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# ECONOMICS

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## *Sociology*

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## RISK TOLERANCE ANALYSIS: ROMANIAN CASE BEFORE AND DURING FINANCIAL TURMOIL

**ABSTRACT.** One of the most challenging problems of investment theory is to explain and to understand the risk behaviour of people interested in investing their savings on the stock exchange. The recent global financial crisis significantly affected public perception about the risks and had a direct impact on the transaction volume and type of operations performed on international capital markets. Risk tolerance is considered in crisis theories as one of the major factors inducing global contagion. Social aspects like gender, social status, level of income (wealth) are considered to be relevant for explaining risk tolerance. This research proposed a specific instrument used to test the level of risk aversion (inverse of risk tolerance) applied on the Romanian case in two different periods (before crisis and during crisis) and on a statistically relevant sample of respondents. Using specific tools (non-parametric and parametric instruments), the paper provides a closer insight on this specific problem, trying to explain the significance of different social aspects on the risk aversion level for different categories, but also to explain how the crisis affected this aversion.

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G12, D53, D81, G01

**Keywords:** risk aversion, behavioural finance, optimal portfolio  
investments, capital market, investment criteria

### Introduction

Risk attitude is important for explaining why a potential investor is interested or not to introduce money on capital markets and for determining the amount of money invested (if the decision will be in favour of investments). According with mainstream approach (the research was initiated by Pratt, 1964; Arrow, 1971; continued by Kihlstrom & Mirman, 1974 that studied the difficulties in defining comparative risk aversion of individuals facing with different preferences requiring a prioritization; followed recently by Borghans *et al.*, 2009; Kraeussl, *et al.*, 2010 and Ruble, 2011), the investors could adopt three different attitudes toward investment risk: *aversion, indifference and preference*. Different utility functions are associated to expected returns (using probabilities), in order to explain these attitudes (risk aversion meaning that the investors will associate a higher utility to the possibility of losing money from a risky investment alternative compared with those investors that prefer the risk and therefore they associate a higher utility for potential gains than potential losses). There are *families of utility functions* proposed for describing such behaviours: logarithmic functions are used for describing risk aversion investors, linear functions for risk indifferent individuals and exponential functions for risk preferring investors (Wakker, 2008; Würth & Schumacher,

2011). These utility functions of investors' wealth are used to estimate the parameter of *absolute risk aversion (ARA)* and *relative risk aversion (RRA)*. Absolute risk aversion is determined by the absolute amount of investor's income that she / he agrees to invest in a risky alternative and this absolute risk aversion is dependent on the changes in the income level – a decreasing absolute risk aversion means that the investor will increase the amount of money invested when his income will be higher, while an increasing absolute risk aversion means that the invested amount of money will be lower when the incomes will increase (there is also a constant absolute risk aversion reflecting no link between the increase of investor's wealth and the amount of money invested on the market). Comparatively, relative risk aversion expresses the willingness of an individual to invest his money in a risky alternative as a function of weight of the total wealth of this individual that is allocated in risky assets. A decreasing relative risk aversion means that an increase in the investor's income level will increase the weight of his wealth allocated in risky alternatives (or assets). Risk aversion was initially associated to the investor's wealth and was considered to be measurable by implying these utility functions. The main critics that could be addressed to this utilitarian approach are focused on the idea of utility function that is individual and unique without the possibility to make inter-personal shifts; the dynamic of changes at the level of individuals that requires a permanent adjustment of individual utility function and the cardinal measure associated to these functions (utility of an investment alternative compared with other one is sometimes based on qualitative measures rather than quantitative ones). The opposite (or inverse) of risk aversion is called risk tolerance.

This study provides a perspective on the investment profile of Romanian investors and confirms the most important hypothesis regarding the factors that impact the risk tolerance and their behaviour. Comparing the results before crisis (in 2007 Romania registered the highest economic growth among Eastern European Countries) and during crisis (2012), this study is also interesting because is catching the shifts in the investors' risk tolerance due to crisis. On the case of emerging markets from Eastern Europe there are not so many studies on risk tolerance and investment behaviour. Therefore, the results provided by this study could be useful not only from theoretical point of view but for the capital market specialists and financial intermediaries interested to understand better the investment behaviour in this particular region and country and to adapt their strategies and products to the identified level of risk tolerance. These kinds of studies are included in the area of interdisciplinary studies combining economic investment theory with psychology and sociology, offering a more complete image on the specific actions of capital market participants. The proposed study is structured on the following main sections: [1] an insight in the main theories provided by economic literature regarding measuring methods on absolute and relative risk aversion, similar studies and proposing similar or alternative research methodologies; [2] the development of research hypothesis and their correspondence in the current economic theory; [3] the presentation of research methodology used in this study and the description of data sample and data collecting method and [4] results and concluding remarks.

### **Literature review on the measure of risk aversion**

Individual wealth and utility functions provided the basis for models that estimate the risk aversion. Behavioural economics opened new approaches and provided more insights and decomposition of risk aversion determinants. Factors like social status (married or not), household situation (the existence of children in the family), education, knowledge about financial markets and financial instruments, gender or job status (employed or not, student or retired person) completed the analysis based only on the wealth level (and its utility). Based

on such analysis, an entire financial industry was developed and was made sophisticated, in order to offer the most suitable financial products adapted to customers' risk aversion.

The methods used to estimate risk aversion could be structured as follows (this classification was initially proposed by Hanna *et al.*, 2001): [1] *Asking about portfolio choice*: The method is based on a survey focused on the structure of investments made on a capital market by a group of investors (if the risk tolerance is lower the investors will prefer stocks rather than treasury bills). The advantage of this method consists in the real assumed investment choices made by investors in the past. This method is not asking about a hypothetical situation and is applied to existing investors with explicit investment actions: Borghans *et al.*, 2009 tested the differences of risk aversion and ambiguity aversion between male and female by using a methodology based on a number of four different urns containing two coloured balls and offered to the respondents a prize of 2 \$ in case of guessing the right colour; Heaton and Lucas 2000 estimated the importance of labour income in the volume and structure of personal investments in risky assets of households; in the theoretical model developed by Kraeussl *et al.*, 2010 the fraction of capital invested by individuals in risky assets is proposed to characterize the relative risk aversion and the importance of uncertainty about risk aversion is influencing the relationship between wealth and risk aversion; [2] *A mixture between real investment (explicit) choices mixed with subjective questions*: This method combines the questions about investment choices with questions about the ability of investors to assume specific risks in accordance with their risk tolerance: Hallahan *et al.*, 2004 used ProQuest database and compared self-assessed risk tolerance with the risk tolerance measured by that psychometric instrument; Neelakantan 2010 combined the information on individual portfolio choice with data on Individual Retirement Accounts from the Health and Retirement Study to assess the influence of risk tolerance on capital accumulation; [3] *The analysis of current investment behaviour using economic models*: in this case, an utility function of wealth is associated to different investment patterns and the coefficient of *absolute risk aversion* is calculated using the following formula:

$$ARA = Wealth \times \frac{U''(Wealth)}{U'(Wealth)} \quad (1),$$

and the coefficient of *relative risk aversion* is calculated eliminating the "Wealth" as:

$$RRA = \frac{U''(Wealth)}{U'(Wealth)} \quad (2)$$

The main problem with this method (as it has been already suggested) consists in the difficulty to aggregate such coefficient to a group of investors. In fact, there is infinity of utility functions that could be associated to different investment behaviours and there is no objective criterion to transfer a function from an individual to another (adding also the problem of stability of this behaviour in time): Blavatsky 2008 developed an improved theoretical model of estimating risk aversion based on expected utility theory applied to lotteries that are providing outcomes "*not necessarily measurable in real numbers and (with) people (that) do not necessarily have a unique preference relation over risky lotteries*"; Fair 2002 correlated the PE ratio of selected companies from S&P 500 with the risk of the measured by using CAPM framework and estimated individual beta concluding that risk aversion could be used to explain the evolution of prices of risky assets traded on capital markets; Rubble 2011 explained in a theoretical model the possibility to compare risk aversion over different individual preferences; Caballe & Esteban 2007 developed a theoretical framework from Arrow-Pratt index of absolute

risk aversion to estimate a global risk aversion; [4] *The use of hypothetical scenarios based on economic models*: by using specific questions (for example, to double your current income by taking a risky decision or not) and based on the answers to calculate absolute and relative risk aversion using economic models (based on utility functions): Guiso&Paiella 2008 used Survey of Household Income and Wealth provided by the Bank of Italy that in 1995 introduced a hypothetical question about investing money in a proposed financial security and asked about the maximum price that the respondents are willing to pay for it. The price was used to estimate absolute risk aversion that was subsequently correlated with different demographic and consumption attributes such as age, education, wealth etc.; Yao *et al.*, 2005 used data provided by a hypothetical question introduced in the Survey of Consumer Finances about the amount of financial risk that respondents are willing to assume in accordance with their expected returns and [5] *Probabilistic models using option pricing theory* and measuring the risk premium of risky assets (options) in connection with risk-neutral probabilities of an investor that is indifferent when decides between certain equivalent and risky bet offering the same outcomes: Jackwerth 2004 explained the relevance of option pricing theory for the relationship between option implied risk neutral distributions and risk aversion; Cheng 2010 compared probability distributions for stock market indices and for selected stock traded commodities in different scenarios of risk aversion.

The theories and methodologies developed in this particular field are very important for: [1] explaining the investment behaviour; [2] for providing insights on the asset pricing techniques; [3] for understanding the relationship between risk and expected return and [4] for studying the factors that could influence the investment decision under uncertainty. These kinds of researches are placed in an inter-disciplinary area of knowledge, providing a behavioural perspective on financial economics (including social, psychological and biological explanations to such issues). We should not neglect the critics on the fact that this behavioural approach on investments (about the social or psychological resorts of acting man) could be not so relevant for economic theory, but such studies could be useful only for understanding the functioning of capital markets and to understand the pricing mechanism (in a specific time horizon and in a specific place). The most common method used for estimating the risk aversion remains the survey on potential investors asking about hypothetical portfolio choice or asking about the existence or the structure of financial assets allocation. This method has the specific limitation of any survey: the answers on hypothetical questions about lotteries or investment behaviour are not always identical with real investment actions involving capital and uncertainty of real gains. For this reason the results provided by surveys on risk aversion should be compared with real data on investment behaviour. This study will compare the results on risk aversion with real data from Romanian capital market regarding the total volume of investments (higher risk aversion should reduce the volume of investments) and the structure of portfolios or investment funds (higher risk aversion will reduce the allocation in risky assets).

### **The research hypothesis**

This study is focused on the measure of absolute risk aversion by using a survey applied to the level of potential investors on Romanian capital market. The questionnaire was developed by using a similar methodology initially introduced by Grable and Lytton 1999 for testing the risk tolerance for investments. We proposed a specific number of questions that asked about the opinion regarding different investment decisions. According to these answers, it is possible to calculate the coefficient of absolute risk aversion within a range of values.

The main research hypotheses are the following:

**H1: Risk tolerance is increasing with wealth of investors:** Derived from utilitarian approach, wealth is considered the most important factor explaining risk aversion. Empirical studies revealed that investors with higher wealth will show a lower risk aversion (Paravisini *et al.*, 2010 used a person-to-person lending platform to measure risk aversion questioning 2168 investors about their portfolio choice and concluded that "*wealthier investors exhibit lower absolute risk aversion and higher relative risk aversion*"; Sousa 2007 used in their study macroeconomic data about portfolio structure and concluded that "*the share of housing wealth in portfolio falls when the agent is faced with a positive wealth shock*" and that "*the wealth effects are slightly stronger for direct holdings than for indirect holding*"). The wealth is measured in our study by income level declared by respondents;

**H2: Risk tolerance is increasing with age:** Several studies found that risk tolerance is increasing with age; however; other studies showed that very young people declared a higher risk aversion that is decreasing with age until maturity (around 45 – 55 years) and after that risk aversion is increasing again and few of them failed to find any relationship between risk aversion and age: Chaulk *et al.*, 2003 collected data from university housing community that accepted to respond to a survey in 1999 on employment risk and investment risk and their conclusion was that the age influence the marital status and children that affect the level of aversion against both tested risks; Sahn 2008 used Health and Retirement Study applied in USA by University of Michigan based on a couple of hypothetical questions and she concluded that "*there are some sources of systematic change in an individual's risk tolerance, such as aging and changes in macroeconomic conditions*"; Bellante & Green 2003 measured the risk aversion among elderly population using AHEAD Survey conducted by University of Michigan and they found "*clear support for the postulate of decreasing relative risk aversion among the elderly*" and "*equally clear evidence that relative risk aversion increases modestly as the elderly grow older*"; Guiso & Paiella 2005 submitted a lottery question to 8,135 household and found that "*share of risky assets is increasing with age with the portfolio share increasing by 2 percentage points for a 10-year increase in age*" but they excluded from their study the persons aged higher than 60 arguing that "*the elderly may have various incentives to decumulate assets after retirement, particularly the riskier ones*".

**H3: Risk tolerance is increasing with education:** There are studies that illustrate an inverse influence of education on risk aversion, higher educated people assuming more risks due to their improved knowledge: Hryshko *et al.*, 2011 used the data provided by Panel Study of Income Dynamics applied in USA and they found that "*growing up with more educated parents matters: children of educated parents are less risk averse in adulthood*" and that "*less risk averse households have higher volatility of permanent shocks to income*"; Guiso & Paiella 2005 found in their study that share in risky assets increased with education meaning a higher risk tolerance; de Paola and Gioia, 2011 tested the non-financial risk aversion by analysing the choice of study field at the level of undergraduate students enrolled to university and concluded that more educated students are willing to assume more difficult and challenging study area like Engineering or Science; Al-Ajmi 2011 used obtained that less educated people are less interested to assume higher risk. However, the results regarding educations seem not to be conclusive: several studies are illustrating that more educated people became more risk averse because education transforms people into more conscientious and responsible actors: for instance, Lin 2009 obtained a negative coefficient for the education as factor explaining the relative risk aversion and absolute risk aversion but the sectorial results show that sectors like forestry or transport, storage and communication have lower relative risk aversion than finance, insurance, real estate; Belzil & Hansen 2002 conducted a study based on 1979 The National Longitudinal Survey of Youth including 12686 American respondents and obtained a similar relative risk aversion between High School Graduates and College Graduates and

also that relative risk aversion is exponentially increasing with Expected Schooling Attainments (mean schooling).

**H4: Women are less risk tolerant than men:** Empirical studies proved that gender (women vs. men) is a relevant factor for risk aversion (Badunenko *et al.*, 2009 used cross-sectional data from different national surveys on private households from five European countries: Austria, Cyprus, Germany, Italy and the Netherlands and found that “*women are less likely to hold risky assets than males, ceteris paribus*” and “*males and females invest equal shares of their wealth to risky financial assets, ceteris paribus*”; Yao and Hanna 2005 concluded in their study based on Survey Consumer Finance that “*were consistent in that males were more risk tolerant than females, regardless of their marital status*”). Several studies also indicate that gender is inconclusive: Keller & Siegrist 2006 conducted a mail survey in Switzerland and found that “*the latent variables across groups (women and men) were partially invariant*”; Booth & Nolen 2009 conducted an experiment among students of University of Essex based on a survey including questions about a lottery, general risk and hypothetical lottery and obtained that “*it is untrue that the average female avoids risky behaviour more than the average male*”; Feng and Seasholes (2007) collected data from stock market traders and tested the risk attitude between men and women from China and obtained not significant differences.

**H5: Social status is relevant for risk tolerance:** Previous studies revealed that social status (marital status, existence of children in the family) could be relevant for risk aversion. When an individual is involved in a family, the investment decision and risk assuming scheme is different than for a single unmarried individual without such responsibilities for third parties (Paun *et al.*, 2008 applied an online survey and found consistent differences between divorced, married (with and without children) and unmarried people; Chaulk *et al.*, 2003 found that “*individuals with children are less willing to take investment risk than childless individuals but are not dissimilar to childless individuals in their propensity*”, Yao and Hanna 2005 obtained “*not systematic differences between men who are married and men who are not married*”; Spivey 2008 measured risk aversion by using data on preferences collected from 1979 National Longitudinal Survey of Youth and obtained that “*risk attitudes seem to have a larger and more statistically significant effect on time to marriage for men than for women*”).

**H6: Job status is relevant for risk tolerance:** Job status (unemployed people, students, retired respondents, employed people in private or public sector) is correlated to the level of risk aversion. Additional studies are focused on the relationship between wages, labour market and risk aversion. There are several studies concentrated on entrepreneurs and their willingness to tolerate risk: Pfeiffer 2008 used longitudinal survey of private households – German Socio-Economic Panel that tested the relationship between risk aversion and the option for a job in public sector and obtained that “*more risk averse workers sort into public sector employment if employment security is larger in the public than in the private sector*”; Xiao *et al.*, 2001 used 1995 Survey of Consumer Finance applied in United States for testing risk tolerance of family business owners and obtained that “*family business owners are more willing to take financial risks and have a larger share of financial assets in risky assets compared to people who do not own a family business*”.

**H7: Current crisis reduced investors’ risk tolerance:** The financial crisis significantly reduced risk tolerance of individuals that withdrew their capital from stock exchanges or changed the structure of their portfolio (preferring less risky assets like bonds or money market instruments with lower maturity). In fact, shifts in risk aversion are considered to increase the crisis, spreading it ever wider till it assumes global proportions – crisis contagion effect: Coudert & Gex 2007 used multilogit models applied on panel data from 20 different foreign exchange and capital emerging markets and obtained “*that risk aversion indicators remain high during the months following the crisis*”; Duwel *et al.*, 2011 analysed

the long-term credits granted by the largest 69 German banks to the private operators from 66 different countries and obtained that “*a stronger reduction in loan supply abroad than at home, particularly during the financial crisis*”, this shift being explained by an increased risk aversion due to crisis.

The synthesis of the expected impact of different factors on the level of risk tolerance (the inverse of absolute risk aversion) is presented in *Table 1*.

Table 1. Estimated impact of different factors on the level of investors' risk tolerance

Research Hypothesis	Estimated impact on risk tolerance	Shifts determined by financial crisis [H7]
[H1] Wealth of investors	+	↓
[H2] Age	+/-	↓ / ↑
[H3] Education	+/-	↓ / ↑
[H4] Gender	+/-	↓ / ↑
[H5] Social status	+	↓
[H6] Job status	+	↓

Source: own calculations

### The research methodology and sample description

To test these hypotheses we used a survey on risk tolerance initially developed by Grable and Lytton 1999, containing 13 closed questions with a single choice asking about attitudinal and behavioural aspects in terms of different investment decisions. The survey was completed by 6 questions about factors included in the study (wealth, age, education, gender, social and job status). The survey was applied on-line on Romanian respondents in two different periods: in 2007 (considered to be the period before crisis; in that year, the Romanian economy registered its highest economic growth rate after adopting market economy principles) and in 2012 (considered to be the crisis period; according to the latest data, Romania again entered a recession period at the beginning of 2012). This survey was promoted among students, clients of different brokers and financial institutions, employees and entrepreneurs (in order to cover, as well as possible, the targeted group). According to Grable and Lytton methodology, each answer for each question has associated with it a number of points and, using a scoring table, it was possible to calculate an aggregate score for risk tolerance (a higher score meaning a higher tolerance or a lower risk aversion to invest money on capital market). The maximum score that could be obtained (indicating the higher risk tolerance) was 47 points and minimum was 13 points, so we divided this interval into three risk tolerance intervals: [1] high tolerance corresponding to a score between 37 and 47; [2] medium tolerance with a score between 27 and 37 and [3] low tolerance (high risk aversion) with a score between 13 and 27.

The total number of respondents to this survey about risk tolerance was **1071 respondents (615 respondents in 2007 and 456 respondents in 2012)**. The structure of the sample is presented in the Appendix 1. According with Romanian Stock Exchange data (<http://www.bvb.ro>), the total number of individual accounts open by Romanian investors in 2007 was 11.906 and in 2008 the number was only 10.200 accounts. According with data provided by Investors Compensation Fund (<http://www.fond-fci.ro/>) the total number of individual investors on Romanian Capital market was estimated in 2007 to 87.664 individual investors (the only available data is for 2007). Taking into account the last information and the sample size for 2007 and 2012, our study has the following total margin of error: 3.94% in

2007 (615 respondents) and 4.58% in 2012 (456 respondents). Due to unavailable data about the structure of individual investors on Romanian Capital market, it was difficult to estimate the relevance of the study of different demographic categories (men and women, married and unmarried people, more or less educated people etc.).

For testing the influence of age on the risk tolerance, 5 intervals were proposed (in both periods the respondents are concentrated in a range of age less than 45 years and this corresponds with the investor's profile on Romanian capital market; see *Table 2* from *Appendix 1*). The influence of educational level supposes a classification of respondents on 5 levels (college, faculty, masters, doctoral and post-doctoral stages) in accordance with educational system of Romania (see *Table 3* from *Appendix 1*). The major part of the respondents indicated that they have graduated / faculty and masters level. For the social status, we selected 4 different categories: single (not married), divorced (corresponding also to single status), married without children and married with children (see *Table 4* from *Appendix 1*). The influence of income level (wealth) was measured by using net income of respondents divided into 5 categories: less than 150 Euro; between 150 and 350 Euro, between 350 and 650 Euro, between 650 and 850 Euro and more than 850 Euro. We established these values in accordance with the statistics regarding the average net income in Romania in both periods. The major part of respondents indicated a net income in the range between 150 and 850 Euro (see *Table 5* from *Appendix 1*). For job status, the respondents were structured into 7 categories: students, unemployed persons, retired, employed in public sector, employed in private sector, entrepreneurs and liberal professions (similar to entrepreneurs). The major part of respondents came from private sector, public sector and students (see *Table 6* from *Appendix 1*).

## Results

The analysis performed on the total sample indicates a medium to low tolerance to investment risk (meaning a risk aversion higher than average). The current crisis affected the risk tolerance of Romanian investors by reducing it by 7.11% (see *Table 2*).

Table 2. Risk tolerance before and during crisis (all respondents)

General situation	Before crisis (2007)	During crisis (2012)	Change	All
All respondents	28.67	26.63	<b>-7.11%</b>	27.80

*Source:* own calculations

Therefore, our study confirms the hypothesis regarding the direct impact of the financial crisis on risk tolerance (H6) and, consequently, explains the evolution of Romanian Stock Exchange and the shifts in portfolio choice in the last period (investors significantly reduced their investment position and restructured their portfolios, preferring less risky assets; official data indicates that in 2007 the total volume of transaction was 4.2 billion Euro, in 2008 1.9 billion Euro, in 2009 1.2 billion Euro and in 2010 1.3 billion Euro).

The major studies mentioned in the literature review on risk aversion consider the wealth factor to be the most important explanatory variable for risk tolerance (the utility function approach of the risk aversion was based mainly on wealth or income level of investors, wealthier investors assuming different risks than less wealthy ones). Our study indicates a lower risk tolerance for lower net incomes and a higher risk tolerance for higher net incomes (see *Table 3*). The results are confirmed in both periods (before and during crisis risk tolerance increases with income level). However, there is an exception during crisis where respondents with an income less than 150 Euro indicate a risk tolerance higher than the

respondents with incomes higher than 150 Euro. The possible explanation of results may consist in the fact that are students or (to a faculty or masters level) with low income but with high willingness to assume the risks (for this category risk tolerance increased during crisis). Therefore we consider that the hypothesis regarding the positive relationship between risk tolerance and wealth (H1) is confirmed for both periods.

Table 3. Risk aversion of different wealth categories

Net Income (wealth)	Before crisis (2007)	During crisis (2012)	Change
Less than 150 Euro	26.70	26.71	<b>0.05%</b>
Between 150 and 350 Euro	27.04	25.78	<b>-4.68%</b>
Between 350 and 650 Euro	28.65	26.33	<b>-8.10%</b>
Between 650 and 850 Euro	29.17	26.59	<b>-8.85%</b>
More than 850 Euro	31.17	27.48	<b>-11.84%</b>

*Source:* own calculations

The most important negative shift for risk tolerance due to the crisis effect is registered in case of respondents with highest net incomes. This is explained by the fact that higher incomes mean more implication on capital market and more exposure to risk. Therefore their reaction to crisis is normal.

According with previous studies, risk tolerance is increasing with age (the main explanation consisting in accumulated experience about investments, financial instruments, financial markets). This study confirmed a negative correlation between risk tolerance and age (more aged people being more risk tolerant and less risk adverse; see *Table 4*).

Table 4. Risk aversion structured by age

Age	Before crisis (2007)	During crisis (2012)	Change
Under 30 years	28.38	26.85	-5.40%
31 - 44 years	29.38	26.73	-9.02%
45 - 54 years	28.85	25.55	-11.45%
55 - 64 years	26.85	25.52	-4.93%
Over 64 years	n.a.	23.33	n.a.

*Source:* own calculations

The economic crisis especially affected aged people; risk tolerance significantly decreased in all cases due to the uncertainty induced by this financial turmoil.

The next explanatory factor for risk tolerance was educational level. Our study reveals that, in almost all cases, risk tolerance is higher in case of more educated people (however, there is an exception for respondents that declared graduate to doctoral stage educational status; in both cases, they proved to have a lower risk tolerance). Therefore, we appreciate that the study confirmed that risk tolerance is positively affected by education: more educated people having a higher risk tolerance and lower risk aversion. An interesting result is in the case of PhD graduates that indicated a lower risk tolerance than master graduates for both periods (see *Table 5*). Therefore we can conclude that higher education increase risk aversion. Because the post-doctoral graduates reported a higher risk tolerance during crisis this indicates that the results are inconclusive and requires a more depth additional studies on the investment

behaviour of highly educated investors to study this inconsistency. So, the results are partially confirming the research hypothesis that more educated people are less risk averse.

Table 5. Risk aversion structured by educational level

Education	Before crisis (2007)	During crisis (2012)	Change
College	27.81	26.31	<b>-5.40%</b>
Faculty	28.35	26.18	<b>-7.65%</b>
Masters	29.38	27.10	<b>-7.77%</b>
Doctoral	28.80	25.90	<b>-10.06%</b>
Post-doctoral	n.a.	28.57	<b>n.a.</b>

*Source:* own calculations

The crisis produced negative shifts (meaning lower risk tolerance) for all studied categories of potential investors. The highest decrease is registered in case of more educated respondents (due to their better perception and knowledge about the crisis).

Another important factor in the theory of risk aversion is gender. In this case the previous studies found that women are more risk averse than men. This study confirmed this hypothesis in both periods (before crisis and during crisis).

Table 6. Risk aversion structured by gender

Gender	Before crisis (2007)	During crisis (2012)	Change
Women	27.86	26.03	-6.58%
Men	29.97	27.48	-8.32%

*Source:* own calculations

The crisis affected both categories of investors, reducing their tolerance to risk. Men registered a higher decrease than women (they become more risk averse in times of crises).

Social status reflects the specific responsibilities assumed by an individual toward other individuals (family, children). A person involved in a family is reluctant to assume high risks. The results provided by this study are partially consistent for the relationship between social status and risk aversion only in crisis time: married persons (with or without children) have a lower tolerance than single or divorced people. Before crisis, married respondents indicated to have a higher risk tolerance than single or divorced people and during crisis there is an opposite situation. Based on observed results, we can conclude only that crisis produced a shift in the risk aversion of people with family (with or without children).

Table 7. Risk aversion structured by social status

Social status	Before crisis (2007)	During crisis (2012)	Change
Not married	28.34	26.57	<b>-6.24%</b>
Married without children	29.50	25.70	<b>-12.90%</b>
Married with children	28.92	26.98	<b>-6.71%</b>
Divorced	28.52	27.36	<b>-4.06%</b>

The current crisis significantly reduced the risk tolerance of all categories of investors. Risk tolerance significantly decreased in case of “married without children” respondents.

The last factor tested in the study was job status. Usually, the willingness to assume investment risks is higher for people that are involved in risky activities: entrepreneurs and liberal professionals (lawyers, notaries) are submitted to have the highest risk tolerance being involved in activities that suppose this fact. Employed people (that are not determined enough to assume the uncertainty of an entrepreneurial act) are assumed to have a lower risk tolerance than entrepreneurs (with the differences between people working for public sector and private sector). Unemployed people, retired and students should prove to possess the highest risk aversion, due to their uncertain status. The study confirmed the existence of a positive correlation between job status and risk tolerance (see *Table 8*). As expected, the highest risk tolerance is registered in case of entrepreneurs and employees in private sector (however, the results are inconclusive in the case of unemployed persons – due to the reduced number of respondents for this category, we consider that this result could be ignored and studied separately in a different study focused solely on them).

Table 8. Risk aversion structured by job status

Job status	Before crisis (2007)	During crisis (2012)	Change
Student	27.80	26.72	<b>-3.87%</b>
Unemployed	29.00	29.33	<b>1.15%</b>
Retired	27.00	22.33	<b>-17.28%</b>
Employee in public sector	27.65	25.93	<b>-6.24%</b>
Employee in private sector	28.83	26.40	<b>-8.44%</b>
Entrepreneur	30.92	29.35	<b>-5.06%</b>
Liberal profession (lawyer)	29.68	26.91	<b>-9.31%</b>

The crisis affected all the categories in the same way – the tolerance to risk decreased (with only one exception – unemployed respondents). The most significant negative shift is registered in case of retired persons (crisis significantly increased their risk aversion and aged people are reacting very strong to changes in the market conditions) and liberal professionals.

## Final conclusions

Risk aversion is a very important factor in the investment process. The shifts in terms of risk aversion affect the volume of transactions on capital markets and the structure of investment portfolios from one period to another. Risk aversion influences everyone's cash balance. The economic theory revealed that the wealth of investors is not the only factor that is important in explaining these shifts in terms of risk aversion. Besides investors' wealth, there are several factors that should be reconsidered in this respect: education, age, gender, social status, job status. This study based on a specific survey tested the risk tolerance of potential investors from Romanian market before crisis (2007) and during crisis (2012) and confirmed the following hypothesis:

- Risk tolerance is increasing with income level of investors. When the income level is higher, investors are interested in keeping a higher cash balance on their own and to invest in a secured portfolio;
- Risk tolerance is decreasing with age. Aged individuals become more risk averse and more sensitive to crisis;
- Risk tolerance is increasing with education level. However, more educated persons become more risk averse and more sensitive to crisis;
- Women are more risk averse than men and more sensitive to financial turmoil;

- There is a positive connection between job status and tolerance to risky situations.
- The crisis affected almost all categories analysed in this study and produced a decrease in the level of risk tolerance.

However, the study provided inconclusive results for specific categories: unemployed persons, aged people or social status. These inconclusive results should be studied in separate and more focused research. Other research directions will be developed in the idea of testing the relationship between risk tolerance and included factors (wealth, age, education etc.) by using non-parametric tests that could provide a better insight to the explanation of risk tolerance associated to Romanian investors' behaviour before crisis and during crisis.

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