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# INTERNAL RATINGS SYSTEMS: AN EMPIRICAL APPROACH<sup>1</sup>

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**Abstract:**

*The objective of this article is to describe the standard architecture of an internal rating system, based on the theoretical references and empirical evidences of a limited number of banking groups operating in UE, USA and Romania. The first part of the paper sets out the theoretical and conceptual framework and it defines the methodology. The second part is focused on the internal rating system components and its organization.*

**Keywords:** credit risk parameters, risk management, rating assignment

## 1. Introduction

Following the crises and deep transformations which marked the world economy after the World War II, Basel Committee developed a standard of risk capital applicability in the 80s, leading to Basel Agreement, published in 1988 and revised in 2004. The major objectives of the revised agreement, called Basel II Agreement, are the same – promotion of bank system security and soundness and increase of competitive equality of banks – but the agreement is better adapted to the dynamics of modern financial world. It is the manner of approaching credit risk and the perspective on operational risk which bring novelty with Basel II. The banks have the opportunity to choose between three distinct technics of determining credit risk: standard approach, simple approach based on internal ratings and complex approach (advanced) based on internal ratings. Simple approach, as well as the advanced one, based on internal ratings (IRB) requires drawing up and using an intrinsic system of evaluating credit risk.

The objective of this article is to describe the general architecture of an internal rating system. In this respect, the first part of the paper consists in conceptual limitations and theoretical references. The second part describes a general internal rating system in terms of the studied works and information publicly available referring to several big bank groups from EU and USA. The last part of the work shows the conclusions.

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## 2. Theoretical references and methodology

Bank internal rating, similar to the risk rating published by the rating agencies, shows the credit risk, understood as loss risk inducted into the incapacity of a given debtor to take up payments in accordance with the credit contract (Treacy and Carey, 2000). Credit risk ranges three categories of risks, namely: the risk of cease (default)/delay of payments with principal and/or interest, the recovery rate risk when payments are ceased and the risk of damage of credit portfolio quality (Gourieroux and Tiomo, 2007). Professional literature separates score and rating: score is the quantitative form of the credit risk while rating is the qualitative form of it. According to Basel Committee, the default occurs when "the bank estimates as improbable the total reimbursement of the credit by debtor without requirements of adequate measures, such as working out a guarantee (if it is the case) or when major credit arrears of a debtor towards a bank group overpass 90 days" (Gourieroux and Tiomo, 2007). The definition is broad enough to allow interpretations from the part of banks. Therefore, the definition of default is different from one bank to another, but it always encompasses two cumulative conditions: the delay of payments on principal and interest for a given period of time (between 60 and 90 days for the banks under study in this research) and the existence of a value judgement, drawn up by a bank officer stating that payments are improbable in the future (Jacobson et al., 2006).

The system of bank internal rating is shortly defined as a process of classification of debtors in categories of different grades of non-payment risk (Foglia et al., 2001). Credit risk parameters substantiating a rating system can be represented as in the table below:

Table 1. Credit risk parameters

Parameter	Definition
Expected losses (EL)	The amount the bank could lose, on an average, given its portfolio of credits at a particular time period.
Unexpected losses (UL)	The difference of the expected maximum loss on a portfolio at a particular time period and EL.
Probability of default (PD)	The risk that a debtor does not comply with the agreements related on principal and interest during one year; it „gives the average percentage of obligors that default in this rating grade in the course of one year”.
Exposure at default (EAD)	The amount of the outstanding financial capital during one year, or until maturity, in case maturity is below one year.
Loss given default (LGD)	It measures the loss, as percentage of the credit volume.
Maturity (M)	The date when the loan is due and payable.

Sources: Gourieroux and Tiomo, *Risque de credit*, 2007, p. 41 – 42, Basel Committee on Banking Supervision, *An Explanatory Note on the Basel II IRB Risk Weight Functions*, July, 2005, p. 5 – 8

The rating system encompasses “the set of methods, processes, control systems, data collecting systems and informatics systems allowing the assessment of credit risk, assignment of exposures on rating classes or risk groups and the quantification of estimates regarding the probability of default (PD) and loss given default (LGD) for a certain type of exposure” (See Regulation no.15/ 20/14.12.2006 on the credit risk treatment for the credit institutions and investment companies in accordance with the approach of internal rating models). The economic literature is comparatively poor in empirical works related to the activity and internal rating systems from the developed countries.

A foundation for this research is the study of Krahen and Weber (2000), who describe the principles generally accepted, also called general standards, governing the rating activity, and thus offering the assesment framework of the quality of rating systems. Fight (2004), in his book on risk management, explains the procedures and quantitative and qualitative indicators which represent the basis of assessing the credit risk. Also, his work gives an outline of the manner in which information can be included into a coherent unitary system ensuring bank stability and an appropriate ratio of profit and risk, being similar in structure with the one described by Ganguin and Bilardello (2005) referring to Standard and Poor’s. Treacy and Carey (2000) analyze the rating process into fifty banks from USA, identifying two ways of organizing the rating systems: a system “with a single dimension”, where grades are associated only to credit facilities, and a dual system, in which two grades occur: one associated with the debtor and another with the credit instrument. They believe that the latter system ensures a finer accuracy to the evaluation. Crouhy et al. (2001) explain the way in which an internal rating system can be organized in the banks, starting with the experience of the rating agencies. The three authors conclude that the internal rating system should have a dual form, with a debtor rating, reflecting PD, and a facility rating, depending on its nature, quality of guarantees and history of debtor in terms of commitments.

Is this organizing formula met into the international banking practice following 2008, the year when banks started applying Basel II? To answer this question, there have been studied the internal rating procedures applicable in five big credit institutions from France, Germany, USA and Romania. The selection of these institutions has been made in accordance with the volume and quality of information publicly available related to credit risk management. In drawing up this paper there have been used three sources of information: annual reports of the banks and reports on risk management, as public information (the only information sources for the banks into the first three countries), and internal conduct norms, as private information and treated accordingly (ensuring confidentiality and checking authenticity). Starting with the above mentioned theoretical references and the information gathered from bank documents, there will be explained hereinafter the general architecture of a banking internal rating system.

### **3. Architecture of the banking internal rating system**

The common elements of the systems of banking internal rating considered for this study are: a specific procedure of establishing the parameters of the system (parameters described in table 1), a determined number of well-specified classes (an assessment scale), an organizational structure of the rating process by means of which the debtors are distributed by classes, IT resources and complex statistico-mathematical models of rating sustaining the experts' opinions, and a methodology of validation. The main determiners of the rating system structure are the the structure of the bank credit portfolio (specific bank combination between small and big debtors) and the scope for which such a system is implemented. Generally, internal rating is used by big bank groups, for the big debtors, which are characterized by high values of exposures related to different financing lines. With reference to the usefulness of the rating system, there are two main uses of rating: credit risk management and analyses on profitability.

Generally, the bank internal rating system is a bidimensional one, involving in a first stage the determination of the grade of debtor reliability (PD), then the set-up of the facility grade (EL) related to this PD, in terms of specific structure of the credit instrument. The system parameters (PD, LGD, EAD) are set up in accordance with the bank historical data, external information and value judgement of experts.

When choosing a scale, the banks decide on the number and significance of grades and if they take into account a "warning" category (watch list). The watch list represents the need of special monitoring, not necessarily problem assts, in other words, a debt under incidence of regulating authorities. This watch list can be separated by the scale or it can be included into it in two ways: associated to the existing grades (e.g. classe A, but watch list) or separate. The scale system answers at least three requests: distinction between risks, uniformity within classes and monotony (to show a monotonous increase of risk, that is an increase of PD going forward on the scale). Of course, the higher the refinement grade of the scale is, the finer the risk distinction will be, but the operational costs are also higher because it is required an additional work to differentiate between debtors and formal systems applicable to credit risk. In accordance with Treacy and Carey (2000) among the ten largest USA banks, the median number of Pass grade was six, and the tendency noted by them in the year 2000 was to increase the number of classes. The trend is confirmed by the banks involved into this research, their number ranging between 12 and 26. Whatever number, all credit institutions under study use classes with a certain risk degree, from excellent to alarming, and risk classes for default on payment. Moreover, the banks define equivalence scales with the rating issued by the rating agencies. The assessment scale structure depends on the bank activity scale: if this one has receivables mostly on big clients, with low risk, it will be interested in possessing more classes from the investitional category, while the banks whose market target is represented by small and medium affairs, rarely placed in the class A, will range

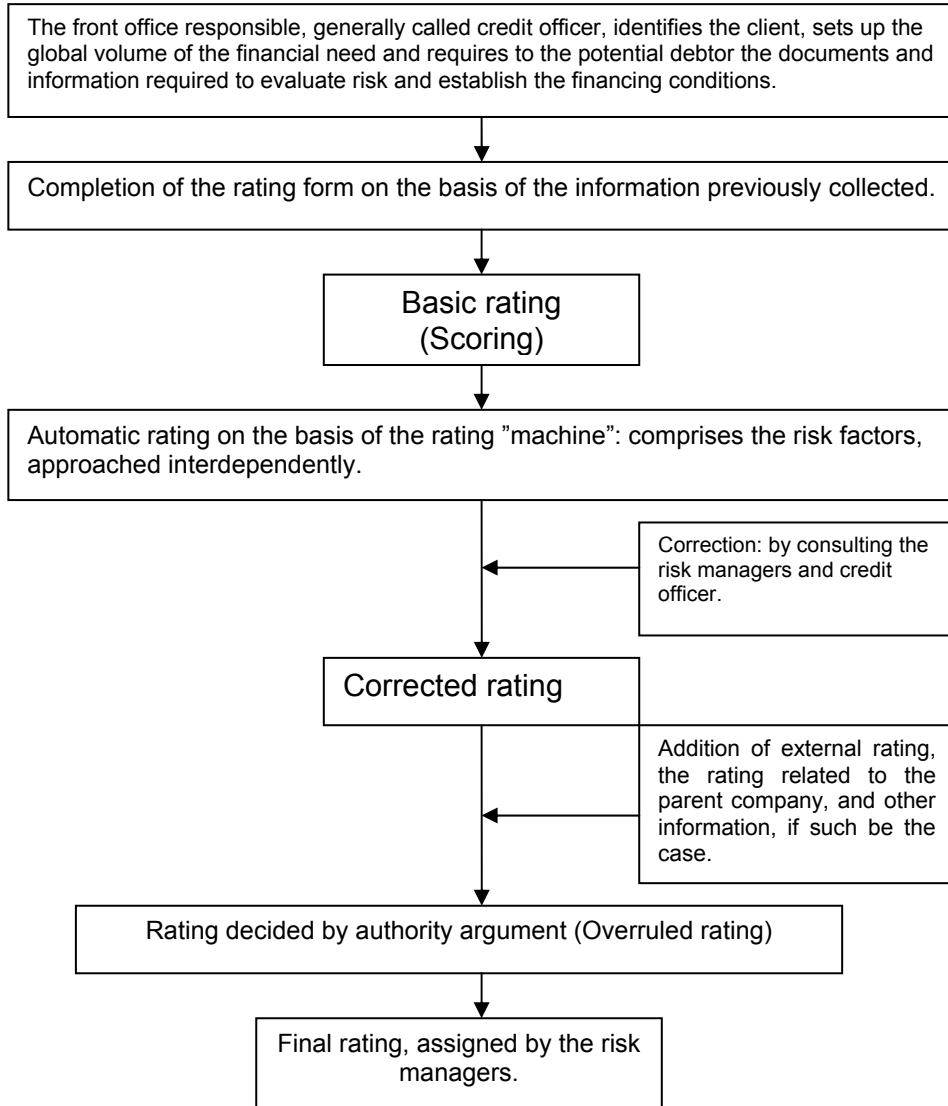
classes considered to be speculative by the rating agencies. Thus, considering the case of the four UE 27 bank groups under study, the difference between the investment classes and speculative ones was of +/- 2-3 classes, in respect of the typology of debtors.

Besides the structure of the assessment framework for debtors, another important element within the rating system architecture is the procedure of assigning the grades (the so-called "operational design"). In the operational design, in accordance with Tracey and Carey (2000) the key aspects are: setting up the department responsible for the assignment of ratings, methodology of reviewing ratings in order to avoid errors, establishment of the "utmost" authority responsible for the final rating, the role of external ratings and statistic models. The front-office department is responsible with the achievement of sale targets, but at the same time, it is the department giving information to the risk department or even setting the first rating. In this context, there is possible for this department to have an interest to underevaluate risk, but this error is corrected by the next risk responsible: the risk unit, usually a component of the back-office department, whose remuneration does not depend on the achievement of sale targets. The level and structure of the risk unit which is responsible with the rating approval depends on the credit and risk size.

All the five banks under study have specialized departments of risk management (Credit Risk Management) directly subordinated to the managing board (executive board) or to a subdivision of it. Generally, credit risk systems are organized on two levels:

- a *central level*, considering the consolidated risk of the system and encompassing the central databases and the calculation "machine" of the regulated capital, internally developed, having as a correspondent a central entity of the bank; this entity is represented by the *committee of risk management consisting in members of the managing board*; this committee can be also responsible with the internal control at the group level or that responsibility is attributed to a distinct audit committee.

- a *local level*, comprising the monitoring and reporting systems, controlled by the *risk management department*; this department is directly subordinated to the central committee, it makes recommendations on the risk policy and it is responsible with the approval of corporate credits, exposure limits, credit portfolio quality, procedures of risk measurement, approval and monitoring, information quality provided to the center; at least one member of this department is in the credit committees set to approve individual projects. In respect of the proper methodology, the graph below gives a synthetic description of the structure evaluating a debtor and a credit facility for rating assignment.



Source: Internal banking norms, 2008

**Figure 1. Rating assignment**

The previous graph shows the importance given to the experts' opinion, who, due to their experience and competence, have the authority to modify the rating obtained mainly from quantitative analyses. In fact, in accordance with Bank of America (2008), the most important elements in risk management are the people and corporation culture, culture which should encourage debates and the expression of personal opinions. Banks do not turn the statistico-mathematical models into "the core" of their rating systems for several reasons: the difficulty of these systems to get the qualitative factors in a correct manner, the complexity of factors interactions, which cannot be standardized and depend on the debtor's features, the industry it belongs to, the geographical area where it operates, a.s.o, the absence of historical data in certain

cases, the lack of trust into the models due to the fast dynamics of economy and the gap between the implementation of a model and the validity of its results. Especially in case of big exposures, each credit facility is unique, it has its own structure and it is hard to evaluate automatically, fact stating that the integral standardization of rating is not possible. The main categories of models used to determine credit risk parameters are value-at-risk models.

Rating is periodically reviewed, at least once a year, or as many times it is required, fact which implies the development and implementation of certain models and *procedures of rapid alert*, as components of the internal rating system. For big exposures, the review has systemic character so that to be obtained an overview of the portfolio and to decide upon measures of improving its quality to bank global strategy.

Also, all the banks studied in this paper have defined procedures of criteria adjustment and rating accuracy assessment. Drawing up the validation methodology depends on the type of rating system. We explain that the rating systems are different, according to the debtor's type, the exposure, the dynamic features of the rating methodology, the availability of historical data, the reporting to external rating. Therefore, validation is a complex issue and requires a good understanding of the rating system and its characteristics. Validation refers both to the statistico-mathematical, informatic and organizational apparatus, and to the operational procedures.

#### **4. Conclusions**

The systems of bank internal rating represent a specific incorporated assembly, consisting in knowledge and technologies which form the basis for the credit risk management and analyses on profitability. The foundation parameters of all internal rating systems are the following: probability of default, loss given default, and exposure at default. The system which has come into prominence into the international practice is a dual one, implying at a first stage the determination of the grade of debtor's reliability (PD), then the set-up of the facility grade corresponding to this PD. The common elements for any internal rating system are: the rating classes, the informatic system and rating models, the organizational structure, the rating procedures and methodologies of validation. Three requirements stand for setting up the rating classes: risk distinction, uniformity within classes and monotony, depending on the size of debtors and on the structure at risk of the client portfolio. The main rating models are those of type VaR. The organizational design and procedures take into consideration the avoidance of the interest conflict, which is inherent to the sales/risk objectives, a correct distribution of debtors on classes and the long term viability ensurance of the credit institution. The validation methodologies refer to the system parameters, models and procedures, on the grounds of norms and recommendations of the regulating authorities. Besides this common structure, the rating systems employed by the banks are different, being based on each bank characteristics and culture.

**References:**

- Altman, E.I. (2005). *An emerging market credit scoring system for corporate bonds*. *Emerging Markets Review* 6 (2005): 311 –23, [www.elsevier.com/locate/econbase](http://www.elsevier.com/locate/econbase)
- Banca Nationala a Romaniei. (2008). *Raport asupra stabilitatii financiare 2008*. [www.bnro.ro/Ro/Pubs/RSF/RSF2008.pdf](http://www.bnro.ro/Ro/Pubs/RSF/RSF2008.pdf)
- BNP Paribas. (2008). *Annual Report*. <http://invest.bnpparibas.com/en/pid738/annual-report.html>
- Bank for International Settlements. (2005). *An Explanatory Note on the Basel II IRB Risk Weight Functions*. Basel Committee on Banking Supervision. [www.bis.org](http://www.bis.org)
- Bank of America. (2008). *Annual Report*. [http://media.corporate-ir.net/media\\_files/irol/71/71595/reports/2008\\_AR.pdf](http://media.corporate-ir.net/media_files/irol/71/71595/reports/2008_AR.pdf)
- BRD-Groupe Societe Generale. (2007). *Raport anual 2007*. <http://www.brd.ro/banca/actionari-si-investitori/publicatii/rapoarte-anuale/>
- Capuano, Ch., Chan-Lau, J., Gasha, G., Medeiros, C., Santos, A., Souto, M. (2009). *Recent advances in credit risk modeling*. IMF working paper [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1457585](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1457585)
- Codirlaşu, A.I. (2007). *Modelarea si măsurarea riscului de credit, teză de doctorat*,. [www.biblioteca.ase.ro](http://www.biblioteca.ase.ro)
- Crouhy, M., Galai, D., Mark, R. (2000). *A comparative analysis of current credit risk models*. *Journal of Banking and Finance*, no 24: 60 – 117
- Crouhy, M., Galai, D., Mark, R. (2001). *Prototype risk rating system*, *Journal of Banking and Finance*, no 25: 48 – 95
- Crouhy, M., Galai, D., Mark, R. (2006). *The essentials of Risk Management*. McGraw-Hill, NY
- Deutsche Bank Group. (2008). *Risk Report*. <http://annualreport.deutsche-bank.com/en/2008/ar/riskreport.html>
- Diamond, D. (1984). *Financial intermediation and delegated monitoring*. *Review of Economic Studies* 51:393-414
- Duffie, D., Singleton, K. J. (2003). *Credit Risk: Pricing, Measurement, and Management*, Princeton University Press
- Fight, A. (2004). *Credit risk management*. <http://www.sciencedirect.com>
- FitchRatings. (2009). *Definitions of Ratings and Other Scales*. [www.fitchratings.com](http://www.fitchratings.com)
- FitchRatings. (2009). *Corporate Rating Methodology*. [www.fitchratings.com](http://www.fitchratings.com)
- FitchRatings. (2006). *The Rating Process*. [www.fitchratings.com](http://www.fitchratings.com)
- Foglia, A., Iannotti, S., Reedtz, M. P. (2001). *The Definition of the Grading Scales in Banks' Internal Rating Systems*. *Economic Notes*, , Blackwell Publishing, Volume 30, Number 3, 1 November 2001: 421-456
- Ganguin, B., Bilardello, J. (2005). *Fundamentals of Corporate Credit Analysis*. McGraw-Hill



- Georgescu, F. (2007). *Piata creditului din Romania si Reglementarile Noului Acord de capital-Basel II*. [www.bnro.ro/Ro/Prez/R20071204FG.pdf](http://www.bnro.ro/Ro/Prez/R20071204FG.pdf)
- Gourieux, Ch., Tiomo, A. (2007). *Risque de credit. Une approche avancee*. Economica Paris
- Government of Romania. (2006). *Ordonanta de urgenta nr.99/2006* privind institutiile de credit si adecvarea capitalului. [www.bnro.ro/Legi/L\\_bancara/OUG\\_99.pdf](http://www.bnro.ro/Legi/L_bancara/OUG_99.pdf).
- Huang, Jing-zhi, Zhou, Hao. (2008). *Specification Analysis of Structural Credit Risk Models*. [www.ssrn.com/id1105640](http://www.ssrn.com/id1105640)
- Jacobson, T., Linde, J., Roszbach, K. (2009). *Credit Risk versus Capital Requirements under Basel II: Are SME Loans and Retail Credit Really Different?*, [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=498882](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=498882)
- Krahnen, J.P., Weber, M. (2001). *Generally accepted rating principles: A primer*. *Journal of Banking & Finance* 25 (2001): 3-23, [www.elsevier.com/locate/econbase](http://www.elsevier.com/locate/econbase)
- Lopez, J. A., Saindenberg, M. R., (1999). *Evaluating Credit Risk Models*. Economic Research Department Federal Reserve Bank of San Francisco, [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=170008](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=170008)
- McGuire, P., Tarashev, N. (2008). *Global monitoring with the BIS international banking statistics*. BIS Working Papers No. 244 January 2008 <http://www.bis.org/publ/work244.pdf?noframes=1>
- Moody's Investors Service (2008). *Moodys ratings symbols and definition*. [www.moodys.com](http://www.moodys.com)
- Moody's Investors Service, Global Credit Research. (2001). *RiskCalc for Private Companies – The German Model – Rating Methodology*. Moody's Investors Service. New York, [www.moodys.com](http://www.moodys.com)
- Moody's Investors Service. (1998). *Méthodologie De Notation*, [www.moodys.com](http://www.moodys.com)
- Morgan, D. P. (2002). *Rating Banks: Risk and Uncertainty in an Opaque Industry*. *The American Economic Review*, Vol. 92, No. 4 (Sep., 2002): 874-88. <http://www.jstor.org/stable/3083285>
- Saunders, A., Allen, L. (2002). *Credit Risk Measurement: New approaches to Value at Risk and other paradigms*. John Wiley and Sons, New York
- Segoviano, M. A., Lowe, P. (2002). *Internal ratings, the business cycle and capital requirements: some evidence from an emerging market economy*. [www.bis.org](http://www.bis.org)
- Standard & Poor's (2003). *Corporate Ratings Criteria*. The McGraw-Hill Companies, New York
- Treacy, W. F., Carey, M. (2000). *Credit risk rating systems at large US banks*. *Journal of Banking and Finance*, no 24: 167 – 201
- Weber, J. (2006). *Discussion of the effects of corporate governance on firms' credit ratings*. *Journal of Accounting and Economics* 42 (2006): 245–54, [www.elsevier.com/locate/econbase](http://www.elsevier.com/locate/econbase)