Qualitative Research in Financial Markets

How the COVID-19 pandemic changed Italians' financial risk tolerance

Francesca Battaglia
Department of Quantitative and Business Studies, University of Naples Parthenope, Napoli, Italy

Enrico Maria Cervellati
Link Campus University Rome, Roma, Italy

Dario Salerno and Gian Paolo Stella
Department of Quantitative and Business Studies, University of Naples Parthenope, Napoli, Italy, and

Valeria Vannoni
Department of Economics, Society, Politics, University of Urbino, Urbino, Italy

Received 26 January 2024
Revised 18 April 2024
Accepted 25 June 2024

Abstract

Purpose – This research aims to investigate the impact of exogenous shocks on individuals' risk tolerance, particularly when originating outside the economic or financial sphere. Focusing on Italy as the first Western country affected by COVID-19, this paper explores whether the pandemic led to a decrease in Italians' financial risk tolerance (FRT).

Design/methodology/approach – This study used a two-stage approach for data analysis. Initial examination of key variables used linear regression (ordinary least square [OLS]) with robust errors. Subsequently, a system of structural equations (structural equation model [SEM]) was used for a more nuanced exploration of hypothetical relationships between constructs and their observed indicators. SEM addressed reliability issues inherent in OLS, offering a robust analysis of structural models based on specified hypotheses. To assess the impact of COVID-19 on Italians' FRT, the Grable and Lytton Risk Tolerance Scale was used, measuring changes through a scored questionnaire with values ranging from 1 (greater risk aversion) to 4 (greater risk propensity).

Findings – This study used three distinct OLS regression models to analyze the impact of COVID-19 on Italians' FRT, considering mortality, infection and stringency rates. Findings revealed that older individuals exhibited lower risk tolerance across FRT dimensions, consistent with previous research. Men were more risk-prone, aligning with gender-related financial literacy disparities. Married respondents tended to be less risk-tolerant, supporting the idea that marital status influences risk attitude. Education level showed a slightly negative impact on investment risk. Professional instability, lower income and stock market inexperience were associated with lower risk tolerance. Notably, the COVID-19 pandemic had a significant positive effect,

Qualitative Research in Financial Markets
Emerald Publishing Limited
1755-4179
DOI 10.1108/QRFM-01-2024-0019

making respondents more risk-averse. SEM methodology was used to examine the moderating effects of COVID-19 proxies on FRT changes.

Originality/value – This research brings a novel perspective to the ongoing debate on exogenous shocks' impact on individuals' risk tolerance, particularly when originating outside the economic or financial domain. Focusing on Italy, the first Western country hit by COVID-19, this study uniquely investigates the pandemic's effect on Italians' FRT. With a large and representative sample, the findings contribute significantly to the literature on risk attitude, shedding light on the pandemic's impact. This study's originality lies in providing reliable evidence with policy implications, emphasizing the imperative for government intervention in addressing both health and economic issues in the wake of such external shocks.

Keywords Italy, Financial risk tolerance, Pandemic

Paper type Research paper

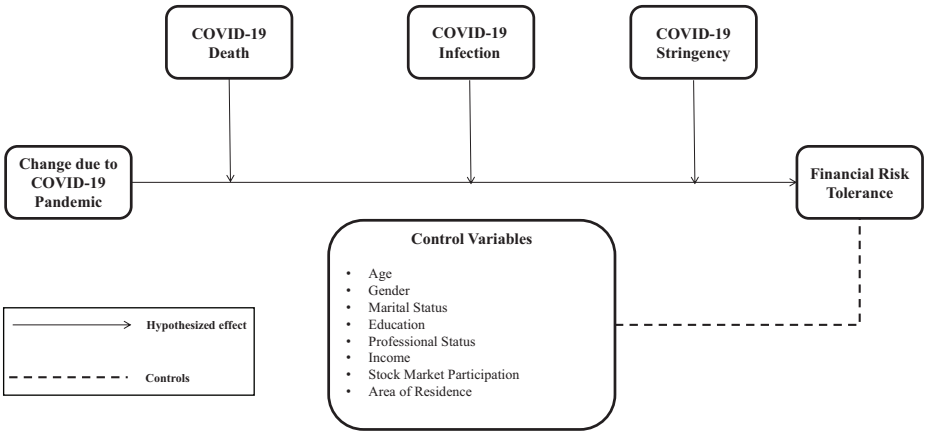
1. Introduction

Risk perceptions influence several decisions in the economic and financial domains as well as in other domains, such as choice related to the field of education or work sector. In several economic studies, risk perception is assumed to stay stable over time, whereas in psychology it has been shown that individual preferences do change in response to the context in which individuals choose, thus risk perceptions itself is not stable, but context-specific and changing over time (see Slovic *et al.*, 1982:1986; Weber and Milliman, 1997; Wahlberg and Sjoberg, 2000; Brewer *et al.*, 2004; Slovic and Peters, 2006; Cori *et al.*, 2020; Siegrist and Árvai, 2020). One of the explanations behind the change in individuals' perceptions of risk may be attributable to the impact that possible shocks may cause on individuals' lives (Weterings, 2022). In particular, considering the shock caused by the recent COVID-19 pandemic, Shachat *et al.* (2021) highlighted how there was a change in confidence of attitude toward risk between the period before and after the pandemic. Specifically, similar to the results reported by Mussio *et al.* (2023) the pandemic caused an increase in individuals' financial risk tolerance (FRT). FRT is defined by Grable (2000) as "the maximum degree of uncertainty that someone is willing to accept when making a financial decision." In particular, Droms (1987) argued that understanding risk tolerance is one of the factors necessary for an individual to be able to make optimal investment choices in terms of risk-return. The study conducted by Roszkowski and Davey (2010) showed that since the 2008 financial crisis, individuals have maintained a similar level of risk tolerance compared to that experienced before the crisis. The result of the previous study is confirmed by the contribution provided by Gerrans *et al.* (2015), which shows that even in situations of economic crisis and uncertainty financial risk appetite tends to be relatively stable. However, during the period from late April 2019 to early July 2020, Heo *et al.* (2020) collected survey data to prove the negative effect of pandemic COVID-19 on financial risk attitudes in a large sample of individuals (N = 18,913). Results show that risk tolerance for financial decisions can be altered when an extreme economic, social or environmental shock occurs (Heo *et al.*, 2020). After the COVID-19 pandemic emergency declaration, a general detachment from willingness take financial risks was noted demonstrating how COVID-19 pandemic has shifted down the risk preference for most investors (Heo *et al.*, 2020). In particular, the study conducted by Ortmann *et al.* (2020) showed how the risk tolerance of individuals increased, determining their trading activity, as it is therefore interesting to analyze whether or not the pandemic affected risk tolerance (Huber *et al.*, 2021). After China, Italy was one of the first countries in Europe to be affected by the spread of the pandemic caused by COVID-19. The immediate response of the Italian Government to reduce the contagion was to limit the mobility of its citizens, requiring them to stay in their homes and go out only for reasons of necessity, health or

work. The effects caused by the government's decisions have resulted in a rapid and sudden change in the behaviors, beliefs and habits of Italians (Armillei and Filippucci, 2020). The goal of this work is to verify whether the pandemic caused by COVID-19 has modified the risk tolerance of Italians. Following the guidance provided by Hunter (2002), we will specifically analyze the link between risk tolerance and risk-taking behavior. Specifically, although there is a correlation between tolerance and risk perception (Forlani and Mullins, 2000), it is advisable to distinguish the two factors into two distinct concepts (Hunter, 2002; Roszkowski and Davey, 2010). To verify how the pandemic has changed the attitude of Italians toward risk, the Grable and Lytton Risk Tolerance Scale (G/L-RTS) will be used (Grable and Schumm, 2010). Furthermore, G/L-RTS scale is composed of 13 items through which it will be possible to identify three different components of risk tolerance: investment risk (IR), financial risk and speculative risk (SR).

We gathered data, processing 2,167 self-evaluations administered in Italy between April 1 and May 30, 2020, a period identified as the Italian COVID-19 "first wave." The results demonstrate that the spread of the coronavirus made Italians less tolerant to risk, reducing their FRT, in all three of the abovementioned dimensions (risk comfort and experience [RC&E], IR and SR) and using the overall measure of FRT. Furthermore, the researchers tested their conceptual model based on a structural equation model (SEM) to verify the relation between COVID-19 and risk tolerance. To study this link, the team considered moderating effects of variables related to COVID-19, such as mortality, infection and stringency rates (Figure 1).

The results demonstrate how the variables subject to moderation are significant in testing the relationship between COVID-19 and risk tolerance. This paper contributes to the existing literature on the role of extreme and rare macroeconomic, social and health-related shocks in FRT by analyzing the impact of the COVID-19 pandemic in Italy. Therefore, the remainder of this paper is organized as follows. The first part includes a theoretical background about risk tolerance and COVID-19 and presents the research hypothesis. The second part presents the research, survey design and econometrical



Source: Created by Authors

Figure 1. Conceptual model

procedures adopted in this study, followed by the results. Finally, the last part provides the discussion.

2. Literature review and development of the hypotheses

Recently, the economic literature has begun investigating how FRT varies over time in response to shocks of different nature. For instance, one can distinguish three major areas in the literature regarding the effects of shocks on risk preferences (Graeber *et al.*, 2020):

(1) natural disasters such as earthquakes and floods (e.g. Eckel *et al.*, 2009; Cameron and Shah, 2015; Sakha, 2019);

(2) the effects of the business cycle and macroeconomic shocks (e.g. Malmendier and Nagel, 2011; Cohn *et al.*, 2015; Fagereng *et al.*, 2017; Koenig-Kersting and Trautmann, 2018); and

(3) negative events affecting people on an individual level, such as unemployment or divorce (Brunnermeier and Nagel, 2008; Chiappori and Paiella, 2011; Sahm, 2012).

These studies suggest that natural disasters and negative individual events do not significantly affect risk tolerance, whereas the effects of the business cycle, especially recessions and macroeconomic shocks, tend to decrease risk tolerance (Malmendier and Nagel, 2011; Cohn *et al.*, 2015; Fagereng *et al.*, 2017; Koenig-Kersting and Trautmann, 2018). Thus, analyzing the impact of COVID-19 on risk tolerance is important both theoretically and practically because its impact affected many individual decisions, such as those related to consumption and investments, which could have impacted the recovery prospects of entire countries (Cervellati *et al.*, 2022).

The literature on COVID-19 has grown exponentially and examines a range of issues, especially ones related to the reactions of governments and financial markets (e.g. Ashraf, 2020; Haroon and Rizvi, 2020; Lavelle, 2020; Akhtaruzzaman *et al.*, 2020). In this respect, the effects on FRT have been different than in previous financial crises. For example, Roszkowski and Davey (2010) claimed that FRT did not significantly change before or after the 2008–2009 financial crisis, confirming the results of Gerrans *et al.* (2015) that showed that FRT tends to stay relatively stable, even through economic crises and other uncertain conditions.

In addition, throughout the ongoing COVID-19 pandemic, there has been a worldwide financial market reaction, including peaks of volatility close to that observed after the collapse of Lehman Brothers at the end of 2008 (Bateman *et al.*, 2011). Moreover, the 2008–2009 global financial crisis originated in the real estate market in 2007 and spread to the financial market and eventually to the rest of the economy (Bateman *et al.*, 2011). Instead, the current crisis is related to a health-related issue, even if this also affects the real economy, and financial markets have reacted accordingly (Cervellati *et al.*, 2022; Stella *et al.*, 2022). Even though the effects of the global financial crisis were long-lasting in many economies all around the world, in terms of FRT, the recovery was quite rapid. However, it is not yet clear how FRT will evolve as time passes. In previous extreme, rare events, there has been clear evidence of negative effects in the financial market, as well as a decrease in FRT (Kaplanski and Levy, 2010; Farhi and Gabaix, 2016).

The macrolevel reactions of financial markets and governments have been extensively investigated, but less attention has been devoted to analyzing the reactions of individuals regarding FRT.

These arguments lead to *H1*:

H1. Italians' financial risk tolerance (FRT) decreased due to COVID-19.

In this regard, Heo *et al.* (2020) demonstrated that COVID-19 did affect risk tolerance. Using survey data from a large sample of individuals (N = 18,913), the authors showed the negative effect of the pandemic on FRT. Interestingly, the authors show how distinct clusters of individuals (low-risk tolerance vs high-risk tolerance) reacted differently to the pandemic: while FRT increased in the high-risk tolerance group, it decreased in the low-risk tolerance one (Heo *et al.*, 2020). Of course, countries differ in many respects – such as cultural differences that affect risk tolerance (Innocenti *et al.*, 2019) – so the reactions of their governments were different.

These arguments lead to *H2*:

H2. The relation between COVID-19 and risk tolerance is moderated by the COVID-19 variables death, infection and stringency.

According to Heo *et al.* (2021), when the number of COVID-19 infections increases, the level of risk tolerance changes, making individuals more risk-averse. Furthermore, evidence proposed by Heo *et al.* (2020) produced policy implications for governments and policymakers, suggesting the introduction of policies to increase overall risk tolerance, so as to boost consumption and investments, and to accelerate economic recovery.

3. Data and methodology

3.1 Survey design and sample description

On March 11, 2020, the Italian Government implemented strict measures to reduce the spread of COVID-19. This study gathered data via a Web-based questionnaire – with the computer-assisted web method – between April 1 and May 30. The questionnaire was promoted on social media platforms such as Facebook, Twitter and LinkedIn. The team collected 2,500 responses that, after canceling the ones with missing values, reduced to 2,167. According to the indications provided by Dattalo (2008), the sample this team analyzed appears to be representative of the Italian population. Table 1 provides a comparative overview of sample descriptive features and Italian averages. The largest age group in the sample is 30–40 years old, comprising 38%, contrasting with the national average of 15.9%. Those above 70 years old are considerably fewer in the sample (3.7%) compared to 14.8% nationally. Regarding gender, the sample is nearly balanced, with males slightly edging females, which differs from the national figures, where there are more females than males. Marital status reveals a higher proportion of married and divorced individuals in the sample compared to national percentages. In terms of education, those with over 12 years of education form a larger group in the sample (62.5%) than nationally (51.4%). The professional status indicates a higher full-time employment rate in the sample (56.3%) than the national average (37.4%), whereas student and stay-at-home statuses are lower in the sample. For income, the sample aligns with national averages, except for a noticeably higher proportion choosing not to disclose their income. The sample has a larger representation of city dwellers (71.9%) as compared to the national average (63.4%). Finally, stock market participation is lower in the sample (28.7%) compared to the national percentage (34%).

3.2 Econometrical approach and measures

The data were processed using both linear regression (ordinary least square [OLS]) with robust errors and through the use of a system of structural equations (SEM). In particular, OLS was useful for testing, in a first stage, the relationships among key research variables. In a second

Table 1. Descriptive statistics (N = 2,167)

Variable	Percentage	National statistics percentage
Age		
30–40 years old	38.0	15.9
41–50 years old	22.7	24.5
5–60 years old	25.9	26.6
61–70 years old	9.7	18.2
>70 years old	3.7	14.8
Gender		
Female	49.1	52.7
Male	50.9	48.3
Marital status		
Married	55.2	47.4
Unmarried	29.5	42.3
Divorced	11.1	7.3
Widowed	4.2	3.0
Education		
(0–9) years	14.2	16.2
(9–12) years	23.3	32.4
>12 years	62.5	51.4
Professional status		
Full-time	56.3	37.4
Part-time	16.5	9.0
Student	6.1	11.3
Stay at home	6.9	17.9
Retired	8.3	18.3
Disabled/unable to work	0.6	1.2
Unemployed	5.2	4.9
Income		
Less than €10,000	7.6	12.3
€10,000–€20,000	22.6	24.9
€20,000–€40,000	33.7	38.3
€40,000–€80,000	14.9	18.8
€80,000 or more	3.9	5.7
Prefer not to say	17.3	/
Area of residence		
Rural area (<20,000)	28.1	36.6
City (>20,000)	71.9	63.4
Stock market participation		
No	71.3	66.0
Yes	28.7	34.0

Notes: "No. Obs." Stands for number of observations (total: 2,167). "Relative %" is the relative percentage of each class for each variable. Regarding the income variable, the option "Prefer not to say" was omitted from the regression analyses presented in Tables 3 and 5 to avoid abnormal fluctuations in the values of the average and thus the standard deviation. National statistics were provided by both the Italian National Institute of Statistics and Eurostat

Source: Created by authors

stage, it was necessary to use more sophisticated econometric methodologies capable of testing hypothetical relationships between constructs and their observed indicators more reliably than OLS. In particular, SEM overcomes the reliability problems inherent in using OLS because it has the advantage of analyzing structural models based on relationships specified in the hypotheses (Deng *et al.*, 2018; Nazim and Ahmad, 2013). To test the hypothesis that Italians' FRT decreased due to COVID-19, the team measured changes in FRT as done by the G/L-RTS, as mentioned above. According to this methodology, the risk tolerance score was calculated as the sum of the individual scores from the 13 questions, scaled from 1 to 4, with 1 identifying greater risk aversion and 4 greater risk propension (Table 2).

Following the examples of previous literature, this regression analysis considered control variables like age, gender, civil status, education, income, professional status and area of residence. To measure how individuals' risk tolerance changed due to the COVID-19 pandemic, the team added the following question: "On a scale of 1 to 10, where 1 stands for 'Less risk averse' and 10 stands for 'More risk averse', how has the COVID-19 pandemic changed your attitude toward risk taking?" Following Keller and Siegrist (2006), this study included the following question involving the respondents' participation in the stock market: "Have you ever invested in the stock market?"

4. Results

To assess the impact of COVID-19 on FRT, this team considered two variables in the analysis to measure the mortality, infection and stringency rates in Italy during the outbreak. The data regarding mortality and infection were provided the by the Italian Ministry of Health, and the data regarding stringency were provided by Hale *et al.* (2021) and related to the period in which the questionnaire was administered.

Our aim was to analyze how the three dimensions forming FRT (i.e. RC&E, SR and IR) and the overall FRT had been affected by the COVID-19 pandemic.

Table 3 presents the findings from three distinct OLS regression models, each one devoted to the three dimensions of FRT (i.e. RC&E, SR and IR).

Regarding age, older respondents in the sample seemed to be less risk tolerant with respect to all considered three dimensions. This evidence confirmed the results provided by Grable and Lytton (1998), Cardak and Martin (2019) and Hartnett *et al.* (2019).

With respect to gender, also consistent with previous evidence, men in this sample tended to be more risk prone in all three dimensions considered, and thus more risk tolerant. In particular, gender gap resulted from the lower degree of financial literacy of women (Lusardi and Mitchell, 2008; Van Rooij *et al.*, 2012) and their lack of familiarity with financial instruments (Prast *et al.*, 2014). As marital status is concerned, in line with previous studies, the team found that married people tended to be less risk tolerant than unmarried respondents were. Apart from Regression Model 2, which considered SR, the positive and statistically significant coefficients in the other three regression models confirmed the lower risk propensity and risk tolerance of married individuals. According to Cohn *et al.* (1975), married individuals allocate a lower proportion of their assets to risky assets. Several other researchers (Guiso *et al.*,1996; Hinz *et al.*,1997; Gutter *et al.*,1999; Hartog *et al.*, 2002) found that married individuals are less tolerant of risk than single individuals. In addition, people's education levels seem to have a slightly negative but statistically significant effect regarding investment risk. This statistic could suggest that more educated respondents, at least in this sample, tend to take fewer risks when investing in financial instruments. More generally, however, in this sample, the level of education seems not to influence the other two dimensions of risk attitude or the overall respondents' risk tolerance in statistically significant ways. This evidence does not support the findings highlighted in other studies

Table 2. G/L-RTS questions

Variable	Components	Code	Questions	Option 1	Option 2	Option 3	Option 4
Financial risk tolerance	Risk comfort and experience (RC&E)	RC&E1	In general, how would your best friend describe you as a risk taker?	A real gambler	Willing to take risks after completing adequate research	Cautious	A real risk avoider
		RC&E 2	You have just finished saving for a "once-in-a-lifetime" vacation. Three weeks before you plan to leave, you lose vyour job. You would:	Cancel the vacation	Take a much more modest vacation	Go as scheduled, reasoning that you need the time to prepare for a job search	Extend your vacation because this might be your last chance to go first class
		RC&E3	When you think of the word "risk," which of the following words comes to mind first?	Loss	Uncertainty	Opportunity	Thrill
		RC&E4	Some experts are predicting prices of assets, such as gold, jewels, collectibles and real estate (hard assets), to increase in value. Bond prices may fall; however, experts tend to agree that government bonds are relatively safe. Most of your investment assets are now in high-interest government bonds. What would you do?	Hold the bonds	Sell the bonds and put half the proceeds into money market accounts and the other half into hard assets	Sell the bonds and put the total proceeds into hard assets	Sell the bonds, put all the money into hard assets, and borrow additional money to buy more
		RC&E5	Your trusted friend and neighbor, an experienced geologist, is assembling a group of investors to fund an exploratory gold mining venture. The venture could pay back 50 to 100 times the investment if successful. If the	Nothing	One month's salary	Three month's salary	Six month's salary

(*contined*)

Table 2. Continued

Variable	Components	Code	Questions	Option 1	Option 2	Option 3	Option 4
			mine is a bust, the entire investment is worthless. Your friend estimates the chance of success is only 20%. If you had the money, how much would you invest?				
	Investment risk	IR1	If you unexpectedly received €20,000 to invest, what would you do?	Deposit it in a bank account, money market account or an insured CD (certificate of deposit)	Invest it in safe, high-quality bonds or bond mutual funds	Invest it in stocks or stock mutual funds	/
		IR2	In terms of experience, how comfortable are you investing in stocks or stock mutual funds?	Not at all comfortable	Somewhat comfortable	Very comfortable	/
		IR3	Given the best and worst case returns of the four investment choices below, which would you prefer?	€200 gain best case; €0 gain/loss worst case	€800 gain best case; €200 loss worst case	€2,600 gain best case; €800 loss worst case	$4,800 gain best case; $2,400 loss worst case
		IR4	Suppose a relative left you an inheritance of $100,000, stipulating in the will that you invest ALL the money in ONE of the following choices. Which one would you select?	A savings account or money market mutual fund	a mutual fund that owns stocks and bonds	A portfolio of 15 common stocks	Commodities like gold, silver and oil
		IR5	If you had to invest $20,000, which of the following investment choices would you find most appealing?	60% in low-risk investments, 30% in medium-risk investments, 10% in high-risk investments	30% in low-risk investments, 40% in medium-risk investments, 30% in high-risk investments	10% in low-risk investments, 40% in medium-risk investments, 50% in high-risk	/

(*contined*)

Table 2. Continued

Variable	Components	Code	Questions	Option 1	Option 2	Option 3	Option 4
						investments	
	Speculative risk	SR1	You are on a TV game show and can choose one of the following. Which would you take?	$1,000 in cash	A 50% chance at winning $5,000	A 25% chance at winning $10,000	A 5% chance at winning $100,000
		SR2	In addition to whatever you own, you have been given $1,000. You are now asked to choose between:	A sure gain of $500	A 50% chance to gain $1,000 and a 50% chance to gain nothing	/	/
		SR3	In addition to whatever you own, you have been given $2,000. You are now asked to choose between:	A sure loss of $500	A 50% chance to lose $1,000 and a 50% chance to lose nothing	/	/

Source: Grable *et al.* (2010, pp. 52–53)

Table 3. Effect of the COVID-19 pandemic on individuals' risk comfort and experience, speculative risk and investment risk

	Model 1: Risk comfort and experience (RC&E)	Model 2: Speculative risk (SR)	Model 3: Investment risk (IR)
Age	−0.323*** (0.001)	−0.150*** (0.001)	−0.254*** (0.001)
Gender	0.160*** (0.023)	0.81** (0.032)	0.103*** (0.022)
Marital status	0.062** (0.017)	0.006 (0.023)	0.049** (0.016)
Education	−0.022 (0.016)	0.015 (0.022)	−0.052** (0.016)
Professional status	0.036 (0.007)	−0.008 (0.009)	−0.042 (0.003)
Income	0.113*** (0.013)	0.150*** (0.017)	0.130*** (0.012)
Stock market participation	0.080*** (0.027)	0.075** (0.036)	0.170*** (0.026)
Area of residence	−0.080 (0.022)	0.040 (0.035)	−010 (0.025)
Change due to COVID-19 pandemic	0.077** (0.004)	0.043* (0.006)	0.074** (0.004)
COVID-19 death	0.018 (0.000)	0.117 (0.000)	0.127* (0.000)
COVID-19 infection	0.050 (0.000)	−0.137*(0.000)	−0.094 (0.000)
COVID-19 stringency	0.048 (0.000)	−0.113* (0.002)	−0.028 (0.025)
σ	0.47	0.60	0.45
Adjusted R^2	0.154	0.087	0.114
No. of observations	2,167	2,167	2,167

Notes: Standard errors are given in parentheses. Asterisks represent the level of confidence based on p-values: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$
Source: Created by authors

where risk tolerance is influenced by education level (Zhong and Xiao, 1995; Halek and Eisenhauer, 2001; Grable and Joo, 2004; Ardehali *et al.*, 2005; Grable and Roszkowski, 2007; Al-Ajmi, 2008; Gilliam *et al.*, 2010; Grable, 2016).

Regarding professional status, in line with expectations, the team found (with the exception of Regression Model 2 for speculative risk) negative and statistically significant coefficients. These results suggested lower professional stability, such as moving from a full-time job to unemployment; lower risk attitude; and overall risk tolerance. This result supported the work of Haliassos and Bertaut (1995). Concerning income, the team observed a positive and statistically significant effect on all three dimensions of risk considered and on the respondents' overall risk tolerance. For instance, higher income may increase risk capacity and risk tolerance (at least indirectly), given that individuals with higher incomes may rely on their stronger ability to face negative events, such as not being forced to sell their financial assets to meet their current expenses. In addition, this evidence was supported by the fact that wealthier individuals can easily afford to absorb potential losses from risky investments (Hallahan *et al.*, 2004; Watson and McNaughton, 2007).

In line with previous studies (e.g. Wang and Hanna, 2007; Grable and Schumm, 2010; Mishra, 2018), this work revealed that respondents who have experience in investing in the stock market have higher risk attitude in all three dimensions and higher overall risk tolerance, as expected.

Regarding the study's main variable, the effect of the COVID-19 pandemic on risk attitudes and risk tolerance, there was a positive and statistically significant effect concerning all the

considered risk dimensions as well as on risk tolerance. Thus, it seems that respondents in the sample became more risk averse during the COVID-19 pandemic. There may be several explanations for this result. First, worries about health may have spread to the financial field, leading people to be less risk tolerant. For example, fear is one of the strongest negative human emotions and may affect several realms life. An additional explanation concerns the negative economic effects of the pandemic, both in general (i.e. with respect to the impact on the country) and on a personal level, potentially affecting respondents' incomes and professional statuses, thus increasing financial worries and risk aversion. Beyond this, the financial crash in March 2020 may have further lowered respondents' risk tolerance. This idea confirmed the work of Heo *et al.* (2021), which suggested that as the number of cases of COVID-19 infections increased, individuals' FRT and willingness to invest in risky assets in uncertain times decreased.

Finally, to test how COVID-19 affected FRT, the team used an SEM methodology.

In this way, the researchers tested the moderating effects of iterating between the COVID-19 mortality, infection and stringency rate proxies and the change in FRT due to COVID-19. The moderation variables appear in Table 4.

Moderation analyses aim to investigate contingencies in which the effect of the independent variable on the dependent variable changes in intensity, sign or both. In this research, the variables CH_Covid_19_Death, CH_Covid_19_Infection and CH_Covid_19_Stringency facilitated a deeper understanding of the link between risk tolerance levels and the changes caused by the proximity of the respondent to traumatic events related to COVID-19, such as infection, death or stringency (Table 5).

Furthermore, the results of the SEM presented in Table 5 confirmed what the team previously found in Models (1) through (3) concerning the three dimensions of FRT. Notably, the relationship between COVID-19 was significant, allowing the researchers to accept the first hypothesis (Table 5). In addition, he relationship between COVID-19 and risk tolerance was also explained by the new moderating variables represented by infection, mortality and stringency related to COVID-19. The significance of the three moderating variables facilitated the acceptance of the second research hypothesis. The negative coefficient of the independent variable Age confirmed that older individuals are less financially risk tolerant than younger ones. This result was consistent with the results of Jianakoplos and Bernasek (2006).

5. Conclusions

This paper contributes to the literature on risk attitudes and risk tolerance and to work related to the effects of the COVID-19 pandemic. The analysis of the effects of socioeconomic and demographic variables such as age, gender, marital and professional status, education, income and stock market participation produced evidence mostly consistent with previous studies. However, the effect of the pandemic on FRT was a novel result, at least to the best of the team's knowledge.

Table 4. Moderations variable

Moderation variable	Coding variable
Change due to COVID-19 pandemic* COVID-19 death	CH_Covid_19_Death
Change due to COVID-19 pandemic* COVID-19 infection	CH_Covid_19_Infection
Change due to COVID-19 pandemic* COVID-19 stringency	CH_Covid_19_Stringency

Source: Created by authors

Table 5. Structural equations model results

	Coefficient	Std. error
Age	−7.40***	0.665
Gender	204***	0.265
Marital status	0.137***	0.040
Education	0.118**	0.040
Professional status	−0.205	0.020
Income	0.406***	0.024
Stock market participation	0.165***	0.024
Area of residence	0.012	0.024
Change due to COVID-19 pandemic	0.501***	0.140
COVID-19 death	148.29	110.51
COVID-19 infection	217.85	249.51
COVID-19 stringency	136.62	108.26
CH_Covid_19_Death	1409.05**	636.82
CH_Covid_19_Infection	40.79**	1582.45
CH_Covid_19_Stringency	36.86**	1472.32

Notes: Standard errors are given in parentheses. Asterisks represent the level of confidence based on *p*-values: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Dependent variable: Financial Risk Tolerance
Source: Created by authors

The evidence that the COVID-19 pandemic lowered people's risk tolerance and increased their risk aversion in the financial domain may be explained in several ways, as detailed above. These reasons referred to future economic worries regarding income, financial worries related to the stock market crash in March 2020 and to health-related worries spreading in the financial domain.

Although this evidence should be regarded with caution, the large and representative sample on which it was based demonstrated that the data are quite reliable. In addition, these results have policy implications regarding the need for the government to face both health and economic issues. Thus, researchers should not assume there is only a trade-off between these two issues but should also consider the effects of health-related worries on FRT and of human behavior in the economic and financial domains.

References

Akhtaruzzaman, M., Boubaker, S., Chiah, M. and Zhong, A. (2020), "COVID−19 and oil price risk exposure", July 13, available at: https://ssrn.com/abstract=3650151

Al-Ajmi, J.Y. (2008), "Risk tolerance of individual investors in an emerging market", *International Research Journal of Finance and Economics*, Vol. 17, pp. 15-26.

Ardehali, P.H., Paradi, J.C. and Asmild, M. (2005), "Assessing financial risk tolerance of portfolio investors using data envelopment analysis", *International Journal of Information Technology and Decision Making*, Vol. 04 No. 03, pp. 491-519.

Armillei, F. and Filippucci, F. (2020), "The heterogenous impact of Covid-19: evidence from italian municipalities"

Ashraf, B.N. (2020), "Economic impact of government interventions during the Covid-19 pandemic: international evidence from financial markets", *Journal of Behavioral and Experimental Finance*, Vol. 27, p. 100371.

Bateman, H., Islam, T., Louviere, J., Satchell, S. and Thorp, S. (2011), "Retirement investor risk tolerance in tranquil and crisis periods: experimental survey evidence", *Journal of Behavioral Finance*, Vol. 12 No. 4, pp. 201-218.

Brewer, N.T., Weinstein, N.D., Cuite, C.L. and Herrington, J.E. (2004), "Risk perceptions and their relation to risk behavior", *Annals of Behavioral Medicine*, Vol. 27 No. 2, pp. 125-130.

Brunnermeier, M.K. and Nagel, S. (2008), "Do wealth fluctuations generate time-varying risk aversion? Micro-evidence on individuals", *American Economic Review*, Vol. 98 No. 3, pp. 713-736.

Cameron, L. and Shah, M. (2015), "Risk-taking behavior in the wake of natural disasters", *Journal of Human Resources*, Vol. 50 No. 2, pp. 484-515.

Cardak, B.A. and Martin, V.L. (2019), "Once in a lifetime? The effects of the global financial crisis on household willingness to take financial risk", *Economic Record*, Vol. 95 No. 311.

Cervellati, E.M., Stella, G.P., Filotto, U. and Maino, A. (2022), "How COVID-19 changed Italian consumers' behavior", *Global Finance Journal*, Vol. 51, pp. 1-6.

Chiappori, P.A. and Paiella, M. (2011), "Relative risk aversion is constant: evidence from panel data", *Journal of the European Economic Association*, Vol. 9 No. 6, pp. 1021-1052.

Cohn, A., J., Engelmann, E., Fehr, M. and A., Marechal. (2015), "Evidence for countercyclical risk aversion: an experiment with financial professionals", *American Economic Review*, Vol. 105 No. 2, pp. 860-885.

Cohn, R.A., Lewellen, W.G., Lease, R.C. and Schlarbaum, G.G. (1975), "Individual investor risk aversion and investment portfolio composition", *The Journal of Finance*, Vol. 30 No. 2, pp. 605-620.

Cori, L., Bianchi, F., Cadum, E. and Anthonj, C. (2020), "Risk perception and COVID-19", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 9, p. 3114.

Dattalo, P. (2008), *Determining Sample Size: Balancing Power, Precision, and Practicality*, Oxford university press.

Deng, L., Yang, M. and Marcoulides, K.M. (2018), "Structural equation modeling with many variables: a systematic review of issues and developments", *Frontiers in Psychology*, Vol. 9, p. 580.

Droms, W.G. (1987), "Investment asset allocation for PFP clients", *Journal of Accountancy*, Vol. 163 No. 4, p. 114.

Eckel, C.C., El-Gamal, M.A. and Wilson, R.K. (2009), "Risk loving after the storm: a Bayesian-network study of Hurricane Katrina evacuees", *Journal of Economic Behavior and Organization*, Vol. 69 No. 2, pp. 110-124.

Fagereng, A., Guiso, L. and Pistaferri, L. (2017), "Firm-related risk and precautionary saving response", *American Economic Review*, Vol. 107 No. 5, pp. 393-397.

Farhi, E. and Gabaix, X. (2016), "Rare disasters and exchange rates", *The Quarterly Journal of Economics*, Vol. 131 No. 1, pp. 1-52.

Forlani, D. and Mullins, J.W. (2000), "Perceived risks and choices in entrepreneurs' new venture decisions", *Journal of Business Venturing*, Vol. 15 No. 4, pp. 305-322.

Gerrans, P., Faff, R. and Hartnett, N. (2015), "Individual financial risk tolerance and the global financial crisis", *Accounting and Finance*, Vol. 55 No. 1, pp. 165-185.

Gilliam, J., Chatterjee, S. and Grable, J. (2010), "Measuring the perception of financial risk tolerance: a tale of two measures", *Journal of Financial Counseling and Planning*, Vol. 21 No. 2, pp. 30-43.

Grable, J.E. (2000), "Financial risk tolerance and additional factors that affect risk taking in everyday money matters", *Journal of Business and Psychology*, Vol. 14 No. 4, pp. 625-630.

Grable, J.E. (2016), "Financial risk tolerance", in Xiao, J.J. (Ed), *Handbook of Consumer Finance Research*, Springer International Publishing, Switzerland., pp. 19-31.

Grable, J.E. and Joo, S.H. (2004), "Environmental and biopsychosocial factors associated with financial risk tolerance", *Financial Counseling and Planning*, Vol. 15 No. 1, pp. 73-82.

Grable, J.E. and Lytton, R.H. (1998), "Investor risk tolerance: testing the efficacy of demographics as differentiating and classifying factors", *Financial Counseling and Planning*, Vol. 9 No. 1, pp. 61-73.

Grable, J.E. and Roszkowski, M.J. (2007), "Self-assessments of risk tolerance by women and men", *Psychological Reports*, Vol. 100 No. 3, pp. 795-802.

Grable, J.E. and Schumm, W. (2010), "An estimate of the reliability of the survey of consumer finances risk-tolerance question", *Journal of Personal Finance*, Vol. 9 No. 1, pp. 117-131.

Graeber, D., Schmidt, U., Schroder, C. and Seebauer, J. (2020), "The effect of a major pandemic on risk preferences – evidence from exposure to COVID-19", available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3724461

Guiso, L., Jappelli, T. and Terlizzese, D. (1996), "Income risk, borrowing constraints, and portfolio choice", *The American Economic Review*, pp. 158-172.

Gutter, M., Fox, J. and Montalto, C.P. (1999), "Racial differences in investor decision making", *Financial Services Review*, Vol. 8 No. 3, pp. 149-162.

Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T. and Tatlow, H. (2021), "A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)", *Nature Human Behaviour*, Vol. 5 No. 4, pp. 529-538.

Halek, M. and Eisenhauer, J.G. (2001), "Demography of risk aversion", *The Journal of Risk and Insurance*, Vol. 68 No. 1, pp. 1-24.

Haliassos, M. and Bertaut, C.C. (1995), "Why do so few hold stocks?", *The Economic Journal*, Vol. 105 No. 432, pp. 1110-1129.

Hallahan, T.A., Faff, R.W. and McKenzie, M.D. (2004), "An empirical investigation of personal financial risk tolerance", *Financial Services Review*, Vol. 13, pp. 57-78.

Haroon, O. and Rizvi, S.A.R. (2020), "COVID-19: media coverage and financial markets behavior – a sectoral inquiry", *Journal of Behavioral and Experimental Finance*, Vol. 27, pp. 100343.

Hartnett, N., Gerrans, P. and Faff, R. (2019), "Trusting clients' financial risk tolerance survey scores", *Financial Analysts Journal*, Vol. 75 No. 2, pp. 91-104.

Hartog, J., Ferrer-I-Carbonell, A. and Jonker, N. (2002), "Linking measured risk aversion to individual characteristics", *Kyklos*, Vol. 55 No. 1, pp. 3-26.

Heo, W., Grable, J.E. and Rabbani, A.G. (2020), "A test of the association between the initial surge in COVID-19 cases and subsequent changes in financial risk tolerance", *Review of Behavioral Finance*, Vol. 13 No. 1.

Heo, W., Rabbani, A. and Grable, J.E. (2021), "An evaluation of the effect of the COVID-19 pandemic on the risk tolerance of financial decision makers", *Finance Research Letters*, Vol. 41, p. 101842.

Hinz, R.P., McCarthy, D.D. and Turner, J.A. (1997), "Are women conseroative investors? Gender differences in participant-directed pension investments", in Gordon, M.S., Mitchell, O.S. and Twinney, M.M. (Eds), *Positioning Pensions for the Twenty-First Century*, University of PA Press, Philadelphia, pp. 91-103.

Huber, C., Huber, J. and Kirchler, M. (2021), "Market shocks and professionals' investment behavior–evidence from the COVID-19 crash", *Journal of Banking and Finance*, Vol. 133, p. 106247.

Hunter, D.R. (2002), *Risk Perception and Risk Tolerance in Aircraft Pilots*, Federal Aviation Administration Washington, DC Office of Aviation Medicine.

Innocenti, S., Clark, G.L., McGill, S. and Cuñado, J. (2019), "The effect of past health events on intentions to purchase insurance: evidence from 11 countries", *Journal of Economic Psychology*, Vol. 74 No. 102204, pp. 1-21.

Jianakoplos, N.A. and Bernasek, A. (2006), "Financial risk taking by age and birth cohort", *Southern Economic Journal*, Vol. 72 No. 4, pp. 981-1001.

Kaplanski, G. and Levy, H. (2010), "Sentiment and stock prices: the case of aviation disasters", *Journal of Financial Economics*, Vol. 95 No. 2, pp. 174-201.

Keller, C. and Siegrist, M. (2006), "Investing in stocks: the influence of financial risk attitude and values-related money and stock market attitudes", *Journal of Economic Psychology*, Vol. 27 No. 2, pp. 285-303.

Koenig-Kersting, C. and Trautmann, S.T. (2018), "Countercyclical risk aversion: beyond financial professionals", *Journal of Behavioral and Experimental Finance*, Vol. 18, pp. 94-101.

Lavelle, J. (2020), "How to communicate with investors during the COVID-19 crisis", *Gartner*, available at: www.gartner.com/smarterwithgartner/how-tocommunicate-with-investors-during-the-covid-19-crisis/

Lusardi, A. and Mitchell, O.S. (2008), "Planning and financial literacy: how do women fare?", *American Economic Review*, Vol. 98 No. 2, pp. 413-417.

Malmendier, U. and Nagel, S. (2011), "Depression babies: do macroeconomic experiences a ect risk taking?", *The Quarterly Journal of Economics*, Vol. 126 No. 1, pp. 373-416.

Mishra, R. (2018), "Financial literacy, risk tolerance and stock market participation", *Asian Economic and Financial Review*, Vol. 8 No. 12, pp. 1457-1471.

Mussio, I., Sosa Andrés, M. and Kidwai, A.H. (2023), "Higher order risk attitudes in the time of COVID-19: an experimental study", *Oxford Economic Papers*, Vol. 75 No. 1, pp. 163-182.

Nazim, A. and Ahmad, S. (2013), "A comparison between ordinary least square (OLS) and structural equation modeling (SEM) methods in estimating the influencial factors of 8th grades student's mathematics achievement in Malaysia", *International Journal of Scientific and Engineering Research*, Vol. 4 No. 7, pp. 717-722.

Ortmann, R., Pelster, M. and Wengerek, S.T. (2020), "COVID-19 and investor behavior", *Finance Research Letters*, Vol. 37, p. 101717.

Prast, H., Rossi, M., Torricelli, C. and Druta, C. (2014), "Do women prefer pink? The effect of a gender stereotypical stock portfolio on investing decisions", Netspar Discussion Paper 01/2014-009.

Roszkowski, M.J. and Davey, G. (2010), "Risk perception and risk tolerance changes attributable to the 2008 economic crisis: a subtle but critical difference", *Journal of Financial Service Professionals*, Vol. 64 No. 4, pp. 42-53.

Sahm, C.R. (2012), "How much does risk tolerance change?", *Quarterly Journal of Finance*, Vol. 02 No. 04, p. 1250020.

Shachat, J., Walker, M.J. and Wei, L. (2021), "How the onset of the Covid-19 pandemic impacted pro-social behaviour and individual preferences: experimental evidence from China", *Journal of Economic Behavior and Organization*, Vol. 190, pp. 480-494.

Siegrist, M. and Árvai, J. (2020), "Risk perception: reflections on 40 years of research", *Risk Analysis*, Vol. 40 No. (S1), pp. 2191-2206.

Slovic, P., Fischhoff, B. and Lichtenstein, S. (1982), "Why study risk perception?", *Risk Analysis*, Vol. 2 No. 2, pp. 83-93.

Slovic, P. and Peters, E. (2006), "Risk perception and affect", *Current Directions in Psychological Science*, Vol. 15 No. 6, pp. 322-325.

Stella, G.P., Cervellati, E.M., Magni, D., Cillo, V. and Papa, A. (2022), "Shedding light on the impact of financial literacy for corporate social responsibility during the COVID-19 crisis: managerial and financial perspectives", *Management Decision*, Vol. 60 No. 10, pp. 2801-2823.

Van Rooij, M.C., Lusardi, A. and Alessie, R.J. (2012), "Financial literacy, retirement planning and household wealth", *The Economic Journal*, Vol. 122 No. 560, pp. 449-478.

Wang, C. and Hanna, S.D. (2007), "The risk tolerance and stock ownership of business owning households", *Financial Counseling and Planning*, Vol. 18 No. 2, pp. 3-18.

Watson, J. and McNaughton, M. (2007), "Gender differences in risk aversion and expected retirement benefits", *Financial Analysts Journal*, Vol. 63 No. 4, pp. 52-62.

Weber, E.U. and Milliman, R.A. (1997), "Perceived risk attitudes: relating risk perception to risky choice", *Management Science*, Vol. 43 No. 2, pp. 123-144.

Weterings, S. (2022), "The effect of an exogenous shock on financial risk perception".

Zhong, L.X. and Xiao, J.J. (1995), "Determinants of family bond and stock holdings", *Journal of Financial Counseling and Planning*, Vol. 6, p. 1.

Further reading

Gortsos, C.V. and Ringe, W. (2020), *Pandemic Crisis and Financial Stability*, European Banking Institute.

Grable, J.E. (2017), *Financial Risk Tolerance: A Psychometric Review*, CFA Institute Research Foundation.

Grable, J.E. and Lytton, R.H. (1999), "Financial risk tolerance revisited: the development of a risk assessment instrument", *Financial Services Review*, Vol. 8 No. 3, pp. 163-181.

Merkle, C. and Weber, M. (2014), "Do investors put their money where their mouth is? Stock market expectations and investing behavior", *Journal of Banking and Finance*, Vol. 46, pp. 372-386.

Sekscinska, K. and Markiewicz, Ł. (2020), "Financial decision making and individual dispositions", in Zaleskiewicz, T. and Traczyk, J. (Eds), *Psychological Perspectives on Financial Decision Making*, Springer, pp. 135-166.

Siegrist, M., Gutscher, H. and Earle, T.C. (2005), "Perception of risk: the influence of general trust, and general confidence", *Journal of Risk Research*, Vol. 8 No. 2, pp. 145-156.

Slovic, P., Fischhoff, B. and Lichtenstein, S. (1986), "The psychometric study of risk perception".

Van de Venter, G., Michayluk, D. and Davey, G. (2012), "A longitudinal study of financial risk tolerance", *Journal of Economic Psychology*, Vol. 33 No. 4, pp. 794-800.

Van Wyk, J., Dahmer, W. and Custy, M.C. (2004), "Risk management and the business environment in South Africa", *Long Range Planning*, Vol. 37 No. 3, pp. 259-276.

Wahlberg, A.A. and Sjoberg, L. (2000), "Risk perception and the media", *Journal of Risk Research*, Vol. 3 No. 1, pp. 31-50.

Corresponding author
Dario Salerno can be contacted at: dario.salerno@uniparthenope.it