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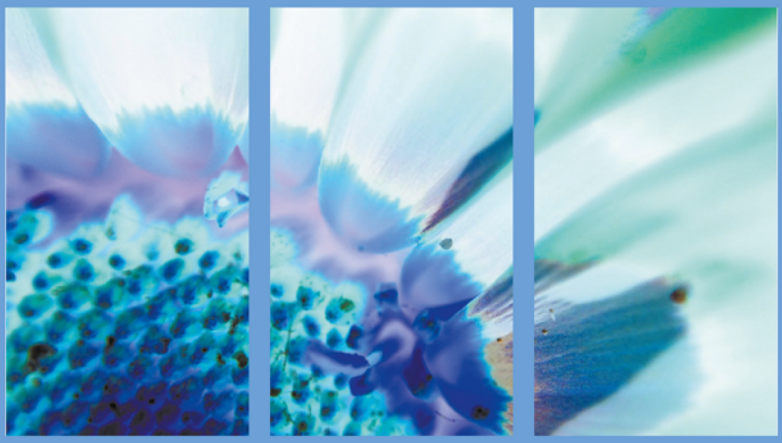
Credit Rating and Bank-Firm Relationships

New Models to Better Evaluate SMEs



Michele Modina

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New Models to Better Evaluate SMEs

Michele Modina
Associate Professor of Business Economics and Management,
Università degli Studi del Molise, Italy

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Introduction

The entry into force of the capital adequacy rules (Basel II) has required banks to allocate significant investments in the development and in the implementation of tools to support the entire credit process. These actions range from the assessment of the creditworthiness of the counterparties and the determination of risk-adjusted pricing to the management of loan portfolios.

In this context, the internal rating systems represent a strong element of novelty. Their introduction, which took place at the height of the economic crisis, has produced a strong impact on bank management and on the relationship between banks and businesses. In particular, small and medium enterprises have experienced this innovation of the rating system, but at the same time the worsening of financial results and the occurrence of liquidity tensions, aggravated by stricter conditions of access to bank credit.

The deep divisions in the competitive, productive and financial dynamics of the economic system require a verification of the approach followed until now in the daily use of rating systems. It means to fully understand if the assessments of the creditworthiness of counterparties, which guide the granting of credit and the management of credit relations in the long run, are sufficiently articulated, meet the counterparties' actual competitive ability and prove farsightedness in guiding with efficiency the relationships between lenders and borrowers.

The control of the quality, the completeness and the adequacy of rating models plays a fundamental role for two reasons. On the one hand, we must avoid the risk of a simplistic use, if not misleading, of the instrument that plays a role in the delicate relationship between banks and businesses. On the other hand, the revision is preparatory to the

evolution of the instrument so as to ensure that companies are evaluated by models consistent with the bank business model.

The focus on the potential uses and the critical elements of the rating plays a key role in making sure that its diffusion contributes to creating value for all stakeholders and does not represent instead a new element of competitive tension and a further obstacle to the relationship between banks and businesses.

In order to elevate the understanding of the rating and to interpret it correctly in relation to companies and to the financial market, the book aims to identify the key elements that guide the design of a new rating system, intended as a set of tools, processes and procedures that can mix appropriately mechanical approaches and human assessments in the evaluation process. The ultimate goal is to make sure that the rating is not limited to the simple mechanical assignment of a score based on quantitative variables, but instead evaluates, through the incorporation of qualitative and environmental information, the assessment of the company's successful and competitive factors in order to highlight its prospective value (and, conversely, its risk) and grasp the complexities.

This is particularly important in a historical moment, as the present one, where the reflections of the crisis, which started in 2007, are still producing severe consequences on the economy of many countries. During the most acute recession what emerged strongly is the vulnerability of SMEs which, because of their size, are struggling to implement resizing interventions. In particular, SMEs have suffered a deterioration of economic performance and the emergence of strong liquidity tensions, exacerbated by stricter conditions to bank credit access.

The downturn was not a normal reversal of the economic cycle, but it has taken the form of a more complex phenomenon that has changed the nature of demand for credit and redesigned the characteristics of the relationship between the bank and businesses. The latter have expressed dissatisfaction not so much in the ample variety of banking products and/or services, but more in the lack of foresight in the allocation of credit, which has intensified the effects of the unfavorable economic phase.

Among the most destabilizing elements of the crisis, there is the procyclical amplification of the shock that has manifested itself in the financial markets and then transmitted to the business world. The tendency to procyclicality has been expanded by several elements – new accounting rules in accordance with the application of International Accounting Standards (IAS), financial leverage – among which we note the new approach to the measurement of credit risk introduced with the

entry into force of the legislation on capital adequacy for banks (Basel II). Within a more comprehensive transformation in the banking industry, Basel II has promoted the adoption of more advanced procedures for risk management by giving banks the opportunity to use internal rating systems. Based on the collection and the processing of information from multiple sources and using mainly mechanistic solutions, rating systems give customers/businesses a creditworthy assessment which estimates the borrower's probability of default (PD) within a certain time horizon based on the applicant's characteristics and financial situation. In measuring the lending risk, the use of rating models is functional to the management of the loan portfolio, and to determining the pricing and the allocation of capital.

The current economic context has expressed some doubts on the adequacy of the rating systems, especially with regard to their application to SMEs, that represent a heterogeneous set that varies by size, business model, ownership structure, organizational complexity, propensity to growth and innovation, and are already difficult to evaluate.

With regard to the procyclicality of the rating systems, empirical evidence agrees in recognizing a certain cyclicality of the existing rating models, the results of which tend to change in the presence of different economic scenarios. At the basis of the relationship between rating and business cycle there is the use by banks of the approach Point in Time (PIT) rather than Through the Cycle (TTC). The first assesses the company's ability to make repayments based on its current solvency requirements, neglecting the effects of possible changes in macroeconomic variables that are instead considered in the alternative approach, whose time horizon is not limited to one year, but embraces a full business cycle. In times of crisis the PIT approach, acknowledging in a timely manner the worsening of economic and financial conditions of counterparties, produces a negative change of the rating assigned to debtors, making it less easy for them to access the banking channel and/or tighten up the conditions of the financing. The difficult availability of financial resources increases the liquidity strain and elevates the difficulties of company's operating management, putting at risk their very own survival.

With reference to the issue of the adequacy of the rating, the main criticisms are: (1) the modest use of qualitative information about the competitive position of the company and its prospects for development; (2) the number of quantitative data (budget data), which are mainly historical and not predictive; (3) the strong weight in the overall assessment of internal performance information, which suffer for the limits of

punctuality and self-determination (the more the bank grants loans, the better are the indices of tension and the use of loans); (4) the predictive horizon of the status of the debtor limited to one year.

The result is that the rating assignment is highly dependent on accurate data, based on a limited spectrum of information, has a short-term predictive capacity and is largely self-determined. The consequence is that the assessment of the customer/company made so far by rating models may not capture the company's real competitive potential and is not neutral with respect to economic cycles accentuating the volatility of assessments, making the access to credit stricter and the relationship with the bank unstable.

The expansion of the information set, the exploitation of all available information and their proper insertion in the assessment are fundamental to identify companies which, although suffering financial stress, have a competitive advantage that allows them to overcome these moments of crisis and prosper in the long run. Hence the need to give greater importance to the rating models rather than to the treatment of the so-called soft information especially in areas where the intangible components (i.e. human capital, capacity for R&D and design, degree of internationalization) contribute most to the value added and to the competitive benefit of successful businesses, as well as the need to enrich the collection of quantitative data by adding periodical and perspective information to historical financial statements.

The search for more sensitive quantitative data and the more intense use of qualitative information are the key elements required to grasp the phenomena in the company management that will be reflected in the rating assessment only at a later time. The construction of a more complete set of information with a longer observation period can facilitate the transfer of information from the company to the bank, which has occurred up to now in a fragmentary manner due to both the natural reluctance of the entrepreneur in transferring sensitive data to others and due to fear of transmitting information, especially in times of crisis, that can be evaluated negatively. At the same time, the evolution of the rating model and the operational use of information contribute to the improvement of lending in terms of pricing, measurement and risk control.

The revision and the improvement of internal rating systems and, consequently, of the credit process is, therefore, a necessary step to take in order to improve the strength of the bank-business relationship and to encourage the presence of a financial system that is capable of supporting the growth of businesses or to support them in times of difficulty, which is essential for the success of local economies.

Aside from the considerations set out above, the book seeks to highlight the development prospects of the models of assessment of creditworthiness due to the requirements imposed by the crisis.

The importance of internal rating systems in the economic structure of a country has attracted the interest of scholars and economic and financial operators. Numerous studies have deepened the structural and procedural characters of rating systems, their strengths and their weaknesses within a debate among experts in corporate finance, industrial and regional economists and, most recently, business scholars.

The mechanistic view of the assessment of credit risk and, therefore, the potential of the company is being enriched with new perspectives of investigation. Today's rating is seen as a functional tool when starting a new system of relationships between banks and businesses. This relationship for the bank means an increase of its sensitivity in understanding, through the rating system, the company's competitive paradigms – and for the enterprise the ability to better communicate their strategic industrial and financial policies. Thus reinterpreted, the rating tool leaves its technical boundaries to become the source for a new dialogue between the company, the bank and the financial-economic system.

Set in this debate, the book highlights the desirable profiles of a new rating system as an ideal program to reach a greater sharing between tools, needs and operational solutions. In this context, the correct interpretation of the principles and the characteristics of internal rating systems becomes a necessity in order to avoid the risk of a rejection of an approach that, if properly understood, incorporates the benefits of financial innovation.

The book is divided into three parts. The first part, "Credit Rating and Internal Rating Systems", provides a review of the characteristics of credit risk management to reach out to the identification of the strengths and the weaknesses of risk assessment systems. The first chapter discusses the distinctive elements of the credit rating by focusing on the key concepts of credit risk. The second chapter focuses on the relationship between process management and credit operations and the logic behind credit risk management by introducing the internal rating approach. It ends by describing the main changes introduced by the new framework (Basel III). The third chapter focuses on the strengths and the weaknesses of internal rating systems. After having outlined the main problems related to the phenomena and the economic impact on the banking management, the chapter concludes with some assessments on merit regarding the opportunity for the bank to pursue operational efficiency and allocative efficiency.

The second part, "Toward a New Architecture of the Rating", provides insights and reflections on the need to develop a new architecture of the rating system. The fourth chapter focuses on methods and techniques for building rating systems able to reinterpret the relationship between banks and businesses. The fifth chapter focuses on the need for banks to adopt a dual track approach to the rating that enhances the peculiarity of the screening phase rather than monitoring; the reason for the adoption of a dual track finds comfort in the examination of some Italian banks' business decisions. The sixth chapter provides a concrete proposal for the establishment of a more sophisticated method for assessing credit risk. It concerns the definition of the new architecture of the model consisting of two main modules: the rating module and the monitoring module. In this context, it provides guidance on the information that must sustain the different modules and the modular structure of the computing system.

The third part, "Credit Rating in an Evolving Scenario", emphasizes the role that the rating can play in making business financing strategy more modern and effective. The seventh chapter, in particular, highlights the role of the rating as a central element for the construction of a conscious comparison between banks and businesses. Moving from the existence of the strong relationship between financial weakness, its probability of default and the ability to create value, the eighth chapter emphasizes the importance for companies, especially smaller ones, to review the funding policy. From the results of a recent empirical research, the ninth chapter highlights the role that the rating can take in promoting the dissemination in SMEs of a new corporate finance culture.

Part I

Credit Rating and Internal Rating Systems

1
Credit Rating

1.1 The distinctive features of credit rating

Rating systems are among the main innovations of the modern banking industry. Developed since the mid-1990s on the basis of a scheme that finds its definition in the working paper of the Basel Committee (BCBS, 1999), it is now possible to define more precisely the hallmarks of credit rating.

The rating is an innovative tool, widely spread, very important for the size of the investments made, the impact on the bank management and the bank-firm relationship. However, credit rating shows some weaknesses, the resolution of which requires the revision of some of its founding principles.

On the innovation front, the rating has introduced elements of strong innovation in the credit process contributing significantly to review the credit risk measurement both in large multipurpose banking groups and within commercial banks (Berger et al., 2005).

Before the introduction of the internal rating approach, the bank's lending decisions were essentially binary. In fact, its role was limited to the granting or not of the loan based on the characteristics of the loan and on the borrower's creditworthiness. The creditworthiness of a borrower was defined on the basis of knowing the applicant and on the guarantees made available to the borrower. The internal rating systems are, however, models that use quantitative techniques and measure the likelihood that the applicant becomes insolvent within a specified time horizon. The measure of the distance from insolvency becomes a guiding element that influences not only the granting of the loan, but also the general conditions of the loan and its pricing. In the decision-making process in credit granting, the statistical techniques of scoring have

replaced the approach based on mutual sharing of the non-performing loans and on the unit costs of the credit production supporting instead the introduction of risk-adjusted pricing (Albareto et al., 2008). If until the 1990s the determinants of the rate charged by the bank were the delinquency rate of the banking system and the economic dimension of the borrower (the larger the company, the lower the loan production costs), nowadays there is a clear relationship between the counterparty's risk defined by the rating and the rates charged to customers. To the company that has been assigned a better rating (worst), money is lent at lower interest rates (higher) and more (less) advantageous conditions.

In addition to being one of the major financial innovations, the rating process has reached a widespread diffusion which is the result of the intense activity carried out by the bank's risk management division (De Laurentis and Maino, 2009). Having invested significantly in the development of internal rating methodologies and favoring their application in many countries, the idea that the validity of the credit rating system is not limited in time and its gradual expansion will be difficult to stop has been reinforced. Hence, the need to fully understand this tool in order to avoid adopting attitudes of uncritical acceptance. Understanding the rating methodology by identifying its potentials and also its limits is a commitment for all stakeholders (banks, businesses, academics) in order to make it as functional and usable as possible.

1.2 Literature review

The rating is an assessment of the overall solvency of the borrower, or the ability of a company to repay, at an agreed maturity, the principal and interest. In other words, it is a judgment on the borrower's ability to generate the resources required to meet its commitments to creditors. The rating may also be referred to a single debt rather than the assessment of the overall solvency of the borrower. In essence, the rating indicates in a decisive, complete and unique manner the company's degree of risk.

By assigning the rating, there is a measure of the borrower's risk of failure to return the capital obtained with the loan because of its insolvency. The better the rating on the company, the lower the bank's risk of losing their money and the lower should be, at least in theory, the interest rate they charge on the loan. The measurement of credit risk limits the information asymmetry by providing useful information to strengthen the process of decision making of those who grant funds.

The adoption of the rating produces a major impact on the field of financial and credit intermediation since it reduces the manifestation of the phenomenon of adverse selection and moral hazard.

In recent decades, the literature on rating systems has extensively developed, ranging from construction methodologies to management uses and related organization.

A first conceptual framework of the philosophy of the rating system is found in the working paper of the Basel Committee (BCBS, 1999), which outlined a general scheme for the validation of the rating systems. This was followed by large and diverse literature, which investigated the issues in question from different points of view: the one regarding regulations, the one related to managerial implications and more specifically the economic-business one.

Among the works on the state of the rating systems in Italy the research by Albareto et al. (2008) and the survey of the Bank of Italy (2011) are worth mentioning. The latter, referred to the end of 2009, investigates 398 intermediaries (38 medium-large banks and 360 small ones and cooperative banks) on the subject of business assessment factors used by banks, the spread and the use of credit scoring models, and the effects of the crisis on business assessment factors. With reference to the first point, nearly 90 percent is (precisely 88 percent for medium-large banks and 87.9 percent for small ones and Italian Cooperative Credit Banks the share of intermediaries which include quantitative information that is not included in scoring models among the main elements when analyzing borrower's creditworthiness (reference is made for example to the degree of use of credit lines or the frequency of overrunning). About half of the smaller banks in the sample (47.3 percent) and 32.5 percent of others give instead importance to qualitative information and to personal knowledge of the customer's identity. However, the most striking differences between the two groups of banks regard the guarantees (considered important for 12.4 percent of the larger institutions compared to 32 percent of the smaller ones) and belonging to districts (considered only by 7.5 percent of the smaller banks and completely neglected by medium-large banks). The statistical-quantitative method contributes decisively when assessing customer risk for 63.1 percent of the major banks and for only 25.5 percent of the smaller ones. The tendency to intensify the development of credit scoring models by Italian banks, already highlighted by Albareto et al. (2008) for the period 2000–2006, is confirmed in 2009, and it can be attributed to the progressive use of new information technologies and telecommunication. Furthermore, while all banks tend to use credit scoring models for granting and monitoring

credit, only for the bigger ones what can be noticed is an increase in the use of credit scoring models for the determination of pricing. Finally, irrespective of the size of the banks, the orientation of intermediaries is to strengthen the wealth of information on customers in conjunction with the financial crisis. As of October 2008, 21.4 percent of the larger banks and 53.9 percent of the smaller ones have increased the importance given to quantitative information not included in the automatic models; the percentages are respectively 49.5 and 73.2 percent if related to guarantees, as well as 37.8 and 35 percent if considering qualitative data. There is an increase, with the same intensity, for both types of banks, in the diffusion of exclusively statistical-quantitative methods (the variation is 26 percent for the larger banks and 24.8 for the others).

More generally, studies on rating systems that have taken place over time cover the following areas (Altieri Pignalosa et al., 2012):

- the mechanics of rating systems, i.e. the methods of construction of the variables/measures of credit risk and subsequent use in the process of credit risk management;
- the bank's choices regarding the related organizational rating or better, the relationship between the rating philosophy, the size of the bank and the organizational choices;
- procyclicality of credit ratings and the evolution of the rating systems during the current financial crisis.

Belonging to the first, Sartori (2007) analyzes the estimation process EAD and its operational implications, while Oricchio (2007) works on the measurement of LGD, the cure rate and the capital ratios. Resti (2004) reports on the estimation of the EAD and of the Recovery Rate (RR). Berndt et al. (2005) dedicate their work to the estimate of the default risk premium, the default swap rate and their expected default frequency; Friedman and Sandow (2003) work on the estimation approaches of the RR. Vasicek (1987, 2002) estimates the probability of loss of a loan portfolio; Altman et al. (2002) investigate the interdependencies between RR and default rates and their potential effect on the procyclicality of capital ratio. Into this first thematic area is also included the work by Klugman et al. (2004) dedicated to the loss model and, in particular, to the operational process that separates the moment of data collection from the decision making process. De Laurentis and Maino (2009) analyze the basic elements of the profiles of credit risk, the main developments of international best practices in the area of credit risk management, as

well as the technical and operational phases for the development of a rating system based on statistics.

As regards the relationship between rating philosophy and the size of the bank, the literature has extensively discussed reaching conclusions partially different especially with regard to the type of approach (relational or transactional banking) used by the bank.

The literature is unanimous in stressing that the adoption of credit scoring techniques is influenced both by the size of the intermediaries and by their organizational structure. Generally larger banks have more human, financial and technological resources to invest in technical innovation, also in the measurement of credit risk, and in the possibility of dividing the cost of investments on a larger loan portfolio. However, there are more noneconomic consequences related to the distance, as well as difficulties in the transmission of information not encoded within the structure, in the selection and monitoring of loans at a distance and in the formulation of proper incentives for local supervisors; the distance from the borrower can also reduce the weight of the soft information. Bongini et al. (2009) argue that large banks should also develop a relationship that focuses on customers and that it is achievable with different organizational and institutional models. From their point of view, there is no contradiction between big banks and maintenance / development of customer relationships, especially if banks adopt structures organized in market segments and pursue the personalization of the offer: in other words if they are organized as groups of intermediaries dedicated to specific territories. In a similar way, Berger and Udell (2002) argue that the larger banks, considered less capable of developing relations with smaller and riskier companies, must consider the market segmentation as a strategy to attack local credit markets better controlled by local banks.

When considering systems of delegation, recent evidence on a sample of 400 Italian intermediaries has shown that in the most acute period of the crisis, 2006–2009, the role of local managers in terms of decision making in granting loans to SMEs has weakened. Compared to the measurements of Albareto et al. (2008) for the period 2003–2006, in fact, the index of independent decision-making – in terms of the ratio between the amount of credit that the branch manager can grant to SMEs and the amount that can be granted by the Board of Directors – has decreased, especially for smaller banks.

In terms of related organization of the rating, other studies have pointed out that within the same organizational model can coexist different structural options (Schwizer, 2005), equally varied strategic

guidelines and processes for rating assignment, configurations of the role of businesses management differentiated in terms of tasks and instrumentation (De Laurentis and Gandolfi, 2008).

However, the organizational structure of the ratings must function as the glue that keeps the mission to the strategic approach of the bank on individual segments of the credit market, since the options of the rating system are one of the most important components in the various segments of market, as noted by De Laurentis and Maino (2010).

The international financial crisis has highlighted some critical issues regarding the technical and methodological aspects of the rating systems, the related organizational profiles, as well as their managerial use, especially with reference to the impact on progressive selectivity of credit and, more generally, on the relationship between banks and companies. As already pointed out by Draghi (2009), if capital requirements depend on the rating, a possible recession will lead more frequently to higher default rates and a worsening of ratings, with the consequence of an increase of the minimum capital required by banks. Since it is more difficult to raise new equity during a period of recession, in order to maintain the ratio between capital and risk activities, banks end up granting less credit. This exposes companies to further financial stress, accentuating the recession. Similarly, the procyclicality effect of Basel II influences the performance of insolvencies and changes in the rating assigned to borrowers.

In recent years, the procyclicality of the rating system is one of the issues on which numerous empirical tests have focused their attention. Catarineu-Rabell et al. (2005), recognizing the greater procyclicality of Basel II through a theoretical model of general equilibrium, examine the implications of stable rating models in comparison to cyclical or countercyclical models. Saurina and Trucharte (2007) focus on the analysis of the cyclical nature of a mortgage portfolio built on data from the Spanish system. The stability of the capital requirement calculated under Basel II depends significantly on the estimating rating model Point Time or Through the Cycle. According to the concept Point in Time, the creditworthiness of the counterparty is measured in reference to the current solvency conditions; whereas with the concept Through the Cycle (typically adopted by the rating agencies), the borrower's risk is evaluated over a much larger time horizon, typically measured over a full business cycle.

Recent studies have focused on the issue of rating during economic crisis. Salis and Turri (2009) showed that, in the current market turmoil, rating models that assume independence between the probability of

default (PD) and Loss Given Default (LGD) appear no longer adequate in providing the actual riskiness of the borrower and of the lending process, thus leading to an underestimation of the capital required in macro-economic conditions and being adverse to accentuate the procyclical effects already inherent in the regulatory models. In addition, currently the methodology most widely used in LGD estimates – the actuarial analysis, which is based on discounting all cash flows recorded during the transition of the loan position to default to the closing of the practice – usually produces results which are not related to the actual situation of the economic cycle. This is especially true, as evidenced by Grippa et al. (2005), in contexts like the one in Italy where, due to its bureaucracy, it is characterized by very long recovery procedures.

De Laurentis and Maino (2010) point out that the current methodological approach of rating systems emphasizes the cyclical responsiveness of the rating; many, in fact, still use as a time-frame a one year period of observation from time zero, but this limits the temporal extension of validity and makes the evaluation of the customer relation more unstable over time and as a whole. The cyclical nature of the ratings can be measured with reference to the volatility of default by rating category; a fully cyclic model will be able to predict correctly the default rates through the migration and, therefore, will follow the fluctuations over time, making them stable around the PD assigned to the different classes.

The analysis conducted by Cannata (2011) highlights the cyclical effect of the crisis on a representative sample of the entire Italian banking system; such evidence regards the evolution observed in capital ratios, in risk-weighted assets (RWA) in the risk parameters PD and LGD and in the default rates during the period 2008–2009. The authors show that the credit exposures treated with the Internal Rating Based (IRB) approach have led to an increase in RWA (with particular reference to the solvent counterparties) and, therefore, an increase in the minimum regulatory capital.

Some of the measures introduced by the new Basel III regulations and, in particular, the countercyclical measures, originate as a result of the renewed concern about the effect of the current procyclical capital rules (Basel II) induced by the recent economic crisis and the cyclical nature of the rating systems. The new countercyclical instruments identified by Basel III intend to strengthen the resilience of banks in the event of crisis and to neutralize the level of cyclicality implied in rating models, ensuring fair treatment among banks that adopt models with different philosophies. Cornaglia and Morone (2011) also argue on the topic

of the cyclic behavior of the ratings and countercyclical mechanisms provided for in Basel III.

1.3 Classification and key concepts of credit risk

Credit risk can be analyzed and measured in different ways. Figure 1.1 lists the various methods of classification of credit risk.

In the first line, the risk of default or default risk is found; it expresses the possibility that the applicant requesting the funds does not honor the financial obligations it has assumed, generating a loss for the creditor counterparty which corresponds to the difference between the value of the credit and what will actually be recovered.

The recovery risk refers to the possibility that in the event of company insolvency, the recovery rate of the loan is found to be lower than originally estimated by the bank; therefore, it is the risk related to the fact that the amount of the loan that the bank is able to recover, once the default has occurred, is less than the actual amount due. This decrease can be caused by several factors such as a lengthening of the time related to judicial procedures, an increase in interest rates or even a decrease in the value of assets as collateral. The recovery risk is closely linked to the rate of loss in the event of default (LGD) since the latter is the complement of the recovery rate of the loan.

The exposure risk is closely linked to the possible increase of the exposure in default compared to the current exposure. It is in relation,

Types of risk	CORRELATION WITH FINANCIAL RISKS		MARKED-TO-MARKET VALUATION	
	Low	High	Default-mode valuation	Value-based valuation
Default	■		■	
Recovery	■		■	
Exposure	■		■	
Migration		■		■
Spread		■		■
Liquidity		■		■

Figure 1.1 A classification of credit risk

therefore, to the actual amount of the loan at the time of insolvency. It is typical of the risk of credit lines at random value, where exposure to the onset of insolvency may differ, even significantly, from the current one: consider for example an overdraft facility where the customer is free to use the credit granted to varying degrees.

The migration risk is the risk of a change in the judgment given by the rating agencies or the bank's credit analysts and may take the form of an upgrading or downgrading (of the creditworthiness).

The spread risk is the risk that, with an equal credit rating, the risk premium increases, namely the spread, required by the capital market. This means that an issuer with a positive rating could be in a position, without undergoing any changes in its economic and financial conditions, to support a greater cost to raise funds in the capital market due to a crisis of market liquidity or an increase of investors' risk aversion. In adverse market conditions positive situations may also arise, which can lead to a re-evaluation of existing values of the exposure, in contrast to the devaluations generated in the first case. Therefore, the spread risk can result in losses as well as gains.

A special case of credit risk is the liquidity risk (asset liquidity risk), a further risk highlighted by the recent financial crisis, connected to the possibility that the market could become less liquid. If the market becomes less liquid, there will be greater difficulties for the market operators, and the volume traded daily will be less; therefore, there is a risk to sell credit exposures at lower values than the ones expected.

The following table summarizes the types of risk analyzed.

Credit ratings are critical tools in the analysis and measurement of the abovementioned risks. Consider, for example, that the risk premiums as well as the liquidity of a market are usually rating sensitive.

Table 1.1 A classification of credit risk

Types of risks	***Exposure***	***Causes***
Default risk	• Counterpart • Portfolio	• Economic cycle • Interest rates
Migration risk	• Counterpart • Portfolio	• Economic cycle • Interest rates
Recovery rate risk	• Counterpart • Portfolio	• Interest rates • Collateral value
Exposure risk	• Transaction	• Banking model • Banking relationship

From a modeling point of view two basic approaches in measuring credit risk can be distinguished: on the one hand the model-based approach, among which can be distinguished the structural models and the reduced form models; and on the other hand, the traditional approaches (or model-based), based on historical data in defaults.

The structural model (or models based on the value of the company) can in turn be divided into:

- firm-value models, where the determination of the event of default and the recovery rate in case of insolvency is based on the evolution of the asset value (assets) of the issuer in relation to the capital structure (Black and Scholes, 1973; Merton, 1974);
- first passage time models introduced by Black and Cox (1976) and developed by Longstaff and Schwartz (1995), who consider the possibility of default before the maturity of the debt, if the value of the assets falls below a certain level (threshold or default boundary).

The difficulty associated with the use of such models regards the estimation of the parameters underlying the evolution of the company's value. It is in fact values that are not directly observable.

The reduced form models or intensity-based models (Jarrow and Turnbull, 1995) represent a recent approach to credit risk where, unlike the structural models, the default does not depend on the evolution of the asset value or the capital structure of the company, but it is a sudden event. The event of default is modeled regardless of the financial structure of the company, by introducing hypotheses on the functional form of the intensity of default (it is typically assumed that the incident is distributed according to a Poisson distribution, and often it is assumed that the rate of recovery is exogenous to the model).

In the literature, hybrid models that set the focus on the recovery rate of the loan (i.e. the fraction of the loan that will be repaid to creditors) were highlighted. However, the fact that this rate depends (in the structural models) or not (in the reduced form models) on the capital structure of the company is not a key feature that can differentiate the two models.

However, a contribution by Jarrow et al. (2007) shows, as an element of distinction between the two models, the characterization of the time at which the insolvency is manifested (default time). In the structural models, the time to default is a randomly predictable variable, while in the reduced form models it is totally inaccessible (Protter, 1990). The two authors end up preferring the reduced form models because they do

not consider the value of all assets and the liabilities of the company: the information provided is the same as the market.

The models for the measurement of credit risk can also be classified according to other factors such as the choice of the time horizon which is being considered, the methods used for the quantification of the exposure and the rate of loss in the event of insolvency, the different risk aggregation data, the different techniques for measuring the interdependencies (correlations) among the factors that contribute to credit losses and the consideration or not of information on the state of the economy or of a particular economic sector.

In general, the credit risk refers to the traditional activity of banking business and substantially is the non-repayment of the debt which consequently means the insolvency of the counterparty. In a loan agreement, in fact, the credit risk is a measure of the possibility that the borrower will be insolvent in whole or in part in fulfilling the obligation. Against the counterparty risk, the credit intermediary places in reserve, for prudential purposes, a certain portion of its assets in case the loan is not repaid. In fact, Basel II provides, unlike the first agreement – which required capital requirements equal for any type of loan – the possibility of differentiating asset allocations depending on the risk of a single loan. In short, the risk of a position is connected to the assignment of a rating and then proceeds with the estimation of risk components related to default risk (probability of default – PD), the recovery risk (Loss Given Default – LGD) and the exposure risk (Exposure at Default – EAD), which will be covered in the next section on the changes introduced by the Internal Rating Based (IRB) model.

2
Credit Risk Management

2.1 Credit Risk Management and Internal Rating Based (IRB) approach

In recent years the banking industry has been affected by a profound transformation that has heightened the need to identify more sophisticated methods in Credit Risk Management and monitoring. For banks the process of risk management has assumed increasing importance in particular with regard to the credit risk. New regulations and the opening of new assessment approaches have helped to overcome traditional practices in granting loans which were based on limiting the risk through guarantees and the development of new methodologies oriented to the management of portfolios of loans and the estimate of the risks associated with them in a strategic manner.

The importance given to credit risk, rather than to other types of risk, is linked to the specific nature of commercial banks and the occurrence of a number of circumstances:

- the importance that the activity of lending credit assumes compared to the total assets of the portfolio;
- the relevance of credit losses, which contributes to significantly worsen the economic performance of credit intermediaries;
- the traditional attention that the supervisory authority has always reserved to the control of credit risk, particularly in recent times following the proposed changes to the Basel Accords on the capital requirements;
- the growing interest of investors in the economic trend and the performance of credit institutions.

Credit risk is basically the extent of the possibility that the contractor is insolvent in whole or in part in fulfilling the obligation. Any type of loan can provide for this kind of risk, even if granted in technically correct forms and with adequate guarantees. Moreover, it is necessary to underline the fact that the risk in question is not determined only by the insolvency of the borrower, since to the bank even a simple delay of the loan repayment can be detrimental.

In consideration of the increased complexity in banking services, it is therefore necessary to prepare more sophisticated tools for managing credit risk going from a simple process of estimation toward a more complex mechanism that involves all the phases of the credit process. Included in this context is Credit Risk Management (CRM) that is considered as an integrated system of models and measurement tools that allows, along with the existence of appropriate organizational structures, a finalized and optimal management of the credit risk. CRM, therefore, is defined as a process of risk measurement connected to an activity and subsequent management of the strategies relating to that position. It involves a precise identification of the objectives, of the models, of the indicators and of the tools for the risk assessment, and it also must provide, during the measurement phase, a quantification of the expected loss of the individual exposures, considering the borrower's default probability.

Following the entry into force of the new bank agreement (Basel II), a central role is assumed by the rating system which refers to the structured and documented methodologies, the organizational and controlling processes, the way in which databases are organized that allows the collection of relevant information and their elaboration for the formulation of comprehensive assessments of the creditworthiness of an entrusted party and of the risk of each credit transaction. Through the rating system, the bank gives the borrower an evaluation that allows sorting the counterparties in relation to their risk.

The term rating derives from the English "to rate" which means to judge, to evaluate. In fact, the rating is an opinion that expresses the reliability of a company, and more specifically its ability to repay a loan in a given period of time.

It is therefore a comprehensive assessment of the entrusted company's risk profile predicting the regularity of its repayments over time.

The company, based on the rating it has received, is then classified into a certain class of merit in which are found all the companies that are considered equivalent in terms of the likelihood of repayment of their loan.

The introduction of rating systems has revolutionized the modern Credit Risk Management system, affecting the organizational structures and the operational processes, by making necessary a quality and quantity adjustment of the resources involved in the various functions.

To better understand the extent of the internal rating systems, following are described the key concepts of CRM intended both in the more restrictive sense of portfolio management and in the broader one of Credit Risk Management (De Laurentis, 2001).

In CRM a significant aspect is made with the distinction between the concept of expected loss and unexpected loss. The first can be expressed in both absolute and percentage terms. The expected loss (EL) represents, in terms of percentage, the loss that on average occurs within a period of one year on each existing exposure in the portfolio, and it is the product of Probability of Default (PD) and Loss Given Default (LGD). The absolute value, instead, is the product of PD, LGD and Exposure at Default (EAD). The expected loss is generally covered with provisions and value adjustments. The unexpected loss (UL) is for a debtor, allocated to a given rating class with a particular PD, the loss in excess of the EL to a confidence level of 99.9 percent over a period of a year. Basically it is the deviation between the expected loss, estimated level *ex ante*, and the actual loss, the detected level *ex post*. The concept of unexpected loss is more appropriate when considering the risk, and it reflects the existence of a variability of the expected losses. The source used to cover the unexpected loss is the bank's assets.

Expected losses, generally, tend to correspond to the actual losses, but it is advisable to increase the regulatory capital so that the bank can cope during times when the actual losses are greater than the expected losses and thus lead to an unexpected loss.

These last involve an adjusted book value of the receivables. The measure of the variability of the losses is the standard deviation:

$$\sigma = \sqrt{(1/(n-1) \times \sum i = 1 \text{ (LR-WALR)}^2}$$

with LR = loss rate; WALR = average loss rate.

The more distant each datum is from the mean, and the more frequently this occurs, the greater the standard deviation.

The VaR (Value at Risk) is another important concept of CRM. It is the measure of the risk associated with a financial asset. VaR defines the maximum possible loss that a financial instrument can suffer within a specific period of time (day, month, year) given a certain confidence interval. If we consider a confidence interval of 99 percent, it means that

there is a 1 percent probability of suffering a loss greater than the estimated one (VaR). The Value at Risk is used to determine the minimum level of capital required to cover unexpected losses that can occur with a given probability.

The risk of migration is the risk related to the down-grading of the issuer, namely the transition to a lower credit rating class when the borrower's ability to repay the loan is reduced. Consequently, the downgrade of creditworthiness generates a raise in the rate on the loan in order to compensate for the greater risk which is associated to it.

The decrease in the market value of loans resulting from the downgrading is part of the mark-to-market approach and involves connecting the migration probabilities and the resulting change of credit spreads to the rating.

Another fundamental concept in CRM is the concept of diversification, according to which the individual risk of each exposure is greater than the portfolio risk. Obviously loans falling within the portfolio are subject to a certain variability of the losses, which results in a loss of the portfolio. However, the variability of portfolio losses also depends on the correlation between the losses of the considered loans.

The covariance is a measure of the correlation. If the loss rates of two different loans move together, then the covariance is positive, while it is negative if they tend to move in the opposite direction. Another measure of the correlation is the correlation coefficient which has a variation range between +1 and -1. The unexpected loss expressed with a correlation coefficient reveals that the marginal risk to a portfolio made by the addition of another loan is always less than the individual risk of the single loan except in the only case in which the correlation between the variability of the losses is positive and perfect which means equal to one. In other words, the risk that a loan brings to the portfolio is less than the risk of a new loan considered on its own. If the portfolio expands to include new loans, and if the new loan has no positive correlation with the other loans in the portfolio, the portfolio risk made by the new loan is limited.

Methods of management and monitoring of credit risk are part of the CRM. Two of them are typical of the insurance and regard the search for the unique combination of risk and pricing and its diversification through portfolio management. The third modality is most typically part of the banking activities and affects the entire chain of credit (analysis, granting, reviewing and controlling exposures).

The understanding of the reasons behind the modern risk management and the introduction of internal rating systems have supplied the

opportunity to raise the quality of government functions of credit risk and have made credit rating an instrument of credit policy.

2.2 The approaches for the credit rating assignment

The measurement of the reliability of a company through statistical approaches dates back to the 1960s with the first analysis, based on balance sheet data, on the risk of insolvency of companies in order to define threshold values that could separate the financially healthy companies from the non-healthy ones. The aim of these studies was to measure the probability of default of a company within a certain time horizon. Two methods are employed to achieve this: the univariate model and the multivariate model.

Starting from the pioneering study of Altman (1968), several studies have been conducted on the problem of company default prediction modeling. For many years univariate (Beaver, 1966) and multivariate discriminant analysis (Altman 1968; Beaver 1966, 1968; Blum, 1974; Deakin, 1972; Edmister, 1972) have been the leading methods.

The univariate model considers the indicators individually when assessing the company's insolvency trying to perceive its weak points (Varetto, 1999). Beaver (1966) underlined the predictive ability of approximately 30 indicators to provide relevant information that could identify a company's risk of default. By examining a sample of 158 enterprises (79 failed companies and 79 non-failing companies), the researcher highlighted how the indicator with greater explanatory power in defining a company as failing or non-failing was represented by the ratio cash-flow/debts.

The univariate approach is the first step toward the development of more comprehensive models (including the multivariate approach) that can expand the capacity of prediction. In this context are included the business failure prediction literature and the business failure prevention literature that face the problem of insolvency in different ways. The first considers statistical models that classify companies from the perspective of the management of credit risk through quantitative variables (hard information); the second emphasizes the role of non-quantitative variables (soft information) and shifts the focus on models of a strategic-business type and performance measurement as the keys to understanding and interpreting the causes and pathways that conduct to insolvency.

The discriminant models analyze, individually or simultaneously, the various aspects through which a firm can be examined to obtain a measure of its solvency. In order that discriminant analysis work

efficiently, as Ciampi and Gordini argued (2013), two conditions must be fulfilled: (1) the independent variables in the model must be normally distributed; and (2) group dispersion matrixes (variance and covariance matrixes) must be identical in the two groups, that is, in defaulting and non-defaulting firms (Barnes, 1982; Karels and Prakash, 1987; McLeay and Omar, 2000). Because discriminant analysis requires these two specific assumptions (Foglia et al., 1998), the application of this methodology shows some shortcomings when the prediction variables adopted are not completely independent of one another (Karels and Prakash, 1987; Martin, 1977; Ohlson, 1980).

For these reasons, later studies apply the logistic regression analysis to determine the default probability (Wiginton, 1980; Altman et al., 1994; Laitinen and Laitinen, 2000). These models assume that the probability of default is logistically distributed and that the cumulative probability of default takes a logistic functional form (Altman and Saunders, 1996). The idea underlying the logistic model is a relationship between the likelihood of a company to become insolvent (latent variable) and a set of observable quantities that are closely connected to the event. Unlike discriminant analysis, this methodology is useful to obtain an estimation of the probability of default. Rather than having a clear division between healthy and insolvent firms, logistic regression defines a ranking in firms' classification. However, logit and probit techniques work with monotonic relationships between dependent variables (default/non-default) and independent variables (economic–financial ratios). Therefore, new innovative methodologies taken from other disciplines, such as neural networks and genetic algorithms, have been taken in order to relax the requirements on data and/or lower the dependence on heuristics (Härdle et al., 2009).

As far as the use of different statistical methods, the relationship between generalization and specificity in these models is another widely debated theme. Several authors are discussing the need to develop industry-specific models rather general ones. In most cases, industry-specific model oriented researches (Altman et al., 1994; Sironi, 2003) are more accurate than general models. This is probably due to greater homogeneity of financial indicators within specific industries. It goes without saying, however, that in these cases researchers have decreased, on their free will, the operational applicability of their own models.

The overlapping of the dichotomy hard/soft information with prediction/prevention must be interpreted correctly. The modeling that can be made part of a trend rather than another often uses both quantitative and qualitative variables. However, in the prediction vision, there

is absolute prevalence of hard variables, and any qualitative variables are expressed by proxy of a quantitative type. In the prevention vision, hard variables are included in an overall interpretation of the company with a more intense effort to integrate with soft variables, surging to the characteristic element of the analysis. Information can be treated by applying models that use statistical methods, that is, a model whose variables and parameters have been identified with mathematical and statistical procedures or judgmental models, based on the subjective judgment of the analyst. The following paragraphs provide a general view of existing models in order to highlight the relevant aspects and shortcomings of each approach.

2.2.1 The statistical approach

The statistical approach is based on a series of rather complex statistical models that lead to a scoring, which means that a score is given to a number of economic and financial indexes, appropriately weighted. Quantitative and qualitative information is processed by the model and leads to a clear and objective result, based on which the decision can be made. It is being used more frequently both for the widespread availability of information technologies that facilitate its use and for the ease with which they can be applied to standardized situations such as consumer credit.

These models are based on historical data regarding loan portfolios, and this helps to reduce the weighting of personal assessments when deciding to give out loans, which is therefore based on objective and measurable elements.

When banks use the mathematical-statistical models they need to identify the most explanatory indicators in order to be able to discriminate between creditworthy and non-creditworthy companies. Despite the greater accuracy and transparency of this model, its standardized nature weakens the intermediary's ability to evaluate the loans in the origination phase. The quality of the processing is strongly conditioned by the completeness and accuracy of the database that is being used, therefore the effectiveness of the mathematical-statistical models remains partial if not complete with the assessments made by the bank analysts on the qualitative aspects of the company and its dynamism.

The credit scoring models analyze accounting indexes by making appropriate weightings, and through the use of statistical techniques they come to produce a numerical value that summarizes the creditworthiness of the counterparty and therefore an estimate of the level of risk associated with the loan.

The credit scoring model aims to be able to place an item, given two groups of the same population, within the group to which it belongs, without knowing its real characteristics but by using only information connected with it. This setting was introduced for the first time, in 1936, by Fisher, who used to distinguish two different types of irises only by referring to the size of the petals.

Durand (1941) was the first to apply it in the area of credit; he used statistical techniques to distinguish good loans from bad loans, with no predictive intent. The adoption of mathematical-statistical models came about when financial companies for consumer credit and mail-order companies had to overcome the lack of experts who could assess the possible granting of loans; in fact there was a shortage of loan experts because of the war. Therefore, he opted to define general rules that could also be used by inexperienced agents when granting a loan. A further boost is due to the diffusion of credit cards, where their issuing is not entrusted to experienced analysts but to statistical techniques that can speed up the decision making process.

The scoring models allow a reduction of failure rates by 50 percent (Myers and Forgy, 1963); in fact, they turn out to be better than the judgmental methods, so their use was extended to the prediction of business failure in 1968 by Altman, who developed a model called the Z-Score. The scoring model found a further claim in 1974 and in 1976 with the approval of certain laws (Equal Credit Opportunity Acts) which declared the impossibility of denying a loan to a person unless the denial was calculated by statistical methods and therefore be able to be statistically justified.

The use of scoring models, since 1980, was extended to personal loans and toward the end of the 1990s also to mortgages and loans to small businesses. Obviously, the adoption of credit scoring techniques has been strongly encouraged by the rules of Basel II so that capital requirements are proportional to the credit risk that the intermediary can actually sustain.

The credit scoring, then, is an automated system adopted by banks and financial intermediaries to assess the status of the counterparty and therefore the possibility of granting the loan through the use of information related to specific variables, so that the whole decision making process is quicker. The result is a judgment on borrowers' reliability and their punctuality in making payments; in short it synthesizes the risk profile of the person concerned. Among the advantages when using this method is not only the possibility to speed up the decisions, but also the reduction of the inquiry costs due to the high degree of automation.

The scoring models can, in turn, be divided into three categories:

- linear discriminant analysis, which allows classifying a company in one of the two groups identified a priori (bankrupt companies and non-bankrupt ones), based on a number of variables, defined by precisely discriminating (financial ratios);
- logit/probit models, which allow assignment of a numerical value to the meaning of probability of default, through the use of the logarithmic transformation; and
- neural networks, used mainly in those cases where the decisions of expectations concern a large number of homogeneous loans such as those related to consumer credit.

When adopting the linear discriminant analysis, it is indispensable to identify the characteristics of the statistical units that make the two groups discriminating. This is required in order to adjust the classification of the various subjects into preset groups (failed companies or non-failing companies). For any business of unknown origin, those characteristics deemed relevant to the classification rule will be selected, and on the basis of these, each company will be classified into the relevant group. Once all the necessary characteristics are available, a discriminant function (of the characteristics) for each group is built, through which it will be possible to classify any individual, even if not included into the groups of estimates (provided of course that the characteristics are available).

The number of discriminant functions obtainable varies according to the number of groups; in particular it is equal to k-1, where k is the number of groups (thus when considering the binomial solvent / insolvent, the discriminant function is one). Another way to read the result of the model is that which allows identifying the likelihood of the distance of a subject with respect to the average characteristics of a given population. For example, a new subject can be judged based on the distance from a population of insolvent companies, allowing quantification of creditworthiness (De Laurentis and Maino, 2009).

As earlier mentioned, Altman developed in 1968 a prediction model known as test Z-Score. This model allows one to predict with statistical techniques the probability of bankruptcy of a company in the following years. The test was developed by analyzing the balance sheets of 66 publicly held manufacturing companies (ignoring the small and medium-size ones) randomly drawn from Moody's lists and other sources, half of which had filed for bankruptcy, and the test proved to be able to "predict" the state of bankruptcy with a 95 percent degree of accuracy.

For the analysis, a list of the most significant fiscal indicators was compiled, grouping them into five classes: liquidity, capital strength, profitability, rotation and operating efficiency of the company. The analyst based on personal opinion will take into account certain indices rather than others and each time will give importance to each indicator and its contribution to the analysis, trying to combine the ones that in his/her view appear to be more appropriate in the specific situation that is being evaluated.

The list of the most important indicators is achieved in two ways: through the simultaneous or direct method and the stepwise method. In the direct method, the variables are selected on the basis of a theoretical model; the stepwise method involves inserting in the list only one variable at a time, which is kept in the model if it proves to have a considerably adequate discriminatory power. Once a new variable is added, the behavior of all the others has to be observed, and those that have a less discriminating power are removed (this can happen when two variables determine the same economic effect).

The variables that are used to calculate the Z-Score are net sales, operating profit, invested capital, circulating capital, total liabilities, retained earnings and market value.

The formula to calculate the Z-Score is the following:

$$Z = 1{,}2X1 + 1{,}4X2 + 3{,}3X3 + 0{,}6X4 + 1{,}0X5$$

where: X1 = net working capital/total assets; X2 = retained earnings/total assets; X3 = EBIT/total assets; X4 = market value equity/total liabilities; X5 = sales/total assets

The indicator X1 expresses the value of the company's liquid assets compared to total capitalization. The indicator X2 expresses the capacity that a company has had to reinvest its profits, so a young company will have an index that is less than the one of the old constitution because it will not have had time to build up its reserves. The indicator X3 measures a company's profits from its assets, before deducting interest and taxes. The indicator X4 shows how much a company's market value can be reduced before the total liabilities exceed the assets and create the conditions for bankruptcy. The indicator X5 shows the company's ability to generate revenues with a given value of the assets.

The most significant variables are profitability and overall efficiency, while the less important variable is liquidity.

On the basis of the Z-Score result, the probability of default is high if the Z-Score result is less than 1.79; medium high if the result is between

1.8 and 2.69 (possibility of bankruptcy within two years); medium if the result is between 2.7 and 2.99 (caution in the management); and low if the result is higher than 3 (financially healthy company).

Therefore, this model identifies a range of values, and the extremes are significant for the classification of companies in the group of healthy ones and those in default. If the Z-Score value, calculated by analyzing the economic and financial structure of a company, is greater at the higher end of the range, then the company is structurally sound and creditworthy; if Z is minor at the lower end then the company will most likely go bankrupt and therefore it is unreliable; if Z lies between the values of the interval, the model is not able to predict whether it belongs to the group of healthy companies or to the one of insolvent companies.

The model allows one to predict companies going bankrupt up to two years prior to this occurrence, with an average error of prediction of 15 percent, for a year before the bankruptcy, and 17 percent for two years before.

In 1977, Altman's original model was improved and a new version known as the Zeta model was developed (Altman et al., 1977). Firstly, it was different from the Z-Score model because of the number of companies that were taken into account (53 bankrupt companies and 58 healthy); secondly, there was an adjustment of the indicators used in the model; and finally six different tests were used. The Zeta model uses seven variables:

- ROA (Return on Asset), the ratio of earnings before interest and total assets;
- stability of earnings, calculated by a normalized measure of the standard error of estimate around a ten-year trend in ROA;
- debt service, measured by the ratio of earnings before interest and taxes (numerator) and the total borrowing costs (denominator);
- cumulative profitability, calculated as the ratio of retained earnings and total assets;
- current liquidity;
- capitalization, calculated as the ratio of market value of equity (five-year average of the stock prices) and the total value of debt;
- size, measured by the logarithm of the net assets.

Altman then modified the original model in order to widen its applicability. The indicator of financial structure, namely the fourth variable, in order to make the model useful in the evaluation of unlisted companies, was calculated using the book value of equity. There was the elimination of the turnover indicator (the last variable) in order to adapt the model to

non-industrial companies; in fact, this variable indicates the inclusion of the companies that are being analyzed in the industrial sector. There was a further adaption of the model in order to include the credit risk of the new emerging countries and to create a similarity between the scores of the discriminant function and the rating classes defined on US bonds.

An additional credit scoring model is the logit model, which analyzes the relationship between the probability of a company becoming insolvent and the explanatory variables observed strictly connected with insolvency. This means estimating a model using fiscal indicators as independent variables and a dichotomous variable Y as the dependent variable, which takes the value 0 if the company is healthy and takes the value 1 if it is insolvent.

A quite similar model to the logistic one is the probit model. It differs from the logit model because the shape of the distribution function of the cumulative distribution is not the logistics, but the normal standard distribution.

Another model used in the 1990s to face the risk of insolvency is the model of artificial neural networks. This model takes the cue from research in biology and in particular when based on the structure of the brain. Specifically, some studies have focused on the way in which people make gestures and/or decisions. In this regard, what has been studied is the shape, the characteristics and the organization of neurons in order to build an artificial node, through computer programming, which would represent the activity of the biological neuron. The neuron is considered the elementary computational unit of the brain. This representation has allowed researchers to consider artificial neurons as being able to solve complex problems such as the risk of insolvency (economic-financial). Actually, neural networks are used as sensors able to infer market trends.

Neural networks therefore represent a viable alternative to other methods used for the analysis of the risk of bankruptcy (numerical scoring models). Different studies compare Altman's model on discriminant analysis to the model of neural networks on the basis of effectiveness and efficiency.

The authors adopted as inputs the same financial indicators used by Altman and obtained with the neural networks that the accuracy of the results was much better. In this direction, the study carried out by Coats and Fant (1993) about the neural approach on the prediction of financial insolvencies offers a high rate of successful analysis. Out of 94 companies, neural networks have been able to predict the situation correctly for 91 percent of the firms in distress and 96 percent of healthy ones. From a comparison with the traditional technique, namely the multivariate discriminant analysis, it was demonstrated, in fact, that it could

classify correctly only 72 percent of firms in distress and 89 percent of healthy companies, with a good chance of using neural architectures.

2.2.2 The judgmental approach

The judgmental approach predicts that the estimate of the borrower's probability of default is determined manually by experienced analysts within the banking company, and so it is the bank itself that gives a rating to the customer through its own internal system. These are models of "rating" that in fact, imitate the whole process of assigning the "rating" carried out by the major external "rating" agencies.

The credit analyst checks the suitability of the qualitative and quantitative elements and based on these, he/she expresses, with discretion, an evaluation of the subject's ability to be on the market and to honor its debts. The analyst's task primarily aims at assessing the riskiness of the potential company, highlighting the trends of the rated company economically and financially. Therefore, the analyst must be qualified with highly specialized skills in analysis.

The judgmental approach offers a subjective evaluation, mitigating the degree of standardization of evaluations, but the frame of mind and the subjective perception of the analyst does not have to guide too excessively the evaluation of the credit risk of the subject to be entrusted; there are in fact numerous guidelines and well documented processes, at the base of the activity of the analyst's subjective evaluation, which have to be monitored.

The expert carries out a type of analysis that is quantitative and qualitative, historical and predictive, which is able to grasp those discriminating elements and those critical factors which from time to time become relevant and are also difficult to quantify and standardize using simple algorithms; consider, for example, the following factors: the potential ability of entrusted companies to generate income and cash flows; the quality of the borrower's generated income and economic and financial stability; financial and organizational flexibility; strategic positioning in the industrial sector; determinants of competitive advantage; industrial sector in which the company operates and possible future developments; quality and management adequacy; professional and entrepreneurial motivations of corporate entities; strategic and operational planning capabilities; strategic success of the enterprise; adequacy of the company's value chain; adequacy of the ownership structure; quality of corporate image; fairness, honesty and professionalism in business relationships; degree of behavioral uncertainty; quality of information provided, etc.

In short, the judgmental approach not only takes into account quantitative variables – which are the basis of statistical models – but also qualitative variables thus leading to a more accurate valuation of the probability of default.

Banks and customers agree on the fact that a customer's probability of default is best expressed by an analyst rather than by a statistical model. But the recruitment of financial analysts and the preparation of internal rating agencies, independent from the departments responsible for the development and growth in loans, could be very expensive and thus initially applicable only to customers with large exposures to the banking system (Large Corporate) and with low default rates, in fact the bigger the counterpart, the lower its probability of default.

To sum up, the judgmental approach is complex and with limited application. It is hopeful, however, that a major "cultural" awareness will bring to an increasing use of this approach.

The economic-statistical and judgmental approaches which have been briefly described represent the two extremes of a hypothetical continuum of approaches for measuring credit risk.

The two extreme approaches, in fact, can be variously combined in time and space, generating hybrids (constrained expert judgment based): in this way, there is an integration of the quantitative analysis

Table 2.1 The models of information processing

Statistical models	**Judgment models**	**Constrained Expert Judgment models**
• based on quantitative and qualitative standardized factors • generally poorly applicable to small banks as required sophisticated skills • difficulties in identifying the variables and the assignment of their respective weights	• based on primary analyst's subjective evaluation to arrive at an objective formalization through formal models • necessary presence of an analyst with high skills • does not guarantee consistency in the evaluation because customers with identical characteristics can exert influence to receive different ratings	• represent a fusion of previous models • formulate a first judgment of the application of formal statistical models • subsequently require the intervention of analysts who may revise, supplement or correct the rating

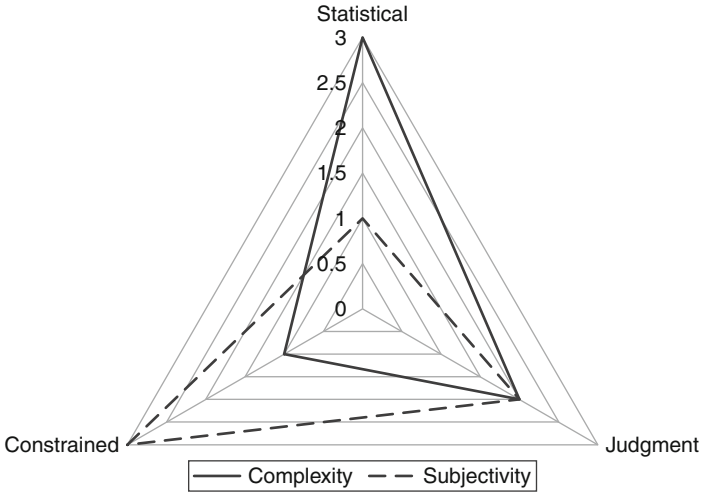


Figure 2.1 The models of information processing

resulting from the statistical approaches and the qualitative analysis better outlined through the judgmental approach. The banking analyst could then intervene in adjusting the rating resulting from the mathematical-statistical approach, in order to grasp certain qualitative and behavioral aspects of the credit report.

As stated by De Laurentis (2001) the combination of the rating determined by mechanical calculations and the judgmental based rating often appears to be the main objective and the necessary condition in order to benefit from both approaches. However, there is no ideal approach because the diversity of the rating processes is an important part of the marketing strategy of the individual banks.

2.3 Introduction of the IRB methods

2.3.1 Characteristics of internal rating systems

Among the main innovations in the field of credit risk is the introduction of Internal Rating Based (IRB) methods. The new element is the possibility for banks to adopt internal systems, supplied by judgments about the creditworthiness of counterparties, which allow them to calculate the capital requirement. The rating system is the set of methods, processes, controls and information systems that support the assessment of credit risk, the assignment of internal classes of merit and the

quantitative estimate of defaults and losses. The use of the rating system means that the capital requirements are related to the riskiness of the loan portfolio. The goal is to encourage the adoption of more sophisticated methods of risk assessment which are functional in determining the capital of the bank more accurately. The correlation between the bank's assets and the riskiness of loans pushes the bank to distinguish the quality of the borrowers through the use of rating systems that assess accurately their degree of risk. In doing so, the equity capital of the bank tends to better reflect the actual quality of its assets.

The adoption of the rating system allows the bank to have an internal evaluation of the borrower's creditworthiness. Since the rating is the assessment of the ability of a party to fulfill its contractual obligations within a specific time frame based on a set of quantitative and qualitative information, the concept of credit risk goes beyond the traditional dichotomy (ability to honor or not the debt at a given time) in order to set an approach which is able to grasp the deterioration over time of the borrower's creditworthiness.

The introduction of new risk models has a significant impact on the entire credit process, producing consequences on the preliminary investigation, the granting of the loan and monitoring. Under a management viewpoint, the functions of the rating system affect not only the decision of the granting of the loan, but also the determination of the interest rate, the definition of operating powers and the activity of performance control. It becomes an instrument that guides the granting of the loan through the search of the best risk-return combination.

The IRB approach requires that banks build their rating system using two different methodologies: the basic approach or foundation is designed for banks with limited experience in rating, while the advanced approach, which is more complex and sensitive to risk, is designed for banks with more qualified knowledge and experience. In the basic approach, only the PD is estimated by the bank, while the other risk components are provided by the supervisory authority. In the advanced approach, it is the bank itself that estimates all the components of credit risk.

The implementation of an internal rating system is required to comply with specific guidelines and also with organizational and quantitative requirements. The supervisory authority shall, in fact, control the consistency and the soundness of the methods and models used to calculate the rating. This control ensures that the evaluation method is built in an accurate and consistent way in terms of classifying borrowers with the same risk profile, identifying the risk components and applying weighting functions for calculating the capital requirement.

Table 2.2 Estimation of the calculation components

	Foundation IRB	**Advanced IRB**
PD	Bank	Bank
LGD	Supervisory Authority	Bank
EAD	Supervisory Authority	Bank
M	Supervisory Authority	Bank

In addition to the parameters and the functions that lead to the assessment of the risk-weighted assets (which is described in later sections), the IRB approach introduces some new elements:

- the review of the classification of exposures compared to the standard method;
- the determination of the four risk components (PD; LGD, EAD and M);
- the introduction of specific weighting functions for the determination of the balance sheet buffer.

The legislation requires that borrowers with the same risk profile are placed into homogeneous classes. With regard to the type of exposure, the regulated categories are: (1) loans to governments and central banks, to public sector bodies, to multilateral development banks and to international organizations; (2) loans to financial intermediaries for the purposes of the IRB method; (3) loans to businesses; (4) retail loans (divided into exposures secured by residential properties, retail revolving credits and other exposures); (5) exposures in equity instruments; (6) securitization positions; (7) other activities. The regulator allows the bank to maintain its own classification for management purposes provided that there is a connection between each counterparty and the regulatory classification.

For each of the classes included in the IRB approach, there are three basic elements: the risk parameters; the functions of risk weights (the process by which risk components are transformed into risk-weighted assets, and therefore, into capital requirements); and the minimum capital requirements that banks must meet to apply the IRB approach to a given asset class.

The risk parameters considered in the internal ratings approaches are (Banca d'Italia, 2006):

- Probability of Default (PD) is the evaluation of the probability of default of the counterparty; in other words, it is the likelihood of the negative event (that is that the company will be in default on the loan within a time horizon of a year). It is the only parameter estimated by the bank in both the IRB approaches, and it is strictly connected to the concept of rating.
- Loss Given Default (LGD) is the amount of funds that the bank considers to be lost when a borrower defaults on a loan, net of recovery. The concept of expected loss in case of default is connected to the issue of guarantees (real and personal) in favor of the counterparty or in support of a position and the ability of the bank to recover loans which have gone into default (the better the guarantees the higher the probability of recovery). The loss in event of default is expressed as complement to one of the recovery rate of the loan.
- Exposure at Default (EAD) is an evaluation of the expected amount of loss the bank would be exposed to if a company defaults on a loan. The estimate of this parameter is determined through the credit conversion factor (CCF) that represents the ratio between the free part of the credit line that will be used in case of default and the current free part.
- Maturity (M) is the average, for a given exposure, of the remaining contractual maturities of payments, each weighted by the relative amount. In other words it is the remaining time to the maturity of the loan. For the maturity adjustment, which is applied to retail exposures, a distinction must be made between the foundation and advanced approaches: in the first case M is considered fixed and equal to 2.5 years, in the second case it is determined, according to internal assessments, as a weighted average of the times missing to different payments contractually required (for example, the payment of interest and repayment of the principal), each weighted by the relative amount.

An essential element for the estimation of risk components and the application of the IRB approach is the notion of default, based on an approach by counterparty: these are non-performing loans, substandard loans, restructured loans and past due loans. For retail exposures banks may adopt a definition of default on an individual transaction, if consistent with their management practices.

Table 2.3 Comparing capital absorption (K) for regulatory classes

Exposure classes	**K**
Businesses, governments and central banks, supervised intermediaries	7.83%
SMEs with turnover of less than € 50mln	6.88%
Residential mortgages	4.78%
Qualifying revolving retail exposures	1.46%
Other retail exposures	3.88%

In the internal rating systems, the risk parameters are used as inputs of weighting functions to determine the minimum capital requirements needed to meet the credit risk. Different functions are provided for the various types of exposures. In particular, only one function shall apply to claims on central governments and central banks, supervised institutions and companies; distinct functions are provided for the three subclasses of retail exposures. Specific rules are defined for specialized loans; instead for the equities there are three different methods.

The retail counterparts and corporate SMEs enjoy special treatment: the first are provided with more favorable curves compared to other segments and ad hoc treatment for revolving credit (credit cards); instead a benefit is given to the second compared to the treatment received by large companies when they prove to have a turnover of less than 50 million euro.

Hp: PD = 1%; LGD = 45%; M = 2.5 years; Turnover = 25 mln/€

When considering specialized loans, banks that meet the criteria for estimation of PD, LGD and EAD may apply, depending on the cases, either the basic or the advanced approach. Banks that do not meet the criteria for the estimation of PD must set specialized loans to five regulation categories, which are associated with the weightings shown in the following table (system based on regulatory classification criteria).

For exposures in equities and Undertakings for Collective Investment in Transferable Securities (UCITS) banks can adopt three different methods: simple risk weight method, PD/LGD approach or internal model method. Different provisions compared to the standard methodology are also planned for the mitigation techniques (Credit Risk Mitigation) and transfer (securitization) credit risk.

Table 2.4 Specialized loans: regulation categories

	Category 1	Category 2	Category 3	Category 4	Category 5
Judgment	***	***	**	*	Default
Remaining maturity < 2.5 years	50%	70%	115%	250%	0%
Remaining maturity >= 2.5 years	70%	90%	115%	250%	0%

Box 2.1 The determination of capital requirement

In both IRB approaches (basic and advanced) the bank determines the capital requirement (K) considered as the amount of risk assets equal to one euro. The weighting factor associated with each activity is obtained by multiplying K by 12.5. The determination of the risk-weighted assets (RWA) with reference to a given exposure depends on the estimates of PD, on the values from the regulations or internal estimates of LGD and EAD (depending on the IRB method that has been adopted) and, in some cases, on the actual M expiry (Banca d'Italia, 2006).

The risk-weighted assets (RWA) are calculated using the following formula:

RWA = K * 12.5 * EAD

K is the capital requirement and it is a function of the probability of default (PD), the percentage of expected losses given the default (LGD), the maturity (M), the correlation ρ between the positions held and other factors such as the turnover of the counterparty if a small-medium enterprise (SME) is being considered.

The calculation of the capital requirement K for non-defaulted exposures can be summarized with the following formula:

K = 1.06 *LGD *{ N [(1 – R)^–0.5 * G (PD) + (R / (1 – R))^0.5 * G (0.999)] – PD}
* [1 + (M – 2.5) * b]/ (1 – 1.5 * b)

where: Ln is the natural logarithm; N (x) is the cumulative distribution function for a standard normal random variable (i.e., the probability that a normal random variable with mean 0 and variance of 1 is less than or equal to x); G (z) is the inverse cumulative distribution function for a standard normal random variable (i.e., the value of x so that N(x) = z); R is the correlation, and it is calculated as follows R = 0.12 * [1 + EXP (–50 * PD)]; b is the adjustment based on and is calculated as follows: b + [0.11852 – 0.05478 * Ln (PD)]^2. If PD = 0 then RWA = 0.

For exposures in default for which banks apply prescribed estimates of LGD, the capital requirement (K) is equal to 0 [IRB Base: K = 0]. For exposures in

default for which banks apply internal estimates of LGD, the capital requirement (K) is equal to the highest between 0 and the difference between its LGD and the best approximation of the expected loss estimated by the bank advanced IRB: K = max (0, LGD – ELR)].

Banks may treat exposures to SMEs (defined as exposures toward companies forming part of a consolidated group whose declared turnover is less than € 50 million) separately from those to large enterprises. For corporate businesses with a turnover exceeding € 50 million a standard weighting function is used [K = f(PD,LGD,M)]. For small-medium enterprises, the weighting function is subjected to an alteration, and it also includes the turnover [K = f(PD,LGD,M,S)]. For these exposures the following adjustment in the formula for the calculation of the correlation is provided: 0.04 * [1– (S–5)/45]. The formula for the correlation thus becomes:

R = 0.12 * [1 + EXP (–50 * PD)] – 0.04 * [1 – (S-5)/45].

2.3.2 Determination of the risk parameters

The quantification of risk parameters (PD, LGD, EAD and M) that are used in the weighting functions for the definition of regulatory capital is part of the evaluation of the minimum quantity requirements.

The methodology used to calculate the PD is common to both the basic and advanced approaches. The bank must calculate internally the PD for the different classes of borrowers. The agreement does not specify which indicators should be used for the calculation of PD, but it expects that the criteria are documented and stored transparently and they are reviewed regularly. For exposures to corporates, banks and retail customers (retail), the PD is the major value between 0.03 percent and the annual PD corresponding to the borrower's internal merit class to whom is assigned the exposure which is being considered. In the event of a counterparty in default, the PD is equal to 100 percent.

PD estimation is done conceptually into two stages: first, each counterparty is assigned to a certain rating class (PD individual); then the bank will have to determine a PD for each rating class that will be associated with each counterparty included in the same rating class (PD class). Banks estimate the PD for each rating class on the basis of long-run average of one-year default rates. In fact, with reference to the extension of time series required to estimate the PD, the legislation stipulates that, when applying for authorization, the PD associated with each rating class is calculated over a period of minimum two years (with an increase of every year until at least five years) and five years

respectively in connection with the use of the foundation and advanced method.

For the estimation of PD, banks may use one or more techniques, eventually in combination. The first is the internal experience of the default, in which the bank uses its own historical data on frequencies of default observed among obligors in each rating class. The second technique consists of mapping with external data, through which the bank establishes a correspondence between the internal rating system that has been used and the scale used by an external rating agency and assigns to its rating classes corresponding default rates reported for external ratings. Lastly, the third possibility is the use of statistical models for predicting default through which the intermediary calculates the (simple average) PD estimated for individual obligors in the same grade. While the first techniques are frequently used with corporates, automatic component systems are commonly applied to retail customers.

The rate of expected loss in case of default (LGD) is set at 45 percent for unsecured loans and 75 percent for subordinated loans under the basic approach; whereas with the Advanced approach, LGD must be estimated in a long-term period considering recovery costs and discounting cash flows. While for the PD, the emphasis is placed on giving more importance to the internal data as a source of information, for the LGD it is not possible to use estimates based solely on subjective and discretionary assessments conducted by experts (so-called subjective methodologies). To estimate the rate of LGD, objective methodologies should be used, for example, those based on the observation of the market values of securities issued by companies in default (cd. LGD market) or those based on its own internal evidence regarding the recoveries actually obtained (and, therefore, the losses actually observed) on exposures in default (cd. workout LGD). Banks must take into account both the characteristics of the exposures (dimensions, technical type, guarantees) and all direct and indirect relevant costs, related to the additional collection compared to the amount of credit in default. These costs and the portion of the non-collected loan in case of borrower's insolvency should be appropriately discounted through methods of discounting cash flows. When wanting to be prudential, it is preferable that the banks use LGD estimates appropriate for an economic downturn (downturn LGD) if these are more cautious than those based on the long-term average. LGD estimates are based on data over a minimum period of five years for exposures to corporates, banks and government (two for retail exposures), extended

by one year each year until reaching a minimum period of seven years (five for retail exposures).

Even the EAD measure varies, and it depends on the method that has been adopted (basic or advanced). The basic method involves a series of fixed rules. In particular, the EAD is calculated considering the type of exposure that is currently used by the client and distinguishing between irrevocable and revocable loans. To the first is applied a credit conversion factor (CCF) of 75 percent regardless of the maturity of the underlying credit actor conversion preset for the second (for example, the margins for the opening of an account are considered for 75 percent of the nominal amount). The determination of the CCF corresponds indirectly to the measure of EAD as they reflect the possibility of using additional credit by the debtor before and after the time of the occurrence of the default, that is, the amount of money that, although not yet received, will be used by the borrower until the time of default. The credit, revocable at any time, is not subject to the calculation of EAD: they are subject to a CCF of 0 percent. In the case of overdrafts and credit lines immediately and unconditionally cancellable, banks may apply a zero CCF if they prove to actively monitor the financial condition of the borrower and to activate the withdrawal as soon as the creditworthiness of the counterparty deteriorates.

In the advanced IRB approach the CCF are estimated by the bank. In order to estimate the credit conversion factors, the characteristics of the exposures (technical form, size and rating, economic sector) have to be considered, recalling that the CCF cannot take negative values (the EAD cannot be less than the current value of the exposure). The CCF according to the regulations are calculated as long-term average; in recession, banks may adopt more suitable CFF estimates if these turn out to be more conservative than the long-term average. For the estimation of CCF, in addition, what is considered is the data resulting from a period of observation equal to that provided for the estimation of LGD.

In the basic method, the remaining life (Maturity) assumes a fixed value of 2.5 years apart from the repos for which the actual duration is fixed at six months. The banks that adopt the advanced approach must calculate the effective maturity for each transaction. The remaining life is calculated as the mean of the remaining time to the various payments contractually agreed upon, weighted by the relative amounts; thus M takes on a greater value within one year and the actual remaining life expressed in years, although its maximum value cannot exceed five years. With the exception of some short-term exposures, the effective maturity in the advanced method is between 1 and 5 years.

2.3.3 Requirements of the IRB methods

The architecture and the operation of an IRB system cannot be separated from the requirements requested by both the organizational and quantitative regulation.

For a more effective assessment of the credit risk, it is therefore necessary that banks adopt organizational solutions that can enhance the results of the estimation approaches that have been used. The organizational requirements regard the following areas: corporate governance and internal organization, internal validation, use of the rating system in business management, rating assignment process and information systems (Altieri Pignalosa et al., 2012).

Banks must respect, within the rating assignment process, the following organizational requirements: replicability and integrity of the process of rating assignment, homogeneity and uniqueness of the evaluation, documentation on the methodology and on the organization of the rating system.

The replicability of the assignment process and the possibility to recalculate the rating for each position should be guaranteed. The minimum requirement of replicability is ensured by keeping track, even electronically, of the decisions taken as the process of elaboration takes place highlighting for instance the intermediate rating and the reasons behind any override. It must be possible to trace the person who is responsible for the assessment, the date of initial rating assignment and its subsequent updates.

With regard to the requirement of integrity, the rating assignment must bring neither economic benefits nor any other type of benefit to those who are working on the granting of the loan. Banks take appropriate precautions on their organization and procedures to ensure the integrity of the rating process by adopting organizational solutions focused on the guiding principle of a clear distinction between the functions of granting the loan and the assignment of the definitive rating. In this context there are two possible solutions: (1) the centralization of the responsibility of rating assignment at a dedicated facility – the needs of separation are fulfilled at the highest level by the exclusivity of the authority conferred on the structure, as well as its autonomy and independence; (2) the attribution of responsibility for the allocation of the definitive rating to subjects included in the ordinary path of evaluation and decision of granting the credit. In this case, the requirements of integrity must be guaranteed through the adoption of a code of conduct and the allocation of powers to ensure, in cases of conflict of interest,

the separation between the deliberative functions and the tasks of rating assignment.

The requirement of homogeneity assigns borrowers and operations that carry similar risks to the same rating class, while the uniqueness must ensure that, in the case of loans at different legal or territorial entities within a bank, the counterparty must receive the same rating assessment. Therefore, uniform assessment criteria should be applied at all organizational and territorial structures within the bank.

With regards to documentation, the entire organization of the whole rating assignment process must be documented, in particular with reference to the allocation of responsibilities and to the identification of individuals who have the power to assign the rating, as well as the criteria and the limits when exercising such power. The formalization of all the control activities of the process, in terms of facilities, tools and procedures also assumes importance.

At least once a year there should be an update of the rating. If, during a review of the terms and/or conditions of a loan, elements may imply changes in the creditworthiness of the customer or that there may be a risk with the transaction, it is necessary to update the rating even before the following review deadline established by internal rules.

The determination of the minimum quantity requirements calls for an assessment of the overall design of the rating systems; of the methods of quantification of the risk parameters (PD, LGD, EAD and M) used in the weighting functions for the definition of regulatory capital; of stress tests used in assessment of capital adequacy; of the use of internal models approach to equity exposures; and finally of the use of external models (the so-called "vendor models").

2.4 The innovations introduced by Basel III

The financial crisis of 2007–2008 has made it necessary to define some actions to strengthen the capital base of the banks. In this context, the proposed new system introduced by Basel III, which is the set of rules approved by the Basel Committee on Banking Supervision, is inserted in order to strengthen the current regulations on capital adequacy (better known as Basel II), the effectiveness of supervision and the ability of intermediaries to manage risk.

The publication of Basel II, which improved the measurement of credit risk, dates back to 2004, while its implementation was almost completed in 2011. Basel III, preceded by Basel 2.5 agreed upon in July 2009 in order to improve the measurement of the risks related to securitization

transactions and trading book exposures, was introduced in 2009 as a consultative document to become a final document in December 2010 (further revised in 2011).

The reform has two aims: the first (micro-prudential dimension) is to increase the capacity of each bank to cope with periods of stress; the second (macro-prudential dimension) is to contain the spread and possible procyclical amplification of risks through the banking system. The combined effect of the micro and macro actions (improvements in the quality of capital, expansion of the coverage of risks, limitation of the degree of leverage, introduction of the countercyclical capital buffer and new liquidity requirements) aims to mitigate the likelihood of contagion of systemic risk through greater resilience of each bank to financial and economic shocks.

The crisis has highlighted some critical aspects of the banking system: non harmonized configuration of capital, weak transparency of its components and a lack of high capacity of non-equity instruments to cover losses. The revision of Basel III is has developed toward several directions including, most significant for the purposes of this paper, those that relate to the upgrading of the level of the core component of the capital, the ability to absorb losses through the harmonization of regulatory adjustments and the computability of innovative capital instruments, the simplification of the aggregates (elimination of Tier 3).

The strengthening of the level and quality of capital reflects the need to increase the capacity of banks to absorb losses in the case of business continuity (going concern), or in the event of a liquidation of the intermediary (gone concern). That aim is met through the reconstruction of regulatory capital in favor of ordinary shares and retained earnings (Common Equity), the adoption of more stringent criteria for the computability of other capital instruments, the different ways of deduction to avoid the recurrence of cases where there is a low core capital and higher capital ratios.

Drawing on study by Birindelli and Ferretti (2011), following is a description of the main changes introduced by Basel III in terms of capital adequacy.

For the Common Equity, amount of ordinary shares and retained earnings and share premium, Basel III provides 14 requirements that must be met jointly for inclusion in the aggregate (BCBS, 2010, para. 53). Failure to comply with this results in the inability to admit them in Common Equity in order not to compromise the ability of bank capital to absorb losses and to withstand stresses from market shocks. Under

Italian law, this exclusion might affect certain types of shares (preference and savings) unless there adaptations to statutory provisions in order to continue to make their computation possible.

The Common Equity forms Tier 1 along with other instruments (Additional Tier 1) with the capacity to absorb losses on a going-concern basis. To fall within this aggregate, the instruments must comply with 14 criteria, among which are highlighted the subordination to deposits, unsecured and subordinated debt of the bank, the absence of a due date and a ban on step-up clauses or other incentives for early redemption.

Some of these requirements (for example, the subordination to the deposits and unsecured loans and the prohibition of step-up clauses or other incentives for early redemption) also apply for Tier 2, whose purpose is to absorb losses in case of crisis (Gone Concern Capital). When considering the criteria for computing in Tier 1, the main differences relate to the deadline (not less than five years) and depreciation (the amount calculable in the five years prior to maturity is amortized on a straight line).

The legislation also provides a series of "adjustments regulations" governing the deduction from Common Equity of the following elements: goodwill and other intangible assets; investments in common shares; the differential, if negative, between total adjustments and expected losses in the Internal Rating Based Approach; capital gains and unrealized losses due to changes in fair value of the bank's liabilities to changes in its credit risk; the Deferred Tax Assets (DTA) to be realized through the reduction of payments for subsequent tax depends on the future profitability of the bank. Finally, investment in the capital of banking, financial and insurance companies outside of the scope of consolidation are subject to different predictions depending on the percentage held.

The capital measures proposed by Basel III are not limited to the quality, but also greatly affect the minimum levels. At the end of the transition period (and therefore in 2018), the capital base measured by Common Equity Tier 1 ratio (CET 1) shall not be less than 4.5 percent (compared to 2 percent requested previously) of risk-weighted assets, 6 percent for the core capital (it was 4 percent) and 8 percent for the overall one. To this must be added the capital conservation buffer of 2.5 percent in excess of the minimum, introduced by the Committee for the purpose of building up additional capital buffers for the expansion phases of the economy that can be drawn upon in moments of stress, and an additional countercyclical buffer of 2.5 percent.

The gradual application of the norms provides that the regulatory adjustments applied to the core component will begin to be partially deducted from 2014, in full by 2018. Therefore, the equity instruments other than ordinary shares such as the innovative capital instruments issued by the same rules, will remain entirely in tier basic or in the additional one until January 1, 2013, and, as of that date, the amount recognized for prudential purposes will be reduced by 10 percent each year; equity instruments signed by the governments will be fully recognized until January 1, 2018.

In conclusion, recalling that the minimum requirement for the total capital remains stable at 8 percent; 4.5 percent in case of Common Equity and 1.5 percent for Additional Tier 1 ratio, the remaining 2 percent will be filled with supplementary capital (Tier 2). Considering the capital conservation buffer, the requirement will be 10.5 percent or 13 percent in the case of presence of the countercyclical buffer.

The description of the changes introduced by Basel III on strengthening the capital underlines the aim of the new framework and the implications on bank management. If on one hand, the aim of making the banking system more solid and stable is admirable, on the other the new set of regulations creates doubt as to which will be the actual impact on the banking system. For some, the gradual application of the new rules will have a neutral effect; for others, however, there may not be marginal effects especially in terms of possible phenomena of credit rationing, and thus with the inevitable consequence of slowing down the crisis exit.

3
Internal Rating Systems: A Critical Vision

3.1 Strengths and weaknesses of IRS

The evaluation of a company's creditworthiness has become more sophisticated following the application of the Basel II set of banking regulations. The Basel II Accord has brought about important modifications to the risk management system and, in particular, introduced an opportunity for the banks to use internally created rating models, considered an innovative form of business diagnosis. However, the use of these systems is not without flaws which can be ascribed, on one hand, to economic phenomena and, on the other, to the impact they have on bank management.

As to economic phenomena, one must remember that the creation of these models came about in a period characterized by economic stability which has favored the dominance of financial company variables with detriment to the real ones. The latter have been influenced by investments and choices which a company experiments and carries out in relation to market, product, process and clientele relationship strategies. Rating models, so conceived, tend to reward a mature company with significant cash flow rather than a dynamic company characterized by less brilliant financial performance, but which can have a better competitive position and greater cash flow. Rating systems, though, were introduced during a financial crisis which altered the compliance models created in normal management conditions. Due to the presence of the crisis, the process of granting credit based on rating has faced greater overuse compared to that which would have been found in a normal economic cycle, modifying the scenario of the decisions regarding financing companies.

With regard to the impact which internal rating systems (IRSs) have on company management, it is necessary, first of all, to verify that the functions of this instrument have increased over time, involving normative, accounting and management aspects. The use for purposes which do not always correspond to each other and which have different risk contents has increased the complexity of the instrument and amplified the versatility of its technical characteristics, the adherence to the counterpart's risk, the sensitivity to the economic cycle and the long-term vision (De Laurentis and Maino, 2010). The increase of the risk of inadequacy occurred because the rating characteristics are modified according to the use of the instrument. In fact, when it is used in credit monitoring activity (management purposes), the sensitivity of the economic cycle and the counterpart's adherence to risk must necessarily be high; on the contrary, when it is used to determine the adequacy of the capital (regulation purposes), these variables lessen. At the same time, the use of rating for a precise credit line requires different characteristics as compared to its use as support for commercial policy or long-term credit strategy by the bank.

Representing the main instrument of risk measurement, credit rating has established and is establishing elements at the base of the relationship between bank and company. It is not easy to define the correct relationship between rating, segments of clientele and the organizational structure of the bank. The adoption and application of rating systems are influenced by the aims of the clientele relationships (a choice between a relational approach as compared to a transactional one) and by the dimension of the credit intermediary and its organizational structure (Rikkers and Thibeault, 2007). In this area, rating acts as a bonding agent between strategic vision, choice of market segments and clientele to serve and the credit policies of the bank (Cuneo and Maino, 2010). The strategic aim of this instrument is that of reaching excellence in its relationship with the clientele. For this reason, banks have to use a stable and long-term rating system, undertake an adequate communication policy and define correct incentives and adequate approval powers of delegation for those who are in charge locally. Otherwise, the use of statistical systems by the banks in order to foresee possible insolvencies reduces the banks' capacity to evaluate the company's health (which depends on the type of activity, the phase of the economic cycle, aspects regarding the company-client and the sector/territory to which it belongs), to enhance the role of the manager of the relationship (the acquisition of competences is discouraged and the value of the

proprietary information is weakened) and to collect information of a qualitative nature, necessary in order to formulate a personalized credit service (De Laurentis and Maino, 2011). The result is that, in moments of discontinuity, the introduction of more sophisticated methods of analysis only weakens, instead of strengthening, the relationship with the clientele, above all when it is made up of small companies.

The crisis has created more heightened tension in the granting of credit than that which would have occurred in a less turbulent phases of the economic cycle. It is necessary to fully understand the phenomena which go along with moments of important structural change, in order to stop rating models from specializing in the increasingly exclusive and not always efficient selection of established clientele instead of more effectively evaluating new or more active companies.

3.2 Rating and the economic cycle

At the end of the 1990s, financial intermediaries brought significant innovations to credit management through the creation of rating systems. Their creation occurred in a moment in which the credit market was going through a period of stability (except for the first years of the new millennium) which allowed the creation of a compact and homogeneous system, based on information regarding the short-medium term (12–18 months). Said information was also used for granting credit in the long term.

However, passing from the creation to the application of these systems was not easy in that it occurred during a significant financial crisis which altered the compliance of rating models created during normal management conditions. During the crisis, rating models proved to be inadequate in managing risk, and this brought about overuse in the process of credit granting. In the most acute phase of the crisis, there was an important contraction of liquidity and credit availability on behalf of the banks (credit crunch), with significant repercussions on the entire financial system. The motivations that influence the cyclical nature of the rating can be traced to the process of rating (rating assignment), the calibration process and the frequency of revision (Cuneo, 2014). As for the rating assignment, including the set of financial indicators, indices of profitability and debt service are more cyclical than the indices of the structure; the performance indicators are located on an intermediate level, and qualitative information can be useful to introduce or remove the cyclical effect. On the calibration, the length and frequency of update of historical default rates affect the cyclical nature of the

rating. In the probability of default (PD) estimation, the longer duration of the observation period gives more stability to the rating assessment. However, in times of recession PDs are systematically underestimated. Finally, the high frequency of the review process of the rating may increase volatility.

Faced with this critical change in the credit cycle, a question is raised as to the capacity of rating to support concrete decisions in times of recession and great economic tension. Until today, little attention has been given to the evaluation of risk in a cyclical context, and it is not possible to find a valid rating philosophy which defines the relationship between risk measurement and the economic cycle.

Today, rating systems are going through an important developmental phase; while before they were used only to support credit granting decisions, today their areas of application are increasing. From the initial operative relevance, there has been a quick shift toward application for regulatory purposes (recognition, for calculation purposes, of minimum capital requirements), accounting purposes (provisions policy, impairments, fair value evaluations of the portfolio) and the financial structure of the intermediary (capital adequacy, growth, hedging and financial innovation strategies). An example of possible areas of rating application is shown in Table 3.1.

In this table, on the top right, the functions which emerged in the use of the models during the last years are shown; the first column shows, briefly, the desired characteristics with reference to risk measurement, its sensitivity to the economic cycle and the capacity to offer a measurement of the greatest term with respect to the cycle (the so-called "long-term vision" of the measurement). The cyclical dependence of the rating model/process determines the exposure to the effects of the credit cycle. Said dependence, not measured and not foreseen during the development and evaluation of the instruments, is considered to be increased after the introduction of new accounting rules.

3.2.1 Alternatives for dealing with rating during the credit cycle

An economic cycle stands out for its intensity (for example the variation of the GDP) and for its quality (for example the determinants of the supply and demand). Within the credit cycle there are, in various measures, structural innovations (which permanently modify the economy) and economic tendencies (meant to recuperate with the changes in the revenue and production levels). Amongst the latter is the tendency of the financial sector to accumulate risk and debt in favorable economic conditions or, otherwise, to cut the credit offer. The inclination of the operators

Table 3.1 Useful functions and characteristics of the counterpart's rating

Principal functions	**Characteristics useful to rating models**
Punctual credit lines (transaction)	• Adherence to risk • High sensitivity to economic cycle • Low long-term vision
Commercial policy (client's perspective)	• Adherence to risk • Medium sensitivity to economic cycle • Medium long-term vision
Client strategy (relationship)	• Adherence to risk • High sensitivity to economic cycle • Low long-term vision
Early warning / watch list	• Adherence to risk • High sensitivity to economic cycle • Low long-term vision
Risk control & reporting	• Adherence to risk • High sensitivity to economic cycle • Medium long-term vision
Provisions for losses	• Adherence to risk • High sensitivity to economic cycle
Economic capital	• Adherence to risk • High sensitivity to economic cycle • Low long-term vision
Regulatory capital	• Adherence to risk • Medium sensitivity to economic cycle • Medium long-term vision
Adequacy of capital (Pillar 2)	• Adherence to risk • Low sensitivity to economic cycle • High long-term vision
Market communication(Pillar 3)	• Adherence to risk • High sensitivity to economic cycle • Medium long-term vision

Source: adapted from De Laurentis and Maino (2010)

to behave in a procyclical manner is connected to several motivations. Amongst these, there are the accounting principles, applied to activities assessed at market value and loans held until expiration; the procedures of adjustment of margins; and the accumulation and restocking of financial leverage by financial institutions, companies and consumers.

A financial crisis is able to bring about an exogenous shock which leads to an increase in insolvency and, therefore, a greater occurrence of downgrading, which implies an increase in the adjustments, both specific (on

non-performing loans) and generic (on performing loans), as well as on capital requirements. The banks will find themselves forced to look for new capital and/or a reduction in credit granting with the consequent reduction of investments by the companies. This may bring about a period of recession. On the contrary, periods characterized by economic growth can have a different impact, especially if they are associated with different levels of inflation, unemployment, external or internal demand for investments, final consumption and governmental expenses.

That which has just been described is accentuated by the banks' use of Point in Time rating systems, able to evaluate creditworthiness on a certain date without considering the possible future of the rating. In this regard, it is very important for financial institutions to decide whether or not to adopt, within their rating, systems which by nature evaluate the current condition of the counterpart (point-in-time) or systems in which the measurement of risk prescinds from the current condition (through-the-cycle). This because the instrument of evaluation adopted influences many aspects such as credit approval, pricing, credit and portfolio monitoring, regulations, internal capital requisites and the competitive position of a bank (Rikkers and Thibeault, 2007).

For these last reasons, during the process of risk analysis it is necessary that the analyst consider that each business is characterized by cycles and that, in turn, each company goes through different periods. Otherwise, if, for example, only the accounting data was analyzed, penalizing results could appear as compared with the actual situation. In the figure which follows, the rating position within the economic company cycles is graphically depicted.

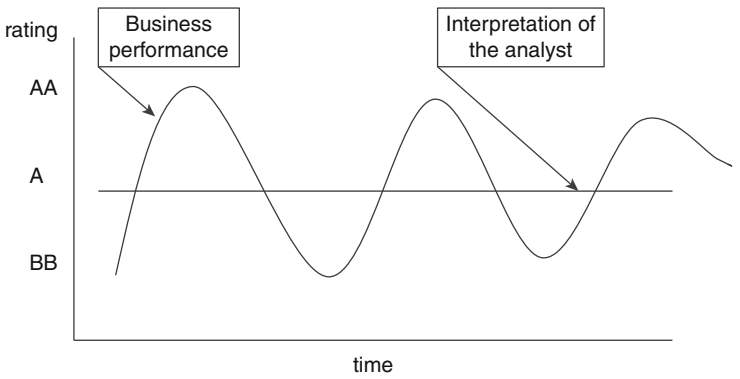


Figure 3.1 Rating position and economic cycles

In conclusion, the rating should express a judgment on the tendency which reduces the effect from the economic cycles, informing the market as to the company's profound potential (Cantino, 2002). From here there is the need to use rating instruments with different validity on various temporal horizons and, therefore, with different sensitivity to the credit cycle. This would allow both the establishment of clientele relationships on a medium term which are less subject to economic variability, and the periodic reevaluation of the most significant credit as provided for by the new International Financial Reporting Standards (IFRS) accounting regulations.

Said necessity has, until now, been obstructed by impediments of an objective character regarding the difficult determination of the moment of the economic cycle and the impact which the latter can have on different markets and production segments.

3.2.2 Stressed PD

One of the most procyclical dynamics is the incapability of the prudential frameworks and the risk management systems to comprehend, before the crisis shows itself, important aspects such as those connected to complex negotiation activities, re-securitizations and exposures regarding off-balance sheet vehicles. The possibility to modify the rating judgment based on the cyclical moment, according to well-defined and non-discretional methodologies represents an unavoidable element in order to correct the procyclicality of the capital requirements and, consequentially, a relevant and partially unresolved problem. In this respect, in July 2009, the Basel Committee completed a series of crucial reforms in order to improve the standards for the prudential supervision (second pillar) and for public disclosure (third pillar). Said reforms raised capital requirements against the exposures connected to the negotiation portfolio or against complex securitizations, sources of important losses for numerous banks active on an international level. It is important to remember that the goals of surveillance prevalently adhere to the determination of the minimum capital requirements which have a specific value in terms of portfolio more than as a single counterpart (De Laurentis and Maino, 2010). Such reforms are said to have a micro-potential dimension, as they contribute to increasing the solidity of the single banking institutions in periods of stress, and a macroprudential dimension, as they face systematic risks which can accumulate in the banking sector, such as the procyclical amplification of said risks through time. Both surveillance approaches are interconnected,

since a better performance for single banks reduces the risk of shock of a systematic capacity. Amongst these, surveillance proposes the criterion of default probability estimation, called "stressed" estimation, which means preventative and worsened as compared to current ones to allow for a relatively negative point in the cycle (called "mild recession"). One default probability Through the Cycle (TTC) is stressed and used to produce forecasts of default probability which are equal to the average of the long period of default rates in a year (adjusted average of the purely cyclical effects). Contrary to the point-in-time approach, in through-the-cycle systems the solvency of the subject is calculated apart from the economic effects, both current and perspective, but in a pessimistic scenario. The credit risk evaluation is carried out through a stress analysis, in the "worst" conditions (worst case) of the cycle (Sironi, 2004). The result of such methodology should lead to a non-volatile rating, immune to the variations of the economic cycle. The TTC rating systems only respond to permanent shocks for the company, while transitory shocks are ignored (Löffler, 2004).

The methodology for the calculation of a stressed default probability can be understood on two levels: (1) fix the default probability on an unfavorable level which it would have during a defined situation of stress; (2) fix the default probability at a certain confidence level which is more conservative than the mean distribution.

The figure which follows aims to exemplify this concept.

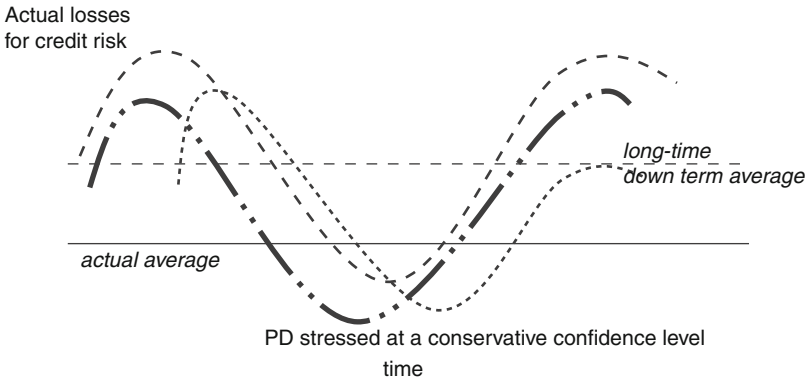


Figure 3.2 Credit losses, economic cycle and rating

The dark line indicates the level of loss measured according to this criterion. Given an actual average (the dark axis), the average of the measurements lies above (called "long time downturn average"). However, apart from the size of the losses, the trend of the curve follows the effective economic cycle without significant delays. In the case of the adoption of a constant stressed default probability, the estimated loss would not vary through the cycle and it would lie along one of the upper parallels above the long time downturn average.

The limits of such a methodology emerge when it is applied on a counterpart level and not on a portfolio level. As to the first case (1), said methodology applied at a counterpart level has 2 limits:

- The default probability is closely correlated to the situation of stress given exogenously. If the latter does not change, the default probability would only change after a substantial change in the counterpart's fundamentals.
- The evaluation depends on the manner of defining the stress. Structural innovations can change the nature of the extreme events and make hypothesized stress less significant.

As for the second case (2), a more conservative confidence interval does not determine with certainty that the result of the estimation is less cyclical. In fact, the stressed default probability can be anticyclical or acyclical since the whole distribution of the expected events tends to move with the economic phase (a case shown by the other two curves of the graph in Figure 3.2).

In conclusion, the use, for operating purposes, of such default probabilities is significantly limited. On one hand, the stressed default probabilities do not seem compatible with the International Accounting Standards (IAS) accounting regulations which were recently introduced, on the other, the application of systematic stress makes the rating from which it derives incomprehensible, reducing the possibility to involve the expert judgment of the management in the evaluation. All of this simply has an effect on the bank-company relationship due to the scarce involvement of the management in determining pricing and in the evaluation of the profitability of the relationship.

3.2.3 Unstressed PD

Given the significant limits which are associated with stressed default probability (pricing, accurate management of relationships, verification of correct risk management, accounting purposes), the financial

intermediaries have, until now, tended toward unstressed default probability. A Point in Time default probability (PIT) is unstressed and shows the default probability for the following year, given the current point in the economic cycle. In the PIT evaluation method, the risks are evaluated based on the current condition of a company, independently from the phase of the economic cycle at the moment of evaluation (Rikkers and Thibeault, 2007). The solvency of a subject is generally calculated in a short-term temporal horizon (usually annually), considering the current and prospective economic conditions of the same and of the economic cycle. In this manner, it is possible to obtain a cyclical measurement, sensate to macroeconomic conditions and characterized by an elevated volatility.

An unstressed default probability, therefore, is estimated without considering the cyclical moment through operation of statistical or structural character. In the first case, the techniques used are: lowering the current default probabilities, mediating with the historical ones, and the adjustment of the default probability of the overall rating with models which take the economic cycle into account.

The first solution presents both strengths and weaknesses. In fact, if, on one hand, one strength is that it is easy to implement, on the other its implementation simply delays the effect of the cycle rather than highlights its effective impact. In a context of market risk, such an approach can be useful to subtract the evaluation from excessive volatility, connected to temporary conditions as to price or liquidity and destined to be taken over in a brief time span.

Even the second technique (more utilized) presents strengths and weaknesses. In this solution, default probability is calculated through the use of models of an essentially macroeconomic nature which barely consider the main productive sectors of the economy. Due to their nature, said models are suitable for the modification of the counterparts' results which are affected by the economy as a whole, such as large national or multinational companies. Problems arise at a single market level, with SMEs and production segments. In this context, the cyclical correction applied is not always effective as its idiosyncratic nature prevails upon its systematic one. Therefore, this method is suitable for extensive portfolios which are affected by the macroeconomic cycle.

As to the second case (structural), reference is made to the "hybrid" approach which tries to repair the previously described limits, supporting the overall rating results with more long-term elements (or structural ones), combining the two judgments with weights specified in the same rating model. In fact, the hybrid logic has different gradations between

the two extremes, made up by two pure approaches, Point in Time (PIT) and Through the Cycle (TTC).

3.2.4 Rating and company analysis: the "hybrid" approach

As noted by Maino (2012), the reasons which explain the greater solidity of the hybrid (or structural) approach, compared to the models previously described, are many. First of all, in this type of approach, attention is paid to strategic factors (also derived from qualitative detection) in the long term, evaluated company by company. For this reason, it is more advantageous, above all for the evaluation of the SMEs, compared to the application of cyclical factors connected to forecasting scenarios in that, because of their nature, they are characterized by general validity. Secondly, the hybrid approach stimulates and incentivizes a broader relationship with the company in that the judgment also depends on a significant involvement of the analyst. He, in fact, is called to focus attention on the fundamental economic factors, competitively, of the company being considered and, therefore, not only on the economic elements which justify the single transaction. For this reason, the analyst, in carrying out his work, does not only consider financial risk factors but also factors of a realistic, competitive, productive and income nature. In this way, such an approach allows the analyst to obtain a clear final judgment which highlights the relevant aspects of the short and medium term. In this context, the result of the model should also be fully acceptable from an accounting point of view since it meets the requirements of the International Accounting Standards Board (IASB).

Finally, thought must be dedicated to the temporal horizon of decisions. As to this, it is necessary to distinguish between a vision of risk in a longer term (for example relative to the business model) from that of a short term (for example connected to daily management of disruption in the credit cycle), to which suitable management behavior of a strategic and tactical nature must be associated. This is because the different choices made by the company, regarding competitive positioning, placement of resources (capital, reserves, provisions) or internal organization (strategies, competitive choices, instruments and processes), play out at different times, requiring coherence between risk measures and respective temporal horizons. An attempt at synthetic representation comes from Table 3.2 where, next to rating goals previously highlighted, the relative criteria divided in classes are summarized. Regarding the rating judgment, a distinction as to temporal character (short term and medium term) is made; instead, as to the process of credit granting, there

is a distinction between the possibility to automate the process and the possibility of expert intervention.

As it can be seen, the choice of the metric of risk is not univocal. Such decisions should not be taken considering short-term measures only through the result of rating models (for example of management/correction of the portfolio, of hedging particular emerging risks, of aggressiveness/conservativeness of credit policies, for price and coverage purposes); instead, other factors should be pondered and implemented with qualitative information through the activation of an up/down grinding process by an analyst, able to make the evaluation of the company be considered more reliable. This would allow, besides a greater efficiency, the possibility to create relationships in the long term with clientele, significantly incentivizing the perspective of a relational bank. The problem becomes more complex when the credit is not only generated by independent transactions (retail), but is balanced in long-term relationships, with barriers at the entrance and exit which protect/threaten the economic result of the relationship (corporate relationships, large groups, sophisticated enterprises, market leadership positions) and which generate cross-selling activities. Such relationship

Table 3.2 Rating functions

Principal functions	**Rating**	**Credit granting**	**Portfolio management**
Punctual credit lines	• Short term	• Automated process	• Model based
Commercial policy	• Short and medium term	• Semi-automated process	• Model and value based
Client strategy	• Medium term	• Expert integration	• Model and value based
Early warning / watch list	• Short term	• Automated process	• Model based
Risk control & reporting	• Short term	• Automated process	• Model and value based
Provisions for losses	• Short and medium term	• Expert integration	• Model and value based
Economic capital	• Short term	• Automated process	• Model based
Regulatory capital	• Medium term	• Expert integration	• Model and value based
Adequacy of capital (Pillar 2)	• Medium term	• Expert integration	• Model and value based

Source: adapted from De Laurentis and Maino (2010)

shows a significant contribution of value, with a nature of open option on the future dynamics of the respective markets.

In conclusion, the choice of rating model becomes a fundamental point in which, on one hand, the choices of company culture are expressed and, on the other, there are the choices upon which the competition in the credit activity is founded. Following the continuous changes in business models, the irreversible increase of applications of said models pushes toward an organic solution of the risk metric though the economic cycle.

3.2.5 Implementation of "hybrid" models

The hybrid approach considers long-term factors and, upon them, it bases a more stable and lasting vision of the counterpart's risk. In certain situations it has greater reliability and quality as the standardized, mechanized and statistical procedures are integrated toward an override process, regarding a qualitative analysis (of opportunities and threats), in order to evaluate the competitive positioning of the counterpart. In this way, an objective analysis is obtained, founded on quantitative elements, in which the analyst's judgment is indispensable. In this regard, the Basel Committee also affirmed that said mechanistic measures could only be admitted as a primary or partial basis for the rating assignment. Evaluation and supervision by the analysts of the credit institutions is necessary (Scannella, 2004).

In these models, attention is given to the counterpart's industrial and structural elements of competitiveness. Such elements should have a different assignment during analysis, and this requires the segmentation of clients' problems, perspectives, types of risk and monitoring requirements, setting up a policy of generating value through time. The implementation of strategic analysis within the rating models and, therefore, the insertion of purely industrial considerations within the evaluation, presents significant advantages. Firstly, the judgment becomes more stable because attention is focused mainly on the counterpart's long-term competitive factors and, therefore, not only on short-term factors. Secondarily, it makes the rating evaluation and the relationship with the counterpart more involved as not only financial risk factors are analyzed, but elements of real, competitive, productive and income elements are also analyzed. Lastly, it allows the creation of clientele portfolios which award companies with real, lasting and documentable competitive advantages with possibly virtuous circles in the selection and location of credit in various available technical forms.

The completion of the analysis, required by the regulations ("disclosure completeness"), should take shape through evaluations of a qualitative character. As Carosio (2010), a former Vice-Director General of the Bank of Italy, affirmed: "Preoccupations regarding the effects which a mechanical use of rating systems could have on the credit supply are increasing. We have, on several occasions, encouraged the banks to integrate the balance sheet data with information collected locally, make the revisions of the credit granting quicker, improve the creditworthiness evaluation methods, foresee equilibrated incentives for those who manage relationships with the clientele".

In this regard, it is necessary to make a distinction as to the use of said models by rating agencies and by banks. The field of action of the agencies is represented by large counterparts with complete and structured information. They follow such an approach by breaking down the analysis in a structural module, dedicated to the evaluation of the sustainability and competitiveness of the company through the acquisition of available qualitative information, and a module which highlights solvency and liquidity of the financial structure. The situation is different for banks that do not have the same information of the official agencies. Usually, access to internal budget data and strategic planning data is limited. This is especially true for small and medium enterprises, defined as a heterogeneous group which varies according to size, organizational model, ownership structure, inclination toward growth and innovation. Their behavior is influenced by numerous variables such as life cycle of the business (younger companies without credit history have different needs and perspectives as compared to more mature companies), the proprietary and organizational structure and the difference in geographical location. The presence of said variable does not allow the SMEs to be defined as a homogeneous universe (Maino and Modina, 2012). The Italian economic fabric is principally made up of small- and medium-sized companies. For banks, access to information is blocked by well-known factors such as information asymmetries and the cost of information, the unclearness of company prospects (of a difficult external evaluation, with public balance sheet data which is often simplified and not very meaningful), as well as the difficult line between company choices and choices of location/management of the entrepreneur's family wealth, with a company life cycle which is confused with that of the entrepreneur (Maino and Masera, 2005). The need for this data requires the development of a specific methodology which aids in reading the elements of a competitive character (for quality,

robustness, stability) valuing the available public information and the historic (behavioral) knowledge of the counterpart (Cuneo and Maino, 2010).

In fact, the alternatives for the rating evaluation of the SMEs are scarce, and the dependence on the macroeconomic factors is limited in favor of idiosyncratic elements (niche, district, industry). It is necessary, therefore, to point rating toward a forward-looking perspective, needed in order to guide positioning choices in granting credit and services. The SMEs need an evaluation process which goes beyond the simple analysis of balance sheet data and performance data. Attention to long-term competitiveness factors, company by company, seems more advantageous compared to the application of forecasting scenarios which have, naturally, a general validity and not that of individual screening.

In conclusion, the hybrid approach allows a qualitative evaluation of the company and, in particular, of its competitive, industrial, strategic and productive opportunities and threats. In this manner, a complete, robust and stable judgment of the company's credit quality is obtained, considering these characteristics amongst those admissible for regulatory purposes. In this regard, a significant effort would not be possible if the evaluation of the portfolios, for the purpose of determining the risk-adjusted assets, did not take into consideration its importance. Contrarily, the risk of activating a vicious process of progressively distancing the effective processes of credit granting from those of determination of the measurements for regulatory purposes is run. However, this evolution, explicitly excluded from the Basel regulations, would be harmful for the same regulatory purposes as those of capital protection of the financial intermediaries.

3.3 Potentiality and criticality of internal rating systems

With the implementation of the International agreement on capital requirements for banks, better known as Basel II, a new phase for the credit market began, having markedly changed the behavior of all interested parties.

In particular, faced with the centrality of the role of lending activity to the private sector, still today considered the core business of the banking system, credit management has been significantly renewed after the use of internal and external rating. Risk management techniques and their effective application within the company organization become points of contact between compliance with system's need for stability and the opportunities of efficiency of the financial intermediaries and bankers

(Minetti, 2005). The principal innovation introduced consists of the possibility for banks to internally measure, through an autonomous evaluation process, the degree of company risk and to assign them their own rating, on the condition that they respect specific requisites under the explicit approval of the supervisory authorities. The committee, in order to assure consistency and objectivity of the internal banking estimates (which will have to be checked by the national authorities of banking supervision), simply limits technical, statistical and procedural requisites, as well as the calculation structure of the internal estimates. The bank, in order to use the IRB system, has to show the supervisory authorities that it knows how to satisfy, from the start and in a continuative manner, a series of minimum requisites which include quantitative, qualitative, regulatory and management aspects.

The regulations require that the models for the estimation of the risk parameters are developed within the banks with the possible help of outside companies. However, in specific areas of operation, the possibility to use external models is allowed ("vendor models"), as long as these satisfy the requisites expected for internal systems. In general, supervising requires the respect of the same criteria defined for the recognition of internal systems for prudential purposes, in particular, the following are required: adequacy of the model to the portfolio; coherence with the internal banking methodologies; continuity in the functioning and verification if the supply is interrupted; and internal competences suitable for the use and maintenance of the model. Therefore, the external models need to undergo a process of internal validation. Additionally, a verification in the daily use of the rating systems is necessary, given the deep fracture in competitive, productive and financial dynamics in the entrepreneurial and banking system. As Modina states (2012) it must be understood whether or not the judgments on the counterparts' credit quality which guide the concession of credit and the management of long-term credit relationship management respond to the effective competitive capacities of the counterparts and have "long-term" vision in efficiently guiding the relationships between financiers and those who are being financed.

The distinction between internal and external rating systems is necessary in order to evaluate potentiality and criticality connected to their usage. From their application, a series of problems which necessarily have to be faced and evaluated are generated. Evaluating the scoring techniques adopted either internally or externally by the banks, Albareto et al. (2008) signal firstly the need for greater control on the application of internally elaborated methodologies by intermediaries

and more "elevated flexibility". In this regard, these methodologies can be easily modified when the bank no longer considers them adequate. Additionally, it affirms that resorting to methodologies of external production on behalf of the intermediaries could imply a "greater homogeneity" in the evaluation criteria of creditworthiness by diverse intermediaries. Finally, he holds that acquiring a statistical procedure externally could reduce the control that the bank wields on its own instrument of clientele selection. In this manner, the black box perception is favored both in the initial phase, in relation to the algorithm and to the database used for the implementation and in later moments of revision (the results of an investigation carried out in 2007 by the branches of the Bank of Italy on several characteristics of organizational solutions adopted by the bank in credit granting activity point out that for each bank size class, the scoring procedures of the SMEs are more frequently determinant or very important in credit concession when they are developed within the bank).

At this point, in relation to the considerations made above, it is considered necessary to reflect on the equilibrium which regulates the bank-company relationships which, with the introduction of Basel III, have acquired greater complexity and criticality. The interaction between the macroeconomic imbalances, the conditions of abundant liquidity, the financial innovations, the incapability of the operators to attribute a correct price to some financial activities and the elevated growth of indebtedness levels permitted phenomena of instability which were initially limited to development between markets and jurisdictions, taking on a global dimension (Carosio, 2010).

The reflection on the future of the relationship between banks and companies and their respective strategic choices, underlying the race to the capital and relational capital growth, must be accompanied by the search for a new balance in the logic of exchange. This refers to three joints that will determine the success or failure of the new structure of the relationship between banks and enterprises (Caselli, 2014): the logical connection virtuous, the dynamic cooperation, the role of the rules.

The logic of the fitting requires guarantee institutions, institutional investors, private and public instruments (national and international) and advisors to harness and channel the energies in the same direction, intended to disperse if not coordinated, in a common logic driven by banking structures.

The dynamic cooperative and cultural action requires establishing logical exchange between banks and enterprises based more on

preliminary interaction than on the exchange market and trade. They concern the strengthening of the mechanisms of financial communications firms in the rating outlook, the promotion of system solutions for the management of special situations, the return to the basic technicalities and consistency with the macro-needs of enterprises.

The role of the rules requires an agenda of tax and regulatory interventions such as the issue of the cost of capital (dual-income tax versus thin capitalization), the incentive to going public, the different taxation of start-ups and the facilitation of the intervention of institutional investors in corporate crises.

The beginning of Basel III creates the conditions for the development of a solid and prudent financial system. The interventions introduced by the regulations move in three directions: the reinforcement of capital resources to cover risks to which the banks exposed themselves, above all those that, in the light of the crisis, showed the greatest source of losses; the introduction of anti-cyclical instruments to ensure that the banks accumulate resources during phases of expansion and of a stricter discipline for systematically relevant operators; and the increase in quality of liable equity capital (Carosio, 2010).

Such rules, designed to stabilize the financial world in order to impose correct practices in terms of capitalization on its protagonists, as well as in terms of risk and liquidity management, significantly condition their use in the real economy, including companies and citizens. It is held that the creation of a certain degree of equilibrium, amongst the various measures introduced, contributes to the development of the real economy. A greater assurance of the institutes, through even stricter anti-crisis capital cushions, leads to a credit crunch and consequentially restrains the real economy. From this it can be seen that if a bank applies excessive restrictions on its own loans, it must reduce loans to companies and families in order to respect them, with the risk that this brings about a tightening in the lifeblood of the economy. On the contrary, an excessive superficiality could bring about the fall of financial giants, like Lehman Brothers, and/or a crisis, like those occurring now.

The equilibria of banks are closely and intimately connected to the quality of the company system, the economic fabric in which they work, and the equilibrium and the quality of the national system.

These connections, or branches, lead us to understand how, within the credit system, there is an increasingly greater request for active participation in the recovery of the real economy.

One wonders what role the bank can have within the current economic system. In this regard there are two possible options: the bank and the

financial system are actually self-sufficient, or the bank and the financial system draw their raison d'être from the economic system. This choice involves a wide area of stakeholders (practitioners, regulators, academics, investors), and it is not a mere intellectual exercise, but generates consequences on the structure of the system (Caselli, 2014).

The first option is to design the structure of the bank following rules based on a logic of internal consistency (i.e., self-sufficient approach). The prerequisite for this is that a well-performing bank has a positive impact on the economic and industrial system and that the payoff of this choice is the efficiency of the system itself. The second option (and maybe the challenge for the future) is to design the structure of the bank recognizing the diversity and specificity of the economic system and the industrial system. The assumption is that a well-performing financial system is the result of hard work, knowledge, contamination and service within the economic system. In this case, the payoff is the service and the growth of the economic system.

The banking supervision committee has been entrusted with the whole course of prudential regulations, from Basel I to the current Basel III, with the goal of making modifications to the banking system which, before Basel I, registered low interest margins, high costs and credit losses. This situation was no longer considered functional regarding the economic growth from the 1980s onward, and the banking system was called upon to take steps forward. With the Agreement of 1988, new capital requisites for banks active on an international level were introduced. Basel I had an important role in reinforcing the capital base of the international credit system. The relationship between capital and risk-adjusted assets of the banks in G10 countries, active on a national level, went from 9.3 percent in 1988 to 11.2 percent in 1996 (Masera, 2000).

The revision of said agreement was carried out for many reasons, of different natures, connected to environmental evolution, the development of technology, the evolution of competitive modalities on the bank market and sensitive financial innovation which characterized this decade. The availability of more sophisticated and efficient risk management systems and models and the possibility of better aligning the supervision aims of each single credit agency have created a strong stimulus toward the revision of evaluation modalities and the control of capital adequacy of the banks (Cosma, 2000). Resorting to standardized capital regulations has created some distortions in favor of less efficient intermediaries in a market environment in which the decisions and their costs derive from the capability to evaluation and optimize performance

and risk (Carosio et al., 2001). In addition to this, there was also the evolution of the credit market and interest rates which have markedly reduced interest margins, imposing a more adequate credit risk management and coherent pricing in order to avoid that the loaning activity generate an inferior performance at the cost of the allocated capital (Santececca, 2000). The aim of the level playing field evolves from a substantial competitive parity, pursued through the setting up of the same rules for everyone, to a situation in which the same opportunities are assured for all banks (Carosio et al., 2001). This led to the development of mechanisms of product innovation, development of commission activities, streamlining of cost management and the development of risk management in order to best manage credit risk.

The phase in which our country, like all the main countries of continental Europe, has found itself for the last few years is undoubtedly a phase of low growth, not to mention stagnation. In fact, the recent financial crisis and the consequential repercussions on the real economy require a revision of the use of rating in processes of credit management and concession and a reflection on the credit policies with special reference to small and medium enterprises (Pallini, 2011). SMEs present some characteristics which make the evaluation of their creditworthiness complex. Compared to large companies, they operate with inferior levels of capitalization, they have a more limited investment capacity and more contained levels of profitability. There is a close connection between the company and the entrepreneur's personal patrimony. The latter is often used as a direct or implicit guarantee. For this type of company evaluation, information of a qualitative nature is very important as its acquisition is facilitated by its connection to the territory, by the knowledge of the local economy and by people.

This creates other questions regarding the capability of the banking system to contribute to the recovery of the real economy. In particular, one asks himself if there are other margins of improvement within the operative efficiency pursued in the mid-1980s. In this regard, the bank business model becomes strategic and crucial. As stated by top bank spokespeople, the best direction for credit management (or the management of Risk Weighted Assets, RWA) requires the recovery of the client's centrality, the valorization of the search for information in order to shorten distances between companies and the recovery, as compared with the past, of the bank identity rather than that of the company. Consistent with these tendencies, there are requests from the business world which invoke a company bank rather than a bank of the territory. Additionally, the banking system is asked not only to have operative

efficiency, but also efficient allocation, pointing capital toward entrepreneurial initiatives which are able to produce wealth not only in the short term but also in the medium term. This will also entail implications as to the credit management models adopted (on people's competences, on credit management instruments, etc.).

In such a context, a central role is played by the relationship which banks build with their clients, in particular with less standardized clients. The development of a relationship represents the requirement of a more efficient evaluation of credit risk for the bank which is concretized through the acquisition of better and more complete information.

As of today, the goal of creating a relational bank has not yet been reached, and the reasons can be traced to the following causes: segmentation of the clientele; credit splitting, new instruments and processes; and better competences.

Regarding segmentation, Channon (1995) pointed out how the segmentation of English banks was too simplified as it refers only to size criteria, that is, the turnover of the companies. After about 20 years, the situation has not really changed. This logic of extremely simplistic clientele segmentation has seen a multitude of corporate divisions born through time. The condition necessary in order to create a relational bank lies in the configuration and classification, on behalf of the banking system, of clients with whom said relationship can be built. Reaching said goal could be compromised by this overly simplistic segmentation system, based exclusively on a classification by turnover classes.

Another key piece of the puzzle is credit splitting. Banks, through time, have pursued splitting in order to divide risks and diversify their use. In Italian companies which are already small, this created a significant reduction in financial backing. Said reduction is not compatible with costs of analysis or costs of service which arise when the bank intends to analyze and serve companies with a relational approach and, therefore, is not compatible with relationship banking logic.

A greater splitting is shown in the bank's profits and losses. In fact, it entails an increase in operational costs, credit selection and monitoring, credit recovery, assistance and commercial development. One asks if the banks' choice of greater splitting (with a consequential increase in costs) is justified by reaching greater transparency and, therefore, by lesser risks which would derive from it. Probably, if the bank reduced by a third the current clients and set aside the triple of the Value at Risk financial backing for them, above all in medium-large banks, the bank would grow in an imperceptible manner. But, above all, one reflects on the growth potential, in terms of "service efficacy", which the bank

could obtain if it had just a third of its current clients. To this regard, De Laurentis (2013) states: "If all the banks in the Italian banking system had a third of the client which they have today, the demand for services would be identical but the banks could reduce operational costs significantly and, at the same time, increase efficacy in assistance. In a bank, company managers, no longer having 180 clients on average to manage, but only a third, would work better."

Today, the bank, by virtue of the competences acquired as to portfolio instruments and models, is incentivized to evaluate advantages and disadvantages connected to splitting.

Regarding the instruments, the availability of models which are more and more standardized with a statistical-analytical nature, which use purely quantitative indicators of creditworthiness, pose obstacles to the relationship between the bank and the company. This is true, above all, for the risk evaluation regarding SMEs which adopt less evolved behavioral logic with company structure closely connected to the personal sphere of the founder and the partners (Cosma, 2000).

To this regard, Draghi, former governor of the Bank of Italy and current President of the ECB, affirms that it is important that the banks, in deciding on credit to grant, use all the information available to them. They must integrate the results of scoring statistical ethos which lose part of the predictive capability in exceptional moments, with direct knowledge of the client, of his effective growth potential and profitability in the long term. Connection to the territory of the bank system is precious; it should be used, and where it is lost it should be rebuilt. Knowledge of the field should be valorized as much as possible, avoiding an excess of automatisms, such as "we will try to see the positive potential with the companies even if the balance sheet data is not exactly positive".

Such models/instruments are mainly based on performance data from the central credit register and, therefore, although effective, they lose validity on a medium-long term horizon (their validity is limited to one year).

In a statistical-based rating model, hard idiosyncratic information is much more useful for short-term and medium-term evaluation. It is sufficient to measure the predictive performance of "statistical-based" models on a temporal horizon of two/three years to understand that they are not effective. Actually, the use of performance data from the central credit register proves to be ineffective with the extension of the temporal horizon; it follows that this information, if changed in predictive models, amounts to a short-term bank instead of a relational bank.

In addition, statistical rating models do not produce spillover information useful for selection activities of customers in the medium term and for commercial activities.

The possibility, when necessary, to distance itself from the automatic directions of the rating system represents, in fact, an important instrument for the valorization of the proprietary information of a bank which is significantly connected to its territory and for the increase, consequentially, of the allocation efficiency and the competitiveness of the same. It is necessary to "humanize" rating systems and to adequately evaluate the information on the client.

The processes are not of inferior importance; the bank must operate in the following directions in order to act as a relational bank: reconstruct its ability to gather soft information; reconstruct its ability to help people grow (employees); recreate sectorial specializations; and maximize informational spillovers between commercial activity and risk management, between corporate and private/wealth management.

The recent economic and financial crisis has further increased the importance of organizational choices of the banks in terms of credit activity. In 2010 the Bank of Italy carried out an investigation, similar to that of 2006, in order to evaluate if and how the banks responded to the crisis by modifying their organizational choices. Said investigation regarded a sample of about 400 banks, which, at the time of the data collection, represented more than 80 percent of the credit granted to companies, both on national and local levels. From this analysis it has emerged that, after the crisis, banks gave greater importance to all informational sources regarding the clientele (qualitative or quantitative), also valorizing those which were previously considered useful but not decisive, increasing the securities (Del Prete et al., 2013). In this way, the tendency to acquire and greater valorize qualitative information (soft information) has increased.

The last point to take into consideration regards competencies. Many banks have developed and, still now, are developing their own competencies in company analysis, sectorial analysis and family business; additionally, they are acquiring competences (in terms of reactivity) in taking new market opportunities or new organizational forms, such as corporate networks. Now, there is an increase in demand for training on company analysis and family business. Additionally, there are banks which have created new figures such as the private-corporate business unit or subjects destined to satisfy the entrepreneur's needs, private and wealthy at the same time.

In conclusion, the creation of a relational bank requires each of the variables mentioned to be realized; if just one of the pieces were to be lacking, the resold will inevitably be unsatisfactory.

Part II

Toward a New Architecture of Rating

4
The Generation of New Models

4.1 The need to review rating models

Early versions of the rating models were designed to introduce in the credit process the calculation of the probability of default (PD), in other words to group customers into classes based on their creditworthiness. The aim was to equip banks with a model to be used both in the acceptance/revision of a loan and in the monitoring of customer's behavior. Based on this, the cornerstones of the architecture of credit rating were built: customer segmentation; the use of different profiles of investigation (quantitative, qualitative and sectorial) and their weighing according to the customer segment; the introduction of correction factors in case of prejudicial elements; and the determination of PD through a mapping process. The end result was to determine the theoretical pricing of a loan based on the creditworthiness of the borrower (risk-adjusted pricing).

The first models allowed the bank to be fairly flexible with the possibility to change some of the parameters such as the use of external sources, the recalibration of the weight of the sources and the variation in the size criteria of customer segmentation. In the course of their implementation, the models have been changed and completed. Among the main changes, it is worth mentioning the increased frequency of the calculation of PD and the introduction of the risk-return correlation function that allowed the calculation, although approximately, of the profitability of the correct use for the risk.

In light of the changes/additions, in many cases the rating models have functioned differently from the use with which they were originally conceived becoming de facto daily monitoring tools (early warning/watch list) and, therefore, taking those characteristics typical of that

role such as the adherence to counterparty risk, the strong sensitivity to the economic cycle and the lack of foresight to interpret the borrower's real expectation over the one-year horizon, losing in part the practice of granting loans accurately (to grant or not the loan or to revise the granting).

Structured in this way, the model seems to be a valuable tool for daily monitoring, but loses in part the practice of granting loans accurately (whether to grant or not the loan or to revise the granting). At the same time, its limitations are highlighted in terms of determining the pricing, of being a support tool for defining the bank's trade policy and of building long-term relationships with customers. Even its use as a tool for control and allocation of the capital is limited.

This is due, in particular, to the time horizon of the rating validity and to the calculation of the PD in which the weight of the performance sources dominates. When considering a one-year time horizon and the reliance on performance data (especially domestic), it is possible to get a good performance in the continuous monitoring of the borrower, but there also is a number of risks deriving from such an approach.

The early warning models reflect, in fact, the borrower's current conditions, and not its potential in the medium term, and the models are self-determined (if the bank gives more credit, the borrower's rating improves – because parameters such as stiffness and tension of use of the banking account improve – although the borrower's fundamentals remain unchanged). The consequence is the instability of PD over time (partially mitigated with the introduction of the average PD) and the strengthening of the risk of procyclicality and myopia when evaluating the customer. In other words, the approach has the characteristics of a Point in Time (PIT) model, which may fulfill the role of monitoring tool, but not those typical of a system oriented to interpret the borrower's perspective fundamentals.

Considering the bank's role in building relationships with customers and the inability to meet all aspects when using the rating with only one operational application, it is necessary, after a few years from their first introduction, to redefine the purposes and the characteristics of the internal rating systems so as to mitigate some of the problems and strengthen innovation that may result from it.

The guidelines for the review process are to make explicit the criteria for measuring credit risk, and to clarify the relationship between the rating criteria and its application. The full knowledge of the fundamental principles of the rating assumes an important role in order to ensure

the adequacy of the rating in regulatory, management and accounting terms, also to respond effectively to the downturn and finally to improve the strategic content of the relationship between banks, companies and area of operation.

The development must be based on three key principles: (1) avoid that the credit rating is mainly used for monitoring; (2) lay the foundation for the construction of more predictive models; (3) implement a system of effective support for the bank's credit strategy.

When considering the first aspect, that is the use of the rating as a monitoring tool for loans, it should not be instrumental in the decision of granting and reviewing loans. The use as an early warning system alerts the operator signaling those positions on which an in-depth investigation should be done in order to understand how much the borrower's reliability is actually changing. The formation of observation lists reflects, in fact, the borrower's current conditions and its potential in the medium term and, as such, has a natural "self-determined" aspect as mentioned above. The consequence is the instability of the assessment over time, and the strengthening of the risk of procyclicality and myopia when evaluating the customer (De Laurentis and Maino, 2010).

Hence the need for a more solid model in terms of management, which guides the rating with an anticipatory (forward looking) perspective in order to guide the bank's choices when granting credit. In the following paragraph the topic will be further discussed; however, the difference between the selection phase and the monitoring of the credit process requires us to distinguish among the various tools for measuring risk, in order to enhance their use according to the specific purpose that a bank intends to achieve in one phase rather than in another. The monitoring tool is characterized by a strict adherence to counterparty risk and a strong sensitivity to the economic cycle, while the model of expectations, which intervenes in determining the pricing, must be able to seize the borrower's perspective beyond the short term.

In order to build a more predictive model, the current structure of the rating systems must be revised so that all the information arising from the relationship between banks and businesses is valued. In this context, working on a multistage architectural model (operational, managerial, strategic), it is possible to predict the separation of those models that are based on the parallel use, although combined differently, of the information deriving from multiple sources. The determination of a strong PD must, in fact, incorporate a more complete set of information in

order to maximize the process of direct knowledge of the company and to grasp the actual possibility to perform well in the long term. In order to maximize the predictive ability when estimating the risk, it is necessary, therefore, to strengthen the weight not only of the quantitative variables, but also those that consider performance, and enhance the contribution of the qualitative ones, which can be obtained preferably by the continuous relationship between the company and the manager in charge of the credit report. This is due to the fact that the quantitative information increases its importance when the time horizon of reference of the PD grows, and the qualitative information is central to the reporting of specific competitive factors, essential when evaluating smaller companies.

As already mentioned, the orientation to the implementation of an approach of the calculation of PD with a stronger perspective connotation is particularly true in times of adverse economic situations when it is crucial to be able to grasp the long-term fundamentals of the businesses which are being served, especially when they are modest in size and when the intermediary gives strategic value to the relationship with its customers.

The identification of competitive paradigms which are able to explain the reasons for the company's success is the key factor that elevates the supporting role of the rating when making decisions on granting loans. Strengthening the role of non-financial variables and their appropriate calibration allows the bank to take a holistic view of the credit portfolio on the basis of the information contained in the rating. In this context, the credit rating provides data, information and analysis which can assist the formulation of the most appropriate strategy for credit. In the medium term, the strategic management of loans should, in fact, know how to combine the bank's aims of growth respecting a coherent binomial, the one of profitability and risk. The decision to grant or not a loan is the result of business decisions that find the rating a valuable support tool and should not be the result of the application of a procedure, albeit sophisticated.

When reviewing the rating strategically, the necessary condition in order to start constructing a new generation of models is to respect the new guidelines. Such models, in the presence of evolving scenarios, can not only assess the conditions in the short term, but must also tend toward the awarding of more stable, solid and forward-looking assessments, because they can predict, better and over time, the long-term fundamentals of the company which has received the loan.

4.2 A multistage path

The review of the existing rating models goes through the adoption of three possible options:

- the refinement of the model of early warning (operational level);
- the construction of a more forward-looking model (management level);
- the creation of a model that supports the bank's credit strategy (decision-making level).

The options which have been identified are not mutually exclusive, but they can connect with one another (also in terms of a "double track" or "triple track") in accordance with a reasonable time horizon.

The first option (operational level) substantially reproduces the characteristics of the modules in force dedicated to the coverage of credit risk. The aim is the determination of a monitoring PD to define/anticipate interventions of return and/or repositioning of the customer.

As part of this application, the source is the central trend (both internal and external) accompanied, wherever possible, by quantitative information. If this were the choice, it is essential to first analyze and then implement the indications that arise from the periodical activities of statistical verification. Since at the operating level it is impossible to determine a strong PD, the correlation function of risk-profit should not be implemented in the early warning model. The instrument of credit monitoring is not, in fact, a functional tool when deciding to grant and to review the credit; in fact, it indicates the positions which need further investigation in order to understand if the borrower's reliability has actually changed or is changing. Hence the need for a stronger managerial model that will guide the rating with an anticipatory (forward looking) perspective to lead the bank's choices when deciding to grant credit.

For the production of a management model that can expand the predictive ability of the PD, the existing structure of the models of credit risk must be strengthened in order to give greater value to the quantitative and qualitative variables. The first, although older than the performance ones, see their importance grow as the time horizon of the PD gradually stretches. The latter are essential when evaluating small and medium size companies because, the more the size of the firm is reduced, the more it reduces its dependence on macroeconomic factors in favor of specific competitiveness factors that only qualitative

information can intercept (Maino, 2012). In this context, the actions to be taken are the following: strengthen the calculation of PD through careful review of the indications coming from the statistical verification and the inclusion of the qualitative profile, make the determination of LGD more sophisticated, anticipate the cases of override, and identify and implement the most appropriate pricing formula.

Such a model makes it possible to calculate the theoretical pricing of the loan (i.e. the price of loans adjusted for risk). Moreover, its functions of use would be widened because they could become an instrument of support for the bank's trade policies and for the determination of the economic capital and provisions (according to the logic of unexpected loss and expected loss). Finally, it can encourage the introduction of risk-adjusted performance measures (RAPM) for the loan portfolio.

As for the support model to the bank's decisional procedures, its realization is founded on the two previous models. In order to have a strategic value, the key factor is the identification of competitive paradigms capable of explaining the reasons for the company's success. Thus the role of non-financial variables should be enhanced, intensifying the collection and the processing of qualitative and non-accounting information into the model.

The model should be able to provide a holistic view of the loan portfolio and to enable the analysis of the customer and the profitability of the relationship on the basis of the information contained in the assigned rating. In other words, the decision model provides data and information from which derive the strategies of the credit on the customer and on the entire portfolio. The credit strategy is a fundamental tool for the bank, and it is useful when granting credit because it defines the customers, the amount, the products, the price and the duration. It is supportive within the commercial chain and allows for coherence between the objectives of the bank (regarding risk, return, positioning, etc.) and the activity of lending and the management of customer relations. The strategic management of loans should thus know how to balance, in the medium term, the bank's aim for growth with respect to a coherent binomial, the one of profitability and risk. In this context, the use of RAPM elevates the effectiveness of credit policy and acts as a bridge with the processes for allocating and managing which are typical in planning and risk management.

This is especially true when considering the two components of the bank's credit policy (Naso, 2014). The first component (portfolio optimization) allows the bank to understand where it is going and aims to generate structural savings with time in terms of capital absorption and cost of risk

through an optimal allocation of credit among segments, sectors and products. The second component (credit deployment and decision) defines credit rules both to guide the lending activity and to readjust the portfolio in order to reach the target portfolio identified in the phase of portfolio optimization and improve the risk profile of the portfolio. The correct formulation and implementation of the strategy of credit generates benefits to all the actors involved in the process. In particular, the benefits for the bank are both qualitative (risk culture, strategic integration) and quantitative (risk capital, capital absorption). They represent a real strategic success factor in the medium-long term because they allow a greater dissemination of the risk culture throughout the organization, a greater participation of the network to the achievement of business goals, a reduction of the distance between top management and distribution channels, a more proactive commercial action, the reduction of the absorption of capital tied to credit risk and the significant reduction in the cost of credit.

As already highlighted, the three options are not mutually exclusive, but they can follow a modular route, safeguarding the background settings and allowing the realization of a "layered" architecture of the new rating system. By doing so, it is possible to expand the horizon of prediction and elevate the function of the model from being a mere monitoring system to becoming a system that supports the bank in defining the best credit strategy.

Whatever the direction that the bank decides to undertake, some suggestions seem obligatory. The first one is to not confuse rating systems with monitoring systems; the technical development of the models must carefully examine the indications emerging from the statistical procedure; a rigorous process of work must be immediately identified in order to avoid the errors and the pitfalls that typically arise when building rating systems.

The consideration of the abovementioned tips and the clear strategic vision of the bank are the factors propitious to the implementation of a rating model that, for those banks that build relationships with customers, can not only be based on the borrower's short-term conditions, but must tend toward assigning more stable ratings, strong and capable to predict the borrower's long-term fundamentals.

4.3 The new generation of rating models

The rating system is not a black box; it is instead a combination of methods, processes, controls, data and functional information systems that supports the assessment of credit risk, the assignment of internal

classes of merit and the quantitative estimate of defaults and losses (BCBS, 2004, para. 394). The definition given by the Basel Committee clearly explains how the lending process should not respond only to mechanical decisions, but must also consider organizational aspects and the bank's business decisions.

When examining the critical aspects developed over the past few years, what has been noticed is the one size fits all syndrome (De Laurentis and Maino, 2010). Provided with only one size, the internal rating systems are not able to respond to all management needs and regulations to which they are called if not at the cost of expensive devices. It is therefore necessary to reconsider rating models in order to find the best combination of regulations, statistical methodologies, available tools, organizational procedures and quality of human resources. The first step of the review is to verify if there is coherence between the principles underlying the adoption of the rating and the development of models with their application in the management of the relationship with the customer. The requested maintenance is not a secondary issue since it suggests a necessary strategic rethinking of the rating. This applies in particular to those banks which are oriented to the relationship with their customers: if using only statistical rating is not sufficient because of its discriminatory ability and calibration, and generally it is applicable to large aggregates of customers, then it has to be satisfactory for each single case, and in terms of time horizons, those longer than a year have to be considered.

As the main instrument for measuring risk, the rating has redesigned the scope and the content of the relationship between banks and businesses. The search for the ideal combination of ratings, customer segments and organizational structure of the bank is not a simple one. The orientation toward customer relations (the choice of the relational approach rather than the transactional one), the size of the financial intermediary and its organizational structure influence the choice of rating systems and should be reflected appropriately in the rating philosophy and in the application of rating systems (Rikkers and Thibeault, 2007). For banks operating within the territory, the rating has an active role in acting as a connector between strategic vision, choice of market segments to be served and the bank's credit policy (Cuneo and Maino, 2010). If the strategic goal is excellent management of customer relationships, the bank must have a rating system which is stable and forward-looking, and also define correct incentives and autonomy delegated to local managers and enable a proper communication policy. Otherwise, the use of statistical tools to predict insolvencies reduces the bank's ability to interpret in an

integrated manner the company's health status; it does not value the manager's role (which discourages the acquisition of skills and weakens the value of information heritage), hence collecting qualitative information becomes of marginal importance.

The result is that, in times of discontinuity, the introduction of more sophisticated methods of analysis is likely to weaken, rather than strengthen, the relationship with customers, especially when they are smaller companies. The crisis has generated tensions in the granting of credit which are much higher than those that occur during the normal business cycle. The understanding of the phenomena that accompany moments of great change is necessary to make sure that the new generation of models is equipped with the features (stability, articulation, solidity, farsightedness) such as to avoid excessive specialization.

In this context, Maino (2012) provides important recommendations to the various stakeholders that are functional to trace the path of upgrading the rating models.

The first invitation is for those who develop and validate the models. The performance indicators of the models are essential, but often misleading because conditioned by the presence of internal data detected with high frequency that can give rise to statistical errors. Generally, insolvency is detected and reported on the basis of the data provided by the daily relationship between bank and customer, namely the internal information. The models developed automatically tend to favor such information because it is closely related to the result that wants to be estimated (declare the problematic counterparty in default). This implies that the instrumentation, as well as being heavily influenced by self-referentiality, tends to overestimate certain categories of variables, making the model highly cyclical. The use of multistage models, such as those described in the previous paragraph, based on multiple levels and using parallel and combined information elevates the solidity of the evaluation which becomes more explicit even in the eyes of the final decision maker.

The second recommendation concerns the manner in which the rating systems were built. Since the assessment samples do not refer to a long-term time reference applied to a homogeneous phase of the business cycle (for example the period before the economic crisis that began in 2007), the current models are struggling to grasp the impact of strong economic discontinuity. This occurs when the industrial, competitive and technological variables explaining the company's success or failure tend to be transformed by changing the basis of the competitive advantage. When the economic outlook is subject to considerable

change, models tend to overestimate the financial variables rather than the real ones. It may therefore occur that a mature company, rich in cash flow but in decline may appear less risky than the one which, following a path of growth, invests in new projects and consumes, as a result, cash flow.

The creation of models which are not articulated in modules and dependent on few sources may give rise to diagnostic tools which seem perfect, but in reality are characterized by high opacity. If the rating model assumes the characteristics of a black box, whoever uses it will find the working mechanism difficult to grasp and will simply adopt the mechanical opinion without comparing it to one's own personal knowledge. In order to be valid, a model must be competitive and must contain all kinds of information arising from the external environment and the relationship with the customer. Otherwise, the models tend to be anchored to historical information, losing the ability to incorporate the flows of data and information into new compositions of risk factors.

Finally, a set of recommendations is addressed to the banks. There are two main recommendations that can be made based on the fact that all decisions are made by humans. The first is to avoid confusing the rating systems with early warning systems to monitor the credit quality of the counterparty. The prompt response to the counterparty's crisis cannot be confused with the well-founded decision of strategic positioning, of trade policy and of the profile of the customer relationship that wants to be adopted with key customers and businesses. The second concerns the organizational structure of the ratings, namely the need to define the rating as a connector between the corporate vision of the bank and the policies it intends to pursue. The necessary condition for those banks interested in customer relations is to have farsighted and stable rating systems which are able to reduce the sensitivity of the instrument to the company's financial conditions in the short-term period. Within this context, consideration should be given to the importance of working on communication in order to support both the commercial activity and to provide consultancy in the assessment of the credit risk.

The delicate transition to a new phase of the economic and financial world requires the construction of a new architecture of the rating that projects the ratings beyond the perimeter to which it has been confined today. The rating shows organizational externalities and impacts on the real economy that are not limited to credit intermediation.

Firstly, the introduction of scientific methods to assess customer's creditworthiness has placed on different bases the traditional relationship

between the company and the bank. In this context, the application of discrete scoring models and better communication with customers regarding credit standards are some of the actions that have been taken in order to strengthen the ability to identify worthy companies, or those potentially competitive enough to enable them to overcome the instability of the market. At the same time, the more attentive enterprises have initiated an improvement process of their abilities and financial skills as well as strengthening their communication by giving value to those elements that lead to the allocation of more favorable rating assessments.

However, the most significant effect of the rating has yet to be discovered (Maino, 2012). The discovery goes from removing the concept of the rating as a barrier to access credit to provide instead an understanding of the social value of the new generation of models. If, on the one hand, it will be hard for banking intermediaries to return to the pre-crisis levels, on the other hand there is an increase in the need for institutional and retail investors to find new investment opportunities in the market. In such a context, the rating can play a central role, becoming the connection between fund suppliers, borrowers, markets and financial intermediaries. By acting on the enlargement of the instruments for raising capital for firms and facilitating the access to the capital market through the securitization of debt positions, the rating will acquire a social dimension. The reliable measurement of the issuer becomes the premise to create stable relationships between banks, companies, investors and markets in order to use virtuously, away from forms of manipulation and obscure information, the channels offered by financial innovation.

5
Rating Systems: A Dual Track for Screening and Monitoring

5.1 Reasons for the dual track

The information needed in order to estimate the value of default probability is elaborated in a different manner (statistical-quantitative approach vs. judgmental approach), noting, in this manner, the segment of clientele considered each time. For the evaluation of retail clientele, the use of automatic systems prevails: each piece of available information has a certain weight based on a statistical model. The significance of the qualitative information, in order to estimate the default, is gathered by associating it to a numerical value to insert in the statistical models. The judgement obtained can be subject to opportune modifications by expert analysts, if it is not considered suitable in representing the level of risk of the counterpart. This methodology is appropriate for segments of clientele with insignificant income margins. On the contrary, in segments of clientele considered more important in terms of the applicant's dimensions, the reliability of the statistical techniques tends to decrease due to the different characteristics of the counterparts and, for this reason, it is necessary to accompany the statistical judgement with an interpretation by expert analysts in the credit sector.

The rating judgement assigned to the company does not remain constant in time, but it can be subject to possible modifications (overriding mechanism); it must be periodically checked and updated by the bank based on all available information. In fact, the company will have to try to supply the bank, in accordance with set deadlines, with an important quantity of information in order to obtain, in time, a rating judgement which reflects the effective level of risk of the entrusted entity, which must be positive and allow the bank to reduce the restricted risk capital against the clientele's loans.

It is necessary, therefore, to keep possible variations in the risk profile of the debtor under control: these are activities typical of the monitoring phases directed toward the comprehension of changes which the economic-financial situation of the debtor can undergo through time and to establish suitable measures (repayment and/or repositioning of the client).

The risk connected to granting a loan must be evaluated, assumed and managed in two moments at the base of the credit relationship: screening and monitoring.

Screening regards the processing of overdraft and the attribution of the rating; monitoring refers to the manners in which the judgement is revised.

In the first phase, the goal is made to coincide with the estimation of the probability of the debtor's insolvency and the entity of the possible loss, with the individuation of the loan amount and the most suitable technical form for the applicant's needs. The bank, therefore, based on qualitative information (dimension, ownership structure, location, supply policies, production and sales) and quantitative information (accounting data) given to it by the company, evaluates the creditworthiness of the counterpart and assigns it a rating.

Monitoring is a periodic updating of the judgement assigned to the company where credit is granted through the use of the balance sheet data, the analysis of information received periodically, etc. Although this phase can allow the assignment of a new rating, it is, however, more simplified as compared to the first assignment since the relationship with the issuer (company) allows a constant exchange of information.

Along with the judgement on security, therefore, the following indications are made: negative, if there is a possibility that the rating decreases; positive, if the rating can improve; developing, if the situation is not clear and does not allow the direction of the change to be predicted.

If the trustworthiness of a client improves or worsens, with the consequent modification of the judgement, there will be effects on the merchantability of the security and on the reputation of the issuer.

Ultimately, the screening evaluates the analysis of trustworthiness before granting the loan, and the monitoring consists in the continuous verification of the trustworthiness of the client during the life of the loan.

The goals that the bank aims to reach in one phase rather than another are different; therefore, the instruments used to measure risk differ based on the moment of the credit relationship, the screening and the monitoring. The monitoring phase is characterized by a close adherence to the

risk of the counterpart and an accentuated sensitivity to the economic cycle; the screening phase, however, has a greater capacity to reach the goal of determining pricing.

Another element of distinction is temporal horizon and the type of information taken into consideration: monitoring is based on a temporal horizon of 12 months and on information of a performance nature (internal and regarding the system) which reflect the current conditions of the debtor. The information used have a self-determined character, especially for the internal component: the more credit a bank grants, the less probable it is that there are overdrafts and pressures on the credit lines; the short-sightedness of the evaluation which derives from it, together with the instability of the risk estimate and the dangers of procyclicality, impedes the monitoring instrument of a point-in-time type to be fully functional for the granting and revision of the credit line.

In the screening phase (credit authorization), for an efficient estimate of the risk profile of the company, it is necessary to refer to a strong default probability, which must also be the result of the analysis of a complex informational structure (qualitative, quantitative, performance) which allows direct knowledge of the company, its opportunities for growth and profitability in the long term.

The use of rating systems can and must extend beyond the granting of credit and its monitoring, interesting pricing techniques, the calculation of economic capital, strategic planning, provisions and reporting policies.

For management reasons, in fact, in many advanced applications such as those which regard the risk-adjusted pricing of loans, the rating must also be as suitable as possible for each individual debtor.

5.2 Operational procedures: some evidence from banking groups

The validity of choosing to resort to different approaches of credit risk management in view of the initial screening activities which are followed by monitoring finds confirmation in the operational procedure of the Italian banking system. Of such practices, Altieri Pignalosa et al. (2012) supply evidence through the analysis of the experience of 20 Italian banking groups listed at the end of 2011 as two informational areas: screening and monitoring.

5.2.1 Screening

Financial institutions tend to adopt rating models with high levels of complexity and with an inclination toward the judgmental approach for

segments of more important clientele (regarding profitability margins) distinguishing – if the company business justifies it – between domestic and international clientele.

The pool of clientele must be distinguished and segmented based on several variables, such as dimension, turnover, the quantity of financing, legal status, geographical area and sector, in order to form classes which group the companies with the same risk profile.

The rating model, in order to reach an estimate of the company's risk profile, will be supplied with financial information, internal and external performance and system information, whose predictive capability is assured through the adoption of the modular approach. The elementary modules are then integrated (sometimes only some of them and, in any case, each one with its own weight depending on the segment considered and, in some cases, on the pre-existence and the seniority of the credit relationship), generating a score which is the synthetic evaluation of risk, obtained through a statistical function which associates an important variable in identifying the default in a certain time period (12 months) with each piece of available information. The company, with its own integrated statistical score, becomes part of a rating class; it will then be the intermediary who decides whether or not to integrate more information, which is difficult to elaborate statistically, with the already existing information on the borrower, in order to consent to a better rating.

The most significant evidence is reported in the following box (Altieri Pignalosa et al., 2012).

Box 5.1 Description of internal rating systems – default probability models

Banca BPM

Small Business Segment

It includes capital companies, sole proprietorships, small economic operators and physical persons with a VAT number with credit lines less than 1 million euros (also considered as exposure on a bank group level).

Modules considered: financial (information from balance sheets and tax returns, separated according to capital companies and accounting scheme, either ordinary or simplified); internal performance (credit behavior regarding the bank group); external performance (Central Credit Register). The three modules contribute toward the formation of an integrated statistical score, classified in nine rating classes, within which a qualitative module is inserted (company information collected through questionnaires filled out during the electronic credit request; it contributes to the final rating through a notching process); monitoring events (when they occur a downgrade is automatically

proposed); override (variations in the rating based on discretional evaluations formulated by those who manage the relationship and approved by designated structures).

SME Segment (when nothing is specified the previous segment is to be referred to)

Companies with a turnover between 5 and 50 million euros or with a turnover inferior to 5 million (or without turnover), but with a credit line between 1 million and 12.5 million, both for each single institution and for the whole bank group.

Modules considered: balance sheet (Central Credit Register); internal and external performance; qualitative (developed with statistical methodologies on the internal population of the bank, it refers to information on the company structure and the context of reference). Monitoring operations and override are inserted within the integrated statistical score, determined and classified in nine rating classes.

Company segment (when nothing is specified the previous segments are to be referred to)

(Large corporate) companies with a turnover greater than 50 million euros or, if turnover is absent, with a credit limit of 12.5 million euros.

Modules considered: balance sheet; external performance. The qualitative module (expert analysis of the strategic sectorial risk, of the economic-financial risk and that of internal performance, of the affiliation with economic groups) is inserted within the integrated statistical score; monitoring operations; override.

Banca Credem

Small Business Segment

Reference is made to single or group turnover, between 1 million and 2,582,000 euros or lesser turnover, but with single or group credit limits (meant as the group of companies and/or credit limits granted overall by the bank group) superior to 1 million euros. Significant weight of the performance and Central Credit Register information.

Corporate Segment

Companies with single or group turnover greater than 15 million euros; start-up and atypical companies are explicitly included in this segment.

Informational areas considered: balance sheet; external performance (Central Credit Register) and relationships (presence of protests); the trend regarding the size of the financial debt; qualitative (the compilation of questionnaires to evaluate data which was not quantified with automated mechanisms, but reflects the knowledge and experience of those who manage the relationship and the analysts from the sector and the company; information on governance, operational and financial aspects, as well as those regarding

competitive and organizational positioning. Aspects regarding competitive positioning have a forecasting function, with the goal of highlighting the company's ability to stay on the market, its ability to take advantage of favorable opportunities and face adverse economic conditions or unexpected events in the following 18 months); belonging to a group of companies (if the group draws up the consolidated balance sheet, the degree of economic relevance for the bank group is evaluated; otherwise, the information has qualitative value).

Banca Intesa Sanpaolo

A distinction is made between Italian and International clientele.

Italian Corporate (unrated)

Companies or groups of companies with exposure of the bank group greater than 1 million euros or with consolidated turnover greater than 2.5 million euros.

A quantitative and a qualitative model which generates an integrated rating is considered, on which the proposing manager can possibly intervene (override). The initial score is calculated through a linear combination of variables which are transformed accordingly, coming from two quantitative areas (financial and performance areas). The model is optimized according to the bracket of turnover and takes on the name of Financial when only the balance sheet is available and Financial-Performance when the informational set is completed with data from the Central Credit Register. Between the quantitative model and the qualitative one, there is a comparison with an internal performance indicator of the counterpart's risk, which in certain cases can worsen the risk class. The qualitative module consists of a questionnaire through which the manager makes a structured evaluation of the company.

Italian Large Corporate (unrated)

Counterparts with a yearly turnover greater than 500 million euros. A specific qualitative questionnaire is used, with suitable adaptations, taken from that used for the evaluation of international counterparts. The output of the model is divided into several areas of analysis: economic-financial (profitability, debt servicing, working capital management and capital structure); qualitative; performance. For each area, the manager must formulate his own independent evaluation (overriding), which interact with the output, determining the final rating.

International Corporate

Evaluation based on two different models, developed adopting company rating instead of the performing/default status (shadow rating approach) as the variable target of rating assessment; said choice depends on the low number of defaults identified on this segment in the historical databases of the bank group. The override procedure is activated with the comparison of the company's rating, if available, or by structuring the judgement upon several areas of analysis similarly to unrated Italian Corporate.

International Large Corporate

Non-resident clientele with turnover greater than 500 million euros (the Italian corporate clientele is included). As Italian Corporate use of a model made up of one quantitative model and one qualitative one which generate an integrated rating, on which the proposing manager may possibly intervene, modifying it in accordance with rules defined in the override process. The quantitative module has been estimated based on a sample of foreign companies with company ratings and produces a score which is the linear combination of fiscal indicators. The qualitative module consists of a questionnaire divided into two areas of analysis (sector and competitive position; specific characteristics of the counterpart). The two parts of the qualitative module supply scores which are integrated with the quantitative one in a statistical manner, supplying a score which is then calibrated on a central tendency which represents the long-term default rate of the application portfolio.

Foreign Middle Market Model

Non-resident clientele with turnover inferior to 500 million euros. It is characterized by the presence of a single module which contains both quantitative indicators, automatically supplied both by fiscal data and by qualitative indicators, integrated in a linear combination. The calibration of the score is analogous to that of the International Large Corporate, also in terms of the default probability of reference.

5.2.2 Monitoring

This area regards the information on the monitoring process, to be understood as the entirety of activities and competences aimed toward the revision of the judgement (rating) assigned to the company after having confirmed the possible worsening of the credit quality.

The credit is, in fact, put through a periodic re-examination, in order to identify the indicators which are able to point out a possible decline in the quality of the attributed position; the periodic check allows the intermediary to come to know of possible negative signs and to intervene, with readiness and efficacy, with actions which are necessary in order to prevent hidden decline.

The early warning systems implemented by the intermediaries tend to focus on the performance analysis of the relationships (daily verifications of overdrafts, monthly checks on expired repayments, quarterly reports on pre-existing overdrafts), on the loss of value of ancillary guarantees (verification of the consistency of the pledges and mortgages), as well as the negative returns of the system (verification of the feedback from the Bank of Italy).

Within a well-defined framework, most of the institutions recognize that the territorial structures which are holders of the credit standing

have a pivotal role in that, by maintaining direct relationships with the clientele, they are able to immediately perceive anomalies.

In Box 5.2 some banking experiences are outlined as to monitoring activity (Altieri Pignalosa et al., 2012).

Box 5.2 Credit monitoring

Banca Popolare dell'Emilia Romagna

The attribution of a declining position to a particular class occurs based on internal regulations which discipline the transition to a certain administrative check when certain anomalies are found: Sometimes the transition is automatic, other times it is based on subjective evaluations carried out in the performance monitoring area. In order to optimize the monitoring process of the clientele, during 2010 a new early warning model was implemented, able to differentiate the performing positions according to level of risk; this was done in order to suggest timely and targeted management interventions on behalf of the appropriate structures. This model has been developed according to a methodological approach, aimed to reach the following goals: identify the counterparts which will undergo a specific monitoring activity, in order to avoid a decline in position or to execute measures which allow for the improvement of the counterpart's risk profile or to limit possible future losses; define observation processes of said positions; determine priorities and monitor regulations in order to optimize both the organizational effort of the specific figures for clientele management and the results of said activities.

Banca Popolare di Sondrio

After the granting of credit, the exposures are put under a periodic re-examination in order to promptly identify negative signs which will lead to a modification in the rating. As to the profiles of contained risk levels, the periodic revision can be carried out through the analysis of predefined indicators.

Through methodologies of measurement and performance control on internal and systems data, and the Credit and Stranded Costs Check Service, there is a monthly construction of a synthetic index of risk levels. The positions with important risk indexes will be put through appropriate analyses and, if there are concrete signs of tension, they will be put under observation or classified amongst the doubtful loans, based on their seriousness.

Unicredit

The aim of the monitoring activity is that of promptly identifying possible declines in the various positionings, so that the negative signal can be manage before default, when there are still margins to reach the reimbursement of the positionings.

The actions focus mainly on performance checking until reaching, when necessary, the total release from obligation of the client. Besides determining

a positive effect in terms of EAD, monitoring allows the optimizations of the conditions for a possible future recuperation phase (through the request for added guarantees), with the consequential decrease in LGD.

Banca Intermobiliare

Credit checking is based on a series of activities carried out with different temporal frequencies, all dedicated to the detection (automatic and non) of different indexes which can signal a possible decline in the quality of the position given. It regards (1) anomalous trends in relationships: daily verification of overdrafts managed automatically based on a form of authorization powers delegated by the Board of Directors for various company functions; monthly checks on outstanding payments; (2) quarterly reports on positions which have lasting overdrafts: loss of value of the pledges; annual verification of the consistency of mortgages with an application which revises the values of the evaluations present in the bank databases; (3) negative feedback on the system: verification of the anomalies identified automatically on the return flows of the Bank of Italy; verification of signals regarding clients in the internet database on checks and payment cards.

Intesa Sanpaolo

A performance indicator is present in the rating system, calculated monthly, which represents the principle element for credit checking. It interacts with the processes and procedures of credit management and checking and allows prompt evaluations of the rise and persistence of anomalies. The positions to which the index assigns a high evaluation of risk confirmed over time are intercepted in the Process of Problematic Credits. This process aims to promptly intercept and manage credits which show symptoms of different degrees of difficulty with possible deterioration of the quality of the risk taken. The activities foresee the re-examination of the intercepted positions through rating updating, the possible adjustment of credit policies and the definition of management procedures aimed toward the minimization of risk. The default probability of monitoring is calculated on a monthly basis, using the same motor as the online default probability and is, therefore, able to identify the variations in creditworthiness of the counterpart, being able to utilize updated elements of evaluation of a financial and behavioral nature. The comparison between online default probability and that of monitoring allows the highlighting of the evolution of the debtors' risk profile; in all cases in which the minimum pre-established limit is exceeded, in negative, the rating decreases and the reallocation of the same is obligatory.

Banca MPS

Performance Management is based on a system of Early Warning which works through four sub-processes: (1) Routine Monitoring, with which the actions are concentrated and are aimed in order to protect the positions at greater risk. With this process, the bank aims to act in a predictive manner in order

to protect the performing portfolio, with a goal of diagnosing in advance and implementing requalification measures for the portfolio. The algorithm of automatic detection of the positions of Routine Monitoring is based on the use of two metrics: official rating and the comprehensive index of anomalies of client credit behavior, calculated in presence of at least one critical event. The process of Routine Monitoring is supplied by a critical portfolio in accordance with the combination of the two metrics, considering a total score to assign to each position equal to the sum of the scores regarding the rating and the ISA of reference; (2) Operational Management, to whom the duty of monitoring the credit portfolio daily, identifying internal and external anomalous events, indicative of potential risk, with the aim of foreseeing phenomena of decline during the month which are not identified by rating. The process uses a computer application which highlights anomalies for the operators, referring to differentiated management actions based on the level of criticality; (3) Arrearage Management, a process which highlights all overdraft positions. For some positions, characterized by modest sums and in absence of commercial objectives, it is possible to active external management of the recovery activities; (4) Simplified Renewals, with the aim, for limited risk positions, to automatically extend the validity of the existing credit lines year by year.

As already seen, rating carries out a fundamental role in the phase of granting/concession of credit lines because it is in this phase that the debtor's creditworthiness is evaluated and is assigned a rating. The monitoring phase holds an equally important role, aiming toward the periodic revision of the judgement assigned, based on signs of decline in the counterpart's credit quality.

The parameters of credit risk contribute to the definition of risk-adjusted pricing, the calculations of risk-adjusted performance and value management. The output of rating system is, in fact, integrated in the capital measurement processes, in terms of the regulatory and economic capital, contributing to the determination of value creation during the phase of recognizing business unit goals and in that of management measurement of performance. The need to use rating systems is found within granting credit and its monitoring, pricing techniques, calculations of economic capital, strategic planning and budgeting, as well as the policies for provisions and reporting.

Based on accounting rules, the collective devaluation of performing credits is carried out through the transformation of the expected loss in incurred loss; for the counterparts in default the loss forecasts are based on the evaluation of the risk profile of the exposition and the LGD.

Rating systems are also used in the report management area, with the specification of contents (in one case the EAD, the expected loss, the average default probability and the LDG for the various segments

of clientele; in another the capital consumed, both regulatory and economic, as well as the specific metrics for each single risk, such as the sensitivity and the expected loss), Risk Management and frequency (generally quarterly).

In a bank, additionally, one of the aims of rating is to fix pricing and management by objectives to assign to managers, as well as to identify clients with negative economic value added for whom targeted action must be activated. Lastly, the reward system for the commercial business units foresees risk-return indicators linked to the default probability estimation.

6
The New Architecture of Rating Model

6.1 The archetype of the new architecture

In the previous chapters strong and weak points regarding current rating models have been examined. The analysis has underlined the need to rethink the architecture of internal rating systems (IRSs), pinpointing some possible manners, such as the identification of a dual track which distinguishes the granting phase from that of monitoring.

Building on the considerations which have emerged, the present chapter offers a proposal for the determination of a more sophisticated manner of credit risk evaluation. This concerns the definition of the new architecture of the model, made up of two principal modules: the management model (rating) and that of monitoring. In this area, indications regarding information which must enrich the different modules and which regard the modular structure of the monitoring system are supplied. At the same time, the revision of the segmentation of the clientele, the manner of score assignment, the successive assignment to a rating class, the indication of corrective measures (*override*), the default probability estimated by the statistical model and the calculation of pricing formulas are illustrated.

Since midway through the last decade, many banks have developed, in collaboration with computer and consultancy companies, models which aim to calculate the default probability or the assignment to a class of creditworthiness for each bracket of clientele. The goal was to give banks, even smaller ones, instruments to use for the management and monitoring of client relationships. On this basis, an architecture whose fundamental elements were the segmentation of the clientele, the use of different investigative profiles (performance, quantitative,

qualitative, sectorial) were prepared, as were their weighing according to the segment of clientele, the introduction of corrective factors in the presence of prejudicial elements and the determination of default probability through a mapping process.

Besides the assignment of a creditworthiness judgment, the model determined the risk-yield correlation of a loan which, through several simplifications, allowed the approximate calculation of profitability of a correct use for risk. Despite the implementations carried out over time, the utility function of models was typically that of monitoring (early warning/watch list) and, as such, took on the characteristics typical of this role: the counterpart's aversion to risk, strong sensitivity to the economic cycle, models a long-term vision in reading the real prospects of the debtor beyond the short-term horizon.

So structured, the models realized appear as daily monitoring instruments, but partially lose alignment with accurate granting of credit (granting the loan or not, or checking the credit granting). At the same time, limits are highlighted in terms of pricing determination, of supporting instrument for the definition of the bank's commercial policy and of support in construction of a long-term relationship with the clientele. Its use as a capital allocation and control instrument is also limited.

The brevity of the temporal horizon of the default probability and the dependence of performance data (above all of an internal nature) allow current models to obtain good performance in the continuous monitoring of the corporate borrower, but at the same time they determine the onset of some limits which themselves regard a similar structure.

As De Laurentis and Maino indicated (2010), the early warning models reflect, in fact, the debtor's current conditions and not his medium-term potential and take on a "self-determined" nature (if the bank grants more credit, the debtor's rating improves – because indices such as rigidity and overuse improve – even if the creditor's fundamentals remain unchanged). The consequence is instability over time for the default probability (partially mitigated with the introduction of the average default probability) and the development of the risk of procyclicality and short-sightedness in the evaluation of the client. In other terms, the model presents the classic characteristics of a Point in Time (PIT) model, which can take on the role of monitoring instrument but not that of a system oriented toward reading the forward-looking characteristics of the credit line holder.

Box 6.1 Description of internal rating systems

The rating systems with a Point in Time (PIT) approach determine a default probability which tends to change from period to period. The alternative model, defined as Through the Cycle (TTC), produces a judgment of trustworthiness of he who receives funds which tends to remain stable even in different economic scenarios. The use of the PIT methodologies increase, for some, the phenomenon of procyclicality which is, instead, softened by the use of the estimates of losses according to the alternative method. Procyclicality is show in periods of economic difficulty with the introduction of credit limits in banks. The companies in financial difficulty are not able to cover their own needs through bank debt due to the worsening of their ratings. The difficult availability of financial resources exacerbates the criticality of operational management of the company. In times of economic difficulty, the application of the PIT procedure may not include the potential of the smaller company. The Italian context, with its prevalence of small and medium companies, makes it necessary to reinforce the internal rating systems approach, especially for banks, such as co-ops which have more than transitional relationship in credit activity.

Considering the role of the relational bank in commercial banking and the impossibility to take care of all rating functions with one operational application, it is necessary, many years after its introduction, to rethink the goals and characteristics of the rating model.

The implementation proposed foresees the realization of an integrated system in two phases, in agreement with the following evolution: improvement of the early warning model (so-called monitoring model) and construction of a forward-looking model (so-called rating model and integration with the monitoring model).

The first stage consists in improving the current function of the models as monitoring models to determine/foresee interventions and/or repositioning of the client. The improvement of the early warning system allows a greater understanding of the tendency of deterioration of creditworthiness of the clientele in performing classes. The model does not foresee the quantification of default probability, but activates signals on the health of the borrower, to be sent to units which take care of credit risk checking.

The second stage regards the realization of a management model focused on the definition of default probability, defined based on a more complete set of information. This approach allows the calculation of default probability in a robust manner, favoring the abandonment of a PIT system in favor of the adoption of a more TTC default probability.

The realization of a management model able to increase the predictive capability of the default probability requires the adoption of an innovative approach, described below, which gives greater nobility both to hard information (balance sheet analysis, performance analysis) and to soft information (company intangibles, sectors belonged to). The former contribute to the formation of a statistically based rating, while the latter are essential in order to evaluate the small and medium enterprises, because as the size of the company decreases, so does the dependence on macroeconomic factors in favor of precise competitive factors which only qualitative information can intercept (Maino, 2012).

Although the description of intervention modalities and choices will be discussed later, here the constituting elements of the new architectonic plan of the rating model will be presented, based on:

1. the determination of a robust default probability;
2. the quantification of the LGD;
3. the forecast of the override process;
4. the determination of the correct loan for the risk involved.
   (a) The calculation of the default probability adopts a hybrid approach which, starting with a rating based on quantitative variables (financial rating), considers long-term competitive factors of the counterpart through the analysis of the company's qualitative profile and of the sector in which it operates. The association of the rating class to the default probability (rating quantification) occurs initially through a mapping process and provides for the average, minimum and maximum default probability indication for each rating class.
   (b) Attention to the determination of the loss rate in the case of insolvency (LGDR) or the recovery rate (RR) aims to identify the modalities of the valorization of the most appropriate LGDR within the credit risk management models.
   (c) The introduction of the qualitative profile makes foreseeing the override process useful, that is, identifying a series of surveys which may require the revision, in terms of improvement or worsening, on behalf of the manager, of the rating judgement assigned in a statistical form. In this context it is crucial to: (1) define the guidelines to avoid interpretative dissimilarities by the analysts; (2) foresee periodic analyses aimed toward the verification of the causes of deviations registered as compared to the automatic scoring results; (3) guarantee the integrity of the overall rating assignment process.

(d) The calculation of a robust default probability allows the application of theoretical pricing whose formula, initially, is that of risk-adjusted, single-period pricing.

The realization of the management level permits reaching the determination of an effective rating for the counterpart which produces important effects on the bank in terms of:

- Expected loss: The default probability associated with specific rating classes leads to the increase/decrease of expected losses for each bank in order to define the LGD and EAD levels. Based on the expected loss, the adjustments on the profit and loss account are decided.
- Pricing: The association with a rating class produces an impact on the risk-adjusted spread and, consequentially, on the theoretical pricing and the adoption of corrective measures after having defined homogeneous counterparts in terms of risk, credit needs and commercial positioning.
- Operational delegations: Size limits (for branch, manager, etc.) vary in relation to the counterpart's rating class.

The construction of a new perimeter of credit risk supervision allows the bank to equip itself with a creditworthiness evaluation system integrated in decisional processes and in the management of company efficiency.

Making the principle of separation its own, between the selection phase and that of monitoring, which was further explored in the previous chapter, the system foresees a dual-track approach in which the true rating model is flanked by a monitoring model. Both present specific temporal contents and horizons of reference.

The rating model is applied in the granting and renewal phase of the credit line. For this reason, it is marked by an attentive, but not too strict, adherence to the counterpart's risk and a modest sensitivity to the economic cycle in order to understand the debtor's prospects beyond the short term and to determine the counterpart's default probability from a more forward-looking point of view. In such an area, the rating model contributes to reaching different goals, such as those related to pricing and allocation of capital determination processes, the calculation of risk-adjusted performances, commercial credit planning and the determination of expected loss for the adjustments of profits and losses.

The monitoring model focuses attention on the evaluation of creditworthiness throughout the relationship with the client. Once the rating is determined, the effective risk of the client has to be monitored to verify possible variations in the risk profile: these are typical activities

in the monitoring phase which are regulated by the need to understand the alterations which the economic-financial situation of the debtor can undergo over time and to establish suitable means (repayments or client repositioning). It follows that the monitoring instrument has less importance as compared to the rating model; it is based on information of a performance nature (both internal and systemic) and has a punctual temporal horizon of reference.

Once the guidelines have been introduced, Figure 6.1 illustrates the architecture of the model divided in three modules, integrated amongst each other: the rating module, the monitoring module and the executive module.

The rating module represents the central module of the model and aims to determine default probability through the elaboration of quantitative data (balance sheet, internal and external performance). The qualitative and sectorial information do not intervene in the rating determination, but are used in the notching/override phase for specific rating classes. In such cases, in fact, the manager's intervention is foreseen, as he can modify the overall judgement and, consequentially, the default probability. The examined evaluation of the counterpart's creditworthiness is carried out annually and is represented through the assignment of a class from 1 (best) to 10 (worst) and by a score from 0 (best) to 100 (worst). Through the rating quantification procedure, each score is assigned an average, minimum and maximum default probability and, finally, a diversified pricing based on the risk of the borrower and the technical form of the loan.

Through the analysis of monthly performance data (both internal and systemic), the monitoring module verifies the good health of the borrower of funding during its relationship with the bank. The comparison between performance score and rating class underlines the necessity of eventual operations on the client. In the presence of deviations above the previously established limits, the automatic recalculation of the default probability is foreseen through the transition to loan procedure. The results and the deviations are highlighted in a watch list and make up the base for eventual client recuperation and repositioning.

Taking a cue from the data processed in the previous modules, the executive module proposes an up-to-date and aggregate vision for each recipient, for different views of the main information regarding the credit portfolio.

6.2 A new rating model

Built according to the previously illustrated architecture, the rating model allows banks to reach different goals which go from classic

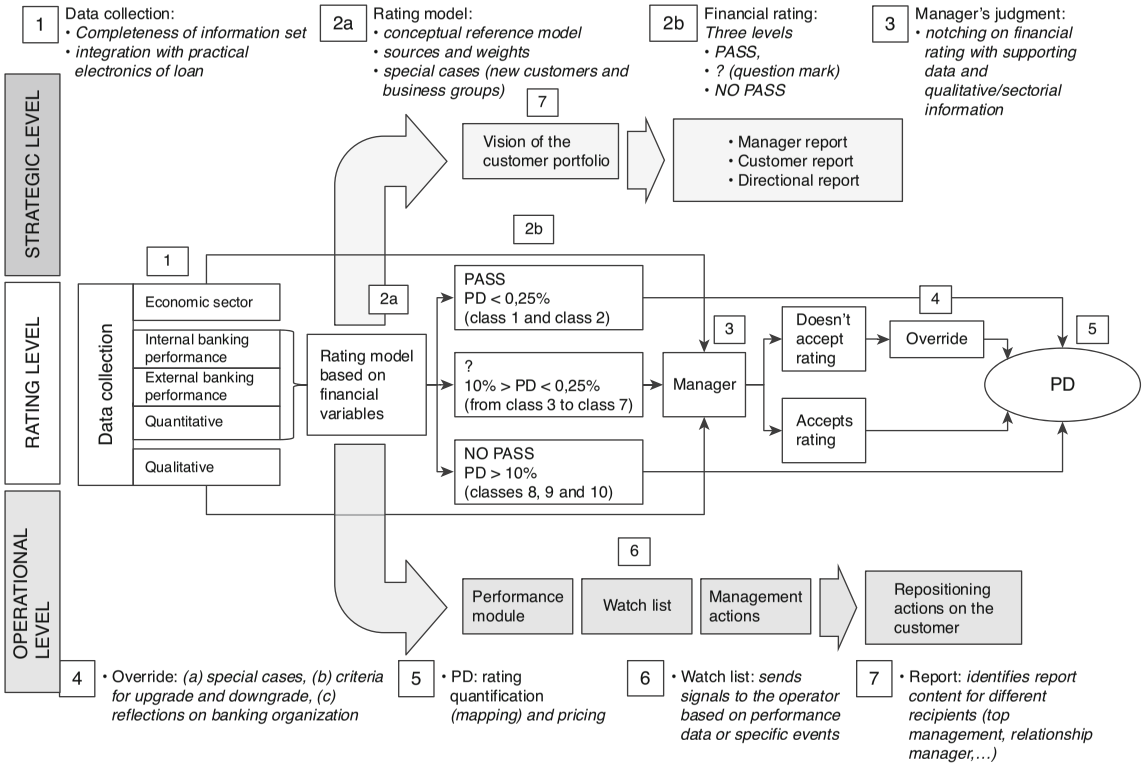


Figure 6.1 The architecture of the model

application of the determination of a credit quality for the client to the risk-adjusted pricing calculation, from the credit portfolio management to the determination of expected losses, from identifying commercial policies to the definition of operation autonomy limits.

As to the measurement of the counterpart's risk (PD), the model permits the distinction of the counterparts by credit risk class, identifying clusters with sufficient granularity and limited intersections between classes. The model permits, in fact, associating each borrower with a probability value (probability of default) which identifies the possibility that the default can occur within a certain temporal horizon (fixed as equal to a year).

The segmentation of debtors in homogeneous groups according to risk class (measured by the default probability) allows the bank to price the loans to clientele in a rational and transparent manner, according to pricing-risk adjusted logic. The management of price leverage can be aimed toward each single transaction of which the debtor is a beneficiary in the case in which the risk of recuperation (LGD) and the availability of credit margins (EAD) differ.

The comparison between risk-adjusted pricing and the objective output of the bank (measured, for example, by the RAROC, that is the risk-adjusted return on capital) contributes to determining the capacity of the bank to create value for each credit line, client and credit portfolio (performance-risk adjusted).

As to provisions for losses, the determination of expected loss (PD $\times$ LGD) of the credit portfolio allows the estimation of provisions of risk capital which passes through the profits and losses.

The model allows analysts to determine the absorption of the economic capital (IRB foundation model) for rating class and to compare it with the regulatory capital (standard method), as well as to support the commercial policy thanks to the risk evaluation of a group of transactions toward a client on a given temporal horizon (for example 12 months) and the verification of the respect of goals regarding the profitability of the relationship.

Additionally, the model allows the calibration of a system of operative delegations guided by the relationship between levels of autonomy and levels of risk defined in terms of expected loss, aiming the operational units toward the bank's goals of risk/performance.

Finally, it contributes to the management of uses, since it offers indications as to the concentration of the credit portfolio (for rating, pricing and portfolio quota class), highlighting the migrations during the temporal horizon of reference.

The work process provided by the rating model follows an itinerary in phases as shown in Figure 6.2.

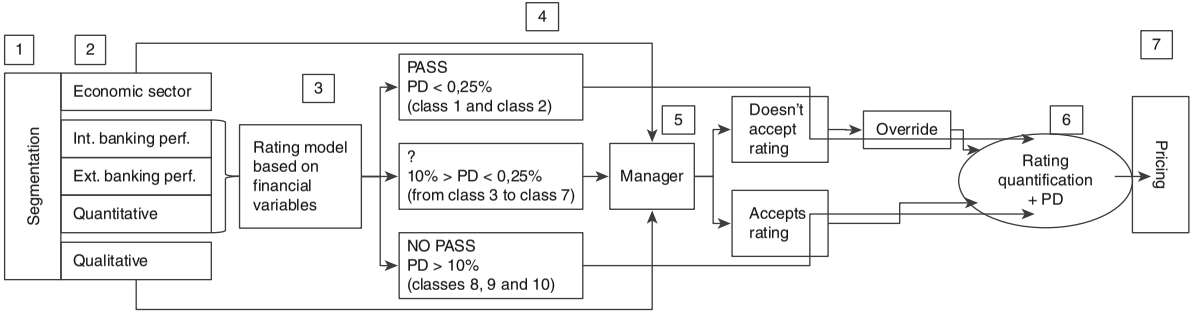


Figure 6.2 Phases of rating model

In Phase 1 (segmentation), the counterpart is classified in one of the established categories (Private, Small Economic Operators, Corporate, and Other).

Phase 2 regards the collection of all information regarding each counterpart which occurs within the Electronic Credit Practice. If the informational set is incomplete, the calculation process of default probability is blocked. The required information is of four types:

- Quantitative: The counterpart is requested to hand in the balance sheets and/or other accounting documents (trial balance, Unified Tax Return form).
- Performance: The bank collects information regarding the internal and external performance.
- Qualitative: The counterpart is given a specific questionnaire based on the segment it belongs to.
- Sector: The data regarding the sector is acquired from an external supplier.

In Phase 3 (elaboration of financial rating (rating model): through the use of only quantitative and performance information, the model assigns a rating judgment (so-called statistical or financial rating).

Phase 4 foresees the subdivision in classes. Based on the financial rating assigned, each counterpart is placed in one of the following classes: Pass, No Pass or Question Mark. For the Pass and No Pass classes the automatic assignment of the default probability is foreseen through the rating quantification phase. The counterparts in the Question Mark class undergo a subjective evaluation (judgmental) on behalf of the relationship manager. In said area, the information of a qualitative nature and that regarding the sector to which it belongs, although they are not part of the statistical rating calculation, support the manager's decision-making activity. The qualitative profile is based on the elaboration of answers to the questionnaire given during data collection and determines a synthetic indicator in a graphic form (with stars as indications). The sectorial profile is supplied by external providers and determines a synthetic indicator in a graphic form (with stars as indications).

Phase 5 is carried out by the manager. If the counterpart undergoes a check by the manager, there are two possible alternatives: (1) the manager accepts the financial rating and, consequentially, confirms the calculation of the default probability based only on financial rating; (2) the manager does not accept the rating and, if possible, through the

override procedure, he modifies the class (+ o – 1 class) and, consequentially, the financial rating.

Phase 6 regards the Rating quantification and the determination of the default probability. With the aid of a matrix for financial rating transition obtained, average, minimum and maximum default probabilities are associated to it.

Lastly, in Phase 7 (Pricing), each counterpart, based on the default probability obtained, is assigned a pricing, diversified according to type of operation. The availability of minimum and maximum default probability allows the determination of a range of rates within which the rate to be applied to the client can be found.

6.3 The function of the rating model

The rating model measures each granting of credit. The main element of the model is represented by the counterpart's rating, which gives each debtor a value of probability between 1 and 0 which quantifies the risk that default occurs within a certain timeframe (usually considered equal to a year).

6.3.1 Segmentation of the clientele

The segmentation adopted in the new model is characterized by the abandonment of size criteria (turnover) and is based on available informational sources regarding accounting documents. The choice is motivated by the fact that the turnover is not able to create an effective homogeneity of the clientele, such as commercial banks. Considering the importance of the financial component in the calculation of financial scoring, it is necessary to have information which can be found only in accounting documents. The result is that the availability of accounting documents becomes the guideline used to distinguish debtors with sufficient granularity and limit intersection amongst them.

Based on said criteria, four groups can be found: Private, Small Economic Operators, Corporate and Other. In the "Other" segment there are co-ops and non-profit bodies for which, in addition to construction and real estate companies (both Small Economic Operators and Corporate), there will be an ad hoc quantitative and qualitative module. Financial companies are excluded from segmentation.

Segmentation regards all bank clients, both current (even if they are not borrowers) and potential (new clientele). The same segmentation is applied to the monitoring model.

6.3.2 Sources, timing and depth of calculation

The model foresees the obligation of the completeness of sources. In absence of an informational source, the financial rating calculation is not carried out and, therefore, the process of determination of default probability is interrupted. The informational sources regarding the quantitative and qualitative profiles vary based on segmentation; the performance and sectorial sources are common to all segments considered.

Default probability, whatever the measure of credit risk, determines the probability that the default occurs within a year. For this reason, the financial rating, mainstay of the rating system, should be calculated annually.

Once all the informational sources are available, the calculation can be carried out in two ways: in bulk or one-time.

The bulk calculation is applied to clients who are already entrusted to the bank. When the model is launched, the first application of the financial rating calculation will occur using the informational sources available at the moment. Alternatively, the application will begin only with the most up-to-date accounting documents. The one-time calculation is applied in one of the following cases: in presence of a renewal request (the client is already a borrower); the request for a new credit line (bank client but not borrower or new client); when, in the monitoring model, there is a significant variation between the assigned rating and the monitoring score (for more information see the section on the monitoring model); depending on the bank's discretion.

In the cases described previously, the calculation requires that all the sources are updated to the most recent date.

As to the depth of the calculation, the financial rating is based on the combination of scores connected to quantitative profiles (balance sheet/accounting data) and performance (both internal and systemic). The quantitative score is calculated using the most up-to-date accounting document. The score of the performance proxy (internal and external) is calculated using the most updated one-time monthly value, following the indications of the consolidated banking procedure (the one-time value already incorporates the results of historic values referring to previous periods).

The use of alternative techniques (functions of trends calculated on the time series of the last 12 months, arithmetic or weighed mean of the last 12 months) such as the type of calculation (current modalities or the score calculated based on a greater temporal base – 12 months) can be subject to further modifications/integrations of the model.

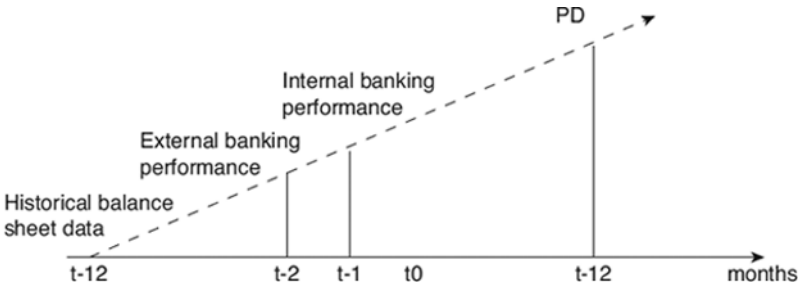


Figure 6.3 Depth of calculating the financial rating

The financial rating is obtained through the weighed combination of the results found in the quantitative and performance (internal and external) profiles. The weighing of the results regards only the financial rating component (quantitative and performance profiles). The weighing of the qualitative and sectorial profiles is not contemplated in that they are not considered in the direct calculation of financial rating, but only as the manager's judgmental elements of evaluation.

6.3.3 Qualitative and sectorial profile

The scheme proposed for the qualitative profile is based on the PIMS program (Profit Impact of Market Strategies) which is the most mature attempt to connect, in a systematic manner, the company strategies with the economic-financial performance (Cuneo and Maino, 2010). The causal hierarchy which connects key strategic factors to the economic performance of the company follows a consolidated scheme which allows the evaluation of the impact of strategic variables on the economic-financial performance of the company. In particular, the most significant variables seem to be the attractiveness of the sector to which it pertains, the absolute and relative market share, the quality and differentiation of products, the level of vertical integration and the intensity of the capital.

The goal of the quantitative analysis is to evaluate the entrepreneurial/managerial capacity of the company to guide itself, adopting strategic choices which are coherent with the market and the sector of reference. The evaluation of the qualitative profile is based on three dimensions: the attractiveness of the sector, the competitive position of the company and the analysis of strengths of the company organization (internal analysis). The questionnaire is mandatory. If it is missing, the process of financial rating calculation is blocked. For each

segment of clientele, an ad hoc questionnaire is provided. The results of the qualitative profile are not part of the direct calculation of financial rating, but are used to support the manager's subjective evaluation. The representation of the results obtained occurs through LED (light emitting diode) symbols shown graphically from 1 (worst result) to 5 (best result) with symbols (for example, stars).

The data relative to the sector are supplied by external providers and are requested within the data collection system. The presence of sectorial dates is mandatory. Otherwise, the process of financial rating calculation is blocked. The insertion of a sectorial module acknowledges the indications supplied by an external provider and are then converted in a score which can go from 0 to 100. The representation of the results obtained occurs through LED symbols shown graphically on a scale of 1 (worst result) to 5 (best result) symbols (for example, stars). The results of the sector profile are not part of the direct calculation of the default probability but are used to support the manager's subjective evaluation.

Calculation of financial rating. The calculation of financial rating can be carried out through two manners of calculation.

The first, considered preferable, foresees that the statistical score is calculated only with the values expressed from quantitative and performance profiles. The qualitative and sectorial profiles are excluded from the direct calculation and supply only graphic judgments (with stars), used to support the manager's subjective evaluation. The second offers the possibility to modify the elements used to calculate the default probability, adding qualitative and sectorial profiles; in this case it is necessary to add a weight to the two sources and review the weight assigned to the quantitative and performance profiles.

Even for the classification of the rating classes in Pass/No Pass/ Question mark there are two complementary modalities.

In the best case, the result obtained by financial rating determines the counterpart's belonging, examined as to one of the three following classes based upon which the methodology of the default probability determination varies:

- "Pass": Such an aggregate includes the counterparts which present a high rating (classes 1 and 2) for which another evaluation by the manager is not considered necessary. The financial rating is used for the assignment of the default probability.
- "No Pass": Such an aggregate includes the counterparts which present an extremely negative rating (classes 8, 9 and 10) and cannot be modi-

fied by the manager's intervention. Also in this case, the financial rating is used for the assignment of the default probability.

- "Question Mark": The intermediate classes (from 3 to 7) are evaluated by the manager who can intervene, through the override procedure, to modify (better/ worse) the class belonging to a position.

In the alternative hypothesis for the "Question Mark" class, it is possible to choose between the automatism of the class correction based on predefined rules and the correction proposal left to the decisional autonomy of the manager/organizational unit.

6.3.4 The manager's role

The information contained in the qualitative and sectorial profiles are not used in the financial rating calculation, but they support the notching up and notching down activity of the manager foreseen for the counterparts included in the "Question Mark" class. In such a case, the manager (1) accepts the rating: such a choice entails the adoption of the financial rating for the determination of the default probability; (2) does not accept the rating; in the case in which the override is possible, the manager answers closed questions; in the case of an obstacle, the financial rating will be adopted as the base of the default probability calculation.

The override procedure consists of the formulation of answers to closed questions in order to support the evaluation by the manager; the result of said answers can result in the improvement of the counterpart's judgment (the class assigned goes up a position) or in the worsening of the counterpart's judgment (the class assigned goes down a position).

The number of questions foreseen must not be more than three and must have closed answers (Yes/No).

6.3.5 Override process

The override process requires, firstly, the finding of a series of cases which justify the intervention proposal, the definition of criteria for eligibility and the modalities for override application. For more information, see Table 6.1.

6.3.6 Rating quantification

The estimate of the default probability follows an itinerary in two stages. After the each counterpart is assigned its own rating class, the default probability is quantified for each class (rating qualification phase).

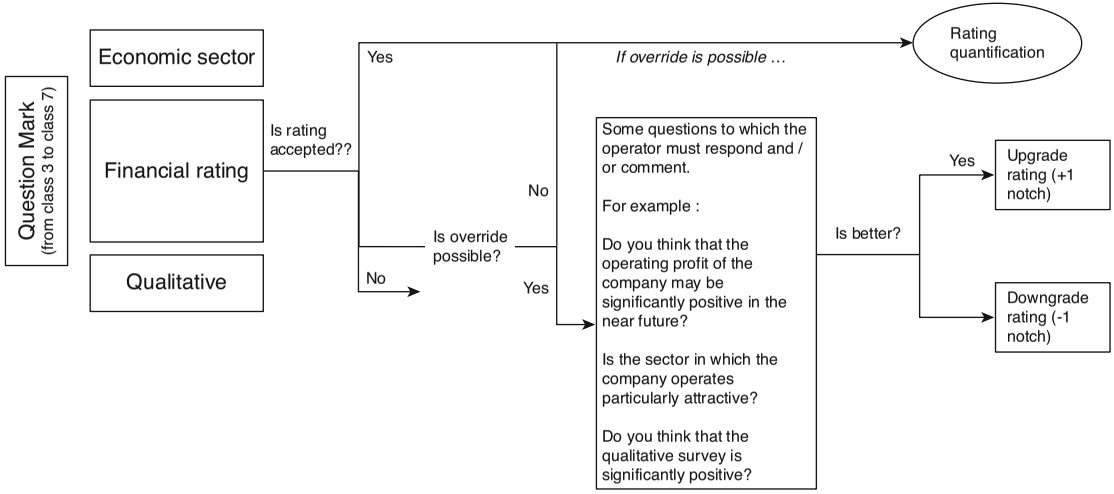


Figure 6.4 The manager's role

Table 6.1 The override process

Case of studies	Eligibility criteria	Mode of application
• External banking performance (erroneous reports of Centrale dei Rischi, regularized anomalies, performance anomalies, data not considered by the model) • Internal banking performance (incorrect internal reports, internal anomalies subsequent of scoring calculation) • Accounting data from balance sheet (adjustments be made to the financial aspects for subsequent financial information regarding the investment cycle, acquisition of new contracts) • Other (new information arising from the customer or by the relevant representatives, industry margins of operation, area of qualitative research, influence of the reference group)	*Possible counterparts object of override* • Customers falling within certain segments • Customers with credit lines above certain thresholds • Notwithstanding the threshold limits for start-ups and new customers • Updated qualitative information *Positions that cannot be subject to override* • Positions covered by the impaired loans (past due and/or overdue, substandard and doubtful loans) • Previous override request fails and no new facts in support of the new proposal	• Define override if it is for the applicant or require an organ validating • Define any thresholds override for which it is required the intervention of the organ of decision • The application consists in the variation of the override of a rating class to replace the former one; it is not allowed to pass the class Pass or No Pass

For the quantification it is possible to use one or more techniques, even combined, differentiated regarding the degree of relevance recognized to automatic judgements produced by the model and those from the judgment of experts in the credit sector:

- the internal default experience, in which the bank uses its own historical data regarding the frequency of non-fulfillment observed in the debtors assigned to each rating class;
- the mapping with external data, through which the bank establishes a correspondence between the internal rating system used and the scale adopted by a External Credit Assessment Institutions (ECAI) and

assigns the corresponding default rates found for external ratings to its own classes;
- the statistical or actuarial models of default forecasting through which the intermediary calculates the (simple average of the) default probability estimated for the single debtors assigned to the same class.

The most suitable solution for the rating qualification is that of mapping with external data. In particular, each rating class is associated not only with an average default probability but also with a minimum and maximum default probability as the exemplifying figure which follows (Figure 6.5) shows.

6.3.7 Pricing formula

The determination of the active rate on financing aims toward a spread on the loan itself in such a way that the revenue predicted on the loan (the net of the expected losses) covers all the relative financial (and operational) costs of the loan itself.

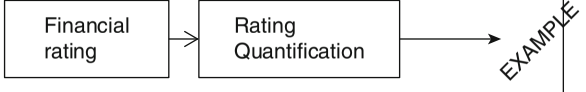
To determine the rate, the uni-periodic risk-adjusted pricing formula is adopted, represented here:

$$r = \frac{i + PD \cdot LGD + PATR(r_e - i)}{1 - PD \cdot LGD}$$

where: r is the active rate on the loan; $PD * LGD$ is the expected loss (given by the product of the default probability and the LGD); i is the cost of the pre-established funds from the bank (which is possible to consider as equal to the fund transfer pricing); r_e is the performance of the bank's own capital, necessary to grant the own; $PATR$ is the sum of the patrimony which the bank holds against the loan.

In the formula, compared to a more complicated version, operation costs (considered equal to zero) are not included, nor is the effective exposition at the moment of the default (EAD) always considered equal to 100 percent.

Differently from the risk-neutral approach, in the risk-adjusted approach there is the introduction of the most realistic hypothesis of risk aversion by the intermediary. In fact, the level of risk is considered inherent in the loan operations, incorporating, besides the expected losses, the connected cost of economic capital which upholds the operation in risk capital logic.



Rating	average PD	minimum PD	maximum PD
1	0.05%	0.00%	0.10%
2	0.15%	0.10%	0.20%
3	0.25%	0.20%	0.30%
4	0.40%	0.30%	0.50%
5	0.75%	0.50%	1.00%
6	1.25%	1.00%	1.50%
7	2.50%	1.50%	3.50%
8	5.00%	3.50%	6.50%
9	10.00%	6.50%	13.50%
10	25.00%	13.50%	–

Figure 6.5 The rating quantification

It is assumed, in fact, that a loan of 1 euro is financed, for a quota equal to (1 – PATR) (for example 93 cents) to the TIT and for 7 from capital. The determined loan rate also manages to cover the cost of capital which the bank holds against a euro loan.

The loan rate to apply to a loan of 1 euro for a year for a given rating class will be such that it guarantees the obtaining of an objective rate which covers the total of the financial cost elements.

The traditional pricing formula is of a uni-periodic risk-adjusted type and is based on elements of calculation described in the following table.

Table 6.2 Elements of pricing

Elements	**Definition**	**Method of calculation**
i = TIT	Represents the internal rate of transfer of funds to the bank and is an expression of the marginal cost of funding	Provided by the bank
PD	Represents the probability that the debtor becomes insolvent within a year	The PD is associated with the rating of the borrower and the output provided by the rating model. The availability of minimum and maximum PD for each rating class is used to determine a band of rates within which the rate could be applied to the customer.
LGD	Represents the percentage of expected losses for euro lent	For the calculation of the LGD the techniques provided by the standard method or the approach IRB foundation could be applied
PATR (capital requirement)	It is the capital of the bank (for euro lent) associated with the loan	Known PD and LGD, the capital requirement is defined by applying the weighting function in the IRB approach according to the type of exposure
r_e	It is the risk premium on the capital that the bank has to pay to its shareholders given the riskiness of the bank itself	The risk premium is calculated using the approach of the Capital Asset Pricing Model (CAPM)

The application of a risk-adjusted pricing system does not attempt to establish a fixed and binding limit under which it is not possible to go, as the loan would not be granted. At the same time, the result of applying the formula does not have to function as a mere suggestion for he who establishes the conditions of the loan.

To limit the possible aforementioned criticality, there are two possible solutions (the second is preferred, as indicated in Resti and Saita (2009):

- If the loan is granted at a lower rate than the risk-adjusted one, the approval of a superior organizational unit is necessary.
- Each rating class does not have an overall rate, but a range. This choice is motivated by the fact that, within a rating class, there is a certain variability in the default probability. Therefore, each rating class is associated not only with an average default probability, but a minimum and maximum default probability which define the risk-adjusted pricing limits. The minimum and maximum default probability availability allows the determination of a range of rates within which the rate to apply to the client is found.

Consider that class 3 presents the following minimum, average and maximum default probability: 0.20 percent; 0.25 percent; 0.30 percent. From this it is shown that there would not be the determination of one active rate (= 4.36 percent) but a range of rates between 4.33 percent and 4.38 percent. The range will tend to grow as the rating classes worsen. It is possible to apply an increase to the range of rates, depending on the complexity of the operation according to the "pricing spread" defined by the bank.

On a theoretical level, the formula of the risk-adjusted uni-periodic pricing has two main limits: on one hand, its application to complex operations or those with a temporal horizon longer than a year; on the other, the estimate of capital needs associated with single loans through measures such as VaR (Value at Risk).

As to the first point, the lack of an available term structure of the default probability (that is, the default probability has different values as the temporal horizon varies) makes the migration of multi-periodic risk-adjusted pricing approach impossible at the moment.

The calculation of the default probability associated with n years according to the formula below, which is based on the constancy of marginal default probabilities, is not confirmed by empirical evidence

Table 6.3 Calculation of pricing

Minimum PD	0.20%
LGD	45.00%
Internal Rate of Transfer	4.00%
re	10.00%
ELR (expected loss rate)	0.09%
CO (operating costs)	0.00%
PATR (capital requirement)	4.00%
Pricing Risk-adjusted min	**4.33%**
Maximum PD	0.30%
LGD	45.00%
Internal Rate of Transfer	4.00%
Re	10.00%
ELR (expected loss rate)	0.14%
CO (operating costs)	0.00%
PATR (capital requirement)	4.00%
Pricing Risk-adjusted max	**4.38%**

(rating agencies) or by theoretical evidence (for example, the Merton model).

$$PD_{n,j} = 1 - (1 - PD_{1,j})n$$

The difficulty in calculating the VaR and to apply it to single loans (in order to reflect the effective degree of risk of the loan portfolio to incorporate in the determination of the capital of the bank for the euro loaned) makes the use of capital charge, conveniently reviewed, necessary, as the proxy of risk capital.

For the above reasons, the function of risk-adjusted uni-periodic pricing has to be used with caution, and its application must occur gradually. Its management utility is shown in the determination of "shadow prices" which support the organizational units in defining the financing conditions. They are, therefore, list prices from which the bank can distance itself (positively or negatively) during the period of negotiation with the client.

From this point of view, after the calculation of the theoretical active rate and the finding of an average market rate regarding the considered client/product segment, for the bank and its organizational units, it is possible: (1) to have a loan price in line with the risks taken; (2) to adopt policies of diversification of the conditions set for the clientele based on

risk and operation type (maximizing the risk-adjusted returns on single clients); (3) to monitor the profitability of the conditions effectively practiced; (4) to support decisional processes and commercial actions.

6.3.8 Uses of the model

Previously, the uses of the rating model were described, that is, the possibility of use for the determination of the counterpart's risk (default probability), for the calculation of an active rate of the risk-adjusted loan and the performance of the loan adjusted for risk (e.g., RAROC), for the estimation of the provision of losses, for the definition of opera-

Table 6.4 Uses of the model

Variables	Description	Threshold values
Risk level	• The greater the PD of the customer, the lower the Bank's interest in the development of the relationship with the customer • Clients with PD > x% are managed by progressively reducing the credit lines in the share of the portfolio held • Clients with PD < x% to be developed as a function of the other two variables (price ratio, share of wallet)	• Good: all customers with PD value < x% • Pass: all customers with x% < PD < x1% • No Pass: all customers with PD value > x%
Price ratio	*Ratio between actual and theoretical pricing.* The higher the price ratio for customers with PD < x%, the higher the interest of the bank to develop the credit lines or acting on the lent amount or stimulating the use of the loan	• Cluster 1: Price ratio > = x • Cluster 2: x = < Price ratio < = x1 • Cluster 3: Price ratio < x
Share of Wallet – SW	Serves to identify the commercial positioning of the Bank for customer/ cluster in order to define the ways in which to take action development	• SW > x • SW < = x

tional autonomy limits, for the support to commercial policy and the management of the portfolio concentration.

Going back to the reporting system and what was previous described (pricing) as to the use of the rating model, what follows is a representation of two possible operation aims: the use in a commercial manner and the determination of operational delegation.

From a commercial point of view, after having defined the counterparts as homogeneous in terms of risk, credit needs and commercial positioning, it is possible to specifically intervene.

As suggested by Resti and Saita (2009), another use of the rating model consists in the definition of the limits of operational autonomy for the various organizational units of the bank. Credit rating allows analysts, in fact, to go from dimensional logic (nominal value of the exposure) to logic based on the risk factor of the operation as a guideline.

In structuring the limits of decisional autonomy, it is possible to define the limits in terms of maximum expected loss, given by the product of default probability, LGD and EAD. For example, consider that the maximum limit for a manager is set at 100 euro of expected loss. It follows that the manager can autonomously decide if and only if, given the default probability and the LGD of the client, the EAD is equal/inferior to the relationship between the limit of the expected loss (100 euro) and the product of default probability and LGD.

EAD <= limit PA / (PD * LGD)

If a counterpart is part of class 4 to which an average default probability of 0.40 percent corresponds, he asks for financing with LGD equal to 45 percent, the maximum exposure which the manager can take on autonomously is 55.555 euro.

max EAD = 100 / (0.40% * 45%)

Since in the rating model proposed the organizational unit can contribute to the determination of the default probability through the override process, it is important to carefully observe that the unit does not tend to improve the rating judgement of the counterpart in order to elevate its own operational autonomy limits (even only to be able to

answer financing requests more quickly). At the same time, to favor a greater control, it is best to set lower limits of decisional autonomy for new clients for which less information is available.

6.4 The monitoring model

The monitoring model includes the entirety of the activities and competences aimed toward identifying the possible deterioration of the position and evaluating the possibility of repayment actions or the repositioning of the client (bringing him back to a performing status or deciding to move on to recovery).

Through this process, the creditor is subject to a periodic exam in order to identify the indicators which can signal a possible decline in the quality of the assigned position. As to formalized organizational procedures, the control activities aim to quickly find negative signals and effectively put the necessary actions in place in order to avoid further decline.

The result of said control process is summarized in a score called a monitoring score.

In banking practice, the early warning systems implemented by intermediaries tend to focus on the performance analysis of relationships (daily verification of overdrafts, monthly check on past-due payments, quarterly signal of pre-existing overdrafts) and on negative system returns (verification of cash flow anomalies of the Bank of Italy), as well as the loss of value of collateral (verification of the congruity of the pledges and mortgage collateral).

The model foresees that the determination of the monitoring score is based on models of a performance nature (both internal and external). The constant updating of performance data and the finding of possible prejudicial elements contribute to strengthen an early warning system (watch list) which ends in the assignment of a monitoring score.

The monitoring score takes on a number of points which goes from 0 (best) to 100 (worst) and has five categories. Belonging to one of the five categories and the periodic check with the class assigned by the rating model determines the need to carry out some possible corrective actions which, in severe cases, can bring about the automatic recalculation of the default probability or the end of the credit relationship. The interaction between the monitoring score and the rating creates an area of intersection which takes on

different tones depending on the intensity of the deterioration of the position:

- dark green: no anomaly;
- light green: slight anomalies;
- yellow: moderate anomalies;
- orange: significant anomalies;
- red: severe anomalies.

The watch-list is informed with a daily and/or monthly frequency by the processing of internal and external performance data and by the presence of possible prejudicial events. Communication to the manager goes through signals (traffic lights) which take on different colors depending on the type of management actions to be taken.

Based on the cut-off limits (determined based on the distance between management rating and the monitoring score), a certain color is given to the area of intersection which takes on different tones depending on the need to take certain corrective actions which will be evaluated by the manager and/or the organizational unit. The automatic recalculation of the default probability occurs only after crossing the cut-off limit (see Figure 6.6) and in the presence of negative performance trends.

6.4.1 Segmentation, font and calculation modalities

The monitoring model uses the same segmentation utilized in the rating model, which foresees the subdivision of the counterparts in four groups: Private, Small Economic Operators, Corporate and Other. In the last one, there are co-ops and non-profit bodies. The segmentation regards all bank clients, both those who are current (even if they have not received loans) and potential (new clientele). The model uses only internal and external performance sources for all the considered segments. As compared to the rating model, it is not considered to be the quantitative profile (of the balance sheet).

In terms of calculation, the monitoring score aims to verify the shifts in the assigned rating class from the rating model and the monitoring score itself and to make possible corrections. The monitoring score is only based on the score connected to the performance profile (both internal and systemic). The performance profile score (internal and external) is calculated using the most up-to-date overall monthly value, following the directions of the consolidated banking practices (the overall value incorporates the reflections of historic values referring to

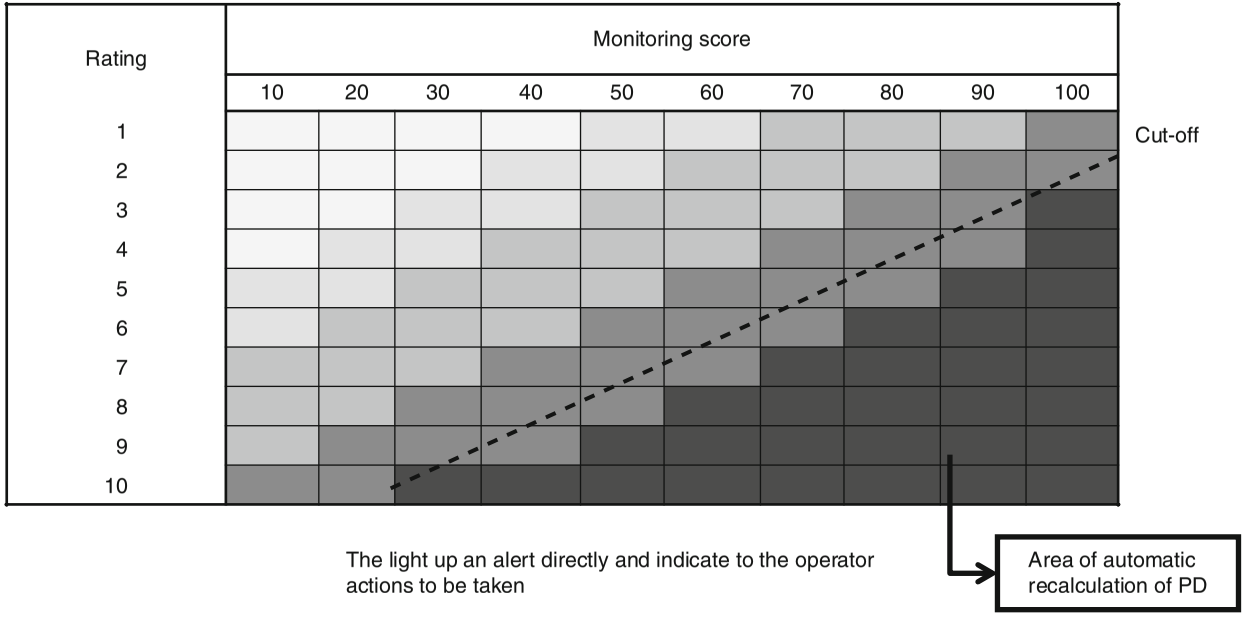


Figure 6.6 The cut-off limit

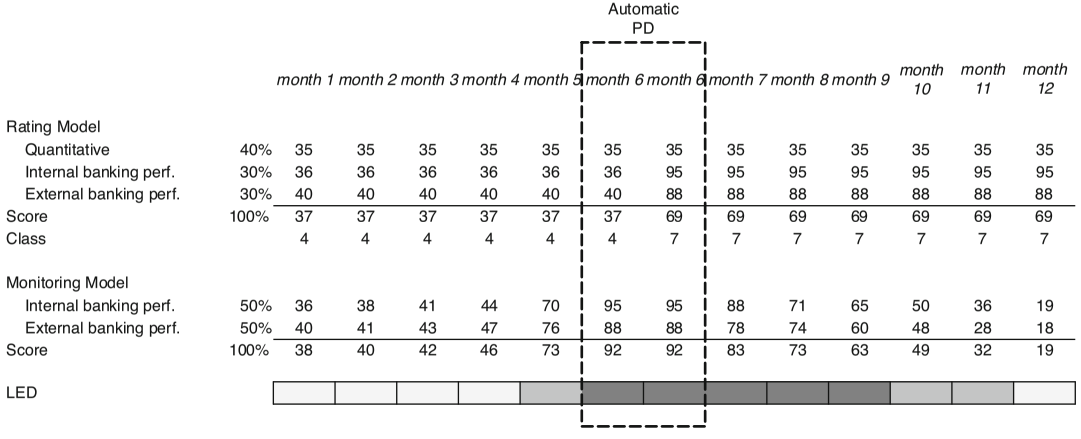


Figure 6.7 Example of calculation

previous periods). It is also possible to use alternative techniques (trends calculated on the historic series of the last 12 months, arithmetical mean or weighed average of the last 12 months).

The comparison between the class assigned by the rating model and the monitoring score determines the color of the LED sent to the manager. Only if the color is read is the recalculation of the default probability automatic.

The transmission of signals to the manager occurs through the turning on of lights in a monitoring card which varies the color depending onh the results of the comparison between rating class and monitoring score.

Part III

Credit Rating in an Evolving Scenario

7
Rating and Bank–Firm Relationship

7.1 The strategic interaction between bank and firm

An internal rating system is made of "the articulated whole of organizational methods and processes which allow to reach the classification on an ordinal scale as to the creditworthiness of a subject and which, therefore make the distribution of all credit borrowers in different risk classes, to which different probabilities of insolvencies correspond" (De Laurentis, 2001). In other words, credit rating is an instrument able to estimate the probability of insolvency of a company, expressed in terms of probability on a specific temporal horizon. These models are not based on abstract hypotheses but are generated by databases which accumulated years of measurements regarding default events which occurred in different economic, technological and operational conditions. The introduction of said system has had significant importance as it occurred in a context in which the transitions of risk were evaluated with a track character (acceptance/nonacceptance).

In recent years, rating systems have represented one of the greatest financial innovations introduced, as well as one of the greatest investments in industrial and financial knowledge. The banks, through the application of the regulations introduced by Basel II, have invested important resources for the creation of rating systems, necessary for a more sophisticated evaluation of the counterpart's creditworthiness, above all, companies. The introduction of rating models is about to be completed in more than 100 countries, and it is calculated that more that 300 million companies will be evaluated with quantitative models halfway through the current decade.

However, the introduction of rating systems is not without criticism, in fact, it occurred in the midst of a period of financial crisis of historical

significance, which has altered the compliance of models built in ordinary management conditions. Precisely for the presence of the crisis, the process of credit granting based on ratio has faced greater tension in its application than what would have happened in a normal economic cycle, modifying the scenario of the financing decisions of the companies. The significant cyclical dependence on this instrument (as occurs for the current internal rating systems) strongly influences the nature and intensity of the relationship created between bank and company. The diffusion of the rating has had a negative impact on the principle macroeconomic variables, such as gross domestic product, investments, consumption, employment, credit, and on elements which are found at the base of company activity, such as production, turnover, orders and payments. With time, the functions of models have been better defined, which interest regulatory aspects (determination of bank capital), management aspects (credit processes), and accounting aspects. The revolution has made the model builders' work more delicate and has increased the possible areas of inadequacy of the instrument, for use and function. It is possible to affirm, therefore, that the relatively young age of said system and of the processes which used it have contributed to worsen the crisis itself. Additionally, in this context, the deep fracture which is occurring in competitive industrial dynamics must be considered, as they modify critical success and sustainability factors of the companies' financial structures.

In order to consolidate the positive innovation introduced by rating, it is necessary to redesign the rating philosophy in line with the recent revision of the Basel Agreement (Basel III). After surpassing critical elements and the definition of limits and the usage potential, it will be possible to define rating as a necessary instrument to redesign the bank-company relationship to favor the content in the long term of the relationship and to help the SMEs get closer to the capital market. As shown in scientific studies, it is necessary to emphasize the role of intangibles in the construction of rating models for SMEs. The statistical models, founded solely on quantitative data, increase the gap of knowledge between the SMEs and the financial markets, creating phenomena of adverse credit selection (Bester and Hellwig, 1987). It is thought that the scarce importance assigned to the company's intangible patrimony is able to impede the banking system from having a reliable estimate on potential SME growth. In such a context, the banking system is asked, as otherwise it may not survive, for a greater effort in evaluating the prospects of the growth of the SMEs, considering the immaterial resources such as

the measurement of the company's capacity to reach goals regarding the creation of value. It is understood how, in this scenario, it is necessary to have technical and organizational improvement in the rating system in order to make it as functional and significant as possible. The objective of said improvement, pushed by an economic system which needs more and more articulated methodologies, is to define rating as an irreversible management instrument. Fundamental points in this "revolution" are company finance, public finance and the sustainability of family incomes.

At the end of the eighties, before the dawn of Basel I, one of the reports from Centrale dei Bilanci (1989) analyzed an econometric function able to explain the intermediaries' behavior in practicing credit pricing and guiding provisions policies. Despite the limited availability of data, this estimate was considered valid and efficient. There were two variables considered: the economic size of the counterpart (company) and the credit distress on the entire banking system. The result of such an evaluation is not very surprising. In fact, in the case of a large counterpart (company), the significant availability of public information allowed the sharing of decision-making burden (connected to the information) on overdrafts of a larger size and, therefore, with a lower (and more efficient) cost per unit. The same evaluation, given the opacity and the precariousness of industrial and productive perspectives, was not possible for small-sized companies. On the contrary, the relationship with credit distress was easily understood, as the intermediaries shared the credit cost in a mutualist manner, that is, ex post on all subjects which enjoyed the credit itself. This scenario, ten years later than the previously described relationship, was completely different. An investigation in 2002, carried out by the Bank of Italy (Banca d'Italia, 2002), defined a relationship between the counterpart's risk (taken from the score system elaborated by the supervisory authority) and the rates used according to the statistics of the Centrale Rischi stating that the first variable considered in the determination of credit cost was the counterpart's risk. In this manner, the approach based on considerations of mutualistic sharing or manufacturing costs of credit has been set aside. From that investigation to today, the situation has not changed: it can be affirmed that the main variable which influences the determination of the credit cost is represented by the counterpart's risk. With the introduction of Basel II, which enabled the adoption of internal rating models, the pricing has gone from a logic of negotiation per transaction (bottom up) to a logic of profit or loss for the bank (top down) as pricing activity focused on

the risk-return profile of the specific jobs, in line with the market situation and trade policies of the bank. Subsequently, Basel III required banks to take a series of measures that constrain management operation and freedom of action in terms of loans to customers. The introduction of the liquidity buffer, the global recession and the trend toward stagnation of industrial production have significantly increased the sensitivity of the companies at the cost of bank credit borrowers. Customers with a low rating (best customers) have managed to tick better rates, taking advantage of the multi-banking approach and increasing competition between banks. Customers with a high rating (riskier) have increasingly received rates not profitable due to the increasing probability of default and non-recoverability of credit (Ranzieri, 2014). In fact, today, if a bank used the manufacturing or mutualistic approach as an exclusive criterion, it would inevitably leave the market.

An important wild card is that of understanding whether pricing coherent with the borrower's risk is a valid principle to guide the credit relationship. Initially, one can only agree since, if there is coherence between risk and credit price, the company, considering the other production factors, will draw the due conclusions. This will bring about a rational formation of internal costs, both financial and real, and therefore of values, underlining the implications of the choices of financial structure with which to carry out production. It is not to be forgotten that the internal cost of funding is the decisional matrix of investment choices, and therefore of long-term competitive positioning. Coherent choices, therefore, in the medium term insist on a greater sustainability of the companies' financial structure as long as the measurement is correct and is itself coherent with the temporal horizon of the relationship with funders.

As of today, rating systems have gone past the phase of diffusion and gone through the phase of operational maturity, reaching their full insertion amongst the instruments of ordinary management. Twenty years have passed since the initial usage, ten years since the consultation on the adoption for regulatory uses with the formal definition of internal rating system (BCBS, 1999). In this context, the financial system has undergone important modifications and innovations, and the banks, pushed by management and regulatory importance, have adopted these new instruments of credit risk evaluation. The bank groups, enriched in their universal or poly-functional character, have become the key players of the market. Commercial banks associate ordinary credit activity with those of the medium term accompanying, at times, industrial participation activities in the form of private equity or venture capital. Therefore,

rating has represented as a formidable instrument for risk measures and the credit processes amongst the different components of the groups (Maino, 2012).

After the severe financial crisis which began in 2007, the credit granting model, based on rating systems, was the object of significant discussion. The aspects at the base of the cyclical dependence of this model have not yet been fully analyzed and it is thought that these can negatively influence the relationships between banks and companies. The bank-company relationship, today, can be considered a relationship of strategic interaction. The behavior of the subjects is conditioned by assessments of convenience and by productive and cost structures but, above all, by the actions of the other member of the relationship, exposing itself to the uncertainty which comes from how the other party decides to behave. This means that each action depends on the behavior adopted by the counterpart.

The bank-company relationship is differentiated based on the contents, length and manners of interaction. In scientific studies, the existing financial exchange between an intermediary and a company is defined as relational if it is founded on a lengthy duration, on the existences of a certain degree of exclusivity and on the existence of a reciprocal commitment which allows both to reap common advantages (Baglioni, 1992). The relationship is born from the repetition of exchanges and the creation of a long-term credit relationship which reduces the possibility of formal contracts and is based on the incentive compatibility of implicit agreements and on the existence of reputational mechanisms (Sharpe, 1990). The term commitment cannot easily be translated with the term "involvement", "obligation" or "encumbrance". It is considered that the term commitment holds the propensity to not behave opportunistically, contradictorily or differently as compared to initial agreements, expressed intentions and goals considered shared.

In conclusion, the socio-economic environment in which the historical-cultural evolution of the banking and entrepreneurial system takes place significantly influences the relationship created between bank and company. Banks and companies must be considered representatives of a greater competitive-relational network which produces effects on behavior, on the possibilities of behavior and on the evaluations made by individual parties (Mattson, 1987). From this it can be seen how this relationship depends, strongly, on the positioning of single bodies within its network and on the characteristics of the latter.

7.2 The bank

The bank-firm relationship, which means the relationship is created by the interaction of intermediaries with the company, went through three evolutionary phases in which the concept of capital has been interpreted in very different ways (Caselli, 2014): the historical pattern of bank institution in which dominates the centrality of credit and spontaneous relationship; the universal bank model (hausbank) in which the multi-directional is the pivot of the business relationship; and the model of the bank in which divisional segmentation and management at the corporate level of customer relations are the operational lines. This relationship is going toward a fourth stage where, behind the big rush to capital induced by the new banking regulation, it is necessary to rethink intensely the strategic model and confront the major challenges of the market regardless of the institutional and commercial model chosen.

The bank-firm relationship is necessary in order to carry out financial exchange and has a different value according to the characteristics which distinguish the financial system, the economic system and, above all, the

Table 7.1 Evolutionary phases of the bank–firm relationship

Years	Banking model	Highlights
1970–1980	• Institutional Bank	• Public capital • Tight regulation • Local clientele • Human experience
1990	• Universal Bank	• Banking IPO • Liberalism • New targets customer • Intense knowledge • M & A
2000	• Divisional Bank	• Efficiency • Technology low • Market segmentation • Huge database • Internal rating
2010	• Not yet identified	• Low capital • Ad hoc regulation • Customers redemption • Hard and soft into management • Advanced internal rating

Source: adapted from Caselli (2014).

financial exchange. The latter, according to economic theory, is defined as a company which, in carry out its typical activity, develops specific experience in the evaluation of creditworthiness and the management of credit lines. This allows it to carry out an almost singular role in the selection and allocation of resources on the credit market. However, its role is not limited to the transfer of financial resources, generally long-term, but also regards the management of related risk. Therefore, the bank is exposed to credit risk, that is, the risk that the borrower is in default or, in the worst case scenario, insolvent. Such a risk is measured with methodologies which are part of the evaluation criteria of overdraft limits. Instead, regarding the analysis of the creditworthiness of the clientele, the bank needs a lot of information which is generally confidential, accessible only after the creation of a trusting relationship with the company under examination. During the credit limit granting phase and in future monitoring, the information collected is of two types: quantitative, aiming to investigate the economic, financial and patrimony solidity (current and prospective) of the asker, and qualitative, regarding the capacity of management, the company organization, the competitive position of the company and the possible prospects of the development of the sector (De Vincentis, 2006).

The creation of such a relationship determines benefits not only for the bank but also for the company, which can obtain a stabilization of the financing cost, that is, obtain financing at lower rates. Therefore, the existence of intermediaries is justified by their greater efficiency in governing financial exchanges, in the presence of heterogeneous information and other market imperfections. The bank-company relationship is necessary in order to develop financial exchanges, minimizing the cost as compared to other possible forms of government (efficiency of the exchange). The introduction of the Basel II Agreement has brought about numerous benefits, mainly regarding the analysis of risk-performance, the push of investments in innovation and research, the reinforcement of the bank-company relationship and greater transparency in the credit market. Despite these benefits, such regulations present numerous criticalities regarding procyclicality and assessive dependence on rating techniques. For this reason, after the recent financial crisis brought to light all of these defects, another revision of the agreement was planned.

The revision of the agreement occurred with the introduction of Basel III, that is, a new surveillance scheme which essentially foresees the improvement of the quality of regulatory capital (so that the banks are more capable of absorbing losses), the increase of minimal patrimonial

requirements, the introduction of anti-cyclical measures (in order to provide for patrimonial resources during the expansive phases of the economic cycle, to draw on them in periods of economic crisis and/or financial market stress), the increase of the range of risks considered, the introduction of a leverage index (which impedes bank activity in disequilibrated conditions between equity capital and debt capital) and two minimum standards of liquidity, the improvement of standards for the prudential control process and public disclosure (Ruozi, 2011). With such a revision, the banks are conditioned by a higher need for capital, by stricter rules, by less financial leverage, by greater transparency and by constraints necessary to soften the cyclicality of the choices and financial behavior (Draghi, 2009; BCBS, 2010; Kodres and Narain, 2010).

It is a group of regulations which should reduce the probability that a financial crisis happens again, understood as that which characterized the 2007–2009 period, whose consequences have not yet ended. Basel III is a new system of supervision of banks that will produce important effects on banking. With its introduction, different processes will suffer a significant impact: granting credit, risk management, planning and allocation of capital, governance. The adoption of the metric of Basel III (as happened with Basel II) will not be immune from costs and find resistance in the organizational structure of the bank for the following reasons: the requirements of Basel III are not always understood by the departments involved and are neutral to market conditions and competition, the risk is primarily managed with techniques of the portfolio and the theoretical price of the loan to be applied to the customer can be particularly different from the one in use.

For these reasons, banks have to face massive investments to adapt their organizations, data collection systems, and transmission and checking of company data, in order to adapt to the new regulations. These new rules will affect in an important way the decisions that the banks have to make to redefine their operational framework and their positioning in the market. The capital content per unit of bank product will increase, and the capital itself will have a higher cost/opportunity; the most risky environment will absorb greater capital shares per reporting unit (client, product, activity). The revenue will be based on more traditional intermediation activities. In this frame, the competitive terrain almost necessarily moves from activities and products to the relationship and the defense of the clientele base. The business model will inevitably be subject to reconsideration (Tumpel-Gugerell, 2009). Service levels and competence will be distinguishing criteria; credit selection will have an essential role in industrial dynamics of the entire economy.

In this framework, it will be necessary to think not only to the strengthening of the capital, but also to new ways of interactions with firms and customers in general, which are the relational capital of the bank. The theme of the relational capital must be properly treated equally with respect to relevant issues to avoid dangerous misunderstandings and overlapping (Caselli, 2014): the debate, often ideological and specious, between transaction and relationship banking; the social responsibility of the bank; and the issues of the bank's reputation and of localism. Compared to these issues, relational capital is broader and is based on the quality and extent of relations with the external system along three essential pillars such as reliability, competence and fairness. The role of relational capital becomes crucial in the early stages of change, of historical discontinuity and crisis, in which the bank increases its economic and social responsibility and its service role to the system (Onado, 2009).

The introduction of Basel III will represent a complete cultural revolution; the banks will have to aim toward an improvement in the long-term relationship content. The crisis will be left behind with a greater knowledge of strategic and financial goals at the base of the bank-company relationship. The funder will no longer only have to assist the client, but will also have to put in greater effort to reach the final result. This means that the bank must not only fulfill a role as a qualified supplier of financial resources, but traveling companion in the growth (or defense) of enterprises and therefore the economic system. Rating, therefore, will have to measure itself with this new practical context. The bank will have to carefully evaluate the elements of long-term competitiveness of the counterpart in examination, in order to create a stable relationship with the clientele, and measure the portfolio risk from a medium-term point of view (Maino, 2012).

The financial crisis had a dual impact on credit management. On one hand the banking system decreased financing to SMEs; on the other, companies which insured credit reduced their operation (Grasso, 2010). In Italy in January 2015, the dynamics of loans to non-financial companies amounted to –2.8 percent (–2.3 percent the previous month, down 5.9 percent in November 2013, the more negative value). However, with regard to the new loans, loans to businesses grew in terms of cumulative value in the quarter November 2014 to January 2015, an increase over the corresponding period of the previous year by about 4 percent. Today, the companies are called to take charge of the financial risk associated with credit portfolios, a risk which used to be taken on by credit insurance. For companies, therefore, it is necessary that they equip themselves

with internal risk evaluation and monitoring systems (rating models), management systems and the integration of internal and external information regarding the client, useful for risk monitoring.

In conclusion, the introduction of the rating system requires significant changes in the qualitative management of data, of the information system and the entire organizational structure for the bank, affecting operational mechanisms of the overdraft limits and of the competences of the structures which take care, in different ways, of credit risk. This will have effects on the manners of interaction with the clientele and the market positioning of the bank itself (Pogliaghi and Vandali, 2004). After the Basel Reform, the banks will be obligated to measure credit risk, and the companies will have to face an explicit risk judgement attributed to them, knowing that the conditions of money taken on loan will depend on the judgement of the bank (Minetti, 2005). It is evident how the company managers have to face the problem of the new structure in order to have relationships with the credit market.

7.3 The firm

The crisis was particularly deep, producing a strong impact on the economic and financial system and redrawing the boundaries of the credit environment. The new market environment is characterized by a decrease in corporate loans, the reduction in the profitability of the segment and, especially, the deterioration of credit quality.

As a result of the continuing crisis, the risk of lending in Italy increased further. Gross net performing losses in January 2015 amounted to almost 186 billion euro, with a report on bank lending of 9.7 percent, up from 8.4 percent a year earlier. Compared to the pre-crisis period, worsening for smaller companies was more marked: from December 2007 to January 2015 the report in question has more than tripled in the whole of the private sector (from 3.3 percent to 11.3 percent) and more than quadrupled for non-financial firms (from 3.6 percent to 16.3 percent).

The gradual and steady deterioration in credit quality is powered by the irregularity of payments of enterprises, the growing number of bankruptcies and the length of procedures for debt collection. According to data of Cerved Group, the percentage of Italian companies that pay their own bills overdue (over 60 days) reached its peak in 2012 with a value of 10.8 percent. The number of business bankruptcies is continuing to increase: in 2014 more than 15,000 businesses have opened bankruptcy proceedings, an increase of 10.7 percent compared to 2013. Finally, the high level of bad debts is also determined by the length of recovery

procedures. Latest figures show that in 2012 the average duration of bankruptcy proceedings amounted to an average of seven years, while the average length of proceedings of estate executions was 3 years and 5 months. Early signs of improvement, however, are manifesting. Cyclical indicators point to a moderate recovery in economic activity due to the actions undertaken at national and transnational levels to promote the improvement of competitiveness and economic growth. The positive momentum resulting from the recovery of industrial activity should gradually be extended to services as envisaged by the recent trend of qualitative indicators on the confidence of businesses and households.

Firms must focus on the future in order to compete through the right strategies and patterns of long-term transformation of their business model. The role of entrepreneurs in redefining their vision to lenders will be crucial. Reviewing the cost opportunity of financial resources, redefining the financial structure and the composition of the sources and creating a system of strategic and financial alliances are some of the actions that the company should put in place to benefit from the effects of the recovery. In this context, the rating should not be an additional cost to the company, but a way to reflect on their own industrial design even before the financial one. The rating is a focal point for the future of enterprises and the national economy. Firms should not only think to survive, but also to provide a roadmap on how to choose their area of business and their production and market position.

Faced with the crisis, the companies reacted violently, carrying out full organizational, productive, commercial and financial restructuring (Ruozi, 2011). Particular attention was paid to cost reduction; the companies which surpassed this phase now find themselves in a privileged position on the markets. The crisis, therefore, represented an opportunity for companies.

Within the European industry, Italy presents itself as a country with a slightly diversified productive structure in which there are large industries with their small and minute companies and a multitude of firms of smaller sizes. In several sectors, the industry of small and medium companies has reached positions of excellence, contributing to the economic and social development of the country (Minetti, 2005). The reduction of the size of companies, as the Governor of the Bank of Italy has often underlined, is a trend which began in the 1970s but which today is more marked and is accompanied by elements of a crisis of Italian capitalism, limiting "the increase in productivity, research, the development of innovative and technologically advanced products, the conquest of new markets" (Fazio, 2004).

Financing modalities for small and medium Italian companies, as to their financial profile, are essentially two: self-financing or resorting to bank credit, especially in the short term. In this context, the small-medium companies attribute greater importance to the use of internal sources. The entrepreneurs' inclination to invest cash flow generated by routine management is strong, while they introduce new resources with less facility, beyond the quota originally produced, increasing their commitment in terms of risk capital. This means that entrepreneurs are inclined to "conserve" capital to then use it as a guarantee for bank financing, which represents strong support for small and medium companies.

This scenario is not exclusive to the Italian panorama. The companies' financing choices can be traced back to a decision-making model of selection of financing sources based on rigid priorities (pecking order theory). The courses of company development resort mainly to internally generated funds; secondly, the companies resort to indebtedness and only then, having exhausted the possibility to contract debt or its hybrid forms, the companies decide to turn to the market to collect risk capital (Myers, 1994). The study was carried out through the observation of those financial contexts which had a central role in the development of the economy, above all in Great Britain and the United States.

Small companies, in order to carry out their activity, need, therefore, to undertake a privileged relationship with the bank to have access to financing at costs which are adequate to their possibilities. The creation of this relationship allows the small-medium company to access the capital market. In fact, if large companies have the possibility to act freely on financial markets, and directly access financing opportunities, the smaller ones must necessarily refer to the financial market in a mediated manner. The granting of financing to a company depends directly on the evaluation of investment projects it takes on and, above all, on the calculation of the probability that in certain situations the debt may not be repaid. Variables which influence the dynamics of the credit relationship are the size of the companies, mortality rates, life cycles, client portfolio, the degree of managerial sophistication, the composition of the economic entity, the geographic location, their financial structure, the aspects which characterize the sectors, the legal forms of the company, the proprietary aspects and all the company's characteristics. Many theoretical/empirical studies have aimed to highlight the advantages and disadvantages which derive from the creation of a bank-company relationship. In these studies, the expectations of the participants were the main topic of evaluation, regarding exchange and the

functions attributed to it. As for the company, it hopes to be granted a quantity of credit to support its needs, with adequate scheduling for its goals and at contained costs with bank intervention in the case of financial stress and monetary shocks which could negatively influence the outcome of company plans.

The principal motivation which pushes the granting of credit, since the company autonomously manages its own business, is the ability to produce revenue. The company is able to strengthen itself in terms of patrimony, to reduce the risk of crisis and to refinance liabilities, for which financial capability is decisive in that credit reimbursement depends on the debtor's liquidity. Lastly, the company patrimony is the first guarantee for credit exposure and allows, at least, reducing the burden of the recuperation of credit in difficulty and which is not punctually reimbursed.

In this context there is the rating system which is adopted by the banks each time a company intends to access financing. In fact, each company will receive a rating value which aims to define the characteristics of credit granting, will condition the pricing policies of credit institutions and will influence the company's economic accounts. The adoption of this system by the banks, besides permitting the differentiation between debtors of higher quality and those with worse solvency, should encourage companies to pay greater attention to strategic and financial planning processes. In this way, companies will not passively submit to the rating judgement and will therefore be able to access credit in the most favorable manner. In fact, the rating culture will be advantageous for those companies which will have learned to identify, analyze and evaluate their own risk factors, inherent to their sectors and to the competitive environment of reference, and to determine their own strong points and opportunities to create or take advantage of, as well as weak points and threats to face.

Not of lesser importance is the acquisition, by the companies, of management instruments such as the financial statements, which aim to push management to keep financial performance under control.

In conclusion, so that companies do not undergo an empirical evaluation on behalf of the banks, it is necessary that they acquire a better perception of their position regarding each element evaluated by the bank for the rating assignment. It could be useful to introduce self-evaluation systems in order to define the ability to produce revenue and positive financial cash flow, the level of indebtedness and the ability to make accurate financial forecasts. The aim of these systems could be that of verifying, through time, the evolution of their own conditions

of economic, patrimonial and financial equilibrium. In this way, it is hoped that each company builds an operational system which collects, processes and represents the information and data to be communicated to the banks for the assignment of a correct rating. For example, in reference two small and medium companies, it has been observed that the information flows transmitted externally are scarce, incomplete and fragmented. This attitude of scarce economic-financial communication takes on a negative relevance when the banks cannot adequately evaluate the risk connected to the company's financing operation and are forced to assign interest rates which are higher than average and require forms of external guarantee for the credit line.

From this point of view there is the need to establish an adequate information flow of an economic and financial nature, necessary in order to set up a relationship between the company and those who generate credit and risk capital on solid and lasting foundations. The most effective communication and greater transparency in the exchange of information improves the process of managing and monitoring credit and fosters the adoption of more virtuous behavior. Rethinking the relationship between business and the bank is a strategic issue for both parties involved: on the one hand, companies must strive to redefine the funding policies in order to decrease the dependence on bank credit which is often not adequate to the real needs of the company; on the other, the financial industry must support the production system in access to capital markets and in helping to identify new forms of capitalization.

8
Rating and Corporate Finance: Implications and Opportunities

8.1 Rating and financial management in a changing world

Corporate finance is the entirety of activities, processes and models which sets out to identify the economic and financial sustainability of corporate management, to find the correct forms of coverage and to carefully manage cash flow and risks of a financial nature.

In large companies, the financial function has held an important role in organizational structure: more and more frequently the financial director is called to carry out general managerial roles. In smaller companies, the role of finance is blurrier, sometimes taking on marginal specificity. However, the changes produced by the crisis which began in 2007 mark the introduction of new models of evaluation of business risk, requiring a transformation of the role and specific importance of company finance. The company which has a vast array of products of services and strong competences available struggles to operate successfully if its activity is not supported by a forward-looking financing policy. The search for financing sources can no longer be considered an extemporaneous activity, but must find support in procedures and models which can accurately estimate the quality and quantity of financial needs and show financial backers the destination of sources and correct debt servicing.

As Modina stated (2012) three important changes have affected the financial world in the last decades (Turner et al., 2010): (1) the increased importance of financial intermediation as compared to real intermediation; (2) the greater complexity of financial products and services, in particular those connected to derivative instruments; (3) the introduction of more sophisticated models for risk management, amongst which

the use, in banks, of internal rating systems and statistical techniques for the evaluation of credit risk.

It was generally thought that the entirety of the aforementioned action would have improved the overall efficiency and effectiveness of the financial system, creating, on the whole, greater value for all and reducing risks. The reality of the situation greatly weakened said belief.

This is also true for rating, whose introduction received strong criticism. For example, companies think that its application has made access to credit more difficult, weakening the historic relationship between the entrepreneurial system and the banking system. At a macroeconomic level, rating is held responsible for having increased the phenomenon of procyclicality that is the worsening of the effects produced by the crisis. Hiding the fact that rating systems are not perfect is an error. Their development and their application showed limits and criticality which have been described in depth in the previous chapters. This, however, does not mean that rating is technically weak (considering the great investments made by the banks), nor that the direction toward which it is moving (making the evaluation and the management of credit risk more sophisticated) is wrong. This is not the time for the uncritical abandonment or refusal of the innate approach to rating. It is, though, necessary to understand the instrument, understand its weaknesses and carry out the opportune interventions for improvement if its potential use is not to be lost.

Recognizing the distinctive features of rating is, in fact, fundamental in order to understand its reflection on company financial management and on the relationship between companies and financial markets (not only those regarding credit). Until today, company experts have somewhat neglected the impact of rating, either considering it as a phenomenon which is only the concern of specialists or considering its introduction to the economy and to company management as neutral.

This chapter makes these considerations in order to reach some conclusions regarding the relationship between rating and corporate finance choices:

- There is strong evidence regarding the relationship between the financial weakness of the company and its probability of default; the higher the stock of debt, the greater the occurrence of financial burden on the operating result, the higher the risk that the company can enter into a crisis phase. At the same time, great indebtedness lessens the investment capacity of the company, restricting its future income and competitive performance. The patrimonial imbalance

tends to worsen ratings with negative consequences on the operational and financial management of the company. This is especially true for small and medium-sized companies, known for the imbalance toward bank debt.

- Rating introduces important new elements which need to be investigated appropriately. The use, in banks, of internal rating systems is one of the main innovations which regard the credit intermediation sector. Rating models have a strong impact on capital adequacy, on credit policy, on company organization, on pricing choices, on the relationship between the bank and the company and on the manner in which the latter is financed. Said effects cannot be ignored by any of the involved actors. Understanding the founding principles and mechanisms of rating, introducing incentives for the correct application and the transparent communication of the ratings constitute obligatory steps in order to make this instrument functional.
- The financing function, in general, and the financing decisions, in particular, cannot continue to play a marginal role. While recognizing their ancillary character compared to other company functions, company finance must become the platform supporting entrepreneurial choices. A company which has created a good strategy and which is able to carry it out correctly risks losing competitiveness if it goes without a robust financing policy. The revision of the liability structure, the search for the best combination of sources and the allocation of new governmental structures are some key activities without which the path to recovery and to the revitalization of Italian companies will not easily begin.
- If correctly understood, rating gives relief to company finance because it pushes the company to initiate more virtuous behavior and to increase external financing options available which are, today, limited to banking channels. In such a setting, the contribution is twofold. On one hand, rating favors the introduction of new forms of financing (for example, mini-corporate bonds and hybrid instruments of capitalization); on the other, it allows access to the capital market both directly and indirectly. In both cases, the expression of a rating judgment which incorporates the capacity of evaluation of the bank and its reputation capital becomes an effective measure to understand the risk contained within (a single security issued by the company or a tranche of securitized portfolios).

In order to clarify the above points, the chapter is structured as follows: the second section describes small and medium-sized Italian companies

and the third section covers the creation of value via rating, while the final section describes the impact of rating on the financing choices of the company.

8.2 Financing behavior of SMEs

The aim of this section is to describe the financing characteristics and behavior of companies, with particular attention to small- and medium-sized Italian firms.

The premise is that classifying the financial approach of the SMEs in just one category is not an easy task because they make up a heterogeneous group. Each company is different from the rest. Size, governmental and organizational structure change, as do the capacity to compete and innovate, as well as belonging to market niches or different phases of the life cycle. Consequentially, financial behavior varies and makes it difficult to find a solution to the financial structure puzzle despite the fact there are numerous scientific contributions dedicated to this issue.

Despite the differences, it is however possible to identify some common traits in the financing policy of smaller-sized companies. As highlighted in Modina's work (2010), the distinguishing feature of the financing policy of the SMEs is the intense bank borrowing, especially in the short term. This is particularly true for Italian SMEs whose liability structure, compared to homologous European companies, is less articulated and tends more toward current liabilities of a banking nature.

The reasons which explain a similar approach are several: the family business model, the lack of financing options and informational clarity.

As to the connection between type of financing and governmental model, bank borrowing can be explained through the ownership structure of the company (Stiglitz and Weiss, 1981). Family-run businesses prefer a financing structure which leans toward debt in order to maintain corporate control and, therefore, limit the entrance of third parties in shareholding group (Shleifer and Vishny, 1997; Mishra and McConaughy, 1999).

In terms of the Italian context, the Italian industrial economic fabric shows a strong concentration of property in the hands of the entrepreneur: almost 90 percent of the companies are property of natural persons. Such a phenomenon is more evident in small companies and in more traditional economic sectors, where the family-run characteristic goes hand in hand with the substantial connection between ownership and management of the company. The desire to keep the ownership

structure closed determines the greater trend toward bank financing (often supported by collateral guarantees issued by the owning family), the modest use of the capital market and the prevalence of unmodified rules of government which become an (intentional) inhibitor of growth (Accornero, 1999).

The entrepreneur-manager's wariness toward operations which could dilute the power of control (the issue of shares) or require a market discipline (bond issuance) limit, in fact, financing options to self-financing, to the owning family's funds and to bank debt. Once the debt becomes saturated and the capacity of the operational management to generate cash flow subsides, the company has difficulty in finding new financial resources for investments and, therefore, limits its growth.

A third element which explains the financial behavior of the SMEs is the more contained disclosure as compared with larger companies. The financial backer's difficulty in collecting information on smaller companies, together with the cost of its collection, makes the set of information available smaller and makes it more difficult to understand the quality of the company and its investments. This determines the presence of information asymmetry which pushes financial backers to less willingly give money to SMEs. The consequence is that the number of financing channels is lower, as the possibilities of arbitrage are more limited as compared to larger and less insignificant companies which, being able to better resort to the capital market in which information-sensitive shares and bonds show less dependence on bank debt.

The fundamental characteristics of the financing methods of Italian companies are confirmed in the empirical evidence regarding the composition of SMEs' liabilities.

Studies by Guiso (2003), Castelli and Modina (2010) and Unicredit (2011) highlight the prevalence of foreign financing in Italian companies, mainly based on bank debt, while the resort to financing instruments which are complementary to those supplied by banking channels is low. The analyses carried out, which benefit from the comparison with companies in other European countries, highlight that Italian companies mainly resort to foreign financing, the main source is bank debt with a disequilibrium tending toward short-term loan accounts; although the medium-long term debt component weighs greatly on the liabilities, the effect on bonds is irrelevant.

The segmentation into size class does not highlight specific differences in the structure of capital. The principal distinctive element is that larger companies show a greater opening toward medium-long term bank debt and toward the issuing of debt securities.

In terms of a dynamic reading of the aggregates, the Unicredit study (2011) shows that in the last year considered (2009), the use of foreign financing sources increased. The raising of funds was mainly motivated by liquidity reasons which appeared due to a decrease in the generation of operating cash flow (a reduction in return, the lengthening of the date of collection). In a significant number of cases, self-sufficiency has made debt restructuring or rescheduling necessary. Bank borrowing has increased, both in long and medium terms, and in the non-banking financial services sector, while the emission of shares has continued to be marginal: only 12 percent of Italian companies have resorted to said option in 2009, as compared to 29.6 percent of French companies and 33.7 percent of German companies. In the Italian company panel, only the larger ones have shown greater dynamism in the use of financial instruments.

On the whole, Italian companies have continued to pursue traditional financing policies which are based on more common technical forms.

Dependence on bank debt does not seem to favor a close relationship with a reference bank. From the European comparison, it can be observed that Italian companies operate with a greater number of banks (phenomenon of several lines of credit) and have a lower proportion of debt with their principal bank. If, in Europe, companies have an average number of relationships with three banks and the value of the proportion of debt with the reference bank is that of 58.3 percent, in Italy this number increases to four and the proportion of debt decreases to 46.1 percent.

Cross-referencing the two dimensions (number of relationships, proportion of debt with the principal bank), it is shown that the intensity of the relationship with the bank is lower in Italy and Spain as compared to the other five countries in the study (the UK, Germany, France, Austria, Hungary). In Italy, relationship banking does not seem to show itself so fully (Bongini et al., 2009; Modina, 2010).

Finally, the selection criteria of the bank show that Italian companies prefer the competitiveness of services (69.9 percent), transparency (49.9 percent) and flexibility (42.3 percent). Such factors tend to have particular importance in the more severe economic phases when access to credit becomes less easy, both in terms of lending volume granted and in terms of conditions applied.

During a period of crisis, the imbalance tending toward debt produces negative effects on the capacity of supplying funding, on growth rates and on the competitive capacity of the company. The negative effects on company growth come about because elevated quantities of debt

weaken the structural equilibrium of the company; external events such as the adoption, by the banking system, of restrictive credit policies, can cause a negative impact on the solidity and liquidity of the indebted companies. Companies with a more equilibrated capital structure collect money more easily in adverse market conditions, thanks to greater financial flexibility.

The consequences of capital imbalance on the competitive capacity of the company are twofold. On one hand, the weight of the debt can bring about difficulties in covering financial burdens (when the capacity of the company's revenue decreases due to a drop in revenue or when it increases due to interest rates for their tightening) and in debt service (when the capacity of the management characterized by the generation of cash flow decreases). On the other hand, the use of more traditional forms of debt does not require company use of forecasting competence or instruments (i.e. business plans, financing plans), relegating money management to the fulfillment of temporary needs. Both of these aspects are intercepted by rating systems which, other things being equal, move toward less favorable judgments with the company's consequential increase in difficulty to acquire funds through banking channels.

Understanding the characteristic features of rating, its potential and its limit of use is important in order to grasp the repercussions on financing decisions and on the relationship between the bank and the company, and to contribute to the identification of necessary corrective measures in order to make the instrument usable.

8.3 Rating, capital structure and the creation of value

In the definition of the optimal structure of capital, rating represents a significant development, which is still not fully explained by tradition theoretical and empirical studies on the company's financing choices. The hypothesis of a relationship between rating and capital structure contributes to extending the assumptions of traditional theories regarding company financing, introducing rating amongst the variables examined until now (asymmetric information, taxes, bankruptcy and institutional costs).

With reference to the pecking order theory, which indicates in the hierarchical order self-financing – debt – net capital, the choice of financing options, the costs associated to the rating can push the company to issue shares to avoid a possible downgrade, just like benefits connected to a possible upgrade favor the collection of one's own means despite the greater cost. What follows is a change in financing choices as compared

to that which is indicated by theory: the use of net capital precedes the use of debt due to the rating impact. At the same time, the costs associated with a change in rating determine a capital structure which is different than the optimal one hypothesized by the tradeoff theory which is obtained when the fiscal benefits of the debt are offset by the costs of insolvency. For example, a company which fears a worsening of its rating and does not want to support the costs could decide to keep a lower level of debt compared to that which allows the maximization of the fiscal advantages of the debt. The choice of a sub-optimal debt policy is motivated by the fear of being assigned a less favorable rating judgement.

On the whole, the existence of a relationship between rating and capital structure increases the assumptions of the traditional theories offering, in perspective, new starting points for the analysis of the company's financial choices. The causal relationship can go through the mechanism of the rational formation of the cost of credit. A better informed lender (through the rating) on the counterpart's credit quality assigns a different pricing than that defined in the hypothesis of irrelevance of the capital structure (Modigliani-Miller model) influencing, consequentially, the company's capital cost and investment preferences (Maino, 2003).

Kisgen's studies (2006, 2009) highlight how the company's financing policy is conditioned by the assignment of a rating judgment: the companies which are about to undergo an improvement or a worsening of the rating make more conservative financing decisions than ordinary ones. In particular, the company which finds itself at the edges of a rating class tends to reduce the leverage as compared to companies in the middle of the range to avoid downgrading or favor the shift to a better class. Since the rating has weight in financing choices, the company is cautious in modifying capital structure when it fears unfavorable rating variation just like, in the case of downgrading, it tends to reduce the level of debt to favor a return to a higher class. For Kisgen, the relationship between rating and capital structure is due to specific costs and benefits which are shown in the presence of belonging to different classes of creditworthiness. The costs and benefits of the rating are mainly connected to the investment choices of financial intermediaries, often regulated by ratings assigned to the issuers and the signaling function which the rating exerts on the capital market. Belonging to a certain rating class is associated with benefits and costs which, depending on their equilibrium, produce an impact on the cost of capital and on the way financing sources are collected.

The introduction of the rating is an element which further complicates the tightrope walking which the financial manager carries out on his search for the ideal mix of financing, able to contribute to the creation of value. Is the company's aim to obtain the best rating in order to minimize the capital cost or fix a rating target and estimate the corresponding capital structure?

For some, reaching the best rating class does not automatically mean the minimization of capital cost. The highest rating class can seem to be preferable, but in truth an AAA rating indicates that financial and operational risk of the company is low and, therefore, its default probability is minimal. The financial risk is marginal because, generally, the degree of indebtedness of companies with an AAA rating is modest, while the excellent operational risk profile can depend on the fact that the company invests in not very risky projects which reduce the volatility of economic performance. Therefore, the assignment of an AAA rating does not assure the reaching of the best possible performance by the company. It follows that the optimal rating for a company is not always the highest one. Since risk is a natural component of any activity, the rating should not be a goal unto itself, but should be functional to the main goal of maximizing company value.

The definition of the capital structure which contemplates, on one hand, a contribution to the creation of value and, on the other, the assignment of a rating investment grade requires respect for some guiding principles and the adoption of a structured approach.

Amongst the first, there are the minimization of capital cost, respect for financial clauses inserted in financing contracts, the maintenance of adequate financial flexibility and positive rating judgements even in the presence of unfavorable scenarios.

To guarantee that the above goals will be respected, the financial manager must follow a structured procedure in several phases (Table 8.1). The approach allows the designation of a financial structure based on the choices of strategic positioning of the company and its ability to generate cash flow based on realistic assumptions.

The first step is the determination of future financial need. Through planning, the company estimates the quantity and quality of the resources to be collected externally due to investments in working and fixed capital not covered by self-financing. Starting with a basic scenario (whose main assumptions regard the growth rate of revenue, the volatility of operational margins, the volume of investments in operating and fixed assets), the financial manager estimates the excess or the deficit of resources generated by the company's characteristic activity

Table 8.1 Steps for the determination of the optimal capital structure

Phase	***Description***
1. Estimate the future financial need (quantity and quality of the need)	Carry out careful and robust financial planning, paying attention to the determinants of cash flow and foresee different scenarios.
2. Fix the target credit rating	Fix the rating target within a range, with a desirable and minimum value, using sensitive indicators as a proxy, such as degree of indebtedness *(Equity debt)* and the capacity to service the debt *(Operational result on borrowing costs)*.
3. Determine the optimal level of debt	Verify the coherence of the structure identified with the economic cycle, the rating target and the key indicators used in the previous phase (2).
4. Implement functions which act to realize the optimal capital structure	Create an action plan which foresees: • modification to make on the capital structure to reach optimization (choice of financing instruments), • temporality and the sequencing of actions, • the type of approach to adopt with shareholders, lenders and the capital market.

Source: adapted from Goodhart et al. (2006).

over 3–5 years. Above all in the case of companies who have existed for a long time, it is preferable to accompany the prospective determination of need with simulations which aim to verify the impacts on cash flow due to the change in microeconomic variables (e.g. revenue growth, operating cycle) or macroeconomic ones (interest rates, inflation).

The next step consists in defining the rating class goal, paying attention to sensitive indicators such as the degree of indebtedness (debt/net capital) and the degree of coverage of financial burdens (operational result/financial burdens). For example, a company which presents stable operational margins could establish an ideal rating class between A and BBB to which a leverage of 1.5 corresponds (the debt is twice the net capital) and a degree of financial coverage of 4 (the operations result is equal to four times the sum of the financial burdens). The comparison with the sectorial data can be useful in ascertaining the relationship between a specific rating class and the value of the most significant financial indicators.

Once the target rating class is chosen, the next step foresees the definition of the optimal capital structure, which must be coherent with the values of the key indicators identified previously. As an example, one can hypothesize that the operational result of a certain company is equal to 1 million euros for the next year. Since the degree of financial coverage in order to maintain the rating of A/BBB must be equal to 4, it follows that the financial burdens must be equal to 250 thousand euros. Given an interest rate of 4 percent, the corresponding sum of company debt will be 6.25 million euros. Considering a financial reserve of 500 thousand euros, the optimal debt level will be equal to 5.75 million euros with a new capital of about 2.5 million euros. In order to ensure the reaching of the rating goal and the sufficient financial flexibility with the goal of maximizing value, it will then be necessary to verify that the leverage of 1.5 falls within the area which minimizes the average weighed cost of the capital. Whenever the value is found on the right level of the optimal level of debt, the financial manager will have to intervene, reducing the debt exposure to avoid a possible worsening of the rating and the consequent increase of capital cost. Vice versa, if the value is found on the left side, it will be possible to increase the degree of indebtedness, reducing the weight of net capital. Finally, it is necessary to verify the capacity of resistance of the structure identified if the market conditions worsen. To this regard, the analysis of the scenario allows to test whether or not the target level of debt allows the conservation of the rating judgment assignment desire and to maintain the capital cost within the area which minimizes its value.

The last step is made up of the implementation of actions necessary to modify the capital structure in order to reach its ideal composition. Said actions regard the choice of financing instruments, temporality and sequence of actions, and the type of approach to adopt on the capital market and regarding the shareholders (issue of stocks, policy of dividends, reacquisition of shares). In this phase, it is necessary to explore all financial options available at the lowest cost possible. At the same time, the financial manager has to define the policy of dividends and the possible reacquisition of shares which is compatible with the strategic and operational goals and with the maintenance of capital structure and the rating target. A company with a low level of indebtedness, moderate growth and stable cash flow could decide to modify the capital structure, increase the degree of distribution of the profits, foreseeing an extraordinary dividend or putting a plan for reacquisition of shares in place.

The adoption of a structured plan, which starts with the knowledge of financial need and reaches the definition of how to intervene, is a necessary requisite so that the definition of the ideal combination of sources contributes to the creation of value and supports company strategy. The definition of the optimal capital structure makes up a fundamental step in order to allow the company, of any size, to widen its horizons regarding financing policy, considering the hypotheses of the creation of value and rating impact.

8.4 The repercussions of rating on financing decisions

The use of rating systems by banks produces significant repercussions on the financial behavior of the company. This is especially valid for those of small and medium sizes.

Larger companies have already experimented rating innovations. Working more on the capital market, these have already incorporated the effects produced by the attribution of rating judgements into financing decisions (in this case those assigned to external agencies).

The introduction of rating, a guiding element of the credit policy and process of banks, make the number of companies subject to rating much larger and redesigns the relationship between those who lend and borrow funds. The transformation of the interaction between the bank and the company and the new elements of which rating is the bearer contribute to the modification of the nature and role of company financing. The choices regarding the optimal composition of financing sources are modified and propose more stringent constraints as to the determination of the quantity and quality of the debt.

The confirmation of what was previously stated is found in the results of a simulation carried out by us on a sample of Italian SMEs, based on a model with the following characteristics:

- The cost of share capital is fixed based on the unpredictability of the operating margins and the profits.
- The relationship between market value and book value of the shares (Price/Book Value) reflects the conditions for profitability and opportunities for growth of the issuer.
- The probability of default is estimated based on a rating mode and is a function of profitability, of the degree of indebtedness and the intensity of the capital invested.
- The cost of debt (expressed, in this case, by the bank rate) is calculated using a pricing function which is correct in terms of risk.

The combination of the actual cost of capital and the cost of debt determines the weighted average cost of the capital (WACC), a point of reference for the company in terms of the approval of investments to make and in terms of the verification of their capacity to create value. The results of the simulation, that is, the variation of the overall cost of the capital and the default probability, given certain leverage levels, are shown in Figure 8.1.

Observing this, it can be noted that with the increase of the leverage ratio from the effect of debt on the capital, the cost of the capital increases and the default probability takes on increasingly higher values (the line on the right axis). The behavior of the cost of debt differs. Following the traditional approach in accordance with Modigliani-Miller, the cost of debt remains unchanged as it is set by the market indistinguishably for all counterparts. Using, however, the classical theoretical approach, the cost of debt increases when the quantity of debt in increases, as it incorporates the relative costs of instability in the main default expectations of the debtor.

If the value of the "debt on capital" relationship is equal or inferior to 2, it falls into the investment grade area. After that limit, it falls into the speculative grade area.

The impact on research of the optimal capital structure, obtained through the same simulation, is show in the second graph (Figure 8.2). Before commenting the results, it must be specified that the criteria considered in order to determine the optimal level are three (and for each of these there is a different target value of the leverage ratio).

The first criterion is consistent with the Modigliani-Miller theory: the company aim is the maximization of the overall output of the company capital measured by the Return on Equity (ROE). The second criterion considered is that which sets as a primary objective the maximization of the return on share capital. This is reached when the Esso Price/Book Value has the highest value (or when the earnings per share is at its highest). The P/BV grows when the company has good opportunities for future growth (which increase dividends) and keeps capital cost to a minimum (calculated, in this case, through the Capital Asset Pricing Model). The third criterion, previously illustrated in the first chapter, calls for the minimization of the weighted average cost of the share capital and the debt which vary according to the degree of indebtedness; the minimum WACC is obtained in correspondence to a finite value of indebtedness.

The observation of Figure 8.2 permits one to appreciate the results of the simulation. If the criterion is the maximization of net worth,

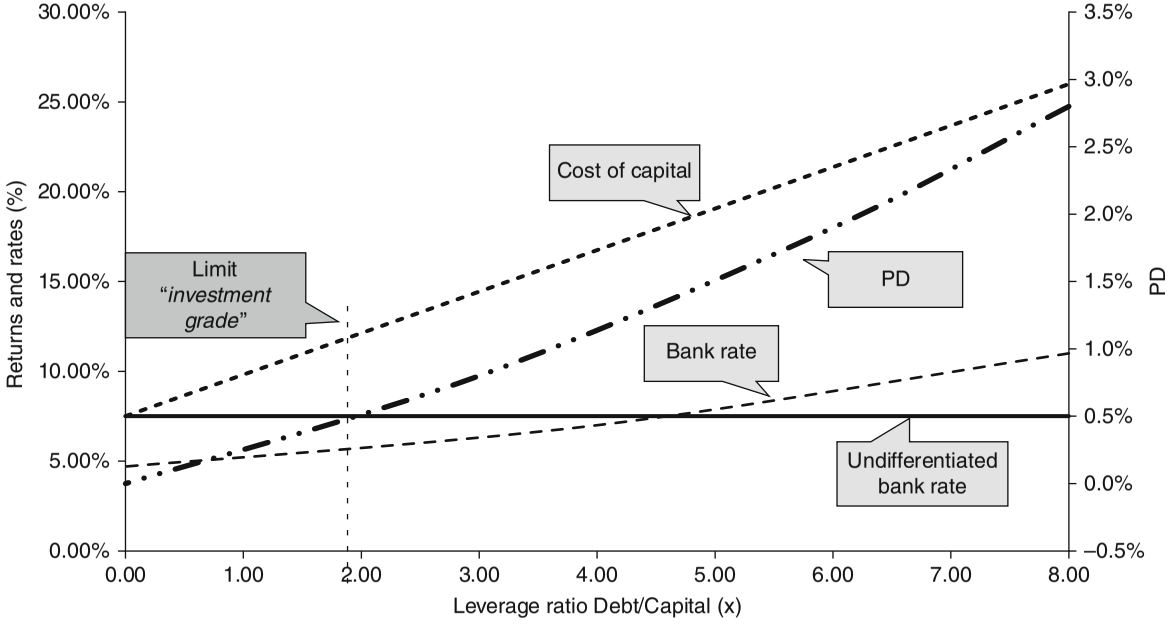


Figure 8.1 Rating, cost of capital and cost of debt

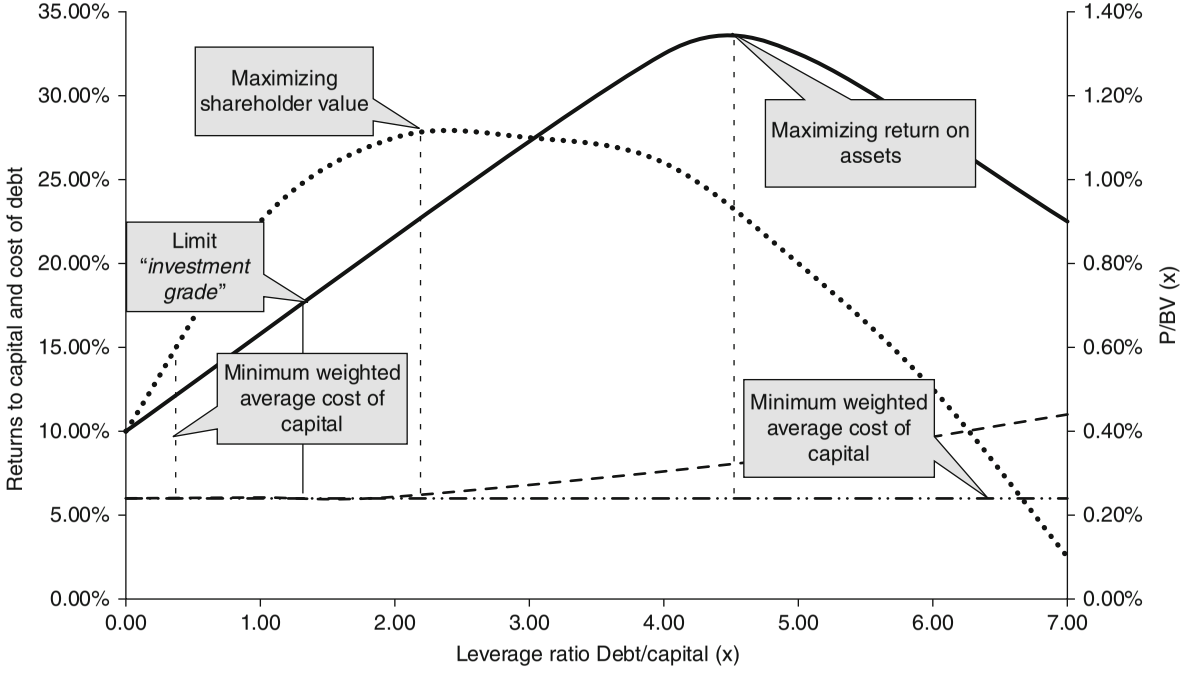


Figure 8.2 The different optimal levels of capital structure

the structure of the capital foresees elevated levels of debt. The ROE has, in fact, maximum value when the burden of debt is high (in the simulation of debt-to-capital ratio is 4.5). This situation is not new and finds its empirical application in the behavior of some actors, such as private equity funds, which look for high returns on equity through an important resort to leverage. Even the criterion of the maximization of the shareholder's value leads toward capital structures which tend more toward debt, even though the bearing on external sources is lower as compared to those determined with the previous criterion.

The minimization criterion of the WACC seems to indicate the adoption of more conservative financing policies in terms of exposure to debt, confirming that which has emerged in previous contributions regarding the relation between rating, capital structure and creation of value. In the simulation which was carried out, the target level of leverage falls into the investment grade area which corresponds to the condition of better credit quality of the issuer.

The rating availability on behalf of the rating creditors seems to continuously limit the financing choices of the company and, specifically, the more dynamic ones. In other words, it represents the query as to whether, for the company, it is preferable to tend toward the best class of rating to reduce the cost of capital or set a rating target (which could possibly not fall into the investment grade area) and then construct capital structure around it. Going back to what has been previously mentioned, belonging to the highest class of rating (AAA in Standard & Poor's terminology) is a synonym of a low level of financial and operational risk.

The first is due to the limited degree of indebtedness (leverage inferior to 2), while the second depends on the modest unpredictability of the operational results which could, for example, be obtained due to the lesser inclination of the company to invest in low-risk projects. However, in the long term, companies with a lower cost of capital seem to be those more capable of offering higher return on invested capital (and, therefore, able to maximize the creation of value) or, in the case of listed companies, of generating performance which is higher than stock market indexes (Thompson and Krull, 2009). This is due to the fact that the management of these companies undertake a greater volume of investments (since the hurdle rate is low, the chosen projects are more numerous), and it is more prepared to face the variability of conditions present on financial markets.

The conclusions which our empirical analysis reaches indicate the opposite phenomenon for those which resort to leverage. The great stock

of debt and the other financial burdens increase the company's financial risk, increasing the threshold of acceptability of the investments (and, therefore, they reduce their volume), slowing, in essence, the company's capacity to develop, as well as elevating its exposure to the fluctuations of financial markets and rating judgements.

The possibility that the company has to benefit from a greater industrial diversification and a wider investment activity helps the maximization of the value created.

The examination of the relationship between the company's financial behavior and the presence of rating models leads to two observations. The first is that the introduction of internal rating is not an irrelevant element in the optimal structure of capital. Rating produces, in fact, an impact which aims directly toward the essence of financial policy, highlighting the risk of imbalance due to an unbalanced composition of financing sources. An excessive imbalance toward debt makes the company vulnerable to short-term factors which condition the stability of the profits and require continuous readjustment in order to make leverage sustainable. The second is that internal rating systems do not penalize the company. They do not seem to stimulate the application of more severe criteria and limitations in the choice of financing sources; instead, they seem to move toward stimulating the adoption of more virtuous financial behavior in which target levels of leverage are more coherent with the aim of creating value.

9
Rating and Bankruptcy Prediction

9.1 Rating and SMEs funding policy

The European industrial framework is characterized by the prevalence of small- and medium-sized enterprises (SMEs). As described by Modina and Pietrovito (2014), SMEs account for over 95 percent and up to 99 percent of the business populations whose contribution changes depending on the nation to which it belongs. Considering the European economy, they account for 99.8 percent of non-financial firms (91.2 percent are micro-enterprises with fewer than ten employees), corresponding to 20.7 million businesses. As for statistics regarding employees, SMEs provide 67.4 percent of jobs in the non-financial business economy. Italy and other EU members demonstrate the relevance of SMEs, in that in Italy small firms (less than 50 employees) make up 99 percent of manufacturing enterprises (OECD, 2005).

In terms of financial policy, SMEs prefer the bank debt to cover their financial needs. There are two reasons for this choice (Pederzoli and Torricelli, 2010): only banks issue direct loans to SMEs and SMEs rarely use other financial sources, for example, the issuance of shares on capital markets. When the stock of debt tends to saturate, the company's growth is achieved through self-financing or issuing new shares. Since the self-financing source has a limited size by its nature and openness of the shareholder is hampered by the reluctance of the entrepreneur to transfer the property to a third party company, minor companies are struggling to grow at the risk of loss of competitiveness.

Consequently, the simplicity of the financial structure is a constraint to growth, and the limited variety of financing options restricts the investment capacity and, therefore, the competitive position of SMEs.

In this context, the introduction of the rating, expression of financial innovation, plays a key role. In particular, the adoption of the internal rating system (IRS) by the banks changes the scenario of the financing decisions of firms leading to a change in searching for the optimal level of debt.

This chapter focuses on the relationship between IRS and corporate funding policy and the role that financial variables can play in determining the probability of default. Inspired by recent works, it uses an empirical point of view by conducting an investigation of the ability of balance sheets' indicators to measure the health of firms and predict, with appropriate advance, the event of insolvency. In particular, the work analyses the determinants of the default probability of a sample of 9,208 Italian SMEs in a time frame of three years. Since the focus is to identify variables predicting the default event after three years, the sample includes firms that turned out to be insolvent in 2009–2010 and companies that have proved to be healthy until 2010. The analysis was conducted on the 2006 (2007) balance sheet's data for companies in default in 2009 (2010) and 2006 data for healthy companies. By applying factor analysis and stepwise method (to reduce the original set of information) and logistic regression (for the bankruptcy prediction), the results show important links between capital structure and corporate insolvencies. Some indicators related to the composition of the sources and the debt ratios are, in fact, important variables in identifying companies that will become insolvent after three years. Specifically, these indicators include the level of capitalization, interest expenses and bank loans.

This chapter offers a threefold contribution. First, it analyses a sample that ensures a broad representation of the universe of SMEs. Second, unlike the existing rating models for SME firms, the work is more "forward-looking" extending the time horizon to three years (instead of one), which helps to mitigate the influence of the economic cycle on the risk of insolvency. Finally, it focuses in more detail on the link between specific categories of financial ratios and the risk of insolvency.

Because elevated debt (especially bank debt) and the high incidence of interest cost are important factors in anticipating insolvency, rating models suitable for SMEs should include financial variables and, most importantly, variables which regard the composition of funding sources and the interest expenses (Modina and Pietrovito, 2014). At the same time, SMEs have to utilize new approaches and financing instruments so that their funding policies become more solid.

9.2 Contribution to the literature

Before presenting the results of some recent empirical work, it is useful to highlight the contributions to two strands of the literature. The first contribution is related to statistical techniques used to predict default probability. The second one refers to the studies that analyze the determinants of SMEs' default, with particular attention to financial statement indicators.

9.2.1 Determinants of firm default

As shown in the second chapter, statistical techniques used to distinguish between healthy and default firms and to predict the risk of default can be classified into three categories: (1) the univariate approach, (2) the multivariate approach (including the discriminant analysis) and (3) the logistic regression (Ravi Kumar and Ravi, 2007). The first two models analyze, individually or simultaneously, the various aspects through which a firm can be examined to obtain a measure of its solvency. On the other hand, the logistic regression aims to identify the predictive ability of some indicators with respect to the default event.

The univariate approach individually examines the various financial indicators, aiming to capture the elements that can explain the weaknesses of the company, its current status and the constraints potentially affecting its future development (Beaver, 1966; Varetto, 1999). Applying the technique developed by Altman (1968), several studies have been conducted on different samples and groups of indicators (Eisenbeis, 1977; Piesse and Wood, 1992; Altman et al., 1994, 1995; Lussier, 1995; Foglia et al., 1998; Grice and Ingram, 2001; De Laurentis and Maino, 2009; De Laurentis et al., 2010).

While recognizing a significant maturity, the application of this methodology shows some shortcomings related to the assumptions made on the independent variables. Discriminant analysis requires indeed specific assumptions (Foglia et al., 1998): (1) the indicators used must have a multivariate normal distribution, and this prevents using dummy variables; (2) the variance-covariance matrix of indicators must be the same in the two groups of companies; (3) the probability of belonging to one of two groups must be known a priori; and (4) the means and variance-covariance matrices of the distributions of indicators must be known.

For these reasons, some recent studies apply the logistic regression analysis to determine the default probability. The advantages of this method are due to: (1) missing assumptions about independent variables

and (2) the fact that the dependent variable is dichotomous and the coefficients of the explanatory variables can be interpreted as the slopes of the probability of default. The idea underlying the logistic model is a relationship between the likelihood of a company to become insolvent (latent variable) and a set of observable quantities that are closely connected to the event. Unlike discriminant analysis, this methodology is useful to obtain an estimation of the probability of default. Rather than have a clear division between healthy and insolvent firms, logistic regression defines a ranking in firms' classification.

With regard to the empirical applications of logistic regression, Ohlson (1980) studies the impact of different financial indicators on the probability of default of more than 2,000 firms during the period 1970–1976. Through this methodology, the author identifies four categories of factors that influence the likelihood of firm default: firm size, financial indicators, performance indicators and current liquidity. The accuracy of prediction is 96 percent for the indicators calculated on the balance sheets one year before the bankruptcy, 95 percent for two years before and 93 percent for one or two years before the insolvency.

Following the work of Ohlson (1980), recent literature enriched by numerous studies using logistic regression (Platt and Platt, 1990; Laviola and Trapanese, 1997; Mossman et al., 1998; Becchetti and Sierra, 2003; Altman and Sabato, 2007; Pierri et al., 2011). Concerning Italy, Laviola and Trapanese (1997) estimate the probability of default of more than 3,330 companies using 35 financial indicators. The percentage of correct classification of default events in this case is equal to 91 percent. In addition, Becchetti and Sierra (2003) estimate, for a sample of Italian firms, the impact of some qualitative variables, while Bottazzi et al. (2011) estimate a probit model to predict the default in a large sample of Italian firms. This work verifies the significance of financial ratios, also controlling for profitability ratios.

9.2.2 SMEs credit rating studies

Financing decisions are among the most important commitments of corporate management. The correct definition of the financial resources mix promotes investment activities, supports the strategic and operating decisions and ensures the maintenance of adequate levels of financial flexibility.

In a scholastic view, when a firm has to finance an investment it faces two options: to issue shares or to contract debt. In a perfect world, such a choice would be irrelevant (Modigliani and Miller, 1958). Each investor may, in fact, access the capital market under the same conditions of the

company, with which it shares the same set of information. By adopting a strategy of arbitrage and not having transaction costs, an investor can undo the effects of the change in the financial structure of the company whose market value is independent of the capital structure. However, financial markets are not perfect. There are information asymmetries, taxes, agency costs, transaction costs and bankruptcy costs. The choice of the debt level is thus tied to the tradeoff between tax benefits and bankruptcy costs (Stiglitz, 1972; Altman, 1984), depends on agency costs (Jensen and Meckling, 1976) and incorporates signaling functions (Ross, 1977).

Because of these shortcomings, the design of the capital structure is a complex activity with approaches and methods that vary from company to company. As described in the previous chapter, the introduction of rating adds complexity because the relationship between rating and capital structure extends the assumptions of traditional theories about the financing of businesses including credit ratings in the variables so far considered.

With reference to the Pecking Order Theory – POT (Myers, 1984), which indicates the hierarchical order self-financing – debt – equity, the costs associated with credit rating may push the company to issue shares to avoid a downgrade so that the benefits of a possible upgrade encourage raising of equity despite its higher cost. These effects change the funding choices indicated by the POT: the use of the equity prior to the use of the debt due to the impact of the rating. At the same time, the costs associated with a change in the rating result in a capital structure different from that assumed by the Trade-Off Theory (TOT), which is obtained when the tax benefits of debt are offset by the costs of distress (Kraus and Litzenberger, 1973). For example, a company which fears a deterioration of its credit rating and does not want to bear the costs may decide to hold a debt level below the one which helps to maximize the tax benefits of debt. The choice of a sub-optimal debt policy is motivated by the fear of a less favorable rating.

Overall, the existence of a relationship between rating and capital structure expands the assumptions of traditional theories offering, in perspective, new ideas for analysis on the financial decisions of the company. The causal relationship can go through the mechanism of formation of rational cost of credit. Through the rating, a lender is better informed on the credit quality of the counterpart. Therefore, he will assign a price that differs from the one defined in Modigliani and Miller's hypothesis of the irrelevance of capital structure by influencing, consequently, the cost of capital and the financing choice.

The introduction of rating is a factor which further complicates the search for the ideal funding mix. Because of the intensity of its impact, the rating becomes a variable that matches those previously considered by the theoretical and empirical studies on the financing choices of firms (information asymmetries, tax benefits, discipline of debt, bankruptcy and agency costs). The choice of how to cover the financial needs must thus consider the reflections produced by the rating. It must understand how phenomena such as downgrade or upgrade affect the funding policy, making it more or less conservative and leading to suboptimal capital structure.

Until Basel II, credit risk modelling expressly designed for SMEs enjoyed little attention, albeit in the last years the literature on this issue is increasing. As a result, a significant number of studies aim at analyzing and predicting the bankruptcy risk of SMEs in different geographical contexts. Although SME studies differ amongst themselves, they converge toward the idea that there are five groups of important financial indicators for the prediction of default probability in SMEs: leverage, liquidity, profitability, coverage and activity ratios.

9.3 An empirical analysis

In order to investigate the close relationship between the capital structure of SMEs and their probability of default, this section highlights the results of recent empirical studies conducted on a large sample of Italian firms (Muscettola and Pietrovito, 2012; Modina and Pietrovito, 2014). These studies are characterized by the presence of three distinguishing elements: (1) the significant number of companies being investigated; (2) the timeframe of reference; and (3) the depth of the analysis regarding the relation between balance sheet indicators and the risk of insolvency.

The database utilized includes 9,208 capital companies which operate in different productive and commercial sectors with a number of employees inferior to 250 and a turnover (2009) between 5 and 50 million euros. Amongst these, 8,886 companies are financially sound (96.5 percent of the sample), while there are 322 insolvent companies (3.5 percent of the total).

Unlike existing rating models, the period of analysis is three years long (and not just one), in order to gather anticipatory signals of a possible company crisis and to soften the effects of the economic cycle of the probability of the companies' insolvency. In the sample, in fact, companies in default during the 2009–2010 two-year period and those which

were financially sound (at least until 2010) are included. In particular, the analysis was carried out on the balance sheets from 2006 for companies which were insolvent in 2009 (143 cases), on the balance sheets from 2007 for those insolvent in 2010 (179 cases) and on balance sheets from 2006 for financially sound companies.

Finally, the studies use a multidimensional methodology for the statistical forecast of the insolvencies (factor analysis, stepwise logistic model, bootstrap logistic regression) in order to elevate the capability to interpret company performance. Starting with the financial ratios, in the first step the original set of indicators was reduced through the extraction of factors with the method of factor analysis. In the second step, the stepwise logistic regression model was applied to select those factors that, on the whole, are significant in predicting the probability of default of companies after three years. In the third and final step, the factors extracted and selected in previous steps are then used as explanatory variables in a logistic regression model to which the bootstrap methodology is applied. The bootstrap consists in the repetition of the estimates over the two samples taken from the balanced group of companies in default and the group of healthy companies. The model structure identifies the predictive ability of each factor. Finally, the probability of default for each firm is estimated using the coefficients of the logistic model.

The descriptive analysis (Muscettola and Pietrovito, 2012) shows that the financial structure of the companies takes a particular importance in identifying the companies which have a greater probability of facing moments of difficulty. The insolvent companies, after three years, show an imbalance toward debts, confirming the financial approach of Italian companies described previously. In particular, the weakness of the capital structure appears both in terms of the composition of the sources (coming from external sources instead of personal means) and type of sources (dominance of debts of a financial nature). At the same time, the less virtuous companies show, as compared to those which are sound, a lesser capability in the management of invested capital, a more contained elasticity in assets and lesser liquidity.

The indices operational and rotation profitability, just like some indices of efficiency and of the composition of the assets, do not seem, however, to have a high communications value in that the values present in the two clusters (financially sound companies, insolvent companies) present values which do not greatly differ. In other words, the profitability indicators do not allow researchers to foresee the arrival of a company crisis in a period preceding the default by at least two years and, therefore, do not seem to be an effective supporting parameter in finding companies

in the sample which will become insolvent, as compared to those which will continue to operate.

The statistical relevance of the company's financial structure tends, in this way, to prevail. For the purposes of default forecasting, the indicators connected to capital structure, such as the incidence of bank debts on the total indebtedness and the degree of leverage, take on greater importance as confirmed by the analysis of standardized means. In particular, statistical analysis compares the average values of the two groups of companies, the object of the investigation, referred to a set of three indicators for each of the three profiles examined (net profitability, operational profitability, efficiency, rotation, financial structure, elasticity in assets and liquidity). The greatest distance between insolvent companies and financially sound companies after three years is found in the presence of financial indicators (financial burdens on sales, financial debts on the debt total).

Empirical analysis (Modina and Pietrovito, 2014) leads to results which confirm the direct connection between company financing choices and the probability of insolvency. Some indicators connected to the capital structure show strong predictive capabilities in identifying companies which will be insolvent after three years. From the factor analysis which extracts the most relevant factors in predicting the probability of insolvency from a set of indicators (composition of the sources, relation between liabilities and assets, profitability, productive efficiency, liquidity) and the successive estimate of factor scores (values of the new variables for each company included in the sample), it is possible to identify, through the comparison of the standard means of the two groups of companies (financially sound, insolvent after three years), that the factors of the companies in default with value which are less financially sound, are all of a financial nature (indebtedness per production unit, bank indebtedness and cost of debt, capitalization).

The results of logistic regression with stepwise methodology (Table 9.1) move the same way. Out of eight significant factors, four refer to the financing choices of the company (capitalization, indebtedness per production unit, bank indebtedness, index of the financial structure), confirming the importance of the financial variables in foreseeing situations of company difficulty and, therefore, in promoting interventions which reinforce the company capital structure.

The table shows the results of the stepwise logistic regression which considers the factors selected as determinants of the probability of default. The forward-selection technique was used. The table shows the coefficients (β) of factors with a significance level ranging between

Table 9.1 Logistic regression stepwise

Factor	*β*	***SE***	***p*-value**	***Exp(β)***
Capitalization	–0.660	0.107	0.000	0.517
Efficiency	–0.314	0.092	0.001	0.730
Commercial working capital	0.254	0.056	0.000	1.289
Interest expense and bank debt	0.889	0.052	0.000	2.433
Industrial profitability	0.221	0.060	0.000	1.248
Debt	0.225	0.049	0.000	1.252
Fixed assets coverage	–0.379	0.121	0.002	0.684
Liquidity	–0.330	0.088	0.000	0.719
Constant	–3.992	0.098	0.000	0.018
Cut-off	0.03	0.05	0.10	0.15
Type I errors	63	116	213	262
Type II errors	3164	1733	537	208
% correct default	0.804	0.640	0.339	0.186
% correct non-default	0.644	0.805	0.940	0.977

Source: Modina and Pietrovito (2014).

1 percent and 5 percent. SE is the standard error of the estimated coefficients. The p-value indicates the significance of the coefficient and Exp(β) indicates the linear prediction. Cut-off indicates the threshold used to define default and non-default firms in the sample by adopting the estimated model. Type I errors refer to the number of firms that are actually defaulting, but are classified as non-default firms. Type II errors refer to non-defaulting firms that are incorrectly classified as default firms. % correct default indicates the percentage of firms that are correctly classified as defaulting, of the total number of defaults (322). % correct non-default indicates the percentage of firms that are correctly classified as non-defaulting, of the total number of non-default firms (8886).

The validation of the results obtained with logistic regression, realized with the application of the bootstrap method, confirms that the factors with the greatest impact on the probability of insolvency (capitalization, indebtedness per production unit, bank indebtedness and debt cost) are those connected to the composition and the type of financing sources (Table 9.2). More precisely, the most significant factor is that referring to bank indebtedness which is made up of four indices: financial burdens on cash flow, ROD (Return on Debt), bank debts on the total liability and debts on total assets.

In the table there are the results of a logistic regression carried out on the factors extracted with the bootstrap method. Balanced sample are composed by 322 observations. Number of repetitions equals to 1,000.

Table 9.2 Logistic regression with the bootstrap method

Factor	**β**	***SE***	***p*-value**	***Frequency***
Capitalization	0.303	0.457	0.008	4
Efficiency	1.265	0.238	0.006	2
Fixed assets	1.740	0.215	0.010	1
Commercial working capital	1.747	0.337	0.006	3
Interest expense and bank debt	2.580	0.271	0.002	74
Industrial profitability	2.316	0.290	0.005	5
Debt	2.020	0.242	0.004	1
Incidence of costs	1.450	0.237	0.002	5
Cut-off	0.03	0.05	0.1	0.15
Type I errors	162	229	277	293
Type II errors	1409	687	271	131
% correct default	0.497	0.289	0.140	0.090
% correct non-default	0.841	0.923	0.970	0.985

Source: Modina and Pietrovito (2014).

The table shows the coefficients (β) of the significant factors on a level between 1 percent and 5 percent. SE represents the standard error of the estimated coefficients. The relevance indicates the p-value of the estimated coefficient.

The empirical evidence leads the groups of most significant factors to the composition of financing sources and the burden of debt in order to predict insolvency. The great exposition to debt elevates the company's financial risk, makes its service more difficult (especially in adverse economic periods) and limits the investment capability, making it more difficult for the company to efficiently meet new market challenges and face the introduction of new criteria of selectivity and trustworthiness in internal rating systems (Varaldo and Lamberti, 2009).

The results of the analysis indicate that the financial components, more than the industrial ones, are those which send the strongest signals regarding the approach of company situations of crisis. The choices connected to the financial structure seem to prevail upon the aspects of a more industrial nature. In other words, not very virtuous financial behavior can also lead to situations of insolvency, even in the presence of satisfying industrial results: the presence of consistent debt stock pushes toward company default, even in the presence of non-compromised operational and industrial performance.

This is a significant initial consideration which is important, for example in the choice of whether or not to reorganize a company

in difficulty. If the reason for the instability is due to a capital structure which is no longer compatible with the industrial capacity of the company, the reorganization could have greater possibilities of success. A second point of consideration emerges. As Maino and Modina (2012) affirm, separating the industrial component from the financial component is necessary because it allows to more precisely differentiate the financial contribution from the long-term competitiveness of the company. The adoption of forward-looking financing policies which are coherent with the company's industrial strength takes on a key role in guiding the company toward the creation of value and in reinforcing its long-term competitive capabilities.

9.4 Toward a new frontier

The excessive corporate debt and the high financial charges generate a significant increase in the financial risk of SMEs and decrease their investment capacity. Companies with the largest debt exposure have been found, therefore, difficult to face the crisis and are more vulnerable from the intensification of the general market conditions. In particular, the micro and small firms have suffered a lot because their low capitalization levels make it more difficult to respond to the increasing globalization of markets and to the new credit criteria introduced by banks. At the same time, the excessive bias toward debt makes the firm vulnerable to short-term factors that affect the stability of earnings and require constant readjustment interventions to achieve sustainable levels of leverage. In firms that rely on leverage, the large stock of debt and high borrowing costs raise the financial risk and the hurdle rate for investment acceptability (and, therefore, reduce its volume). As a consequence, the growth patch decreases and the exposure to fluctuations in the credit market increases.

Constraints of a financial nature make it difficult to undertake new investments and, without alternative financing options, companies remain dependent on banking channels. In a similar situation, the risk is that the fragility of the entrepreneurial system and the competitive gap can increase instead of decreasing. Therefore, it is necessary to active new measures and instruments to allow SMEs to reinforce their capital endowment, so that they can better innovate and compete and lighten the financial weight upheld only by credit lenders.

Capital structure is a determining factor in driving the ability of SMEs to operate successfully in the medium term. Specifically, a weak financial structure, characterized by a high level of indebtedness and limited

supply of capital, is a marker of future difficult situations. The empirical analysis conducted on the sample of SMEs highlighted the close relationship between weak financial structure and the probability of default. Despite not yet compromised industrial performance, the disequilibrium of the capital structure toward debt raises the likelihood of failure events. The various techniques of investigation conducted agree that the poor composition of the sources of financing is the most significant factor in anticipating insolvency. High debt and the consequent difficulty in covering its cost with the operating results are clear predictors of company crisis. At the same time, the current market conditions and the nearing entry into force of the Basel II norms work toward the reshaping of the role of credit intermediation. The reduction of leverage of the banking system in favor of the strengthening of the capital base makes it difficult to think that exiting the company crisis could occur through greater credit granting. Besides the existence of macroeconomic constraints, the further growth of bank loans could risk to make the financing system more unstable and inefficient.

Therefore, it is a priority to intervene on the financial policy of SMEs. Companies must move toward the adoption of more virtuous financial behavior in which the target levels of debt are more consistent with the objective of long-term sustainability of the company. The need for more structured corporate finance is urgent. The current composition of the sources of financing (equity, bank debt, commercial debt) is no longer in line with the financial needs of businesses. New tools and new approaches to cover the financial needs must be enabled to get stronger (and dynamic) capital structure of enterprises and to promote effective access to the capital market.

In this context, the internal rating can play a crucial role to strengthen the solidity of Italian companies because it moves toward a greater diversification of financial resources. In this regard, the rating provides a dual contribution (Maino and Modina, 2012). On the one hand, it supports the strengthening of the company's net worth through the introduction of new forms of financing techniques such as hybrid capital instruments. On the other hand, the rating given to securities issued by companies (for example, the same hybrid) or to bank loan portfolios promotes the mobilization of corporate debt to markets and institutional investors.

As to the topic of greater capital strength, hybrid capital instruments are a possibility. These are financial instruments which combine their own elements of debt and shares, examples of which are convertible bonds and subordinated loans. For the lender, these add the benefits of traditional debt instruments and capital: the fiscal deductibility of

interest, the elongation of the duration of liabilities, the reduction of capital cost, maintenance or improvement of rating class. Acting as a cushion between senior debt and personal means, hybrid capitalization instruments, if correctly structured, increase the range of the company's available instruments and contribute to decreasing the internal cost of the capital. The hybrid, in fact, acts as substitute of the debt (compared to which it is immune to credit rationing) and shares (compared to which it is less costly and more flexible). As a substitute of the debt, the capital hybrid offers the company the opportunity to improve indices of capital strength and, consequentially, to improve (or to keep stable) the rating judgment without, however, distorting the management which remains that of the entrepreneur. As a substitute of shares, it reinforces the capital endowment of the company without requiring changes in the shareholders. Being characterized as a non-dilutive instrument is particularly important in the Italian context because it allows the entrepreneur to keep ownership and governance of the company (which occurs in the case of new risk capital investors), although strengthening asset control, while the control delegated to a financial intermediary is favored (Diamond, 1984). Resorting to hybrids encourages the growth of an entrepreneur with capability and industrial vision, ensuring the continuity of company management and retention of ownership. To make the introduction of hybrids applicable for small and medium companies, two regulatory conditions must be met: (1) the hybrid must become part of the composition of the assets recognized for accounting purposes; (2) the hybrid must be excluded from "thin capitalization" and from anti-usury regulations. Finally, these securities, issued by SMEs and accompanied by the rating assigned by the bank, could be securitized for institutional and foreign investors, helping circulation, liquidity and the inflow of critical resources toward the SME segment.

Regarding access to the capital market, credit rating takes on a greater role. The SMEs either barely resort to the financial markets or not at all, increasing their dependence on traditional banking channels. The possibility to associate the rating judgment, expression of the banks' capability to evaluate creditworthiness, with securities issued by the SMEs or with loan portfolios granted to them allows soliciting private and institutional savings. Access is direct if the investors accept securities issued by the companies, accompanied by a rating judgement; access is indirect if the creation of adequate bank loan packages, divided according to rating tranches, is to be set up during negotiation. The (direct or indirect) collocation of the companies' liabilities creates the premise for new financial resources, reinforces the medium/long-term

investment horizon and facilitates the recovery of competitiveness. In both cases, the banks enrich the issuing by making their reputation, their knowledge of the company and of the territory in which it operates available and, therefore, their capability of evaluating creditworthiness. As a fundamental measurement of underlying risk (individual security or securitized loans), the credit rating becomes a resource and not an obstacle for the company and in giving stability and continuity to company financing with conditions in line with those of larger companies.

The innovative capacity of the rating produces positive effects on the determination of a balanced capital structure. The expansion of financing options helps the recovery and the growth of SMEs and works on the efficiency of the financial system. This is especially true in times like the present when it is difficult to think to the further raising of the bank debt stock considering the existing volumes and the downsizing of the role of credit in place.

In a context in which a good business strategy may not be performed if accompanied by a weak financial policy, the rating takes full importance as long as it is properly understood (to avoid the adoption of uncritical attitudes of resistance) and applied (to ensure that the rating is an effective tool to support the credit process).

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