

## MANAGING THE MARKET RISK IN BANKS

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**Abstract.** *On an international level, the last 30 years brought constant increases in the global exposures of the banks (and not only), towards the market risk. All these dependencies and risks, if not properly known and managed, are turning into threats for the entities or persons that have exposure to the monetary market, on the foreign currency market and also on the capital market. These risks were strongly acknowledged in Romania also, following the markets liberalization, creating confusion in many instances and also creating dissatisfaction among the ones that were registering losses. For such reasons even, the current paper aims to scientifically explain the necessity to introduce and use, at a wider scale, some management techniques and instruments for fighting the market risk that has to be assessed before registering any losses and to be understood in exact quantitative terms. The paper presents methods to determine the market's volatility and ends by presenting a case study in which is illustrated how can be optimized a title portfolio consisting of „n” financial assets that are temporarily owned by a person so that this person's exposure to the market risk should be evaluated and diminished. Such an indicator that, by a single value, calculates the total exposure risk by a portfolio of this kind is VaR indicator. This way of ratio calculation is actually a scientific method for historical portfolio simulation and presents the advantage that the methodology relies on a real distribution of probabilities.*

**Keywords:** *Market Risk; VaR; assets and liabilities; volatility; interest margins.*

### Introduction

In Romania, the market risk became present once its effects appeared in 1990 (Treapăt, 2004) at the same time with the markets liberalization: monetary, financial, foreign currency, with establishing the capital markets and the stock exchange market, with creating new financial products, namely the derivatives.

The exposure to such risk may occur as a result of some speculative positions deliberately taken by the bank (own account trading) or may derive from the market creator activities for the clients (dealing). The modification of the conditions on the financial markets may affect the bank through the main three interdependent but separately managed transmission channels. These are: the variation of the evolution trend and of the level of the interest rates, the variation

of the foreign currency exchange rate and consequently, of the local currency value of the various assets and liabilities expressed in foreign currency and the variation of the financial assets rate that may affect the market value of the titles portfolio and the value of the titles issued by the bank (bonds or shares). The financial – banking markets developed also in Romania together with the globalization process, the derivate financial instruments began to be more intensively used, either for protection reasons against the adverse reactions resulted from the market evolution, or purely speculative, trying to obtain advantages depending on the conditions existing on the market.

In our opinion, particularly the usage of such financial instruments induces additional risks at the banks' level, at a systemic level and then, until the crisis unleashes, there is just one single step left. All these market risks types are represented by the author in Figure 1.



**Figure 1. Types of Market Risks**

*The Interest Rate Risk* is in relation with the position associated with the fixed revenue titles and with their derivatives, as Ross, Westerfield, and Jordan (2010) considered. The risk factors that are in the direct relation with the interest rate are estimated in each currency for which the bank has positions that are sensitive to the interest rate, within the balance sheet and also outside. The risk factors refer to the portfolio's sensitivity accepted by the market, where the short and long position on various instruments may be compensated. It is known that the bank has a „long position” when the assets with fixed interest rate are bigger than the liabilities with fixed interest rate. This position is favorable to the bank during the periods of interest rate decreasing, as it benefits from the fixed level of interest rates for the assets (that are bigger), in a period of time when the interest rates are decreasing. The position of the bank is „short” when the assets with fixed interest rate are smaller than the liabilities of the same type, and this is to the bank's benefit, in the period of interest rate increase, as the level of the interest rate stays fixed at a lower level compared with the market trend.

The objective of any bank concerning the prevention of the risk associated with the variation of the interest rate is to achieve an as large as possible margin between the average level of the passive interests and the one of the active interests, and also maintaining this margin for as long as possible, meaning, in conditions of minimum volatility of the market.

*The Foreign Currency Risk* or the risk of currency rate is determined by the probability that a variation of the currency rate of the market to lead to a net profit diminishing for the bank or to negative influences upon the banking interest margin. Several studies, such as Ionescu (2003) and Roxin (1997) underline that

the risk impacts, obviously, the banking operations in foreign currency, performed on own name or to the clients' orders, the exposure being directly proportional to the difference between the assets and liabilities in foreign currency from the same maturity category, and has three components. The first component is the exposure due to banking transactions developed with assets and liabilities that sensitive to risk. The second is represented by the exposure associated with the operations of conversion from one foreign currency to another, and the last one, by the economic exposure that undertakes the influence of the foreign currency rates fluctuations upon the bank's value and is calculated as the discounted value of all the incomes obtained by the bank, in all its operating foreign currencies.

*The Risk of Shares* represents the probability that a bank registers losses or not achieves the estimated incomes, following the unexpected modifications of the owned financial assets prices on the market. This risk category refers to having the certain positions in the trade register, positions that are related to the shares or instruments having a similar behavior and their derivatives (e.g. Futures and Swaps). Also, the risk related to shares is calculated for the specific risk that is associated with the ownership of a title and also, for the position on the market, as a whole. For the derivatives, the risk is evaluated by converting the derivative into a notional position of shares on the initial instrument. The equilibrium prices are the ones that settle the market based on the rate between the demand and supply. When this report is unbalanced, the prices of the financial assets register significant variations that express the volatility of the price. For a complex and diversified portfolio of financial assets, the effect of some titles' variation may be compensated, at least partially, by reverse variations of other ownerships, fact that, at the level of an entire bank that professionally manages the assets and liabilities, may not only lead to loss avoiding, but also has to lead to profit making.

We may thus state that the sources of risk on the market are the price variations of the financial portfolio, of the own capital instruments, of the interests spread and of the foreign currencies exchange rates. This is why, its major components are the risk related to the shares position, the risk related to the goods, the risk of the interest rate and the foreign currency exchange rate risk.

### **Methods for evaluating and measuring the efficiency of the risk covering operations**

This extended development of the derivative instruments that we have mentioned before, allowed the banks to cover the risk of the open positions in more and more complex ways. Yes, as the liquidity of the market is a crucial precondition for using such instruments, there increased the researchers' preoccupation concerning the evaluation and the efficiency of the risk covering operations, by more sophisticated methods. These preoccupations are also the focus of our current work and thus, we will perform an empirical analysis of the most used methods of evaluation and measurement of the Romanian banks' exposures to the risk.

### ***The Value at Risk (VAR)***

Most of the banks that are key actors with big exposures to the market risk have implemented complex risk indicators and instruments for evaluating the impact of the risk upon the activity, tools that can be applied to different markets. Although the specific arrangements may differ, these internal evaluation models are usually framing into the common conceptual scenery. Typically, these models are evaluating the aggregated exposure to the market risk a bank has and, given the probability level, they estimate the amount that the bank would lose if it owned certain assets for a certain period of time. As such models, relying on VAR cover a series of market risks, the bank may „adjust” its portfolio’s structure, by choosing from a series of options for diversifying its portfolio, for reducing the risk it is exposed to and/or the associated capital requirements.

The data that are the input in the VAR-based model comprise information about the bank’s positions and the prices, the volatility and their risk factors such as the term of the assets. The data must be comprehensive enough for illustrating all the risks that are incidental to the bank’s balance sheet positions and to the positions outside the bank’s balance sheet. All the risks that are covered by the model must include all the positions related to the interest, foreign currency rate, shares, commodities and to the options in the bank’s portfolio.

The evaluation parameters include the duration of ownership, the historical time span considered for the observation, the prices of the risk factors and the trust interval that allows a prudent judgment for the optimal protection level (meaning, that identifies the maximum acceptable losses).

The time span considered for the observation will be chosen by the bank so that it can surprise the market conditions that are relevant for its risk management strategy. Usually, the internal models combine the potential modification of the value of each position that would result from the variations that are specific to the basic risk factors, with the probability that these variations occur. The value modifications are accumulated at the level of the segments in the trade registry and/or for all the activities and markets. The VAR value may be calculated by using one method from the ones depicted bellow:

- *The method of the historical simulation* that calculates the hypothetic modification of the value of the current portfolio, based on the historic variations of the risk factors. (at a level of trust of 99%, we could consider the lowest value out of 100 daily observations and apply this profitability to the current portfolio, for thus determining the maximum loss for the following);
- *The delta-normal method* or of the variance/covariance is the widest used method by the portfolio managers. This assumes that the distribution of the assets profitability is normal and that the daily profitability is successively independent (meaning it is not influenced by the previous day’s profitability).
- *The Monte Carlo simulation method* builds the distribution of the current portfolio, by using a larger sample of random combinations of price scenarios, whose probabilities are, usually, based on the historical experience. This approach is more flexible than the other two methods and does not rely on hypotheses about the normality of the profitability, but the scenarios number rapidly increases along with the portfolio’s complexity and with the related risk factors.

The Basel Committee established certain quality standards for the internal models when they are used in the context of capital adequacy. The qualitative standards comprise a trust interval with one single limit, of 99%, an ownership period of 10 trading days and a historical observation time span of minimum 1 year, if the recent volatility of prices was high.

### ***The Stress Test***

The scope of the stress test is to identify the events and influences that may generate a loss – namely, the ones that have a negative impact on the position of the bank's capital. The stress tests must have a both qualitative and quantitative nature. The quantitative criteria must identify possible stress scenarios that might occur within the market environment that is particular for a bank. The qualitative criteria must focus on two key aspects of the stress test: the evaluation of the bank's capacity to absorb big losses and on identifying the measures that the bank can take for reducing the risk and for preserving the capital.

The results of the stress tests must be periodically revised by the committee that manages the risk and by the superior management and must be reflected, as necessary, into the upcoming modifications regarding the policies for specific risk management and the exposure limits. If the stress tests indicate certain vulnerability, the bank must immediately take the necessary measures concerning the situations and the risks that generate the respective vulnerability. The stress test scenarios and the testing results are, usually, subject to a supervisory attention (Central Bank).

### ***Mark to market activity***

It refers to (re)evaluating one's bank's portfolios for reflecting the variation of the assets prices due to the fluctuations of the price on the market. The volume and the nature of the activities a bank engages in determine, in general, the prudent frequency of the evaluation. It is considered prudent a bank to (re)evaluate the positions of the investment portfolio having a stable liquidity, at least monthly. As the assets in the trading portfolio are being continuously sold and purchased, the positions related to the trading portfolio of one bank must be evaluated and marked to the market at least once a day.

The advanced IT technology, available in the recent years, was compulsory for developing many new instruments. The technology improved the quality and the access to information, and this, in its turn, increased the efficiency and the liquidity of the interfacing secondary markets. The modeling and the analytical techniques, supported with pertinent and exact information and that are consistent at an internal level, offer the necessary technical support for developing the transactions and the decision-making acts.

This technological capacity allowed the banks to engage themselves in trading, meaning, to assume positions for financial instruments, including positions for derivative products and outside balance-sheet instruments.

### **The management of the interest rate variation risk**

The objective of each bank, in what the prevention of the interest rate variation risk concerns, is to achieve an as wide as possible margin between the average level of the passive interests and of the active interests and maintaining such a margin for an as long period of time as possible, meaning in conditions of minimum volatility of the market. On the background of a keen banking competition and of a constant economic increase, the interest rate margins are on an ascending trend that is normal, considering the fact that the average passive interest cannot decrease below the level of inflation.

Along the elaboration of the current paper, the Romanian economy registered positive levels of economic growth every year, this trend being interrupted within the 3rd quarter of 2008. The effects of the global economic crisis started to be perceived in Romania during the 4th quarter of 2008 and afterward, along 2009 when, in April, after two subsequent quarters of GDP decrease, the Romanian economy fell into recession to come back to growth only after 6 years. In such conditions, the banks' preoccupations for stabilizing and maintaining the margin is to be understood, as, from practice, we know that, between 2003 and 2007, there existed banks that practiced margins between 12 and 18 p.p. for the interests in national currencies and between 7 and 8 p.p. for the loans granted in foreign currency. Of course, the margins decreased nowadays, but still, they are high.

Thus, we got to the situation that the weight of the incomes from interests to be between 60-70% from the total incomes achieved by some banks or even more, for the banks that do not have such a wide range of products and services to bring commissions or other non-interest incomes. A different situation in what the margin between the active and passive interests concerns could be acknowledged starting with the 4th quarter in 2008 and was properly felt during 2009, following the financing sources' severe price increase on one hand, and the blocking of the real estate market, on the other. This fact determined the dramatic decrease in what the demand of loans for immovable assets or the mortgage loans concerns and also of the consumption loans.

The bank's sensitivity to the interest's variation on the market, is illustrated by the margin's variation, under the influence of, at least, two categories of factors: internal, respectively the ones that are related to the balance sheet's structure, the assets quality, the account receivable eligibility, the maturities management, etc. and external factors related, mainly, to the general economic conditions, the political and social stability, etc.

The indicators of the interest rate variation risk are the gap and the sensitivity indicator. Consequently, the bank's immunization strategy against the interest rate variation risk is to have, at any moment, a null gap and an indicator that equals 1.

In the banking practice, the methods used for reducing the interest rates variation risk are using, as much as possible, the adjustable interest rates and operations outside the balance sheet, by covering the tenors gaps through swap or term contract with options.

### **The foreign currency risk management and of the price variation for the financial assets**

*The Foreign Currency Risk* represents the possibility that an adverse variation of the foreign currency exchange rate to produce losses or to lead to not achieving the targeted profits, to a bank. The risk obviously targets the banking operations in foreign currency, performed in own name or at the clients' orders, the exposure being directly proportional to the difference between the assets and the liabilities in foreign currency belonging to the same tenor group and having three components:

- the exposure due to the banking transactions developed with assets and liabilities that are sensitive to this risk;
- the exposure associated with the conversion operations from one currency to another;
- the economic exposure that undertakes the influence of the foreign currencies fluctuations upon the bank's value and that is calculated as the un-updated value of all the obtained incomes, in all the operating foreign currencies.

The indicators for measuring the foreign currency risk are the individual foreign currency position and the gross (total) foreign currency position. The individual foreign currency position is calculated separately for every currency in the bank's portfolio and it is considered to be:

- *a long position*, when the assets expressed in a certain currency are bigger than the liabilities expressed in the same currency and have a favorable evolution when the rate is on an ascending trend.
- *a short position*, when the assets expressed in a certain currency are smaller than the liabilities expressed in the same currency and have a favorable evolution when the rate is on a descending trend.

The gross (total) foreign currency position is calculated as a net balance of the accounts receivable in foreign currency towards the liabilities in foreign currency, both converted into the reference foreign currency, for comparability reasons. This gross foreign currency indicator is being used more for statistical purposes, the operational relevance being limited by the generality of the provided information.

The bank's exposure to the foreign currency risk is measured by the proportion of the individual foreign currency position, separately managed for each foreign currency. The foreign currency position of each foreign currency is calculated on daily basis, as an algebraic sum of the balance sheet foreign currency position and the outside balance-sheet foreign currency position for the respective foreign currency, this being long when the result is positive and short when the result is negative.

*The Management of the Price Variation Risk for the Financial Assets* represents the probability that a bank registers losses or not achieves the prospected incomes, the result of the unforeseen modifications of the prices on the market for the owned financial assets. The equilibrium prices are the ones that adjust the market based on the request and demand ratio and when this ratio is unbalanced, the prices of the financial assets register significant variations that express the volatility of the price. For a proper management of the prices volatility, we have to analyze the

factors that generate and feed this instability and to search for remedies for placing these variations within an acceptability range, beyond which the exposure to risk must be necessarily covered by specific methods. These disturbing factors for the financial assets prices may be:

- *general, related to the macroeconomic policy modifications*, to the overall status of the economy that is characterized by the economic increase, GDP, the price increase indicator, the evolution of the interest rates and of the exchange rate etc.;
- *specific, that are related only to certain titles* given some situations or circumstances due to which their prices vary compared with other titles.

This is why, for a complex and diverse portfolio of financial assets, the effect of some titles variations may be at least compensated with reverse variations of other owned elements, that, at the level of a bank that manages the assets and liabilities in a professional manner, may lead not only to loss avoidance but must also lead to profit making.

### Conclusions, findings, and outlook

For demonstrating the practical utility of applying the measures for estimating and diminishing the market risk in the daily activities of the companies and persons that temporarily have certain liquidities, we present a calculation example for a titles portfolio with “n” financial assets that we can call optimal or immune to the market risk, of course, in certain limits that we will describe in the following part.

A particular situation from the issues presented above is due to the fact that many banks build portfolios from the financial assets that exist on the market and also offer the possibility for the clients to build deposits by investing in such portfolios. In the structure of some portfolios of this kind, there are mainly bonds issued by the state but also other kinds of financial assets. As any investor in such a portfolio is permanently exposed to the market risks, it is useful to follow an indicator that, by a single value, calculates the total inducted risk by a portfolio of this kind, without spreading it at the level of the risks created by every asset in particular. A response to such a necessity is represented by the value at risk (VaR).

For modeling the phenomenon, we consider a portfolio consisting of N financial assets, according to the description above, in the present moment “t”.

We note with  $S_i(t)$ ,  $i= 1,2,3,\dots, N$ , the value of the asset  $i$  at the moment  $t$ , and we admit that the number of assets  $i$  included in the portfolio is  $n_i$ . Then, the value of the portfolio at the moment  $t$  will be:

$$\prod(t) = \sum_{i=1}^N n_i(t) S_i(t)$$

Legend:

- $S_i(t)$  – the value of the asset  $i$  at the time moment  $t$  ;
- $n_i$  – the number of assets purchased by the bank, at the value that was taken into consideration in the present formula;
- $\prod(t)$  – the value of the built portfolio;



- $V - VaR$  ;
- $R$  - the number of necessary simulations for determining the VaR.

The value of the portfolio at the moment  $t$  will change in time, both due to the modifications in the portfolio's structure (the numbers  $n_i(t)$ ) and also to the modification of the values of the components  $S_i(t)$ . Consequently, we can speak about a future value of the portfolio  $\Pi(t + \Delta t)$  after  $\Delta t$  time units.

We call the value at risk (VaR) that corresponds to a certain period of time  $\Delta t$  and to a level of trust of  $p$  percents, the number  $V$  below which the value of the portfolio at one point  $t + \Delta t$  will not decrease, with a level of trust of  $p\%$ , namely:

$$\text{probability} [\Pi(t + \Delta t) \geq V] = p$$

For the banks' case, it is recommendable that, for calculating the value at risk, to use the following values:  $\Delta t = 10$  days and  $p = 99\%$ . Then, we can express more eloquently that, for a surety degree of 99% in the following 10 days, the value of the owned portfolio will not decrease under  $V$  monetary units. Of course, the values in view for  $\Delta t$  and  $p$  can be modified as the user of the model wish.

We would also like to mention that the relation for defining the value at risk can be written in equivalent, as follows:

$$\text{probability} [\Pi(t + \Delta t) - \Pi(t) < V] = 1 - p$$

A high number ( $K$ ) of simulations are to be done for the evolution of the financial assets prices that are included in the portfolio's structure. For every simulation, the future value of the portfolio will be calculated  $[\Pi(t + \Delta t)]$ . Out of these, we will keep in mind  $K(1-p)$  unfavorable values and consequently, the  $K(1-p)+1$  value, in an increasing order, will be VaR. If we have a database available, containing the daily movements of prices for the assets in the portfolio (and, of course, any bank have such statistics), it can be used as a simulation fund. This way of calculation called historical simulation presents the advantage that, the method relies on a distribution of probabilities that really existed. This way we can demonstrate not only the scientific validity of the method but also its practical utility for the investors.

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