CREDIT RISK MANAGEMENT IN BANK: IMPACTS OF IFRS 9 AND BASEL 3

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Abstract

The expected loss approach (ECL) defined by IFRS 9 replaced the old incurred loss approach (IAS 39) in the international accounting standard setter. In Europe, the IFRS 9 are accompanied by new regulatory frameworks (BCBS), opinion, technical standards (EBA) which do not always provide the same methodological and operational implications of the accounting standard setter. Many aspects of IFRS 9 have been studied, but this paper analyzes its interdependencies and overlaps with the credit risk framework for financial intermediaries (also Basel 3). Using a case study, the purpose of this paper is to investigate the ECL, its main impacts on coverage ratio of a loan's portfolio. The main findings are: usually, the rules laid down for Stage 1 of IFRS 9 do not reduce the excess coverage produced on a portfolio *in bonis*; in the presence of impaired loans IAS 39 generates a lack of funds; the lifetime ECL (Stage 2 of IFRS 9) imposes excess of provisions because it does not consider the effect of coverage produced by expected premiums; for loan portfolios with short repayment times, the excess of provisions produced by IFRS 9 compensates the lack of coverage of the capital requirement. From the academic research perspective, this paper contributes to the literature on ECL model in several ways. First, it adds knowledge to the research on the relationship between Credit Risk Management framework and accounting standard IFRS 9. Second, it also links our findings related to ECL approach with potential implications for the financial sector, policymakers and regulators.

Keywords: Credit Risk, Expected Loss Approach, Basel 3, Pricing at Risk, IFRS 9

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1. INTRODUCTION

It is commonly known that IFRS 9 Financial Instrument was developed by the International Accounting Standard Board (IASB) to replace IAS 39 Financial Instruments. During the international financial crisis, the delayed recognition of credit losses identified as a substantial weakness in accounting rules. Both the IASB and the FASB have been requested on several occasions, to modify the existing *incurred loss approach*, based on the *impairment* discipline established by IAS 39 and to consider alternative approaches to the recognition and measurement of losses on loans that incorporate a broader information base. The IAS 39 *impairment* criterion linked the credit impairment made by financial intermediaries to the emergence of a "*trigger event*" that showed the dubious availability of cash flows produced by the loan. In this way, often non-congruous reserves and

movements were produced, strongly pro-cyclical and not adequately anticipated regarding provisions to cover risks. The new *impairment* model, prepared by the IASB called "*the three buckets model*", provides for the recognition of expected losses and therefore, the recognition of provisions, according to the degree of deterioration of the assets credit risk. In the current accounting regime, the occurrence of an event or an explicit sign of actual loss for the recognition of an accounting charge is no longer required. Unlike IAS 39, the financial intermediary must immediately recognize, regardless of the presence or absence of a trigger event, future expected losses on its financial assets and must continuously adjust the estimate also in consideration of the credit risk for the counterpart.

Compared to the IAS 39, the IFRS 9 provides a single method for calculating value adjustments on loans valid for all financial instruments that are not recognized at fair value with effect on the income statement. This is done to standardize the methodology and facilitate the comparison of loan impairments. The FASB and the IASB worked together on the development of the three-stage model, but feedback from stakeholders led US *standard setters* to review the impairment project. In 2012, the FASB published its proposal to update accounting standards in the *Exposure Draft, Accounting Standard Update "Financial Instruments – Credit Losses (subtopic 825-15)"*, (FASB, 2013) which was followed by subsequent changes until the publication of the final version in July 2016. The model introduced is also based on expected losses (CECL – *current expected credit losses*) and *forward-looking losses*, which differs from that chosen by the IASB, as it provides the calculation of the expected *lifetime* loss of all financial instruments (Table 1). The enforcement of the CECL model is set for January 1, 2020, for certain types of banks and public companies, while for all other banks it will follow the year after (January 1, 2021) (FASB, 2016).

This work aims to analyze the *expected loss approach* predicted from the new accounting standard IFRS 9. In particular:

The impacts on the Credit Risk Management framework or, more precisely, on its fundamental pillars (risk assessment, impairment, capital requirement, profitability/pricing at risk). To this end, we propose a *case study* (implemented by applying a portfolio model that operates on a multi-period basis) with the aim to assess the impact of the *expected loss approach* on coverage ratio of portfolio losses. The methodology used is based on *lifetime-oriented portfolio models* that associates each loan with the relative default probability vector (default curve). The Monte Carlo simulation referred to these vectors permit to identify possible default events and the relative times of occurrence. Simulating a large number of scenarios allows estimating the distribution of margins that can be obtained from the portfolio and to assess the expected total coverage of losses by credit premiums, risk funds and own funds.

- Its interdependencies and overlaps with the new prudential supervisory framework (Basel 3) on credit risk. The latter is not always reason in the same terms as the accounting principle and implies the same methodological and operational consequences for the Credit Risk Management activity.

There are a lot of contributions on IFRS 9; the role of IAS 39 for financial stability has generated a lively debate even among academics (Laux & Leuz, 2009, 2010; Barth & Landsman, 2010; Laux, 2012), because IAS 39 is considered to be a controversial accountings standard, largely due to its complexities (Armstrong, Barth, Jaqolinzer, & Riedl, 2010; Paananen, Renders, & Shima 2012). From the academic research perspective, this paper contributes to the literature on ECL model in several ways. First, it adds knowledge to the research on the relationship between Credit Risk Management framework and accounting standard IFRS 9. Second, it also links our findings related to ECL approach with potential implications for the financial sector, policymakers and regulators.

The remainder of the paper is organized as follows. Section 2 presents the literature review on the main features of IFRS 9; Section 3 describes the main features of ECL model; Section 4 presents the case study, the methodological framework; Section 5 describes the main findings; Section 6 presents some conclusive reflections and the implications for policymakers.

2. LITERATURE REVIEW

IAS 39 requires an incurred loss impairment approach for financial assets measured at amortised cost. Under that approach, an impairment loss is required to be recognized if an impairment loss has been incurred. If losses are expected to arise from future events, those losses are not recognized.

Among the most significant changes that the new accounting standard has made to the current IAS 39, is a reduction in the number of accounting portfolios in which an asset can be classified. The financial assets for the purposes of IFRS 9 can be classified into two main categories and a residual category, as indicated in the table below (Table 1). The choice to classify an asset in the first or second category derives from a double evaluation relative, respectively, to the business model adopted and to the characteristics of the cash flows for which it can be used (SPPI, *solely payments of principal and interest test*).[1]

[1] Unlike the identification of the business model, which must be conducted at a higher level of asset aggregation, the analysis of the contractual characteristics of the cash flows must be performed on each asset at the time of initial recognition in the financial statements. The test in question aims to verify whether the cash flows generated on a pre-established date represent solely the payment of the capital (*principal*) and interest. Exceeding the SPPI test allows the bank to enter the asset at amortized cost or at *fair value through other comprehensive income*, provided that the asset in question falls into one of the two business models. If this condition is not verified and in cases where the business model is the trading one, the asset will fall into the third measurement category: *fair value through profit and loss* (FVTPL).

Table 1. Financial asset classification

Held to collect	The standard establishes that an entity is required to classify a financial asset at amortized cost if both of the following conditions exist: 1) the asset must have the essential characteristics of a loan, i.e., it must be characterized by financial flows relating only to the share reimbursement of the nominal value and interest payable at fixed maturities. This verification occurs through the application of the SPPI test (*solely payment of principal and interest test*); 2) the asset must be managed on the basis of a business model whose objective is to hold the instrument until maturity, in order to collect the financial instruments generated by the activity.
Held to collect and sell	The asset "belongs" to a business model whose objective is to collect the contractual flows and sell the asset. This business model should usually be characterized by greater transfer activity, both regarding frequency and volumes. The contractual terms consist in flows and dates for capital and interest shares. In particular, interests are considered as the time value of money and credit risk on residual capital over a given period.
Fair value option through profit and loss	The asset that follows every other business objective that cannot be classified in the previous categories. The collection of cash flows is secondary to the objectives of this business model which represents a residual category (the asset cannot be classified in any of the previous categories). The fair value option can be used with profit and loss accounting if this option reduces or eliminates the accounting mismatch that would occur as a result of the valuation of financial assets by different methods. Furthermore, a novelty is introduced for financial liabilities classified in the FVTPL category: the changes in the value of these financial instruments due to the worsening of their creditworthiness will no longer be recognized in the income statement but will be accounted through other comprehensive income, so as to eliminate a sometimes-considerable volatility factor (IASB, 2014, par. 4.1 - 4.4).

Source: Author's elaboration.

It is common knowledge that IAS 39 was based exclusively on historical data (*backward-looking*), while IFRS 9 must also incorporate *forward-looking* forecasts, which must be periodically updated and revised to take account of market trends. The new classification of instruments, the impairment model based on the *expected loss approach* and the forward-looking measurement logic, summarize the main changes in IFRS 9.

Depending on credit quality, banks are required to calculate expected losses for a minimum period of one year up to potentially the entire residual life of the credit. This will take place if the loan is affected by significant deterioration. The need to incorporate forward-looking information implies that the application of the new accounting principle requires the use of assessments/projections of the impact that macroeconomic changes may have on expected losses. In particular, it is necessary to take into consideration the forecast scenarios of macroeconomic variables (e.g., GDP, unemployment rate, inflation, etc.) which, through a statistical macroeconomic model, can estimate forecasts along with the entire residual maturity of the loan. This *forward-looking* approach will allow credit adjustments to be set up in advance proportionally to the increase in credit risk, avoiding overburdening the income statement when loss events occur and thus, hopefully mitigating the pro-cyclical effect of the accounting valuation of loans in the portfolio (IASB, 2014, par. 5.5).

According to the *three buckets approach*, the financial instruments falling within the application field of the norm are allocated into three classes (stage or buckets) and transferred from one class to the other about whether the bank detects a *significant increase in credit risk* (SICR) in comparison to the origin. The three classes (stages) are identified as follows:

- *Stage 1*: covers performing loans so that the credit risk is not significantly increased compared to the origin; the accounting devaluation corresponds to the *expected loss* measured for one year. Interest income is recognized from the effective interest rate (EIR) applied to the *gross carrying amount*. Corrections to positions classified in Stage 1 of IFRS 9 may be partially matched by the adjustments that, under the IAS 39, were made for a portion of the performing portfolio to recognize the *incurred but not reported* component (IBNR). The IBNR logic of losses incurred (but not accounted for) required creating an impairment provision against credits that have already suffered a loss event. However, the internal monitoring system considers them still performing (*in bonis*), due to physiological delays in the mechanism for identifying the losses incurred.[2]
- *Stage 2*: covers are performing loans where credit quality has deteriorated significantly since the date of initial recognition. For these loans, the so-called "*lifetime expected credit losses*" (ECL) (IASB, 2014, Appendix A) is measured, i.e., the expected loss calculated over a period covering the entire useful life of the financial instrument. The calculation of income interest takes place as in the previous stage. As already anticipated the expected loss, in addition to being of *lifetime* type, must be forward-looking. The higher impacts of adjustment increase, following the introduction of the new IFRS 9 model, are likely to be attributable to this stage. As a consequence, adjustments to credits calculated according to IFRS 9 will be significantly higher than those envisaged for IAS 39.
- *Stage 3*: includes all assets known as *impaired* which present objective evidence of decline. Non-performing due dates, probable defaults, and non-performing loans are part of this stage. Additionally, in this case, the criterion for determining the expected loss is that of "*lifetime expected credit losses*" as in Stage 2, while the interest income is calculated by the value of the net exposure of the instrument. A financial asset is considered impaired (*credit-impaired financial asset*) if one or more events have occurred that have a negative effect on expected cash flows.[3] In this

[2] In the assessment of IBNR losses, a *loss confirmation period* (LCP) parameter was commonly used, which determined a credit devaluation fund that was as high as the longer period observed between the loss event and its accounting recognition. The loss confirmation period can be defined as the average delay between the debtor's impairment and the recognition of losses.

[3] Consider for example the significant financial difficulties of the debtor, contractual conditions breach, delays in payments or overdrawn.

stage, the expected loss is detected with a lifetime perspective, but unlike the positions in Stage 2, the calculation of expected lifetime loss is analytical. Increases in accounting provisions are expected due to the adoption of a forward-looking forecast estimate on positions classified as a default.

Considering this tri-partition underlined above, it is clear that, compared to IAS 39, the new standard will determine greater impacts on the recognition of the provision, especially in Stage 2 and, to a lesser extent, to positions classified in Stage 3.

In general, the role of IAS 39 for financial stability has generated a lively debate even among academics (Laux & Leuz, 2009, 2010; Barth & Landsman, 2010; Laux, 2012), because IAS 39 is considered to be a controversial accountings standard, largely due to its complexities (Armstrong et al., 2010; Paananen et al., 2012). The impairment model generates a large debate also in relation to the fact that it's relevant at the micro-prudential level and at the macro-prudential level. From a macro perspective, value adjustments assume importance for financial stability; losses in the value of loans can contribute to the performance of the economic cycle, amplifying or reducing its scope. The pro-cyclical effects of provisioning estimates are also determined by the logic of the reference accounting model (Financial Stability Forum, 2009). Models in which a *forward-looking* approach prevails and that recognize the possibility of considering elements of a forecast nature can allow the creation of buffer adjustments in advance that can be used in the subsequent phases of the cycle, dampening the negative effects provoked by the contraction. The models anchored to *incurred logics* conversely can cause significant adjustments in the downturn phases of the economic cycle, lowering the capital levels and encouraging the reduction of loans to satisfy capital adequacy. This behavior if adopted at the system level, leads to a situation of the credit crunch, amplifying the economic trend. The *expected loss model* is currently the preferred model of international accounting bodies for determining the loss of value of assets as, based on its intrinsic characteristics; it is better suited for timely recognition of losses. It has been the subject of numerous studies that have highlighted its strengths and potential critical issues.

Concerning the issue of pro-cyclicality, there are several pieces of evidence supporting the trend in incurred losses of accounting models to amplify the cyclical movements of the economy. Also, according to the regulators and policymakers, the pro-cyclical effects of rules on capital have been amplified by the accounting rules of IAS 39. This has spread internationally since the *incurred* and *backward-looking* models cause the recognition of losses precisely in the worst moment in the cycle in which exposures tend to go into default. The (high) losses that are recorded and cause strong pressures on the levels of capital tend to amplify the pro-cyclical effects of prudential regulation. In this regard, Cavallo and Majnoni (2002) have highlighted the cyclical behavior of banks in recognizing the losses incurred, highlighting a negative relationship between the adjustments on loans and the relationship between credit and GDP growth during and not before the crisis. Leaven and Majnoni (2003) and Quagliariello (2007), have also reached the same conclusions for Italian banks. Will the new impairment model effectively solve the problems associated with pro-cyclicality?

With the results to date, the literature on this subject seems to be controversial. Novotny-Farkas (2016), in examining the potential implications in terms of financial stability deriving from the introduction of IFRS 9, argues that the principle will produce pro-cyclical effects in the economy due to the fact that the parameters used for the estimate of expected losses are at a *point in time* and therefore vary as the economic cycle varies. The same conclusions come from the ESRB (2017) that identifies in the cyclical sensitivity of the credit risk parameters used, and in the steps of credit exposures between the various stages (in particular from the first to the second internship and vice versa) the causes of possible pro-cyclical effects attributable to the new principle. Most likely, the extent to which the *expected loss model* will be pro-cyclical will depend on how it will be applied.

One element, highlight Dabbene and RobertyVittory (2017), is the increase in volatility of provisions and, other things being equal, the economic and equity results as well as regulatory capital. The volatility is attributable to the passage of exposures from the first stage to the second stage (and vice versa) and the relative change in the time horizon of measurement of expected loss from twelve months to a *lifetime*. If correctly applied, the expected loss model envisaged by IFRS 9 can contribute to financial stability by introducing better levels of transparency and more rapid and decisive recognition of loan losses when the availability of macro and microeconomic information allows banks to anticipate such losses ESRB (2017).

However, the high margin of discretion expected for the *stage assignment*, to primarily determine the "significant increase in credit risk" and transfers from the first to the second stage, could give rise to *earnings management* conduct.[4] The IASB, in response to this risk, has decided to strengthen disclosure by requesting detailed documentation of estimates. The expansion of disclosure obligations and the recognition of expected losses improve the transparency of bank balance sheets, as well as the information capacity of the same while ensuring greater stability of the individual intermediaries and the financial system. In addition, Hashim, Li, and O'Hanlon (2016) in examining the new *impairment* approaches adopted by the IASB and FASB following the financial crisis show, referring to the *incurred loss model*, the reduction of both the delay in detecting losses and incorrect managerial practices.

Bushman and Williams (2012), on a sample of banks belonging to 27 countries, have verified the consequences deriving from the use of a prospective *provisioning* approach characterized by discretion. The empirical evidence has shown that greater

[4] Earnings management is manifested when managers use their discretion in the preparation of financial statements and in structuring transactions to alter financial information in order to deceive some stakeholders regarding the economic performance of the company, or to influence the contractual results that depend on accounting data shown.

discretion reduces transparency and facilitates *income smoothing*. The reduction of transparency, moreover, support the authors, reduce the ability of banks, especially in times of crisis, to raise capital. In banking literature, it is widely recognized that discretion is a double-edged sword, if, on the one hand, it could give rise to opportunistic conduct, on the other it allows bank managers to incorporate prospective information in the forecast of future losses (Bushman, 2016).

The briefly mentioned literature seems to highlight interesting but controversial results concerning the "structural" aspects of the new accounting standard; in the rest of the work we intend to analyze from our point of view, with the support of a practical case, the effects of the IAS/IFRS 9 on the Credit Risk Management of the bank and, in particular, on the degree of coverage of portfolio losses.

3. ECL MODEL: MAIN FEATURES

Also, with the aim of introducing operational simplification to the general context of the new standard, IFRS 9 introduces two "presumptions". The new IFRS 9 impairment model requires impairment allowances for all exposure from the time a loan is originated, based on the deterioration of credit risk since initial recognition. If the credit risk has not increased significantly (Stage 1), IFRS 9 requires allowances based on 12-month expected losses. If the credit risk has increased significantly (Stage 2) and if the loan is 'creditimpaired' (Stage 3), the standard requires allowances based on lifetime expected losses.

In general terms, the definition of expected loss must take into account the time value of money (IASB, 2014, par. 5.5.17 (b)), i.e., the cash flows used must be discounted. IFRS 9 provides, as a general rule, the use of the effective interest rate (EIR) (IASB, 2014, par. B5.5.44-48).

IFRS 9 prescribes the measurement of *expected lifetime loss* for all assets that, at the balance sheet date:

a) have undergone a significant increase in credit risk in relation to the origination phase, therefore falling within Stage 2;

b) for impaired assets and for those whose losses materialized, therefore, falling within Stage 3.

The expected *lifetime* loss for assets referred to in point (a), based on the provisions mentioned in the previous paragraphs and always considering a measurement approach based on the *probability of default* and the *loss given default*:

$$EL_{lifetime} = \sum_{t=1}^{T} \frac{EAD_t \times \left(PD_{o,t} - PD_{0,t-1}\right) \times LGD}{(1+EIR)^t} \qquad (1)$$

in which:

- $EL_{lifetime}$ is the expected loss calculated on the residual life of the asset;
- *EAD* is exposure to period *t*;
- $\left(PD_{o,t} - PD_{0,t-1}\right)$ is the difference between cumulative default probabilities in the period *t* and *t-1*;
- *LGD* is the loss given default in case of default in the period *t*;
- *EIR* is the effective interest rate.

Conversely, for instruments referred to in point (b), the probability of default should be equal to 100 per cent, for which the expected loss will be equal:

$$EL_{lifetime} = EAD \times LGL \qquad (2)$$

The measurement of EL over the life of the exposures must also be carried out for impaired assets; so-called, *credit-impaired financial asset*. In particular, a financial asset is considered impaired if one or more event has occurred that produces a negative effect (*detrimental impact*) on the estimated cash flow of the financial asset. IFRS 9 (IASB, 2014, par. 5.5.17 (c)) sets out that expected losses should reflect reasonable and supportable information available at the reporting date, without incurring excessive costs or efforts including information on past events, current conditions, and forecasts of future economic conditions. The IASB therefore, considers both *backward-looking* information, such as past events, and information about the current state, that is the current condition, as well as more forward-looking information, i.e., the forecast for future conditions. The sources to which the IASB adopter can draw such information can be both internal to the entity and external. Possible sources of data are the internal historical experience of credit losses, the historical experience of losses on receivables from other entities, internal ratings, external ratings, external relations, and statistics (IASB, 2014, par. B5.5.51). The possibility to draw on external information sources helps to make the information used in estimating the expected loss both sustainable and accurate.

It is clear from what has been briefly stated that the new model of impairment implies a significant effort by the bank intermediary regarding *credit risk modelling* and *data col*lection; a more rigorous process of monitoring the credit risk of loan's portfolio. Nonetheless, the *three-stage approach* requires the banks' risk management function to identify indicators of a significant increase in credit risk and, therefore, the "rules" of staging.

3.1. The stage assignment

The definition of staging rules is a very delicate and critical aspect; it must be carried out in such a way as to ensure firstly, the timely detection of significant increases in credit risk and secondly, the reduction in false signs of deterioration. The interception of false deterioration signs in credit risk becomes more relevant as the inclusion in Stage 2 of exposure (with a high probability of return to regularity) involves a temporary weighting of provisions and an immediate impact on profitability. In model IAS 39, a false signal did not produce a significant increase in funds and could give rise to a temporary lack of coverage. In the context of IFRS 9, the reference to *lifetime* ECL produces an increase in coverage throughout the period of the permanence of positions in Stage 2. This leads to the belief that the presence in Stage 2 of positions with a high probability of regularization is likely to translate into a constant excess of funds with an unavoidable impact on profitability. The IFRS

accounting principle in question specifies that the assignment to Stage 2 should be done, not about the absolute risk of the exposure, but to its variation.

The assessment of the change in credit risk/creditworthiness must be made reasonable information. This can be acquired without excessive cost or effort that could affect credit risk (IASB, 2014, Appendix B, B5.5.12), with particular regard to market indicators with "signaling value", internal factors and information on the debtor. The IASB did not want to prescribe a standard or mechanical mechanism for assessing changes in credit risk in the knowledge that this varies depending on the availability of information, asset characteristics, etc. The examination of the significant increase in credit risk carried out by the IASB adopter requires a multifactorial and integrated analysis; the importance and weight assigned to each individual factor depend on the type of financial instrument, its characteristics and the debtor, as well as the geographical area of origin (IASB, 2014, Basis for Conclusion, par. BC5.157). To this end, IFRS 9 provides a non-exhaustive list, shown in the table below (Table 2), of factors that can be used to assess changes in credit risk.

Table 2. Relevant information to evaluate the significant increase in credit risk (IFRS 9, par B5.5.17)

IFRS 9, par. B5.5.17	*Relevant information to evaluate a significant increase in credit risk*
a)	significant changes in internal credit risk price indicators (credit spread);
b)	other changes to rates or contractual terms of the financial instrument that would be significantly different if the instrument was newly created or issued at the balance sheet date (such as stricter clauses, collateral or personal guarantees of a larger amount or greater coverage of income), due to credit risk changes of the financial instrument after initial detection;
c)	changes in credit risk indicators such as credit spread; prices of credit default swaps for the borrower; the duration or amount for which the *fair value* of the financial asset was less than its amortized cost and other market information relating to the debtor, such as changes in the price of debt instruments and representative of the debtor's capital;
d)	a significant change, effective or expected, of the external credit rating of the financial instrument;
e)	downgrading, real or expected, of the borrower's internal credit rating;
f)	unfavorable changes, whether existing or expected, of the economic, financial or commercial conditions that are expected to cause a significant change in the borrower's ability to meet their debts, such as an increase (real or expected) of interest rates or a significant increase (real or expected) in unemployment rates;
g)	a significant change, real or expected, to the operating results of the borrower (including a reduction in sales or margins, increase in operating risks, shortage of working capital, reduction in asset quality, increase in leverage, etc.) that may cause a significant change in the debtor's ability to meet its obligations;
h)	significant increases in the credit risk of other financial instruments of the same borrower;
i)	significant adverse change (real or expected) of the regulatory, economic or technological environment of the borrower that involves a significant variation of the latter to honor its debts (e.g., decline in demand for the product marketed by the borrower due to technological evolution of process/product);
j)	significant changes in the value of real guarantees in support of debt or the quality of third-party guarantees or credit risk mitigation instruments, which should reduce the economic incentive for the borrower to make regular contractual payments or alternatively, have effects on the likelihood of default;
k)	a significant change in the quality of the guarantee provided by a shareholder (or by the parents of an individual) if the shareholder (or parents) is (are) incentivized (i) to avoid default with an injection of capital or liquidity and has (have) financial capacity;
l)	significant changes, such as the reduction of financial support by the parent entity or other affiliates or a significant change, actual or expected, of the quality of the credit risk mitigation tool, which should reduce the economic incentive for the borrower to make regular contractual payments;
m)	expected changes to the loan, in particular, an expected violation of the contract that may involve waiver or amendment of clauses, exemptions from interest payments, increases in interest rates that require additional personal or real guarantees, or other changes to the instrument's contractual framework;
n)	significant changes in the expected return and the borrower's behavior;
o)	changes in the credit management approach about a financial activity;
p)	information on the level of overdue amounts.

IFRS 9 introduces a *relative presumption* that a significant decrease in credit quality is presumed concerning origination if, at the reporting date, the asset expires after more than 30 days (IASB, 2014, par. 5.5.11). Since this is a relative presumption, it can be refuted if the bank shows that, even though the financial asset has expired for more than 30 days, the credit risk has not deteriorated significantly compared to the initial detection.

Another simplification is also envisaged, and it is known as a low *credit risk exemption*. Based on this exemption, the bank can choose to calculate the expected loss in the next twelve months. It can assume that there will be no significant worsening of the risk of credit if the financial instrument, at the balance sheet date, presents a low credit risk (IASB, 2014, par. 5.5.10). This is an optional simplification, i.e., it is left to the banks' will to choose whether to adopt it or not. To determine whether credit risk is low, it is possible to use internal rating or other methodologies that are consistent with a globally shared definition (for example, credit ratings of rating agencies). To define the staging rules, risk management could draw useful suggestions not only from the standard accounting setter but also from an integrated reading of internal practices, delivery criteria and credit processes (watchlist feed, past due management, etc.).

4. CASE STUDY: METHODOLOGICAL FRAMEWORK

As previously highlighted, IFRS 9 modifies the criteria for calculating the amortized cost, aiming at obtaining a consistent increase in credit impairment, starting from the phases in which the first significant signs of reducing the creditworthiness of

the borrowers are observed. By requiring that credits (deteriorated to a significant extent when compared to their origin) be written down by an amount equal to the expected loss for the lifetime of the contracts (*lifetime expected credit loss*), it brings *accounting principles based on advanced fair* valuation techniques from a *double-leg approach*[5], that allows an assessment of expected loss as a specific element, distinct from the other components risky credit value.

In the *double-leg approach*, the expected loss of credit corresponds to the average value ("expected" value) of the possible losses deriving from the possible insolvency of the debtor, which can occur, in various probabilities, at any of the observation intervals in which the period of validity of the contract is divided. Assuming an *n* years-long credit agreement divided into annual observation intervals, the following outcomes are defined:

- full payment of interest and regular repayment of the debt;
- insolvency of the debtor during any of the observation intervals.

Since the regular reimbursement scenario involves a null loss, to calculate the expected loss it is necessary to concentrate on the *n* default scenarios and estimate in advance:

- the vector $P = [p_1, p_2, \ldots p_n]$ of the probability of occurrence of each scenario;
- the vector $EAD = [EAD_1, EAD_2, \ldots EAD_n]$ exposure at the end of each observation interval;
- the vector $RR = [RR_1, RR_2, \ldots RR_n]$ of recovery percentages in case of default in the various intervals.

The EL is therefore obtained as the sum of the current value of possible weighted losses for the respective probability of occurrence of different scenarios. You will then have:

$$E[L] = \sum_{i=1}^{n} EAD_i \times (1 - RR_i) \times p_i \times B_{t,T_i} \qquad (3)$$

In Model 3 i is the index of the observation periods, t is the current time and B_{t,T_i} is the *default-free discount factor* referred to the *i-th* period. The EL at the portfolio level defines a random equity element of negative sign (impairment) representative of the losses that, on average, they expect to derive from the possible default of the debtors throughout the period of contract validity. The EL of a portfolio is therefore defined as the expected value of a statement of costs that should be offset in the parallel statement of revenues relating to the premium credits that the creditor expects to collect from the counterparties that will be solvents over time. In so far as they are conditioned by the persistence of a condition of solvency by the debtor (*survival probability*), the expected premiums from the single credit constitute a positive capital add-on element obtained as:

$$E[P] = S \times \sum_{i=1}^{n} EAD_i \times (1 - \hat{p}_i) \times B_{t,T_i} \qquad (4)$$

where:

- S is the contractual credit spread;
- $\hat{P} = [\hat{p}_1, \hat{p}_2, \ldots \hat{p}_n]$ is the vector of the PD cumulated at various observation dates.

The netting between expected losses and expected premiums defines the *credit leg* (Letizia, 2010), value of a credit agreement. The size and the sign of the credit leg, therefore, indicate the degree of adequacy of contractual *credit spreads*. Without credit leg, the credit agreement configures the only default-free structure that can be easily assessed by discounting the contractual capital and interest flows net of credit premiums. It can be seen in formula:

$$V = \sum_{i=1}^{n} F_i \times B_{t,T_i} \qquad (5)$$

At any valuation date, the value of a credit exposed to the debtor's default risk is given by the value of the *default-free leg* adjusted for the *credit leg* value:

$$E[V] = V + E[P] - E[L] \qquad (6)$$

In the pre-contractual phase, the creditor should use the information on which it bases the counterparty's assignment decision to estimate the expected loss *at inception* and calculate the credit spread that clears the *credit leg* by bringing the value of the credit risk to coincide with the value of the *default-free* component only. In any case, it would be a condition of parity with "local validity" since, over time, the new incoming information may induce a revision of the loss estimates such as to move the credit leg from the neutral valuation, shifting the value of the credit from its valuation default-free. In this logic, the formation of a negative credit leg indicates the insufficient contractual spread and provides the measure of *impairment*.

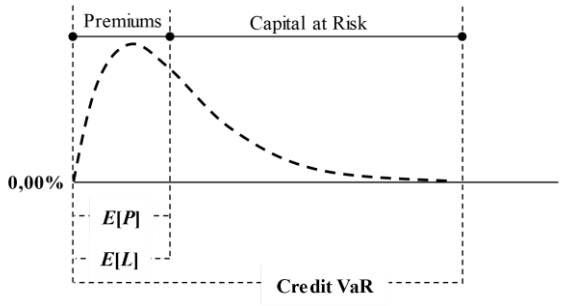
Replicated at the portfolio level, the credit assessment process based on the *double-leg approach* supports the creation of a consistent Credit Risk Management framework that distinguishes the total loss in two components:

- the *expected loss*, which defines the average of the possible loss levels, therefore a cost element;
- the loss is exceeding the average (*unexpected loss*) which configures the "true" credit risk.

As a cost, the EL is covered by expected premiums and impairment, while the risk is hedged through own funds.

[5] This is an approach that refers to the evaluation of credit derivatives and is supported by extensive literature on the subject: Saunders (2002); O'Kane and Turnbull (2003); Giesecke (2002); Giesecke (2003a); Hull and White (2001).

Figure 1. Profile of the distribution of losses in a condition of the appropriateness of premium

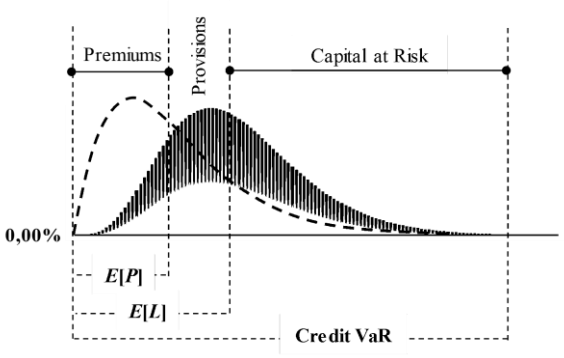


Source: Author's elaboration.

The *distribution of losses* to which the holder of a portfolio of credits is exposed describes the prospect of possible losses deriving from the joint default of an indefinite number of counterparties. Figure 1 shows an ideal break-even condition between expected premiums and expected losses (50th percentile of distribution). The possibility that the final loss is lower than the expected one defines the over-return area of the portfolio, while its complement identifies the risk area and should be covered by the creditor's own funds. In general, coverage of own funds up to the 99.9th percentile of loss (credit VaR) is considered adequate. This implies a PD of the debtor equal to 0.1 per cent.

The following Figure 2 describes a condition in which the estimate of average loss exceeds the value of the expected premiums. In this case, the negative value of the *credit leg* devaluates the credit and determines the appropriate provision that fills the premium shortfall.

Figure 2. Increase in estimates of loss and the capital at risk



Source: Author's elaboration.

The method of calculating the amortized cost envisaged by IFRS 9 reproduces some elements of the Credit Risk Management framework described above, but it seems to violate its underlying logic. The general scheme for calculating the expected loss envisaged by the new standard can be reconstructed by the following elements (IASB, 2014):

- the *loss* on credit is obtained as the sum of the differences between the contractual flows and the expected flows discounted at the effective interest rate calculated at the origin;
- the *effective interest rate* at the origin is the internal credit yield calculated on the basis of the expected contractual flows.

In the calculation of the effective return rate (*EIR, effective interest rate*), the standard applies a *single-leg approach* that only discounts the contract vector flows, including credit premiums, through increased spread rates to an extent of the credit equal to its initial accounting value:

$$V = \sum_{i=1}^{n} \frac{F_i}{(1 + EIR)^{t_i}} \qquad (7)$$

The internal rate at the origin is therefore a rate inclusive of some credit spread which, in an axiomatic key, the principle considers adequate to cover the expected losses *at inception*. This implicit is one of the qualifying elements of IFRS 9. In fact, a condition of insufficient coverage for contractual credit spreads can be considered frequent if one considers that a large part of financial institutions operates as a *price taker* and that many banks do not use an advanced fair pricing model, necessary to properly calculate the margin generated by the individual operations. Nevertheless, the accounting standard does not require a congruity check of the *spread at inception* and allows the initial recognition of the credit to an amount equal to the disbursement of the creditor[6], establishing that, until a significant deterioration of the creditworthiness of the counterparty is detected with respect to the original estimates, the coverage of the contractual credit spread is considered congruous and the credit is written down to a "weak" extent (only for expected losses within a 12-month horizon).

For those credits that appear to be significantly impaired concerning their origin, the standard instead requires recognition of the *lifetime ECL* as an explicit component of the overall value of the asset. This implies a partial opening towards a *double-leg approach*, necessary to bring out the expected loss as a specific element of value. However, the use of the initial effective return as a discount factor for expected credit flows retains a typical element of the *single-leg approach* in the model. It is noted that this solution, as well as appear improper under the profile of the method, does not recognize the valuable contribution of credit premiums and induces an excess of funds to cover the EL.

5. HYPOTHESIS AND MAIN FINDINGS

The portfolio model when applied to credit estimates the distribution of losses and calculates the expected loss at the portfolio level and credit VaR. Typically, this class of model operates on a defined horizon: it detects only losses resulting from default and fully neglects the effects of premium coverage. This approach precludes the possibility of operating from a *lifetime* perspective and does not allow the separation between the

[6] IFRS 9 requires that the initial recognition of a loan is carried out at fair value. In general, the standard directs to consider the fair value coinciding with the price of the transaction unless the bank discovers that the transaction was carried out at an out-of-market price(IASB, 2014, par. B5.1.1, B5.1.2).

performance prospect of a credit portfolio in the *downside* component, connected to the risk of suffering losses exceeding the premiums collected, and its *upside* complement, identified by the possibility that final losses are lower than actual credit premiums. This evidence makes portfolio modeling, in its basic formulation, unusable in investigating the degree of coverage of observable losses up until the loans maturity, and the consistency of related provisions. To carry out this type of analysis, it is, therefore, necessary to develop portfolio models specifically aimed at *lifetime* and shift the notion of "result" from the concept of "loss" to that of "margin", calculated as netting between premiums collected and losses incurred. Below is a case study, realized by applying a portfolio model that operates on a multi-period basis, with the aim of assessing the impacts of the new impairment criterion on the degree of coverage ratio of losses calculated at the portfolio level. To guide the model from a lifetime viewpoint, each unit of the portfolio has been associated with the relative default probability vector (default curve) which covers all the periods up to the expiry date of credit. The Monte Carlo simulation referred to these vectors. It was developed to identify possible default events and the relative times of occurrence. For each scenario, a *credit margin* is calculated as the difference between the present value of the premiums collected on credits that in various periods were "regular" and the current value of losses produced by credits that in the various periods were defaulted. Simulating a large number of scenarios allows for an estimate of the *distribution of margins* that can be obtained from the portfolio. In order to examine the effects of the change in the criteria of impairment on the degree of losses coverage, the model was applied to a stylized portfolio consisting of 100,000 bullet credits of 10,000 euros, homogeneous by type of counterparty, exposure, interest rate (net of credit premiums) with a PD of 12 months. In the specific case, reference was made to the typical values of an *unsecured bank credit* assuming the following hypothesis:

- interest rate risk-free[7] = 3.30 per cent (before applying credit spread);
- PD at 12 months = 1.0 per cent;
- LGD = 70.00 per cent.

To intercept the effects of the change in principle on loans with different maturities, the portfolio was divided into five segments of duration. As a result, 5 clusters have been defined with durations of 2, 4, 6, 8 and 10 years respectively.

Consistent with the provisions of IFRS 9 (par. B5.5.28, B5.5.29), the *lifetime expected credit loss* on a cash credit is calculated as the current value of the differences (*cash shortfalls*) between the contractual flows and the expected cash flows from the creditor. This approach requires that, at each settlement date envisaged by the contract, the creditor defines two alternative scenarios: a scenario of the regular collection of the contractual flow and one of credit recovery resulting from observation of the default. To ensure that these scenarios are disconnected and mutually exclusive, it's necessary to use a notion of default that refers to the entry of credit into an "absorbent" state (typically consisting of non-performing loans).

The multi-period default probabilities have been obtained through the production of homogeneous matrices[8], starting from the following transition matrix at 12 months (Table 3).

Table 3. Transition matrix (12 months)

	AAA	*AA*	*A*	*BBB*	*BB*	*B*	*CCC*	*CC-C*	*D*
AAA	91,05%	8,34%	0,52%	0,03%	0,04%	0,00%	0,00%	0,00%	0,01%
AA	1,37%	92,22%	6,05%	0,28%	0,03%	0,02%	0,01%	0,00%	0,02%
A	0,07%	3,17%	90,61%	5,44%	0,54%	0,11%	0,03%	0,00%	0,03%
BBB	0,05%	0,21%	5,07%	88,50%	4,68%	1,01%	0,27%	0,03%	0,19%
BB	0,01%	0,06%	0,45%	6,83%	82,76%	8,10%	0,67%	0,08%	1,03%
B	0,01%	0,04%	0,15%	0,38%	5,06%	82,68%	6,47%	0,75%	4,45%
CCC	0,00%	0,02%	0,02%	0,36%	0,53%	8,71%	69,59%	5,09%	15,68%
CC-C	0,00%	0,00%	0,00%	0,00%	0,46%	3,54%	13,16%	52,77%	30,07%
D	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%

Source: Author's elaboration.

Since these are homogeneous credits by exposure, *default-free* rate, the PD and LGD, the *par credit spread* originally differs only about the respective maturity, as indicated in the table below (Table 4).

Table 4. Contractual credit spreads for loans

	C-2y	*C-4y*	*C-6y*	*C-8y*	*C-10y*
par credit spread	0,8506%	1,0680%	1,2443%	1,3797%	1,4798%

Source: Author's elaboration.

For the construction of the default scenarios, reference was made to a "mono-factorial" approach adapted to the multi-period case. The default events were modeled through a reverse Merton approach that assumes the lognormal distribution of the assets returns of the obligations. The correlation coefficient between the return asset was assumed to be constant[9] at 0.2.

Each scenario generates two distinct data vectors:

- a carrier of prices obtained by adding the premiums collected in the various periods on all non-defaulted loans;
- a losses vector obtained by summarizing the losses relating to credits which, in each period, have entered the default state.

[7] In the at *inception* credit pricing model, the *default-free* rate covers the cost of funds and unrecovered operating costs in the form of fees. The cost of the funds is given by the *weighted average cost of capital* (WACC) as a weighted average of the internal rate of third party funds and of the target return on the capital absorbed by the transaction.

[8] IFRS 9 addresses the use of "non-homogeneous" matrixes obtained by correcting, in a "*forward*" view, the "*point in time*" matrix (PiT) that records the migration of customers entrusted in a recent time frame. The process of constructing forward-looking default probabilities requires a first correction of the PiT matrix on the basis of macroeconomic forecasts for a medium-term horizon and the subsequent coupling of a "*through the cycle*" matrix (TtC) that describes the transition of the entrusted observed in the long term. In order to grant maximum exercise and allow the reconstruction of the various steps performed by the model, the case study does not include the forward-looking correction procedure of the matrices (moreover, defined autonomously by each bank) and refers directly to a generic TtC matrix calculated as a twenty-year average of transition matrices referring to a large sample of corporate customers.

[9] A correlation of 0.18 is used by the prudential supervision framework on risks and capital for the estimation of the proportionality constant C used for the calculation of the capital add-on for the single-name concentration risk envisaged in the scope of the prudential control process.

The netting between the two data carriers, discounted at the reporting date, identifies the credit margin observed in the specific scenario.

In the Monte Carlo simulation procedure, the margin distribution is defined as a collection of the differences between losses due to insolvency and credit premiums observed on a large number of scenarios. It should be emphasized that the credit margin constitutes only a fraction of the credit intermediation activity margin, whose overall profitability depends on the extent to which the interest and commissions revenues cover all the cost elements, namely: 1) cost of third-party funds; 2) remuneration of absorbed capital; 3) direct and indirect operating costs related to intermediation, and 4) expected credit loss.

The net interest rate of the premium for absorbed capital and the credit spread defines the minimum rate at which a loan granted to a counterparty free of default risk should be settled (default-free rate). To maintain on average, this level of profitability, the intermediary investing in risky credit must raise the contractual interest rate to ensure an average increase in revenues that offset the notional cost of the unexpected loss and generates the expected premium from shareholders on the capital absorbed by the transaction. To support the uncertainty related to the exercise of the credit, the same intermediary must hold own sufficient funds to cover, almost entirely, the possibility that the losses in the final result are higher than EL. Based on these early reflections, it is clear that:

- on initial recognition, the expected premiums and absorbed capital should cover the loss statement up to the credit VaR;
- on subsequent reporting dates, any credit deterioration may render such hedges insolvent and require the establishment of risk provisions and an appropriate adjustment of own funds.

From this perspective, the four pillars of the Credit Risk Management framework are:

1) assessment of the creditworthiness of the counterparties entrusted (rating/scoring);

2) examination of the degree of coverage of spreads applied at origin (pricing);

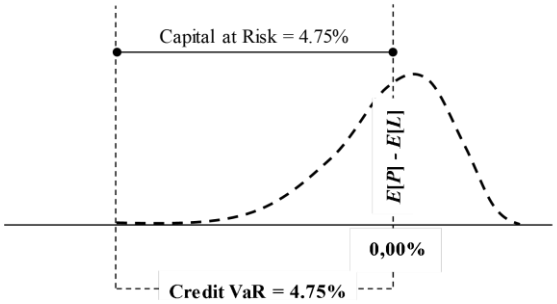
3) verification of the correct sizing of provisions for risks (impairment);

4) verification of the correct sizing of own funds (capital requirement).

Lifetime-oriented portfolio models receive information on the expected evolution of individualcredit positions until the expiry of the related contracts (exposure dynamics, probability of insolvency and loss in the event of insolvency) and make it possible to assess the expected total coverage of losses by credit premiums, risk funds and own funds. For these purposes, the portfolio model developed for our analysis was first applied to a theoretical condition of the appropriateness of contractual spreads and subsequently replicated assuming the deterioration of 15 per cent of loans in all segments of duration.[10]

Figure 3 describes the profile of margins distribution for the entire portfolio under examination, observed in an initial condition of adequacy of contractual spreads, typical of the credit origination phase.

Figure 3. Distribution of margins under conditions of congruity of credit spreads.



Source: Author's elaboration.

The hypothesis of generalized fair pricing conditions determines the substantial balance between expected losses and expected premiums and cancels the expected value of the credit margin. On the positive side, the upside area of the distribution is extended, which shows the frequencies of the portfolio over-performance scenarios, relating to cases in which the simulation recorded the prevalence of premiums collected in respect to losses incurred. The opposite sign scenarios are shown on the negative side of the horizontal axis.

The following Table 5 describes the degree of coverage of the various levels of loss identified by the simulation.

[10] IFRS 9 requires each bank to define its own rules for identifying the positions to be classified in Stage 2 (IFRS 9, par. 5.5.9, 5.5.10, 5.5.11). On this issue, the Supervisor expressed the expectation that the passage of a position to the exposures under observation, the recognition of concession measures or the criteria of amounts overdue by more than 30 days are considered by intermediaries as backstop indicators for entry into Stage 2 (European Central Bank, 2017). The application in the first time adoption phase of the criteria suggested by the Supervision led to the transfer to Stage 2 of a percentage that normally is between 10 per cent and 20 per cent of performing loans of the individual bank.

Table 5. Monte Carlo simulation on the portfolio without impaired loans

		Portfolio	*Clusters*				
			C-2y	C-4y	C-6y	C-8y	C-10y
a	Expected credit premiums	6,40%	1,59%	3,82%	6,35%	8,91%	11,35%
b	Expected credit loss	6,35%	1,59%	3,79%	6,30%	8,83%	11,22%
c	**Expected credit margin (*a* - *b*)**	**0,06%**	**0,00%**	**0,02%**	**0,04%**	**0,09%**	**0,13%**
d	Risk weight	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%
e	Capital requirement	8,00%	8,00%	8,00%	8,00%	8,00%	8,00%
f	Credit VaR 99,9%	4,75%	4,30%	6,03%	7,29%	8,15%	8,98%
g	Capital at Risk	4,69%	4,29%	6,01%	7,24%	8,06%	8,84%
	IAS 39						
h	Provisions	0,72%	0,72%	0,72%	0,72%	0,72%	0,72%
i	Total coverage (e + h)	8,72%	8,72%	8,72%	8,72%	8,72%	8,72%
l	**C-VaR coverage ratio (i/f)**	**183,70%**	**202,91%**	**144,74%**	**119,66%**	**107,02%**	**97,18%**
	IFRS 9						
m	Provisions	0,72%	0,72%	0,72%	0,72%	0,72%	0,72%
n	Total coverage (e + h)	8,72%	8,72%	8,72%	8,72%	8,72%	8,72%
o	**C-VaR coverage ratio (i/f)**	**183,70%**	**202,91%**	**144,74%**	**119,66%**	**107,02%**	**97,18%**

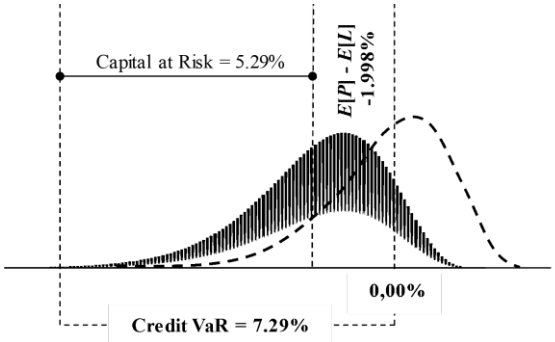
Source: Author's elaboration.

As the EL are fully covered by expected credit premium, the devaluation made under IAS 39 and under Stage 1 of IFRS 9 has proved to be unnecessary. The *capital at risk* calculated for the entire portfolio, equal to 4.69 per cent, is abundantly covered by own funds calculated according to the standard method of the supervisory regulations in force. Considering a 100 per cent *risk weight* and a minimum capital requirement of 8 per cent, the total funds at the portfolio level (obtained by accumulating the risk provisions and the capital requirement) would exceed 183 per cent of the credit VaR. However, in both impairment schemes, the fact that the provisions for risks and capital at risk are not sensitive to the residual duration of the receivables leads to a lack of coverage on bullet loans with a duration of 10 years.

In the second case, the deterioration of a fraction of the portfolio was modeled by simulating an instantaneous increase in the probability of default at 12 months for 15 per cent of the loans belonging to each segment of duration. In the specific case, a 12-month probability increase from 1 per cent to 5 per cent hypothesized, was sufficient to generate the passage of these credits in Stage 2 of IFRS 9.

The sudden increase in expected defaults has raised the loss estimates, made the related credit spreads incapable and reduced the probability of collecting the premiums. This condition led to a negative shift in the distribution of credit margins and its simultaneous lengthening in both directions (Figure 4).

Figure 4. Profile of the distribution of credit margins in the event of a deterioration of a portfolio fraction



Source: Author's elaboration.

The new credit margins table identifies an expected condition of non-payment of premiums that must be filled through the establishment of risk funds. In this light, the impairment of the deteriorated credit, and the consequent erosion of own funds reflect on the accounting plan the transformation into "expected" loss of a fraction of loss which, at the contractual stage, qualified as "unexpected". All other things being equal, the credit deterioration, therefore, raises the need for own funds to the extent necessary to replenish the capital consumed by devaluations and to cover the possible increase of the *capital at risk*.

Table 6 summarizes the results of the Monte Carlo simulation performed after 15 per cent of the credits of each duration cluster was transferred to Stage 2.

Table 6. Monte Carlo simulation on the portfolio with 15 per cent of non-performing loans: summary data

		Portfolio	*Clusters*				
			C-2y	C-4y	C-6y	C-8y	C-10y
a	Expected credit premiums	6,25%	1,58%	3,76%	6,22%	8,69%	11,03%
b	Expected credit loss	8,25%	2,43%	5,33%	8,33%	11,18%	13,74%
c	**Expected credit margin (*a* - *b*)**	**-2,00%**	**-0,85%**	**-1,58%**	**-2,11%**	**-2,48%**	**-2,71%**
d	Risk weight	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%
e	Capital requirement	8,00%	8,00%	8,00%	8,00%	8,00%	8,00%
f	Credit VaR 99,9%	7,29%	6,06%	8,40%	10,13%	11,33%	12,26%
g	Capital at Risk	5,29%	5,21%	6,82%	8,02%	8,85%	9,55%
	IAS 39						
h	Provisions	1,17%	1,17%	1,17%	1,17%	1,17%	1,17%
i	Total coverage (e + h)	9,17%	9,17%	9,17%	9,17%	9,17%	9,17%
l	**C-VaR coverage ratio (*i* / *f*)**	**125,77%**	**151,29%**	**109,21%**	**90,51%**	**80,95%**	**74,82%**
	IFRS 9						
m	Provisions	3,34%	1,68%	2,69%	3,52%	4,15%	4,63%
n	Total coverage (*e* + *m*)	11,34%	9,68%	10,69%	11,52%	12,15%	12,63%
o	**C-VaR coverage ratio**	**155,46%**	**159,85%**	**127,34%**	**113,65%**	**107,26%**	**103,04%**

Source: Author's elaboration.

At the portfolio level, an expected margin of -1.998 per cent is recorded.

At the level of individual clusters, the negativity of the margin is contained on shorter durations and is widened with the increase in the duration of loans. This trend is not intercepted by the impairment criteria outlined in IAS 39, the application of which determines the lack of risk funds on almost all lasting clusters and on the entire portfolio.

The CaR calculation on the new profile assumed by the distribution of the margins raises the capital absorbed from 4.69 per cent to 5.29 per cent and is therefore abundantly covered by the minimum capital requirement. The excess of own funds, observed at the portfolio level, compensates for the lack of risk funds produced by IAS 39 and determines a total coverage equal to 125.77 per cent of VaR. The examination of individual clusters reveals, however, how this condition of the sufficiency of total funds is rapidly reduced with the lengthening of the credit duration.

The change to IFRS 9 was modeled by carrying out a devaluation equal to the expected lifetime losses for the receivables transferred to Stage 2. At the portfolio level, it is noted that the write-downs carried out according to the new criteria (not considering the effect of hedging premiums expected) produce a surplus of risk funds to raise total coverage to 155.46 per cent of VaR. The examination for clusters reveals that, even in the presence of a capital requirement insensitive to the duration of the loans, the change in principle determines a sufficiency condition for the total funds on all segments of duration considered in the example.

In the year just described, the simulation model oriented from a multi-period perspective was used to estimate the distribution of margins obtainable from a hypothetical credit portfolio, with maturities between 2 and 10 years observed in two distinct conditions:

- *Case 1*: the typical condition of the contractual phase in which the congruity of the credit spreads determines the perfect balance between EL and expected premiums;
- *Case 2*: the condition of lack of contractual spreads due to the deterioration, in respect to the origin, of 15 per cent of the credits in the portfolio.

The availability of a margin distribution for each of the cases examined made it possible to calculate the extent to which possible levels of margin negativity were covered by risk provisions and minimum capital requirements. The calculation of *provisions* was carried out concerning the rules established by IAS 39 and to the IFRS 9 system. For simplicity, a 100 per cent *risk weight* was assumed for all loans and the capital requirement was therefore set at 8 per cent of current exposure.

From the two cases examined, it emerged that:

1) the rules laid down for Stage 1 of IFRS 9 do not reduce the excess coverage produced by IAS 39 on a portfolio of correctly priced and bonis loans;

2) in the presence of impaired loans (in respect to the origin), IAS 39 generates a lack of funds;

3) *lifetime* ECL foreseen for Stage 2 of IFRS 9 produces excess of *provisions* because it does not consider the effect of coverage produced by expected premiums;

4) the capital requirement insensitive to the loan's maturity generates a defect in credit coverage with higher return times;

5) for credit portfolios with no longer repayment times, the excess of provisions produced by IFRS 9 compensates the lack of coverage of the capital requirement.

The hypothesis underlying the above considerations is that the bank can determine, for each loan granted, the contractual credit spread necessary to offset expected losses at the origin. The assumptions used (on PD, LGD, risk-free rate) and the stilyzed portfolio used are the main limitations of this research. Possible future developments of this work could consider a large loan portfolio and several starting assumptions about the credit risk variables.

6. CONCLUSION: CREDIT RISK MANAGEMENT BEYOND THE NEW IMPAIRMENT MODEL

This research better explains, also with the case study, how incisive the changes in the Credit Risk Management framework are regarding new accounting principle in terms of:

- *pricing risk-adjusted* models (to make them consistent with the new ECL model);
- definition of *credit policy* (selection of origination of counterparties and sectors with a stable risk profile, or with a positive outlook, less dependent on the performance of the economic cycle);
- of *credit risk modelling* (also for the IRB banks it seems to have, in this regard, a position of advantages well as about the degree of coverage of losses in a loan portfolio).

It also underlines the importance to integrate risk management and accounting functions. This aspect is in continuity with supervisory regulation provisions for the internal control system which has assigned to the risk control function new responsibilities regarding the verification of the credit management and evaluation process: the monitoring of the individual exposures, adequacy of classifications of the credit portfolio and impaired exposures, as well as the analysis of the consistency between the risk measurement systems and the models for the valuation of financial assets.

However, the new accounting standard gives new force to this regulatory provision by replacing the accounting logic of *incurred loss* with that of the risk management of *expected loss* and *forward-looking*. This way, it confers new responsibilities and tasks, not just regarding credit risk modeling to the bank's risk management. These were, in fact, during the process of adoption of IFRS 9, involved in further areas of activity (Letizia, 2016): contribution to the design of the SPPI test; development of the cash flow test benchmark model; analysis of the calculation model of the *lifetime expected credit loss* developed by the computer servicer; definition of how to use the internal rating system for the calculation of PDs and transition matrices or, alternatively, of datasets taken from scoring systems (anomalous statistical or experiential system) for the construction of "decay" curves, development of perspective-sensitive multi-period PD calculation systems for the definition of forward-looking ECL, calculation of the LGD *workout* and *back testing* of recovery assumptions (realization times and

estimates) that feed *impairment* modelling, verification of congruity of provisions according to IFRS 9.

However, at this moment in history, the Credit Risk Management framework is not only impacted by the new accounting principle but is grafted onto a constantly changing regulatory framework that continuously produces frameworks (BCBS), opinions (ECB), guidelines, technical standards (EBA) on the subject of credit risk (modelling, capital requirement, non-performing loans management, etc.) which inevitably must be read and analyzed in an integrated manner with the new accounting framework in order to avoid duplication of measures, information flows, reporting, monitoring activities, roles and organizational responsibilities. The integrated reading by the intermediary is an undeniably important strategic-management challenge.

Due to possible differences in application and interpretation of the new impairment models, in addition to the *implementation guidance* provided by the IASB and the support of the ITG[11], the regulatory bodies (BCBS, EBA) and auditing (GPPC[12]) also intervened with the publication of its own guidelines to support intermediaries in the process of convergence to the new standard. As early as December 2015, BCBS published prudential guidelines (BCBS, 2015) that defined the possible interactions between the *expected credit loss* (ECL) model and the general practices of measuring and managing a bank's credit risk. In recent times, the European Banking Authority (EBA) has also intervened with the publication of its own guidelines (EBA/GL/2017/06) on accounting for expected losses and with various indications on the estimate of credit risk parameters. Many of these prudential regulatory innovations do not exactly coincide with the standard accounting setter; many seem to enrich this with new operational repercussions for the Credit Risk Management process. For example, among these, it should be noted that the identification, among performing credits, of positions that present a greater degree of credit risk than "normal", (which was, in fact, an objective which, albeit with other purposes) had already been set up by the authorities prudential supervision. In fact, the introduction of the concept of *forborne* credit (EBA, 2014) (object of concession, *forbearance*) dates back to 2014, following a situation of difficulty for the debtor (renegotiation of maturity on the term loans that reduces) that had already requested the banks' careful review of credit granting and monitoring practices and an increase in forbearance practices, especially for retail and corporate real estate exposures.

Among the regulatory changes not yet implemented that open area of overlap and divergences between the supervisory framework and the accounting framework, it is considered appropriate to recall those relating to the *capital requirement* for credit risk. Finalizing Basel 3, BCBS (2017) defines the revision of the standard approach and *internal rating based*[13] models, with the aim of mitigating the well-known variability and poor comparability of the *risk weighted assets* of European banks.[14] Additionally, in 2017 the EBA issued guidelines (which will be applied with effect from January 1, 2021[15]), which heavily impact the modeling activity of banks. In particular, they intervene in the following areas (EBA, 2017c): data requirements for the estimate of the PD, general principles for calculating the default rate; (ii) observed average default rates; an estimate of the long-run average default rate (LRAVDR), risk drivers, rating philosophy and calibration, discount rate for the estimate of LGD (Euribor 1 y + 5 per cent[16]); identification of three categories deficiencies for the application of the margin of conservatism (MoC); an estimate of LGD by "open" default (mandatory inclusion of open defaults for transactions whose recovery process has not been completed), IRB floor for the estimate of PD and LGD.

From this perspective, the supervisory models, as often specified by both the IASB and the supervisory authorities, may constitute a starting point for ECL accounting. However, they are not directly usable for accounting purposes and need adjustments due to the different purposes pursued concerning the standard accounting setter. Recalling that the expected loss of Stage 1 of IFRS 9 is conceptually similar to the prudential EL: both are calculated on a time horizon of 12 months, and in both cases, the variables to calculate it are PD and LGD. However, due to the different objectives of the two accounting and prudential regimes, the estimates of PD and LGD are not the same in both cases; the prudential estimates of these variables must be "modulated" to comply with the requirements of IFRS 9. Nevertheless, the measurement and regulatory treatment of loan loss provisions are closely linked to the adoption of the standard or IRB approach by that of the credit institution.

The prudential rules for the estimation of the EL are relevant only for IRB banks, while the provisions for the EL of IFRS 9 include all assets and are also relevant for banks that adopt the standard approach. For these banks in general, prudential regulation does not require a provision for loan loss provisions, while accounting provisions directly affect Tier 1. IRB banks, for performing exposures, use their estimate of PD that may be of type PIT, TTC or hybrid. The CRR does not require a specific rating philosophy to be used, but it should be noted that the PD estimates should reflect a long-term average of one-year default rates to ensure that they are stable over time. This would suggest that only a TTC or hybrid approach would be consistent with the prudential framework.

[11] The Transition Resource Group for the Impairment of Financial Instruments (ITG) was established to provide support for the implementation of the new impairment process contained in IFRS 9.

[12] The Global Public Policy Committee (GPPC) is the committee that brings together the six major audit firms (BDO, Deloitte, EY, Grant Thornton, KPMG, and PwC).

[13] In order to restore credibility in the calculation of RWA and increase capital ratios comparability, the BCBS decided to:

- remove the option to use IRB advanced approach for some asset classes;
- adopt "input" floors (for measures such as PD and LGD) to ensure minimum levels of conservatism in cases where the IRB approach remains usable;
- provide a better specification of the parameter estimation practices.

These changes will have to be implemented by banks since January 2022 (definitively since 2027).

[14] It is largely attributable to discretions applicable in the modelling phase of credit risk variables and in the operational declension of non-compliance concept.

[15] Early implementation is encouraged.

[16] However, the EBA guideline on the 5 per cent spread is still provisional: «…*While the level of the add-on is consistent with the results of the IRB survey carried out across the institutions and reflects a balanced figure between the discounting rates applied within and outside the euro area, the adequacy of the 5 per cent add-on will be further analysed and, if necessary, reviewed before the date of application of these GL*…" (EBA, 2017b):

In this regard, the IASB clarifies that the TTC estimates are not consistent with the EL requirements for IFRS 9 as they consider a range of possible results, rather than those that are expected at the reporting date. This would not allow it to reflect the economic characteristics of the financial instruments at the reporting date.

Further differences related to EL arise with respect to the estimate of LGD. Prudential regulation, as seen above, requires an estimate of the LGD based on the *long-run average weighted by the number of defaults* and, in any case, the *LGD downturn* should be used, if more conservative. Conversely, according to IFRS 9, LGDs should incorporate actual expectations on the future into reporting date. Moreover, according to the prudential regime, the fewer information banks have, the more conservative the estimates of PD and LGD should be; in addition to this, *floors* are applied to the credit risk parameters. These conservative forecasts are inconsistent with EL according to IFRS 9 and must be removed.

Finally, prudential EL is always calculated over a 12-month time horizon for *performing portfolios*, while according to IFRS 9 *lifetime* losses must be recognized for those exposures that have significantly increased their credit risk (those falling so on Stage 2). As briefly summarized above, important divergences arise in the estimates of PD and LGD (Table 7) between the regulatory framework and the new accounting standard that require careful and integrated reformulation of *credit risk modeling.*

Table 7. IASB vs. BCBS

		IASB (IFRS 9)	***BCBS***
PD	Measurement period	12 months (Stage 1) Lifetime (Stage 2 e 3)	12 months
	Sensitivity to the economic cycle	Point-in-time (PD PiT), forward-looking and has to take into account macroeconomic factors	Through the cycle (PD PiT)
LGD	Measurement	Neutral, forward-looking and able to consider macroeconomic factors.	The downturn, time series at least 5 years long for retail, 7 years for corporate, sovereign banks.
		Non-binding on the depth of default time series	Defined by the regulations the impact of the real eligible guarantees
		Costs to exclude to avoid double counting.	Direct and indirect costs of the credit process to be incorporated in the estimate
		Actualization rate intended as (effective interest rate), annual contractual rate (annual rate composed in case of infra-annual capitalization, if permitted).	Actualization rate left to discretion of the bank.

These modeling proposals for estimating credit risk drivers often lead to at least the quadrupling of necessary measures (*PD PIT, PD TTC, PD at one year, PD lifetime, LGD at one year, LGD lifetime, LGD stressed downturn, LGD defaulted asset*).

The EBA has also recently tried to measure the qualitative and quantitative impacts on the IRB and standard banks of the new accounting standard[17] (classification and measurement, impairment and other qualitative impacts *j* – implications for supervisors). Below is a summary Table 8 of the results of this quantitative analysis.

Table 8. IFRS 9 impacts

	Estimated impact on CET1 ratio(bps)	***Estimated impact on total capital ratio (bps)***	***Estimated provision increase (%)***
Whole sample			13%
Small banks	-78	-78	5%
Large banks	-33	-20	15%
Standard approach	-77	-77	6%
IRBA approach	-32	-17	16%
Weighted average			15%

Source: Author's elaboration on EBA (2017a).

In this perspective, this paper adds knowledge to the research on the relationship between Credit Risk Management framework and accounting standard IFRS 9. Second, it also links our findings related to ECL approach with potential implications for the financial sector, policymakers and regulators also in relation to Basel 3 framework. It can be seen from this work that the evolution of the Credit Risk Management process in banks must be planned by analyzing the regulatory and accounting framework in an integrated manner; to clearly and unambiguously design the process and methodological changes on measurement, monitoring, credit risk control and data collection. Challenging changes, but certainly of a different nature and depth for the standard and IRB banks.

[17] EBA used data from 54 institutions from 20 different Member States. For the purposes of the financial year, it was assumed that banks with total financial assets of less than 100 billion euro were part of the group of smaller banks in the sample. In any case, most of the sample banks (94 per cent) were identified as G-SIIs (63 per cent) or as (O-SIIs) (31 per cent). In addition, most of the sample banks use both the standard and the IRB approach for measuring credit risk (EBA, 2017a).

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