

Run for the hills: Italian investors' risk appetite before and during the financial crisis

Italian
investors' risk
appetite

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Abstract

Purpose – This paper sets out to corroborate the existing literature on investors' risk tolerance and to assess how the 2008 financial crisis has affected risk tolerance among Italian investors.

Design/methodology/approach – Based on a unique dataset of real-world portfolio choices made by 1,245 Italian investors over a period of 15 years (from 2003 to 2017), this paper presents two steps of analysis. In step 1, the whole period 2003–2017 is considered with the aim to integrate and corroborate the existing literature on the topic of risk tolerance, considering a complete economic and financial cycle. Step 2 took 2008 as the pivotal point between pre-crisis (2003–2008) and crisis (2009–2017) with the aim to observe the influence on risk appetite of the economic and financial effects of the crisis.

Findings – The results obtained confirm that men are more risk tolerant than women and older people are less risk-taking than their younger counterparts, although the relationship between age and risk tolerance is not necessarily linear. Moreover, our paper demonstrates that a crisis scenario has an influence on Italian investors' risk tolerance.

Practical implications – Our results are of interest to financial advisors, financial planners, asset managers, psychologists, behavioral researchers and more in general to providers of financial products and services.

Originality/value – The results presented in this paper are relevant and original because they are based on real investors who made real choices concerning their portfolio asset allocations.

Keywords Decision making, Risk tolerance, Risk appetite, Financial crisis effects

Paper type Research paper

1. Introduction

Individual risk tolerance is a complex psychological concept widely reported in the literature. Its significance lies in the influence of risk-averse and/or risk-seeking attitudes on decision-making processes, with repercussions at social, psychological, ethical and financial levels. Measuring financial risk tolerance is a difficult task due to its multidimensional nature (Trone *et al.*, 1996). Previous research (e.g. Irwin, 1993) has tried to tackle this issue by examining various factors that can influence risk tolerance, such as demographic factors (e.g. age and gender), socioeconomic status, (e.g. income, education, net worth) and family situation (e.g. marital status). Boyd *et al.* (1994), Levesque and McDougall (1996) and, in particular Xiao *et al.* (2001) and Jamal and Naser (2002), find that factors such as age, race and net worth affect risk-taking attitudes and behaviors. However, the findings of these studies are not always convergent, and the topic of risk tolerance thus remains an interesting area of study.

From a financial perspective, changes in investors' risk tolerance and their determinants are of particular interest to financial advisors and asset managers, as well as to policymakers and suppliers of financial products and services. Indeed, significant changes in risk tolerance can lead to adjustments in asset allocation, a lively portfolio turnover, and modifications in financial planning choices.



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Investors' risk appetite determinants are important to: (1) supply financial advice more consistent with the real level of risk acceptable by each investor, as we believe this is very important especially as regards fintech financial advisory; and (2) enable supervisors to check the appropriate level of risk assumed by each investor through his/her portfolio asset allocation. Indeed, considering the literature on investor's risk tolerance, supervisors may be able to determine some clusters of risks attributable to individuals according to their sociodemographic characteristics. This makes it possible to verify whether the level of risk taken by investors through asset allocation is consistent with the cluster of risk they belong to; (3) identify investment products which consider investors' reactions when the macroeconomic context changes; and (4) enable financial advisors to make a careful selection of investment products for their clients considering their socioeconomic characteristics.

Furthermore, drastic variations in risk tolerance can generate an excess or reduced demand for specific categories of financial and insurance products, generating significant consequences on the supply side. As a consequence, these behaviors are likely to influence perceived levels of customer satisfaction as well as financial intermediaries' overall profitability.

From this point of view, the Lehman Brothers affair of 2008 represents a turning point because of its impact on decisions made by consumers, investors, and also institutions and regulators. Following the outbreak of the crisis, a long chain of events of a macroeconomic and financial nature took place all over the world. The collapse of financial markets, and in particular the stock market, was associated with a significant reduction in house prices, which in some countries represent a significant share of household wealth. In Italy, the trend of GDP has slowed down drastically: the variation observed between 2008 and 2009 was negative by more than 5% points, the worst since 1971. The unemployment rate has increased, while the country's banking system has been put to the test due to the bankruptcy of some important financial intermediaries. The rise in the BTP-Bund spread led to a significant reduction in the price of Italian government bonds and thus to a deterioration in the portfolios of many households and institutional investors, including banks. It is not surprising that after these severe macroeconomic and microeconomic imbalances, investors have drastically changed their asset allocation decisions, usually in the form of a massive flight-to-quality tendency, widespread in the financial system. However, there is still a lack of studies devoted to the impact of the recent economic and financial crisis on investor risk tolerance modification.

Based on a unique dataset that monitors portfolio choices made by 1,245 Italian investors over a period of 15 years (from 2003 to 2017), this paper intends to contribute to fill that gap. More specifically, the aim of our study is twofold: on the one hand, the number of variables observed in this research allows us to corroborate the existing literature on the determinants of risk tolerance through the cycle; on the other, the length of the time period observed allows us to assess whether and how the 2008 crisis has affected investors' risk tolerance. The results presented in this paper are particularly relevant because they are based on *real* investors who made *real* choices concerning their portfolio allocations. Therefore, they are of interest to all those who deal with financial planning in any way. Moreover, this research introduces and tests several hypotheses about the risk-seeking attitudes of investors during severe economic downturns, filling a gap in existing literature.

The remainder of this paper is organized as follows. In Section 2 we present the related literature, and in Section 3 we introduce our sample. In Section 4 we present our methodology and results, while in Section 5 we discuss the obtained results; Section 6 concludes.

2. Conceptual frameworks, previous research and hypotheses

Financial risk tolerance has been studied from different perspectives by psychologists, sociologists and economists. More specifically, it has been defined as a psychological component of decision making under financial uncertainty, a situation in which individuals evaluate the desirability of possible outcomes and their likelihood of occurring (Kahneman

and Tversky, 1979). According to Trone *et al.* (1996), measuring a person's financial risk tolerance is difficult because being a multidimensional attitude, it is an elusive concept that appears to be influenced by a number of predisposing factors. Bell and Bell (1993) and Tigges *et al.* (2000) test factors related to risk-tolerance attitudes. Wong and Carducci (1991) find a positive relationship between certain biopsychosocial factors (i.e. sensation-seeking and aggressiveness) and risk-tolerance attitudes. Zuckerman (1979), Horvath and Zuckerman (1993), and Shelbecker and Roszkowski (1993) have described the role of other psychosocial characteristics (e.g. self-esteem and personality) as possible factors that have an impact on a person's risk-tolerance attitude.

Irwin (1993) highlights the existence of different predisposing factors that influence risk-tolerance attitudes. The author classifies these predisposing factors into two categories: environmental and biopsychosocial ones. Examples of environmental factors include socioeconomic status (e.g. income, education, net worth), family situation (e.g. marital status), and social transition. Biopsychosocial factors include characteristics such as age, gender, ethnicity, personality traits and birth order.

The relationship between gender difference and risk tolerance has long been considered in the literature. A plethora of studies (e.g. Burton, 1995; Graham *et al.*, 2002) based on different samples and methodologies demonstrate that men tend to be more risk tolerant than women. In particular, Guiso *et al.* (1996) use the 1989 Bank of Italy Survey of Households income and wealth while Pålsson (1996) uses a Swedish cross-sectional dataset. Many studies are based on the Survey of Consumer Finances (SCF). Sung and Hanna (1996) consider only working respondents aged between 16 and 70 included in 1992 SCF; the 1995 SCF and the 1989 SCF are considered in the research of Embrey and Fox (1997) and Jianakoplos and Bernasek (1998), respectively. Yao *et al.* (2004) use a logit regression to test changes in risk tolerance considering six SCF cross-sectional dataset from 1983 to 2001. In their studies, Morse (1998), Grable (2000), Bernasek and Shwiff (2001) and Hartog *et al.* (2002) use some questionnaires while Powell and Ansic (1997) use some computerized laboratory experiments. Hariharan *et al.* (2000) consider survey data reported in 1992 Health and Retirement Survey concerning individuals from 51 to 61 years old. Gilliam *et al.* (2010) use a sample of respondents to the FinaMetrica risk tolerance questionnaire US residents born between 1946 through 1964 to confirm that men tend to be more risk-tolerant than women. Sung and Hanna (1996) and Huston *et al.* (1997) find that gender, marital status, ethnicity and education predict risk tolerance. However, Grable and Joo (1997), Hanna *et al.* (2001) and Hari *et al.* (2018) find that gender is not significant in predicting financial risk tolerance.

With regards to marital status, Baker and Haslem (1974) and Cohn *et al.* (1975) argue that married individuals tend to be less risk-taking than singles. Roszkowski *et al.* (1993) find that single investors are more risk tolerant than married people and the same conclusion is supported by the studies carried out by Guiso *et al.* (1996), Sung and Hanna (1996), Hinz *et al.* (1997), Gutter *et al.* (1999), and in more recent years by Hartog *et al.* (2002), Grable and Joo (2004), Hallahan *et al.* (2004), Yao *et al.* (2004) and Fan and Xiao (2006). The main justification for this result is that single individuals do not bear the same responsibilities as those that are married, and thus single individuals are willing to accept more financial risk. When gender and marital status are considered together, Jianakoplos and Bernasek (1998) and Bernasek and Shwiff (2001) find that single men tend to be more risk tolerant than single women. Sunden and Surette (1998) conclude that single women and married men are less risk tolerant compared with single men. According to Chaulk *et al.* (2003), married individuals tend to be less financially risk-tolerant because of a greater need for wealth protection. However, McInish (1982), Masters (1989), and Haliassos and Bertaut (1995) argue that no significant relationship is identifiable between marital status and risk tolerance.

Bearing in mind this literature review, we formulate two starting hypotheses:
Focusing on gender, we expect that:

H1. Men tend to be more risk tolerant than women.

H1a. Men remain more risk tolerant than women during troubled periods.

A plethora of studies argue that financial risk tolerance decreases with age (Wallach and Kogan, 1961; McInish, 1982; Morin and Suarez, 1983; Dahlbäck, 1991; Bakshi and Chen, 1994; Schooley and Worden, 1996; Donkers and Van Soest, 1999; Fan and Xiao, 2006; Faff *et al.*, 2009). On the contrary, Xiao and Anderson (1997) and Wang and Hanna (1997) find that financial risk tolerance increases with age. However, there are also many studies which have found no relationship between age and risk tolerance (Cutler, 1995; Grable and Joo, 1997; Grable and Lytton, 1999; Hariharan *et al.*, 2000; Hanna *et al.*, 2001; Gollier; Zeckhauser, 2002). Using a sample of 15,916 Australian respondents to the survey for the FinaMetrica Personal Financial Profiling system over the period May 1999–February 2002, Faff *et al.* (2009) point out that the relationship between age and risk tolerance is not necessarily linear. This result confirms the studies of Riley and Chow (1992), Bajtelsmit and VanDerhei (1997), Hallahan *et al.* (2004) and Grable *et al.* (2006).

Our hypotheses are:

H2. Risk tolerance decreases with age;

H2a. During a crisis, risk tolerance decreases more strongly with age.

According to Baker and Haslem (1974), Haliassos and Bertaut (1995) and Sung and Hanna (1996), the higher an investor's education level, the greater his/her capacity to evaluate investment risk, thus leading to a higher risk tolerance. Meyer *et al.* (1961), Quattlebaum (1988), Masters (1989) and Haliassos and Bertaut (1995) find that increasing levels of risk tolerance have also been associated with being employed in a professional occupation.

Hawley and Fujii (1993–1994), Sung and Hanna (1996), Kennickell *et al.* (1997) and Grable and Lytton (1999) argue that certain demographic and socioeconomic environmental characteristics (e.g. income) can predict risk tolerance. In this field of research, the studies by Friedman (1974), Cohn *et al.* (1975), Schooley and Worden (1996), Shaw (1996), Grable and Lytton (1999), Grable (2000), Bernheim *et al.* (2001), Chaulk *et al.* (2003), Yook and Everett (2003), Chang *et al.* (2004), Grable and Joo (2004), Hallahan *et al.* (2004), Yao *et al.* (2004) and Fan and Xiao (2006) find a higher financial risk tolerance among people in high income/wealth categories. In particular, Hallahan *et al.* (2004) find a positive relationship between the level of risk tolerance and income, wealth and education, suggesting that financial risk tolerance could be a function of income and wealth rather than education. Many studies (Baker and Haslem, 1974; Cicchetti; Dubin, 1994; Cohn *et al.*, 1975; Riley and Chow, 1992; Zhong and Xiao, 1995; Schooley and Worden, 1996; Shaw, 1996; Grable, 2000; Grable and Joo, 2000, 2004) find that increased levels of income and educational attainment are associated with increased levels of risk tolerance. We argue that people characterized by a greater level of education should make better use of publicly available information. During “normal” times, they are expected to show higher risk tolerance, since they want to take benefits from the virtuous risk-return profile of stock markets. However, during a financial downturn, they will adjust their portfolio according to the new information: they can both reduce or increase the riskiness of their investments using a tactical asset allocation approach. Moreover, people with a lower level of income can feel a greater pressure on the personal financial balance when a crisis period occurs, leading to more conservative asset allocation.

We formulate several hypotheses on these topics.

H3. The higher the education level, the higher the risk tolerance;

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- H3a.* During a crisis period, the relationship between education level and risk tolerance is not significant;
- H4.* The higher the level of income, the higher the risk tolerance;
- H4a.* During a crisis, the positive relationship between income and risk tolerance is stronger;
- H5.* The higher the level of wealth, the higher the risk appetite;
- H5a.* During a crisis period, the relationship between the level of wealth and risk appetite remains positive.

The preceding hypotheses represent the first attempt to provide a rationale for the (expected) different effect of traditional determinants of risk governance during a crisis period. In fact, there are few studies in the literature that consider the relationship between individual risk tolerance and financial crises. These papers are usually based on data collected through surveys and/or specific questionnaires (Bateman *et al.*, 2011; Hoffmann *et al.*, 2013; Gerrans *et al.*, 2015; Schooley and Worden, 2016), and they are characterized by briefer time-spans examined (2007 and 2008 in the case of the study by Bateman *et al.*, 2011; from 2007 to 2009 in the research by Schooley and Worden, 2016, 2008–2009 in Hoffman *et al.*, 2013; from January 2001 to July 2009 in Gerrans *et al.*, 2015).

Besides providing detailed hypotheses on the different effect of traditional determinants of risk governance before and during a crisis period, our research differs from the studies cited above in two fundamental aspects: the time period analyzed, which covers 15 years (from 2003 to 2017), and the nature of our data, which are taken from *real-world* investors and therefore represent implemented behaviors by individuals in the management of their investment portfolios.

3. Sample description

The data used in this research were taken from the “Italian open-ended Mutual funds shareholders registry” provided by Assogestioni (the association of asset management firms operating in Italy). This unique dataset contains information about the individual owners of mutual fund shares in Italy since 2003: these include gender, age, education, marital status and portfolio composition items.

Since the data are confidential, in this registry shareholders are coded randomly. However, each code remains constant over time for a specific individual, allowing us to track his/her features and choices for the whole time-span under consideration. Data restrictions were necessary to filter outliers and manage missing data. In particular, we excluded from the sample individuals with a net worth invested in mutual funds lower than €15,000, those with an age outside the 18–90 interval, and those with missing data in any of our variables of interest. This allowed us to work with a strongly balanced panel of data, including 1,245 individuals observed over a period of 15 years (from 2003 to 2017). Moreover, some variables have been provided in a pre-calculated form. The dataset specifies the portfolio composition for each investor per year. Assogestioni chose a 70% threshold as the trigger for attributing a specific portfolio classification. We recoded this information in three clusters of risk-taking; specifically, if the portfolio held by the individual comprises at least 70% monetary or bond products, a low risk tolerance is assigned; vice versa, if the portfolio is made up of at least 70% equity products, a high risk-appetite is attributed. In all other cases, a medium tolerance to risk is assigned. According to these categories, our dependent variable, risk tolerance, assumed a value equal to 0 in the case of a low risk tolerance, 1 in the case of medium risk tolerance, and 2 in the case of high risk-tolerance. Moreover, the investors' level of wealth may

be grouped into three clusters: up to 99,999 euros, from 100,000 euros to 499,999 euros, and over 500,000 euros. The number of individuals in each cluster (1.146, 14.686, and 2.843 respectively) is consistent with the Banca d'Italia report titled "The wealth of Italian families."

Table 1 shows the variables used in this study. For each variable, we provide a description and our expectation as to its risk-tolerance influence, following the prevalent literature on the topic.

We divided individuals into those living in the north and in the center-south of Italy. Our expectation was that residents in the north of Italy are more risk-taking than others: there is clear and long-standing evidence that the north and south of Italy are characterized by great differences in per-capita GDP, net wealth and financial portfolio composition [1].

Table 2 shows some descriptive statistics of the sample and highlights the specific features of the panel of available data.

As shown in Table 2, most of the individuals in the sample live in northern Italy (80.20%). The majority of the individuals are married men (legally or *de facto*, 60.46%), followed by unmarried men (single or widowed, 16.73%), unmarried women (single or widowed, 11.92%), and married women (legally or *de facto*, 10.89%). The average age in our sample is about 57

Variable	Description	Expected sign
<i>Dependent</i>		
risk_appetite	This indicates the level of risk taken by each investor year by year according to his/her portfolio composition. It is an ordinal variable which considers three categories: 0 indicates low risk tolerance; 1 indicates medium risk tolerance; 2 indicates high risk tolerance	
<i>Independent</i>		
north	Dummy variable: 1 if the individual lives in the north of Italy	+
center-south	Dummy variable: 1 if the individual lives in the center or in the south of Italy	-
unmarried_male	Dummy variable: 1 if the individual is a single, divorced, separated or widowed male; 0 otherwise	+
unmarried_female	Dummy variable: 1 if the individual is a single, divorced, separated or widowed female; 0 otherwise	-
married_male	Dummy variable: 1 if the individual is a married male (legally or <i>de facto</i>); 0 otherwise	+/-
married_female	Dummy variable: 1 if the individual is a married female (legally or <i>de facto</i>); 0 otherwise	+/-
age	Age of each investor	-
age ²	Squared value of the age of each investor	
low_edu	Dummy Variable: 1 if the individual has no education or if he/she did not complete high school (low level of education)	-
mid_edu	Dummy Variable: 1 if the individual completed high school (medium level of education)	+/-
high_edu	Dummy Variable: 1 if the individual has a degree or equivalent (high level of education)	+
self-employed	Dummy Variable: 1 if the individual is self-employed	+
employed	Dummy Variable: 1 if the individual is salaried	+/-
retired	Dummy Variable: 1 if the individual is retired	-
low_wealth	Dummy variable: 1 if the individual' level of wealth is up to 99,999 euros	-
mid_wealth	Dummy variable: 1 if the individual' level of wealth is from 100,000 euros to 500,000 euros	+/-
high_wealth	Dummy variable: 1 if the individual's level of wealth is over 500,000 euros	+
2003, 2004, ...	Time dummies from 2003 to 2017	+/-

Table 1.
The variables used in the analysis

Table 2. Summary of variables shown in the dataset ($n = 1,245$; $N = 18,675$; years: 2003–2017)

Variable type	Variable		Mean	SD
Dependent variable	risk_appetite	Overall	1.0293	0.6840
		Between		0.4873
		Within		0.4802
Independent variables	north	Overall	0.8020	0.3985
		Between		0.3984
		Within		0.0141
	center-south	Overall	0.1980	0.3985
		Between		0.3984
		Within		0.014
	unmarried_male	Overall	0.1673	0.3732
		Between		0.3506
		Within		0.1284
	unmarried_female	Overall	0.1192	0.3240
		Between		0.3133
		Within		0.0833
	married_male	Overall	0.6046	0.4889
		Between		0.4720
		Within		0.1284
	married_female	Overall	0.1089	0.3115
		Between		0.3003
		Within		0.0833
	age	Overall	56.975	12.4759
		Between		11.8440
		Within		4.4941
	low_edu	Overall	0.3361	0.4724
		Between		0.4543
		Within		0.1301
	mid_edu	Overall	0.4533	0.4978
		Between		0.4739
		Within		0.1531
	high_edu	Overall	0.2106	0.4077
		Between		0.3991
		Within		0.0844
self-employed	Overall	0.3391	0.4734	
	Between		0.4116	
	Within		0.2343	
employed	Overall	0.3942	0.4887	
	Between		0.4166	
	Within		0.2557	
retired	Overall	0.2667	0.4423	
	Between		0.3772	
	Within		0.2311	
low_wealth	Overall	0.6137	0.2400	
	Between		0.1333	
	Within		0.1996	
mid_wealth	Overall	0.7864	0.4099	
	Between		0.2705	
	Within		0.3080	
high_wealth	Overall	0.1522	0.3593	
	Between		0.2650	
	Within		0.2426	

years. With reference to levels of education, 33.61% are investors with a low level of education, that is to say, individuals who have no education or did not complete high school;

45.33% of individuals completed high school, while 21.06% have a degree or equivalent. Our sample consists of 33.91% self-employed workers, 39.42% employees, and 26.67% retired workers. Due to the long period of time covered by our sample, as shown in Table 2, status changes can occur within the categories described above.

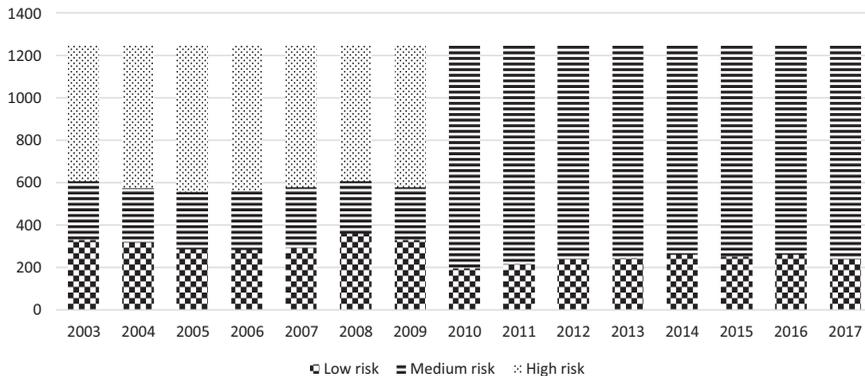
Graph 1 shows the dynamics of the dependent variable (risk appetite) over the period of time examined.

First of all, it is clearly observable that portfolios mainly exposed to the most risky component (i.e. equity products) have disappeared since 2009, a year after the beginning of the global financial crisis in 2008. The change in risk appetite is evident and striking: individuals literally flee from the most aggressive investments. Second, it is possible to observe that among Italian investors, the risk profile of mutual fund portfolios is generally moderate. In line with this view, Table 3 suggests that risk tolerance shown by Italian investors is deeply influenced by the macroeconomic context. This result is confirmed and justified by the literature.

Indeed, according to Kahneman and Riepe (1998), investors tend to be overconfident in bull markets but exhibit myopic loss aversion (Benartzi and Thaler, 1995). This combination explains swings in portfolio choices before and after crises, as highlighted in Table 3. In fact, the reduction in the number of investors holding high-risk portfolios is dramatic before 2008 and after 2008 (52.93 vs 5.95%); nevertheless, it is very interesting to observe that after 2008, the majority of investors shift to a medium-risk portfolio level (74.11%).

4. Methodology and analysis

The analysis described in this paper was carried out in two steps. In Step 1 we examined the sample over the whole time period under consideration (2003–2017). The aim of this step was to integrate and corroborate the existing literature on the topic of risk tolerance, considering a



Graph 1.
Dynamic of risk
appetite over time
(2003–2017)

Risk tolerance	Number of investors 2003–2008		Number of investors 2009–2017	
		%		%
Low	1,869	25.02	2,234	19.94
Medium	1,618	21.66	8,304	74.11
High	3,983	53.32	667	5.95
Total	7,470	100	11,205	100

Table 3.
Investor distribution as
regards risk tolerance

complete economic and financial cycle. Step 2 took 2008 as the pivotal point between the pre-crisis and the crisis periods. We thus divided the dataset into two subsamples: pre-crisis (2003–2008) and crisis (2009–2017). In this way, we aimed to observe the influence on risk appetite of the economic and financial effects of the crisis.

Step 1 – Overall analysis

In this step, we considered 18,675 observations over a period of 15 years, from 2003 to 2017. Since risk appetite is a categorical variable ranging from 0 to 2, a panel ordered logistic regression was used. The estimated equation is as follows:

$$\begin{aligned} \text{risk_appetite} = & c + \alpha_1 \sum_{i=1}^2 \text{area_}i + \alpha_2 \sum_{j=1}^4 \text{maritalstatus_}j + \alpha_3 \text{age} + \alpha_4 \text{age}^2 \\ & + \alpha_5 \sum_{z=1}^3 \text{z_edu} + \alpha_6 \sum_{k=1}^3 \text{job_}k + \alpha_7 \sum_{w=1}^3 \text{w_wealth} + \alpha_8 \sum_{t=1}^{15} T_t \end{aligned} \quad (1)$$

where:

- (1) *area_i* is the codification for northern (*north*), central and southern (*center-south*);
- (2) *maritalstatus_j* indicates if the individual is a single male (*single_male*), single female (*single_female*), married male (*married_male*), or married female (*married_female*);
- (3) *age* indicates the age of each investor, and *age*² is its squared value;
- (4) *z_edu* indicates the education level achieved by the investor, specifically *low_edu* indicating a low level of education, *mid_edu* a medium level of education, and *high_edu* a high level of education;
- (5) *job_k* indicates if the individual is *self-employed*, *employed* or *retired*;
- (6) *wealth_w* indicates the investor's level of wealth, specifically *low_wealth* indicating a level of wealth up to 99,999 euros (retail investors), *mid_wealth* a level between 100,000 euros and 499,999 euros (usually linked to affluent investors), and *high_wealth* a level over 500,000 euros (typical of private investors);
- (7) *T* indicates time dummies from 2003 to 2017.

The results obtained are shown in [Table 4](#).

Outcomes suggest that investors living in northern Italy are more risk tolerant than those in central and southern Italy.

Males are more risk-taking than females and this result confirms H1; based on our results, we state that gender (male or female) prevails over marital status. More specifically, this is confirmed for both unmarried men ($p < 0.01$) and for those who are married ($p < 0.05$). The results obtained therefore confirm conclusions expressed in the prevailing literature, i.e. that men are more risk tolerant than women, but do not support the conclusions of some researchers (e.g. [Chaulk et al., 2003](#)) who claim that married men and single women are less risk tolerant than single men.

In accordance with the prevailing literature (e.g. among others [Yao et al., 2004](#); [Fan and Xiao, 2006](#)), the result obtained with reference to the age variable confirms H2: there is an inverse relationship between increasing age and risk tolerance. However, the significance and sign of the variable “age-squared” shows that the relationship between age and risk tolerance is not necessarily linear, as was argued by [Hallahan et al. \(2004\)](#), [Grable et al. \(2006\)](#), and [Faff et al. \(2009\)](#), among others.

north	0.550*
	(0.319)
unmarried_male	1.005***
	(0.380)
unmarried_female	-0.600
	(0.447)
married_male	0.644**
	(0.328)
age	-0.474***
	(0.0665)
age ²	0.0039***
	(0.0005)
low_edu	0.216
	(0.279)
high_edu	-0.0096
	(0.230)
self-employed	0.335*
	(0.181)
retired	-0.490**
	(0.231)
low_wealth	1.028***
	(0.241)
mid_wealth	0.819***
	(0.159)
2003	1.769***
	(0.194)
2004	2.085***
	(0.189)
2005	2.422***
	(0.181)
2006	2.470***
	(0.175)
2007	2.420***
	(0.169)
2008	1.969***
	(0.167)
2009	2.319***
	(0.163)
2010	0.023
	(0.086)
2011	-0.0468
	(0.0859)
2012	-0.102
	(0.078)
2013	-0.0797
	(0.0720)
2014	-0.126**
	(0.0597)
2015	-0.0661
	(0.0500)
2016	-0.115**
	(0.0431)
Observations	18,675
Number of individuals	1,245

Table 4.
Panel regression
analysis on the whole
sample

Note(s): Ordered logistic regression. Dependent variable: Risk tolerance. Time span under scrutiny: 15 years (2003–2017). Robust standard errors in parentheses. Significance codes: ***indicate statistical significance at 1%, **at 5% and *at 10%

The level of investor education turns out as not being significant in our analysis. This result seems to corroborate the study by [Hallahan et al. \(2004\)](#) according to which individuals' level of risk tolerance does not depend on their level of education. Thus, H3 is rejected.

The self-employed appear to be more risk taking than employees while retired people appear to be less risk-taking ($p < 0.10$ and $p < 0.05$ respectively). This result confirms H4 and supports other studies on this topic (e.g. [Masters, 1989](#); [Halaiissos and Bertant, 1995](#)).

H5 is not completely supported by the obtained results; indeed, investors seem to be risk seeking independently of their level of wealth.

The values and significance of the time dummies highlight the fact that from 2003 to 2009 the level of risk appetite was positive and strongly significant ($p < 0.01$), while after 2009 significance disappeared.

Step 2 – Analysis of risk appetite before and after the financial crisis (year 2008)

The analysis carried out in Step 2 is intended to demonstrate the consequences on Italian investors' risk appetite of the financial crisis that began in 2008. For this reason, the sample was divided into two subsamples: the first covering the years from 2003 to 2008 (included) and the second covering the years from 2009 to 2017. Equation (1) is then replicated, including a set of time dummies consistent with the time span considered in each estimation. The results obtained are shown in [Table 5](#).

Subsample 2003–2008		Subsample 2009–2017	
north	1.534*** (0.326)	north	0.642** (0.257)
unmarried_male	3.924*** (0.682)	unmarried_male	0.821** (0.357)
unmarried_female	-0.619 (0.493)	unmarried_female	-0.360 (0.386)
married_male	4.240*** (0.528)	married_male	0.521* (0.312)
age	-0.151 (0.137)	age	-0.213*** (0.0774)
age ²	-0.0011 (0.0013)	age ²	0.0018*** (0.0006)
low_edu	-0.161 (0.305)	low_edu	0.0410 (0.218)
high_edu	1.856*** (0.382)	high_edu	0.245 (0.218)
self-employed	0.0974 (0.282)	self-employed	0.494** (0.198)
retired	-0.522 (0.384)	retired	-0.534*** (0.259)
low_wealth	2.840*** (0.492)	low_wealth	0.312 (0.343)
mid_wealth	2.223*** (0.331)	mid_wealth	0.621*** (0.192)
Time dummies	(YES)	Time dummies	(YES)
Observations	7,470	Observations	11,205
Number of individuals	1,245	Number of individuals	1,245

Note(s): Ordered logistic regression. Dependent variable: Risk tolerance. Time dummies included. Robust standard errors in parentheses. Significance codes: ***indicate statistical significance at 1%, **at 5% and *at 10%

Table 5. Panel regression analysis on the impact of the financial crisis on risk appetite: before 2008 (on the left) and after 2008 (on the right)

Outcomes show that residents in northern Italy were more risk tolerant until 2009 and continued to be so even after 2008 compared to those living in the center-south of Italy.

It is interesting to note that unmarried men continue to be risk-takers in both subsamples (2003–2008 and 2009–2017), and the same is confirmed for married men. Between the first and second period the significance declined, as did the magnitude of the coefficients: this shows that the crisis also had an impact on risk tolerance among males. However, H1a is confirmed: in general, men tend to be more risk tolerant than women both in a positive and in a negative scenario, but the advent of a crisis can flatten the dissimilarities between different marital status.

From 2003 to 2008, in a period of generalized macroeconomic growth, the age variable does not appear to be significant; from 2009, on the other hand, we observe a negative and significant relationship between age and risk appetite, although it is not necessarily linear. Hence, H2a is confirmed in the case of a negative scenario: macroeconomic context influences the investors' decision making process.

Until 2008, investors with a high level of education were more risk tolerant than those with a school-leaving diploma, confirming the literature on the topic (e.g. [Baker and Haslem, 1974](#); [Haliassos and Bertant, 1995](#); [Sung and Hanna, 1996](#)). However, since 2009 the level of education has no longer been significant. This result could be an expression of a flattening behavior caused by the crisis: thus H3a is confirmed.

Until 2008, working status was not significant; since 2009, in contrast, retired people have been less risk tolerant than the employees while the self-employed, on the contrary, are more risk tolerant. For this reason also H4a is confirmed.

Before 2008, investors seem to be risk taking independently of their level of wealth; after 2008 H5a is rejected. In fact, in the case of a negative macroeconomic context wealthier people tend to be less risk tolerant than affluent investors, while the coefficient associated to retail investors is not statistically significant.

5. Discussion

Much research (e.g. [Thaler, 1991](#); [Kahneman and Knetsch, 1992](#)), specifically designed to describe how decisions are made in a specific economic and financial setting, confirm that the subjective perception of what is deemed fair in an economic transaction is always biased by a reference framework ([Kahneman and Tversky, 1984](#)) affected by the magnitude of stimuli and the perceived subjective intensity of sensation ([Fechner, 1860](#); [Deco et al., 2007](#)). This is the “framing effect” ([Kahneman, 2003](#); [Levin et al., 2002](#)), whose influence on investors can cause a change from “risk averse” to “risk-seeking” behavior and vice versa ([Kanheman and Tversky, 1979](#); [Olsen, 1997a, b](#)). The analysis presented in this paper, which has allowed us to observe Italian investors' risk-tolerance changes in the real world over 15 years, confirms the influence of the macroeconomic context on investors' decision-making process. Some of the obtained results are ambiguous, as for many other studies reported in the literature on this topic, but some interesting conclusions can be drawn.

Investors who live in the north of Italy are more risk tolerant than those who live in other areas. This behavior is in line with the GDP distinction between northern and central-southern Italy, such that northern Italians are more confident in risk-seeking when making their asset allocation choices. Hence, a sounder surrounding economic environment exerts a positive effect on risk-taking attitudes of investors: this is not surprising, since this underlying framework reduces the uncertainty in economic decision-making by the individuals.

Men turn out to be more risk tolerant than women. This is confirmed in every examined scenario and regardless of marital status. However, a reduction in risk appetite is observed over the crisis period (2009–2017). Therefore, male investors are not indifferent to the

macroeconomic context: the advent of a crisis can flatten the differences between singles and married people.

The studies reported in the literature reach contradictory conclusions with reference to age. Our results allow us to argue that, in general, there is a negative relationship between age and risk appetite, although this relationship is not necessarily linear. However, in a positive economic scenario, (pre-crisis) age is not significant in determining the investors risk appetite. Indeed, after 2008, older people are less risk tolerant than younger ones. A more prudent risk attitude in a negative macroeconomic context is rational and supported by the status quo tendency. [Kahneman and Tversky \(2000\)](#) argue that investors decide by bearing in mind their status quo (i.e. their current level of well-being). In any situation where it might be altered, the decision procedure is adjusted ([Tversky and Kahneman, 1981](#); [Sonnemans *et al.*, 1998](#)) in order to keep it almost the same ([Kahneman and Tversky, 1979](#)). In this perspective, in a macroeconomic context of great uncertainty and with the possibility of incurring even significant financial losses, older people, who have a reduced survival prospect compared to younger ones, show less risk tolerance with the aim of protecting the level of wealth they have accumulated over time.

Investors' level of education does not seem to have an impact on risk tolerance, except in the pre-crisis period (2003–2008) when people with a higher level of education are more risk tolerant than people educated to a lower level. The positive macroeconomic context leads educated people to be more risk-seeking, while the context of uncertainty renders risk appetite insignificant. As previously stated in explaining the rationale behind H3a, during a financial downturn, more educated investors are expected to adjust their portfolio in a tactical way, reducing or increasing the riskiness of their investments according to the new information.

The analysis devoted to income-related covariates shows that retired people have dramatically reduced their risk-tolerance during the crisis; on the contrary, self-employed individuals have shown a greater risk attitude. Overall, these outcomes suggest that income matters in determining portfolio choices and this effect is likely to be magnified by the advent of severe economic and financial downturns.

Finally, our results identify a negative relationship between people's risk appetite and wealth, contrary to previous studies (e.g. [Hallahan *et al.*, 2004](#); [Yao *et al.*, 2004](#); [Fan and Xiao, 2006](#)). This outcome is interesting when coupled with the result obtained for the area dummy: it emerges as a picture where wealthier macroeconomic conditions promotes risk-seeking, while microeconomic (personal) attitudes may lead to an opposite behavior.

Overall, the results of our study provide guidance on investor behavior in the transition from normal market conditions to episodes of deep financial crisis. In this sense, the outcomes of the data analysis broadly confirm the conceptual framework and assumptions we made in Section 3.

The overall result is a comprehensive picture of the decision-making behavior of individuals in making investment choices during a period of severe economic and financial stress. In particular, gender, age and income level appear to be the drivers that most influence investors' risk-attitude. Education and marital status appear to be less explanatory impact.

6. Conclusions

Risk tolerance remains an extremely fascinating and stimulating research topic. Many demographic and socio-economic variables affect risk appetite in a dynamic mix. However, this study shows that the macroeconomic context is able to influence investors' risk tolerance significantly, thus modifying their portfolio asset allocations. In effect, risk tolerance is a topic in which psychological aspects merge and interact with financial opportunities and macroeconomic conditions. Under these assumptions, it must be noted that radical portfolio

changes due to risk-tolerance modification can generate an excess of transaction costs, leading to severe reductions in gains. Furthermore, the massive shift of capital from risky products to less risky ones can lead investors to incur significant opportunity losses and may involve sudden interruptions in financial planning strategies. In addition, some products may suffer in terms of lack of assets under management, liquidity problems, and biased price setting due to shocks in demand/supply with regard to financial products in the market.

Given the massive shifts in portfolio asset allocation observed in our sample, from a strategic point of view it may be useful for financial intermediaries to develop advanced asset management services to support their customers. In effect, the observed dynamics previously discussed in our study tend to undermine both the soundness of portfolio management over time and overall customer (and intermediary) satisfaction. In this sense, a closer relationship between private investors and their financial consultants should reduce the magnitude of portfolio changes over time and increase the speed of portfolio adjustments to the surrounding macroeconomic environment. Future research could focus on understanding how the presence of the financial advisor impacts on investors' risk tolerance. Furthermore, the impact of financial literacy programs on the choices made by investors in their asset allocation could be examined.

Note

1. Detailed figures on this topic are included in the "Surveys on Household Income and Wealth" undertaken since the 1960s by the Bank of Italy to gather data on the incomes and savings of Italian households, and available on the Bank of Italy's website (www.bancaditalia.it).

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