5 ABSOLUTE RISK AVERSION ON THE ROMANIAN CAPITAL MARKET

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Abstract

Stock prices move as corporate earnings prospects change, but they also move as investors change their aversion to risk. One of the central tenets of finance is that investors expect higher return for taking risk. They exchange some of their riskless securities for risky assets because they expect the total payoff in the long run to be optimal in terms of the risk-return trade-off. The previous studies proved that expected return is linearly related to risk and if we further assume investors are risk averse, the alluded relation will have to be positive. Aversion to risk is reflected on a risk premium, which consists of an expected extra return that investors require to be compensated for the risk of holding stocks. In this paper, we tried to assess the risk aversion on the Romanian capital market by using the optimal portfolio selection method.

Keywords: equity funds, optimal portfolio selection, risk aversion, utility.

JEL Classification: G12

1. Introduction

The whole financial theory is based on the fundamental hypothesis of rational agents investing in the financial markets. This rationality is characterized by a continuous pursuit of the investors to maximize their utility function (actually maximizing the return of the investment for a given risk level or minimizing the risk for an expected return level). In spite their rationality the investors have a different perception over risk, its bearing having an important psychological dimension. Most investors show a motivated risk aversion, but we can find on the financial markets, even if only in theory, investors indifferent to or with preference for risk.

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The first trial of conceptualizing the investors' risk aversion belongs to Milton Friedman and Leonard Savage (Milton Friedman, Leonard Savage, *Utility Analysis of Choices Involving Risk*, JPE, 1948), who defined the risk aversion by using the following decisional situation: an investor who can chose among comparable investments will always chose the one with the lowest risk. Explaining the investment behaviour using the returns of risky financial investments' utility function brought a new perspective to the risk aversion theory. Studies show that investors behave differently regarding the risks they have to take, the risk aversion dominating these behaviours. In Friedman's and Savage's opinion the main factor that changes, in time, the investor's attitude towards risk is the size of their wealth. Further studies showed that there are also other factors with direct impact over the attitude towards risk (economic growth forecasts of a market, the level of training and the experience gained, fluctuations of the exchange market, psychological factors, etc.). Accepting the three main investment behaviours (aversion, neutrality and preference), the specialists' attention was directed towards measuring the investors' degree of risk aversion – the first step in setting the risk premium (the price an aversive investor is willing to accept in exchange of the risks he has to take), expressed in wealth terms. The first notable efforts in understanding the factors that influence the degree of risk aversion were made by John W. Pratt and Kenneth J. Arrow (*Aspects of the Theory of Risk-Bearing*, 1965). Their observation begun with the fact that an investor with high risk aversion is less willing to take those risks, that is, for him the price of bearing it (the risk premium) is much larger. In their approach, the main factor of risk aversion is the wealth of the investors (the capital going to be risked and, moreover, the return they are expecting). The utility function concavity can thus be a relevant measure of the investors' degree of risk aversion.

Further studies tried to assess what happens when only risky titles and none risk free are on the market. A first hypothesis derived form the Arrow-Pratt model was that if an investor A is more risk aversive than B and α is the share of the investment in the more risky title, and $(1- \alpha)$ is the share of the investment in the less risky title, then $\alpha A \leq \alpha B$.

The investors' behaviour on the financial markets is influenced by the way they perceive and accept the inherent risks they encounter. Investors take the risks if there is a compensation to justify it. The risk aversion theory showed that always acceptance of the risky investment alternative over a risk free investment (or a less risky one) will be made only if there is a supplementary return – the risk premium. Analyzing the investors' attitude towards risk it was noticed that most of them were risk averse and that they valued more the potential loss than the potential return. In order to better understand the importance of this risk premium, we shall begin with a concrete example. Studies performed on different capital markets showed that the investor is not directly interested in the expected value of the final return, but in its utility. For a risk aversive investor is more important if in the end he will lose, considering the capital he had initially, while for an investor with preference for risk is more important how much it will win in the end, the risk premium being set accordingly. The empirical studies performed afterwards demonstrated that the risk premium can be broken into two main components: an objective one, given by the amount of risk involved by a risky investment alternative (measured by the return's

variance, Xi, with the probability pi) and a subjective one, determined by the shape of the utility function U´/U´´ which is characteristic to each individual, considering its risk aversion. Other studies supplemented this idea, showing that the objective dimension is a lot easier to determine on the basis of the probable earnings volatility, buy the individual investors' subjective volatility is directly influenced by a series of psychological or socio-demographic factors (earnings, age, sex, race or religion).

In this respect, the fact that the risk premium depends directly on the risky investment alternative risk (measured by the variance), inversely on the amount invested initially and directly on the investors' absolute risk aversion degree (measured by the Arrow-Pratt index) was concluded. In this case, it is obvious that two investors can have different risk premiums when they decide to invest the same initial capital in the same financial titles, because their different degree of risk aversion. The increase by one unit in the initial wealth for the investors with risk preference calls forth an acceleration of the utility augmentation (the second grade derivative of the utility function is strictly positive), a decrease in the absolute risk aversion and, implicitly, a reduction in the risk premium.

2. Methods for measuring the investors' risk aversion

Decisions are not solely influenced by people's objective risk exposures, which for investors could simply be determined as the variance of their risky assets returns from the risk free returns, given a certain probability. The fact that these objective events earn distinct utilities in people's minds is mainly due also to their psychological characteristics: their risk aversion ('RA'), or its inverse, risk tolerance ('RT'). However, measuring risk aversion is not a simple task because of the impossibility of finding a universal utility function. Any subsequent calculation would seem trivial: compute the first, second or third derivatives to determine the coefficients of risk aversion, the prudence coefficients or the risk premium, etc. This is why more indirect ways of inferring the degree of risk aversion have been searched. There are at least four methods used for measuring the risk tolerance: asking about investment choices, asking a combination of investment and subjective questions, assessing actual behaviour, and asking hypothetical questions with carefully specified scenarios.

The first method is based on a specialized questionnaire addressed to potential investors, testing their willingness to take risks in their investments. A good example of this method is the questionnaire applied by the Federal Reserve Board's Surveys of Consumer Finances (SCF). Sung and Hanna analyzed a subset of the 1992 SCF households, with employed respondents aged 16-70 and they found that only 4% of the sample were willing to take substantial risks on investments in order to make a substantial return, and 40% were not willing to take any financial risks. Empirical studies based on the SCF proved that risk tolerance increased with education and income, and female headed households had lower risk tolerance than otherwise similar married couple and male headed households.

The second method is based on the theory developed by Arrow and Pratt. There are two different approaches based on the Arrow-Pratt theory. Risk aversion could be measured taking into consideration the first and second derivation. In this particular

case, we deal with an absolute risk aversion (Aabsolute = - [U''(W) / U'(W)]) and a relative risk aversion (Arelative = - [W x U''(W) / U'(W)]). Other models (derived from this one) take into consideration the risk compensation assumed by investing in risky financial assets. In non-finance applications of the theory of choice under uncertainty, this variable is almost always referred to as the risk premium. In other finance applications, however, the term risk premium refers to the expected return on a security less the risk-free return. Kimball also defined a coefficient of absolute prudence for a better characterization of the investment behaviour under risk and uncertainty (Pabsolute = - [U'''(W) / U''(W)]). This method is quite difficult because it supposes a good identification of the utility function type that is relevant for a group of investors (or for a market). The empirical studies proved that the most appropriate function that describes the investment behaviour is the function with the following characteristics: strictly increasing function, strictly concave, with A'(w)<0 ant not too large relative risk aversion (0<R(w)<4). This particular utility function is called the HARA function (hyperbolic absolute risk aversion or linear risk tolerance utility function class). Testing the relationship between risk tolerance and income based on a questionnaire we can determine the value of b and the shape of the utility function. Using the first and the second derivative of this function we have the possibility to determine the risk aversion for a specific group of investors (for a country) and we can make comparative analysis. A method derived from the Arrow-Pratt theory of risk aversion measurement is based on the optimal portfolio choice. This method supposes an assessment of the investors' preference for risky assets on a market, the risk aversion being determined from a relationship between this indicator, the risk of the risky assets (measured by standard deviation) and expected return (measured as an average or based on CAPM equation).

The third category of models used for risk aversion assessment supposes the use of hypothetical scenarios constructed on the basis of economic models. The scenario takes into consideration a hypothetical investment with a 50% probability to double the initial wealth and with 50% probability to reduce the initial wealth to 1/2. If we denote by n the number of investors willing to take de risk than we obtain that: $\lambda = (2 - 2(1-A))[1/(1-A)]$, where A is the measure of relative risk aversion (taking into consideration that the utility function for such an investment plan is 50% x U(2C) + 50% x U(λ C) ≥ U(C)). By asking questions with different levels of λ, we have the possibility to determine exactly the level of the relative risk aversion. For instance, if one is indifferent between the current job and the new risky job with a 50-50 chance of either doubling income or a one-third cut, then $1-\lambda = 0.3333$ and the relative risk aversion must equal 2.0.

The fourth group of models is a mixture of the methods presented above. In this particular case, the model is based on a questionnaire that implies a combination between investment and subjective questions. For instance, Grable and Lytton created a questionnaire containing a lot of questions about portfolio choice in different situations combined with questions that are measuring the risk tolerance.

3. Empirical evidences on the Romanian capital market

For the estimation of the risk aversion on the Romanian capital market we proposed a different methodology, based on the optimal portfolio selection. Using the optimal allocation hypothesis we can approximate the following relationship:

$$\alpha \approx \frac{E(\bar{z})}{\sigma_z^2 A_u(w)}$$

where α is the demand for risky assets on a market, E(z) is the expected excess risky return (difference between the risky portfolios' return and the risk free rate) for a market, σ_z is the variance of the risky excess return and A(w) is the absolute risk aversion.

Thus, if we want to determine the risk aversion on the Romanian capital market we should calculate the demand for risky assets on a market, the expected return for an index, variance of the index's return and we have the possibility to assess the absolute risk aversion for a market. For the estimation of α, we used the structure of the investment funds on the Romanian capital market. We included in our research all the equity funds and we determined their share in the total investment funds. The following tables (Tables 1 to 4) show the evolution of the net assets for the Romanian equity investment funds (including the whole market, too).

Table 1

Evolution of net assets for investment funds and equity funds (2004)

Value of total assets	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04
Total equity funds	82832	88956	103317	113847	118830	115586
Total investment funds	1391058	1527674	1858841	2157409	2279866	2480221
Value of total assets	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04
Total equity funds	134239	108017	156103	184784	215403	244184
Total investment funds	3434144	3829805	4338944	4095792	4463167	4643927

Table 2

Evolution of net assets for investment funds and equity funds (2005)

Value of total assets	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05
Total equity funds	337955	433620	348663	309533	309119	337742
Total investment funds	4841520	5120133	5113832	5011821	3294062	3316784
Value of total assets	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05
Total equity funds	385940	421261	389628	497082	551013	460941
Total investment funds	3317760	3405580	3768790	3876820	4112910	4368910

Table 3

Evolution of net assets for investment funds and equity funds (2006)

Value of total assets	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06
Total equity funds	106080.3	102751.4	95140	96682	91567	68552
Total investment funds	475466	504911	575528	591509	651079	472146
Value of total assets	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06
Total equity funds	86061	163828	189334	215498	226191	235701
Total investment funds	493590	510954	533060	557967	595604	668834

Table 4

Evolution of net assets for investment funds and equity funds (2007)

Value of total assets	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06
Total equity funds	106080.3	102751.4	95140	96682	91567	68552
Total investment funds	475466	504911	575528	591509	651079	472146

Source: Uniunea Nationala a Organismelor de Plasament Colectiv din România.

On the basis of this data, we determined the value of the alpha variable that indicates the measure of the preferences of Romanian individual investors for risky assets (equities). This preference is very important for the risk aversion, reflecting the willingness to include risk in the investment decision. The values of the alpha variable are presented in Table 5. As one may see, the value of this variable increased (Figure 1), providing the information that more and more investors were interested in riskier instruments such as equities.

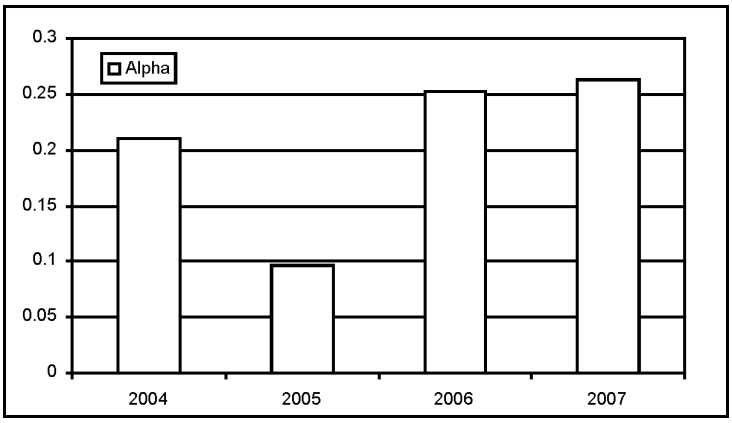
Table 5

Evolution of the alpha variable for the Romanian capital market (2004 – 2007)

Alpha	2004	2005	2006	2007
Jan	0.325291	0.069803	0.223108	0.287019
Feb	0.302282	0.084689	0.203504	0.305112
Mar	0.259161	0.06818	0.16531	0.102399
Apr	0.228235	0.061761	0.16345	0.311744
May	0.228235	0.061761	0.16345	0.311744
Jun	0.219848	0.101828	0.145194	0.256988
Jul	0.16687	0.116325	0.174357	na
Aug	0.158358	0.123697	0.320632	na
Sep	0.14106	0.103383	0.355183	na
Oct	0.174422	0.128219	0.38622	na
Nov	0.166128	0.133972	0.379768	na
Dec	0.158761	0.105505	0.352405	na
Mean	0.210721	0.096594	0.252715	0.262501

Figure 1

Annual average value of the alpha variable



The next step was to determine an expected monthly return for a risky portfolio. We included in our analysis monthly data from January 2003 to June 2007 about the evolution of the net assets for the investment funds on the Romanian capital market, the share of capital allocation on listed equities and the return for these investment funds. We generated a risky portfolio composed by each equity fund. The structure of the risky portfolio was determined by taking into consideration the value of the net assets invested in equities by each investment fund. The return for such a portfolio was calculated as a weighted average of the returns for each equity investment fund. Table 6 shows the evolution of return for a risky portfolio composed by all equity funds on the Romanian capital market.

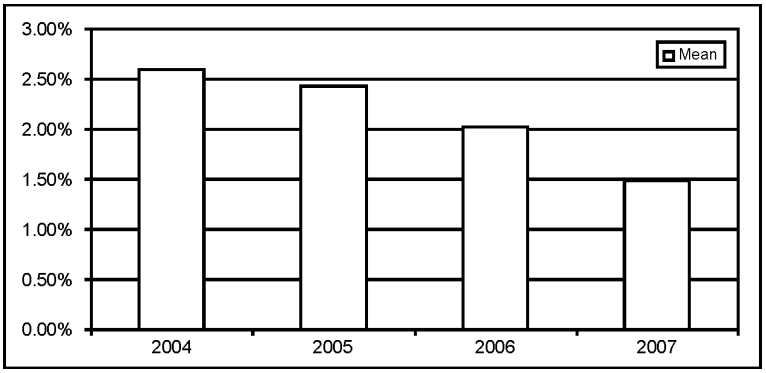
Table 6

Evolution of the risky portfolio return (2004 – 2007)

Risky return	2004	2005	2006	2007
Jan.	4.65%	13.17%	6.90%	9.34%
Feb	2.49%	9.55%	-1.83%	1.06%
Mar	0.54%	-11.04%	-2.60%	-7.39%
Apr	1.55%	-2.36%	0.45%	5.22%
May	3.44%	-1.39%	-3.38%	-1.25%
Jun	4.04%	0.30%	-3.82%	10.85%
Jul	3.24%	5.57%	11.34%	0.00%
Aug	0.10%	1.06%	3.55%	0.00%
Sep	1.32%	5.36%	4.48%	0.00%
Oct	5.05%	4.91%	6.38%	0.00%
Nov	1.50%	3.44%	0.97%	0.00%
Dec	3.20%	0.54%	1.85%	0.00%
Mean	2.59%	2.43%	2.03%	1.49%

Figure 2

Annual mean of the risky portfolio return (2004 – 2007)



The average monthly risky return decreased over the period 2004–2007, reflecting a higher maturity of the Romanian capital market. For the expected excess risky return we used a monthly risk free rate calculated on the basis of the interest rate for treasury certificates.

Table 7

Evolution of the risk free rate for the Romanian capital market (2004 – 2007)

Indicator	2003	2004	2005	2006	2007
Risk free rate estimation	16.23%	15.65%	8.64%	6.54%	6.80%

On the basis of the monthly risk free rate, we calculated the market excess risky return as a difference between the risky market portfolio (based only on the equity funds) and the risk free rate. We computed also a cumulative expected risky excess return and a standard deviation on these values, taking into consideration all past data (see Table 8).

Table 8

Cumulative expected risky excess return and standard deviation

Expected excess return	2004	2005	2006	2007
Jan.	-0.06%	0.62%	0.98%	1.10%
Feb	0.21%	1.09%	1.12%	1.26%
Mar	0.28%	1.39%	1.03%	1.25%
Apr	0.21%	0.90%	0.93%	1.07%
May	0.21%	0.76%	0.90%	1.13%
Jun	0.32%	0.66%	0.78%	1.08%
Jul	0.46%	0.62%	0.66%	na
Aug	0.53%	0.76%	0.90%	na
Sep	0.45%	0.75%	0.94%	na
Oct	0.43%	0.86%	1.01%	na
Nov	0.58%	0.96%	1.11%	na
Dec	0.56%	1.01%	1.10%	na

Expected excess return	2004	2005	2006	2007
Standard dev.	2004	2005	2006	2007
Jan.	0.000127	0.000231	0.0038231	0.002192
Feb	0.000205	0.000781	0.0029425	0.002454
Mar	0.000196	0.00098	0.0024345	0.002312
Apr	0.00019	0.003351	0.0011697	0.002947
May	0.000177	0.003535	0.0010233	0.002996
Jun	0.000188	0.003636	0.0011608	0.002809
Jul	0.000209	0.003627	0.0013979	na
Aug	0.000209	0.003754	0.0021355	na
Sep	0.000213	0.003709	0.0021506	na
Oct	0.000203	0.003783	0.0021141	na
Nov	0.000244	0.003802	0.00222	na
Dec	0.000233	0.003788	0.0022148	na

Using the formula of risk aversion (Kihlstrom, 1981, Pratt and Zeckhauser, 1987, Kimball, 1993, Gollier and Pratt, 1996), we calculated an annual value of this indicator for the Romanian investors (see Table 9).

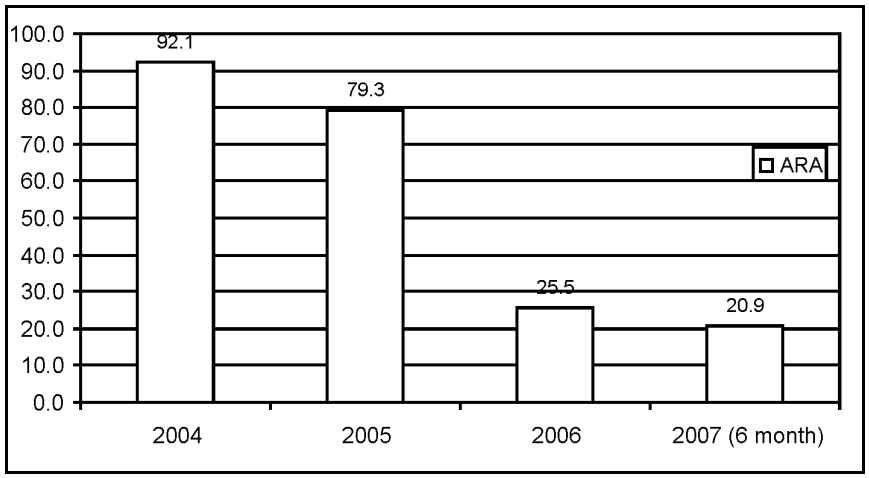
Table 9

Absolute risk aversion of the Romanian investors (2004–2007)

Year	ARA
2004	92.1
2005	79.3
2006	25.5
2007 (6 months)	20.9

Figure 3

Absolute risk aversion (Pratt) for the Romanian capital market



As one may see from this empirical study, the absolute risk aversion could be measured by using the preferences of investors for risky assets (equity funds in our case). This measure is an alternative for different models based on questionnaires applied at the level of individual investors or managers of the investment funds or portfolios.

The indicator ARA calculated for the Romanian capital market indicates a decreasing risk aversion. This evolution could be explained by a higher efficiency of this market (especially at institutional and regulatory level), a higher experience of the Romanian investors and increasing investment opportunities, an increase in the income level that generated a higher interest for risky assets and a different attitude towards risks.

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