Empirical Check of the Return - Risk Tandem

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Abstract

This work is a part of a previously started cycle, published in this magazine and which is focussed onthe diverse analysis of the tandem risk-profitability. The purpose of the approaching this subject is obviously given by the economic and social realities of the beginning of the new millennium: local crises, financial crisis and currently the medical crisis with severe econimic effects.

This paper brings to the fore a simplified mathematic model, that of hope for wealth and the analysis of the cosequences determined by the resulting conclusions.

Simplification is determined by the impossibility of quantifying the multitude of factors that influence the development of an economic act, by the difficulties of calculations, but also by the subjectivism of the investor. However, for the development of the investor’s reasoning in the analysis of reality, the model makes an important contribution.

Key words: efficient market, projected return, risk-seeker, risk-adverse, utility function
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1. Introduction

Return-risk tandem is the essence of taking decisions. Achieving a balance between the two terms, meaning how much risk we can take in order to achieve the return, which however, is an extremely difficult process due to the complexity of factors influencing the divergent action. Meanwhile there can remain a significant dose of risk or of hidden return that cannot be identified at the moment of taking the decision, but which can be manifested during its process. In general, the risk factors leading to differences between what we expect and what we get are determined by the economic environment and the issuers of securities. The capital market is perceived both as an *efficient market*, dominated by reason, but also as a "*casino room*" where speculators intended to have immediate gains from the price differences.

2. Theoretical background. Mathematical quantification of the attitude towards risk

Whether the position of the investors is strategic or speculative, it is dominated by the attitude towards risk (Stancu, 2010). Accordingly, quantification using a mathematical function is highly complex, and if it is impossible it would have practical application. The difficulties of such an approach led to the development of a simplified model of the projected return [V (x)], whose function takes the form of a line.

$$V(x) = E(x) + \beta\sigma^2(x)$$

The function of the final value is based on the investor subjectivity. The mathematical expectation of return [E (x)] is determined from the probable manifestation of different stages. The coefficient ß is the term for comparing individual attitudes towards risk with the marginal rate of substitution (RMS) of the last risk unit having a certain level of the expected return. Derivative of the function V (x) with respect to return and risk indicates a negative correlation between return and marginal risk (RMS = - dV / dσ^2), which means a dominant aversion attitude towards risk (Stancu, 2010).

We take into consideration four alternatives of investment with the following characteristics:

Indicators	X_A	X_B	X_C	X_D
E(x)	8	8	15	7
$\sigma^2(x)$	16	64	64	25
$\sigma(x)$	4	8	8	5

The information given by the three indicators are conflicting (Vlad, 2015):

- Expected return indicates alternative X_c as the most appropriate to increase the final wealth;
- Standard dispersion and deviation point out alternative X_A as the less risky and having the lowest deviation from the actual return to the expected return;
- alternative X_B has a disproportionate ratio between return and risk as compared with alternative X_A;
- alternative X_D is not marked by any indicator.

Table no 1. Alternatives matrix of equivalence

	X_A	X_B	X_C	X_D
X_A		$\beta = 0$ $V(x_A) = V(x_B) = 8$	$\beta = -0{,}14$ $Vx_A = 5{,}75$ $Vx_C = 6{,}04$	$\beta = +0{,}11$ $Vx_A = 9{,}76$ $Vx_D = 9{,}75$
X_B	$\beta = 0$ $Vx_A = Vx_B = 8$		It cannot be mathematically compared	$\beta = -0{,}025$ $Vx_B = 6{,}4$ $Vx_D = 6{,}38$
X_C	$\beta = -0{,}14$ $Vx_A = 5{,}75$ $Vx_C = 6{,}04$	It cannot be mathematically compared		$\beta = -0{,}20$ $Vx_C = 2{,}2$ $Vx_D = 2$
X_D	$\beta = +0{,}11$ $Vx_A = 9{,}76$ $Vx_D = 9{,}75$	$\beta = -0{,}025$ $Vx_B = 6{,}4$ $Vx_D = 6{,}38$	$\beta = -0{,}20$ $Vx_C = 2{,}2$ $Vx_D = 2$	

Source: (Vlad, 2015)

Combining the alternative two by two, there result six possible combinations with different values for β, which match different risk behaviours.

- **$\beta = 0$** occurs for the pair (A, B): $8 + 8 + \beta \times \beta \times 16 = 64 \Rightarrow \beta = 0$

The only criterion taken into account is that of return, notwithstanding the attached degree of risk and therefore the final amount of wealth will be equal to the marginal expected return:

Expected Return (β) = RMS

This behaviour is typical for the investor with a neutral attitude towards risk. As the returns are equal for both alternatives, the investor can choose either of them: $V(x_A) = V(x_B) = E(x) = 8$

- **β <0**, occurs for the pairs (A, C) of -0.14; (B, D) of -0.025 (C; D) of - 0.20.

For negative values of coefficient β there can be determined the lowest values of final wealth as a big attention is paid to the risk at the expense of return.

Expected Return (β) <RMS

Sacrificing the return is a typical risk-adverse behaviour that avoids taking risks. The question is whether risk-adverse decision-maker takes as exclusive criterion for assessing the lowest risk possible. Analysis of the pair (A, C) shows that, although the alternative C is the most risky, its expected value of 6.04, is higher than of alternative A, namely 5.75, which means that to some extent the ration return-risk is also taken into account for this type of behaviour.

- **β > 0**, the example is given for the pair (A, D) of +0.11.

The higher expected value, of 9,76, is assigned to Project A, superior to the other combinations of the matrices. And the competitor Project D, is quoted with a superior expected value of (9.75) than any other project with negative or zero β.

Expected Return (β)> RMS

Positive β is typical for the risk-seeker behaviour that deliberately assumes high risks, and final value is estimated based on higher expected return based on the hidden potential of the investment project.

In conclusion, the behaviour towards risk is assessed as it follows **[2]:**

0 < β > RMS - risk-seeker
0 = β = RMS – neutral
0 > β < RMS - risk-adverse

Summarizing, the interpretation of the function is the following: increasing the attached risk by a unit triggers for the risk-seeker behaviour the increase of the return with value of β, and for the risk-adverse behaviour the decrease with the value of the coefficient.

3. Preferences determined by individual attitude towards risk

It is interesting to analyse the preferences of these three categories of investors judged by individual attitude towards risk.

Table no. 2. Ranking order of the investment projects

Attitudes towards risk	1	2	3	4
risk-seeker (β = 0,11)	$Vx_C = 22$	$Vx_B = 15$	$Vx_A = 9{,}76$	$Vx_D = 9{,}75$
neutral (β = 0)	$Vx_C = 15$	$Vx_A = Vx_B = 8$	X	$Vx_D = 7$
risk-adverse (β = - 0,14)	$Vx_C = 6{,}04$	$Vx_A = 5{,}75$	$Vx_D = 3{,}50$	$Vx_B = -0{,}96$

Source: (Vlad, 2015)

Every investor prefers alternative C, which is characterized by the highest return and the greatest risk, the difference being given by assessments on the final value. Even if the expectations are different, the project will produce the same return for every investor and all of them will bear the same risk effects. The fact that there is the same preferences, broach the growth of aggregate demand in the market with consequences for the increase of the price of securities issued by Project C, which for an investor represents a decline of return or another manifestation of risk. Another aspect of the analysis concerns the limit up to which a risk-adverse investor is willing to sacrifice the return for reducing the risk or the limit up to which a risk-seeker investor assume the risk. For risk-adverse investor as minimum limit for the decrease of return can be accepted the limit that ensures the preservation of its assets, and for which of the variation of the function $\triangle V(x) = 0$.

For given example the accepted alternatives of the maximum negative value of β are:

$$\beta (x_A) = -0{,}5; \quad \beta (x_B) = -0{,}12; \quad \beta (x_C) = -0{,}23 \quad ; \quad \beta (x_D) = -0{,}28$$

Higher negative values of return would lead to the decrease of the final return, which is not acceptable for any rational investor, regardless of their degree of risk aversion behaviour. In the other case of risk-seeker behaviour, the risk cannot become the exclusive criterion for assessing an investment because it exceeds rational behaviour. We have to pay attention when we use this formula, as a positive β value increases the risk and leads to a high value of the function. Comparing the features of these three different projects, for β = 1, we obtain:

Alternatives	E(x)	σ²	V(x)
A	15	64	79
B	13	80	93
C	10	90	100

The expected value of V (x) proportionally increases with the risk, while the return is declining. A rational behaviour requires the proportional consideration of both risk and return. The linear utility function allows the understanding the necessary logic pattern for taking the decision and understanding of the factors taken into account. The manners of the investment behaviour can also be illustrated by other mathematical functions, such as a type of power: $U(Vx) = (Vx)^{\beta}$ where $\beta > 1$ and is the specific for the risk-seeker behaviour and $0 < \beta < 1$ is characteristic for the risk-adverse behaviour.

4. Conclusions

Profitability and risk analysis is ubiquitous in the literature.

This article presents a mathematical model, in a simplified form, but with a practical applicability, namely that of the hoped-for-fortune whose function takes the form of a line. It starts from the idea that whatever position the innvestor adpts he has as his dominanance his attitude towards the effects of risk on the business. In the analysis of the possible alternatives the information provided by the indicators in the composition of the mathematical function can be consonant or contradictory..

In principle, information is given about the most adequate return expectation for the increase of the final fortune, the dispersion and the standard deviation recommend as the least risky and with the smallest deviation of the effective return from the expected one, the alternatives that have a disproportionate ratio between prifitability and risk.

Based on the formulated hypotheses, the equivalence matrix of the alternatives is constructed, which, by comparing the existing possibilities, gives rise to six possible combinations that register different values of the individual attitudes towards risk. Depending on value of this indicator compared to the marginal rate of substitution of the last risk unit, there are three groups of investors, depending on the approach to risk: riskophiles, risk neutral and riskophobes. Depending on this attitude they will guide their actions on the market. Apparently there may be an imbalance of supply and demand if the share of a category is the majority.

Reality has shown that such a fact does not occur unless very rarely, there are other causes that can deviate from the normal course of the market.

5. References

- Stancu, I., 2010. *Finance*, Fourth Edition. Bucharest: Economic Publishing House;
- Vlad, C., 2015. *Finances in the Globalization Era*. Germany: Lambert Academic Publishing;
- Pavel-Surlaru, A., Surlaru, E. 2019. *Opportunities and ways to implement creatively the strategic management, realistic strategies and policies by companies to increase the competitiveness of the local economy.* Buzău: Teocora Publishing House.