How the Covid-19 Pandemic Influences Risk Tolerance Over Lifetime

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Abstract. An individual´s attitude to risk is relatively stable throughout one's lifetime, but individual risk tolerance changes over time. How much it changes regarding financial decision-making primarily depends on individual risk preferences, but can also be influenced by exogenous shocks like a pandemic. The ongoing Covid-19 pandemic is a good example: It has created a tremendous uncertainty globally, resulting in, e. g., emotional reactions at the stock market, many missed job opportunities in the labor market, and many damaged business opportunities.

Keywords: Risk Tolerance, Covid-19, Behavioral Economics

JEL classification: E 71, D 91

1 Introduction

A major global crisis—by definition a temporary, unpredictable and unstable situation—like the ongoing Covid-19 pandemic can have a negative impact on the functioning of the economy [11]. This includes, but is not limited to a decline of investments, unstable stock markets, and unemployment rise. Such a crisis can change our tolerance of risk preferences. It can evoke feelings of uncertainty on an individual level influencing the decision making on fundamental life issues such as investments, job change, or business activities.

According to relevant literature, it has been proven that people actively make use of life experiences for future decision-making, and that economic crises and downturns generally result in an increase of individual risk tolerance [7]. Malmendiar and Nagel

(2011) conclude people who experienced the financial crisis of 2008 can feel unpleasant in financial decision-making for several decades.
This paper considers data from key long-term studies on individual financial risk tolerance and first studies on the impact of the Covid-19 pandemic measured through hypothetical economic game experiments. These first studies on the impact of the Covid-19 pandemic only show minor changes if any in individual financial risk tolerance.
This paper aims to analyze the impact of the Covid-19 pandemic on individual financial risk tolerance based on the results of recent and long-term hypothetical game experiments. It argues that the Covid-19 pandemic will have a measurable significant influence in the mid- and long-term, because, as long-term studies have proven, traumatic events and defining experiences generally have a lasting influence on risk taking.

2 Review of Relevant Literature

There is a number of studies primarily focusing on changes in risk preferences (e.g. Barsky, Juster, Kimball, Shapiro, 1997; Hui, Sherman 1998; Kimbal, Sahm, Shapiro, 2008; Dohmen, Falc 2011). Most of these studies find heterogeneity by individuals' perception of risk. They find a correlation between risk preferences and demographic factors like age or gender. Generally, men are more risk tolerant than women (Dohmen et al., 2006, 2011; Falk et al., 2018), and younger more than older people (Barsky, 1997; Sahm, 2007). However, this has also been proven by these and many other studies, risk preferences are generally not affected by economic or social circumstances.
This paper is based on the assumption that "the stability of risk preferences implies that, in the absence of measurement error, one should observe the same willingness to take a risk when measuring an individual's risk preferences repeatedly over time" [17]. Alexy et al (2016) tested in their experiment consistency of depicted risk attitudes in three different measurement procedures, two uniparametric and one multidimensional. They did not find association in uniparametrics procedures [1]. Empiric studies confirm low correlation related to macroeconomic factors like exogenous shocks or financial crises. Cohn et al. (2013) uses a laboratory experiment to measure risk tolerance during economic downturn. They indicate "fear is a plausible explanation for why risk aversion is higher during a bust than a boom" [4].
Usually, stability of risk preference is measured on individuals. In order to quantify the stability level of risk preferences of individuals throughout lifetime, panel data from long-term research studies are used. For example, Sahm (2007) used panel data from hypothetical gambles on lifetime income conducted with more than 12,000 individual participants over a period of 10 years. She identified a modest decline (1.7% each year, in total 20%) of risk tolerance among the group of older adults aged 45-70. These results correspond with the findings of other, similar studies.
Human capital is chosen as a reference variable, because it significantly affects relative risk aversion. Barsky (1997) found substantial heterogeneity in estimates of risk

preference. While most respondents of his experiment incline to undertake substantial gambles over lifetime income, i. e., most of the population are characterized as low risk tolerant, strongly increased risk-tolerant behavior by individuals is rare [3]. Hence, this finding suggests an increase of risk aversion after the Covid-19 pandemic in the mid- and long-term.

During the ongoing Covid-19 pandemic, most studies that measured risk tolerance through hypothetical economic game experiments, as usual, compared the influence of demographic factors on risk tolerance. Many economic experiments were repeated in several waves before and during the pandemic, allowing to measure the stability of risk preferences over time. The results of these studies are consistent with findings of previous studies conducted before the pandemic regarding the influence of demographic factors (see, e. g., Fan et al., 2020).

The economic experiment of Drichoutis and Nayga (2020) repeatedly measured risk and time preferences in three waves in 2017, 2019 and 2020 (about 1,000 respondents across all waves). The study participants were undergraduate students from Greece, but only the experiments in 2019 and 2020 were realized with the same participants. This allows conclusions on individual stability of risk preferences, and they found no statistically significant changes. The last wave was completed by the end of the first lockdown in March 2020. The results did not find any statistically significant differences in risk preferences, i. e., the pandemic generally had not affected the participants' risk preferences [6]. Angrisiani et al. (2020) came to similar results. They conducted a two-wave economic experiment with students and professional traders from England in 2019 and 2020. In general, the risk preferences of these sample students and traders remained stable and did not show a change in risk appetite. However, there were minor, but statistically significant changes on the individual level: when asked, participants who went through a Covid-19 infection themselves or experienced infection cases in their private sphere generally showed a measurable increase in their risk preferences.

However, a few studies already show broader measurable impacts of the Covid-19 pandemic on decision-making under risk, e. g., the study of Harrison et al. (2020) in the United States. It used a six-wave online experiment with students between May and October 2020. This study found an instability in atemporal risk preferences in comparison to similar studies conducted before the pandemic. A majority of the participants from previous studies inclined to risk neutral choices, while participants of this study showed an increase in risk aversion [10]. Also Guenther et al. (2021) measured changes in risk tolerance in an experiment with students in the United Kingdom during the first months of the pandemic last year. While men showed a higher than average risk tolerance than women, it still decreased in both sexes with age [9]. Another study from Wuhan shows that participants who remained in Wuhan during the lockdown in 2019/20 exhibit lower trust, cooperation and increased risk tolerance in relation to participants of similar, previous studies [18]. These studies show first signs how the Covid-19 pandemic influences economic preferences and behavior.

3 Methodology

This paper is inspired by studies that measured long-term risk tolerance preferences (Barsky, 1997; Sahm, 2007). They quantified the approach to financial risk using the utility function in lifetime income games. The results confirm the theory about stability of risk preference by individuals over life time span. The research of Sahm relates to results of older adults aged 40-75. This study includes hypothetical gambles on lifetime income from the U.S. Health and Retirement Study (HRS). HRS collected data from individuals over a period of 10 years, which was used to quantify individuals' risk preferences. The results suggest that "less than 30% of the systematic variation in risk tolerance—for this sample of older adults in the 1990s—is associated with time-varying attributes" [15].
For this study, we are using further research to analyze the influence of exogenous shocks on financial decision making. Economic instability and crises, triggered, e. g., by war, climate changes or a pandemic, influence our financial decisions under risk and change individual risk preferences in the mid- and long-term.

Table 1. Responses to Lifetime Income Gambles [13]

Response	% by HRS Survey Wave				
Category	1992	1994	1998	2000	2002
1	64.7	44.4	39.5	45.0	43.2
2		17.2	18.7	19.4	18.8
3	11.9	13.8	16.2	14.6	15.6
4	10.9	15.0	9.4	8.6	9.9
5	12.5	5.9	9.1	6.8	6.5
6		3.7	7.1	5.6	6.0
Responses	9,647	594	2,502	943	4,939

Table 1 shows how different individual levels of risk tolerance can be based on HRS data. Depending on the accepted level of risk by hypothetical game, the participants were assigned to one of six categories. The first two category included participants who could choose a low risk of loss, even when the expected value of gamble is substantially larger. In 1992 and 1994, almost two-thirds of the respondents decided for this category. The sample of respondents in those years included individuals born between 1931 and 1947. In order to quantify the approach to risk, the respondents were divided in two groups, on the one hand those who were born between 1931 and 1936 and on the other hand those born between 1937 and 1941. The first group was 16% less willing to take a risk, i. e., the respondents born closer to the Great Depression behaved more risk averse. Table 1 also shows the stability of gamble response across waves. Only the respondents of 1998 were willing to accept a somewhat higher income risk.
Another analysis of 693 respondents (see Table 2), who participated in the gamble in both HRS waves in 1992 and 1994, allows to compare and quantify the stability of individual preferences between two waves by the same respondents. "The correlation

of the response categories across the two waves was 0,27 and almost half switch response categories" [13]. The results show how unstable the decision-making preferences are.

Table 2. Age, Cohort and Time [13]

Latent Variable: Log of Risk Tolerance				
Parameter	Alternate Specifications of Time Effects			
Age	**-0.017**	-0.16	**-0.021**	**-0.021**
	0.008	(0.09)	0.010	0.010
		(0.00)		
1937-1941 Cohorts	**0.16**	**0.17**	0.14	0.14
	(0.06)	(0.07)	(0.07)	(0.07)
1942-1947 Cohorts	0.16	0.16	0.10	0.10
	(0.10)	(0.11)	(0.12)	(0.12)
		(0.00)		
Consumer Sentiment	**0.009**	**0.006**		**0.007**
	(0.002)	(0.003)		(0.004)
ICS Six Months Ago		0.004		
		(0.003)		
ICS One Year Ago		-0.001		
		(0.003)		
1994 HRS			**0.27**	**0.19**
			(0.08)	(0.09)
1998 HRS			**0.37**	0.19
			(0.08)	(0.11)
2000 HRS			**0.32**	0.12
			(0.11)	(0.14)
2002 HRS			**0.24**	0.17
			(0.11)	(0.11)
Log-likelihood	-23573.5	-23571.5	-23571.2	-23569.0
Parameters	55	59	59	61

The first column of Table 2 illustrates how the level of risk tolerance changes over life time span. The results show an average reduction of willingness to take risks by 1.7 % each year. The second column contains the data about macroeconomic effects with a help of consumer sentiment. The results suggest the association between a macroeconomic condition and risk tolerance is only strong at the beginning. Initially, a it has an association of 0.006 (t-statistic of 2.2). After 6 months it declines to 0.004 (t-statistic of 1.6), and after one year to -0.001 (t-statistic -0.4). These results indicate why current studies only show minor changes if any in individual financial risk tolerance, because the Covid-19 pandemic has begun about one and a half years ago.

Table 3. Elicited Risk Preferences across Treatments [2].

	Pre-Covid Treatment			COVID Treatment			$H_0 : \Delta BRET = 0$
	Mean	SD	Med	Mean	SD	Med	p-value
All ($N = 108$)	46.35	14.32	50.00	48.00	15.26	50.00	0.32
Traders ($N = 48$)	50.25	12.40	50.00	53.38	14.97	50.00	0.17
Students ($N = 60$)	43.23	15.07	43.50	43.70	14.19	46.00	0.85

Agrisani et al. (2020) used "median and standard deviation of the BRET, which remain over time constant" [2], in order to quantify risk by individuals (BRET stands for Bomb Risk Elicitation Task; see Crosetto and Filippin, 2013 [5]). They conducted a two-wave economic experiment with students and professional traders from England in 2019 and 2020. The first wave took place before, the second wave at the beginning of the Covid-19 pandemic. 60 students and 48 traders participated in both rounds. The average age of the students was 21, of the traders 34. The majority of participants was male. The first experiment was conducted in the first quarter of 2019, the second part in April 2020, when the United Kingdom and many other countries were in a hard lockdown.
This paper analyzes what changes may occur in the perception of risk triggered by the Covid-19 pandemic. According to previous literature, the kind of uncertainty we are experiencing during the ongoing pandemic can change individual risk tolerance. Stress, fear, or cognitive load induce elevated levels of risk aversion. Although the results from Agrisani et al.'s (2020) t-test measuring risk aversion across periods of pre-Covid-19 and Covid-19 time find no treatment effect, as was fail to reject the null hypothesis, the last columns of Table 3 provide BRET choices between pre-Covid-19 and Covid-19 treatment (p-value for whole sample was 0.32, for traders 0.17 and for students 0,85). Those, who did not change their preference, incline to be moderately or severely worried about the pandemic. Respondents with worries stayed approximately 20% more at the previous decision from pre-Covid-19 time than the other groups. This result is significant at the 5% level (Table 4) [2]. Also participants who had a close relative, friend or colleague diagnosed with Covid-19, or had Covid-19 themselves, increased their risk tolerance by a significant coefficient of 1%.

Table 4. Changes in Risk Preferences across Treatments [2][1]

	Decrease	No Change	Increase
High Impact on Current Finances	0.003	-0.101	0.098
	(0.103)	(0.104)	(0.118)
High Impact on Future Finances	-0.006	-0.010	0.016
	(0.082)	(0.078)	(0.099)
High Activity Disruption	0.136	-0.019	-0.117
	(0.088)	(0.084)	(0.088)
Worried about Pandemic	-0.047	0.188**	-0.140
	(0.089)	(0.092)	(0.096)
Diagnosed Own - Yes	0.064	0.240	-0.304***
	(0.223)	(0.263)	(0.107)
Diagnosed Others - Yes	0.113	0.169	-0.282***
	(0.120)	(0.106)	(0.083)

The negative experiences with Covid-19 caused changes in behavior and participants inclinated to choices with less risk. The study was able to quantify influence of traumatic events and confirmed influence of emotions. Changes in income or wealth were excluded.

[1] Method standard errors in parentheses. *: p - value < 0:1, **: p - value < 0:05, ***: p - value < 0:01.

4 Results & Conclusion

Risk preferences change over the lifetime. Individuals become more risk averse year by year over lifetime. Some research showed that the willingness to take risks is higher by young people than adults; this applies to both sexes. Several scholars have researched how risk tolerance changes with advanced age and macroeconomic conditions (Barsky, 1997; Sahm, 2007). Economic crises and downturns resulted in an increased risk aversion, possibly reducing self-employment and investments in stocks, which in turn can amplify macroeconomic downturns (Schildberg-Hörisch, 2018). Stability of preferences change over lifetime and influence financial decision-making. However, if lasting preferences are correlated with time or financial risk, fundamental changes may occur in the results. Research confirms non-stability of risk preferences over time. The value of life experiences must also be taken under consideration in decision-making. According to the literature the current Covid-19 situation influences the risk tolerance for financial decision-making. Figure 1 illustrates the stability of risk preferences during lifetime. The solid line shows the standard course of risk preferences, related to empirical results about decreasing risk preferences with advancing age. Exogenous shocks can rapidly affect the level of risk tolerance (see the dashed line). Temporary variation of risk preferences can be evoked by emotions, self-control, or stress. It represents only temporary deviation.

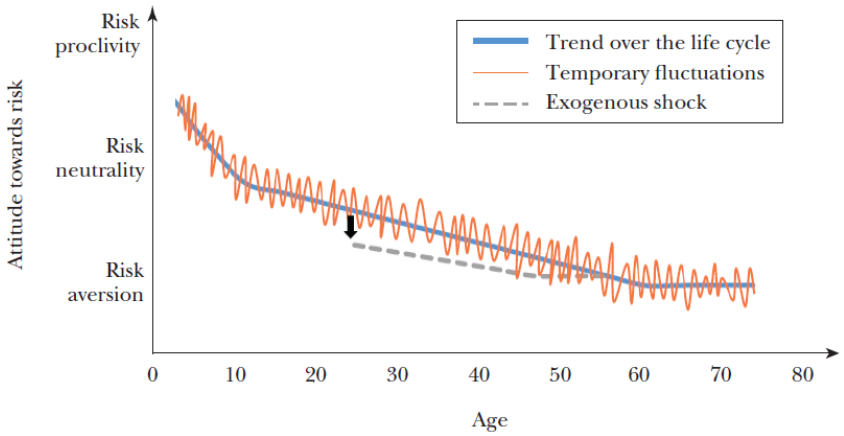

Fig. 1. Illustration of Framework for Studying the Stability of Risk Preferences [16].

Exogenous shocks such as natural disasters, violent conflict, or financial crises affect risk preferences. The research of Hanna and Wang (1997) included people born before 1929, when the stock market crashed. The memories of the Great Depression affected their risk perception, i. e. they had a higher risk aversion in comparison to the people born in times of economic stability. Similarly, the ongoing Covid-19 pandemic has the

potential to change the willingness to take financial risks of a whole generation. Financial crises reduce risk-taking of investors in the stock markets. Uncertainty in the labor market can cause irrational behavior of individuals. The study of Sahm (2007) suggests that changes in income or wealth are unrelated with financial crises.

Further papers have addressed the impact of economic crises in relation to risk perception. Research by Guiso, Sapienza and Zingales (2013) confirmed, that the financial crisis of 2008 affected the risk tolerance of Italian bank clients. Compared to the pre-financial crisis period the risk tolerance of the bank clients had increased [8]. Empirical studies have shown how traumatic events can affect risk appetite. In times of uncertainty, individuals reconsider their behavior which is reflected in increased risk aversion. Our savings, investments, or pension depend on individual decisions. From the willingness of individuals to take risks predictions can be made regarding health issues, job change, habits, or financial behavior [13]. Although the study of Guiso et. al. (2013) confirmed an impact of the financial crisis on decision-making, it was not able to explain how big it actually was.

Since the Covid-19 pandemic is still ongoing, the mid- and long-term effects on individual financial decision-making cannot yet be analyzed, but they can—as outlined in this paper—be predicted based on previous long-term studies that included participants who experienced major exogenous shocks in the past like the Great Depression. In order to get a solid data basis for the future, ongoing long-term studies on individual financial risk tolerance measured through hypothetical economic game experiments need to be continued. Now is also a good time to launch new long-term studies in this field, also in Slovakia.

References

1. Alexy, M., Georgantzis, N., Káčer, M. and Péliová, J., 2016. Risk attitude elicitation methods: do they tell similar stories?. Economicky Casopis/Journal of Economics, 64(9), pp.847-877.
2. Angrisani, M. et al., Risk Preferences at the Time of Covid-19: An Experiment with Professional Traders and Student, FRBNY Staff Reports, no. 927, 2020
3. Barsky, R., Juster, T., Kimball, M., Shapiro Matthew D., Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study. 1997, Quarterly Journal of Economics, 112(2):537–579
4. Cohn, A., Engelmann, J., Fehr, E., Maréchal, M., Evidence for Countercyclical Risk Aversion: An Experiment with Financial Professionals, UBS Center Working Paper Series Working Paper No. 4, August 2013, pp. 16
5. Crosetto, P., Filippin, A., The “Bomb” Risk Elicitation Task, 2013, Journal of Risk and Uncertainty, 47(1): 31-65.
6. Drichoutis, A. C., Nayga, R., On the stability of risk and time preferences amid the COVID-19 pandemic, 2020, University Library of Munich, Germany, MPRA Paper No. 104376
7. Fischer, A., Funke, J., 2016, Entscheiden und Entscheidungen. Die Sicht der Psychologie
8. Guiso, L., Sapienza, P., Zingales, L., Time varying risk aversion (NBER Working Paper No. 19284), 2013, Cambridge, MA: National Bureau of Economic Research, URL: https://www.nber.org/system/files/working_papers/w19284/w19284.pdf

9. Guenther, B., Galizzi, M. M., Sanders, G. J., Heterogeneity in Risk-Taking During the COVID-19 Pandemic: Evidence From the UK Lockdown, Frontiers in Psychology, 2021, URL: https://doi.org/10.3389/fpsyg.2021.643653
10. Harrison, G. W. et al., Subjective beliefs and economic preferences during the COVID-19 pandemic, Georgia State University, 2020, CEAR Working Paper 2020-22
11. Hertati, L. et al., The Effects of Economic Crisis on Business Finance, IJEFI, 2020, 10(3): 236-244
12. Hui, W., Sherman H., Does Risk Tolerance Decrease With Age?, 1998, Financial Counseling and Planning, 8(2), URL: http://dx.doi.org/10.2139/ssrn.95489
13. Kimball, M.S., Sahm, C. R., Shapiro, M. D., Imputing Risk Tolerance from Survey Responses, 2008, Journal of the American Statistical Association 103(483): 1028–38
14. Sahm, C., How Much Does Risk Tolerance Change?, 2007, FEDS Working Paper No. 2007-66, URL: https://www.federalreserve.gov/pubs/feds/2007/200766/200766pap.pdf
15. Sahm, C.: How much does risk tolerance change?, 2012, Quartely Journal of Finance 2(4), 1-38
16. Schildberg-Hörisch, H., Are risk preferences stable? Journal of Economic Perspectives, Vol. 32, Nr. 2, 2018, pp. 135-154
17. Schooleya, D. K, Worden D.D., 2016, Perceived and Realized Risk Tolerance: Changes During the 2008 Financial Crisis, 2016, Journal of Financial Counseling and Planning, 27(2): 265–276, URL: https://core.ac.uk/download/pdf/80332193.pdf
18. Shachat, J., Walker, M. J., Wei, L., The impact of the Covid-19 pandemic on economic behaviours and preferences: Experimental evidence from Wuhan, 2020, ESI Working Paper 20-33