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LOSS AVERSION AND AN EQUITY RISK PREMIUM IN EMERGING MARKETS

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ABSTRACT

In the paper it was provided an explanation to the equity risk premium in emerging and developed markets. The research is based on the Capital asset pricing model under Prospect theory. The gains and losses were present in terms of stock market returns. The model presents the relationship between the loss aversion degree and the equilibrium market price of risk. We applied the model in an empirical data of developed and emerging markets. It was found that the emerging markets have higher loss aversion in the research period. This fact was the reason of the higher equity risk premium in these markets.

Keywords: mean-variance asset pricing, Prospect theory; loss aversion; equity risk premium.

РЕЗЮМЕ

У роботі запропоновано пояснення премії за ризик на розвинутих ринках та ринках, що розвиваються. Дослідження базувалося на принципах моделі оцінки капітальних активів під впливом теорії перспектив. Вигоди та втрати теорії перспектив були представлені як дохідності на фондовому ринку. У моделі досліджено зв'язок між рівнем страху втрат та премією за ризик. Автором було застосовано модель щодо даних премії за ризик на ринках, що розвиваються та розвинених ринках. Було виявлено, що інвестори на ринках, що розвиваються, мають вищий рівень страху втрат, що зумовлює вищу премію за ризик на цих ринках.

Ключові слова: моделі ціноутворення дохідності-ризику, теорія перспектив, страх втрат, премія за ризик.

РЕЗЮМЕ

В работе предложено объяснение премии за риск на развитых рынках и рынках развивающихся стран. Исследование базировалось на принципах модели оценки капитальных активов под влиянием теории перспектив. Выгоды и потери теории перспектив были представлены как доходности на фондовом рынке. В модели исследована связь между уровнем страха потерь и премией за риск. Автором была применена модель по данным премии за риск на развивающихся рынках и развитых рынках. Было обнаружено, что инвесторы на развивающихся рынках, имеют более высокий уровень страха потери, что приводит высшую премию за риск на этих рынках.

Ключевые слова: модели ценообразования доходности-риска, теория перспектив, страх потери, премия за риск.

INTRODUCTION

Mean-variance approach to asset pricing is one of the most robust on the financial theory. Despite theoretical discussions, it is still widely used by academics and practitioners in the developed and emerging markets. The model is usually criticized because of the assumptions of a normal return distribution and the investor's expected utility function maximization. It was find empirically that the return distributions are more peaked and have heavier tails than the normal distribution has [12]. The investors' behavior is better describe with Prospect theory but not expected utility theory [14].

The Prospect theory gives several challenges for mean-variance approach. First of all, investors maximize a value function, which is defined on change on wealth rather than on total wealth. Second, the S-shaped value function has a risk-seeking segment, which is steeper than the risk aversion segment, implying loss aversion. Loss aversion is define as an increased sensitivity to losses relative to gains. This means that people fill more regret losing the sum than enjoy winning the same sum. Third, people employ cumulative decision weights and transformed distribution [14].

Recently Professor H. Levy (2012) has proved that the economic loss of applying the mean-variance rule when normality is reject is negligible. Moreover, when diversification is allowed mean-variance analyze is consistent with Prospect theory. H. Levy has made the supposition that the equilibrium price of risk may be different in different countries and times because of the value function parameters, such as loss aversion and risk attitude [16]. To test this supposition we will study the equity risk premium in emerging and developed markets in different times with Capital asset pricing model under Prospect theory. It is assume that the loss aversion in the emerging markets is higher than in developed markets, so the equity premium should also be higher.

LITERATURE REVIEW

The equity premium puzzle is widely discussed in the financial literature. Mehra (2003) realized that the historical equity premium in the U.S. was much larger than could be explained as a risk premium on the basis of

standard theory [17]. Fase (1997), Dimson, Marsh and Staunton (2003) proved the robustness of the puzzle to other developed countries [10, 13]. Bernartzi and Thaler (1995) claim that higher equity risk premium is a necessary condition to induce agents to invest into the stock markets [4].

In the emerging markets equity risk premium is even higher than in developed markets. Barry, Peavy and Rodriguez (1997) have shown that investing in emerging markets the one gets higher return on the same variance [3]. These papers give the explanation that investors are compensated for bearing the country risks in terms of higher average returns and a low correlation with developed markets.

To explain the equity risk premium researchers were concentrated on modifications of the neoclassical models with alternative assumptions about preferences, market imperfections and probability distribution (Kocherlakota (1996), Cochrane (1999), Mehra (2003) [9, 15, 17].

Currently the financial scientist focused on adaptation the prospect theory into the asset pricing models. Barberis (2001) investigated the trade volume on the stock market under prospect theory assumption [2]. Berkelaar (2004) analized the investment periods for the investors with different loss aversion level [5]. Benartzi and Thaler (1995) proved that investors with value function review their portfolio annually. These cause underinvesting in stocks despite its high equity premium [4].

The implications of Prospect theory to portfolio theory are developed by H. Levy (2012). The scientist proved that under assumption of normal return distribution the mean-variance approach was still robust for investors with prospect theory preferences. H. Levy constructed the theoretical model relationship between the degree of loss aversion, the concavity/convexity of the value function, and the equilibrium market price of risk. It was realized that loss aversion level explains the equity risk premium in developed markets [16].

In this paper we provide the extension of the researches to realize the influence of the loss aversion level to the equity premium in the emerging markets.

VALUE FUNCTION PARAMETERS AND THE MARKET PRICE OF RISK

Prospect theory applies that investor under uncertainty maximize the expected value function, which has form:

$$V(X) = \begin{cases} x^{\alpha}, if\, x \geq 0, \\ -\lambda(-x)^{\beta}, if\ x < 0 \end{cases}, \quad (1)$$

where x – change in wealth relative to the reference point, λ - loss aversion coefficient, α i β - concavity/convexity parameters.

D. Kahneman and A. Tverski (1992) experimentally estimated α i β parameters that were equal to 0,88 [14]. The results of other researches varies from0,37 to 0,96 because of differences in estimation methods [1, 8]. The crucial role plays the equivalence of the coefficients. H. Levy (2012) has proved that it is the necessary condition for the value function consistency. It is the only case when investor expresses the required aversion to fair symmetric bets [16].

The quantitative estimation of loss aversion also differs upon scientists because of the disagreement in loss aversion definition. In the table 1 it is presented the overview of loss aversion coefficients in different research papers. The estimated values for the loss aversion coefficient are difficult to compare because of the different assumptions and definitions used. Some studies reported median values and the others mean values. For research purposes we will use Abdellaoui, Bleichrodt, and Paraschiv (2007) results because their nonparametric measurement method doesn't need assumptions about the shape of utility or probability weighting [1].

Table 1

Estimates of the Loss Aversion Coefficient

Study	Definition	Domain	Estimates
Tversky and Kahneman (1992) [14]	-V(-1)/V(l)	Money	2.25
Bleichrodt et al. (2007) [6]	-V(-x)/V(x)	Health	1.53-2.13
Abdellaoui, Bleichrodt, and Paraschiv(2007) [1]	-V(-x)/V(x)	Money	1.72; 2.15*
	V'(-x)/V'(x)		1.53; 2.02*
	$V_{\uparrow}'(0)/V_{\downarrow}'(0)$		2.52;4.99*
Booij and van de Kuilen (2006) [7]	$V_{\uparrow}'(0)/V_{\downarrow}'(0)$	Money	1.79*

*denotes a mean value. Otherwise it is a median value.

To study the impact of loss aversion on the emerging markets let us consider the equilibrium prices model, that was adapted to the Prospect theory conditions by H. Levy (2012) [16]. The value function was formulated using the experiments with expected amount of money. But in the stock market gains and losses are expressed with returns. So, to implement the value function to the stock market it was proposed to specify the returns as changes in wealth in dollar terms.

Let W0 denote the initial wealth. Suppose there are two assets in the market: riskless with yield r and risky

(market portfolio) with excess return $\tilde{R}$. The representative point for investor is the wealth invested in riskless asset W0*(1+r). When a proportion invested in the market portfolio is z, and the proportion invested in riskless asset is (1-z), then the future wealth is given by:

$$\widetilde{W_1} = W_0(1-z)(1+r) + W_0 z\left(1+r+\tilde{R}\right) \quad (2)$$

So, the change in wealth ($\tilde{x}$) in dollar terms can be expressed with equation:

$$\tilde{x} \equiv \widetilde{W_1} - W_0(1+r) = W_0 z\tilde{R} \quad (3)$$

The change in wealth is a function of the initial wealth W_0 in the stock market in contradistinction to the classic prospect theories postulates.

The value function for the stock market with risk and riskless asset will be:

$$V = \begin{Bmatrix} (W_0 z\tilde{R})^{\alpha}, \text{if } \tilde{R} \geq 0, \\ -\lambda\left(-W_0 z\tilde{R}\right)^{\beta} \text{if } \tilde{R} < 0 \end{Bmatrix} \quad (4)$$

The expected value function with the return distribution f(R)can be rewritten as:

$$EV = \int_0^{\infty}\left(W_0 z\tilde{R}\right)^{\alpha} f(R)dR - \lambda\int_{-\infty}^{0}\left(-W_0 z\tilde{R}\right)^{\beta} f(R)dR. \quad (5)$$

The equality assumption for the parameters α = β simplify the expected value function:

$$EV = z^{\alpha}W_0{}^{\alpha}\left[\int_0^{\infty}\tilde{R}^{\alpha} f(R)dR - \lambda\int_{-\infty}^{0}\left(-\tilde{R}\right)^{\alpha} f(R)dR\right]. \quad (6)$$

When concavity parameters are equal, the initial wealth does not affect the optimal investment proportion in the risky asset. This conclusion is supported with the empirical results H. Levy (2012) [16].

To maximize the value function investor should invest all the wealth in the risky assets, if the term in the square brackets is positive. If the term is negative, the optimal investment proportion in risky asset is zero. So, the diversification principles with the Prospect theory framework differ a lot from the diversification with the classic Expected Utility postulations. A little change in the return distribution leads to the shift from the total investment in one asset to another. The only point, where the proportion of the risky investments is finite and positive is the crossover point, where the square brackets condition of equation (6) becomes zero. So this is the equilibrium price point:

$$\int_0^{\infty}\tilde{R}^{\alpha} f(R)dR - \lambda\int_{-\infty}^{0}\left(-\tilde{R}\right)^{\alpha} f(R)dR = 0 \quad (7)$$

The process of the equilibrium price formation looks as so. Let the distribution of returns stimulates to invest all the wealth in risky asset. This will lead to the price increasing and the expected returns decreasing to the crossover point, in which investors are not interested any more to shift their wealth from one asset to another. Thus, the market equilibrium is reached only in the crossover point.

If the return distribution can be determined by its mean and standard deviation (the uniform, normal, lognormal and logistic distributions) it is possible to estimate the equilibrium risk-return relation solving the (7) equation.

For the normal distribution assumption the point for equilibrium price is:

$$\frac{1}{\sqrt{2\pi\sigma^2}}\int_0^{\infty} e^{-[(\mu-R)^2/2\sigma^2}R^{\alpha}\,dR = \lambda\frac{1}{\sqrt{2\pi\sigma^2}}\int_{-\infty}^{0} e^{-[(\mu-R)^2/2\sigma^2}(-R)^{\alpha}\,dR \quad (8)$$

It is presented the equilibrium relations between the excess return and the standard deviation for the different parameters of the value function (figure 1). This relation was estimated with the uniform distribution assumption using the (7) equation. It was realized that the loss aversion λ parameter has a great impact on the equilibrium price of risk. But the equilibrium price line doesn't change much because of the change in the value function parameter α. This result is robust for the uniform, normal, lognormal and logistic distributions [16].

For each symmetric distribution the relation between the excess return and standard deviation is linear. The straight line represents the set of all possible market equilibrium. The slope of the equilibrium line determines by the parameters of the investor value function, such as λ i α. If there are any fundamental changes, the equilibrium point will change only on the same line.

EMPIRICAL ANALYSIS

To study the equilibrium relations between the excess return and the standard deviation for the developed and emerging markets it is necessary to use the same research period and research method. The complex study of the equity risk premium was presented by Donadelli and Prosperi (2012) [11]. For the research purpose we will apply their estimation data. It was used the Morgan Stanley Capital International (MSCI) Total Return Index. All returns were monthly returns denominated in US dollars. The proxy for risk-free rate was the one-month Treasury Bill rate.

The Morgan Stanley classifies the markets on developed, emerging and frontier with capitalization, liquidity and infrastructure criteria. For the developed markets we restrict our analysis to the G7 members (Canada, France, Germany, United Kingdom, United States, Japan and Italy), as the largest world's economies. The list of emerging markets includes 13 economics (China, Argentina, Egypt, Czech Republic, India, Brazil, Morocco, Poland, Indonesia, Mexico, South Africa, Russia, Ukraine). Despite the equity market data for developed markets are available from

December 1969; the equity data for all emerging countries is open only from January 2000. So, to use the same study period we will analyze the data from January 2000.

In Table 1 it is presented the estimation results of equity risk premium for developed and emerging markets (Jan 2000 – Dec 2010). The results have confirmed that the emerging markets have the higher equity and higher volatility.

Table 1

Monthly Excess Returns for Developed and Emerging Markets (Jan 2000 - Dec 2010)

Country	Observations	Mean excess return	Standard deviation
Developed markets			
Canada	132	0.83%	6.58%
France	132	0.28%	6.50%
Germany	132	0.35%	7.51%
Italy	132	0.19%	6.88%
Japan	132	-0.20%	5.21%
UK	132	0.18%	5.07%
USA	132	-0.02%	4.76%
Emerging markets			
Argentina	132	1.30%	12.29%
Brazil	132	1.83%	10.80%
China	132	0.90%	8.62%
Czech Republic	132	1.91%	8.55%
Egypt	132	1.56%	10.10%
India	132	1.38%	9.31%
Indonesia	132	1.74%	11.02%
Mexico	132	1.19%	7.41%
Morocco	132	0.85%	6.11%
Poland	132	1.05%	10.35%
Russia	132	1.66%	11.19%
South Africa	132	1.26%	8.01%
Ukraine	132	1.54%	12.84%

To find the equilibrium risk premium we use the equation (8), assuming the normal return distribution. If the loss aversion is higher for emerging countries, the slope of the regression line should be also higher. It is also interesting to realize the time differences in the loss aversion for developed markets.

In Figure 1 it is described the equilibrium relationship between the standard deviation and the expected excess return for developed and emerging stock markets in different study periods.

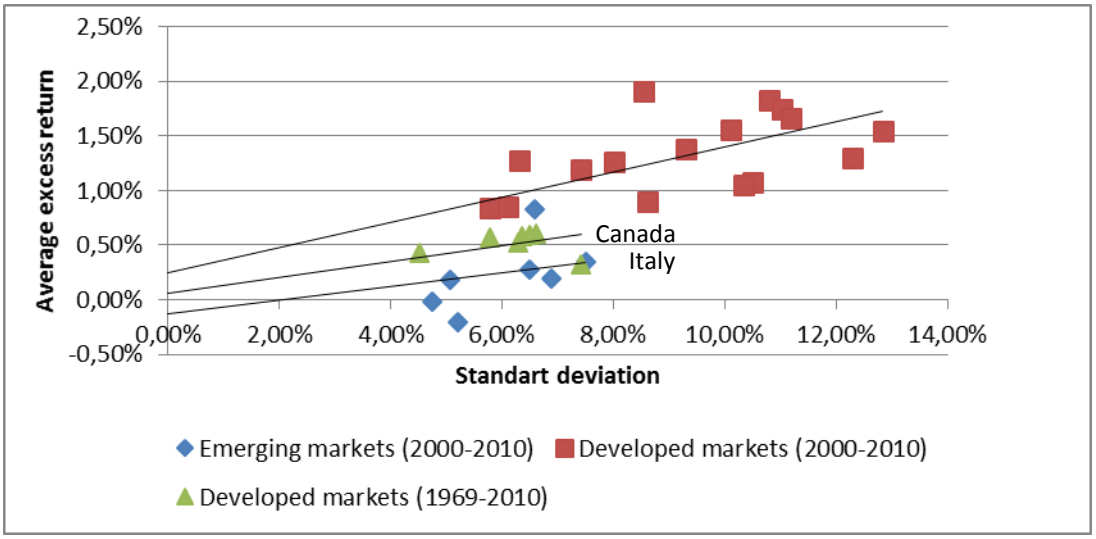

Figure 1. Regression line for the equity risk premiums in developed and emerging markets

The regression line confirm the liner relationship between the expected excess return and the standard deviation for the developed markets (Jan 2000 – Dec 2010) on the 90% significance level(R=0.2263) with slope coefficient 0.0626 (Pr.=0.0834). The interception line is equal to-0.0013 and is not significantly different from 0 (Pr.=0.6455), which is consistent with theoretical expectations. The slope of the regression line for the emerging markets (Jan 2000 – Dec 2010) is higher 0.1156 and statistically significant on the 95% significance level (R=0.5898, Pr.=0.0003). The interception line is equal to 0.0024 and is not significant (Pr.=0.3116). The result confirms that in the emerging markets equilibrium equity premium is higher than in developed markets because of different value function parameters.

The regression line for the developed markets for longer period (Dec1969 – Dec 2010) has a slope, which is higher than in Jan 2000 – Dec 2010, and equal 0.0717 and statistically significant on the 95% significance level (R=0.6593, Pr.= 0.0143). The interception line is equal to 0.0006and is not significant (Pr.=0.6317). So, equilibrium equity premium in the 41-years period (Dec1969 – Dec 2010) was higher than in ten-year period.

The mean-variation relation for Canada (Jan 2000 – Dec 2010) doesn't fit the regression line of the developed markets. For the 41-years period (Dec1969 – Dec 2010). Italy had lower equity premium than proposed by the equilibrium regression line. The deviation from the regression line can be explained by the estimation errors, cross-country difference in loss aversion and the international diversification. We suppose that for the ten-year period the loss aversion of Canadian investors was higher than in other developed countries. For the 41-years period the loss aversion in Italy is assuming to be less than in other developed countries.

To prove that the loss aversion differences define the equilibrium price of risk let us estimate the empirical loss aversion coefficient using the (8) equation. The estimated loss aversion coefficients are presented in the table 2.

Table 2

Loss aversion coefficients for developed and emerging markets in ten-year period

Country	a = 0.88	a = 1	a = 1.10
Japan	0.88	0.94	0.97
USA	0.98	0.99	1.00
Italy	1.10	1.05	1.02
UK	1.13	1.06	1.03
France	1.15	1.07	1.04
Germany	1.16	1.08	1.04
Average	1.07	1.03	1.02
Poland	1.32	1.18	1.11
Argentina	1.33	1.18	1.12
China	1.34	1.18	1.11
Ukraine	1.37	1.21	1.13
Canada	1.43	1.22	1.13
Russia	1.47	1.27	1.17
Morocco	1.48	1.25	1.15
India	1.49	1.27	1.17
Egypt	1.50	1.28	1.18
Indonesia	1.51	1.29	1.18
South Africa	1.53	1.29	1.18
Mexico	1.55	1.29	1.18
Brazil	1.55	1.31	1.20
Czech Rep.	1.78	1.43	1.27
Average	1.48	1.26	1.16

The results in table 2 confirm the assumption, that the loss aversion coefficients for emerging markets are higher than for the developed markets. The average loss aversion coefficient for emerging markets is 1.48 and for developed – 1.07, when a = 0.88.The results do not change much with different concavity/convexity coefficients. The empirical loss aversion coefficients are closeto theoretical estimation by Abdellaoui, Bleichrodt, and Paraschiv (2007) [1].

CONCLUSION

The discovery of prospect theory caused new direction of researches in asset pricing. It was proved that the mean-variance approach is robust under prospect theory postulates. Even more, the equilibrium price model with the mean-variance approach under the prospect theory brings the explanation of the equity premium puzzle. The equilibrium price of risk is defined by the value function parameters, such as loss aversion and risk attitude. The loss aversion plays a key role in equity risk premium explanation.

In the empirical section it was studied the equity risk premiums in 7 developed markets and 16 emerging markets in 10-year and 41-year periods. It was realized that the loss aversion level in emerging markets is higher than in developed markets in 10-year period. The average loss aversion coefficient was 1.26 for emerging markets and 1.03 for developed markets with a=1. High loss aversion level caused high equity premium in these markets. The average loss aversion coefficient was equal to 1.28 in 41-year period for developed market. The result supports the proposition that the loss aversion vary in time and depends on the economic situation in the country.

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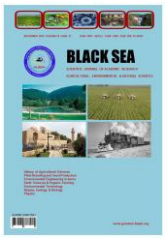

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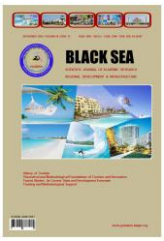
Ecology, Immunology and Biotechnology
Virology and Immunology
History of Biology
Entomology

TECHNICAL AND APPLIED SCIENCES

Applied Geometry, Engineering Drawing, Ergonomics and Safety of Life
Machines and Mechanical Engineering
History of Science and Technics
Electrical engineering, Radio Engineering, Telecommunications, and Electronics
Information, Computing and Automation

Mining and Geodesy Sciences
Metallurgy and Energy
Chemical Technology, Chemistry Sciences
Technology of Food Products
Technology of Materials and Products Textile and Light-load industry
Machinery in Agricultural Production
History of Art
Project and Program Management
Innovative Technologies
Repair and Reconstruction
Materials Science and Engineering
Engineering Physics
Mathematics & Applied Mathematics

REGIONAL DEVELOPMENT AND INFRASTRUCTURE

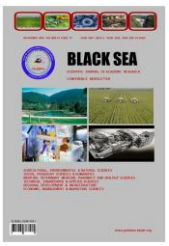


History of tourism
Theoretical and methodological foundations of tourism and recreation
Tourist market , its current state and development forecasts
Training and methodological support

ECONOMIC, MANAGEMENT & MARKETING SCIENCES

Economics and Management of Enterprises
Economy and Management of a National Economy
Mathematical Methods, Models and Information Technologies in Economics
Accounting, Analysis and Auditing
Money, Finance and Credit
Demography, Labor Economics
Management and Marketing
Economic Science

CONFERENCE NEWSLETTER



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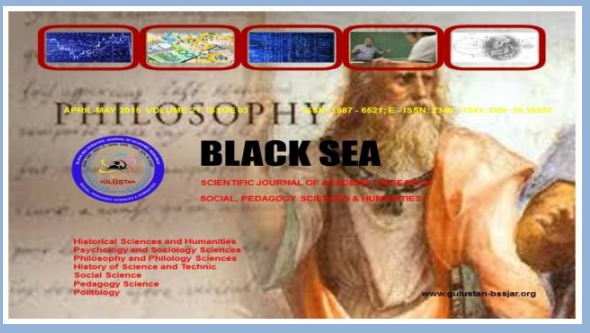

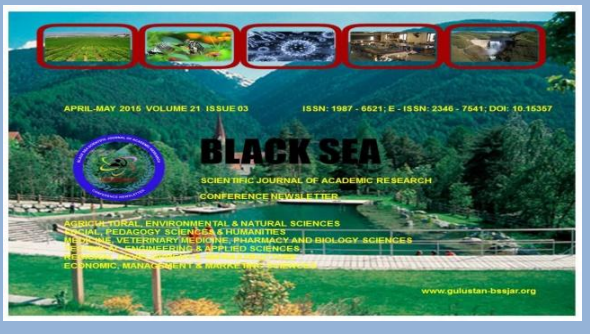

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