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KEY WORDS

financial risk, Financial Risk Management Card, risk index R_{NG} , internationalization of risks, decision making process, probabilities, attitudes towards risk, cash-flow, risk-flow, risk controlling, risk management strategies, risk defined as a volatility, risk defined as a downside risk, decision making principles, the moments of distribution, Wienerberger

INTRODUCTION

2011 is the third year after the outburst of the biggest economic crisis of the human history: the economic crisis from 2008 (Stein, 2010: 2-12; Euler Hermes Overview Country Rating din 2009, Annex 1). There have never been such tremendous financial losses in the whole human history. The forecasts of global economic prosperity fights against the shadow left by the economic crisis (SAS Risk Update 4/2008: 1-4; Weber, 2009: 22-25, 41-43; Sauer, 2009: 18-23, 47-83; Euler Hermes World-risk-map in 2009, Annex 2). The economic growth is disastrous for the most of the countries because the financial crisis started in 2008 still captures a big part of the globe (SAS Risk Update 2/2009: 1-4; Münkler *et al.*, 2010: 11-35; Euler Hermes Online din 2009, Annex 3). In this context, the financial mobility of the most companies in a risk environment vanishes

continuously because the danger of a bankruptcy becomes even more real (Xiao, 2009: 11-43, 89-119; Macrothink Institute: ERM, 2010: 2-8), and the economic prosperity of the most companies becomes even weaker (Euler Hermes Online, 2010; Puzanova, 2010: 29-33, 44-55; Hoag, 2010: 1-47).

The motivation of choosing the subject. In this unsecure time, there is an increasing need for risk management (Hull, 2010: 3-17; Coface Online, Country Ratings, 2009, Annex 4). A new instrument of economic risk, especially of financial risk management is the so-called Financial Risk Management Card (FRMC). It is based on the idea to quantify the financial risk by means of the R_{NG} index, which was proposed by ourselves (N-Grünewald) and which is based on different decision making principles, such as the Laplace's equal shares or the economic decision making principle μ , μ - σ , etc.

The research area. The FRMC is a controlling instrument of the modern financial risk management and operates with different accounts and balances in the intern and extern accountancy of a certain economic entity. The FRMC belongs to the active policy of financial risk management, like the well-known instruments such as: *Value-at-Risk*, *Lower Partial Moments*, *Financial Mobility-at-Risk*, *Liquidity-at-Risk* or different risk indexes such as variance (σ^2), standard deviation (σ), risk index (β) or rentability indexes (T)ROE, (T)ROI, (T)ROA, (T)RORAC or (T)RARO(RA)C. All these indicators try to quantify the undertaken risk, based on minimizing the time of processing the information. The financial risk management, FRMC, defines the decision making process from the risk point of view, exclusively. It has an objective and subjective part. The objective component is the decision rule of FRMC, meanwhile the subjective component implies choosing the information and the corresponding shares by the decider when determining the R_{NG} indexes on which the FRMC is based.

In this case, the economic decision-making process is influenced by two external elements, having opposite effects. The first element is external and focuses on the precision of the obtained results, which must be, of course maximized, because the more precise the results are, the smaller is the probability of making a mistake. The second external factor refers to the time in which the economic decision should be made; it is and is becoming more and

more a luxury good and which can be afforded by just a few economic agents (Claasen, 2009: 15-24, etc.).

Because of the time minimizing condition of economic decision making, FMC does not take into account the various inter-risk correlations of the financial risk management, which induces a certain inaccuracy of the results, but this disadvantage is required to be accepted. If this inaccuracy of the results is not intended to be accepted, then the time minimizing condition of economic decision-making is no longer valid. In this case, the risk situation can be analyzed by the means of variance (σ^2) and covariance (σ_{mn}) tables or *Value-at-Risk* concept (Zweck, 2009: 21-31, 41-48, 50-53, 58-63, 63-64), which takes into consideration the effects of different cross risks.

Obtaining the required data for risk analysis with FRMC is often relatively simple: company managers may use the existing databases of the internal controlling, and different external investors can use the financial reports of the corresponding departments of different companies, in order to obtain data for quarterly or annual balance sheets. The only difference between the two groups of interest is the quality of data, because the companies' managers will gain data from the internal controlling, while different external investors will get data from the external one only. The Financial Risk Management Card (FRMC) is a flexible conclusion to quantify the risk, because there are three groups of models of financial risk management namely $FRMC_{\text{Alpha}}$, $FRMC_{\text{Beta}}$ and $FRMC_{\text{Gamma}}$ that adapt to various existing external factors. The Financial Risk Management Card offers the opportunity to choose exactly the model that would allow an overview of the assumed risk and an analysis within a convenient period of time.

The main purpose of this paper is the empirical analysis in financial management using the financial risk index, R_{NG} , after N-Grünewald and the Financial Risk Management Card – FRMC – in the two currently existing forms $FRMC_{\text{AG}}$ and $FRMC_{\text{AP}}$. Financial concepts focus not only the monetary flows called *cash-flow*, but also the influence of different risks on these, aspect best underlined by the concept of *risk-flow*. The three distinct groups – Alpha, Beta and Gamma – of the two models $FRMC_{\text{AG}}$ and $FRMC_{\text{AP}}$ analyze in the present Ph.D. thesis the risk situation for the Wienerberger Group for the economic years 2010 and 2011 based on the information offered in 2009 and 2010.

Our research focuses in:

1. the literature research, selection and order from various national and international libraries such as “Niedersächsische Staats- und Universitätsbibliothek”, Wiesbaden library, the one in St. Gallen, of the internal library of the International Group Wienerberger in Vienna, as well as
2. the generation of a bibliography on the researched topic – the financial risk management;
3. the selection of basic theories and developing these theories in the direction of financial risk;
4. the inquiry of empirical results in the field of financial management during a collaboration over 4 years with different departments of the International Group Wienerberger;
5. the use of statistical models in the financial risk management process.

The studies regarding risk quantification are quite advanced and focus in two different directions: the possibility to measure risk from an exclusively objective and subjective perspective. The purely objective possibilities are composed by many models, well known, such as: *Value at Risk*, *Lower Partial Moments* method, variance σ^2 , standard deviation σ , β index from MEAF or the various risk indexes (T)ROA, (T)ROI, (T)ROE, (T)RORAC, (T)RARORAC. The purely subjective methods are based on the experience of economic agent, who must take a decision. The more experience a businessman has, the better is the risk quantification. We believe that an appreciation of the magnitude of risk in a mixed mode, by combining the subjective and objective possibilities, would be appropriate being also something new in this field, because until now there have been no attempts in this direction. Our Ph.D. thesis combines the two restrictive directions of risk quantification and opens a new orientation, this time a mixed one.

Research methodology. The bibliographic documentation, a component of the scientific documentation process has a critical importance, because it enables us using the economic literature to know the scientific heritage, the assumptions used to explain the economic phenomena, the methods of analysis and measurement, the conclusions and scientific theories in the researched field.

We used logical methods in order to assure the economic quantification and assumptions' formulation such as: induction and deduction, but also quantitative measurement instruments, namely the correlation method. Another method of analysis is represented by the synthesis of functions built and used such as risk preference function for the Wienerberger Group (Nistor & Grünewald, 2010).

The structure of the paper is the following: an introduction, five chapters, conclusions and the contribution of different groups of Financial Risk Management Card in the financial theory. The starting point of this paper is a brief introduction into current macroeconomic conditions valid for the Wienerberger International Group. The definition of Financial Risk Management Card, the main purpose of this Ph.D. thesis, the research methods, literature review and the structure of the paper, all these complete the useful information in the introduction.

The first chapter entitled “Present Approaches Regarding Risks in Business” presents the concepts of economic risk and chance, described as a reflection of the Ying-Yang universal principle. Current issues regarding the risk internationalization are followed by the description of decision-making process, and the definition of different situations in which an economic agent can be while he takes a decision. The role of probability in risk analysis and in different attitudes of the decider versus risk complete the first chapter.

The second chapter called “Theoretical Fundamentals Regarding the Financial Risk Management” describes the theoretical aspects based on which our paper has been built. In this respect, we classified the different types of risks; we presented the characteristics of financial risk management, and the management methods of various sorts of financial risks, all these with the purpose of preparing the approach of risk management issue, in general and that of financial risk management, in particular.

The notions of *risk-flow*, *cash-flow*, *treasury*, *risk control* as well as the instruments of the active and passive financial risk management form a complex information basis for the description and classification of financial risk in the next chapters by the FRMC models.

The third chapter, “Risks' Quantification”, examines the analytical basis of FRMC together with the possibilities the financial risk quantification. Different strategies such as operational

flexibility, real options theory, *hedging*, *outsourcing* and *mergers & acquisitions* transactions prepare the framework in which the financial risk will be quantified. Risk management methods are divided into two groups: those who see risk in terms of volatility and other who see risk as a “downside risk” or a “shortfall”. Various simulations, models like Value-at-Risk, sensitivities, “the four Greek letters” Delta, Gamma, Theta and Vega are some concepts that will be described within this chapter. In addition FRMC will be described in detail along with the risk indexes, R_{NG} .

Chapter four called “The International Group Wienerberger and Some Characteristics Of The Risk Management In the Group” includes general information about Wienerberger International Group, a brief history, group organization, its products, influence and success factors in the production of bricks, a brief description of the idea of corporate governance, a detailed report of the Wienerberger Group, the impact of economic crisis on the company, and other information about its activity.

The fifth chapter entitled “Empirical Study Regarding the Financial Risk Management” combines the two existing forms of FRMC, i.e. $FRMC_{AG}$ and $FRMC_{AP}$ with the three different groups – Alpha, Beta and Gamma. The six new ways to quantify risk using risk index R_{NG} – $FRMC_{Alpha-AG}$, $FRMC_{Beta-AG}$, $FRMC_{Gamma-AG}$, $FRMC_{Alpha-AP}$, $FRMC_{Beta-AP}$ and $FRMC_{Gamma-AP}$ – specifically describe, from different points of view, the risk situation for the analyzed economic entity, i.e. for the International Wienerberger Group. This chapter makes the connection between theory and practice and combines the theory from the fourth chapter with practical situation regarding the International Wienerberger Group in the year 2009 and 2010. The conclusions and predictions of the $FRMC_{AG}$ and $FRMC_{AP}$ models are for the year 2010 and 2011. The most macro- and microeconomic influence factors of the brick manufacturing industry has changed dramatically in the history of Wienerberger International Group. The future, in general as well as future development of the group becomes more and more interesting.

The conclusions of this paper systematically describe all the results of this research regarding FRMC – the Financial Risk Management Card. Various annexes complete the information of our work.

SHORT PRESENTATION OF THE PH.D. THESIS' CHAPTERS

In the *first chapter* "Present Approaches Regarding Risks in Business" we presented the risk and the chance as the two sides of a coin. They can be presented in this way, because whenever there is an economic chance, whatever its nature, an economic risk occurs and viceversa.

Walter Scheel said: "Nothig is achieved without risk, but without risk we achieve nothing." (Knigge, 2005: 1). Although the probability of risk's and opportunity's occurrence is the same, people tend to focus more on risk.

Because the perception about risk is rather subjective and individual, it can be defined in different general ways using many various explanations, such as:

- in Italina, the risk is seen like a cliff (Ital. *risco*), around which one must navigate, or;
- it is also describe as courage, existing the possibility that a decider's action or activity to cause physical or material damage or even loss.

From the risk management point of view, it is understood as a continuous threat for the economic activity and the decision-making process and as a measurement of a possible event, but which is not wanted on the way towards the desired goal.

Nowadays, an important element to be considered is globalization. It means increasing the intensity, spead and area of influence regarding the interaction and transactions between states, inter- and multinational, which can not be controlled anymore in terms of economic, political, social, cultural and informational development. The concept of globalization exists for decades, but the news is represented by the intensity, material and spatial quality of

internationalization as well as by the adaptation pressure exerted on countries or regions (Fischer, 2008: 202-203).

Trade liberalization, deregulation of selling markets and of financial one, global integration of financial markets, and openness of the East-European countries which were closed before, the rapid expansion of international infrastructure through Internet, container and air traffic, all these bring with them not only the chance of a wealthy future but also the risk of an unwanted one (Fischer, 2008: 202-203).

During our Ph.D. thesis, we consider appropriate to present a brief history of some elements from the history of various institutions, which were and still are used to direct the efforts of mastering different complex risk.

In this macroeconomic context, the financial risk management (FRM) is a concept which covers a broad and very detailed range of aspects described both by economists and by others in different research areas. There are some basic elements which built the foundation of financial management. The first element of FRM are the notions of economic decision and information, because the basis of each economic decision is represented by the amount of information available to the decision maker at a certain moment in time.

Meyer (2000: 18) analyzes all the waiting structures and finally concludes that there are just two situations regarding decision: certitude and incertitude. Moreover, he demonstrates that the incertitude can be divided in two situations: uncertainty and risk.

Neus (2001) differentiates besides the situation of certitude, also the situation of apparent certitude (Neus, 2001:5). According to Neus, the case of apparent certitude belongs to the group of incertitude, because although there are many possible situations in the present, but just one of them is taken into consideration. In this manner, the incertitude situation is compulsively transformed in an apparent certitude.

Bitz (2004:2) adds the issue of play to the incertitude group. It is different from other uncertainty situations because its occurrence depends on the action of a rational opponent.

Götze and Bloech (2004: 47) expand the decision-making situations starting with the analysis of Meyer and adding the fuzzy one.

Wagner (2003) completes the class of possible situations by adding the fourth one: ignorance situations. In this situation the decision maker has no informations either related to the possibilities to act, or the consequences of his actions.

In order to facilitate the relations between different possible situations of the decision-making process, in which the decision-maker can be, we set up Figure no. 1 (Nistor & Grünewald, 2007):

Figure 1: The classification of decision-making situations



(Source: own adaptation)

From this classification, the most important for our study is the situation of insecurity and especially the subgroup of risk.

The above mentioned notion of risk must be clearly separated from that of uncertainty. In 1921, Frank Knight differentiated these two concepts in his book, “Risk, Uncertainty and Profit” where he mentioned:

“The distinction between risk and uncertainty:

If you don’t know for sure what will happen, but know the odds, that’s risk.

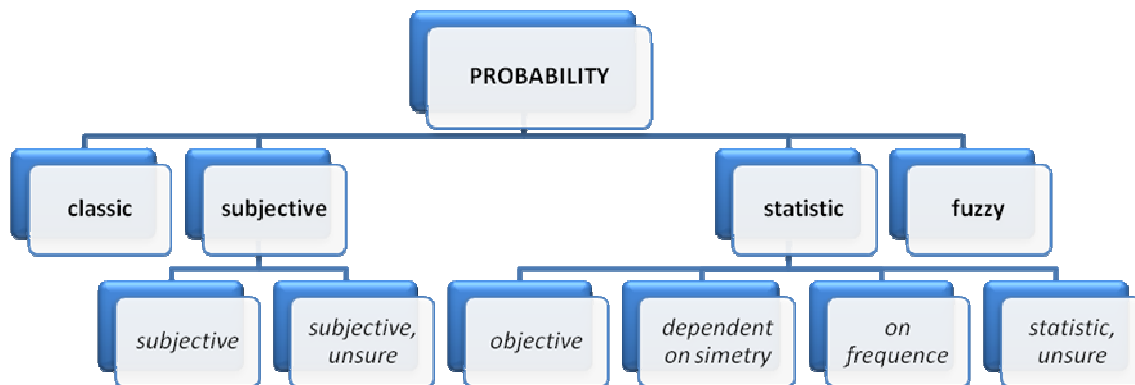
If you don’t even know the odds, that’s uncertainty.”

Frank Knight relates the risk with the likelihood of occurrence of an event. He is the first one who finds a linkage between the risk and the mathematical and statistical quantification of the probability, in order to show that risk can be measured and controlled.

Following, according to Frank Knight, one of the basic elements of FRM is the notion of probability. Knowing the origins of probability is for different situations of risk, as well important as the concept of probability *per se* (Saliger, 2003: 43).

Summarizing the points of view of different researchers, we can identify the following types of probabilities, Figure no. 2.

Figure 2: Types of probabilities



(Source: own representation)

For the present paper, the effectively subjective probabilities and those called statistic, objective play a major role.

In order to subjectively estimate the probabilities, the decision-maker's attitude towards risk has a decisive role. There are businesses in which the decider risks his own money, his own business (eg. antreprenour) or he risks the money of someone else (eg. the manager who is not the owner). The question is if taking risks (assuming the possibility of loss) is justified and whether taking high risks can lead to appropriate remuneration.

Each decision-maker has a default, instinctive preference towards risk, preference which takes into account their personal disposition and character received from nature. By knowing someone's individual preference towards risk, one can anticipate the future choices and decisions that will follow. If we take into account that, most of the time, people are reluctant to change, by relating to it with fear, distrust, it is safe to say that the same people have a certain degree of aversion to risk. Often, those who run businesses tend to take risks more easily when their own position in the structure of the firm is threatened (having more to lose than to gain if they don't take action), or in situations where decisions can threaten the

survival of the firm and they are not willing to take risks that would jeopardize the existence of the company. If these decision-makers have in mind that the company's market position is threatened by the competition, they are more likely to engage in risky actions.

The managers' attitude towards risk is not always the same. It depends on the specific individual characteristics, as well as on contextual factors. We can say that, in general, the smaller the probability of getting the wanted results is (the uncertainty of obtaining certain results is greater) and /or the more difficult to achieve (more ambitious) the objectives are, the more risky are the decisions. The way one perceives a situation where a decision is required, the manner in which risky situations and appropriate alternatives are identified and assessed depends on the decision-makers's attitude towards risk.

Thus, the attraction toward risk reflects the individual's natural tendency of assuming or avoiding risk-taking. This influences the assessment and selection of alternatives for decision-makers. Identifying, prioritizing or classifying and quantifying risks, assessing a situation as being more or less risky, depends on the perception and the attraction towards risk. The control of the consequences of risk and of the uncertainty of the firm's business environment is the essence of risk management.

The second chapter entitled "Theoretical Fundamentals Regarding the Financial Risk Management" classifies risks according to several criteria, Stocker's analysis from 2006, developed by Keitsch, being highly relevant in this regard. The following categories are distinguished:

1st Category: Uninfluenced risks;

2nd Category: Political and / or macroeconomic risks;

3rd Category: Company related risks;

The first category, *uninfluenced risks*, is represented by earthquakes, floods, lightning and storms. These risks are natural disasters that cannot be anticipated, such as the tsunami in Japan in March 2011 which destroyed not only the defense shield of the atomic reactor in Fukushima, but resulted in a even greater geological catastrophe than the one in Chernobyl, Ukraine, from the 26th of April 1986. If the company is confronted with these risks, immeasurable negative consequences may occur, even to their full resolution.

Political and / or economic risks from the second class describe the changes and transformations of the macro-context and social mezo-economic areas where companies are activated financially. These political and / or economic risks describe the risks arising from social and economic transformations at different levels of national or regional macroeconomics.

Company related risks, the third category, are divided into three different groups:

- 3rd Category, Group 1: Business risks;*
- 3rd Category, Group 2: Financial risks;*
- 3rd Category, Group 3: Operational risks;*

Business risks have a negative impact on the economic strategies and goals of companies, on the organization, supply, sales and also on the research and development of new products. These business risks relate to the most important departments in the company and influence its strategic decisions, predefined products and essential innovations.

Financial risks are related to the liquidity and the dependencies generated by fluctuations in interest rates and exchange rates, respectively to the risk of losses in various financial positions. The range of action of the risks in this group covers all financial positions of companies and is defined as risks of loss. They are rooted in a lack of liquidity or financial planning or in an unpredictable daily volatility of financial markets, as well as unanticipated changes in financial performance or financial positions.

Operational risks describe the negative influences on the operational structure of the enterprise, business processes, same as the negative influences on the staff and IT. They are defined as internal and organizational risks and are found within the organizational processes, the general organization of the company, the company structure, the procurement system, the range of sales, the technology used by employees, and staff structure.

To be more suggestive, in Figure 3 we represented graphically the complexity of risk in a company (Keitsch, 2007: 6):

Figure 3: The breakdown of the risks within a company



(Source: Keitsch, 2007: 6)

Of course, the three different risk categories are interdependent. Each risk category influences the others more or less.

Closely related to the notion of risk, are the *cash-flow* and *risk-flow* concepts. From a practical view, the treasury department of a company understands the concept of *cash flow* as the future cash flows of the company. For this reason, the flows of cash are divided into safe and unsafe flows.

Foreign exchange transactions and market transactions result in a secure *cash flow*, which can be measured at the time of the signing of a contract.

In terms of future cash flow safety, *cash-flows* become an issue when they come from contracts with financial derivatives which, at the time of signing the contract, cannot calculate the future cash flow. Even in the case of credits that can be refinanced, such as *roll-over*, we can only know the moments of potential change in interest rates, but not the size or its future volatility. In this context we mention the option contracts which have as result an uncertain *cash flow*.

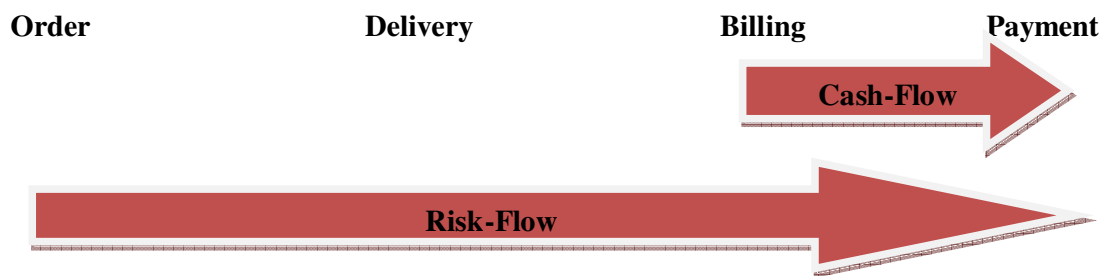
Based on these considerations, forecasting cash flow should include information on assumed risk. Not the *cash-flow*, but the *risk-flow* is the most important in financial and accounting departments.

Risk-flow precedes the actual existence of cash flow. In addition, *risk-flow* expresses the involved, realted risks such as fluctuations in interest rates, currency or failure of each *cash flow*. In other words, *risk flow* not only takes into account the pure cash flow, but also the risks that accompany it.

Risk-flow includes all the transactions of a company that generate cash-flow, or that are most likely to generate cash-flow, not matter if the cash-flow is tangible now or in the future. Therefore all the transactions are taken into account, even the ones that are not embodied in the financial department and which belong to core business activities of the company.

In order to clarify the interdependencies between the two concepts, we used the graphical representation in Figure 4 (Keitsch, 2007: 58):

Figure 4: Comparison between cash-flow and risk-flow



(Source: Keitsch, 2007: 58)

As it can be observed from the previous scheme, *risk-flow* is cash flow before actual entry. More specifically, it is generated at the very beginning of the order and exists throughout the future delivery, invoicing and the actual payment. *The cash-flow* appears much later, with the moment of invoicing /billing and the actual payment.

In the *third chapter*, "Risks' Quantification", we focused on various strategies used in current management practices, in general, in order to manage risk successfully, and in financial risk, in particular. The most commonly used strategies are:

1. Operational flexibility;
2. Real options theory;
3. *Hedging*;
4. Other strategies, such as *outsourcing* or tools specific to mergers and acquisitions.

The concept of operational flexibility, which is specific to real options, is now mostly replaced by intuition of the successful agents which have executive positions, and is based on their subjective experience. Their strategies, and the ramifications used to analyze the future status of the company in a dynamic environment of uncertainty and risk, the Risk Management Department has the opportunity of using operational flexibility through various options of action. It can perform multiple operations in order to avoid pessimistic scenarios of the enterprise's evolution and in order to benefit from future opportunities.

The real options theory embodies an agreement between the buyer and the seller, through which the buyer has the right, but not the obligation, to buy or sell a financial instrument at a predetermined price whenever he wants, within a predetermined period of time. The *payoff* is the yield of the option and depends on the active price at due time. If the price of the underlying is higher than the strike price, as for call options, or smaller than the strike price, as for put options, then the option is exercised. Otherwise the option is not used, as it does not bring any economic gain.

Real options are options of purchasing, selling or exchange of real assets in the most favorable business terms. The decision-maker reserves the right, not the obligation, to exercise them on a predetermined period of time.

In order to be entitled to this right the buyer pays a premium, which is the price of the seller. If the buyer decides to exercise the right to buy or sell the financial asset, the seller has the obligation to deliver or accept the delivery of that financial asset at the exercise price, regardless of the current asset price. For this reason, a potential loss for the seller is

theoretically unlimited. On the other hand, if the buyer decides not to exercise the right, leaving the option to expire (*burn-out*) his loss is limited to the paid premium.

According to the right granted, the options are of two types: *call* and *put*. A *call* type option gives the buyer, the one who pays the premium, the right to purchase the core financial asset. The option specifies the strike price at which the asset can be purchased at the due date or prior to the due date of the option. A *put* type option gives the purchaser the right of selling the core financial asset (the *underlying*) at the due date or prior to the due date of the option at a predetermined exercise price.

Each option contract has two parts: one that sells and that holds a *short* position and another one that buys, having a *long* position. Therefore we have, theoretically, four possible situations: a long *call* position, i.e. a buy of a *call*, a short position in *call* option, i.e. the sell of a *call*, a long position in a *put* option type, which is a buy of a put and a short position in a put option, meaning the sell of a *put*.

The hedging is another strategy that is used by the current risk management in order to minimize potential risks for the enterprise. It can take many forms. In the practice of multinational companies, the most widely used is *foreign currency hedging*, which involves one or more transactions conducted in order to protect against exchange rate risk. It refers to hedge transactions, which aim to maintain the purchasing power of a currency by making successive spot and forward transactions.

Other strategies used in current risk management practice are outsourcing, mergers and acquisitions transactions, which have as main purpose the increasing of volatility and decreasing of predictability of future actions and business operations.

With the delineation of these theoretical aspects, we decided to move on to describe various methods to quantify risk. Therefore the risk assumed was defined in this paper on one hand as the danger of loss (*upside* and *downside risk* respectively), a loss which can be quantified for example by the “Value-at-Risk” method, “Lower Partial Moments” or “Financial Mobility at Risk” and on the other hand the volatility that can be quantified using the variance ($\sigma(x)^2$), the standard deviation ($\sigma(x)$) or risk ratio (β) of MEAF – The Equilibrium Model of Financial assets (Holst, 2003: 79-98).

“Value at Risk” (VaR) is a method of measuring of what we call “downside-risk” and which is used to measure the volume of potential losses. This means that only the “negative” probability distribution is taken into account (Schierenbeck, 2003: 73-80).

The method mentioned above aims to determine the value of financial assets when the risk is real. In other words, the VaR is a risk indicator, which quantifies the statistics of past experiences with the investor’s maximum loss which can be generated by a particular financial instrument or a portfolio of financial instruments in a predefined period safety with a default safety (Feucht, 2001: 263).

In financial theory there are three kinds of “Value at Risk” models (Feucht, 2001: 263):

1. Variance-covariance models,
2. Monte Carlo simulations and
3. Historical simulations.

The “Lower Partial Moments” Method (LPM) describes another way to quantify the downside risk. LPM embodies only one part of the probability distribution, more specifically, only the negative deviation of an economic variable in comparison to a certain level (*benchmark*). The economic barrier can be for example, the average (μ) or another value from the operational or strategic plan. The result obtained by LPM is expressed in absolute values not in percentage.

The method “Financial Mobility at Risk” or “Liquidity at Risk” defines the possibilities of action and degree of dynamism of the economic agent when a certain risk becomes real. The tools that the business uses in these situations are from ART and ARF area (Schierenbeck, 2003: 3).

An important aspect of financial risk management is the risk adjustment of the various reports, respectively of the various indices. The most important, known and used three profitability indices are:

1. The ROE , respectively “Return on Equity”
2. The RORAC, respectively “Return on Risk Adjusted Capital” and
3. The Raro (RA), respectively “Risk Adjusted Return on (Risk Adjusted) Capital”.

Throughout the paper we will work with three different groups of models, namely: model group “Alpha” which is based on the principle of economic decision of Pierre Simon Laplace, group “Beta” based on on the principle of economic decision μ and group “Gamma” which is based on the principle of economic decision $\mu - \sigma$.

Table 1 illustrates the connections between the groups of models and the rules used in economic decisions:

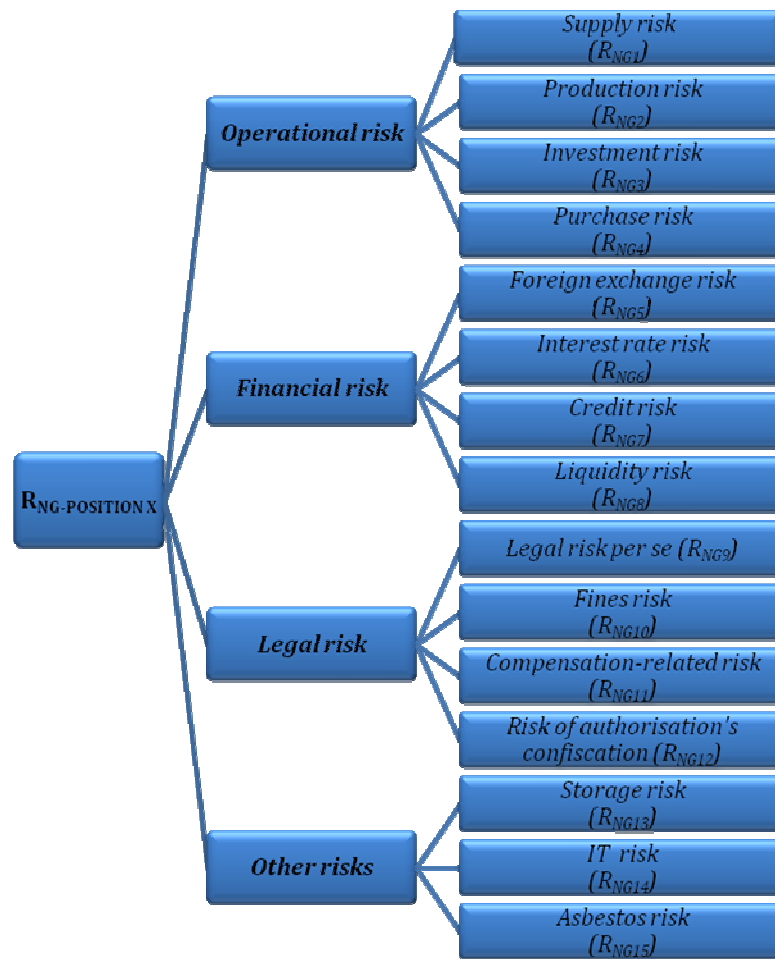
Table 1. The groups of Alpha-Beta-Gamma models

	The group of “Alpha” models	The group of “Beta” models	The group of “Gamma” models
The decision-making principle	<i>Laplace</i>	μ	$\mu - \sigma$

(Source: own representation)

The following figure describes graphically the 15 major different sources of risk as defined by the department of “Risk Management” of the Wienerberger International Group.

Figure 5. RNG-position x



(Source: own representation of the Wienerberger Management Annual Report, 2008: 140-144)

The risks are predetermined by the Wienerberger Group and have been kept throughout the paper in order to ensure the comparability of results and the feasibility of the FRMC model in the process of decision within the Group. The $R_{NG\text{-position } x}$ risk numbers for the 15 types of preset financial risks are chosen by the economic agent, the one who must take the economic decision.

They are quantified using round natural numbers from 0 to 10, 0 representing the lowest possible financial risk, respectively the safety situation, and 10 being the highest possible financial risk.

The following table shows the number assigned to each R_{NG} risk index adequate characterization to increase understanding of the situation relating to:

Table 2. The assignment of words → numbers

R _{NG} -poziția x	Representative words	Detailed listing
0	Non-existent risk	Means a non-existent risk for position x or a risk that: <ul style="list-style-type: none"> • was forgotten • was not forgotten, but was not recognized or • was not forgotten and was recognized, but could not be quantified • was not forgotten, was recognized and quantified, but could not be implemented
1	The lowest possible risk	Means the lowest risk possible, but still existent for position x
2	Low risk	Means a low existent risk for position x
3	Minor risk	Means a minor existent risk for position x
4	Moderate risk	Means a moderate existent risk for position x
5	Medium risk	Means a medium existent risk for position x
6	Above-average risk	Means an above-average existent risk for position x
7	Increased risk	Means an increased existent risk for position x
8	Major risk	Means a major existent risk for position x
9	High risk	Means a high existent risk for position x
10	The highest possible risk	Means the highest existent risk for position x.

(Source: own representation)

Chapter four called “The International Group Wienerberger and Some Characteristics of the Risk Management in the Group” has the purpose to acquaint the reader with some of the defining attributes of this company. It is one of the leading international companies in the construction industry, more specifically in the production of bricks. Basically, the Wienerberger Group is an Austrian multinational manufacturer of construction systems, roofs, pavements, etc. (online Wienerberger, 2011).

This economic entity is the largest producer of bricks in the world and the second largest producer of roof tiles in Europe. The group is present on brick markets for non-load bearing and bearing structures and also on the segments of clay and concrete roof tiles. In addition,

the Group manufactures clay and concrete pavements as well (online Wienerberger, 2011). Founded in 1819 in Vienna, Wienerberger has been listed on the Vienna Stock Exchange ever since 1869.

Today, the Group owns 263 plants in 26 countries, data which is based on an impressive tradition in the production of bricks. 1986 marked the beginning of the company's geographical expansion, and it soon turned into a multinational company which shortly became a world leader (online Wienerberger, 2011).

The Wienerberger multinational company is considered the undisputed leader in constructions, being, by their own published data, the number one worldwide in the production of ceramic blocks, number 1 in Europe for the production of apparent bricks, number 2 in US for the production of bricks, number 2 in Europe for roofing systems and number 2 in Central and Eastern Europe for pavements. The primary focus on business production and the introduction of the “Value Management” concept in 1997 influenced majorly the international business strategy (Börsen-Zeitung, 2011). The main objective of the company was and continues to be the creation of long term value for the shareholders, customers and employees. This is materialized by a steady annual growth in revenues and profits. The Wienerberger stocks are so appealing due to the elevated / high *cash flow* and the *risk* that *high-flow*, the assumed risk being relatively low, and due to the potential for profitable growth, and earnings in dividends (online Wienerberger, 2011).

Based on the fact that Wienerberger Group was listed to the Vienna Stock Exchange since 1969, we took into consideration possible structural breaks that could coincide with the official date of implementation of financial risk management models, FRMC (1st of July 2010) in the 11 units of the Group. In this respect, we applied structural breaks tests, namely the ones elaborated by Zivot-Andrews and Lee-Strazicich. These tests were applied to both the daily and weekly data for the period 1st of January 1990 – 30th of September 2011.

A descriptive analysis of data revealed the presence of a leptokurtic distribution due mainly to the fact that the information arrived on the market takes time to be included in the quotation, this leading to a cluster behavior of rentabilities.

The first method used by us that of Zivot and Andrews takes each point as a potential break point in the data (T_B) and establishes one regression for each possible data break. Of all possible breakpoints, the procedure selects the data split which minimizes the one-sided t-statistics when testing $\hat{\alpha} = \alpha - 1 = 1$. According to Zivot and Andrews, the presence of final points causes the asymptotic distribution of statistics to diverge to infinity.

Zivot and Andrews have developed three models to test the unit root: model A (allowing a single change in constant), model B (single change in slope corresponding to the trend function), model C (allows both constant and slope change in the trend function). The last model can be described as follows:

$$\Delta Y_t = c + \alpha Y_{t-1} + \beta t + \theta DU_t + \gamma DT_t + \sum_{j=1}^k a_j \Delta Y_{t-j} + \varepsilon_t$$

where:

DU_t – a dummy variable for a mean variation that can appear to each possible break (T_B)

DT_t - reveals the variation of trend.

Applying the three models, it could be noticed that no model of the Zivot-Andrews test identified the date of introducing financial risk models as a structural break.

The second method used to analyze possible structural breaks was that of Lee and Strazicich proposed in 2003-2004, a test based on the Lagrange multiplier, with one and two breaks. In order to test the presence of unit roots using the above-mentioned test, we used two models, namely AA (with a break both in constant and trend) and CC (with two breaks in constant and trend).

Both the daily and weekly observations showed the same behaviour, i.e. two breaks: one in constant and one in trend. The structural break in constant takes place on 28th of October 1997 for daily observations (for the AA model) and 6th of August 1999 for the weekly data. With respect to the break in trend, it takes place in the first week from January 2009 for both observations. The break in trend identifies the decline of the global financial markets: January 2009 is the period in which the stock exchange indexes fell dramatically. In other

words, the introduction of financial risk management model does not represent a break in the stock exchange quotation of the Group.

Consequently, as a result of using both Zivot-Andrews and Lee-Strazicich test, we can say that the date of implementation of financial risk management models is not a structural break in the evolution of the Wienerberger Group stocks.

The division of the International Wienerberger Group in its five business sectors is very relevant to this paper and to the FRMC's development. These five different business departments, geographically separated, will be important to describe the different models of FRMC and for the understanding of the distribution process of different funds with the aid of different models of FRMC (Wienerberger 2008: 29).

The first department "Central and Eastern Europe" ("CEE") includes the following countries: Austria, Poland, Czech Republic, Hungary, Slovakia, Slovenia, Croatia, Bosnia, Romania, Bulgaria, Russia, Ukraine, Serbia, Macedonia, Finland, the Baltic and the segments of production "Semmelrock", "Bramac" and "Tondach Gleichstätten" (SG, 09/2005: 22-24).

The second department "Central and Western Europe" ("LCA") spreads through Germany, Italy and Switzerland (Wienerberger Online 2010).

The third department "North-West" ("ENV") holds the management departments for the following countries: Belgium, Netherlands, France, United Kingdom, Ireland, Denmark, Sweden and Norway (Wienerberger 2008: 29).

The fourth department, "North America" ("year") targets businesses in Canada and the United States of America (Wienerberger Online 2010).

The fifth department, "Various participations and other business" ("DPAA") deals with various real estate activities, such as the project "Pipelife" and lately and the latest investment of the Wienerberger Group: India (Wienerberger 1-2009: 3).

The two subgroups - "geographical allocation" (in short, AG) and "balance sheet items' allocation" (in short, AP) - of each FRMC model group cover two different economic levels. The notion "geographical allocation" is generally focused on different areas of action,

while the notion of “balance sheet items’ allocation” focuses on the different items of the quarterly or annual balance sheet.

The following table describes the six cards of existing financial risk management:

Table 3. The six types of FRMCs

	Group “Alpha”	Group “Beta”	Group “Gamma”
	based on $R_{NG-Alpha}$ index	based on $R_{NG-Beta}$ index	based on $R_{NG-Gamma}$ index
“AG” Model	$FRMC_{Alpha-AG}$	$FRMC_{Beta-AG}$	$FRMC_{Gamma-AG}$
“AP” Model	$FRMC_{Alpha-AP}$	$FRMC_{Beta-AP}$	$FRMC_{Gamma-AP}$

(Source: own representation)

The next step is to describe the various R_{NGS} , which are replaced with predefined scoring numbers, between 0 and 10, by the Risk Management Department of the Wienerberger Group, as shown in Table 4. Based on the choice and use of risk indices of $FRMC_{AG}$ subgroup models, we have predicted the reality the Wienerberger Group was about to face, both in 2010 (based on 2009 data) and in 2011 (based on situation of 2010).

Table 4. FRMC_{AG} for Wienerberger in 2010 and 2011

FRMC _{AG}											
Risk No.	Risk type	The five geographic activity areas of Wienerberger Group									
		ECE		ECV		ENV		AN		DPAA	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
1	Supply risk	4	5	3	4	2	4	3	3	0	0
2	Production risk	6	6	9	9	8	7	6	8	4	4
3	Investment risk	5	8	7	7	4	5	3	6	5	6
4	Purchase risk	4	5	2	5	3	4	7	5	9	7
5	Foreign exchange risk	8	9	2	4	5	4	7	8	8	6
6	Interest rate risk	6	8	1	2	4	3	5	6	6	7
7	Credit risk	6	7	1	2	4	3	5	5	6	7
8	Cash-flow risk	4	6	1	4	1	5	3	7	4	5
9	Legal risk	7	7	4	5	5	5	8	8	9	9
10	Fines risk	7	7	4	5	5	4	8	8	9	9
11	Compensation-related risk	2	4	3	4	3	3	10	10	7	7
12	Risk of authorisation's confiscation	6	7	5	4	5	3	10	10	8	8
13	Storage risk	4	4	6	4	6	5	6	6	5	6
14	IT risk	1	1	3	2	3	2	5	3	2	2
15	Asbestos risk (only in USA)	0	0	0	0	0	0	10	10	0	0
Total	R_{NG}-Alpha-AG position x	4,67	5,60	3,40	4,07	3,87	3,80	6,40	6,87	5,47	5,53
Total	R_{NG}-Beta-AG position x	4,93	5,95	3,58	4,48	4,00	4,08	6,00	6,60	5,38	5,18
Total	R_{NG}-Gamma-AG position x	11,93	17,44	13,77	13,97	9,85	8,71	13,43	15,58	16,73	19,16

(Source: own calculations)

The R_{NG} s of different regions and the sources of risk are the main component of financial risk quantification by using a $FRMC_{AG}$. This requires the very careful selection of the various R_{NG} indices, as the entire decision and all the conclusions largely depend on this choice. Besides selecting various R_{NG} , the decision rule chosen (so opting for Group Alpha, Beta and Gamma) has, most times, an impact on economic decision and final conclusions.

The purpose of this paper is the applicative analysis of risk in financial management with the aid of the financial R_{NG} risk index and of the financial management risk card $FRMC$. In the subchapters of this paper, with the help of the three different groups of $FRMC_{AG}$ – Alpha, Beta and Gamma – we have calculated the risk situation for Wienerberger Group for the year 2010 with the economic data of 2009 and 2011 economic year based on the situation in 2010. $FRMC$ links theory to practice and combines the theory from the fourth chapter with the situation for Wienerberger International Group.

The three new ways to quantify risk – $FRMC_{Alpha}$, $FRMC_{Beta}$, $FRMC_{Gamma}$ – have described in a new manner, and from different points of view, the risk status for the International Group of 2010 and 2011 and linked the theory related to $FRMC$ to the reality of the existing markets for the company. Taking into account all three forms of the management cards, $FRMC_{Alpha-Beta-Gamma-AG}$, the hierarchy is the following:

Table 5. The sequence of actions according to $FRMC_{AG}$ in 2010

$FRMC_{Alpha-Beta-Gamma-AG}$					
	The five geographic activity areas of Wienerberger Group				
	ECE	ECV	ENV	AN	DPAA
$R_{NG-Alpha-AG}$ position x	3	1	2	5	4
$R_{NG-Beta-AG}$ position x	3	1	2	5	4
$R_{NG-Gamma-AG}$ position x	2	4	1	3	5

(Source: own hierarchy)

In this case, the implementation of the second moment of distribution, meaning the implementation of variance, gave different results compared to its omission. $FRMC_{GammaAG}$ did not have the same recommendation as the previous models,

which means that, in this case, it was worth consuming the energy and extra time to calculate the $FRMC_{\text{GammaAG}}$, because the results are more accurate comparing to the other two models of FRMC.

According to $FRMC_{\text{Alpha-Beta-Gamma-AG}}$ it is recommended (in terms of risk) to make an allocation according to the following order:

Table 6. The sequence of actions according to $FRMC_{\text{AG}}$ in 2011

$FRMC_{\text{Alpha-Beta-Gamma-AG}}$					
	The five geographic activity areas of Wienerberger Group				
	ECE	ECV	ENV	AN	DPAA
$R_{\text{NG-Alpha-AG}}$ position x	4	2	1	5	3
$R_{\text{NG-Beta-AG}}$ position x	4	2	1	5	3
$R_{\text{NG-Gamma-AG}}$ position x	4	2	1	3	5

(Source: own hierarchy)

After restructuring the plan of the new management of the Group, its development, in terms of minimizing risk, lies in the region of the Northwest, which is clearly followed by the region of Central and Western Europe.

The second part of our empirical study is given by the financial risk management card, “balance sheet items’ allocation” ($FRMC_{\text{AP}}$). The card analyzes the monetary allocation on the following five items of short-run assets of the International Group Wienerberger (Wienerberger, Annual Report 2008: 102): “Deposits reserves on the short run” (RDTS), “accounts receivables” (CDF), “other short-run receivables” (ACTS), “short-run securities” (HVTS) and “money” (MM).

In the following table we have replaced the various R_{NGS} with predefined numbers given by the RM department of Wienerberger Group, with values between 0 and 10, in order to bring the table as closely as possible to the reality analyzed by the Group for the years 2010 and 2011.

Table 7. FRMC_{AP} for Wienerberger in 2010 and 2011

FRMC _{AP}											
Risk no.	Type of risk	The five items of short run assets regarding the Wienerberger Group's balance sheet									
		RDTS		CDF		ACTS		HVTS		MM	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
1	Supply risk	3	4	2	3	1	2	2	3	7	9
2	Production risk	5	6	2	3	1	2	0	0	3	5
3	Investment risk	4	4	0	0	0	0	5	4	7	9
4	Purchase risk	3	2	0	0	0	0	2	5	6	7
5	Foreign exchange risk	2	4	5	7	5	6	6	9	9	9
6	Interest rate risk	2	4	0	3	1	3	4	6	6	7
7	Credit risk	4	5	2	3	2	3	6	8	8	9
8	Cash-flow risk	5	7	3	7	3	4	7	9	8	8
9	Legal risk	3	4	1	2	1	4	3	6	7	10
10	Fines risk	7	7	0	2	0	0	8	8	10	10
11	Compensation-related risk	4	4	4	5	3	4	3	5	9	9
12	Risk of authorisation's confiscation	8	7	6	6	6	7	1	3	2	4
13	Storage risk	9	9	3	4	3	5	0	0	4	5
14	IT risk	1	1	4	2	4	2	3	3	5	2
15	Asbestos risk (only in USA)	10	10	0	0	0	0	6	8	10	10
Total	R_{NG}-Alpha-position x	4,67	5,20	2,13	3,13	2,00	2,80	3,73	5,13	6,73	7,53
Total	R_{NG}-Beta-position x	4,08	4,75	2,15	3,15	1,95	2,73	3,63	5,03	6,80	7,70
Total	R_{NG}-Gamma-position x	12,05	14,13	7,51	15,41	7,20	12,22	11,70	23,01	13,64	4,56

(Source: Wienerberger Management Annual Reports 2009, 2010)

As previously stated, the purpose of the present paper is to analyze the application of risk in financial management with the help of the financial risk index R_{NG} and the financial risk management card called briefly FRMC. The three different groups of $FRMC_{AP}$ – Alpha, Beta and Gamma – have analyzed throughout the paper the risk situation for Wienerberger Group for years 2010 and 2011 with the database from 2009 and 2010.

All three models: $FRMC_{Alpha-Beta-Gamma-AP}$ recommends (in terms of risk), an identical allocation of money, such as the following sequence:

Table 8. Sequence of actions by $FRMC_{AP}$ for the year 2010

$FRMC_{Alpha-Beta-Gamma-AP}$					
	The five items of short run assets regarding the Wienerberger Group's balance sheet				
	RDTS	CDF	ACTS	HVTS	MM
R_{NG}-Alpha-AG position x	4	2	1	3	5
R_{NG}-Beta-AG position x	4	2	1	3	5
R_{NG}-Gamma-AG position x	4	2	1	3	5

(Source: own systematization)

In this case, the introduction of the second moment of distribution - σ^2 - has not brought different results compared to its omission. $FRMC_{Gamma-AP}$ had the same recommendation as $FRMC_{Alpha-AP}$ and $FRMC_{Beta-AP}$, therefore, in this case, the extra time the energy used to calculate the $FRMC_{Gamma-AP}$, was simply not worth it, because the results are identical to the other two models of FRMC.

All three models of $FRMC_{Alpha-Beta-Gamma-AP}$ recommend, in terms of risk exclusively, an identical allocation of money, such as the following sequence:

Table 9. FRMC Sequence of actions by FRMC_{AP} for the year 2011

FRMC_{Alpha-Beta-Gamma-AP}					
	The five items of short run assets regarding the Wienerberger Group's balance sheet				
	RDTs	CDF	ACTS	HVTS	MM
R_{NG}-Alpha-AG position x	4	2	1	3	5
R_{NG}-Beta-AG position x	3	2	1	4	5
R_{NG}-Gamma-AG position x	2	3	1	5	4

(Source: own systematization)

The introduction of the second moment of the distribution did not bring different results compared with the omission of σ^2 in this case either. FRMC_{Gamma-AP} had the same recommendation as FRMC_{Alpha-AP} and FRMC_{Beta-AP} and therefore, in this case, the extra time and energy used to calculate the FRMC_{Gamma-AP}, was simply not worth, because the results are identical to the other two models of FRMC.

CONCLUSIONS

This paper intends to be an advocate of the implementation of financial risk management in the context of planning and making strategic and operational decisions at various levels of micro, meso-, and macroeconomic management entity. Therefore, its purpose was to emphasize the different aspects of applying risk in financial management with the concrete example of Wienerberger International Group.

In order to survive in a global complex economic climate which became even more unpredictable starting with the financial crisis of 2008, the Wienerberger International Group has adopted a very aggressive approach on various international markets and has not used only the financial risk management to their advantage, but many other similar instruments.

Following the heavy research, studies and analysis undertaken in the theoretical plan on financial risk, especially in the various models of the financial risk management card (FRMC), we have reached to the following conclusions:

- The R_{NG} is a new risk index after N-Grünewald. It is the base of the so-called FRMC concept, the financial risk management card, which is a new additional tool for controlling, which involves the implementation of Risk Management in the economic decision-making process;
- The FRMC is based on the subjective experience of the decision-maker while combining various economic rules with the businessman's subjective experience. The information that enables the creation of various R_{NG} indices after N-Grünewald comes from two sources, the first being a subjective source and the second an objective one. The first source is based on various subjective information and on the

decision maker's experience. The second part is represented by the decision rule, after which the RNGs are built to a predefined position x . For the "Alpha" group the decision rule takes into account the probability calculated by Laplace, so the contribution of the different RNGs to the final result of a predefined x position. For the "Beta" group the decision rule is μ , and for "Gamma" the decision rule is $\mu\text{-}\sigma$;

- The use of the different FRMC in the various "feed-backs" and "feed-forwards" and in its implementation in the theory of financial risk management in the process of economic decision-making brings a new perspective on the process of making this kind of decision, which can minimize the probability of choosing the incorrect option. The FRMC can be considered a new instrument of Risk Management along with the well-known methods of controlling, such as Value at Risk, Lower Partial Moments, the variance, the standard deviation or risk index β from MEAF, which can be used on its own or together with the other instruments.

From a global perspective, the concept of FRMC, defined as an organic component of the financial risk management strategy, is a new opportunity for analysis, modeling and quantifying the financial risks for the informational based risk-flow.

One of the greatest difficulties we have faced during the preparation of this paper was to obtain the data; respectively the identification of the reasons behind the choice of R_{NG} values, because these indices are at the base of the subjective component of FRMC, no matter is we have in mind $FRMC_{Alpha}$, $FRMC_{Beta}$ or $FRMC_{Gamma}$. This disadvantage appeared while writing the paper as a consequence of the excessive protection of internal and external data by several decision agents in the Wienerberger International Group. However, the above mentioned disadvantage does not have a negative impact on the quality of RNGs or on the FRMC models in the daily economic life.

This happens because the excessive protection of internal and external data does not exist for the person that uses and implements the FRMC in regular economic decision-making. The reason behind the excessive security is the fierce competition that has emerged in the construction shortly before the current economic crisis and which will continue to exist even after overcoming it.

Another problem could be the allocation of the 11 values, respectively the descriptions if the different RNGs (the R_{NGS} are defined from 0 to 10). The possibility to overcome this inconvenience lies in the omission of some numbers and some words, for example, leaving aside number 6 from the RNG scale, other in other words the above-average risk for the position x . This possibility exists and is mentioned because the FRMC is an instrument of modern financial controlling, which takes into account minimizing the time in which the economic decision is taken. However, in this case, we can firmly state, that the omission of numbers from the 0-10 scale, can lead to distortion of results by forging the FRMC's base, and the RNG's.

Concluding the above, it should be mentioned that the main factor that determines the success of an economic entity is the assumed and the accepted risk. The risk and the economic opportunity are the two sides of the same coin, like the Ying-Yang Chinese principle.

The FRMC is a new opportunity that quantifies relatively simple the assumed and accepted financial risk. It is important to know that the concept of financial risk is based on the cash-flow seen through “risk-flow”, which implies much more information than just the “cash flow”. The contribution of the different FRMC models to the effective and efficient performance of an economic entity lies in the implementation of the risk management theory in the process of daily economic decision-making, respecting the time constraints that influence the current and future processes of economic decisions.

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