IMPLEMENTING QUANTITATIVE TECHNIQUES IN ASSESSING THE RISK ATTITUDES[1]

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Abstract

The financial risk does not only affect the future of a company, but also the dynamic of the economy itself. Therefore, a thorough examination of the risk in the decision-making process of a company represents a substantial aspect. Although research in this direction has been made, most of the approaches neither integrate qualitative variables with the measurable ones, nor consider historical data of the companies that are being evaluated. The empirical management has evolved, allowing us to compare and choose from different quantitative techniques in order to find answers to complex managerial problems. No matter the context, the decision-making process cannot be established without a comprehensive analysis of information that helps explaining trends, relationships and changes that can occur in the variables. Risk assessment expects that the term of risk to be defined not only in an explicit way, but also in a determinable way. The aim of this paper is to contribute to the advancement of the theory, but also to strengthen the practical utilization, being helpful in upgrading the research on risk. By finding the most suited models and techniques for an optimal risk assessment, the companies can benefit from having a rational support in the investment process.

Keywords: quantitative risk models, Bowman's paradox, prospect theory, risk-return association

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1. Introduction

Risk has become an imperative variable in most of the fields of strategy research. It has been covered in papers on business strategy, together with the characteristics of the industries, diversification of the companies and organizational systems and processes. Sometimes, the notion of risk is used to emphasize managerial decisions that are correlated with doubtful outcomes, while other times represents a component that has to do with companies experiencing volatile incomes.

The financial risk does not only affect the future of a company, but also the dynamic of the economy itself. In business decision theory, the notion of risk expects a solid knowledge of probabilities or their distribution regarding unpredictable future events. This is why, the risk management should be seen as a process, a sequence of events in time, in a dynamic form. To consider the risk management a static and one-time event is a mistake, and its consequences will be shortly observed at all levels in an organization. Although the identification of business risks that exist in the framework of corporate activities cannot be easily characterized in a unitary form, the risk assessment expects the notion of risk to be defined in a measurable and accurate way.

The correlation between risk and return has received significant amount of debate from researchers in the field of economics, finance, business administration and management science. As for their correlation, the traditional economic knowledge indicates a positive relation between risk and return (Brealey & Myers, 1981). This article pursues to examine the function of behaviour towards risk not only in the field of management, but also in the area of the strategic risk and in the same time to improve the comprehension of the Bowman's risk-return paradox.

"*Implementing quantitative techniques in assessing the risk attitudes*" is structured in 4 sections, as follows: part two reveals the meaning and the differences between risk measurement and risk analysis, together with some examples of quantitative and qualitative evaluation. The next section demonstrates the fact that between risk and return we cannot always find a positive relation, as it was initially thought to be true and that the risk attitudes may change the risk-return profile. The last part briefs the main ideas of the paper.

2. Risk measurement and risk analysis

It has long been thought that risk and uncertainty are directly associated (Knight, 1921). Despite this fact, researchers in economics and in the related fields managed to demonstrate that we can find differences between these two variables. In this manner, March and Shapira explained risk as the probable variation of outcomes of a choice, while uncertainty emphasizes the unpredictability of a given choice (March & Shapira, 1987). In a more detailed picture, a risky alternative can either create a generous reward or it can produce a severe loss even though the distribution of the outcomes was a well-known one.

Many of the theories on risk share the same elemental presumption that risk has a negative connotation. On the other hand, every statement has its contradictions. In this case, there were many researchers that had an opposite opinion, considering risk to represent a potential opportunity. Some examples are Myers' paper (Myer, 1977), the Austrian School of Economics (Schumpeter, 1934) and some entrepreneurial theories (Shane, 2008), where the attention is given to the opportunities that are integrated in the risk component. Basically, the above-mentioned approaches manifest different spotlights in explaining what inspires people to accept a certain amount of risk and to select between preventing a failure and making good use of a promising possibility.

Risk has become an imperative variable in most of the fields of strategy research. It has been covered in papers on business strategy, together with the characteristics of the industries (Andersen et al., 2007; Oviatt & Bauerschmidt, 1991), diversification of the companies (Belderbos et al., 2014; Amit & Livnat, 1988) and organizational systems and processes (Jemison, 1987). Sometimes, the notion of risk is used to emphasize managerial decisions that are correlated with doubtful outcomes, while other times represents a component that has to do with companies experiencing volatile incomes.

The past shows us that during years companies handled various types of risks. For instance, in 1981 Bannister & Bawcutt suggested that risk management involves numerous disciplines that have to cooperate in order to face the unknown future. The same two authors highlighted the importance of a bond between risk management, corporate governance and strategy (Bannister &

Bawcutt, 1981). Continuing this idea, Andersen acknowledges three risk viewpoints (Andersen, 2008):

a) Conventional risk management practices – they aimed their attention at the restraint of the economic risks and environmental threats

b) Enterprise risk management approaches – they see operational risks as part of an integrative structure, which is regularly fulfilled in correlation to an internal audit and with the help of some control systems.

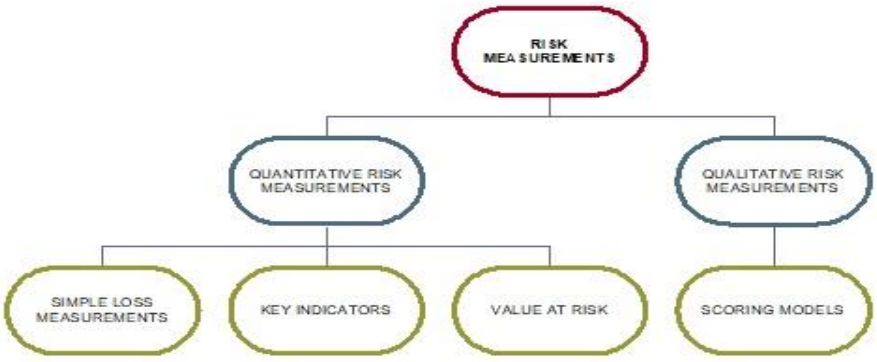
c) Total risk management perspective - all risk categories are being approached from a more holistic angle, including strategic risks.

The idea that enterprise risk management includes not only the traditional risks, as accidents, but also the strategic ones, such as competition was expressed in 2015 by Bromiley et al. (2015). Their contribution can be observed in this standardized and unified approach in regard to the importance of managing the total number of risks which a company has to encounter. An integrative risk management technique involves a whole framework of the total exposure that a company has. Although this is not an aspect that can be easily achieved in practice, elements such as marketing, product development or strategy have to be taken into consideration into the risk assessment.

Risk measurement represents the core of risk management. In order to be able to control and plan, firstly the risks have to be identified and measured. Although a generalization is not always accessible to obtain, some instruments can be incorporated in the process of risk recognition. A proper systematization of the risk types can be seen as well in the following figure, starting from two main categories: quantitative and qualitative risks.

Figure 1

An overview of risk measurements



Source: Risk Management (Wolke, 2017)

The simple loss measurements rely on probability calculations. This way of quantifying the risk has its drawbacks in the incomplete framework of the current and suitable risk substance, especially in a prospect of a conceivably essential risk supervision. In practice, because of this aspect, the simple loss measurements have a secondary role. On the other hand, they still present an advantage: despite their flaws, being easy to use and calculate them, they can provide an approximate estimation for creating a larger structure for some other complex measurements.

In order to overcome the shortcomings of the simple loss measurements, further risk measurements can help improving the results. The second category of the quantitative risk measures is represented by the key indicators, more commonly known as the statistical methods. This category consists of volatility, which measures the variation range, and therefore represents an anchor for the risk assessment. An absolute measure of the volatility includes variance, standard or mean deviation and ranges, whereas the relative measure of dispersion consists of the variation coefficient, which stipulates the volume of the risk that is exposed in correlation to profit.

Among volatility, the sensitivity analysis is frequently used, showing the response of an asset value to a shock occurred in the market parameters. In an efficient risk management, the sensitivity analysis should not be the only evaluation test. The explanation lies in the fact that a change applied to a factor represents a totally subjective

hypothesis without a proper risk assessment. Moreover, the probability of new hidden changes that can occur in the decisive factors is not taken into consideration. If a factor is considered to have a determinant role in the risk management, then the use of the sensitivity analysis should be limited. Relying more on the relevant and decisive factors, the risk management can perform more effectively, especially with the help of some influencing variables.

In a third category of the quantitative risk measurements, we find Value at risk, which is being characterized by its loss-oriented profile. VaR or this risk measurements that correct possible differences in assets in the loss field are also referred to as shortfall or downside risk measures. The value at risk depicts in monetary value the modelled amount of loss, incorporating all risk metrics in a sole possible loss image.

The risk measures discussed above have all as a common characteristic the evaluation and assessment of risk in monetary units. In case of the scoring models, the basic principle of their application lies in the quantification of the influencing qualitative factors. This process can be found in various forms, but the foundation consists in the first phase of weighting those qualitative factors.

The most valuable aspects of the scoring models can be compiled as follows:

a) The scoring models display the opportunity to combine both the intangible and tangible components of the risk and to provide in this manner comparable substitutes.

b) The target level of the scoring methods can provide a starting point for additional quantifiable methods regarding risk.

c) The choice of the significant components and their weighting are chosen in a subjectively manner, being implemented by every individual.

After a comprehensive measurement of the existing risks, the next mandatory step is represented by the analysis of the measurement results, together with the future plan that can be extracted from these outcomes. But the risk analysis counts on the risk attitudes of the decision maker or investor, at an individual level, or of the entire company. Although the array comprises risk-averse attitudes, together with the risk-seeking ones, the extremes are not to be wanted. A complete risk aversion attitude it’s not suitable for a

business activity, because every economic activity is associated to a business risk at some point in its existence. Moreover, a complete risk avoidance would diminish the profit anticipations. These examples show that when we talk about risk analysis, we cannot expect some consolidated principles to serve as patterns for all firms.

3. Behavioural decision theory and the risk-return relation

According to economic research work and knowledge, comparing the risk assumed by a firm and its returns we can find a positive correlation, implying the fact that firms are risk-averse regardless their returns. Existing research studies, which are summed up in the first half of Table 1, have supported to a great extent the positive risk-return association. Nevertheless, a comprehensive review of the empirical literature on this subject exposes a relationship which is not always in this manner. For instance, researchers have found a negative interdependence among risk and return across and within various industries. These papers are also summarized in Table 1, together with the corresponding time periods, samples and their conclusions in regard to the risk-return association.

Of particular interest and the pioneer in this subject is Bowman's work (Bowman, 1980), being the fundament of the so called "risk-return paradox". He described his results as a paradox for strategic management because the conclusions are contrary to the traditional understanding of a positive association. In a later article, the same author highlighted an explanation for his finding, affirming that a firm's risk attitude may determine the risk-return profile and also the fact that "troubled companies take more risk" (Bowman, 1982).

Two major explanations can be found behind this statement: the first one has to do with the efficient managers, who can boost the returns and in the same time diminish risk, causing in this manner the contrary risk-return relation; the next one, managers are rather risk seekers, not risk averse as it was presumed. He also expressed the fact that the notion of *risk seeking* corresponds with the theories of the behavioural decision, an important role being played by the reference level in studying the uncertain choices. The same idea was expressed in 1980 by Laughhunn, Payne and Crum in their paper that tackled the managerial risk preferences (Laughhunn et al., 1980).

What seems to be promising in this respect is represented by Kahneman and Tversky's prospect ideology, where the risk attitudes

are not established by the degree of the outcomes, but by the event's association to a reference point (Kahneman & Tversky, 1979). Additionally, human being is not consistently risk averse, but instead they embrace a conglomeration of behaviours: not only risk-averse, but also risk-seeking.

From a research point of view, it is mandatory to question whether the results of the observation on individuals' attitudes regarding risk and the risky choice behaviours can be used in the analysis of corporate organizational behaviour. In his 1982 article, Bowman remarked that the literature of economics has provided examples, usually described as rational-actor models (Allison, 1971), where firms could behave similar to people. His study, established on a study of firms within three industries, validated the assumption that organizational behaviour resembles with the attitude of the individual decision makers.

By defining utility as a profit-loss base, Kahneman and Tversky managed to extract testable hypotheses regarding a firm's attitudes towards risk: when the efficiency is situated underneath a certain aim point, the ones involved in the decision-making process are risk-seeking (a convex value function) and vice versa, meaning when the outcomes exceed the objectives, then they are risk-averse (a concave value function). Indeed, this evidence was found also in other papers, proving that when the returns are below the target, most individuals are risk seeking and vice versa (Mao, 1970; Siegel, 1957). This means that in terms of risk-return relationship, in a conglomerate of companies that register returns beyond a target level, the risk and the return are in a positive interaction, while in other group of firms with returns that are framed below the target point, the risk and return would have a negative correlation. The explanation lies in the fact that a riskier alternative, having a high variance can provide to a decision maker a greater possibility of obtaining the needed result than a safer opportunity.

In 1988, Fiegenbaum and Thomas used accounting data in order to test Bowman's risk-return anomaly as to prospect theory and behavioural decision concept. For each industry that was examined, firms were divided into two main groups: those with returns that are above target and those with returns below. The target point was established and computed as the industry's mean return, which automatically indicates the fact that in each industry both groups consisted of an equal number of firms. Not only in the two groups, but

also on the entire data set across industries the resulted analysis of the alliance between the notions of risk and return firmly validates the prospect theory predictions (Fiegenbaum & Thomas, 1988).

In another research Marc Jegers, a professor of management and accounting at a university in Brussels, published in 1991 a replication of the Fiegenbaum and Thomas's calculations, using in the methodology Belgian accounting data. For an additional robustness check, the author added other risk and return variables, not only ROE, which displays a shareholder point of view. The return on total assets (ROA) has been as well calculated as a managerial performance index, a measure that accounts for all the earnings of a firm before distribution to creditors and owners (Jegers, 1991). As measures for returns, not only ROE and ROA were taken into consideration, but also cash flow on equity, together with cash flow to which were added other financial outlays regarding the total assets. In the prior study of Fiegenbaum and Thomas, the variance of returns has been used as an absolute measure. As for the 1991's study, Jegers chose the coefficient of variation, a relative variability measure.

Combining the results of the two papers leads to the conclusion that prospect theory is conceivably of great use and meaning in describing the observed liaison that exists between risk and return at a firm level. In a prospect theory framework, Jegers's conclusion indicates that risk is consider as an absolute notion by the decision makers in the firms with above target level returns and as a relative conception in the below target level firms.

The similarities between Fiegenbaum and Thomas's approach and Jegers's methods can be easily found at any level, whether we are referring to the group below or above the target level and also to the analyses made within and across industries. Moreover, all these outcomes strongly comply with the predictions on prospect theory. For the firms that register a performance below the industry's median, the negative risk-return relations are prevailing. Evidence of this preponderance can be found in the high percentage of industries in which such firms exhibit significant negative risk return rank correlations or negative association ratios above the value of 1. The same conclusions can be highlighted as well in the category of the above target level firms.

Johnson's publication from 1994 expresses the risk-taking approach in the banking system, or in other words in a structure that is based on behavioural finance, having as a starting point Fiegenbaum

and Thomas analysis, but the difference can be seen in the usage of another measure of risk, meaning the one proposed by Fishburn (Fishburn, 1977). In his article, the author tests various measures for return and risk, like ROA, ROE, but also primary capital ratio. As for the risk, it is computed as the standard deviation of the effects. The aim of the paper is to analyse the historical information and to decide whether the results lead to an evidence compatible with the prospect theory. In the end, the results gathered validate as well Fiegenbaum and Thomas's results (Johnson, 1994).

Additional practical investigations in this field have demonstrated the influence held by a firm's way of diversification, its market power, and earlier risk analysis over the stability of the company's performance (Bromiley, 1991; Chang & Thomas, 1989; Deephouse & Wiseman, 2000; Miller & Bromiley, 1991, Veliyath & Ferris, 1997; Woo, 1987). For instance, Woo has revealed that the companies which possess market power achieve greater levels of profits, but in the same time lower risks. Hence, the market power is supposed to be in a direct relationship with the return, and contrarily corelated to risk. This may be seen as one of the elements that can explain the Bowman's paradox.

Table 1

Synopsis of the primary empirical views regarding the risk-return relationship

Studies	Time period	Samples	Risk-return association
Conrad & Plotkin (1968)	1950 - 1965	783 U.S. companies; 59 industries	Significant positive association
Fisher & Hall (1969)	1950 - 1964	11 U.S. industries	Significant positive association for both firm and industry level
Cootner & Holland (1970)	1946 - 1960	315 U.S. companies; 39 industries	Significant positive association for both firm and industry level
Hurdle (1974)	1960 – 1969	228 U.S. firms; 85 industries	Significant positive association for both firm and industry level
Armour & Teece (1978)	1955 – 1973	28 U.S. firms	Negative, but not significant association
Neumann, Bobel & Haid (1979)	1965 – 1973	334 West German industrial stock companies	Significant positive association for the whole sample; when the sample was divided into big and small companies, positive and negative association was found
Bowman (1980)	**1968 – 1976**	**1572 U.S. companies; 85 industries**	**Significant negative association within industries; negative but not significant association across industries**
	1972 – 1976	11 industries	

Studies	Time period	Samples	Risk-return association
Treacy (1980)	1966 – 1975	1458 U.S. companies; 54 industries	Significant negative association within and across industries
Bowman (1982)	1979	Food processing, computer, and container industries in U.S.	Significant negative association within industries for troubled companies
Bettis (1981) Bettis & Hall (1982) Bettis & Mahajan (1985)	1973 – 1977	80 U.S. companies	Significant positive association for unrelated firms; significant negative association for related firms; no statistically significant association for related-linked firms
Fiegenbaum & Thomas (1988)	1960 – 1979	2322 companies; 47 industries	The robust results support the basic propositions of prospect theory; negative risk-return association for firms having returns below target levels and positive association for firms with returns above target.
Jegers (1991)	1977 – 1982	3250 Belgian manufacturing firms	Results strongly corroborate prospect theory's predictions; for firms with performance below an industry median, negative risk-return relations are predominant
Johnson (1994)	1970 – 1989	142 banks	The results support prospect theory
Miller & Bromiley (1990)	1978 - 1982	526 firms	The existing risk level of a firm can also influence performance of the firm
	1983 - 1987	746 firms	

Source: Fiegenbaum & Thomas (1988) and personal contributions

4. Conclusions

Many of the theories on risk share the same elemental presumption that risk has a negative connotation. On the other hand, every statement has its contradictions. In this case, there were many researchers that had an opposite opinion, considering risk to represent a potential opportunity. In essence, these approaches reflect different spotlights in explaining what motivates people to take a certain amount of risk and to select between preventing a loss and taking advantage of a promising possibility.

The risk measurement represents the essence of the assertion of risk management. In order to be able to control and plan, firstly the risks have to be identified and measured. By finding the most suited models and techniques for an optimal risk assessment, the companies can benefit from having a rational support in the investment process.

Although in some cases is difficult to gather historical data in order to extrapolate the future possible results and to be able to correctly estimate the rates, without this process the measurement of risk would not be efficiently applied. It is for certain that the benefits of these techniques exceed the inputs. The empirical management has evolved, allowing us to compare and choose from different quantitative techniques in order to find answers to complex managerial problems. No matter the context, the decision-making process cannot be established without a comprehensive analysis of information that helps explaining trends, relationships and changes that can occur in the variables.

After a comprehensive measurement of the existing risks, the next mandatory step is represented by the analysis of the measurement results, together with the future plan that can be extracted from these outcomes. But the risk analysis counts on the risk attitudes of the decision maker or investor, at an individual level, or of the entire company. When we talk about risk analysis, we cannot expect some consolidated principles to serve as patterns for all firms.

Many and important studies have analysed the risk-return models in diverse industry context. This is the reason why the positive risk-return relations have frequently materialized in researches which are cross-sectional, that assess not only the industry level, but also the firm-level data. As for the negative risk-return relations, these occur in moments when alternative methods are included in the examination. Such means differ depending on the characteristics of the industry, the firm's size, strategies, the time period examined, risk measures and risk attitudes. Moreover, the risk attitudes determine affected firms to seek greater risk, which leads to a negative risk-return association.

Bowman's findings have a massive importance in organizations' risk-attitudes perspectives, because they serve as a support for the risk-return paradox. From a pragmatic perspective, firms will be more prepared to supervise their performance if they tolerate the fact that is not impossible to evolve into risk-averse attitude when operating less than expected, transforming to risk-seeking when their results deteriorate. These developments and relationships are indispensable in order to be able to thoroughly understand economic decision making and can help the processes to be made more effective.

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