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**SUMMARY  
DOCTORAL THESIS**

**PERFORMANT METHODS FOR OPERATIONAL RISK MANAGEMENT IN BANKS**

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**CONTENTS**

## INTRODUCTION

### **CHAPTER I – ACTUAL APPROACHES REGARDING RISK MANAGEMENT IN BANKS**

#### 1.1. MODERN BANKING SYSTEM – EVOLUTION AND ACTUAL TRENDS

##### 1.1.1. BANKING SYSTEM IN THE GLOBALIZATION CONTEXT

##### 1.1.2. ROMANIAN BANKING SYSTEM – ACTUAL TRENDS

#### 1.2. BANKING RISK, TIPOLOGY AND SPECIFIC INDICATORS

##### 1.2.1. THE CONCEPT AND TIPOLOGY OF BANKING RISK

##### 1.2.2. MEASUREMENT INDICATORS FOR BANKING RISK

#### 1.3. RISK IN BANKS – BASEL II APPROACHES

##### 1.3.1. THE RISK IN BANKING SYSTEM

##### 1.3.2. BASEL II – REQUIREMENTS FOR BANKING RISK ADMINISTRATION

##### 1.3.3. PRESENT PROBLEMS OF BANKING RISK MANAGEMENT IN ROMANIAN BANKS

### **CHAPTER II – OPERATIONAL RISK IN BANKS – TIPOLOGY AND WAYS OF MEASUREMENT AND CONTROL**

#### 2.1.1. OPERATIONAL RISK MANAGEMENT – A PROCESS

#### 2.1.2. OPERATIONAL RISK SOURCES

#### 2.2. WAYS OF MEASUREMENT AND CONTROL FOR OPERATIONAL RISK MANAGEMENT IN BANKS

##### 2.2.1. IDENTIFY AND ASUMING OPERATIONAL RISK

##### 2.2.2. MEASUREMENT AND CONTROL OF OPERATIONAL RISK

#### 2.3. OPERATIONAL RISK – THE PARTICULARITY OF E-BANKING

##### 2.3.1. APPEARANCE AND DEVELOPMENT OF E-BANKING

##### 2.3.2. BASEL II PRINCIPLES REGARDING E-BANKING

##### 2.3.3. E-BANKING SERVICES

##### 2.3.4. OPERATIONAL RISK MANAGEMENT IN E-BANKING

### **CAPITOLUL III - PERFORMANCE METHODS REGARDING OPERATIONAL RISK MANAGEMENT**

#### 3.1. PROPOSED APPROACHES FOR OPERATIONAL RISK MANAGEMENT FROM BASEL II ACCORD

##### 3.1.1. BASIC INDICATOR APPROACH

##### 3.1.2. STANDARD INDICATOR APPROACH

##### 3.1.3. ADVANCED INDICATOR APPROACH

#### 3.2 CASE STUDY REGARDING OPERATIONAL RISK MANAGEMENT

## CONCLUSIONS

## LIST OF FIGURES

## **The theme's novelty and its degree of study**

### **The theme's novelty**

In recent years the study of banking activity and its related risks proved to be a fascinating field of study, and proof to that stands the abundant literature that was written on this subject. In this context with the present paper I intend to focus on the theoretical and practical issues that regard banking risk management (in particular operational risk). The object of my research is the identification of banking risk management trends; the tools used in managing systemic banking crisis; the regulatory requirements and central bank's supervision methods. The emphasis will be on presenting methods and techniques for the identification, evaluation, analysis and control of the bank's operational risk.

Operational risk is not new, on the contrary is one of the oldest types of risks banks are facing. There are however few aspects regarding operational risk that are quite new:

- the perception that operational risk has increased in recent years;
- the creation of a legal frame and the tendency of studying this risk separately in parallel with those already recognized (credit risk and market risk);
- the official inclusion of the operational risk in bank's management risk policies

From the risk point of view, the banking system suffered major changes in its approach until 2008, an economically reference year worldwide. Until recently many of the risks approaches have been by way of recommendation and only some of them have been required by the control and monitoring bodies established at central and national level. Currently the emphasis has been place on those models that, although require high costs compared to the traditional ones, will provide more accurately the probability of occurrence and the impact of the operational risk. This happens only if the principles guiding these models are applied accordingly and in complete harmonization with market practices.

Unfortunately for banks, their last year's trend showed an increase in their interest for retail and corporate banking in both the operational and lending side so much so that these banks in their quest for profits and market share have failed or were less interested in effective risk management. Today things have changed and the lending process takes place with greater caution. Banks have shifted the points of interest for bringing revenue and market share in the operational area through attractive packages and incentives for current account transactions.

Although the income gained by banks from operations is less risky than that acquired through credit it must be monitored through advanced operational risk management. Attracting resources requires a careful management of their work capacity. If 20 years ago attempted bank fraud were practically inexistent, at present banks must protect from both internal and external fraud attempts and attacks on their accounts and ATMs. Because this risk increases along with the pace with which the software world develops banks should try to be in line with advanced technology through advanced risk management and monitoring.

### **Degree of study**

It is considered that the fundamentals of risk management were created together with the emergence of probability theory in the seventeenth century, which in time became the basis of mathematical theory and the theory of financial risk.

Economic literature on the issue of risk analysis and banking risk management lacks to present, even now, a single opinion on the definition of risk and the principles of proper management. Additionally, the latest issue in banking risks such as operational risk is a challenge for both practitioners and academics. This area of innovation is very wide and has profound implications for banks activity.

In the study I conducted, I took into account the results of several research institutions such as the Basel Committee, World Bank, National Bank of Romania, Romanian Banking Institute, etc. on the operational risk matter.

### **Field of research**

The thesis research topic focuses mainly on the theoretical, methodological and practical aspects of management and risk monitoring at banks and system level.

### **General purpose of research**

The purpose of the thesis is to reveal proper methods for identifying, monitoring, preventing and controlling operational risk in banks under the supervisory and regulatory banking requirements and recommendations of national and international banking risk management bodies.

## **Objectives of research**

The following topics have been analyzed:

- Analysis of modern banking systems - evolution and current trends;
- Bank risk typology and its specific indicators;
- Basel II approach on banking risks ;
- Operational risk in banks - type, methods of measurement and control;
- Operational risk in electronic banking system;
- Recommendations of the Basel II operational risk approaches

## **CHAPTER I – THE CURRENT APPROACHE of RISK MANAGEMENT IN BANKS**

In recent years the rapid growth in financial innovation and the outsourcing of various services offered by banks have significantly changed the banking environment, making them almost unrecognizable. Technological progress has provided new opportunities for both customers and banks. The growth of financial instruments types presented on the international markets increased banks access to funds. At the same time financial markets have expanded creating new opportunities for banks to develop in terms of products and services offered. Although these changes are more visible in some countries than in others, most banks have developed an interest in creating new tools, products and services to better respond to their customers' needs.

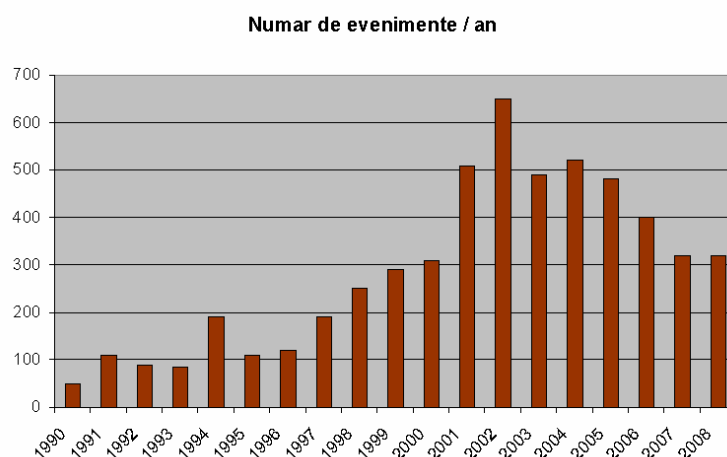
The expansion of national and international traditional credit systems weakened the financial markets making them more fragile triggering thus a state of uncertainty which in time lead to the proliferation of a wide variety of financial and banking system risks. Furthermore, nowadays banks must accept the idea that risks arise with every transaction, being associated with any process and give rise to a combination of risks when different transactions are involved. That is why a major objective of banks management is the management of systemic risk<sup>1</sup>. The Central and Eastern Europe banking market continues to be dominated by international banks. Figures show that in these countries at the end of 2005, the market share of foreign owned bank was 78% (except Russia, Ukraine and Turkey). Since solid banking markets are strong in due to their high privatization process, offering few opportunities for major acquisitions, international

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<sup>1</sup> "Metode și tehnici bancare", **Ioan I. Trencă**, Casa Cartii de Stiinta, Cluj-Napoca, 2003

investors are focusing mainly on countries where consolidation and internationalization process hasn't reached its peak.

The credit, market and liquidity risks have further deepened the severity with which operational risk stroke<sup>2</sup>. Proof to that are the two most serious fraud in bank history: the loss of 7 billion USD cause to the Societe General by trader Jerome Kerviel and the 30 billion USD fraud of Bernard Madoff (in Fig. 1 one can see a statistic processing of operational risk events in terms of number of such events and in Fig.2 the top 10 losses of 2008)<sup>3</sup>



**Fig.1 – Number of events per year - - The Journal of Risk & Compliance Oportunity, February 2009**

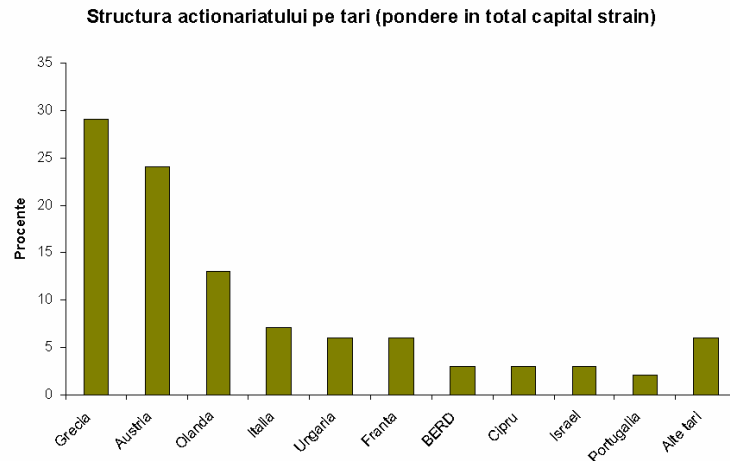
Numele Organizatiei	Stat	Pierdere (USD)	Data descoperirii	Eveniment cauzator
Bernard Madoff				
Investment Services LLC	Statele Unite	50,000,000,000	12-Nov-08	Frauda actiuni
Wells Fargo & Co	Statele Unite	8,400,000,000	21-Jul-08	Active toxice
Societe Generale Group	France	7,762,247,360	4-Jul-08	Trading neautorizat
Fairfield Greenwich Group	Statele Unite	7,500,000,000	15-Dec-08	Frauda externa
Petters Group Worldwide	Statele Unite	3,000,000,000	13-Oct-08	Falsificare acte
Siemens AG	Germania	2,804,200,750	5-Nov-08	Mita
Credit Suisse Group	Elvetia	2,660,700,000	13-Aug-08	Frauda legata de preturi
Visa International	Statele Unite	2,250,000,000	7-Nov-08	Nerespectarea legilor antitrust
CITIC Group	China	1,895,453,490	20-Oct-08	Trading neautorizat
Ascot Partners LP	Statele Unite	1,800,000,000	16-Dec-08	Lipsa unui process fiabil de due diligence

**Figure 2 Top 10 most important events of operational risk and the amount in USD in 2008 - The Journal of Risk & Compliance Oportunity, February 2009**

<sup>2</sup> Managing operational risk through the credit crisis, Penny Cagan, 2009

<sup>3</sup> idem

Today's Romanian banking system is dominated by financial institutions with foreign shareholders, who together hold approximately 88% of total assets as it can be seen from the chart below.



**Figure 3: The structure of banking capital in Romania - NBR**

The restructuring process of the Romanian banking market will continue with the finalization of the last privatizations leading to an increase in its concentration due to competition growth that characterizes a mature market. The late restructuring process and the relatively low degree of banking intermediation compared to other countries in the region makes Romania one of the countries with the most significant development potential.

Before presenting the bank risks' types, clarifying the concept of risk is required. If we consider the linguistic<sup>4</sup> definition, risk is defined as the probability of loss occurrence. The Concise Oxford English Dictionary defines risk as "hazard, the possibility of negative consequences, loss or exposure to deuce"<sup>5</sup>. Economic literature regarding risk analysis shows the absence of a unique view when it comes to defining risk.

In a broad sense, often used in economic literature<sup>6</sup>, risk is defined as the probability of events with negative repercussions on business, activities, etc. to take place. When these events take place they usually generate a financial and an economical loss, additional costs and in some cases even the partial or complete loss of expected income.

In many approaches, the risk is associated with uncertainty. Moreover, in everyday language, risk and uncertainty are used as synonyms, although the two concepts are not

<sup>4</sup> Conform Dicționarului explicativ al limbii române.

<sup>5</sup> Concise Oxford English Dictionary, Fifth Edition, 1995, pg. 1015.

<sup>6</sup> Froot K., Scharfstein D., Stein J (1994)

equivalent. Thus, a clear distinction between risk and uncertainty must be made. Uncertainty characterizes future situations and events which outcomes cannot be measured probabilistically. Unlike uncertainty, risk involves a partial knowledge of the probabilities with which an event will take place<sup>7</sup>.

A risk is unknown if unexpected and even more unquantifiable. The example of authors related to this statement is that of terrorist attacks before September 11, 2001. Although such events happened before that date, the authors consider that the quantification of their outcome could not be predicted and neither could their risk proportion anticipated. Thus, it can be considered that these risks evolve from one form of action to another (unknown risk → identifiable risk → known risk), as: a) they affect the activity of entities in such a manner that they can be ignored and b) they require identifying new methods of assessment for these risks.

In early economic literature, most experts addressed only the credit and liquidity risk process which derives from the classical function of banks' operation. This approach was later strongly influenced by the phenomenon of exponential diversification of bank risk forms.

Thus, until the '70s, the credit and payment system risk were considered to be the most relevant banking risks. What happened after this period was regarded as a milestone in the development of the banking risk concept, as credit institutions had to face new challenges and an increasing number of new risk forms. In these circumstances, many analysts have attempted to identify the causes of the phenomenon which lead to an explosion in the banking risks forms. The results identified were numerous and they can be summarized as follows: the variety of risks and increase in their scale were mainly determined by the process of innovation<sup>8</sup>, globalization<sup>9</sup> and organizations' action<sup>10</sup>.

When referring to the theory and practice aspects of bank risk the following assumptions must be known and acknowledged:

- Risk is inevitable and follows any economic agent in its decision making process.
- Attitude toward risk is different and depends mainly on two factors: the size of the expected profit and the probability of profit.

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<sup>7</sup> Knight, F.H. (1921)

<sup>8</sup> Holzer B. și Millo, Y. (2004)

<sup>9</sup> Guill, G. (2001)

<sup>10</sup> Perrow, C. (1984)



- There are two possible ways for assessing risk: a) using qualitative methods, when determining the utility of expected profit and the influence of potential loss on business, or b) using quantitative methods when the size of the forecasted profit (or the possible loss) and its probability is estimated. Credit risk assessment is a process that involves a prior identification of the forms under which risk materializes.

Depending on the elements affected by risk occurrence, the literature distinguishes the following types of risk:

1) Financial and liquidity risks (which affect assets and liabilities elements) include:

- Credit risk;
- Government securities risk;
- Foreign exchange risk;
- Interest rate risk;
- Price risk;
- Market liquidity risk;
- Technical and organizational risks, (that affect cash flow).

2) Transactional risk:

- Transactional risk from sales made in foreign currency;
- Transactional risk from owning liabilities in foreign currency;
- Transactional risk from foreign currency contracts;
- Transactional risk for foreign currency loans or investments.

At the end of 1974 as a response to the international banking crises, which led to the bankruptcy of Bankhaus Herstatt Bank in West Germany, the Basel Committee was established to supervise the banking system. First Capital agreement, called Basel I was adopted in 1988, offering a framework for credit risk measurement. The next step was made in 1999, when a proposal for a revised capital adequacy framework was issued called Basel II. Its aim was to improve financial stability through a closer collaboration between banks, establishing a performance framework for risk management and corporate governance with banks. To achieve its objectives Basel II policy relies on 3 pillars:

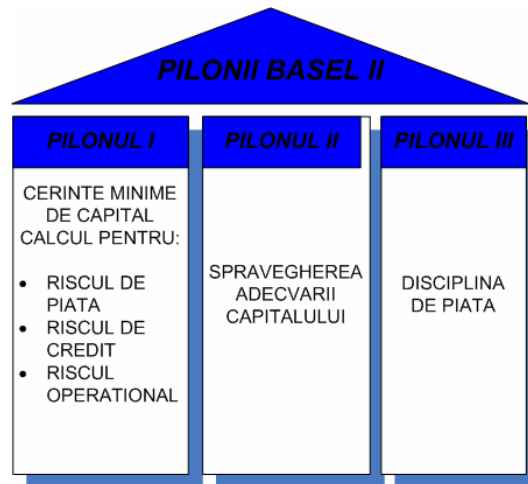


Figure 4- The pillars of Basel II – author’s contribution

- I. Minimum capital requirements (addressing risk)
- II. Monitoring capital adequacy
- III. Market discipline

The first pillar deals with the maintenance of regulatory capital calculated for three major components of risk that a bank faces: credit risk, operational risk and market risk. Unlike Basel I, Basel II treats market risk more accurately offering two methods when calculating the capital requirements:

- a) Standardized approach
- b) The approach based on internal rating models with basic and advanced version

A new element in Basel II approach is the internal rating models. Capital requirements are calculated taking into account to the probability of payment default, the loss in the event of a default, the debtor and the maturity exposure. In the basic approach of internal rating techniques, the likelihood of payment default is determined by credit institutions and the remaining parameters by the central bank sets. In the advanced approach, credit institutions set their own indicators without following those imposed by the central bank. Similar to credit risk, operational risk - defined as the possibility of loss occurrence caused by inadequate internal processes, human or system errors - provides 3 possibilities for calculating capital requirements.

- Basic Indicator approach – requires banks to hold a capital equal to 15% of the average gross income registered over the last three years of activity;

- Standardized approach – implies dividing a bank’s operations in 8 categories. The capital requirement is determined by multiplying the net income obtained by each category of activity with a percentage between 12% and 18%;

- Advanced Measurement Approach - allows for internal models to be used in determining capital requirements.

Risks in Romanian banking system continue to have a significant impact due to a variety of factors such as: lack of banking rules and procedures that cover all risks areas; the non-mature stock exchange market; the reduced number of banks listed; lack of transparency in banks main activities: as creditors banks provide access to information, but when they stand as debtors they are reluctant in providing data, except when they are constrained to report their activity to the National Bank of Romania.

In these circumstances, the market can provide little information on to the quality of a bank. Therefore, for a good risk management every action or event should be properly known and assessed. In this context every bank must designate a Risk Committee whose managers will permanently analyze all arising issues starting from the highest to the lowest level (basically the first line). Among current problems that banks face the most important are those related to operational risk, credit risk, systemic risk, reputational risk, fiduciary risk and country risk. When it comes to operational risk the 2005 figures show that more than one third of the big banks have been the target of a fraud. A feature the operational risk entails, the payment aspects have completely changed the banks approach on doing business. For this type of risk I have identified several problems that most banks face in this period:

- Personnel training - staff dealing with risk identification and prevention programs must be part of risk management training programs;

- Outsourcing solution – they should be considered with certain services in order to minimize the occurrences associated with such risks;

- Data security – to avoid data breach the following actions are required: a secure data storage, running tests on regular bank operations, building a continuity plan in case of risk occurrence, a proper protection of the integrity and confidentiality of customer data and transactions;

- Communication – a frequent communication with bank customers and their information leads to a decrease in risk.

Like operational risk, credit risk it is an essential element in banking practice. According to Deloitte in 2005, 84% of financial institutions included the credit risk in their risk management programs. Current issues regarding credit risk are:

- Knowing the limits - for each contract it handles the bank should consider its maximum exposure capacity by carefully analyzing the credit files and clients' capacity before they grant credit. Negotiating certain clauses in contracts should not be given easily but only after certain principles agreed upon by both the bank and the customer;
- Continuous improvement - Credit analysts must follow certain clear principles in their work and the products banks offer need to be adapted to market requirements
- Risk versus reward - a customer credit renewal must provide a "reward" for the client especially if he has a good credit history with the bank. If the client has complied with his first loan terms of payment and the entire process was conducted under the best conditions, at the following credit application the bank should grant him some facilities such as negotiated interest rate, transaction and management fees etc.
- Other problems banks face are: hyper-regulation – which has created a very dense framework, with many rules, regulations, unnecessary bureaucracy that lead to an increased in banks costs, which are high in our country; rigid legislative framework – affects banks' mobility and their capacity to respond, limiting the number of offered banking products; high costs - some induced by the National Bank of Romania (NBR) when imposing a high percentage of reserve requirements. In general, the costs of business in Romania are high, especially due to financial instability.

## **CHAPTER II - OPERATIONAL RISK IN BANKS - CLASSIFICATION, METHODS OF MEASUREMENT AND CONTROL**

Risk management was described by Steve Thicke <sup>11</sup> as something that “reduces to: what and when you know” certain things. When talking about bank risk management some concepts need to be defined.

Management as a science appeared in a certain stage of social development as a response to the need of seeking appropriate solutions for a better organization and management of processes that in time have grown in complexity. Reece and O'Grady define management as "co-

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<sup>11</sup> Steve Thicke este Director al *Corporate Risk Management Group* în cadrul J.P. Morgan Group.

ordination of human resources, information, physical and financial means, to achieve the purpose of the organization <sup>12</sup> .

Management has, at the same time, developed systems, techniques and specific methods for running activities. Henry Fayol identified five stages in the management process:

- 1) planning
- 2) organizing
- 3) commanding
- 4) coordinating
- 5) controlling

The main purpose of risk management is to minimize risks and maximize the institution's value. There are many approaches when it comes to the classification of bank risk management <sup>13</sup>. Some economists <sup>14</sup> consider that bank risk management needs to be classified as part of the bank's financial management. In practice, under current conditions, bank risk management has become a far too complex and vital element for institutions to continue treating it as part of their financial management issues. Therefore the bank risk management it's addressed as an independent activity but connected with the overall management system of the institution.

Operational risk it's not a new type of risk, but rather one of the oldest forms banks had to face. A new bank on the market can face operational risk right before granting the first credit or running the first transaction. However operational risks has some relatively new aspects that need to be known such as: the perception that in recent years operational risk has increased in accordance with banks growth; operational risk should be treated separately from credit and market risk; the necessity of including operational risk in any risk management process; the increased interest of banks' supervisor authorities on operational risk problems.

Operational risk occurs whenever a company uses its employees and applications to conduct its business or it's the subject of external factors and that is why this risk appears long before credit or market risk. As we know in the last 15 years operational risk has been the main cause of most financial losses in the banking sector. If we look close most of these losses are

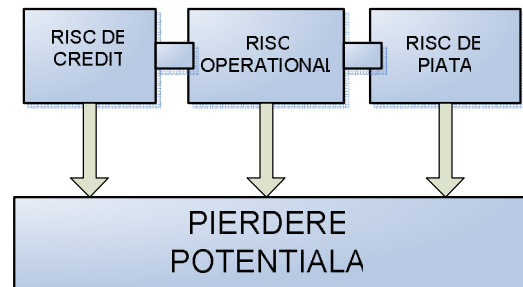
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<sup>12</sup> Nițu, I., (2000)

<sup>13</sup> Vasile, L. (2006)

<sup>14</sup> **Beck, K., Goldreyer, E. & Antonio, L. (2000),** "Duration Gap in the Context of a Bank's Strategic Planning Process", Journal of Financial and Strategic Decisions, Volume 13, No.2

attributable to market or credit risk but in reality the main cause is operational risk. Finally not the consequences but the cause or causes of loss occurrence determines whether or not we're dealing with operational risk, which in the end it takes directly or indirectly the form of market risk or credit risk.



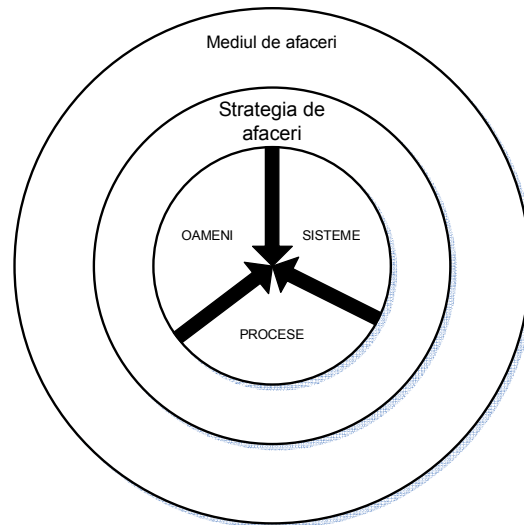
**Figure 5 - Operational risk materializes through market or credit risk –author's contribution**

The differences between operational risk and credit or market risk are as follows: firstly, there is no direct link between operational risk and income, for example when operational risk increases, revenues increase; in contrast to other types of risk, much of this risk is located inside banks and that is why banks do not want to draw attention to their weaknesses. On one hand this leads to lack of data to be studied later and to control risk and on the other types of loss incurred by a bank are not transferable to other banks due to the difference of activity, internal control, etc. Credit and market risk, allow for a much easier determination of their potential loss exposure which can be calculated. Such risks are much easier to measure and monitor than do links between risk factors and then calculate the probability of occurrence of loss, the most important issue for this type of risk that is treated and developed so far is a those cases where banks have suffered heavy losses due to operational risk. The best known case is the Barrings' bank loss, which had a huge impact on the institution. In 1995, trader Nick Leeson caused an 850 million pounds (about 1.3 billion U.S. dollars) loss while working at Barrings' Singapore subsidiary. He was involved in speculative transactions with clients' money, losing large amounts and causing the bankruptcy of one the major investment banks in the world. For three months, Leeson bought more than 20,000 futures contracts, worth about 180,000 U.S. dollars each (136,243 euros). Nearly three quarters of the total loss of 1.3 billion U.S. dollars which he caused to the Barings bank came from these contracts. When bank management discovered the casualties, nothing could be done but to inform the Bank of England that they were completely bankrupt. On March 2, 1995, just a few days after Nick Leeson's arrest in Frankfurt (Germany), Barings Bank was

sold to the Dutch financial giant ING for the symbolic sum of one sterling pound, thus putting an end to 230 years of Barings' history on the market. The bank was renamed ING Barings, but in time the logo changed to simply ING.

In recent years most banks have allocated massive resources to manage credit and market risk. In addition they have developed new models for risk assessment based on international practices regarding the market discipline for crisis prevention. These principles are the 3 pillars of the New Capital Agreement, issued by the Basel Committee in January 2001. It is not surprising that regulations on the banking sector represent the subject of a continue debate on wheatear or not these rules need to be enforced, and if so what are the risks that need to be covered and by which pillar. For example the first pillar regarding the "minimum capital requirements" has brought a series of discussions about its name only. But only recently the attention of banks went to a new risk i.e. the operational risk. It was also acknowledged that the events arising from operational risk have a major impact on the banks' activity. In this context the Basel Committee decided to introduce a set of rules banks needed to follow when managing the operational risk. The operational risk definition gave by the Basel Committee was the following: "the risk of loss resulting from the inadequate internal management of people and systems or that caused by external events.

The main factors leading to operational risk is internal and external fraud, employee practices and safety measures at every workplace, customers, bank products and operating practices adopted by banks, deficiencies in technical infrastructure, disruption in activity and system failure. These factors are integrated within 5 areas (Fig.6) of coverage that the Basel Committee has proposed for implementation, namely: people, processes, systems, business strategy and business environment.



**Figure 6- Scope of operational risk – author’s input**

The banks personnel represent an important source of operational risk occurrence because of at least 3 reasons: staff fluctuation, lack of adequate training and shortage of professionals <sup>15</sup>. Banks are confronted with an increase in their personnel fluctuation and this trend will continue in the near future as no solid solutions regarding the eradication of this phenomenon have been found so far. As a NBR study reveals the rate of personnel’s fluctuation in banks in Romania between 2005 -2007 was 25% as shown in the figure below.



**Figure 7 - Evolution of personnel fluctuation - source National Bank of Romania**

To control and limit risks, banks must be aware of their potential. Identifying risks’ source allows banks to take proper measure to prevent and control them. In the identification and ownership phase <sup>16</sup>, banks should consider certain factors for assessing the activity’s risk type

<sup>15</sup> Silivestru Hadrian – Operational risk in Romanian Commercial Banks – Competitiveness and European Integration Conference , Cluj-Napoca, 2007

<sup>16</sup> In practice these two steps are often combined because the methods used are relevant to both

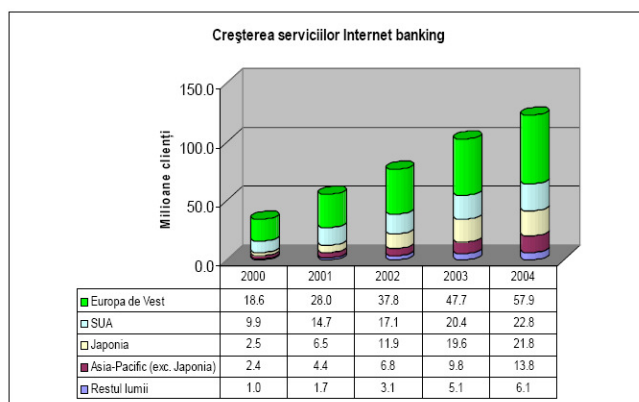


such as: types of clients, activities and products, design, implementation processes, risk culture and banks risk appetite, staff policy, business environment in which they operate.

At this point the following methods have proved to be useful: risk inventory, the recorded loss database, process analysis, scenario-based analysis, and risk indicators. Together with external factors, the recorded loss database and scenario-based analysis form the basis for quantifying and modeling the operational risk<sup>17</sup>. Risk quantification combined with quality management can improve the control and monitoring. Control may be improved if the information obtained will be used for the calculation and allocation of capital in banks' activity.

Along with the Internet's boost electronic business has increased significantly. The term e-business was first used in 1997 by IBM, which defined it as a way to securely and flexibly combine the various processes and systems that run the basic operations of business with the enabling features Internet offers to find information.

Only after 2000, the increase in Internet banking services has become more significant, as can be seen from the figure below.



**Figure 8 - Internet banking services evolution in the world for (200-2004) period<sup>18</sup>**

The rapid changes banking systems in general and IT market in particular have underwent in recent years have revolutionized the way banks deliver their products and services to their customers so much so that each bank is trying to offer rapid solutions to help customers run their business. Electronic banking has some special features which enhance and change the perception of traditional banking risks. Specific operational risk e-banking activities refer to the

<sup>17</sup> Hull, J.(2006), „Risk Management and Financial Institutions”, John Wiley & Sons

<sup>18</sup> International Data Corporation, epaynews.com, Journal of internet banking and commerce, dec.2004, vol.9, nr.3

following factors: system design, its implementation and maintenance, the lack of information on bank products and services by bank customers.

*System design, its implementation and maintenance.* Banks often face the situation in which the system they have chosen for running an electronic banking application is not well defined or implemented. For example, a bank is at risk of interruption or slowing down its main computer system if the electronic banking system purchased is not compatible with the core-banking application. Many banks use the services of third parties to implement and provide support for e-banking applications. The outsourcing of services allows banks to reduce their maintenance, monitoring and application modification costs, but in the same time they represent a source of operational risk as the chosen suppliers might not completely meet the banks requirements or imposed deadlines of delivery. Operational risk in this case can occur when banks fail to instruct their customers on how to use the e-bank's application and secure their personal data. Problems can also arise when customers decide to cancel an authorized transaction after a while they resulting in financial losses for the banks.

### **CHAPTER III – PERFORMANT METHODS REGARDING OPERATIONAL RISK MANAGEMENT**

The methods described in this chapter are different in terms of complexity and senzitivity to risk and form the base for capital allocation for operational risk. The banks are advised to switch from simple approaches to more complex and higher risk senzitivity and finally to develop their own methods for control and risk measure. In this respect these approaches follow a revolutionary design as it is shown in the figure bellow:

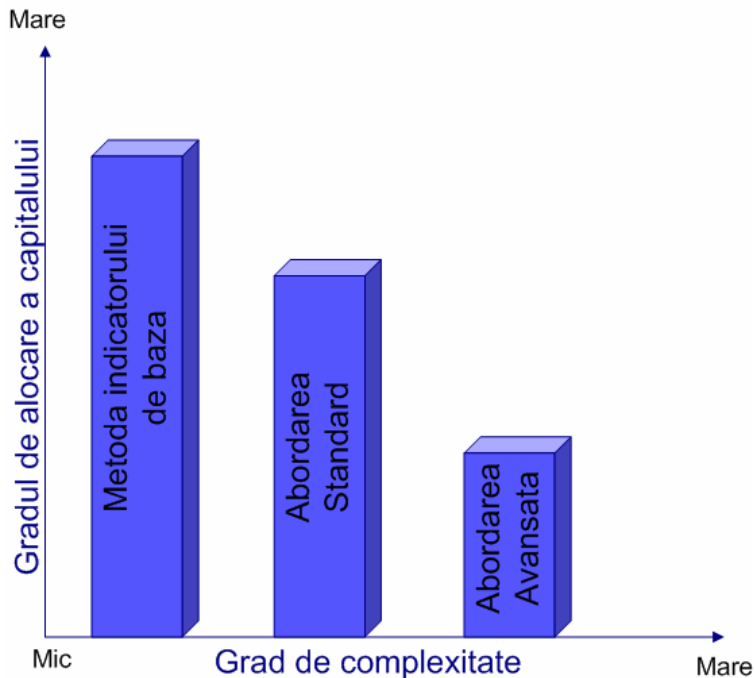


Figure 9 – Switching from simple approach to advanced approach – author

Basic indicator approach – is a simple method for the capital allocation needed for operational risk. It has been modeled for smaller banks taking into account the complexity of their business and the effort for developing their own methods it's not justified. Using this method the allocated capital represents 15% from the indicator as it follows: the indicator represents the average of the sum of net income for the last 3 years. The average of the last 3 years is calculated based on incomes of the end of fiscal year. If this information is not available estimation can be done. If for one of these 3 values or all 3 are negative or zero they are not taking into calculation. This indicator is relevant only if the values are positive.

$$K_{RIA} = \alpha \cdot EI$$

where:

$$K_{RIA} = \text{Allocated capital}$$

$$\alpha = 15\%$$

EI = Sum of 3 years income

Standard Approach – compared with the previous indicator this method is a more developed one in order to calculate capital allocation for operational risk. Standard approach means grouping into 8 categories the banks activity: corporate finance, payment and settlement, agency services, asset management, retail brokerage, retail banking, trading and sales, commercial banking. The gross income of each business line represents an indicator of operational risk exposure. The capital allocation is determined separately for each category, applying a specific multiplier to the gross income. This beta multiplier is between 12% and 18%.

$$K_{STA} = \sum_{i=1}^8 K_{STA,i} = \sum_{i=1}^8 \beta_i \cdot EI_i$$

Where:

$K_{STA}$  = capital allocation

$\sum_{i=1}^8 K_{STA,i}$  = the sum of capital allocation for each business line

$\sum_{i=1}^8 \beta_i \cdot EI_i$  = the sum of business line activity multiply with beta indicator

Advanced measurement approach – this method represents a personalized and inside developed by each bank for operational risk allocation capital calculation. For adopting this method<sup>19</sup> the banks must comply with NBR regulations. After a study on 5 romanian banks (BCR, BRD, Raiffeisen Bank, Banca Transilvania and Unicredit Ţiriac Bank) based on financial situation from 2006-2008 I have calculated the necessary capital using the 3 methods proposed by Basel II Committee.

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<sup>19</sup> Stancu, I. & Bălu, F. (2009), “Modelling Operational Risk under Advanced Measurement Approach”, International Conference “Financial Crime and Securitization of Banking Circuits in order to Prevent and Fight against Money Laundering”, Editura ASE, 2009

Elemente luate in calcul pentru calcularea indicatorilor de alocare a capitalului			
	2006	2007	2008
<b>BCR</b>	<b>803,086,962.69</b>	<b>1,081,283,073.14</b>	<b>1,791,983,598.99</b>
a) Venituri din dobânzi și venituri asimilate, inclusiv cele aferente titlurilor cu venit fix;	844,152,078.31	1,173,095,915.86	1,851,465,772.40
b) Cheltuieli cu dobânzile și cheltuieli asimilate;	388,214,782.24	614,110,208.85	1,068,344,149.67
c) Venituri din acțiuni și alte titluri cu venit variabil;	0.00	0.00	0.00
d) Venituri din comisioane;	170,601,220.03	272,107,092.56	277,882,803.38
e) Cheltuieli cu comisioane;	20,470,421.34	25,221,885.96	42,105,248.87
f) Profitul sau pierderea netă din operațiuni financiare;	189,209,533.27	265,929,943.37	529,955,739.00
g) Alte venituri din exploatare.	7,809,334.66	9,482,216.16	243,128,682.76
<b>BRD</b>	<b>631,642,899.70</b>	<b>912,433,392.56</b>	<b>1,100,840,945.23</b>
a) Venituri din dobânzi și venituri asimilate, inclusiv cele aferente titlurilor cu venit fix;	485,264,772.88	731,006,271.24	1,006,284,728.32
b) Cheltuieli cu dobânzile și cheltuieli asimilate;	233,868,881.26	381,432,911.34	581,575,585.03
c) Venituri din acțiuni și alte titluri cu venit variabil;	4,740,625.05	4,865,164.95	13,572,479.97
d) Venituri din comisioane;	190,792,253.65	282,514,154.86	291,636,396.67
e) Cheltuieli cu comisioane;	15,713,210.10	21,007,365.24	25,494,423.11
f) Profitul sau pierderea netă din operațiuni financiare;	186,006,878.14	274,744,625.90	367,524,977.05
g) Alte venituri din exploatare.	14,420,461.34	21,743,452.19	28,892,371.36
<b>Raiffeisen Bank</b>	<b>313,057,000.00</b>	<b>462,051,000.00</b>	<b>624,548,000.00</b>
a) Venituri din dobânzi și venituri asimilate, inclusiv cele aferente titlurilor cu venit fix;	256,367,000.00	317,378,000.00	429,429,000.00
b) Cheltuieli cu dobânzile și cheltuieli asimilate;	107,589,000.00	117,498,000.00	180,327,000.00
c) Venituri din acțiuni și alte titluri cu venit variabil;	0.00	0.00	0.00
d) Venituri din comisioane;	126,551,000.00	181,807,000.00	227,225,000.00
e) Cheltuieli cu comisioane;	14,588,000.00	15,405,000.00	18,622,000.00
f) Profitul sau pierderea netă din operațiuni financiare;	52,166,000.00	95,769,000.00	166,729,000.00
g) Alte venituri din exploatare.	150,000.00	0.00	114,000.00
<b>Banca Transilvania</b>	<b>185,507,580.93</b>	<b>349,405,301.29</b>	<b>386,866,426.53</b>
a) Venituri din dobânzi și venituri asimilate, inclusiv cele aferente titlurilor cu venit fix;	146,820,786.78	269,973,806.97	411,448,359.36
b) Cheltuieli cu dobânzile și cheltuieli asimilate;	75,806,053.62	137,734,827.85	248,697,234.64
c) Venituri din acțiuni și alte titluri cu venit variabil;	22,608,699.39	31,474,548.89	14,425,968.72
d) Venituri din comisioane;	63,601,185.70	90,886,878.91	110,178,654.79
e) Cheltuieli cu comisioane;	6,585,975.32	9,717,730.50	11,721,831.27
f) Profitul sau pierderea netă din operațiuni financiare;	34,107,649.31	101,870,205.26	107,761,456.27
g) Alte venituri din exploatare.	761,288.69	2,652,419.62	3,471,053.30
<b>Unicredit Tiriac Bank</b>	<b>125,328,759.26</b>	<b>244,633,151.95</b>	<b>231,121,943.14</b>
a) Venituri din dobânzi și venituri asimilate, inclusiv cele aferente titlurilor cu venit fix;	113,538,117.75	237,526,945.73	319,077,118.69
b) Cheltuieli cu dobânzile și cheltuieli asimilate;	50,947,785.22	117,058,322.00	251,155,029.46
c) Venituri din acțiuni și alte titluri cu venit variabil;	356,492.84	617,431.76	1,197,824.69
d) Venituri din comisioane;	28,043,656.69	48,744,349.62	69,786,255.46
e) Cheltuieli cu comisioane;	5,505,536.10	5,433,080.93	7,698,048.44
f) Profitul sau pierderea netă din operațiuni financiare;	38,131,215.21	77,944,074.55	97,293,368.45
g) Alte venituri din exploatare.	1,712,598.10	2,291,753.21	2,620,453.74

Figure 10- Elements from financial situations<sup>20</sup>

The following values have been obtained after calculations:

Banca	KBIA	KSA	KASA
BCR	183.82	137.86	47.40
BRD	132.25	99.18	34.10
Raiffeisen Bank	69.98	52.49	18.05
Banca Transilvania	46.09	34.57	11.88
Unicredit Tiriac Bank	30.05	22.54	7.75

Figure 11 – Values of indicators -authors

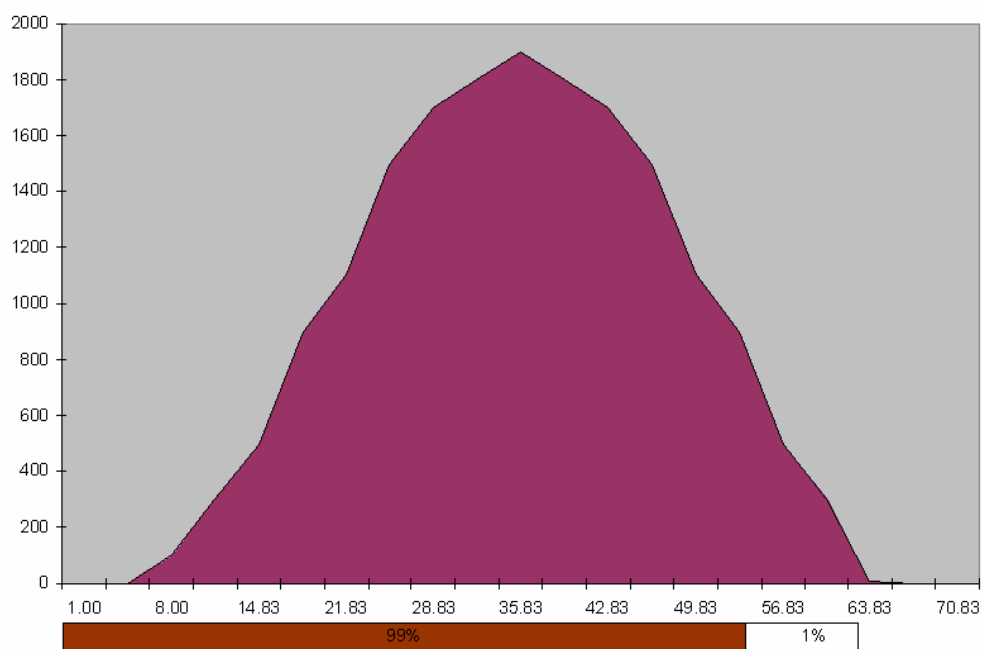
KBIA – basic indicator approach

KSA – standard indicator approach

KASA – advanced standard measurement (the difference between this method and the standard indicator is that the incomes from Retail Banking and Commercial Banking are

<sup>20</sup> Site-urile băncilor și www.bvb.ro

not multiply with 12% and 15% but with 3.5%). Using Monte Carlo method I have generated 17.600 scenarios for different frequencies and severities for one bank from the 5 that I have analyzed



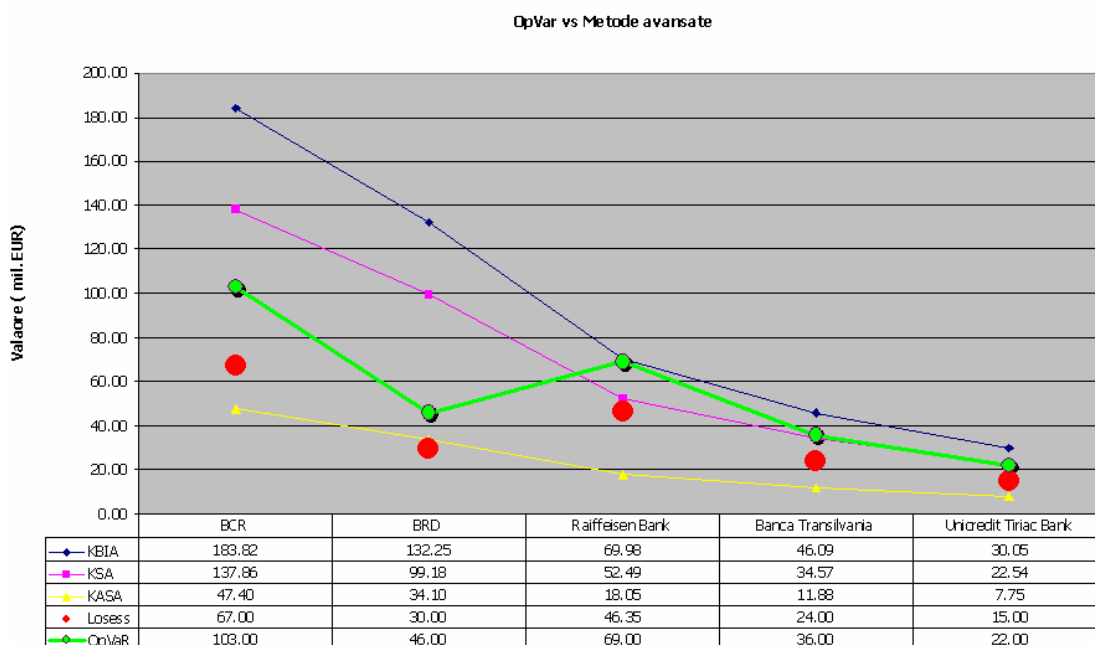
**Figure 12 – Loss Distribution Approach – thousands EUR**

As it can be seen in the figure the average of registered losses is 35.83 millions EUR, which represents the expected loss. This represents the average sum that a bank will use for covering losses. For establishing a necessary reserve for covering unexpected loss we consider different confidence levels from which we take the expected loss.

Procente		Pierdere		Capital alocat	
Nivel de siguranta	OpVaR	Pierdere previzionata	Pierdere neprevizionata	Alocat	Necesar
95%	99	35.83	63.65	35.83	17.32
99%	102	35.83	66.33	35.83	18.05
99.90%	103	35.83	66.93	35.83	18.24

**Figure 13– Necessary capital allocated on different confidence levels ( mill. EUR)**

If a bank wishes to cover the average loss from external fraud must allocate 35.83 millions EUR per year, but if they want to protect against a more severe losses, must allocate another 63.65 millions EUR ( for covering an eventual loss for a 99.99% confidence level). In others words if these reserves will not be available it can be happened in one year to have a loss of 103 millions of EUR and this sum will affect Profit and Loss account. In the bellow figure it can be seen the difference between the capital allocation using the 3 methods proposed by Basel II Committee and Operational Value at Risk<sup>21</sup>.



**Figure 14 – Capital allocation using advanced methods –author**

The basic indicator approach and standard proposed by the Basel II Committee presents some minuses because they are referring to gross income and for neither of them the banks are asked to monitor the implementation. Both methods are used until the banks are able to make the switch to more advanced calculation methods. That's way the banks want to manage the operational risk exposure must develop or switch to more advanced calculation methods like OpVaR. For a good implementation of LDA is a must in having historical data referring to losses, broken down on risk types and

<sup>21</sup> *Böcker, K. & Klüppelberg, C. (2005), "Operational VAR: a closed-form approximation", Risk, December 2008*

business lines in order to model the frequency and severity. Banks can also use external databases for storing data and can model scenario analysis and loss simulations.

Database	Manager
ORX = Operational Riskdata Exchange Association	PricewaterhouseCoopers
CERO = Consorcio Espanol de Riesgo Operacional	Spanish Banks in the ORX
GOLD = Global Operational Loss Database	British Bankers' Association (BBA)
MORE = Multinational Operational Risk Exchange	Netrisk
DIPO = The Database Italiano Perditze Operative	Bank of Italy

Figure 15 – External databases for capturing operational risk events<sup>22</sup>

Regarding the risks that banks must face I must state the following:

- for preventing credit risk the banks must take into consideration besides client bonity also the history of the client with the other banks and also with the current bank especially;
- the banks must have historical databases with clients data and their transactions;
- Developing CRM (Customer Relationship Management) programs in order to have day by day information regarding client's behaviour.

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<sup>22</sup> *Baud, N., Frachot, A., & Roncalli, T. (2002), "Internal Data, External data and Consortium Data for Operational Risk Measurement: How to Pool Data Properly", Working Paper, Groupe de Recherche Opérationnelle, Crédit Lyonnais.*



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