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Some Aspects Concerning the Measurement of Credit Risk

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Abstract

The paperwork outlines the importance of risk management within financial institutions and focuses on the credit risk, given that the statistics have revealed that the overwhelming majority of the banks' bankruptcies are caused by the credit operations. Therefore the paper concentrates on, what the author thinks to be the hub of the quantitative and qualitative models, the scoring/rating models, considered to be the common denominator of them. The risk modelling processes deployed by every entity should be continuously backed up by the rational judgements. The improvement of the risk modelling and of the framework of the rational judgements brings added value in the financial institutions operations.

1. Introduction

"Risk management is a core activity" (bankers, regulator authorities etc.) within the financial institutions, allowing competitive advantages. In the bank's decisions, the ability of measuring risks is an integral part of its organisational culture. Generally speaking, the risk management of the successful financial institutions should be based on the following main principles:

- A genuine commitment at all level to implement and update the data sets and the risk management models;
- A strong and independent control function in order to perform an adequate risk management, allowing flexibility to perform efficiently daily activities, yet prudent concerning the overall risk exposure;

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- An adequate diversification in order to implement an efficient mechanism to manage risks;
- A strong corporate governance "to enhance understanding of key supervisory issues and improve the quality of banking supervision worldwide. It seeks to do so by exchanging information on national supervisory issues, approaches and techniques, with a view to promoting common understanding". (Basel Committee on Banking Supervision, 2005).

To support the risk management mechanism, a financial institution should make substantial investment in Information Technology and Communications (IT&C) and in Human Resources (HR). A risk management mechanism should monitor the bank's whole portfolio, independent of the entity's business lines and to refer directly to senior management. In addition, the risk management is a proactive activity not a reactive one. The risks affect the whole entity and thus the risk management processes should be performed before engaging in risky transactions. Every available opportunity needs to be assessed in order to identify the subsequent risks.

There are different criteria for banking risk classification (financial, operational, business, conjuncture, cyclical and so on). Among financial risks one can list: balance sheet structure, revenue structure, adequacy of capital, credit, interest rates, foreign exchange, liquidity, solvability and market. Among operational risks one can list: internal system function, technological risk, poor management, frauds, lack of compliance with laws, regulations and procedures. Among business risks one can list: development level, infrastructure, systemic and not the least the unwanted effects of the monetary policies, of the taxes and of the legislation. It may include among cyclical risks: politics, contamination, and crisis, others (for instance mass-media).

2. Some faces of risks

But what is the RISK? „Risks are usually defined by the adverse impact on the profitability of several distinct sources of uncertainty." (Bessis J., 1998). The definition focuses on the uncertainty, which could be captured in some ratios as sensitivity, volatility and downside measures (stress scenarios). The idea of this definition is that a set of figures seem to clarify the level of risk.

Another very short and concentrated definition given in Guide 73 ISO 31000 is „the effect on uncertainty on objectives". This definition focuses on the events' effects upon the achievement of an entity scopes, blurring in a way the events themselves, in order to concentrate on the objectives, before identifying the subsequent risks and the methods of managing them. A good example could be the struggle of the financial institutions to offer the most innovative services, in order to increase the number of clients (especially the most sophisticated ones). Thus the main objective is to attract enough clients to cover the costs (often high as there is involved the new technology) and to get a competitive advantage. The bankers should bear in mind that in the financial industry there is not copyrights. Therefore if the project fails, there are losses and other competitors, at least for a while, would not launch similar services.

The modern financial institutions are faced with many correlated risks, multilevel risks, deriving from macro economy such as inflation, unemployment, stock market crashes and so on. The risks have been multiplying after the deregulation period, which brings new products, services and unregulated entities, bearing unknown risks (for instance derivatives), and financial institutions have developed in other business model than intermediation. The competition has erupted and the new innovations could be easily copied.

Beginning with 1988 Bank of International Settlement (BIS) has been periodically issuing a series of regulations in order to improve the processes of measuring and managing banks' risks. But anyhow the regulation framework is generic, bearing a high level of theory and, generally speaking, defines minimum standards. In some countries as in Romania, Monetary Authorities (Central Banks), parliaments, governments issue continuously laws and regulations in the respect of keeping the financial institutions on a safe track. In order to impose a better culture of risk, a new paradigm has become more and more important within banks, namely the compliance.

Nevertheless the main focus has been concentrated on financial risks, which are „related to the market movements" (Bessis J., 1998).

In terms of money the process of measuring, analysing and managing the risks is costly. There are some important principles developed during the time, which answer the question related to the effectiveness of risk management:

- it is a component of the organisational process and decision making;
- it is a dynamic process as the contexts are fluid;
- it is systematic, continuous (iterative), structured, timely and responsive to the changes.

In other word risk management should create value.

Some professionals (as Gerard Joyce – the chairman of the National Standards Of Ireland, Consultative Committee on risk management) argue that the management of the financial institution has been focused for a long period of time on principal-agent theory, which on short perpetuates „the conflict as old as mankind, namely between rights and duties" (Nicula I, 2012).

„For the financial entities there is vital enforcing a good corporate governance, which should take into account the whole aspects of this business type, where the risk is a day by day characteristic, and the correct assessment of their assets and liabilities should be a continuous process". (Nicula I, 2012).

Some studies (see Studies) noted that the banks which experienced serious problems after 2007, implemented sophisticated models to measure the risks, observed the regulations and laws (in other word, most of the financial institutions did not breach them), but had huge losses. In fact they failed to implement the best practices (as the corporate governance imposes), relied too much on the agencies scoring, instead of using their qualitative evaluations to identify dynamically the level of risk (there is a lag within the updates of data used in the quantitative models, especially when the economic shifting are too rapid). Even if the financial institutions have based upon a mix of quantitative&qualitative models, in fact the range of available information was limited. Therefore a longer perspective of data analysis should be performed using as much information as possible. Implementing the risk models is not by itself a universal panacea. The results of the models should be analysed throughout the rational judgements. Moreover, the financial institution should take into account that any adverse change, at least from the clients' point of view, (though credit rules, interest rate/fees increasing) would have a perverse effect on it.

A special attention should be on the interest rates policy. Saunders and Allen (2002) cited a well known study performed by Stiglitz and Weiss (1981) which demonstrated that „the relationship between the level of interest rates and the expected return on a loan is highly nonlinear". The explanation is that in such an environment the banks' clients, who are hungry for money, would throw themselves into risky projects, namely make an adverse selection. Argenti model defines the behaviour as a mistake. The initial default risk shifts into business risk, herein emerging the concept of risk shifting.

3. Credit risks models and scoring systems

Loan operations are the core of banking activities, their risks are very difficult to be measured and the analysis of credit exposure has become more and more sophisticated. In the credit field entered other entities (so called non-bank financial institution – NBFI) granting specific types of credit throughout complex financial instruments. This aspect has renewed the focus on the measurement of credit risk of these new tools, designed to hedge credit risks, but generating themselves risks. Credit risk can be assessed on the individual and on portfolio level and the measurement means to evaluate the default risk of the individual loans (or of a group of loans) from the quantitative or qualitative perspective.

Quantitative models (such as credit rating or scoring, CAR, VAR, RAROC) have the purpose to compute a set of parameters such as the Probability of Default (PD) and Loss Given Default (LGD), based on the statistical data, after sorting the borrowing entities/credit facilities into different classes. Probability of default is a statistical estimation of the probability that a borrower belonging to a specific risk class enters into default across a given period of time (for instance yearly). This variable is derived from historical data kept and updated by the financial institutions and other entities (risk credit agencies) and allows the volatility calculation (standard deviation of the default rate).

Loss given default represents the portion of the outstanding credit exposure (express in %) that is assumed to be non-recoverable upon borrower's default.

Base upon the above parameters, the financial institutions will practically compute two other variables: (a) expected loss and (b) unexpected loss.

The expected loss is (EL):

$$EL = E \times PD \tag{1}$$

where E is the exposure (outstanding credit value at the EL calculation moment or an equivalent of credit exposure LEQ, for instance, when the commitment is recorded off balance sheet).

The unexpected loss is (UL):

$$EL = E \times maximum\ deviation\ of\ the\ default\ rate \tag{2}$$

The methodology of Risk Measurement Model (or IRB – Internal Ratings-based approach) requires that PD and LGD should be evaluated and validated on yearly basis and the historical data should be adjusted any time there are modifications on some factors such as:

- changes in credit and receivables policies;
- changes in economic conditions, business background or on specific markets;
- changes in the volume and/or structure of portfolios;
- changes in the volume and/or structure of defaults;
- changes in debtors classification;
- changes in laws, regulations and supervision framework.

The more important drawback is that the real form of the loss distributions is unknown as shape and skewness, and practical implementation of the models based upon standard deviations requires the process of transforming the real distributions into theoretical ones (log, normal). The theoretical distributions are not the best approximation for the real distributions.

Another critical aspect of these models is to build the migration/transition matrix. The migration matrix is a probability table, reflecting the possibility that a loan or a group of loans belonging to x score to move into y score, bearing another PD.

		To the score:						
		2	3	4	5	6	7	Total
From the score:	3	2%	91%	5%	2%	0%	0%	100%
	4	0%	3%	89%	6%	2%	0%	100%
	5	0%	0%	4%	87%	7%	2%	100%

Fig. 1. Probabilistic matrix of annual migration, Source: Chase Mannhatan, values are for guidance

Interpretation: a 3 score loan (or loans) gets a 91% to keep its score within a specific time (for instance one year), or can migrate into 2 score with a probability of 2%, or into score 4 with a probability of 5%. There is a direct correlation between the period of time and the risk level: the longer the former the higher the latter. Such matrices could be rather stable in a stable economic environment, but unreliable in the case of a rapid shifting of the economic conditions.

Quantitative models can be classified into accounting models (multiple discriminant analysis such as Z Scores – the most cited being Altman and Conan-Holder), scoring models (multifactorial) and complex models (RAROC, CAR, VAR) developed as an answer to the Bank for International Settlement (BIS) restricted models.

In order to customize the risk models a new approach has been defined, namely the banks should follow three ways:

- to use the standard model based upon the credit agencies ratings, but improved through „a finer gradations of risk classification," (Saunders and Allen, 2002) resulting more weights for each loan category;
- to use an internal model developed by every entity (Internal Ratings-Based or IRB), meaning the calculation of probability of default, expected loss and loss given default.
- to develop in time advanced internal models (advanced Internal Ratings-Based).

The last two approaches require an internal rating process to be developed, based on the statistical data accumulated and updated in time.

The scoring systems are in fact multifactorial models in which some series of qualitative and quantitative variables attached to a borrower's business are analysed in order to receive a „grade/mark" (score or rating). The quantitative variables are financial ratios characterising the borrower's business. The qualitative variables are translated into quantitative ones through so called expert systems. „In an expert system, the credit decision is left to the local or branch lending officer." (Saunders A. and Allen L., 2002).

During the time these „local expert systems" (defined by Saunders and Allen) have been transformed into statistical models, emerging from the financial institutions experiences accumulated over a long period of time. Moreover, there was a systemic approach, integrating the individual evaluations into an integrated system (real expert system).

Although highly formalised, the „expert systems" suffer from the same downsides namely: (1) consistency („what are the important common factors to analyse across different types of borrowers?") and (2) subjectivity („what are the optimal weights to apply to the factors chosen?"). (Saunders and Allen, 2002). Anyhow these downsides should be limited by the human factor applying rational judgement (a new paradigm which describes the process of translation from rule-based requirements to principles-based standards, as the rules, laws, regulations have proved to be easy to evade).

Theoretically, the scoring for qualitative variables is based on: (1) specific analysis fields (as industry, technology, market position, economical cycle, human resources etc.) and (2) grading scale in order to mach each variable to a suitable score. The scoring for quantitative variables is based on experience. The various ratios are matched to a score based upon a scale, which has proved to be enough accurate in order to compute a good final score and the rated facility behaves as predicted within the actual class.

As a result of applying a scoring model, the borrower (in fact the credit facility granted to a specific borrower) receives a „final grade/mark", formalised as:

$$R = \sum \omega_i R_i \tag{3}$$

R =   final score for the credit facility
R_i =   score for each variable i
ω_i =   each variable weight

R is analysed according to a benchmark.

Qualitative models focus either on the borrowing entity characteristics (management quality, accounting policies, market position and competition, clients/suppliers, company history, financial conditions etc.) or on specific market factors (business cycle, fiscality, general level of interest rates) or on both.

The credit scoring systems could be analysed within qualitative models as they imply a „degree of subjectivity contained in the decision making process" (Lehmann B., 2003). The concept of subjectivity, heavily used when the rating process does not perform number crunching (which has been for a while fashionable in the banking industry), might be replaced by rational judgement. Thus „hard facts" (models based on number) are supplemented by „soft facts" (models based on reasoning). (Lehmann, B., 2003). The soft facts are based on the personal competence of the individuals, on their background, experience and personality, but also on subjective data. There is another

motive to stress the importance of qualitative models in credit operations, namely the applications for loans, especially for commercial ones. The applications are assessed through interviews, not solely on the basis of computation of the financial data. Anyhow this activity is performed by the specific software, being a valuable tool for credit officers. Nevertheless a professional lending activity should include negotiations, which allow evaluating the human and business character, special contexts, the perspectives, the past and the future. Such evaluation activity is impossible to be included into the software. The competency (knowledge, skill and attitude) of the credit officer concerning the interviewing techniques, the ancillary work, the negotiation skill are crucial in an accurate analysis of the client, his/her business and the economic background. The lending process is one requiring due diligence to be safe and sound.

Moreover, each and every credit institution or NBFI has its own risk tolerance or even more benchmarks (tailored according to various parameters: credit facilities, clients, industries etc.). „The ability to customize cut-off scores allows management to maximize the approval rate without sacrificing asset quality. Some banks have cut-off bands, which define a range of scores for which the consumer would undergo additional judgmental review". (FDIC – Division of Supervision and Consumer Protection, 2007).Among the genuine qualitative models are the Five Cs of Credit (now in fact the Six), CAMPARI and a refinement CAMPARI&ICE and Argenti models.

„The lending process is due diligence so necessary for safe and sound lending...and the process is facilitated by the use of 5 financial analysis themes or tools". (Baiden, J., 2011). In fact there is a new „tool", namely the compliance, which became more obvious, since financial activities have been scrutinized by the public eyes and the confidence in the system has dropped to alarming levels.

The Six Cs of Credit [Character (reputation), capital (in fact the leverage trend), Capacity (the degree to which the income volatility has an impact on the capacity to repay the debt), Conditions (the business position concerning the impact of the business cycle on its activities), Collateral (the velocity of recovering as much as possible from the expected loss), Compliance] is the most known and used model. Another model is Argenti which takes into account the early warning signals emerging from the deploying of a business. The warning signals are not accurate diagnosis, but are valuable clues in order to identify behavioural models revealing the risk of bankruptcy. The Argenti model suggests „that the failure process follows a predictable sequence: defects -> mistakes -> symptoms of failure". (Argenti, J., 1976)

The model develops a sequence formed by areas (top and middle management, accounting, technology, HR) and events (frauds, unsustainable growth, and heavy indebtedness) which can lead to bankruptcy: defects – errors – symptoms (the results of defects and errors) – steady losses. The advantage is that it identifies a series of early clues before the deterioration of the financial ratios. As other qualitative models, the symptoms receive a grade and there is a scale used as a benchmark (see below).

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0 -10   OK
0 - 25       Passing mark, there is a probability of failure
10 -18       A little worry
18 -35       Warning signal, need correction measures
> 35    Risk
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The same limitations are on the qualitative models, namely the matching procedures regarding the translation of the qualitative variables into quantitative ones.

4. Conclusions

Economic risks have been analysing on all their facets, have been receiving various definitions, classifications, as well as methods to limit them.Yet, financial institutions have always admitted that their operations bear a level of risk, higher or lower. The knowledge of the risk facets is the first step, and measuring and identifying the methods to counteract them are further steps.

The studies showed that the overwhelming majority of the credit institutions bankruptcies have been caused by the credit risk manifestation. Therefore the credit risk quantification models are vital for a bank to survive in a very competitive and globalised market, into a fluid economic environment. Whether they are quantitative or qualitative,

the hub of the credit modelling is scoring systems. Scoring systems should offer a comprehensive image on the trends characterising credits (in the broad sense), in fact the impact factors on them.

The expert systems in the narrow sense (as defined by Saunders and Allen) transformed themselves due to the systemic approaches into the expert system in the broad sense (statistic integrated systems). Although facilitating the rating process, these expert systems become too uniform, curing the disease not the patient. The rating systems can have a tremendous impact on credit activities, so they should be carefully developed, tested, used and updated. The internal models should be developed and validated over time, and the feedback thoroughly analysed. The internal methodology should ensure that there is a constant comparison between current and expected performances and the models are backed up by rational judgements. Moreover, the risk committees should understand deeply the models and their uses, should impose the regular validation and whenever necessary and should clearly identify the impact factors (such as changes in economic, legal and supervision framework conditions, changes in the volume/structure of loans and defaults etc.).

Scoring process is a challenging activity, as the errors lead to inaccurate classifications and the modelling, no matter how perfect it would be, could climb the portfolio credit risk, as well as the whole entity risk. Therefore the risk modelling, the improvement of expert systems (in the broad sense) and of the principles-based standards add value to the financial institutions operations.

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