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Attitudes towards Financial Risks and Portfolio Allocations: Evidence from Large-Scale Surveys[1]

*Vladimír BALÁŽ**

Abstract

This paper analyses the determinants of financial risk attitudes and portfolio allocations as established by large-scale surveys in developed countries. After a literature review the paper proceeds with an analysis of two large-scale surveys on financial risk attitudes and the ownership of financial products in Slovakia. Risk attitudes are examined via a stated and revealed preference over portfolio allocations. Two dependent variables were used to test assumptions on investment choices: subjective financial risk tolerance (expressed via stated preferences over hypothetical portfolios) and objective risk tolerance (expressed via the actual share of risky investments out of the total financial assets). The standardised regression coefficients indicated that the risk attitudes seemed to be the most important predictors of both subjective and objective risk tolerance, followed by perceived and actual experience with financial investments. Socio-demographic variables (gender, age, education) had a relatively lower impact on portfolio allocations.

Keywords: *risk taking, financial investments, portfolio allocations*

JEL Classification: D14, G41, G50

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1. Introduction: Risk Attitudes and Portfolio Allocations

1.1. Determinants of Investment Choices

Investment choices are informed by a plethora of factors. Sociodemographic variables, such as gender, age and education, are well-known determinants of portfolio allocations. Risk attitudes are no less important to investment choices.

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Evidence from large-scale surveys points to the fact that the least risky choices are preferred by the largest proportion of respondents. A preference for riskless assets may have significant (and negative) consequences for wealth building. Risky assets, such as stocks and stock funds, outperform safe investments over a long--term period. Nevertheless, many investors prefer riskless assets to risky ones.

The relative importance of sociodemographic variables and psychological factors is not well understood. Is gender or age, for example, more important in making risky financial decisions than the risk trait and/or investment competence? Higher investment competences, for example, could be expected for population of countries with large and liquid capital markets and long tradition of investing. The US and UK populations, for example, account for higher shares of 'above average' and 'substantial' risk tolerance than Slovak one (Appendix, Table A5).

Attitudes towards financial risks and portfolio allocations constitute the central theme of this paper. Chapter 1.3 reviews literature on large-scale surveys of risk tolerance. Chapter 2 presents two large-scale surveys on risk attitudes and portfolio allocations from Slovak investors. Furthermore, chapter 2 introduces the research instruments, hypotheses and methods. Chapter 3 presents the research results. The concluding part of the paper discusses the key findings and limitations of the analysis, and suggests directions for further research.

1.2. Novel Elements of the Research

The novel elements of the paper include (i) an analysis of large datasets on risk attitudes from Slovak investors (with samples comparable to those from the USA and Germany), and (ii) an application of standardised b^*_M regression coefficients in multinomial logistic regression for establishing the strength of the effect of each independent variable on the dependent variable. This method is, by author's best knowledge applied for the first time in the financial risk tolerance studies.

1.3. Literature Review

The literature was identified primarily on the basis of searches on Scopus and Google Scholar pages for various keywords (e.g. "risk trait; investment competence" AND "risk tolerance/financial risk tolerance; portfolio allocation"). Sample sizes and structures, sociodemographic, socioeconomic and risk-profiling variables, and research methods were of prime interest. Table 1 summarises the findings from some highly cited studies on the tolerance of financial risks and general risk tolerance.

Sample Sizes and Structures and Research Questions and Methods

The majority of studies under review used the 'financial risk tolerance' (FRT) variable for assessing attitudes towards financial risks. The qualitative question on the tolerance of financial risks is on an ordinal scale ('none', 'average', 'above-average' and 'substantial') and was introduced by the US Survey of Consumer Finance (SCF) in 1983. The triannual survey is conducted on a sample of 4,000+ households. The US National Financial Capability Study surveys a general population of more than 25,000 American adults on a triannual basis. The US Health and Retirement Study (HRS) is a longitudinal panel study that surveys a representative sample of approximately 20,000 people. The HRS uses 'lifetime income gamble' to examine the general attitudes towards risk ('Suppose the chances are 50 – 50 that the second job would double your lifetime income and 50 – 50 that it would cut it by 75%. Would you take the first job or the second job?'). The German Socioeconomic Panel (SOEP) is a longitudinal survey that is conducted annually on a sample of approximately 11,000 private households. The SOEP contains a question on general risk tolerance ('How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?') and several questions on risk attitudes in specific domains, including finance and investing. Panel-based FRT and LTIG variables are on an ordinal scale. The most common methods of analysis include ordinal logit/probit (Yao, Sharpe and Wang, 2011; Chaterjee, 2017; Guiso, Sapienza and Zingales, 2018; Schroyen and Aarbu, 2018), binary logit (Sung and Hanna, 1996; Fisher and Yao, 2017), binary probit (Dohmen et al., 2006; Halek and Eisenhauer, 2001), and multinomial logit (Yao, Hanna and Lindamood, 2004; Sahm, 2012). Evidence from the longitudinal panel suggests that risk preferences seem to be persistent and moderately stable over a life cycle (Dohmen et al., 2017). The risk trait does not seem to be impacted by major life events such as job loss, marriage, divorce and/or serious changes in health conditions (Sahm, 2012). The qualitative question on financial risk tolerance by the SCF generates a remarkably stable distribution of answers over three decades.

Australia-based FinaMetrica has operated a psychometric-based risk-profiling tool since 1998. The tool computes a risk tolerance score (RTS) for clients of financial advisors. The RTS is on a scale of 0 – 100 and considered a continual variable. Studies with the RTS dependent variable apply the ordinary least squares model (OLS) (Hallahan, Faff and McKenzie, 2004; Van de Venter et al., 2012).

Some panel-based studies recorded information on participants' income and wealth and computed the share of risky assets (stocks and stock-based mutual funds) out of the total financial assets. The OLS with the dependent variable 'portfolio allocation' (PA) was applied in order to examine sociodemographic and psychological correlates of financial risk attitudes (Schooley and Worden, 1996; Barsky et al., 1997; Bannier and Neubert, 2013).

T a b l e 1
Correlates of Risk Attitudes in Large-scale Surveys

Author	Data source/ year	Sample size	Population	Avg age	Age	Male gender	Education	Higher income	Higher wealth	Dependent variable	R square	Estimate Method
Bannier and Neubert (2013)	DE, SAVE (2009)	2,047	GP	52.7	–	0	+	+	n/a	PA	0.165	OLS
Barsky et al. (1997)	USA, HRS (1992)	11,707	GP, 50+	55.6	+	+	+	+	+	PA	0.017 – 0.153	OLS
Chang et al. (2004)	USA, SCF (2001)	4,442	GP	49.0	–	+	+	+	+	FRT	n/a	OLS
Chatterjee et al. (2017)	NFCS (2012)	15,233	GP	n/a	–	+	+	+	n/a	FRT	n/a	ordered probit
Dohmen et al. (2006)	DE, SOEP (2004)	17,337	GP, 17+	n/a	–	+	+	0	+	binary FRT	0.100	probit
Fisher and Yao (2017)	USA, SCF (2013)	2,246	GP	n/a	–	+	+	0	+	binary FRT	n/a	logit
Gibson et al. (2013)	USA, FinaMetrica (2008)	2,327	RI	n/a	–	+	0	+	0	FRTS	0.080 – 0.129	OLS
Guiso et al. (2018)	IT, ad hoc (2007, 2009)	2,078	RI	54.8	0	+	+	n/a	+	FRT	n/a	ordered probit
Halek and Eisenhauer (2001)	USA, HRS (1992)	7,044	GP, 50+	54.9	–	+	+	n/a	0	LTIG	0.474	semi-log
Hallahan et al. (2004)	AU, FM (1999 – 2002)	16,461	RI	n/a	–	+	+	+	+	FRTS	0.238	OLS
Sahm (2012)	USA, HRS (1992 – 2002)	10,231	GP, 50+	n/a	–	+	+	0	0	LTIG	n/a	MNL
Schooley and Worden (1996)	USA, SCF (1989)	2,239	GP	n/a	–	0	+	0	+	PA	0.480	OLS
Schroyen and Aarbu (2018)	NO, ad hoc (2006)	1,509	GP	44.0	–	+	+	+	n/a	LTIG	n/a	ordered probit
Sung and Hanna (1996)	USA, SCF (1992)	2,659	GP	n/a	–	+	+	+	+	binary FRT	n/a	logit
Van de Venter et al. (2012)	AU, FM (2002 – 2006)	3,234	RI	47.9	0	0	0	0	0	FRTS change	0.004	OLS
Yao et al. (2011)	USA, SCF (1998 – 2007)	21,167	GP	n/a	–	+	+	+	+	FRT	n/a	ordered logit
Yao et al. (2004)	USA, SCF (1983 – 2001)	4,442	GP	n/a	–	+	+	+	+	FRT	n/a	MNL

Notes: + higher or increasing; – lower or decreasing; 0 = statistically insignificant; n.a = variable or data not available; GP = general population; RI = retail investors; PS = portfolio allocation; RTS = risk tolerance score. FRT = financial risk tolerance (qualitative); FRTS = financial risk tolerance score (continuous); LTIG = life-time income gamble, FM = FinaMetrica – formerly ProQuest. NFCS = National Financial Capability Study (USA); SAVE = Sparen und Altersvorsorge in Deutschland. R-square for OLS and Pseudo R-square for ordered logit/probit, ORM and MNL.

Source: Author's review.

The majority of studies in the literature survey were interested in sociodemographic and socioeconomic correlates of (financial) risk attitudes. The explanation power of regression models was low to medium (Table 1).

The reported R-squared and pseudo R-squared ranged from 0.004 (Van de Venter et al., 2012) to 0.480 (Schooley and Worden, 1996). The results of studies are impacted by the structure of the surveyed population. Panel studies target the general population (GP) but may focus on specific types of households. The SCF oversamples mid-income and high-income households. The HRS oversamples the population aged 50+. Some surveys target retail investors (RI). In developed countries, the majority of financial investors tend to be well-to-do elderly males with tertiary degrees. Hallahan, Faff and McKenzie (2004), for example, analysed clients of FinaMetrica investors, of whom 71% were males, 14.7% were above 60 years of age, and 50.1% had tertiary education. In the sample of Gibson, Michayluk and Van de Venter (2013), 81.5% were males, 40.1% were above 60 years of age, and 87.2% possessed a tertiary degree. Retail investors are likely to be more knowledgeable and risk-tolerant in financial affairs than are the general population.

Key Findings

The large-scale surveys point to the existence of a 'general risk trait' (Barsky et al., 1997; Sahm, 2012; Dohmen et al., 2017). Individuals high with regard to a 'general risk trait' are more likely to engage in a range of risky behaviours such as fast driving, undertaking risky sports, gambling, drinking, smoking, starting a business and/or investing in risky financial products. Expression of the general risk trait is likely to be moderated by sociodemographic and socioeconomic factors such as gender, age, education, income and wealth, and experience and practice in specific activities.

The majority of studies find that risk tolerance declines with age (Dohmen et al., 2017, p. 114). However, interpersonal differences in the tolerance of various risks persist over time (Schildberg-Hörisch, 2018, p. 148). Reasons for the age-related decline in risk tolerance are not well understood. Biological and health-related motives may mix with pragmatic expectations (Yao, Sharpe and Wang, 2011). Older investors generally have shorter investment horizons than do younger ones, thus having to adjust their portfolios accordingly. Some elderly investors may suffer from declining cognitive abilities and have less capacity for planning sophisticated investments.

Gender attitudes towards risks are subject to debate. The majority of studies find males to be more tolerant of financial risks than females (Barber and Odean, 2001; Gibson, Michayluk and Van de Venter, 2013), after accounting for age,

income, and investment horizons. Some authors argue that gender differences in financial risk tolerance do not stem from gender per se, but rather are the result of the higher income uncertainty and lower net worth (Fisher and Yao, 2017, p. 200) of women in comparison to men, as well as their lower experience with financial products and their lower financial literacy (Bannier and Neubert, 2013, p. 133).

Tolerance of financial risk is positively associated with higher education. Investors with lower education are more likely to overreact and reduce their shares of risky assets during a period of financial downturn (Schooley and Worden, 2016, p. 275).

Research Gap

The results of panel-based studies were to a considerable degree impacted by panel structures and research questions. Gough and Niza (2011, p. 110) stated: 'Socio-demographic factors have been in the spotlight of most retirement saving studies, and less interest has been shown to social and psychological factors.'

The willingness to invest in risky assets can also depend on (1) attitudes towards financial risks (stated preferences over investment products), and (2) perceived and actual competence in financial markets and products. Subjective tolerance of financial risks (stated preferences) and objective tolerance of financial risks (revealed preferences) are correlated, albeit to a degree (Chang, Devaney and Chiremba, 2004; Hallahan, Faff and McKenzie, 2004). Individuals with more financial knowledge and experience with investing are more likely to invest in risky assets (Clark, Lusardi and Mitchell, 2017). Experienced investors, for example, do not overemphasise market risks even in times of financial crashes (Gibson, Michayluk and Van de Venter, 2013, p. 34). Basic financial knowledge and understanding risk diversification sometimes are enough to result in higher wealth holdings, even controlling for income, education and gender (Lusardi and Mitchell, 2011).

The research gap is addressed in the following chapters.

2. Data Sources and Research Instruments, Hypotheses and Methods

There is no longitudinal panel in the Slovak Republic. Ad hoc surveys may offset the lack of information on investors' attitudes towards financial risks and portfolio allocations. The datasets analysed in this paper originate from surveys on financial risk attitudes conducted by two Slovak financial companies. The surveys included several standard international questions on risk attitudes and risk tolerance.

The first survey was undertaken with a large pension manager in 2012 on a sample of 15,586 participants (hereinafter referred to as 'PM survey'). Survey participants were members of a funded pillar in the mandatory pension insurance scheme.[2] The majority of funded pillar members received no investment advice and possessed quite limited knowledge of financial markets and instruments. Few participants, for example, reviewed their portfolios. Participants in the PM survey are considered a sample of the general population (GP) rather than a sample of retail investors (RI).

The second survey was implemented with a large financial advisor and distributor of financial products in 2018 on a sample of 11,619 clients (hereinafter referred to as 'FAD survey'). Clients are regularly approached by company agents. Agents provide clients with some investment advice and financial education. Participants in the FAD survey are considered retail investors (RI).

Descriptive statistics for the PM and FAD surveys are presented in Appendix, Table A2.

Research Instrument

The risk-profiling questionnaire was the key research instrument (Appendix). International comparability was an important aim of the research. The PM in 2012 used seven questions (Q2, Q3, Q5, Q6, Q7, Q8 and Q10), while the FAD in 2018 applied 11 questions (Q1 – Q11).

Questions 1 – 3 (gender, age and education) referred to sociodemographic variables. Question 4 was concerned with the investment horizon.

Question 5, on financial risk tolerance (FRT), explored risk attitudes. The question has been administered by the US Survey of Consumer Finance since 1983. The question was the dependent variable in several papers (Chang, Devaney and Chiremba, 2004; Yao, Hanna and Lindamood, 2004; Yao, Sharpe and Wang, 2011; Guiso, Sapienza and Zingales, 2018). The question was the dependent variable in this paper as well. Financial risk attitudes are measured via two quantitative questions on stated preferences over two hypothetical portfolios. The first question (Q6) on stated preferences frames potential gains in terms of multiple returns on term deposits (TD) in banks. A term deposit has been the most popular saving product with the Slovak population. Some 57.2% of participants in the PM survey and 58.9% in the FAD survey reported experience with term deposits. The respective shares of experience with money market funds (the simplest

[2] In Slovakia, workers have two options within mandatory pension system. One option is to direct all contribution to the pay-as-you-go system ("pillar one"). The other option is to split contributions between pay-as-go and funded "pillar two". Contributions accumulating in pillar two are managed by private pension managers. There were some 1.44 million workers contributing to pillar two in 2012.

investment product) constituted 22.7% and 14.9%. The second quantitative question on stated preferences (Q7) reframed the first one, but gains were stated in absolute monetary terms instead of multiples of term deposits.

Stated preferences over hypothetical portfolios may be informed both by 'pure risk attitudes' and by previous experience with financial products ('competence-based risk taking'). As to establish the potential impact of 'pure risk attitudes' on financial risk taking, the 'general risk tolerance' question (Q8) is added. The question observed the self-perceived image of respondents as mediated by an external audience ('How would your best friends describe you as a risk taker?'). Questions 6 – 8 were adopted from Grable and Lytton (1999).

Question 9 explored perceived investment competence. Question 10 recorded actual investment experience. Participants recorded ownership (yes/no) of eight specific saving and investment products.

Finally, question 11, i.e. 'portfolio allocation', concerns revealed preferences over investment products. Respondents reported the share of risky products out of the total portfolio of financial assets. The question was the dependent variable and approximated objective risk tolerance in several papers (Schooley and Worden, 1996; Barsky et al., 1997; Bannier and Neubert, 2013). Question 11 was the second dependent variable in the analysis.

Research Hypotheses

The research instrument included both sociodemographic and psychological variables. Hypothesis 1 stated that sociodemographic variables are weaker predictors of financial risk tolerance than are investment competence and psychological predispositions to risk taking.

The research design distinguished two sources of risk tolerance: one based on education and experience ('competence-based risk tolerance'), and the second based on psychological dispositions (''general risk trait'). Hypothesis 2 stated that experience and education ('competence-based risk taking) are more important than risk attitudes when the share of risky assets out of the total assets is low. Meanwhile, risk attitudes are more important than experience and education when the share of risky assets is high.

Model Choice and Evaluation

A series of non-parametric tests were conducted in order to detect significant associations between the output variables 'financial risk tolerance' and 'share of risky assets in total financial assets' (Q13) and 12 input variables (Q1 – Q12). Goodman and Kruskal's gamma (γ) indicated key interdependencies between variables (Appendix, Tables A3.1 and A3.2). Rank correlation analysis indicated

high levels of association between questions 6, 7 and 8. Factor analysis was conducted in order to uncover underlying factors of risk attitudes. Two factors were identified in both surveys: Factor 1 'Portfolios' (F1, Q6 and Q7) and Factor 2 'Risk image' (F2, Q8). Factor 1 explained 48.86% and Factor 2 34.36% of the total variance in the PM survey. Meanwhile, Factor 1 explained 55.27% and Factor 2 35.36% of the total variance in the FAD survey. In total, Factors 1 and 2 accounted for 83.22% and 90.63% of the total variance in the PM and FAD surveys respectively. Factor scores were used as input variables for the MLN regression models. The choice of factor score, rather than original variables, mitigates potential problems with multicollinearity.

Ordinal regression models (ORM) are preferred in case the dependent variable is coded on an ordinal scale. The ORM are subject to several assumptions: (1) the dependent variable is measured at the ordinal level; (2) there is no multicollinearity; (3) one or more of the independent variables are either continuous, categorical or ordinal; and (4) the proportional odds assumption. The final assumption requires the effects of any independent variable(s) to be consistent across groups. The parallel line test is applied in order to test the proportional odds assumption. ORM were the first choice in this analysis, but parallel line tess was highly significant for all models. As noted by Williams (2016, p. 18), results of the parallel line test can be impacted by the sample size and the number of predictors. Even small violations of the proportional odds assumption can be statistically significant when the sample is large and/or there is a continuous explanatory variable in the model. If the parallel line test is significant the assumption of proportional odds is violated. Alternative models are applied such as the multinomial logit model (MNL). The MNL is similar to ORM except that it is assumed that categories of the dependent variable are nominal and not ordered.

It is important to know the strength of the effect of each independent variable on the dependent variable. Standardised regression coefficients indicate an effect size in the OLS model. The use of standardised coefficients is less common in logistic regression models, as there is no general consensus on the best way in which to construct the coefficients. Inspection of the Wald statistics is one way of assessing the relative significance (albeit not the effect size) of each predictor. The other way is to use one of the standardisation methods for logistic regression. Menard (2011) examines several approaches to the standardisation of parameters in logistic regression and recommends the fully standardised coefficient

$$b_M^* = \frac{b(s_x)R}{s_{logit(\hat{Y})}}$$

where b^*_M is the fully standardised regression coefficient, s_x is the standard deviation of the respective independent variable(s), $s_{logit(\hat{Y})}$ is the standard deviation of $logit(\hat{Y})$, R is the correlation between the observed values of Y (either 0 or 1) and the predicted values of Y (predicted probabilities for each case), and $\hat{Y}$ is the predicted probability of being in one particular category of Y.

Construction and interpretation of the b^*_M coefficients are parallel to those in ordinary least squares regression models: 'a one standard deviation increase in the predictor is associated with a b^*_M standard deviation increase in the outcome' (Menard, 2011, p. 1422). The b^*_M coefficients are applied so as to evaluate the effect size in MNL regression models.

Unstandardised MNL regression models are reported in Appendix 4, Tables A4.1 – A4.4 (including likelihood ratio tests).

3. Model Results

Model 1: Financial Risk Tolerance

Table 2 presents the results of the MNL for the PM and FAD surveys with the b^*_M coefficients. Financial risk tolerance (FRT, Q5) was the dependent variable and the 'no risk' answer was the reference category in both regressions.

Sociodemographic Variables

Age was negatively related to the FRT variable in both surveys. The B coefficient for age was not statistically significant for the 'average risk' category in the PM survey. The b^*_M coefficient was negative and $Exp(B) < 0$ for other categories of the PM survey and all categories of the FAD survey. It is concluded that for each additional year, financial risk tolerance decreases. The age parameter produced quite low Wald and b^*_M values.

Data on gender were available for the FAD survey only. All categories had positive signs for gender, but the b^*_M coefficient was significant for only the 'above-average risks' category. It appears that males are more willing to accept higher financial risks than are females, but the evidence is not entirely convincing.

Education was coded for five levels in the surveys, from primary (1) to PhD and similar (5). The last level was the reference level in the MNL regression models. Education is a proxy for competence-based risk tolerance. A similar pattern emerged in both surveys: the lower the education (compared to PhD), the lower the tolerance of financial risks. The B coefficient was negative and $Exp(B) < 0$ for all levels of education below level 5 (except for the category 'substantial risk' and level 4 in the FAD survey). A closer inspection of Wald and b^*_M coefficients

suggests that higher education (levels 4 and 5) boosts financial risk tolerance in the 'average risks' and 'above-average risks' categories, albeit less so in the 'substantial risks' category.

Risk Attitudes

Risk attitudes were observed via stated preferences over portfolios (F1) and attitudes towards general risks – risk image (F2). Factor scores for F1 and F2 were positively related to the acceptance of financial risks and generated by far the highest Wald scores and b^*_M values in the MNL regression models. The b^*_M coefficients and Wald scores for F1 and F2 were much higher for categories 'above-average risks' and 'substantial risks' than for the category 'average risks' of the dependent variable. The result indicates that risk attitudes (stated preferences over portfolios and general risk tolerance) are the strongest predictors of financial risk taking in a high-risk environment (Hypothesis 2).

Experience

Actual investment experience (as established by the ownership of financial products) was positively related to financial risk tolerance and highly significant in both surveys. High values of the Wald and b^*_M coefficients indicate that experience was more important for the tolerance of financial risks than were sociodemographic variables. Experience with investment products generates tacit knowledge of financial risks. Investors experiencing rises and downturns in investment returns had a better understanding of financial risks than did those with no tacit knowledge of investing. Actual experience with investment products translates to competence-based risk tolerance. The prospect theory, for example, indicates that losses loom much larger – 2.25 times on average – than gains of the same magnitude (Tversky and Kahneman, 1992, p. 311).

Competent investors understand both financial and emotional costs of losses and may try to avoid investments with substantial risks. Interestingly, the Wald and b^*_M coefficients were the highest for the category 'above-average risks' (albeit not 'substantial risks') of the dependent variable. Again, the result suggests that competence is not enough to mitigate risk tolerance in a high-risk environment. Taking substantial risks is related more to 'risk attitude' than to experience.

The general conclusion from Model 1 is that risk attitudes are much stronger predictors of financial risk tolerance than are sociodemographic variables and experience (Hypothesis 1).

The pseudo R-squared measures were medium-high and indicated significant improvement in the fit of the model, due to the independent variables (Table 2).

T a b l e 2

Standardised Multinomial Regressions; Dependent Variable: Financial Risk Tolerance

PM survey												
FRT:	*Average risks*				*Above average risks*				*Substantial risks*			
	b^*_M	*Wald*	*Sig.*	*Exp(B)*	b^*_M	*Wald*	*Sig.*	*Exp(B)*	b^*_M	*Wald*	*Sig.*	*Exp(B)*
Intercept	0.236	455.43	0.000	x	–0.614	853.95	0.000	x	–0.920	887.81	0.000	x
Age	–0.008	1.57	0.210	0.975	–0.056	22.30	0.000	0.829	–0.028	4.36	0.037	0.871
Educ 1	–0.321	17.35	0.000	0.381	–0.388	6.11	0.013	0.274	–0.177	1.42	0.233	0.421
Educ 2	–0.164	60.86	0.000	0.612	–0.414	74.23	0.000	0.251	–0.088	3.90	0.048	0.652
Educ 3	–0.089	35.64	0.000	0.766	–0.146	33.15	0.000	0.614	–0.063	4.52	0.033	0.735
Educ 4	–0.083	9.35	0.002	0.779	–0.092	4.40	0.036	0.735	–0.051	1.00	0.318	0.779
F1 portfolios	0.333	1513.86	0.000	2.715	0.618	2286.59	0.000	7.883	0.542	1642.08	0.000	14.041
F2 risk image	0.289	1425.28	0.000	2.380	0.477	1309.47	0.000	4.922	0.375	665.59	0.000	6.238
Expe-rience	0.131	272.57	0.000	1.481	0.230	457.59	0.000	2.155	0.168	222.54	0.000	2.271
Pseudo R-Square: Cox and Snell: 0.391; Nagelkerke: 0.452; McFadden: 0.247												
FAD survey												
FRT:	*Average risks*				*Above average risks*				*Substantial risks*			
	b^*_M	*Wald*	*Sig.*	*Exp(B)*	b^*_M	*Wald*	*Sig.*	*Exp(B)*	b^*_M	*Wald*	*Sig.*	*Exp(B)*
Intercept	2.471	1115.72	0.000	x	0.320	112.87	0.000	x	–0.464	267.87	0.000	x
Gender	0.018	3.18	0.075	1.053	0.056	17.31	0.000	1.183	0.010	1.04	0.308	1.061
Age	–0.021	4.60	0.032	0.943	–0.056	15.43	0.000	0.846	–0.056	24.62	0.000	0.720
Educ 1	–0.224	10.18	0.001	0.533	–0.369	10.68	0.001	0.328	–0.233	8.12	0.004	0.257
Educ 2	–0.188	27.19	0.000	0.589	–0.219	19.25	0.000	0.516	–0.096	6.59	0.010	0.570
Educ 3	–0.045	2.98	0.084	0.881	–0.030	0.89	0.345	0.912	–0.005	0.04	0.834	0.972
Educ 4	–0.086	3.13	0.077	0.785	–0.089	2.18	0.140	0.765	0.003	0.01	0.944	1.017
F1 portfolios	0.460	707.41	0.000	3.644	0.924	1981.63	0.000	16.272	0.819	2532.55	0.000	119.593
F2 risk image	0.336	688.48	0.000	2.568	0.616	1370.85	0.000	6.425	0.539	1750.13	0.000	23.314
Expe-rience	0.259	195.03	0.000	2.067	0.318	268.70	0.000	2.609	0.173	224.82	0.000	2.752
Pseudo R-Square: Cox and Snell: 0.560; Nagelkerke 0.618: McFadden: 0.346												

Notes: Reference category for dependent variable: no risk. Reference category for the education is PhD, MBA and equivalent ISCED 6 degree. Females: 0, males 1. educ 1 = primary, educ 2 = lower secondary; educ 3 = upper secondary; educ 4 = undergraduate and graduate; eudc 5 = PhD and equivalent. N = 15,586.

Source: Author's computations.

Model 2: Portfolio Allocations

Table 3 presents the results of the MNL for the FAD survey with the b^*_M coefficients. The FAD survey contained the same set of questions as that of the PM survey, plus questions on the investment horizon (IH), perceived investment competence (IC), and the share of risky assets out of the total financial assets. The last question was the dependent variable in Model 2. The dependent variable 'portfolio allocation' originally had five categories. The number of categories was reduced to three so as to improve the model fit.

The resulting categories for the dependent variable were as follows: (1) No risky investments (reference category in the MNL model), (2) Share of risky investments is up to 10%, and (3) Share of risky investments is higher than 10%.

Model 2 was developed in two stages. The first stage implemented the same independent variables as those in Model 1. The second stage added variables on the investment horizon and perceived investment competence.

Basic Model

Gender became insignificant for both categories of the dependent variable. Age was positively related to the share of risky investments out of the total financial investments. The result may have been mediated by the sample structure and perceived investment competence. The FAD survey constituted a sample of retail investors who received some investment counselling.

The tolerance of financial risks was higher in this sample than in the PM sample (Appendix, Table A2).[3] Perceived investment competence and experience increased with age. The effect of age seemed to be stronger in the 'over 10%' category than in the 'up to 10%' category in comparison to the reference category 'no risky investments'.

Level 5 (PhD and similar) was the reference level for the education variable. The b^*_M coefficient was negative and significant, and $Exp(B) < 0$ for levels 1 and 2 compared to level 5. It indicates that investors with primary and lower-secondary education were less likely to have 'up to 10%' and 'over 10%' of shares of risky investments out of their total financial assets. Interestingly, investors with upper-secondary education were more likely to report 'up to 10%' and 'over 10%' categories than were investors with PhD and equivalent education, in comparison to the reference category 'no risky investments'.

Factor scores for F1 and F2, as well as experience scores, were positively related to the share of risky assets out of the total financial assets in the basic model. The Wald and b^*_M values were substantially higher in the 'over 10%' category than those in the 'up to 10%' category. The result suggests that risk attitudes and actual experience are highly significant for allocating over 10% of total financial assets to risky investments in comparison to the 'no risky investments' category.

The pseudo R-squared measures for the basic model were somewhat lower than those for the FRT model, albeit high enough to indicate significant improvement in the model fit in comparison to the null model (Table 3).

[3] 'No risk' option was reported by 41.0% participants in the PM surveys while 10.0% in the FAD survey. Risk profile of the PM survey was close to that by the US households in the SCF (Yao, Hanna and Lindamood, 2004).

T a b l e 3

Standardised Multinomial Regressions for the FAD Survey; Dependent Variable: Portfolio Allocations

Basic model								
Portfolio allocation	*Up to 10%*				*Over 10%*			
	b^*_M	*Wald*	*Sig.*	*Exp(B)*	b^*_M	*Wald*	*Sig.*	*Exp(B)*
Intercept	0.177	93.589	0.000	x	0.131	27.696	0.000	x
Gender	0.007	0.554	0.457	1.019	–0.017	1.912	0.167	0.963
Age	0.038	18.344	0.000	1.115	0.105	66.620	0.000	1.266
Educ 1	–0.259	14.097	0.000	0.481	–0.262	6.935	0.008	0.556
Educ 2	–0.087	7.762	0.005	0.783	–0.155	11.693	0.001	0.707
Educ 3	0.073	11.874	0.001	1.230	0.102	11.860	0.001	1.256
Educ 4	–0.014	0.122	0.727	0.962	0.031	0.334	0.563	1.072
F1 portfolios	0.120	129.939	0.000	1.404	0.465	1089.281	0.000	2.838
F2 risk image	0.062	46.759	0.000	1.193	0.291	509.070	0.000	1.922
Experience	0.301	431.159	0.000	2.334	0.454	593.517	0.000	2.770
Pseudo R-Square: Cox and Snell: 0.274; Nagelkerke 0.308: McFadden: 0.146								
Extended model								
Portfolio allocation	*Up to 10%*				*Over 10%*			
	b^*_M	*Wald*	*Sig.*	*Exp(B)*	b^*_M	*Wald*	*Sig.*	*Exp(B)*
Intercept	0.770	11.399	0.001	x	0.719	38.877	0.000	x
Gender	0.016	0.470	0.493	1.018	–0.029	4.452	0.035	0.941
Age	0.121	24.914	0.000	1.145	0.108	51.264	0.000	1.251
Educ 1	–0.330	3.248	0.071	0.692	–0.076	0.452	0.501	0.854
Educ 2	–0.045	0.296	0.587	0.951	–0.035	0.466	0.495	0.929
Educ 3	0.243	18.863	0.000	1.312	0.161	23.261	0.000	1.397
Educ 4	0.055	0.279	0.597	1.064	0.075	1.508	0.219	1.169
F1 portfolios	0.107	12.814	0.000	1.127	0.335	382.610	0.000	2.006
F2 risk image	0.058	5.399	0.020	1.067	0.225	223.505	0.000	1.596
Experience	0.654	294.638	0.000	2.077	0.385	331.194	0.000	2.223
IH up to 1 year	–1.041	191.261	0.000	0.313	–0.976	170.493	0.000	0.132
IH 1 – 3 years	0.216	10.621	0.001	1.273	0.122	8.271	0.004	1.287
IH 3 – 7 years	0.195	7.989	0.005	1.244	0.329	70.563	0.000	1.980
IC limited	–0.735	10.026	0.002	0.440	–0.994	71.684	0.000	0.127
IC some	–0.062	0.073	0.787	0.933	–0.524	20.564	0.000	0.337
IC moderate	–0.151	0.410	0.522	0.845	–0.279	5.550	0.018	0.561
Pseudo R-Square: Cox and Snell: 0.340; Nagelkerke 0.383: McFadden: 0.190								

Notes: Reference category for dependent variable: no risky investments. Reference category for the education is PhD, MBA and equivalent ISCED 6 degree. Reference variable for investment horizon is 'IH 7+ years'. Reference category for Investment competence is IC 'substantial'. Females: 0, males 1. educ 1 = primary, educ 2 = lower secondary; educ 3 = upper secondary; educ 4 = undergraduate and graduate; educ 5 = PhD and equivalent. N = 11,619.

Source: Author's computations.

Extended Model

The results of the extended model are similar to those of the basic model. Positive effects of age on the willingness to undertake a risky investment remain statistically significant for both the 'up to 10%' and 'over 10%' categories in comparison to the reference category 'no risky investments'. Again, investors with upper-secondary education seemed to be more likely to undertake a risky investment than did investors with a PhD and similar degree.

Factor scores for F1 and F2 remain positive and important, particularly for the 'over 10%' category. Longer investment horizons (reference level: 7+ years) appear to be substantial for having over 10% of risky investments out of the total financial assets in comparison to the 'no risky investments' category. The investment horizon generated high Wald scores and b^*_M coefficients in the model. Moreover, actual competence (observed via experience with saving and investment products) generated high values of the b^*_M coefficient, particularly in the category 'up to 10%'.

A similar pattern emerged for perceived investment competence. Investors reporting 'substantial investment competence' (reference level) are much more likely to have over 10% of risky investments out of the total financial assets than are those with 'limited' and 'some' competence when the reference category is 'no risky investments'.

The inclusion of the investment horizon and perceived investment competence increased pseudo R-squared by about 7%. An interesting result from Model 2 is that a long investment horizon and high levels of actual and perceived investment competence partially mitigate the effect of risk attitudes when revealed preferences are observed.

4. Discussion, Conclusions, and Directions for Further Research

Two key findings emerged in this research: (1) risk attitudes seemed to be the most important predictors of the stated investment preferences (2) while perceived and actual investment competence and long investment horizons partially mitigated the effect of risk attitudes when revealed preferences were observed.

This research has several limitations. Both surveys were conducted under one-time risk-profiling surveys with private companies. The purpose of the exercise limited the design of the research instrument and the number of research questions. One-time surveys do not enable longitudinal comparisons. Menard's b^*_M standardised regression coefficients provide a good approximation of the standardised *B* coefficients from the OLS models, but results must be interpreted with caution.

This paper indicated some directions for further research. One interesting question is concerned with what measure of financial risk tolerance (subjective or objective) is more suitable for testing assumptions on financial decisions. The correlation between two dependent variables (Q5 by Q11 in the FAD survey) is only medium-high. Actual investments in financial products (revealed preferences) have more determinants than risk attitudes only (stated preferences). Actual investments are constrained by budgetary constraints and/or financial knowledge.

Young people, for example, may have a higher tolerance of financial risks than that of older people but also may have significant financial commitments (mortgage, car-leasing payments, expenditure on child raising). Meanwhile, other people may have a higher general propensity for risky behaviours but lack competence in specific risk domains. Rather limited experience with financial investment may explain lower levels of financial risk tolerance by Slovak population than by the US and UK populations (Appendix, Table A5).

General risk tolerance ('risk trait') probably is innate and difficult to change. The competence-based tolerance of financial risks, however, is malleable. Model 2 indicated that both actual and perceived investment competence were significant predictors of portfolio allocations. Perceived competence can be enhanced via financial education and counselling. Meanwhifle, actual competence may be increased via experience, i.e. the acquisition of tacit knowledge of investing. Increases in actual and perceived competence may, in turn, increase the competence-based tolerance of financial risks and promote investments in more sophisticated financial products. Financial risks relate not only to the accumulation period but also to its outcomes. A better understanding of financial risks may result in better investment decisions and, consequently, higher financial comfort in old age (Lusardi, Michaud and Mitchell, 2017).

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A p p e n d i x 1: Questionnaire

Q1: *Age*: …..years.

Q2: *Gender*: female: 0; male: 1.

Q3: *Education*: 1: primary; 2: lower secondary; 3: upper secondary; 4: University student; and Bachelor; 5: Master and equivalent; 6: PhD and equivalent.

Q4: *What is your investment horizon? Suppose you do not need cancel your investment*. 1: one year; 2: two – three years; 3: three – seven years; 4: over seven years.

Q5: Which of the following statements comes closest to the amount of financial risk that you are willing to take when you save or make investments? (1) Not willing to take any financial risks; (2) Take average financial risks expecting to earn average returns; (3) Take above average financial risks expecting to earn above average returns; (4) Take substantial financial risk expecting to earn substantial returns.

Q6: *Hypothetical portfolio 1:* Imagine you invest for 10 years. Given the best and worst case returns of the four investment choices below, which would you prefer? (a): 1.0 – 1.5 times of term deposit gain best case; zero gain/loss worst case; (b) 1.5 – 2.0 times of term deposit gain best case; 10% loss worst case; (c) 1.5 – 2.0 times of term deposit gain best case; 25% loss worst case; (d) over 3.0 times of term deposit gain best case; 35% loss worst case.

Q7: *Hypothetical portfolio 2:* Imagine you invest 20,000 Euro for 10 years. Given the best and worst case returns of the four investment choices below, which would you prefer? (a): 2,000 Euro gain best case; zero gain/loss worst case; (b) 4,000 Euro gain best case; 2,000 Euro loss worst case; (c) 7,000 Euro gain best case; 5,000 Euro loss worst case; (d) 10,000 Euro gain best case; 7,000 Euro loss worst case.

Q8: *In general; how would your best friend describe you as a risk taker?* (1) A real risk avoider; (2) Cautious; (3) Willing to take risks after completing adequate research; (4) A real gambler.

Q9: *How would you rate your investment competence*? (a) My investment competence is limited so far; (b) I have some competence. I can tell difference between stocks and bonds; (c) I have moderate competence. I think I know what gains can be expected from specific asset classes; (d) I am a competent investor. I have substantial knowledge on investment strategies and products.

Q10: *Please tell us. which of the following financial products you have invested in:* (a) term deposit in bank; (b) life insurance; (c) building society; (d) voluntary pension fund; (e) money market fund; (f) hedged fund; (g) bond fund; (h) balanced and stock fund.

Q11: *Please consider your total financial assets. What is the share of risky assets in total assets?* The risky assets include stock funds, balanced funds, and real estate funds. 1: I have no such investments; 2: up to 10%; 3: up to 20%; 4: up to 30%; 5: over: 30%.

Appendix 2: Descriptive Statistics

Table A2
Descriptive Statistics

	PM survey, N = 15,586				FAD survey; N = 11,619			
x	*mean*	*min*	*max*	*st dev*	*mean*	*min*	*max*	*st dev*
Q1 gender (% male)	n/a	n/a	n/a	n/a	54.350	n/a	n/a	n/a
Q2 age (years)	37.078	18	71	7.858	36.178	16	83	11.110
Q3 education	3.687	1	5	1.142	3.450	1	5	1.040
Q4 investment horizon	n/a	n/a	n/a	n/a	3.265	1	4	1.051
Q5 FRT, qualitative	1.714	1	4	0.705	2.205	1	4	0.851
Q6 portfolio 1	1.636	1	4	0.749	2.182	1	4	0.992
Q7 portfolio 2	1.667	1	4	0.803	2.082	1	4	0.983
Q8 risk trait	2.273	1	4	0.697	2.540	1	4	0.752
Q9 perceived competence	n/a	n/a	n/a	n/a	1.934	1	4	0.876
Q10 actual experience (score)	3.970	0	12	2.615	3.374	1	12	2.682
Q11 portfolio share	n/a	n/a	n/a	n/a	2.062	1	3	0.801

Source: Author's computations.

Appendix 3: Non-parametric Tests

Table A3.1
Coefficients of Association, the PM Survey

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Q1	1									
Q2	n/a									
Q3	n/a	–0.112***	1							
Q4	n/a	n/a	n/a	1						
Q5	n/a	–0.080***	0.232***	n/a	1					
Q6	n/a	–0.079***	0.184***	n/a	0.741**	1				
Q7	n/a	–0.084***	0.164***	n/a	0.648***	0.717**	1			
Q8	n/a	–0.105***	0.095***	n/a	0.649***	0.535**	0.472***	1		
Q9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	
Q10	n/a	0.064***	0.244***	n/a	0.301***	0.215***	0.165***	0.166***	n/a	1
Q11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Notes: Pearson correlation coefficient reported for Q1 age. The Goodman Kruskal Gama reported for all other variables Q2 – Q12. *** Significant on 0.000 level.

Source: Author's computations.

Table A3.2
Coefficients of Association, the FAD Survey

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Q1	1									
Q2	–0.083**	1								
Q3	–0.023*	–0.173***	1							
Q4	–0.167***	0.057***	0.121***	1						
Q5	–0.123***	0.191***	0.144***	0.588***	1					
Q6	–0.136***	0.160***	0.144***	0.549***	0.793***	1				
Q7	–0.145***	0.146***	0.127***	0.543***	0.779***	0.818***	1			
Q8	–0.145***	0.247***	0.032**	0.459***	0.727***	0.638***	0.632***	1		
Q9	0.043***	0.145***	0.246***	0.410***	0.664***	0.593***	0.597***	0.496***	1	
Q10	0.180***	0.049***	0.256***	0.206***	0.311***	0.247***	0.236***	0.201***	0.463***	1
Q11	0.031**	0.071***	0.126***	0.353***	0.546***	0.490***	0.491***	0.431***	0.568***	0.341***

Notes: Pearson correlation coefficient reported for Q1 age. The Goodman Kruskal Gama reported for all other variables Q2 – Q12. * = significant on 0.05 level. ** Significant on 0.01 level. *** Significant on 0.000 level.

Source: Author's computations.

A p p e n d i x 4: Unstandardized Multinomial Regression Models

T a b l e A4.1
Multinomial Regressions. Dependent Variable: Financial Risk Tolerance

PM survey												
FRT:	*Average risks*				*Above average risks*				*Substantial risks*			
	B	*Wald*	*Sig.*	*Exp(B)*	*B*	*Wald*	*Sig.*	*Exp(B)*	*B*	*Wald*	*Sig.*	*Exp(B)*
Intercept	0.230	5.16	0.023	x	–2.331	138.54	0.000	x	–5.082	211.84	0.000	x
Age	–0.003	1.57	0.210	0.997	–0.024	22.30	0.000	0.976	–0.018	4.36	0.037	0.983
Educ 1	–0.964	17.35	0.000	0.381	–1.295	6.11	0.013	0.274	–0.864	1.42	0.233	0.421
Educ 2	–0.491	60.86	0.000	0.612	–1.383	74.23	0.000	0.251	–0.428	3.90	0.048	0.652
Educ 3	–0.266	35.64	0.000	0.766	–0.487	33.15	0.000	0.614	–0.307	4.52	0.033	0.735
Educ 4	–0.250	9.35	0.002	0.779	–0.307	4.40	0.036	0.735	–0.250	1.00	0.318	0.779
Educ 5	0b	x	x	x	0b	x	x	x	0b	x	x	x
F1 portf	0.999	1513.86	0.000	2.715	2.065	2286.59	0.000	7.883	2.642	1642.08	0.000	14.041
F2 friends	0.867	1425.28	0.000	2.380	1.594	1309.47	0.000	4.922	1.831	665.59	0.000	6.238
Experience	0.150	272.57	0.000	1.162	0.294	457.59	0.000	1.341	0.314	222.54	0.000	1.369
Pseudo R-Square: Cox and Snell: 0.391; Nagelkerke: 0.452; McFadden: 0.247												
FAD survey												
FRT:	*Average risks*				*Above average risks*				*Substantial risks*			
	B	*Wald*	*Sig.*	*Exp(B)*	*B*	*Wald*	*Sig.*	*Exp(B)*	*B*	*Wald*	*Sig.*	*Exp(B)*
Intercept	1.693	199.87	0.000	x	0.121	0.50	0.479	x	–2.979	118.28	0.000	x
Gender	0.103	3.18	0.075	1.109	0.337	17.31	0.000	1.401	0.118	1.04	0.308	1.126
Age	–0.005	4.60	0.032	0.995	–0.015	15.43	0.000	0.985	–0.030	24.62	0.000	0.971
Educ 1	–0.629	10.18	0.001	0.533	–1.114	10.68	0.001	0.328	–1.360	8.12	0.004	0.257
Educ 2	–0.529	27.19	0.000	0.589	–0.662	19.25	0.000	0.516	–0.562	6.59	0.010	0.570
Educ 3	–0.126	2.98	0.084	0.881	–0.092	0.89	0.345	0.912	–0.029	0.04	0.834	0.972
Educ 4	–0.242	3.13	0.077	0.785	–0.268	2.18	0.140	0.765	0.017	0.01	0.944	1.017
F1 portfolio	1.293	707.41	0.000	3.644	2.789	1981.63	0.000	16.272	4.784	2532.55	0.000	119.593
F2 risk image	0.943	688.48	0.000	2.568	1.860	1370.85	0.000	6.425	3.149	1750.13	0.000	23.314
Experience	0.271	195.03	0.000	1.311	0.358	268.70	0.000	1.430	0.378	224.82	0.000	1.459
Pseudo R-Square: Cox and Snell: 0.560; Nagelkerke 0.618: McFadden: 0.346												

Notes: Reference category for dependent variable: no risk. Reference category for the education is PhD, MBA and equivalent ISCED 6 degree. Females: 0, males 1. Educ 1 = primary, Educ 2 = lower secondary; Educ 3 = upper secondary; Educ 4 = undergraduate and graduate; 5 = PhD and equivalent. N = 15,586.

Source: Author's computations.

T a b l e A4.2
Likelihood Ratio Tests

	PM survey						**FAD survey**					
	Model Fitting Criteria			*Likelihood Ratio Tests*			*Model Fitting Criteria*			*Likelihood Ratio Tests*		
	AIC	*BIC*	*-2LL*	*Chi-Square*	*df*	*Sig.*	*AIC*	*BIC*	*-2LL*	*Chi-Square*	*df*	*Sig.*
Intercept	17664.04	17870.70	17610.040	0.00	0		16128.85	16349.66	16068.85a	0	0	
Gender	n/a	n/a	n/a	n/a	n/a	n/a	16144.27	16343.01	16090.27	21.42272	3	0.000
Age	17682.02	17865.72	17634.02	23.98	3	0.000	16150.61	16349.34	16096.61	27.76051	3	0.000
Educ	17777.45	17892.26	17747.45	137.41	12	0.000	16151.63	16284.11	16115.63	46.77496	12	0.000
F1 portfolio	21753.66	21937.36	21705.66	4095.62	3	0.000	22177.08	22375.81	22123.08	6054.23	3	0.000
F2 risk image	20138.02	20321.72	20090.02	2479.98	3	0.000	18963.59	19162.32	18909.59	2840.74	3	0.000
Experience	18200.92	18384.62	18152.92	542.88	3	0.000	16458.44	16657.17	16404.44	335.5883	3	0.000

Source: Author's computations.

T a b l e A4.3
Multinomial Regressions for the FAD Survey.
Dependent Variable: 'Portfolio Allocation'

Basic model								
	Up to 10%				*Over 10%*			
Portfolio allocation	*B*	*Wald*	*Sig.*	*Exp(B)*	*B*	*Wald*	*Sig.*	*Exp(B)*
Intercept	–0.941	84.92	0.000	x	–1.713	217.47	0.000	x
Gender	0.037	0.55	0.457	1.038	–0.076	1.91	0.167	0.926
Age	0.010	18.34	0.000	1.010	0.021	66.62	0.000	1.021
Educ 1	–0.732	14.10	0.000	0.481	–0.587	6.93	0.008	0.556
Educ 2	–0.245	7.76	0.005	0.783	–0.347	11.69	0.001	0.707
Educ 3	0.207	11.87	0.001	1.230	0.228	11.86	0.001	1.256
Educ 4	–0.039	0.12	0.727	0.962	0.070	0.33	0.563	1.072
F1 portfolios	0.340	129.94	0.000	1.404	1.043	1089.28	0.000	2.838
F2 risk image	0.176	46.76	0.000	1.193	0.653	509.07	0.000	1.922
Experience	0.316	431.16	0.000	1.372	0.380	593.52	0.000	1.462
Pseudo R-Square: Cox and Snell: 0.274; Nagelkerke 0.308: McFadden: 0.146								
Extended model								
	Up to 10%				*Over 10%*			
Portfolio allocation	*B*	*Wald*	*Sig.*	*Exp(B)*	*B*	*Wald*	*Sig.*	*Exp(B)*
Intercept	–0.520	3.50	0.061	x	–0.177	0.43	0.512	x
Gender	0.035	0.47	0.493	1.036	–0.123	4.45	0.035	0.885
Age	0.012	24.91	0.000	1.012	0.020	51.26	0.000	1.020
Educ 1	–0.369	3.25	0.071	0.692	–0.158	0.45	0.501	0.854
Educ 2	–0.050	0.30	0.587	0.951	–0.073	0.47	0.495	0.929
Educ 3	0.272	18.86	0.000	1.312	0.334	23.26	0.000	1.397
Educ 4	0.062	0.28	0.597	1.064	0.156	1.51	0.219	1.169
F1 portfolios	0.120	12.81	0.000	1.127	0.696	382.61	0.000	2.006
F2 risk image	0.064	5.40	0.020	1.067	0.468	223.50	0.000	1.596
Experience	0.273	294.64	0.000	1.313	0.298	331.19	0.000	1.347
IH up to 1 year	–1.163	191.26	0.000	0.313	–2.025	170.49	0.000	0.132
IH 1 – 3 years	0.241	10.62	0.001	1.273	0.252	8.27	0.004	1.287
IH 3 – 7 years	0.218	7.99	0.005	1.244	0.683	70.56	0.000	1.980
IC limited	–0.820	10.03	0.002	0.440	–2.063	71.68	0.000	0.127
IC some	–0.069	0.07	0.787	0.933	–1.087	20.56	0.000	0.337
IC moderate	–0.168	0.41	0.522	0.845	–0.578	5.55	0.018	0.561
Pseudo R-Square: Cox and Snell: 0.340; Nagelkerke 0.383: McFadden: 0.190								

Notes: Reference category for dependent variable: no risky investments. Reference category for the education is PhD, MBA and equivalent ISCED 6 degree. Reference variable for investment horizon is 'IH 7+ years'. Reference category for Investment competence is IC 'substantial'. Females: 0, males 1. educ 1 = primary, educ 2 = lower secondary; educ 3 = upper secondary; educ 4 = undergraduate and graduate; educ 5 = PhD and equivalent. N = 11,619.

Source: Author's computations.

T a b l e A4.4
Likelihood Ratio Tests

	Basic model						Extended model					
	Model Fitting Criteria			*Likelihood Ratio Tests*			*Model Fitting Criteria*			*Likelihood Ratio Tests*		
	AIC	*BIC*	*-2LL*	*Chi-Square*	*df*	*Sig.*	*AIC*	*BIC*	*-2LL*	*Chi-Square*	*df*	*Sig.*
Intercept	18808.66	18955.87	18768.662a	0.00	0	x	19938.19	20173.72	19874.187a	0.00	0	x
Gender	18810.07	18942.56	18774.07	5.41	2	0.067	19944.51	20165.33	19884.51	10.33	2	0.006
Age	18871.69	19004.17	18835.69	67.03	2	0.000	19986.89	20207.71	19926.89	52.71	2	0.000
Educ	18873.34	18961.66	18849.34	80.67	8	0.000	19970.91	20147.56	19922.91	48.72	8	0.000
F1 portfolio	20278.41	20410.90	20242.41	1473.75	2	0.000	20471.13	20691.94	20411.13	536.94	2	0.000
F2 r. image	19411.83	19544.32	19375.83	607.17	2	0.000	20229.11	20449.92	20169.11	294.92	2	0.000
Experience	19606.61	19739.10	19570.61	801.95	2	0.000	20365.19	20586.00	20305.19	431.00	2	0.000
Inv horizon	x	x	x	x	x	x	20476.83	20668.20	20424.83	550.64	6	0.000
Competence	x	x	x	x	x	x	20392.83	20584.20	20340.83	466.64	6	0.000

Source: author's computations.

T a b l e A4.5
Distributions of Answers on the Financial Risk Tolerance Question (SCF, Q5)

Financial risk tolerance	**SCF avg 1983 – 2016 N = 4,037 – 6,227**	**UK population N = 4,528**	**Slovak population N = 15,586**
No risk	44.1	52.3	41.0
Average risk	37.6	25.1	48.8
Above average risks	13.8	18.0	7.9
Substantial risk	4.4	4.6	2.2

Sources: Grabble and Lytton (2001), Yao, Hanna and Lindamood (2004) and Kim, Hanna and Ying (2016) for the US population; Williams and Baláž (2013) for the UK population (N = 4528); author for the Slovak population (PM survey).