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Impact of Sentiment on Households' Financial Decision Making

[Vliv sentimentu na finanční rozhodování domácností]

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Abstract: The paper investigates the households' sentiment concerning financial decision making based on the micro data from the third wave of the Household Finance and Consumption Survey (HFCS) held in Slovakia in 2017. The aim of the research is to examine the sentiment of Slovak households using HFCS micro data and its impact on household's financial decision making. According to previous research, we assume that positive sentiment increases stock market participation. For the purpose of the research, we created a Sentiment index based on the survey data concerning economic expectations and life satisfaction, as well as Portfolio index based on the households' assets structure. The empirical results indicate a positive and statistically significant influence of sentiment on households' financial portfolios applying Logit and OLS estimates.

Keywords: decision making, financial assets, financial portfolio, household, sentiment.

JEL classification: D10, G11, G41

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Introduction

Households' decisions influence state and business operating, and consequently the nations well-being. Therefore, the decision-making process of households is in the sphere of great interest within researchers. According to the theory, a household is an initial economic unit at the microeconomic level, which makes its financial decisions under budget constraints accounting for certain risk factors. Thus, households' budget constraints determine the freedom in making choices along with the risk factors, which may be regarded as external and internal. We assume sentiment being internal risk factor in households' decision making considering that we as humans are too short-sighted, and instead of concern with the future we rather focus on what we are experiencing at the moment. And as this moment is influenced by moods and emotions, therefore our financial decisions are.

The detailed information on outcomes of such financial decisions at the level of households is reflected in their financial portfolios and provided in different surveys, which are nowadays conducted in many countries of the world and their unions, e.g., the Household Finance and Consumption Survey (HFCS) in European Union, British Household Panel Survey (BHPS), Survey on Household Income and Wealth (SHIW) in Italy, Household, Income, and Labour Dynamics (HILDA) in Australia, etc. "Most work on household portfolio choice relies on surveys", argues Campbell (2006, p. 1556). In recent years such surveys include additional questions for household investigation, e.g. financial literacy and risk attitude questions, as well as the inquiries on households' assessment of their own financial situation and the overall economic climate in their countries with predictions for the nearest future or further intervals. Such household-level information makes it possible to bind the tendencies in economic situation and household financial portfolios. Nevertheless, as we have already mentioned above, those assessments and expected trends may not rely on rational considerations and precise calculations, but rather be influenced by sentiment. In the paper we investigate the link

2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

between the households' evaluated economic conditions and their financial portfolios assuming that households' decision making depends on economic sentiment.

The paper proceeds as follows: section 2 contains the review of the previous main findings on households' decision making under the influence of sentiment; section 3 describes the methodology of the research, i.e., gives a brief description of the HFCS data used, provides an explanation for the proposed measurement of households' Portfolio and Sentiment indices, reports the results of the Portfolio and Sentiment indices measurement, and elucidates the regression model for identifying the influence of sentiment on household's portfolio; section 4 contains the results of applying the regression model of household's portfolio; section 5 suggests a discussion; and section 6 concludes.

1 Theoretical background / Literature review

Considering financial decision making within households, researchers started from the specialization of functions such as labour market employment and household production (Becker 1991). The other dimensions of financial decisions are made within the household on consumption, including private and public goods (rearing and education of children is seen as households public good among others produced within households), and accumulation of households' wealth (Smith et al. 2010). Such financial decisions concern investments (i.e. money market instruments, bonds, equities, and real estate), mortgages, superannuation funds, borrowing and saving patterns, etc. (Campbell 2006, Mihaylov 2015, Bialowolski 2019).

The behavioural economic theory contains the main motivation for our research, according to which households' financial behaviour is subject to variety of heuristics and biases (Ackert, Deaves 2010). Recent studies on household decision making are often concern with the issues of irrational motives, and such decisions are no longer considered being based on utility maximization and perfect information conditions. Households do not always choose the optimal decisions as they may be suffering myopia or overconfidence. The decisions are made according to the households' perceptions of the economic trends and the expectations for the future (Kamdar 2019). The researchers investigate financial behaviour, and are interested in the impact of emotions, moods, and expectations as economic sentiment on household choices (Liu 2022, Filiz 2021, Bialowolski 2019, Kamdar 2019, Kusev et al. 2017, Cryder et al. 2008, Lerner and Keltner 2000, etc.).

What appears to be missing in the literature is the research of the sentiment influence on the financial decision making at the collective level of the households. We aim to fill this gap. We contribute to research studies on sentiment and portfolio allocation, and based on household-level data of HFCS aim to show the effect of sentiment on financial decision making in Slovakia. We hypothesise that household's moods, emotions and expectations have an impact on its financial decision making, and our research question is whether the financial portfolio of the household is influenced by the sentiment of household's reference person. We suppose our paper fills the gap in the existing literature on determinants, which explain the household decision making by linking behavioural aspects of finance to portfolio choice.

1.1 Households' portfolio composition

The outcomes of household financial decision making are reflected in their asset portfolios. The studies on portfolio composition are not homogeneous, and different indicators are used for identifying households' financial decision making (Bialowolski 2019). Researches use household portfolio concept to refer to all types of assets both financial and non-financial

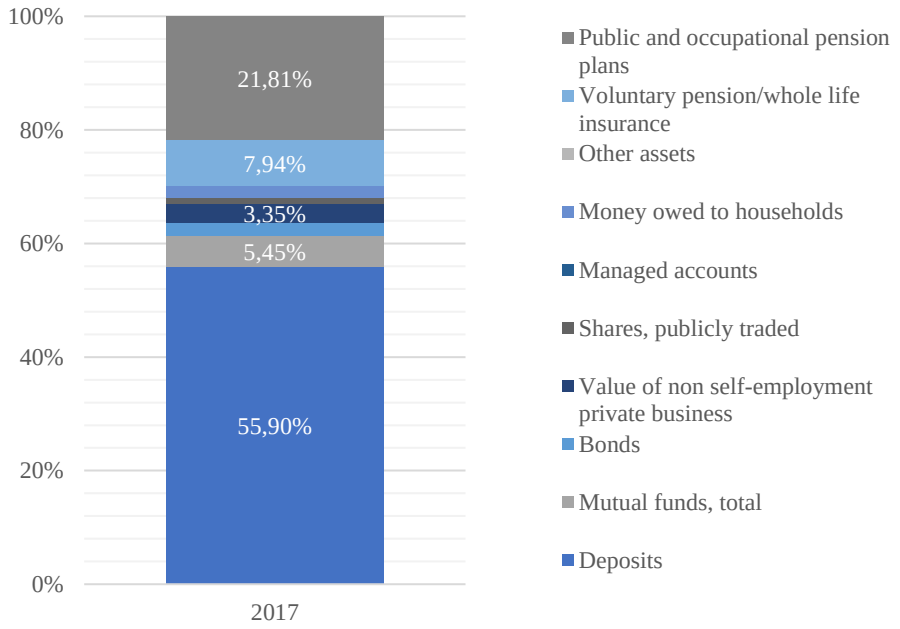
2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

(Campbell 2006, Bricker 2019), or solely financial ones (Alzuabi et al. 2020). We investigate financial portfolio considering financial assets of the households.

Financial portfolio consists of more and less risky financial assets. Examining the portfolio composition, we define more risky financial assets, which we call risky ones in our research. For determining the risky financial assets, we apply the approach similar to the studies, mentioned below. In Alzuabi et al. (2020) authors used the questions provided in US Panel Study of Income Dynamics (PSID) for splitting the financial assets of households into two groups: low risk (money in checking or savings accounts, money market funds, certificates of deposits, government savings bonds or treasury bills) and high risk (shares of stock in publicly held corporations, mutual funds or investment trusts). Campbell (2006) divides assets into several broad categories, namely, safe assets, vehicles, real estate, public equity, private business assets, and bonds. Checking, saving, money market, and call accounts, CDs, and U.S. savings bonds he classifies as safe assets.

When we look at the data of HFCS, they reveal that Slovak households tend to have most of their financial assets concentrated on bank deposits[1] (see Fig. 1). Even though the rest of the financial assets (except public and occupational pension plans) are distributed among other financial products (bonds, mutual funds, etc.), their share in financial portfolio is negligible, which remains the household composition of financial assets strongly conservative. The high increments of real assets in household portfolios in Slovakia may be explained by the minor experience of Slovak households with financial assets, low liquidity of the Slovak capital market, and rising real estate prices (Gertler et al. 2019).

Figure 1: The composition of households' financial portfolio in Slovakia in 2017, %



Source: own computations based on HFCS (2017)

[1] The National Bank of Slovakia gives even greater numbers (around 70% of financial assents of the households were on deposits in 2017) excluding public and occupational pension plans from financial assets (Gertler et al. 2019). We include those assets to our estimation as we assume their possession as a result of household decision making.

2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

The survey results in Slovakia are not unique in sense of financial decision making. For example, in the US more than half of the investigated households indicated holding the risky assets, but just approximately a tenth part of them reported having secured financial assets, which is much lower than the theory predicts (Cupak 2020). Such a finical behaviour of households reveals the discrepancy with neoclassical theory expressed in departures from expected utility maximisation (Haliassos, Bertaut 1995; Cupak et al. 2020).

Thus, a question occurs on what influences the household financial behaviour. As not investing may be considered as a conservative model of financial portfolio composition, it is a matter of interest for us to investigate why people, who invest, actually do invest. And whether they are, for example, more influenced by behavioural economics aspects such as overconfidence, risk aversion, self-attribution bias, or sentiment in their financial decisions (Ackert, Deaves 2010). While the literature providing research on overconfidence, risk aversion, and self-attribution bias is well established (Ackert, Deaves 2010; Mishra, Metilda 2015; Cupak et al. 2020; etc.), the evidence on the role of sentiment in households financial behaviour is rather limited. These questions brought us to a closer look at sentiment issues in households' decision-making process.

1.2 Sentiment in financial decision making

Recent studies based on surveys data are often focused on the influence of different factors on households' financial behaviour. The role of sentiment as an important determinant of household financial decisions has not been sufficiently explored, although nowadays more researchers became involved in that intriguing research sphere. We briefly describe the important sentimental impact, which according to Olson (2006), "is present in both individual microeconomic decisions and aggregate trends in financial markets". The scientific literature on economic sentiment do not contain a unique definition of sentiment and determines it through different categories such as emotions and moods (Filiz 2021, Kusev et al. 2017, etc.), predictions, prospects and beliefs (Rakovská et al. 2020, Kamdar 2019), confidence (Bialowolski 2019), etc. The findings are mixed, and, for example, Rakovska et al. (2020) define positive sentiment as optimism or confidence. We discuss the abovementioned categories in more details as to determine the potential impact of sentiment on households' financial decision making.

We start with emotions and moods, and firstly mention the difference between them, which many authors confuse. Olson (2006) points out that time perspective is a distinct feature. If we consider a temporal perspective, moods persist for a longer period of time than emotions. Therefore, moods appear to be more stable in terms of time (Ekman 1994) whereas emotions oscillate around a long-term average in the short term and do not show the same level of stability as moods (Diener, Lucas 2000). The importance of mood was showed by Grable and Roszkowski (2008), who pointed out that decision-makers in a happy mood have higher levels of financial risk tolerance, holding bio-psychosocial and environmental factors constant.

Similar to mood, the effect of short-term emotions on financial decision making was confirmed by Lerner and Keltner (2000; 2001), who showed that induced fear was associated with pessimistic appraisals of future events and risk-averse decisions, while induced anger was associated with more optimistic appraisals and a more benevolent approach to the degree of risk. Schwarz (2000) came to the same conclusion arguing that two negative emotions, fear and anger, may affect judgements of risk in opposite ways: whereas fearful individuals made pessimistic judgements about future events, angry individuals made optimistic judgements. According to Kusev et al. (2017), emotions can be divided into two large groups. The first one

2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

is called immediate emotions, which include all affective states that the decision-maker has at the time of the decision. Anticipated emotions, on the other hand, are associated with the emotions that people expect to experience if they choose one option instead of another. It should be noted here that expected utility models assume that people can predict emotional consequences (and also utility) and choose the option that maximizes positive emotions while eliminating or minimizing negative emotions.

If we examine household financial decision-making more deeply, there are several studies that reveal the complex dynamics between emotions and risky decisions. Van Winden et al. (2011) observed that the timing of risk resolution (the time that elapses between a risk decision and the consequences of that decision) and anticipatory emotions predicted investment behaviour. He found, that "Solution delay for negative anticipatory emotions (high probability of success) discouraged investment behaviour, whereas solution delay for positive anticipatory emotions (low probability of success) encouraged investment behaviour". Regarding risk-averse behaviour in general, Grable and Roszkowski (2008) reported that people who are in a good mood are *ceteris paribus* less risk averse. Consumption behaviour is influenced by affective states in a way that people tend to spend more money when they are in a sad mood. And there are several side effects of a bad mood, e.g. greater attention and perception of negative phenomena, which can further bias financial decisions even more (Cryder et al. 2008). Oppositely, Guven (2012) through experimental methods demonstrated that happier people spend less, and they are less likely to be in debt. They are more concerned about the future, therefore save more.

Sentiment measurement applies different tools and technics. In general, there is no widely accepted methods of its measuring (Bialowolski 2019). Rakovská et al. (2020) use proxies for mood as to measure the irrational part of household sentiment, and macroeconomic data for the rational part of it. They analyse the role of economic agents' beliefs – their sentiment – in determination of the new consumer loans fluctuation. The authors argue that sentiment is represented by beliefs subjecting to the cognitive and emotional limitations and consider sentiment as economic agents views depending on both their anticipation of economic development in future, and current and past economic situations. The optimistic beliefs lead to optimistic sentiment, and pessimistic – to pessimistic one. Thus, they determine household sentiment as "economic indicator that measures how optimistic (or pessimistic) households are about their personal financial situation, the current state of the economy, and the future economic outlook".

Bialowolski (2019) used the consumer confidence indicator for measurement of changes in household financial portfolios as a predictor of household financial behaviour. The author investigated a link between the assessment of economic situation by households and their financial decisions in the domains of borrowing and saving. Participating households responded to questions pertaining to the economic sentiment along with their credit and saving objectives. It was proved that the changes in financial behaviour are driven by perceptions of the economic environment and vary according to changes in economic sentiments.

Motivated by the research studies of Bialowolski (2019), Filiz (2021), Kamdar (2019), Kusev et al. (2017), Rakovská et al. (2020) and other abovementioned scholars, we aim for defining the role of sentiment in financial decision making at the level of households considering households' sentiment as an outcome of expectations, assessment of the economic situation, and emotion and mood conditions. We have created our Sentiment index using data from HCFS survey as a measure that captures the respondents' assessment of the current satisfaction with

2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

life conditions depending on emotions and moods, as well as expected overall economic situation in the country along with financial situation of the particular household. The detailed methodological description is given below.

2 Methodology

We use Logit and OLS regression models for determining the relationship between household's sentiment and financial portfolio applying the household-level data. The detailed methodological steps are as follows.

2.1 Data

The analysis in the paper is based on the data of the Household Finance and Consumption Survey (HFCS) held in Slovakia in 2017. It was the third and the latest publicly available wave of the survey, which took place in Slovakia as a part of the overall cross-country observation collecting household-level micro data in the eurozone countries under the supervision of ECB according to the common methodology. HFCS contains the data on households' financial situation and some additional information for the overall households' analyses divided into several categories, such as demography, real estate, loans and other liabilities, employment and self-employment, business, pension plans, incomes, consumption, intergenerational transfers and gifts, and some additional data. Thus, a broad range of socio-demographic information provided in HFCS enables to control for a variety of household characteristics. The final sample of the Slovak HFCS data from 2017 contains 2178 households with 10895 observations. We consider the answers of reference persons as the opinion of the household as a whole, as we assume that respondents were the most competent members of the household to answer questions related to financial situation and its prediction, and their opinion have the significant weight in the household financial decision making.

2.2 Measurement of Portfolio and Sentiment indices

The dependent variable of the model (Portfolio index) and the treatment one (Sentiment index) we measured from the data available. As proxies for Portfolio index we used two variables: Portfolio index I has value of 1 if the household has financial assets and 0 if it doesn't have any, and Portfolio index II we compute as the ratio of the household's risky financial assets in total financial assets:

$$Portfolio\ index\ II = \frac{RFA}{TFA} \tag{1}$$

where *RFA* stands for risky financial assets containing mutual funds, value of non-self-employment private business, publicly traded shares, managed accounts, and money owed to households; and *TFA* is total financial assets including public and occupational pension plans. Thus, the values of the Portfolio index II are constrained to lie between zero and one. The approach to measuring the Portfolio index II is consistent with Alzuabi et al. (2020), where authors apply terminology of "low" and "high" risky assets. Similar approach is used by Campbell (2006) applying asset class shares in household portfolio. We employ exceptionally the share of financial assets as Alzuabi et al. (2020), and adapt the "safe assets" of Campbell (2006) and "low" and "high" risky assets composition of Alzuabi et al. (2020) to European financial conditions.

Selecting the approach for sentiment measurement we've considered the experience of implementing the economic sentiment indicator, which is a composite indicator presenting the current state of expectations of all economic environment participants, and is a weighted arithmetic mean of the different confident indicators (Statistical Office of the Slovak Republic

2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

2021). Thus, for computing the Sentiment index, we applied the survey questions on life satisfaction, expectations on household financial situation, and expectations on overall economic situation as confidence indicators. We put the answers values to the comparable form by using the same scale from 1 to 5 for their measurement, and applied the formula as follows:

$$Sentiment\ index = \frac{LS + EHS + EES}{3} \quad (2)$$

where *LS*, *EHS*, and *EES* are values of answers for the questions on life satisfaction, expectations on household financial situation, and expectations on overall economic situation, respectively.

Firstly, we examine the values of Portfolio and Sentiment indices of Slovak households as our dependent and treatment variables. The overall values in Table 1 show that the majority of Slovak households don't hold financial assets (approximately 90% of all households). Nearly half of the households holding financial assets have less than one fourth of them in risky assets (approximately 44%), and only minor part of Slovak households have mostly risky financial resources (circa 22% of households, who hold financial assets).

Within the age groups the Portfolio index shows that the cohort of the reference persons of 35-44 years is the most benevolent to financial assets with the largest share of households possessing financial assets (12.4% of all households within age of 35-44), around half of which have Portfolio index II in the first interval holding less than fourth of their financial assets in risky ones, and only near 12% have the major part of their financial assets in risky ones (more than three fourth of them), which is the lowest result from all age groups. And the cohort of the reference persons of 75 years old and over is the most financial assets averse with the smallest share of households possessing financial assets (5.4% within the households of 75 and older). And surprisingly around half of them hold mostly risky financial assets (approximately 41%), which is the highest result from all age groups.

The relationship of number of children in a household with Portfolio index shows that the households with three children are more inclined to having financial assets (around 14.5% of those households hold financial assets) though major part of those households have mostly non risky assets (40% of households in that cohort have Portfolio index II within first interval), and the households with one child have the highest level of aversion to financial assets among presented (only near 8% of them hold financial assets, and similar to the previous group most of those households, namely around 42%, have less than 25% of financial assets in risky form). The most risk averse group of households is one with two children (only 7% of them have mostly risky financial assets), and the most risk benevolent is the group with five or more children (if compare with other groups they are more inclined to having financial assets in general, moreover 100% of them have more than three fourth of financial assets in risky ones).

2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

Table 1: Portfolio indices[2] across reference persons

	Portfolio index intervals					
	0	1 (0; 0.24)	2 (0.25; 0.49)	3 (0.5; 0.74)	4 (0.75; 1)	Total
Overall	9873	453	193	154	222	10895
Age group						
Under 35	625	34	13	9	14	695
35-44	1279	88	33	38	22	1460
45-54	1649	106	32	31	42	1860
55-64	2562	143	66	39	75	2885
65-74	2334	62	28	30	36	2490
75 and over	1424	20	21	7	33	1505
Number of children in household						
0	7865	348	149	99	179	8640
1	1157	41	26	12	19	1255
2	616	52	14	26	7	715
3	175	12	4	7	7	205
4	30	0	0	10	5	45
from 5 to 7 children	30	0	0	0	5	35
Total household gross income quantiles						
1st	2073	15	16	15	60	2179
2nd	2063	31	20	29	42	2185
3rd	1979	64	40	62	32	2177
4th	1982	101	43	10	39	2175
5th	1776	242	74	38	49	2179

Source: own computations based on HFCS (2017).

From the income quantiles of the Table 1 we can see that households of the first income quantile do not often hold financial assets (only near 5% of households of the first quantile have financial assets), and it's notable that most of those households hold mostly risky assets (around 56.5%). The portfolios change gradually from the first to the fifth quantile, in which there are logically the highest number of households holding financial assets (nearly 18.5%), from which unlike the first quantile only small portion possesses mostly risky assets (around 12%).

The overall values in Table 2 show that the majority of Slovak households are in the middle of the sentiment range (approximately 65.5% of all households), and that the number of not confident and not satisfied households is twice as large as confident and satisfied, although both of them all together consist only 1.25% of all households. The same tendency holds for the age groups: among all of them prevails the middle value of the Sentiment index equal to 3. The number of households with this value increase with age. The second more frequent value is 4 till the age of 64, which then changes to 2, meaning lower satisfaction and confidence with age. Concerning children in households, again the majority of households state their middle position in sentiment range with the exception of household with 5 and more children, which claim less satisfaction and confidence than other groups. Within income quantiles most households show their middle satisfaction and confidence, and it's noteworthy that in lower-income quantiles the most prevailing value after 3 was 2, and from third quantile it changes to 4 logically demonstrating greater satisfaction and confidence with higher income.

[2] Table 1 consist both Portfolio indices I and II in the sense that those households, who have no financial assets (0 value of Portfolio index I) has respectively 0 value of Portfolio index II, and all the others have the value of Portfolio index I equal to 1.

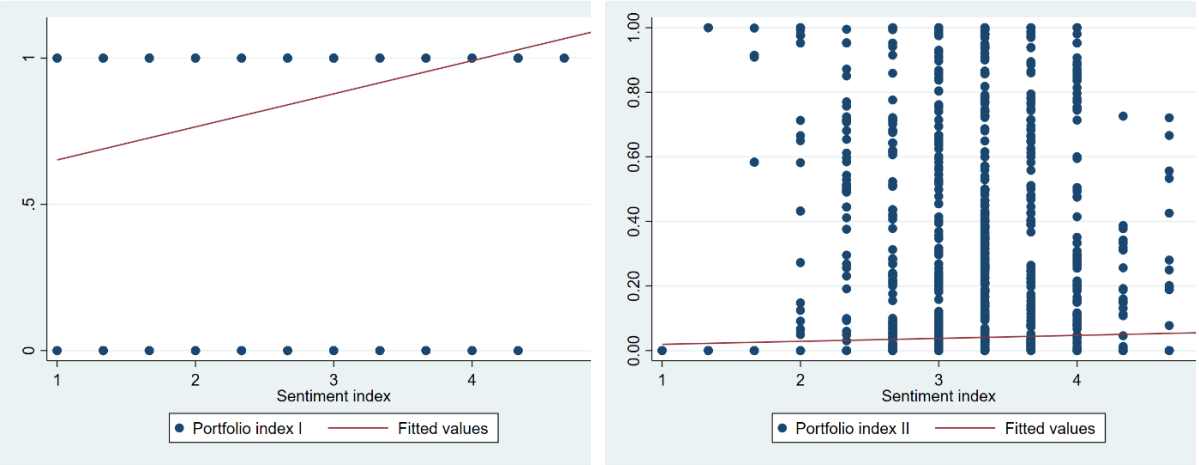
2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

Table 2: Sentiment index[3] across reference persons

	Sentiment index					
	1	2	3	4	5	Total
Overall	95	1543	7129	2087	41	10895
Age group						
Under 35	7	57	428	197	6	695
35-44	10	145	909	375	21	1460
45-54	15	249	1200	387	9	1860
55-64	30	447	1870	533	5	2885
65-74	13	381	1726	370	0	2490
75 and over	20	264	996	225	0	1505
Number of children in household						
0	86	1302	5706	1520	26	8640
1	9	104	848	286	8	1255
2	0	70	420	218	7	715
3	0	34	120	51	0	205
4	0	17	21	7	0	45
from 5 to 7 children	0	16	14	5	0	35
Total household gross income quantiles						
1st	60	489	1416	209	5	2179
2nd	23	416	1420	319	7	2185
3rd	6	318	1402	446	5	2177
4th	3	184	1487	492	9	2175
5th	3	136	1404	621	15	2179

Source: own computations based on HFCS (2017).

Figure 2: The portfolio indices



Source: own computations based on HFCS (2017)

After analysing the indices values we proceed with examining the relation between them. The plots at the Fig. 2 show the positive relationship between both Portfolio indices and the Sentiment index, which allows us to continue with regression analysis of portfolio dependence applying Logit and OLS regression models.

[3] For the creation of the graph the Sentiment index variables have been transformed to integer numbers by mathematical rule of rounding.

2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

2.3 Regression models

First, we use Logit model to examine the influence of sentiment on Portfolio index I (holding financial assets by households). In the model proposed portfolio index is used as a dependent variable, sentiment index is a treatment variable, and other independent variables as control ones. The baseline Logit model in the study is given as follows:

$$Portfolio\ index\ I_i = \beta_0 + \beta_1 Sentiment\ index_i + \beta_2 Age_i + \beta_3 Children_i + \beta_4 Income_i + \varepsilon_i \qquad (3)$$

where *Portfolio index* I_i is a dependent dummy variable equal to 1 if the *i-th* household has financial assets, and 0 otherwise; Age_i, $Children_{i,}$ and $Income_i$ are the variables for age of a reference person, number of children in a household (0-15 years), and total household gross income (including interest payments), respectively; and ε_i is an error term.

Second, for the robustness of our results we use ordinary least squares (OLS) model to examine the same dependence using abovementioned Portfolio index II (the index, based on the ratio of the household's risky financial assets in total financial assets) as dependent variable. The OLS model has the same form as Logit model in formula (3) with the same independent variables.

3 Results

We start our analyses of dependence from the Portfolio index I. Table 1 presents the results of the Sentiment index influence on Portfolio I index estimation along with selected demographical variables.

Table 3: The effect of Sentiment index and demographics on Portfolio index I (Logit estimates)

VARIABLES	(1) Coef.	(2) Odds ratio	(3) Coef.	(4) Odds ratio	(5) Coef.	(6) Odds ratio	(7) Coef.	(8) Odds ratio
Portfolio index I								
Sentiment index	1.075***	2.931***	1.059***	2.884***	1.069***	2.913***	0.693***	1.999***
	(0.0529)	(0.155)	(0.0578)	(0.167)	(0.0582)	(0.170)	(0.0602)	(0.120)
Age of reference person			-0.0521***	0.949***	-0.0617***	0.940***	-0.0403***	0.960***
			(0.00284)	(0.00269)	(0.00293)	(0.00276)	(0.00292)	(0.00280)
Number of children in household					-0.413***	0.661***	-0.442***	0.643***
					(0.0507)	(0.0335)	(0.0542)	(0.0348)
Total household gross income							0.000192***	1.000***
							(9.80e-06)	(9.80e-06)
Constant	-1.108***	0.330***	2.196***	8.993***	2.890***	17.99***	0.759***	2.137***
	(0.150)	(0.0495)	(0.267)	(2.401)	(0.271)	(4.875)	(0.257)	(0.550)
Observations	10,895	10,895	10,895	10,895	10,895	10,895	10,895	10,895
Wald chi2	413.08	413.08	560.85	560.85	775.55	775.55	773.14	773.14
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

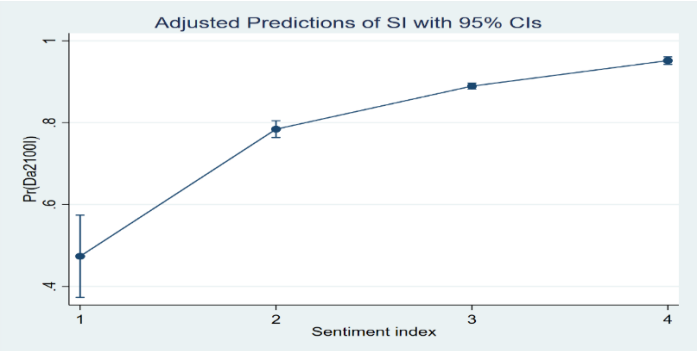
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: own computations based on HFCS (2017).

The chi-square test for all regressions presented in Table 3 indicates that the model fits the data significantly better than a null model. According to the Logit coefficients, standard errors and p-values, Sentiment index is a positive and significant predictor of the probability of having financial assets in all Logit regressions we made. For every one unit increase on Sentiment index the odds of having the financial assets in different regressions increase by factors from 1.999 to 2.931. Considering demographic characteristics, their influence on portfolio choice is statistically significant. With increase of the reference person's age, the odds of having financial assets decreases, as well as with the number of children in a household. Total household gross income is positive and significant predictor for the probability of having financial assets.

2023 Volume XXIII(1): 54-68
DOI: 10.25142/aak.2023.005

Fig. 3 presents the profile plot, which shows dots for the predicted probabilities of having financial assets along with 95% confidence intervals around that predictions. Horizontal axis contains the categories of Sentiment index[4], and the vertical axis present the predicted probabilities of having financial assets. The plot shows that for the household the probability of having financial assets increases along with the value of the Sentiment index.

Figure 3: The predicted probabilities of having financial assets depending on Sentiment index[5]



Source: own computations based on HFCS (2017)

Table 4: The effect of Sentiment index and demographics on Portfolio index II (OLS estimates)

VARIABLES	(1) Coef.	(2) Coef.	(3) Coef.	(4) Coef.
Portfolio index II				
Sentiment index	0.00926***	0.00811**	0.00807**	0.00638*
	(0.00321)	(0.00325)	(0.00324)	(0.00328)
Age of reference person		-0.000363***	-0.000102	-2.96e-05
		(0.000104)	(0.000127)	(0.000129)
Number of children in household			0.0102***	0.0103***
			(0.00353)	(0.00352)
Total household gross income				3.02e-07**
				(1.18e-07)
Constant	0.00999	0.0347***	0.0162	0.0121
	(0.00986)	(0.0128)	(0.0130)	(0.0131)
Observations	10,895	10,895	10,895	10,895
Prob > F	0.0039	0.0000	0.0000	0.0000
R-squared	0.001	0.002	0.004	0.006

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: own computations based on HFCS (2017).

After estimating the dependence of having financial assets on sentiment, we proceed with measuring the impact of sentiment on the share of risky financial assets in total household's financial assets. The F-test for the whole regressions[6] presented in Table 4 is equal to 0, which has shown that regression models have explanatory power.

As we can see from the Table 4, the sentiment has positive and statistically significant effect on portfolio composition. Without having other control variables, the one unit increase in Sentiment index causes the increase in Portfolio index equal to 0.00926 in the 1st regression,

[4] The fifth category of the Sentiment index (Sentiment index = 5) has been dropped as it predicted the success perfectly.
[5] For the creation of the graph the Sentiment index variables have been transformed to integer numbers by mathematical rule of rounding.
[6] Only for the first regression of Portfolio and Sentiment indices the F-test is not equal to 0 (Prob>F = 0.0039), and still less than 0,01.

2023 Volume XXIII(1): 54-68
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and when we control for all proposed household characteristics the effect decreases slightly to the value of 0.00638 in the 4th regression. Thus, even after taking into account the other differences between the households' reference persons the effect of sentiment on decision making remains statistically significant. Considering demographic characteristics, the age of reference persons negatively affects the Portfolio index meaning that the willingness of the households' reference persons to have risky financial assets decreases with age (the parameter is statistically significant in one regression from three conducted with age variable). Number of children in household has positive and statistically significant effect on having financial assets, and total household gross income has the same effect.

4 Discussion

On average, the aversion of Slovak households to holding financial assets is extremely high along with their aversion to risk financial assets: most households in the sample do not hold any risky assets in their financial portfolios supporting "stock-holding puzzle", which is in line with the household finance literature, however not in line with the theory (Alzuabi et al. 2020, Cupak et al. 2020, etc.).

Our findings on sentiment influence are in accordance with previous research given that the literature on sentiment impact on household financial portfolio is not that extend and is rather heterogeneous. Thus, at the level of individuals Liu et al. (2022) examined the changes in investor assets allocation under the influence of sentiment. They argued that investors increase the allocation ratios of risky financial assets if they overestimate the expected return on securities depending on emotion state, and vice versa. Similar to the previous scholars, Filiz (2021) investigated whether emotions have an influence on diversification behaviour at individual level, and argued that mood of subjects impact their portfolio decisions and exposure to risk. Bialowolski (2019) found the effect of sentiment measured by consumer confidence on increasing debt for durables and mortgages, which may be considered as more risky behaviour, while lower sentiment increased the likelihood of savings. Rakovska et al. (2020) obtained similar results showing measurable increase in consumer loans under the influence of household sentiment differentiated to rational and irrational. The authors asserted a positive role of irrational sentiment in periods, when country experiences an above-potential output.

Conclusion

Returning to our real-world motivation, we were interested in the reason of low asset market participation of the Slovak households, which tend to have most of their financial assets concentrated on bank deposits. If we would like to draw conclusions on portfolio allocation in more details, the measurement of Portfolio indices reveals that the majority of Slovak households do not hold financial assets, and from those who do hold financial assets minority hold mostly risky ones. The share of middle-age group of households' reference persons is the largest in possession of financial assets, though the quantity of households holding more than three fourth of their financial assets in risky ones is the smallest in that group. Surprisingly, the less risk averse age group is the oldest one, though this group is the less inclined to holding financial assets in general. The households with three children are less averse to having financial assets while those with one child are the most ones, and the most risk averse group of households is one with two children while surprisingly the less risk averse is the group with five or more children. The households of the first income quantile do not often hold financial assets, and what is interesting that most of those households hold mostly risky assets. Opposite situation is with fifth income quantile, where there is a highest number of households holding financial assets, while only small portion of them possesses more than three fourth of financial assets in risky ones.

The theory claims that the share of risky financial assets in households' financial portfolios should be more significant than it turns out to be according to the surveys data (Haliassos, Bertaut 1995; Cupak et al. 2020), which grounds the behavioural economics approach to decision making (Ackert, Deaves 2010). As according to the behavioural economics, our decisions are subject to the number of biases and heuristics, we assumed that sentiment may be the reason of irrational financial portfolio composition of the households. Based on the assumptions of behavioural economics, our research question was whether sentiment of household's reference person impacts the financial portfolio of the households. For answering the research question, we have employed data on the third wave of HFCS from the year 2017, and created two measures for household portfolio based on financial assets, and one for household sentiment based on actual values of life satisfaction and expected values of the household financial and overall economic situation, to explore how households' financial portfolios react to changes in households' sentiment.

The increase in households' sentiment is associated with the decision to hold financial assets pursuant to out Logit findings. As to explore the robustness of our findings, we have estimated an OLS model of households' portfolio to examine how sentiment affects the extent of the risky financial assets allocation in households' financial holdings. Sentiment has a statistically significant impact on the households' decision to hold risky financial assets in accordance with the outcomes from the OLS model. Thus, the empirical results indicate a positive and statistically significant influence of sentiment on households' financial portfolios applying both Logit and OLS estimates. Concerning the measurement of the households' Sentiment index *per se*, it shows that the majority of the Slovak households exhibits medium values of confidence and satisfaction in average and within the age groups, and that the Sentiment index decreases with age and number of children, and increases with income.

The research contributes to the existing literature regarding the impact of sentiment on financial decision making, and presents an evidence for the relation of household portfolio choice with sentiment. Our outcomes empirically verify the dependence of financial behaviour at household level from current moods and emotions along with expectations of the households' reference persons, which may have significant policy implications. Understanding the influence of sentiment on households' financial attitude is important for future research on determining the fraction of households, which may obtain negative outcomes caused by sentiment in such unfavourable conditions as financial crises, pandemics, natural disasters, wars, etc.

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