dispositions' can be a factor positing in the form of personality.

Although some studies try to argue that risk preferences should be in the form of risk-specific domains, there have been results that support cross-domain consistency. Nicholson, Soane, Fenton-O'Creev and Willman (2005) show that people with the personality traits of conscientiousness and agreeableness do not take risks across six different domains (recreation, health, career, finance, safety and social), while extraversion and openness can predict risk taking in five of the six domains, including overall risk. Weller and Tikir (2011) study four domains

and find that emotionality (emotional stability) predicts risk takings across all the four domains (social, recreational, health/safety and ethical).

Since the literature has shown that personality traits have a consistent relation with risk taking across domains, this article reviews the relation between risk tolerance and behaviour across domains and then forms the expected relation between personality traits and FRT.

### *Big Five Personality Traits and Risk Consistency*

Extraversion is one of the most consistent personality traits for predicting risk preference and behaviour. In general, extraversion represents optimistic, assertive and energetic behaviour (Weller & Tikir, 2011). Extraverts are related to and will be aroused by stimulation and novelty-seeking habits. From these properties, extraversion is expected to have a high correlation with risk preferences and behaviour. The literature shows that extraversion is significant in predicting risk taking across domains, from daily activities, such as risky driving habit in the work of Dahlen and White (2006) who find that extraversion is related to traffic violation, traffic accidents and fatalities, to health risks, such as alcohol consumption (Nicholson et al., 2005). Furthermore, extraversion is associated with higher sexual risks, such as multiple sexual partners, promiscuous sexual behaviour and unsafe sex as reviewed in Schmitt (2004). Since one of the facets of extraversion is 'adventurous (excitement seeking)', it is intuitive that extraverts are more aroused by risky behaviours, such as risky driving, as these activities can provide excitement. Chauvin, Hermand and Mullet (2007) concur that extraverts would normally 'spend less time *reflecting* than *doing*': 'Worrying about risky behaviours may not only take time away from their action-oriented lifestyle, but it could also possibly limit its range'. These attitudes may reflect delinquency in extraverts (John, Caspi, Robins, Moffitt, & Stouthamer-Loeber, 1994) and provide a possible explanation for why extraverts have less fear or worry of taking risk. Furthermore, Gray (1987) shows that compared to other traits such as emotional stability, extraverts show less responsiveness towards punishment. From this finding, I can imply that extraverts may easily ignore the punishment (negative consequences) that will come from future problems, which may result in a higher chance of their participating in risky behaviour.

Neuroticism is the opposite of emotional stability. This trait contains the facets of negative and weak emotions such as anxiety, vulnerability, shyness and depression (Costa & McCrae, 1992). Since neuroticism is full of stress, it is indicative of how neurotics will react in several real-life situations. For instance, research about occupation choice reveals that a career like an entrepreneur has a negative correlation with neuroticism. Zhao and Seibert (2006) explain that the entrepreneurial status is not similar to other occupations. It is characterized by a highly unstructured environment and requires a commitment of responsibility towards a venture. These situations should be more suited to emotionally stable persons. Additionally, neurotic persons lack the self-confidence and self-control that are needed for entrepreneurship (Chen, Greene, & Crick, 1998; Crant, 1996; Simon, Houghton,

& Aquino, 1999). This occupational evidence reveals that emotionally stable persons are more confident, responsible and better able to manage things according to their plan. This justification concurs with the findings of other studies across contexts, such as consumer behaviour, where neuroticism is related to compulsive buying behaviour (Hoch & Loewenstein, 1991). With unmanageable stress and emotions, neurotics more easily lose self-control and seek gratification in escaping behaviours. To release stress, they become more vulnerable to risky behaviours such as alcohol consumption (Martin & Sher, 1994) and unsafe sex (Trobst, Herbst, Masters, & Costa, 2002).

Agreeableness comprises socially preferable facets. It includes trusting, forgiving and caring behaviour. Agreeable persons tend to be more co-operative and have good social relationships. Those who lack this trait can be 'suspicious, self-centred, and ruthless' (Costa & McCrae, 1992). Chauvin et al. (2007) state, 'The essence of this factor seems to be naturally related to the concepts of nonviolence, and care for others and the environment.' Using substances may result in family quarrels, while taking risks without considering the future negative outcomes may result in conflict with the people around them. As agreeable persons prefer to avoid quarrelling, disagreement and violence, and because these negative events conflict with their agreeable personality, consequently, researchers can find a negative relation between the agreeableness trait and risk taking such as substance use (Terracciano, Loöckenhoff, Crum, Bienvu, & Costa, 2008), delinquency (Heaven, 1996) and sexual risk (Schmitt, 2004).

Openness, also known as openness to experience, is the personality trait of novelty and new experience seeking. It can refer to creativity, imagination and innovation (Zhao & Seibert, 2006). Those who score low in the openness items generally are more narrow-minded and traditional. Preferring new experience to familiar activity leads to experimentation that may also lead to risk taking. Openness can be seen as a cognitive stimulus for risk taking (McCrae & Costa, 1997). As expected, there is much support in empirical research for the positive relation between risk taking and openness such as unsafe driving, free sexual preference and substance use (Arthur & Graziano, 1996; Booth-Kewley & Vickers, 1994).

Conscientiousness includes preferable personality facets, such as organized, disciplined as well as exhibiting careful behaviour. Occupational research has shown that for organizations, conscientiousness is preferable as it is related to hard work, good job performance and career success (Barrick, Mount, & Judge, 2001; Bowles, Gintis, & Osborne, 2001). Striving for these achievements in life requires self-discipline and careful life planning. This could explain why conscientious persons try to avoid unnecessary uncertainty by participating less in risky activities. Many studies have found that conscientious people avoid risks across domains. Researchers have found that conscientiousness is negatively correlated with sexual HIV infection (Trobst et al., 2002), car accidents (Arthur & Graziano, 1996) and drugs use (Terracciano et al., 2008).

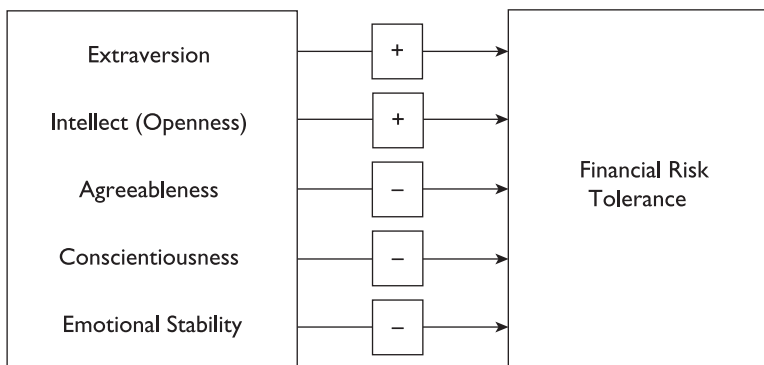
## Hypotheses

I have used three sets of hypotheses. First, I hypothesize the relationship between the big five personality traits and FRT. The first set consists of five hypotheses as shown in Figure 1. The positive and negative signs indicate the hypothesized relationship.

Several previous studies have identified a direct relationship between the big five personality traits and financial behaviour, but these have been limited to the domain of savings. In the second set of hypotheses, shown in Figure 2, I restudy the relationship between the big five and financial behaviour. I investigate the impact of the big five personality variables on three different financial behaviours arranged into three different risk levels: low risk represented by 'saving ratio', medium risk represented by 'bond and mutual fund' ratio, and high risk represented by 'equity ratio'.

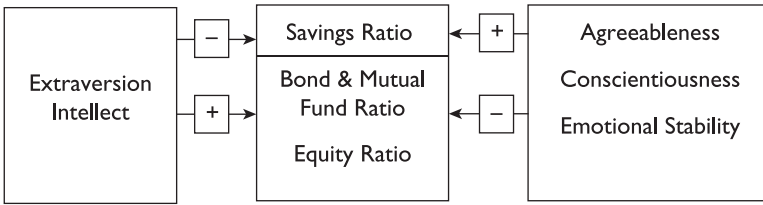
I hypothesize that the personality traits that are positively related to FRT (extraversion and intellect) would have a negative effect on savings, but when moving towards higher financial risk domains, including bonds, mutual fund and equity, they would have a positive effect. On the other hand, the personality traits that are negatively related to FRT (conscientiousness, emotional stability and agreeableness) would have a positive effect on savings, but when moving towards bonds, mutual fund and equity, they would have a negative effect.

The third set contains six hypotheses as listed in Figure 3. For this set, I use the big five personality traits as instrumental variables to predict actual financial behaviour through FRT. I have set these hypotheses to further investigate the circumstances when the big five do not have a significant direct effect on actual behaviour, but only an indirect effect through FRT. Furthermore, any significant personality trait from the second set of hypotheses must not be used in the third set of hypotheses because it will violate the condition of the two-stage least squares (2SLS) method, which states that an instrumental variable must not be significantly related to the dependent variable.



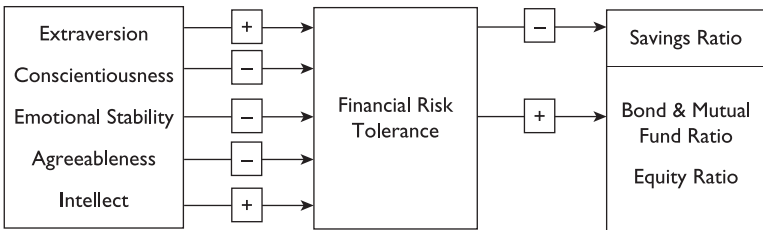
**Figure 1.** Hypotheses for the Big Five and Financial Risk Tolerance

Source: Author's own.



**Figure 2.** Hypotheses for the Big Five and Financial Risk-taking Behaviour

**Source:** Author's own.



**Figure 3.** Hypotheses for the Big Five, Financial Risk Tolerance, and Financial Risk-taking Behaviour

**Source:** Author's own.

The motivation behind these hypotheses is the underlying question regarding the effect of personality traits on financial behaviour: Whether personality traits affects financial behaviour through FRT (indirect effect). These hypotheses will be tested by the 2SLS method. In research, the 2SLS method not only helps examine the direct and indirect impacts among these variables, but also further reduces the reverse causality problem when introducing the instrumental variable in the model. Reverse causality occurs when the error terms of dependent variable are potentially correlated with the independent variables. This problem generates unreliable findings in academic research since the relationship between X and Y can be two directions, namely X can affect Y and Y can affect X. This article not only tests the hypotheses but also tries to prove that the variables in this framework do not have a confusing relationship pattern as stated. Financial behaviour has been affected by financial preferences (financial preferences, such as risk tolerance, have been caused by individual personality traits).

### Data and Method

The data is from the DNB Household Survey (Tilburg, The Netherlands), formerly known as the CentER Savings Survey. Every year since 1993, the survey has collected information on Dutch households, including age, gender and income. It also includes psychological and economic data that could impact the financial behaviour of the households. In this article, I use three sets of data. The first set is

from the 13th wave collected in the year 2005 from January to August, the second set is from the 17th wave collected in the year 2009 from February to December and the last set is from the 21st wave collected in the year 2013 from March to December. The datasets of these three years are the only waves that contain complete measures of the big five personality and the necessary control variables. The total sample size is 4,026, and the composition of the DNB Household Survey is representative for the Dutch population.

### *Big Five Personality Traits and Financial Risk Tolerance*

The DNB Household Survey uses Goldberg's 50-item personality scale. Each set of 10 items measures one personality trait of the big five,<sup>1</sup> including extraversion, agreeableness, conscientiousness, emotional stability and intellect. The participants will score each item from 1 to 5. For instance, suppose one of the 10 items measuring extraversion states, 'I am the life of the party'. The participants then choose a preferred answer from 1 (very inaccurate), 2 (moderately inaccurate), 3 (neither accurate nor inaccurate), 4 (moderately accurate) and 5 (very accurate). The personality score for each trait is calculated by summing every score for the 10 items representing the trait, divided by 10.

For FRT, one of the methods used to measure individuals' risk tolerance in population surveys is through survey questions. The DNB Household Survey provides six items (spaar1-spaar6) which assess the participants' FRT. The participants choose their level of agreement from 1 to 7, ranging from totally disagree (1) to totally agree (7) when responding to the questions. These six items have been studied before, such as in the work of Kapteyn and Teppa (2011), who validate this scale and use it to measure financial risk aversion preference. The six items are listed as follows.

- spaar1: I think that it is more important to have safe investments and guaranteed returns than to take a risk to have a chance to get the highest possible returns.
- spaar2: I do not invest in shares, because I find this too risky.
- spaar3: If I think an investment will be profitable, I am prepared to borrow money to make this investment.
- spaar4: I want to be certain that my investments are safe.
- spaar5: If I want to improve my financial position, I should take financial risks.
- spaar6: I am prepared to take the risk to lose money, when there is also a chance to gain money.

I use exploratory factor analysis (EFA) with a varimax rotation method similar to Kapteyn and Teppa (2011) to examine whether these six items represent FRT. In a preliminary stage of EFA, I find that the value of Kaiser-Meyer-Olkin of sampling adequacy (KMO) is 0.66. This value is higher than 0.5, and, therefore, at an acceptable level to confirm that factor analysis is a suitable method for extracting and forming FRT constructs. Additionally, Bartlett's test of sphericity



is significant at 0.01. It confirms that these six items have a significant correlation among them and they can be grouped into higher order factors. The FRT factor is composed of *spaar3*, *spaar5* and *spaar6*.<sup>2</sup> Cronbach's alpha for the FRT is satisfactory (0.695). The FRT variable is defined by summing the score from the three items, divided by 3. Descriptive statistics for the big five and financial risk tolerance are shown in Table 1.

**Table 1.** Descriptive Statistics on the Big Five and Financial Risk Tolerance

Summary Statistics	Variable	Mean	Median	Highest Value	Lowest Value	SD
Big five	Extraversion	3.06	3.00	5.00	1.00	0.67
	Intellect	3.41	3.40	5.00	1.10	0.53
	Agreeableness	3.89	3.90	5.00	1.10	0.52
	Conscientiousness	3.66	3.70	5.00	1.40	0.59
	Emotional stability	3.58	3.60	5.00	1.00	0.65
Financial risk tolerance	Financial risk tolerance	2.36	2.33	7.00	1.00	1.19

**Source:** Author's calculation.

### *Financial Behaviour*

The financial behaviour variables include three financial asset ratios, indicating the fraction of a specific financial asset compared to the total financial assets of the household. These three ratios are: the low-risk 'savings ratio', medium-risk 'bonds and mutual fund ratio' and high-risk 'equity ratio'. Each ratio is calculated as the amount of savings, bonds and mutual funds, or equity, divided by the total amount of financial assets (the sum of all categories) as shown in Appendix A.

These three ratios need modification as they are not normally distributed and have outliers, such as negative values caused by negative financial assets (a negative asset value is due to, for instance, negative checking account amounts). I solve these problems by replacing negative values with zero and winsorizing values higher than one at one. Descriptive statistics for financial behavior are shown in Table 2.

### *Control Variables*

To control gender, I add a gender dummy variable which is defined as 1 for men and 0 for women. For education, the survey provides nine levels of education that the participants have completed. I group these nine levels into three dummy variables: 'low-level education' (including those who have special education, kindergarten or primary education, pre-vocational education 'VMBO', other sort of education or training and no formal education), 'middle-level education' (including those who have pre-university education 'HAVO'/'VWO' and senior vocational training or training through the apprentice system 'MBO') and 'high-level

**Table 2.** Descriptive Statistics on Financial Ratios

Summary Statistics	Variable	Mean	Median	Highest Value	Lowest Value	SD
Low-risk domain	Saving ratio	0.63	0.86	1.00	-30.95	0.74
	Winsorized saving ratio	0.65	0.86	1.00	0.00	0.40
Medium-risk domain	Bond and mutual fund ratio	0.06	0.00	1.92	0.00	0.17
	Winsorized bond and mutual fund ratio	0.06	0.00	1.00	0.00	0.17
High-risk domain	Equity ratio	0.02	0.00	1.29	0.00	0.11
	Winsorized equity ratio	0.02	0.00	1.00	0.00	0.11

**Source:** Author's calculation.

education' (including those who have completed vocational college 'HBO' and university education 'WO'). For age, I calculate the ages of participants as the year of the survey minus the year of birth.

For income, I use the variable total gross income<sup>3</sup> divided by 100,000, so that when it is included in the regressions, its beta will not be too small since some dependent variables are limited in range, for instance, FRT which is in the range of 1–7 only. The income variable has many outliers, and the data is not normally distributed. I modify it by winsorizing the data at 99 per cent.

Other than general education, I also use one item concerning the level of being knowledgeable in financial matters. The person's particular knowledge about finance (financial literacy) may have some impact on financial risk preference. As found in previous studies, lacking financial literacy worsens financial decision-making among individuals and households. I use the item asking the participants 'how knowledgeable are you in financial matters?' The participants then rate their financial knowledge from 1 (not knowledgeable), 2 (more or less knowledgeable), 3 (knowledgeable) to 4 (very knowledgeable).

I include four additional control dummy variables that represent the status of the members in the household. The participants respond to the question with an answer of either 'yes = 1' or 'no = 0'. First, the financial administrator asks the participants: 'Are you a financial administrator of the household?' The participants answer either 'yes' for being a financial administrator who manages the main financial decisions in the household or 'no' for not being a financial administrator. Second, regarding the head of the household status, the participants answer either 'yes' for being the head of the household or 'no' for being another family member. Third, with regard to the spouse or permanent partner status, the participants answer either 'yes' for being a spouse or a permanent partner or 'no' for being another family member. Fourth, to identify the main wage earner, the participants answer either 'yes' if they are the main wage earner or 'no' if they are not the main wage earner in the household. Descriptive statistics for the control variables are shown in Table 3.

**Table 3.** Descriptive Statistics on Control Variables

Variable	Mean	Median	Highest Value	Lowest Value	SD
Age	53.03	55.00	94.00	16.00	16.33
Gender	0.56	1.00	1.00	0.00	0.50
Income	0.30	0.29	5.54	0.00	0.24
Income (winsorized)	0.30	0.29	0.96	0.00	0.21
Low education	31%	0.00	1.00	0.00	0.46
Medium education	30%	0.00	1.00	0.00	0.46
High education	39%	0.00	1.00	0.00	0.49
Financial knowledge	2.10	2.00	4.00	1.00	0.71
Financial administration	68%	1.00	1.00	0.00	0.47
Main wage earner	65%	1.00	1.00	0.00	0.48
Head of house.	65%	1.00	1.00	0.00	0.48
Spouse/partner	30%	0.00	1.00	0.00	0.46

**Source:** Author's calculation.

## Results

### *Big Five Personality Traits and Financial Risk Tolerance*

In this section, I analyse the data to test the first set of hypotheses. Reported in Table 4, age, gender, income, high level of education, perceived financial literacy and head of the household are significant variables predicting FRT in all columns (before and after the inclusion of the personality traits). Younger age, male gender, higher income, high level of education, high perceived financial literacy, not being head of the household are positively related to FRT.

For the big five variables, five of them are significant and the signs are in line with the first set of hypotheses. Extraversion and intellect are positively related, while agreeableness, conscientiousness and emotional stability are negatively related to FRT. The adjusted  $R^2$  substantially increases from 0.082 to 0.103 or a 25.61 per cent increase, after the big five personality traits have been added to the models. This finding indicates that personality traits can explain a substantial proportion of the variation in people's FRT.

### *Big Five Personality Traits and Financial Behaviour*

Tables 5–7 present the results of the second set of hypotheses. These hypotheses aim at identifying the relationship between the big five variables and the actual

**Table 4.** Personality Traits and Financial Risk Tolerance

	Dependent Variable			
	Financial Risk Tolerance		Financial Risk Tolerance	
	(1)	p-value	(2)	p-value
Constant	2.476	0.000	2.936	0.000
Age	-0.012***	0.000	-0.010***	0.000
Gender	0.448***	0.000	0.421***	0.000
Income	0.401***	0.001	0.386***	0.002
Middle-level education	0.060	0.275	0.048	0.379
High-level education	0.118**	0.037	0.096*	0.088
Perceived financial literacy	0.080**	0.012	0.090***	0.005
Financial administration	-0.019	0.673	0.000	0.992
Main wage earner	-0.010	0.891	-0.012	0.873
Head of the household	-0.372**	0.012	-0.360**	0.015
Spouse/permanent partner	-0.248*	0.065	-0.220	0.103
Extraversion			0.125***	0.000
Intellect			0.121***	0.001
Agreeableness			-0.176***	0.000
Conscientiousness			-0.096***	0.001
Emotional stability			-0.112***	0.000
Summary stats				
R <sup>2</sup>	0.085		0.106	
Adjusted R <sup>2</sup>	0.082		0.103	
F-stat.	31.13	0.000	28.11	0.000

**Source:** Author's calculation.

**Notes:** This table reports the ordinary least-squares (OLS) regression results of the effect of big five personality traits on FRT. The sample consists of 4,026 participants. The independent variables are extraversion, intellect, agreeableness, conscientiousness, emotional stability, along with the control variables including age, gender, income, education, financial knowledge, financial administration, main wage earning position, head of the household position and spouse/partner position. The dependent variable is FRT. Column 1 shows the regression with only control variables as independent variables. Column 2 shows the regression with the big five and control variables as independent variables. Clustered robust standard errors are used to avoid the correlation of the repeated participants, which could result in underestimated standard errors. The standard errors are clustered by a specific code number assigned for each household. \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively.

**Table 5.** Big Five Personality Traits and Saving Ratio

	Dependent Variable					
	Saving Ratio		Saving Ratio		Saving Ratio	
	(1)	p-value	(2)	p-value	(3)	p-value
Constant	1.485	0.000	1.451	0.000	1.645	0.000
Age	0.001	0.306	0.001	0.390	0.000	0.756
Gender	-0.087**	0.026	-0.091**	0.023	-0.063	0.123
Income	-0.366***	0.000	-0.370***	0.000	-0.345***	0.000
Middle-level education	0.057	0.198	0.056	0.206	0.059	0.180
High-level education	0.085**	0.045	0.081*	0.062	0.087**	0.042
Perceived financial literacy	-0.026	0.224	-0.026	0.228	-0.020	0.362
Financial administration	0.256***	0.000	0.253***	0.000	0.253***	0.000
Main wage earner	-0.008	0.906	-0.008	0.906	-0.009	0.897
Head of the household	-0.709***	0.000	-0.706***	0.000	-0.729***	0.000
Spouse/partner	-0.839***	0.000	-0.837***	0.000	-0.851***	0.000
Extraversion			-0.026	0.240	-0.018	0.411
Intellect			0.006	0.831	0.014	0.594
Agreeableness			0.008	0.765	-0.004	0.889
Conscientiousness			-0.003	0.889	-0.010	0.666
Emotional stability			0.026	0.255	0.018	0.423
Financial risk tolerance					-0.066***	0.000
<i>Summary stats</i>						
Pseudo R <sup>2</sup>	0.024		0.025		0.028	
F-stat.	10.08	0.000	7.26	0.000	8.89	0.000

**Source:** Author's calculation.

**Notes:** This table reports tobit regression results of the effect of big five personality traits on the saving ratios. Tobit regression is used because the dependent variables are bounded at 0 and 1. The sample consists of 4,026 participants. The independent variables are extraversion, intellect, agreeableness, conscientiousness, emotional stability, along with the control variables including age, gender, income, education, financial knowledge, financial administration, main wage earning position, head of the household position and spouse/partner position. The dependent variable is the saving ratio. Column 1 shows the regression with only control variables as independent variables. Column 2 shows the regression with the big five and control variables as independent variables. Column 3 shows the regression with the big five, control variables and FRT as independent variables. Clustered robust standard errors are used to avoid the correlation of the repeated participants, which could result in underestimated standard errors. The standard errors are clustered by a specific code number assigned for each household. \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively.

**Table 6.** Big Five Personality Traits and Bond and Mutual Fund Ratio

	Dependent Variable					
	Bond and Mutual Fund Ratio		Bond and Mutual Fund Ratio		Bond and Mutual Fund Ratio	
	(1)	p-value	(2)	p-value	(3)	p-value
Constant	-1.411	0.000	-1.103	0.000	-1.331	0.000
Age	0.008***	0.000	0.008***	0.000	0.009***	0.000
Gender	0.070*	0.090	0.059	0.150	0.020	0.622
Income	0.451***	0.000	0.462***	0.000	0.432***	0.000
Middle-level education	0.046	0.332	0.046	0.326	0.044	0.340
High-level education	0.182***	0.000	0.178***	0.000	0.172***	0.000
Perceived financial literacy	0.082***	0.000	0.093***	0.000	0.085***	0.000
Financial administrator	0.186***	0.000	0.183***	0.000	0.182***	0.000
Main wage earner	-0.035	0.630	-0.040	0.589	-0.040	0.590
Head of the household	-0.101	0.437	-0.088	0.493	-0.070	0.585
Spouse/partner	-0.090	0.415	-0.080	0.470	-0.072	0.510
Extraversion			-0.033	0.143	-0.043**	0.053
Intellect			0.023	0.389	0.012	0.641
Agreeableness			-0.042	0.134	-0.027	0.336
Conscientiousness			-0.025	0.257	-0.018	0.416
Emotional stability			-0.035	0.117	-0.024	0.290
Financial risk tolerance					0.078***	0.000
<i>Summary stats</i>						
Pseudo R <sup>2</sup>	0.099		0.104		0.117	
F-stat.	26.61	0.000	19.35	0.000	20.28	0.000

**Source:** Author's calculation.

**Notes:** This table reports the tobit regression results of the effect of big five personality traits on the bond and mutual fund ratio. Tobit regression is used because the dependent variables are bounded at 0 and 1. The sample consists of 4,026 participants. The independent variables are extraversion, intellect, agreeableness, conscientiousness, emotional stability, along with the control variables including age, gender, income, education, financial knowledge, financial administration, main wage earning position, head of the household position and spouse/partner position. The dependent variable is the bond and mutual fund ratio. Column 1 shows the regression with only control variables as independent variables. Column 2 shows the regression of the big five and control variables as independent variables. Column 3 shows the regression of the big five, control variables and FRT as independent variables. Clustered robust standard errors are used to avoid the correlation of the repeated participants, which could result in underestimated standard errors. The standard errors are clustered by a specific code number assigned for each household. \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively.

**Table 7.** Big Five Personality Traits and Equity Ratio

	Dependent Variable					
	Equity Ratio		Equity Ratio		Equity Ratio	
	(1)	p-value	(2)	p-value	(3)	p-value
Constant	-1.871	0.000	-1.713	0.000	-2.049	0.000
Age	0.005***	0.000	0.005***	0.000	0.006***	0.000
Gender	0.148***	0.001	0.154***	0.001	0.097**	0.034
Income	0.436***	0.000	0.450***	0.000	0.412***	0.000
Middle-level education	0.085	0.107	0.083	0.115	0.081	0.120
High-level education	0.110**	0.018	0.105**	0.025	0.091**	0.045
Perceived financial literacy	0.130***	0.000	0.134***	0.000	0.125***	0.000
Financial administrator	0.068	0.130	0.071	0.118	0.067	0.141
Main wage earner	0.059	0.413	0.060	0.384	0.053	0.456
Head of the household	0.239	0.232	0.218	0.273	0.265	0.186
Spouse/partner	0.367*	0.059	0.353*	0.070	0.383**	0.050
Extraversion			0.010	0.685	-0.002	0.941
Intellect			0.028	0.334	0.011	0.696
Agreeableness			-0.019	0.550	-0.001	0.983
Conscientiousness			-0.012	0.603	-0.001	0.972
Emotional stability			-0.062**	0.015	-0.044*	0.073
Financial risk tolerance					0.109***	0.000
<i>Summary stats</i>						
Pseudo R <sup>2</sup>	0.118		0.126		0.159	
F-stat.	16.56	0.000	11.43	0.000	12.53	0.000

**Source:** Author's calculation.

**Notes:** This table reports tobit regression results of the effect of big five personality traits on the equity ratio. Tobit regression is used because the dependent variables are bounded at 0 and 1. The sample consists of 4,026 participants. The independent variables are extraversion, intellect, agreeableness, conscientiousness, emotional stability, along with the control variables including age, gender, income, education, financial knowledge, financial administration, main wage earning position, head of the household position and spouse/partner position. The dependent variable is the equity ratio. Column 1 shows the regression with only control variables as independent variables. Column 2 shows the regression of the big five and control variables as independent variables. Column 3 shows the regression of the big five, control variables and FRT as independent variables. Clustered robust standard errors are used to avoid the correlation of the repeated participants, which could result in underestimated standard errors. The standard errors are clustered by a specific code number assigned for each household. \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively.

financial behaviour of a household. Dependent variables begin with the lowest risk 'savings ratio' in Table 5, continue with medium risk 'bond and mutual fund ratio' in Table 6 and end up with the highest risk 'equity ratio' in Table 7.

The findings show that income and a high level of education are the only two variables that provide consistent significance throughout the three tables. Income begins with a negative coefficient in the savings domain (Table 5), but later turns to a positive coefficient in the investing domains, including bonds and mutual funds (Table 6) and equity (Table 7). Whereas high-level education has a positive coefficient across the columns, age and perceived financial literacy are significant only in the investing domains (bonds, mutual funds and equity) with a positive coefficient. Referring to what I discussed before, this finding shows that age can be inconsistent as a predictor of financial risk behaviour as the older age has a positive relation to financial risk taking, which contradicts the traditional notion that the 'older age is negatively correlated with FRT'.

For the big five variables, they fail to serve as the significant predictors of financial behaviour. Some personality traits are significant but somewhat weak, such as extraversion in Column 3 of Table 6 and emotional stability in Column 3 of Table 7. For this issue, I notice that the effect of the FRT variable on actual financial behaviour is stronger than the big five, since its significance is constant starting from the savings domain with a negative coefficient and turning to a positive coefficient in the riskier domains (bonds, mutual funds and equity).

### *Big Five Personality Traits as Instrumental Variables*

After the first set of hypotheses has been examined, it reveals that the big five personality traits have a significant effect on FRT. In the second set of hypotheses, I find that most personality traits did not significantly explain actual financial behaviour. Moving on to the third set of hypotheses, which concerns the use of 2SLS, this section will investigate the impact of personality traits on actual financial behaviour through FRT. In Table 8, extraversion is not included in Column 3 due to its significant direct impact on the bonds and mutual fund ratio. Emotional stability in Column 5 is still included as its significant effect on the equity ratio is only marginal ( $p$ -value is 0.073).

In Table 8, all the big five personality traits are included in the first-stage columns. All these big five variables are significant in the first stage across all the columns when explaining FRT. These results are similar to what I have found in the first set of hypotheses. However, to be instrumental variables, the second-stage regression must have the endogenous variable 'financial risk tolerance' significant. With this condition, FRT is significant in Columns 4 and 6, indicating that the big five personality traits can be instrumental variables for the relationship between FRT, bond and mutual fund ratio, and equity ratio.

To be certain that the big five traits are good instrumental variables, I add the robustness tests including the strength of the instruments (weak instrument test proposed by Stock & Yogo [2005]) and overidentifying restrictions. The strength of the instruments test is used to check the relevance of the instrumental variables



**Table 8.** Two-stage least square of the big Five, financial risk tolerance, and saving ratio

	Savings						Dependent Variable											
	Fin. risk tolerance (1st Stage)			Saving ratio (2nd Stage)			Fin. risk tolerance (1st Stage)			Bond&Mutual fund ratio (2nd Stage)			Fin. risk tolerance (1st Stage)			Equity (2nd Stage)		
	(1)	p-value	(2)	p-value	(3)	p-value	(4)	p-value	(5)	p-value	(6)	p-value	(7)	p-value	(8)	p-value		
Constant	2.936	0.000	1.707	0.000	3.049	0.000	-2.133	0.000	2.943	0.000	-2.395	0.000	0.000	0.000	-2.395	0.000		
Age	-0.010 <sup>***</sup>	0.000	0.000	0.935	-0.010 <sup>***</sup>	0.000	0.011 <sup>***</sup>	0.000	-0.010 <sup>***</sup>	0.000	0.007 <sup>***</sup>	0.000	0.000	0.000	0.007 <sup>***</sup>	0.000		
Gender	0.421 <sup>***</sup>	0.000	-0.046	0.403	0.416 <sup>***</sup>	0.000	-0.065	0.308	0.422 <sup>***</sup>	0.000	0.047	0.000	0.000	0.000	0.047	0.480		
Income	0.386 <sup>***</sup>	0.002	-0.329 <sup>***</sup>	0.000	0.407 <sup>***</sup>	0.001	0.332 <sup>***</sup>	0.001	0.388 <sup>***</sup>	0.002	0.357 <sup>***</sup>	0.000	0.002	0.000	0.357 <sup>***</sup>	0.000		
Middle level education	0.048	0.377	0.062	0.157	0.043	0.425	0.032	0.503	0.047	0.379	0.077	0.145	0.379	0.077	0.145	0.145		
High level education	0.096 <sup>*</sup>	0.087	0.096 <sup>**</sup>	0.024	0.084	0.138	0.151 <sup>***</sup>	0.001	0.096 <sup>*</sup>	0.087	0.082 <sup>*</sup>	0.083	0.087	0.082 <sup>*</sup>	0.083	0.083		
Perceived fin. literacy	0.090 <sup>***</sup>	0.005	-0.019	0.413	0.099 <sup>***</sup>	0.002	0.057 <sup>**</sup>	0.012	0.090 <sup>***</sup>	0.005	0.114 <sup>***</sup>	0.000	0.005	0.114 <sup>***</sup>	0.000	0.000		
Financial admin	0.000	0.994	0.254 <sup>***</sup>	0.000	-0.014	0.753	0.190 <sup>***</sup>	0.000	-0.001	0.989	0.069	0.132	0.989	0.069	0.132	0.132		
Main wage earner	-0.012	0.873	-0.009	0.896	-0.011	0.885	-0.036	0.622	-0.011	0.875	0.053	0.462	0.875	0.053	0.462	0.462		
Head of the household	-0.360 <sup>**</sup>	0.015	-0.742 <sup>***</sup>	0.000	-0.361 <sup>**</sup>	0.015	0.004	0.974	-0.361 <sup>**</sup>	0.014	0.314	0.135	0.014	0.314	0.135	0.135		
Spouse/Partner	-0.220	0.102	-0.861 <sup>***</sup>	0.000	-0.224 <sup>*</sup>	0.099	-0.024	0.838	-0.221	0.101	0.415 <sup>**</sup>	0.039	0.101	0.415 <sup>**</sup>	0.039	0.039		
Extraversion	0.125 <sup>***</sup>	0.000							0.123 <sup>***</sup>	0.000			0.123 <sup>***</sup>	0.000				
Intellect	0.121 <sup>***</sup>	0.001							0.121 <sup>***</sup>	0.001			0.121 <sup>***</sup>	0.001				
Agreeableness	-0.176 <sup>***</sup>	0.000							-0.174 <sup>***</sup>	0.000			-0.174 <sup>***</sup>	0.000				
Conscientiousness	-0.096 <sup>***</sup>	0.002							-0.095 <sup>***</sup>	0.002			-0.095 <sup>***</sup>	0.002				
Emotional stability	-0.113 <sup>***</sup>	0.000							-0.117 <sup>***</sup>	0.000			-0.117 <sup>***</sup>	0.000				
Financial risk tolerance			-0.090	0.308			0.293 <sup>***</sup>	0.006			0.210 <sup>**</sup>	0.040			0.210 <sup>**</sup>	0.040		

**Note:** This table reports two-stage tobit regression results of the effect of big five personality traits on bond and mutual fund ratio. Tobit is used because the dependent variables are bounded at 0 and 1. The sample consists of 4026 participants. Column (1), (3), and (5) are the first stage regression where instrumental variables (the big five) and independent variables (the control variables) are included. The dependent variable of every first stage model in the table is financial risk tolerance (endogenous variable). Column (2), (4), and (6) are the second stage regression where independent variables (the control variables) and financial risk tolerance as endogenous variable are included. The dependent variable of Column (2) is saving ratio. The dependent variable of Column (4) is bond and mutual fund ratio. The dependent variable of Column (6) is equity ratio. Clustered robust standard errors are used to avoid the correlation of the repeated participants which could result in underestimated standard errors. The standard errors are clustered by a specific code number assigned for each household. \*, \*\*, \*\*\* denote statistical significance at the 10%, 5%, and 1% levels, respectively.

in the first-stage model, while the overidentifying restrictions test is used to ensure that these instrumental variables are valid and uncorrelated with the error terms of the second-stage model.

Table 9 reports the results for the robustness tests. For the strength test, it shows that both  $F$ -stat values—14.385 (bond and mutual fund ratio model) and 16.796 (equity ratio model)—are significant at 0.01, indicating that the big five variables are meaningful as instrumental variables for FRT. Additionally, for the overidentifying restrictions test, the  $p$ -value cannot reject the null hypothesis at 0.05, suggesting that the big five as instrumental variables are valid and uncorrelated with the error terms. With these robustness tests, I can propose that the big five personality traits are statistically ‘good’ instrumental variables for FRT, which in turn can predict bond, mutual fund and equity investing behaviour.

**Table 9.** Robustness Tests for Instrumental Variables

Endogenous Variable	Financial Risk Tolerance	Financial Risk Tolerance
Dependent Variable	Bond and Mutual Fund Ratio	Equity Ratio
The strength test	$F(4,1915) = 14.385$ Prob> $F = 0.00$	$F(5,1915) = 16.796$ Prob> $F = 0.00$
The overidentifying restriction test	Sargan (score) $\chi^2(3) = 3.884$ $p = 0.274$	Sargan (score) $\chi^2(4) = 8.438$ $p = 0.077$

**Source:** Author's calculation.

## Conclusion

This article aims to find the determinants of financial risk tolerance by using the big five personality traits as main predictors. For decades, many scholars have agreed that demographic variables are the determinants of financial risk tolerance. Younger age, male gender, being single and higher income are associated with risk tolerance as reviewed in the research of Grable (2000) and Sulaiman (2012). However, I have found that some demographic predictors could be inconsistent in prediction, such as older people still have a positive relation to risk tolerance (Wang & Hanna, 1997) or gender is not a significant variable in the model of risk tolerance prediction (Grable & Joo, 2004). The question arises: Are there important omitted determinant(s) of financial risk tolerance? The big five personality traits have been identified as significant factors for preferences across domains, including the risk domain, but they remain less investigated in the financial risk domain.

Using the data of 4,026 participants from the DNB Household Survey, I find that all the big five traits are significantly related to financial risk tolerance. Extraversion and intellect are positively related to financial risk tolerance, while conscientiousness, emotional stability and agreeableness are negatively related to financial risk tolerance. The inclusion of the big five into the model leads to a substantial increase of  $R^2$  and adjusted  $R^2$ . This demonstrates the strength of personality traits as a determinant of people's financial risk tolerance.

Although the main focus of the study is on financial risk tolerance, I further investigate the effect of the big five on the actual financial behaviour of a household. I hypothesize that extraversion and intellect should be positively related to risky investments (bonds, mutual fund and equity ratios), while conscientiousness, emotional stability and agreeableness should be positively related to safe investment (savings). The findings show that most of the big five are not significant predictors of actual financial behaviour when financial risk tolerance is present in the model. I further investigate and examine the two-stage least squares or instrumental variable test of the big five. I find that these personality traits affect the financial behaviour of an individual indirectly through financial risk tolerance. Positive coefficients of extraversion and intellect, and negative coefficient of agreeableness, conscientiousness and emotional stability affect financial risk tolerance and ultimately influence the amount of bonds, mutual funds and equity that the participants hold.

From this study, I conclude that the big five personality traits do affect financial risk tolerance. The effect of these personality traits on financial behaviour is also indirect through financial risk tolerance. Since financial risk tolerance is predictive of financial behaviour, the big five as instrumental variables should no longer be overlooked by researchers. This article has found a meaningful link between these variables as those who have a specific personality can cause them to possess different financial risk tolerance levels, which finally affect their financial behaviours, such as different savings or investing amount. This key finding is novel to the field and I would encourage more study on the relationship between psychological factors, financial risk tolerance and financial behaviour. Future research could also study how personality traits influence long-term portfolio returns and accumulation of wealth on the basis of risk differences among those assets.

### **Acknowledgements**

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### **Appendix A: Financial Assets**

The following table summarizes the composition of financial assets used in this research.

Categories	Details
Transaction and saving accounts and certificates of deposit	Checking accounts; savings arrangements linked to a postbank account; deposit books; savings or deposit accounts; savings certificates
Bonds	Bonds and/or mortgage bonds (all types)
Stocks	Stocks and shares, including shares of substantial holding

Categories	Details
Mutual funds and managed investment accounts	Mutual funds and/or mutual fund accounts
Defined contribution plans	Single-premium annuity insurance policies
Cash value of life insurance	Savings or endowment insurance policies, including whole life insurances linked to a life insurance mortgage (on all types of real estate)
Employer-sponsored savings plans	Employer-sponsored savings plans
Other financial assets	Money lent out to family or friends; savings or investments not mentioned before

**Source:** Adapted from the DNB Household Survey Handbook.

## Appendix B: Big Five Scale

Goldberg's big five scale contains 50 items measuring five personality traits, including extraversion, agreeableness, conscientiousness, emotional stability and intellect. The participants are asked to score each item from 1 to 5—1 (very inaccurate), 2 (moderately inaccurate), 3 (neither accurate nor inaccurate), 4 (moderately accurate), 5 (very accurate). Items with \* in the following table are reversed items.

<b>Emotional Stability</b> <b>(Cronbach's Alpha = 0.851)</b>	I do not like to draw attention to myself*
I have frequent mood swings*	I do not mind being the centre of attention
I get upset easily*	I feel comfortable around people
I often feel blue*	I have little to say*
I get stressed out easily*	<b>Conscientiousness</b> <b>(Cronbach's Alpha = 0.794)</b>
I change my mood a lot*	I like order
I get irritated easily*	I leave my belongings around*
I am relaxed most of the time	I make a mess of things*
I worry about things*	I often forget to put things back in their proper place*
I seldom feel blue	I am exacting in my work
I am easily disturbed*	I get chores done right away
<b>Agreeableness</b> <b>(Cronbach's Alpha = 0.827)</b>	I am always prepared
I sympathize with others' feelings	I pay attention to details
I am interested in people	I follow a schedule
I take time out for others	I shirk my duties*
I am not really interested in others*	<b>Intellect (Cronbach's Alpha = 0.766)</b>
I am not interested in other people's problems*	I have excellent ideas

(Appendix B continued)

(Appendix B continued)

I feel others' emotions	I am full of ideas
I have a soft heart	I have a vivid imagination
I make people feel at ease	I have a rich vocabulary
I feel little concern for others*	I use difficult words
I insult people*	I am quick to understand things
<b>Extraversion</b>	I have difficulty understanding abstract ideas*
<b>(Cronbach's Alpha = 0.857)</b>	
I keep in the background *	I do not have a good imagination*
I am quiet around strangers*	I am not interested in abstract ideas*
I am the life of the party	I spend time reflecting on things
I do not talk a lot *	
I talk to a lot of different people at parties	
I start conversations	

**Source:** Author's own.

## Notes

1. The scale, descriptions and the Cronbach's alphas are reported in Appendix B.
2. The factor loading score of each item is 0.818 for spaar6, 0.794 for spaar5 and 0.703 or spaar3.
3. The sum of pay/salary, early retirement benefits, retirement pension/annuity, disability pension, unemployment benefits, reduced pay, general old-age pension (social security payments), general widows' and orphans' pension, social assistance (welfare)/benefits for self-employed, disability benefits for self-employed, their partner/free-lancers/clergyman, etc., disability benefits for persons who were already disabled at the age of 17 and, therefore, could not work, benefits for elderly and partly disabled unemployed/self-employed, alimony from spouse, profits, premium for subsidized purchase of house and ratable value of accommodation.

## References

- Arthur, W., & Graziano, W. G. (1996). The five factor model, conscientiousness, and driving accident involvement. *Journal of Personality, 64*(3), 593–618.
- Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and performance at the beginning of the new millennium: What do we know and where do we go next? *International Journal of Selection and Assessment, 9*(1–2), 9–30.
- Booth-Kewley, S., & Vickers, R. R., Jr. (1994). Associations between major domains of personality and health behavior. *Journal of Personality, 62*(3), 281–298.
- Bowles, S., Gintis, H., & Osborne, M. (2001). The determinants of earnings: A behavioral approach. *Journal of Economic Literature, 39*(4), 1137–1176.
- Brandstatter, H. (1996). *Saving, income and emotional climate of households related to personality structure* (VSB-CentER Savings Project Progress Report No. 38), Tilburg, The Netherlands: CentER for Economic Research, Tilburg University.
- Brandstatter, H., & Guth, W. (2000). A psychological approach to individual differences in intertemporal consumption patterns. *Journal of Economic Psychology, 21*(5), 465–479.
- Chauvin, B., Hermand, D., & Mullet, E. (2007). Risk perception and personality facets. *Risk Analysis, 27*(1), 171–185.
- Chen, C. C., Greene, P. G., & Crick, A. (1998). Does entrepreneurial self-efficacy distinguish entrepreneurs from managers? *Journal of Business Venturing, 13*(4), 295–316.

- Corter, J. E., & Chen, Y. J. (2006). Do investment risk tolerance attitudes predict portfolio risk? *Journal of Business and Psychology, 20*(3), 369–381.
- Costa, P. T., & McCrae, R. R. (1992). *Revised NEO personality inventory (NEO-PIR): Professional manual*. Odessa, FL: Psychological Assessment Resources.
- Crant, J. M. (1996). The proactive personality scale as a predictor of entrepreneurial intentions. *Journal of Small Business Management, 34*(3), 42–49.
- Dahlen, E. R., & White, R. P. (2006). The big five factors, sensation seeking, and driving anger in the prediction of unsafe driving. *Personalities and Individual Differences, 41*(5), 903–915.
- Delavande, A., Rohwedder, S., & Willis, R. J. (2008). *Preparation for retirement, financial literacy and cognitive resources* (Working Paper No. 2008-190). Ann Arbor, MI: Michigan Retirement Research Center.
- Faff, R., Mulino, D., & Chai, D. (2008). On the linkage between financial risk tolerance and risk aversion. *Journal of Financial Research, 31*(1), 1–23.
- Finke, M. S., & Huston, S. J. (2003). The brighter side of financial risk: Financial risk tolerance and wealth. *Journal of Family and Economic Issues, 23*(3), 233–256.
- Grable, J. E. (2000). Financial risk tolerance and additional factors which affect risk taking in everyday money matters. *Journal of Business and Psychology, 14*(4), 625–630.
- Grable, J. E., & Joo, S. (2004). Environmental and bio psychosocial factors associated with financial risk tolerance. *Financial Counseling and Planning, 15*(1), 73–82.
- Gray, J. A. (1987). *The psychology of fear and stress*. Cambridge: Cambridge University Press.
- Haliassos, M., & Bertaut, C. C. (1995). Why do so few hold stocks? *Economic Journal, 105*, 1110–1129.
- Hallahan, T., Faff, R., & McKenzie, M. (2003). An exploratory investigation of the relation between risk tolerance scores and demographic characteristics. *Journal of Multinational Financial Management, 13*(4–5), 483–502.
- . (2004). An empirical investigation of personal financial risk tolerance. *Financial Services Review, 13*(1), 57–78.
- Hariharan, G., Chapman, K. S., & Domian, D. L. (2000). Risk tolerance and asset allocation for investors nearing retirement. *Financial Services Review, 9*(2), 159–170.
- Heaven, P. C. L. (1996). Personality and self-reported delinquency: Analysis of the “Big Five” personality dimensions. *Personality and Individual Differences, 20*(1), 47–54.
- Hoch, S. J., & Loewenstein, G. F. (1991). Time-inconsistent preferences and consumer self-control. *Journal of Consumer Research, 17*(4), 492–507.
- Hong, H., Kubik, J. D., & Stein, J. C. (2001). Social interactions and stock market participation. *The Journal of Finance, 59*(1), 137–163.
- Jacobs-Lawson, J. M., & Hershey, D. A. (2005). Influence of future time perspective, financial knowledge, and financial risk tolerance on retirement savings behaviors. *Financial Services Review, 14*(4), 331–344.
- John, O. P., Caspi, A., Robins, R. W., Moffitt, T. E., & Stouthamer-Loeber, M. (1994). The “Little Five”: Exploring the nomological network of the five-factor model of personality in adolescent boys. *Child Development, 65*(1), 160–178.
- Kapteyn, A., & Teppa, F. (2011). Subjective measures of risk aversion, and portfolio choice. *Journal of Economic Psychology, 32*(4), 564–580.
- Kaustiaa, M., & Knüpfer, S. (2012). Peer performance and stock market entry. *Journal of Financial Economics, 104*(2), 321–338.
- Martin, E. D., & Sher, K. J. (1994). Family history of alcoholism, alcohol use disorders, and the five-factor model of personality. *Journal of Studies on Alcohol, 55*(1), 81–90.
- Mayfield, C., Perdue, G., & Wooten, K. (2008). Investment management and personality type. *Financial Services Review, 17*(3), 219–236.

- McCrae, R. R., & Costa, P. T. (1997). Conceptions and correlates of openness to experience. In *Handbook of personality psychology*. London: Academic Press.
- Nicholson, N., Soane, E., Fenton-O'Creev, M., & Willman, P. (2005). Personality and domain-specific risk taking. *Journal of Risk Research*, 8(2), 157–176.
- Nyhus, E. K., & Webley, P. (2001). The role of personality in household saving and borrowing behaviour. *European Journal of Personality*, 15(S1), 85–103.
- Schmitt, D. P. (2004). The big five related to risky sexual behaviour across 10 world regions: Differential personality associations of sexual promiscuity and relationship infidelity. *European Journal of Personality*, 18(4), 301–319.
- Simon, M., Houghton, S. M., & Aquino, K. (1999). Cognitive biases, risk perception, and venture formation: How individuals decide to start companies. *Journal of Business Venturing*, 15(2), 113–134.
- Soane, E., & Chmiel, N. (2005). Are risk preferences consistent? The influence of decision domain and personality. *Personality and Individual Differences*, 38(8), 1781–1791.
- Stock, J., & Yogo, M. (2005). Testing for weak instruments in linear IV regression. In *Andrews DWK identification and inference for econometric models*. New York, NY: Cambridge University Press.
- Sulaiman, E. K. (2012). An empirical analysis of financial risk tolerance and demographic features of individual investors. *Procedia Economics and Finance*, 2, 109–115.
- Terracciano, A., Loöckenhoff, C. E., Crum, R. M., Bienvnu, O. J., & Costa, P. T., Jr. (2008). Five-factor model personality profiles of drug users. *BMC Psychiatry*, 8. Retrieved from <https://bmcp psychiatry.biomedcentral.com/articles/10.1186/1471-244X-8-22>
- Trost, K. K., Herbst, J. H., Masters, H. L., III, & Costa, P. T., Jr. (2002). Personality pathways to unsafe sex: Personality, condom use, and HIV risk behaviors. *Journal of Research in Personality*, 36(2), 117–133.
- Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *The Journal of Business*, 59(4), 251–278.
- Wang, H., & Hanna, S. (1997). Does risk tolerance decrease with age? *Financial Counseling and Planning*, 8(2), 27–32.
- Wärneryd, K. E. (1996). Personality and saving. *VSB-CentER savings project* (Progress Report 39) CentER for Economic Research, Tilburg University.
- Weller, J. A., & Tikir, A. (2011). Predicting domain-specific risk taking with the HEXACO personality structure. *Journal of Behavioral Decision Making*, 24(2), 180–201.
- Zhao, H., & Seibert, S. E. (2006). The big five personality dimensions and entrepreneurial status: A meta-analytical review. *Journal of Applied Psychology*, 91(2), 259–271.