LOAN ORIGINATION AND MONITORING

The banking market, shaken by the pandemic, needs to completely rethink its credit processes, using innovative approaches. In this context, Reply supports its clients in all the stages of their banking processes, thanks to AI & ML techniques that allow them to be compliant with new regulatory frameworks.

INTRODUCTION

The current economic scenario has created significant headwinds for Financial Institutions' (FIs) business models, particularly related to credit and lending activities. A number of drivers are weighing down on firms:

- New players, including fintech enabled businesses, are becoming active in the retail, SME and corporate credit markets, threatening the historical domination of incumbents.
- COVID-19 related impacts have created a real possibility of a deep and protracted recession in Europe. The economic and social fallout of this pandemic will push default rates for borrowers across the spectrum.
- Regulatory pressures: even if regulators have taken actions to ease the regulatory and compliance burden on firms, these remain a significant book of work that FIs need to undertake.

To stay viable, FIs will need to adopt more complex and innovative credit strategies that optimize risks, costs and time to market, while effectively servicing the sectors of the market that need continued access to credit.

To enable this, FIs will need to undertake a comprehensive review of their credit processes and strategy. This would include defining a clear risk and data-driven approach, encompassing business, credit monitoring and risk management processes.

1. REGULATORY EXPECTATIONS AND AREAS OF FOCUS

As of June 30th 2021, an important milestone for the regulatory framework on Loan Origination and Monitoring (LOM) was achieved: the entry into force of EBA LOM took place, completing a process started in May 2020. The European Banking Authority (EBA) developed a package of specific Guidelines on Loan Origination and Monitoring after the Council of the European Union's Action Plan developed a strategy for dealing with high levels of non-performing exposures. This emerged as a priority need due to the COVID-19 pandemic and the following deterioration in the economic environment throughout 2020. The EBA, after the June 30th 2021 deadline which applied the LOM norms exclusively to loans disbursed after that date, indicated some additional deadlines related to the transitional regime:

- June 30th, 2022 for the application of the Guidelines also to existing loans that require renegotiations or contractual changes;
- June 30th, 2024 for the complete filling of any data gap by the FIs and thus the adaptation of their monitoring structures and IT infrastructures.

The final objective of the LOM Guidelines is to develop, within the FIs, practices, arrangements, processes and mechanisms in relation to credit granting, in order to identify that:

- FIs have robust and prudent standards for credit risk taking, management and monitoring
- Newly originated loans are of high credit quality

The EBA final aim is to improve the financial stability and resilience of the EU banking system.
The guidelines specify the internal governance arrangements, processes and mechanisms, as laid down in Article 74(1) of Directive 2013/36/EU (Capital Requirements Directive, CRD), and further specified in the EBA Guidelines on internal governance and requirements on credit and counterparty risk, as laid down in Article 79 of Directive 2013/36/EU in relation to the granting and monitoring of credit facilities throughout their life cycle.[1]

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[1] EBA/GL/2020/06 – Guidelines on loan origination and monitoring

The EBA Guidelines introduce a number of requirements in order to specify the borrowers' creditworthiness, together with the handling of information and data, specified in Articles 18 and 20 of Directive 2014/17/EU (Mortgage Credit Directive, MCD). Additionally, the guidelines recognize the extension of the EBA's scope of action in the review of the European Supervisory Authorities' (ESAs') Founding Regulations, and incorporate guidance for the creditworthiness assessment in relation to consumer credit, in accordance with Article 8 of Directive 2008/48/EC on consumer credits (Consumer Credit Directive, CCD).

The aim of the LOM Guidelines, as specified within the EBA document, is to bring together the prudential framework and consumer protection aspects of credit granting, and in particular:

- Clarify the internal governance and control framework for the credit-granting and credit decision-making process, building on the requirements of the EBA Guidelines on internal governance;
- Specify requirements for the creditworthiness assessment of borrowers, differentiating between lending to consumers and micro and small enterprises and medium-sized and large enterprises, and set out the requirements for handling information and data for such assessments;
- Set out supervisory expectations for the risk-based pricing of loans;
- Provide guidance on the approaches to the valuation of immovable and movable property collateral at the point of credit granting, and the monitoring and review of the value of such collateral, based on the outcomes of the monitoring;
- Specify the ongoing monitoring of credit risk and credit exposures, including regular credit reviews of borrowers.

The guidelines reflect supervisory priorities and recent policy developments related to credit granting, highlighted by the recent financial crisis and accounting for the growing importance of environmentally sustainable lending and anti-money laundering (AML), as well as the growing use of automated and statistical models and technology-based innovation in the credit granting and collateral valuation.

1.1 EBA GUIDELINES ON LOAN ORIGINATION AND MONITORING

Loan Origination and Monitoring processes are primary areas for banking supervision over the three years from 2019-2021, and they are affected by several measures: some indirect, like the New Definition of Default, other ones direct, like EBA Guidelines on Loan Origination and Monitoring. The EBA council, starting from a phase of consultation with the Banking Supervisory Institutions, has started a gap assessment and development of action plans, as recently transposed by the Bank of Italy[2]. In the near future, EBA Guidelines will be designed to replace the existing EBA Guidelines on creditworthiness assessments under the Mortgage Credit Directive (MCD) and to become the new standard for credit underwriting across Europe. Driven by the main purpose to ensure a high credit quality for new originated loans, and to certify that credit risk monitoring frameworks will be robust and prudent, EBA Guidelines will have an immediate impact on banks' internal processes as well as on day-to-day operations, IT infrastructure, and governance, because their scope of application covers a full range of borrowers (SMEs Corporate, Commercial Real Estate, Residential Real Estate, Shipping Finance, Project and infrastructure finance).

The new framework will be focused on three core needs. Firstly, the need to improve the information gathering to support the assessments on borrowers' repayment abilities at the moment of origination, enabling the possibility to review and adjust credit policy and lending procedures. The second need is to monitor the credit risks regularly throughout the life of a loan and provide specifications of the minimum financial data and metrics that originators must gather, validate, analyze, stress and report: this also allows for the back testing of the loan pricing policies and for the valuation of collateral.

Finally, the need to align banks' credit risk strategy, and the implementation of this strategy via credit-granting decisions, with capital and liquidity planning (ICAAP, ILAAP) and Risk Appetite Framework (RAF). In addition, the EBA Guidelines suggest that appropriate credit procedures should be established for the lending practices with environmental, social, and governance (ESG)

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[2] See Bank of Italy circular of 17 December 2013, no. 285, 36th update of 20 July 2021.

impacts, also known as "green lending". Financial Institutions that would like to put "green lending" into practice should acquire a structured process starting from the definition of a list of the green projects and criteria that the institutions consider as eligible as part of their green lending policy, in line with the new European Taxonomy. Through a properly defined process, the institutions must also be able to collect relevant information, about climate as well as environmental objectives of the borrowers, to assess the conformity of borrowers' objectives with the qualifying green projects, and finally to monitor on a regular basis the proper allocation of the proceeds.

The EBA Guidelines provide indications on credit origination and monitoring by suggesting the design and the implementation of credit processes tailored for each client segment, or products, or geographical areas, taking also in consideration account type, size, and complexity of the credit facilities being originated (or monitored), as well as the purpose. Within loan origination procedures and credit risk policy, financial institutions should enforce the collection of data and documentation in order to perform borrowers' creditworthiness assessments, and verify their compliance with credit granting criteria, authorization levels and conditions for the application of automated decision-making. Institutions and creditors should introduce metrics that are relevant to assess the borrower's ability to repay the loan, depending on the type of asset and lending product, at its origination and over its entire lifecycle. For the purposes of the creditworthiness assessment, FIs should collect and verify information in relation to the following features:

- purpose of the loan;
- type of product (where relevant);
- income and cash flows;
- business model and corporate structure;
- business plans;
- financial projections;
- collaterals or other risk mitigation factors.

EBA, with reference to counterparties like SME and Corporate, suggests also investigating the turnover of the borrower by comparing the current account to the turnover of those of the financial statement. This allows for the assessment of the cash outgoings in the account compared to the financial documentation provided.

As for Micro-enterprises, they will not be excluded from the assessment. In case they would not produce financial information for tax purposes, the EBA suggests obtaining information by establishing a pro-forma financial position for the purposes of the creditworthiness assessment.

In addition to data collection practices, EBA Guidelines have not failed to set out expectations for institutional data infrastructure and lending activities involving technology-enabled innovation. When using technology-enabled innovation for credit granting purposes, financial institutions should stand up a control framework that ensures to manage and fully understand the results as well as the potential risks that may arise.

In this sense, EBA Guidelines does not define a specific control framework, but provides a list of considerations regarding the innovation for credit granting purposes:

- An adequate caption of the risk management and control frameworks, as well as the risks associated with the technology-enabled innovation in use (commensurate with the business model, to credit risk exposure and to the complexity of the methods in use);
- Understanding of the use of technology-enabled innovation by Management;
- Traceability, auditability, and robustness and resilience of the underlying models;
- Interpretability of models and their fit for purpose;
- Understanding of the quality of data and inputs to the model and detection/prevention of bias in the credit decision-making process;
- The performance of the model, including the validity and quality of its outputs, should be continuously monitored as to take appropriate remediation measures.

Traceability, auditability, robustness and resilience of the model in use will be required as primary attributes. At the same time, continuity, integrity and security of information are required for the data infrastructure. The true challenge regards which and how much information needs to be collected to ensure the robustness of creditworthiness valuation, at loan origination but also afterwards in the monitoring phase, and over the lifecycle of the loan. It is very likely that financial institutions will undertake to collect a slew of new data that is finally revealed as a massive waste of paper. Data infrastructure as well as technology-enabled innovations should help the gathering and the automatic compilation of credit risk data, and limit manual processes for the institution's own risk management purposes, as well as for the regular prudential and statistical reporting. To do that, financial institutions have to maintain an appropriate time series of reporting for current exposures and new lending over time. Within the monitoring framework, financial institutions should implement metrics differentiated by asset type or credit segment in order to define the credit risk profile of borrowers. These metrics could be set as ratios in order to evaluate solvency, liquidity and profitability of SMEs customers, and for the purpose of creating a significant benchmark of creditworthiness indicators to be used for credit origination strategies.
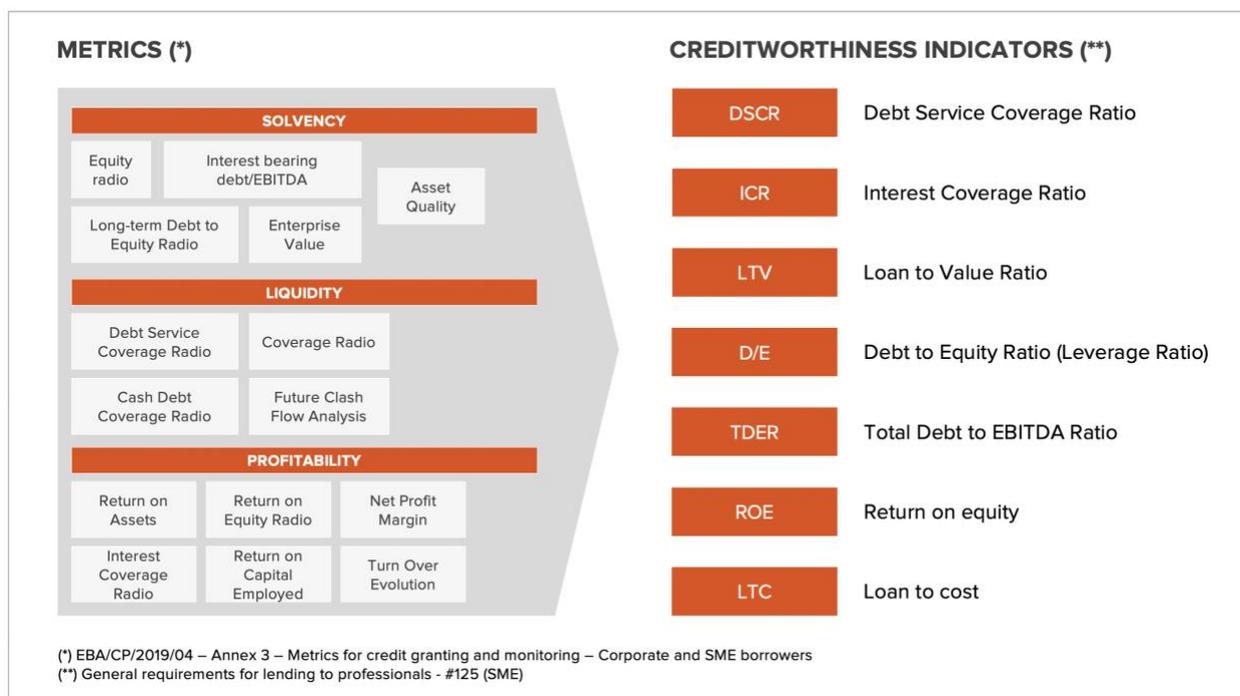

FIGURE 1 - EBA SUGGESTIONS FOR SME'S BORROWERS ASSESSMENT

Beyond the quantitative aspects, qualitative ones are also listed as relevant to be taken into account by financial institutions in order to accurately evaluate the borrower's credit position. The usage of metrics and ratios should not be the reason to underestimate "soft" elements that could influence the ability of the loan's repayment. These factors could include information and reports on quality of management, agreement/disagreement among owners, owner´s commitment to the borrower, forecasted market growth, company´s pricing power, cost structure and flexibility of costs, as well as the trend, size and nature of capital expenditure and research and development expenditure. As part of the FIs' monitoring framework, a relevant component is the quantitative and qualitative Early Warning Indicators (EWI), which should be defined as for the timely detection of potential deterioration in credit quality referred to the whole portfolio as well as to industries, geographies and individual exposures considering they have relevance in the monitoring of the institution's current position regarding its credit risk appetite. Financial Institutions, so as to detect potential negative events before their occurrence, should take into consideration the following relevant risk factors:

- negative macroeconomic events affecting the future profitability of an industry, a geographical segment or a group of borrowers, as well as the increased risk of unemployment for groups of individuals;

- deviation in actual earnings from the forecast;
- an actual or expected significant decrease in the main transaction's external credit rating;
- changes to the conditions of access to markets; and
- for transactions secured with collateral, a significant worsening of the ratio of their amount to the value of the collateral, due to unfavorable developments in the value of the collateral.

1.2 THE ALERT TOOLS APPLICATION

The alert tools linked to the LOM foresee a sequential approach by developing new rules for the firm assessment. As a first step, the equity should be analyzed: if negative, or under the legal obligations, and the company does not replace it, this is the first signal of a state of crisis. In case of positive equity, the assessment is aimed at verifying if there are any delays in payments foreseen. If this test gives a positive result, the DSCR (Debt Service Coverage Ratio), the ratio between cash flows generated by current operations and financial expenses related to indebtedness, needs to be analyzed: a DSCR value greater than or equal to 1 is a signal of a state of crisis. If the DSCR is less than 1 or if it is not available, the following five balance sheet ratios should be considered, where the simultaneous overshoot of their threshold is a clear indicator of crisis:

- Financial expenses/Revenues: gives a general indication of the weight of bank interest;
- Debt to Equity Ratio: the ratio between net worth and debt, the company is more solid and capitalized;
- Current Ratio (Current Assets/Current Liabilities): the lower the percentage the lower the short-term receivables that can cover short-term liabilities to Suppliers and Tax Authorities;
- Cash flow/Total Assets: the ratio indicates the performance of the company in terms of cash generated;
- Tax debt/Total assets: for this indicator, the National Tax Office and the National Social Security Institute are external "qualified public creditors", able to report the state of crisis of the company, in the case of overdue debts exceeding a certain threshold.

Referring to the aforementioned crisis indexes, it is necessary to calculate the Debt Service Coverage Ratio (DSCR), which is based on the prospective cash flows to be compared with the company's future obligations. This requires the availability of a short-term treasury and a punctual budget of receipts and costs at 6/12 months. Cash flow monitoring systems may consist of simple spreadsheets in the case of small and uncomplicated business realities. For more structured companies, some tools are essential: software that manages the company's treasury with regards to forecasting and accounting schedules, control of banking conditions, and forecasting and final financial positions. These systems are particularly efficient when connected with the accounting management systems (ERP). In addition, the presence of risk management dashboards can contribute to strengthen controls towards business continuity, but the sophistication of these tools can vary widely based on the complexity of the company. In some cases, it will be sufficient to complete questionnaires that help administrators and any other control bodies to identify the spectrum of risks that can compromise business continuity, analyzing them in order to give them priority. For the precise control of the well-founded indications of the crisis, it is also necessary that these dashboards, connecting to the management systems, allow for the calculation of equity and five crisis indexes according to the most updated information available. In more structured companies, it will also be necessary to connect risk management indicators with budget assumptions in order to project those indicators to the following 6-12 months. For even larger companies, an adequate organizational structure requires three-year forward-looking projections of the risk of default, and other company variables. In these cases, it is important to connect risk management dashboards not only to budgets, but also to business plans, in order to further expand the timeframe in which it is possible to verify business continuity.

In this regard, a proper bankruptcy law must on the one hand favor a rapid and low-cost exit from the market for companies in a state of irreversible crisis, protecting the assets values that can be put back on the market; while on the other hand it must allow companies, under temporary duress, to restructure and remain in the market. The benefits of an efficient discipline concern not only companies experiencing the crisis and their trading counterparts, but also the economic system. Indeed, efficient rules have positive effects on the conditions of access to credit for the enterprises, on birth and innovation rates, and on the allocation of the resources within the production system.

In 2019 the Italian legislator issued a legislative decree (D.Lgs.) on bankruptcy, the "Codice della Crisi di Impresa e dell'Insolvenza"3, which is expected to enter into force in the spring of 2022. The law represents an innovative discipline that will have significant impact on both customers and credit originators. One of the main innovations of the reform is the introduction of the alert and assisted crisis composition procedures, which aims at the early emergence of business crisis cases. The idea is that an early detection is essential to solve temporary crises before they become chronic, or to preserve the values of corporate assets in the event of an irreversible crisis. In particular, the new discipline has identified two pillars on which the prevention of insolvency has to be founded: first pillar is based on alert tools capable of bringing out early evidence of the crisis (i.e. Enterprise Risk Management Systems); the second one is based on organizational requirements, whereby companies must have adequate organizational arrangements to detect the crisis in a timely manner and to prepare measures to counter it.

The "Codice della Crisi di Impresa e dell'Insolvenza" has therefore strengthened the corporate governance rules and, in particular, has defined a greater responsibility of the entrepreneur and corporate, introducing organizational obligations. According to the new rules, companies, including SMEs, have to put in place monitoring tools able to predict in advance the trends of economic flows and especially of the company's treasury. The same metrics adopted for monitoring the enterprise health should be used in the definition of business plans, annual budgets, treasury and cash plans, and multi-year forecasts, in order to have a clear picture on solvency, liquidity and profitability status for the present and the future.

In essence, the new rules oblige Italian companies to adopt self-assessment systems, able to diagnose the evolution of the risk of default in the short and medium term. A rather disruptive novelty for Italian companies, especially for those of smaller size who will have to demonstrate that they have forward-looking tools for managing business risk. The idea of the Italian legislator is to focus on the probability of default, or rather on predictive aspects, related to the future, and statistics aspects, in a forward-looking perspective.

The shift towards a forward-looking perspective is also an alignment with banking view, an area in which regulation has already gone in this direction (e.g. IFRS9), prompting banks to equip themselves with predictive tools, even with the help of artificial intelligence (AI) and big data analysis, favored also by the European PSD2 Directive.
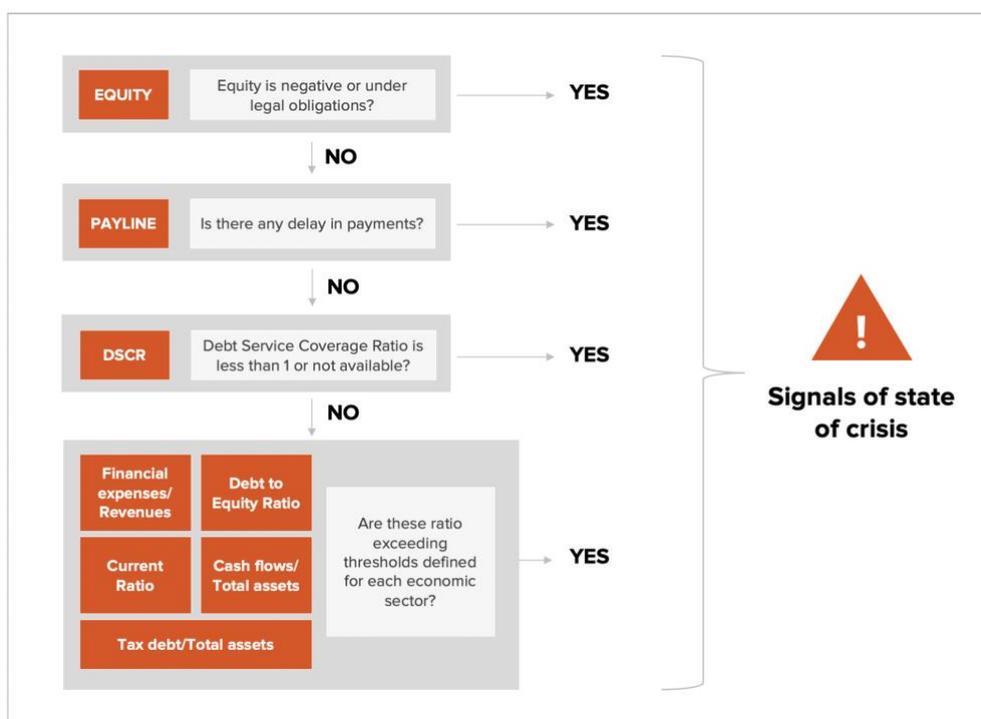

FIGURE 2 – ALERT TOOL FORESEEN BY ITALIAN BANKRUPTCY LAW

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3 DPR (2019), Codice della crisi d'impresa e dell'insolvenza in attuazione della legge 19 ottobre 2017, n. 155, D. Lgs n. 14/2019

The adoption of an adequate organizational structure for the prompt detection of the crisis, as well as the accurate calculation of the indicators, could require the introduction or strengthening of effective Enterprise Risk Management (ERM) systems within the company. It is foreseeable that companies of small dimensions renounce the calculation of cash flows and fulfill the obligations of the new regulations with automatic systems of adequate verification that could interrogate external information sources (e.g. the Centrale Rischi – the Credit Bureau of the Bank of Italy) to assess the presence of situations of tension within the banking system. In some cases, these systems could be integrated with the management ones for updating the calculation of the ratio thresholds. Potentially, operators specialized in analyzing current account movements, which could arise thanks to PSD2 indications, can formulate forecasts of the cash flows based on historical data, especially for companies with frequent incoming movements, perhaps characterized by seasonal phenomena.

The compliance with rules of the new Bankruptcy law, in particular the fulfilment of organizational obligations, will require significant investments for Italian companies. These investments will be mainly focused on the design and implementation of ERM systems, acquisition or creation of risk management skills, and potential outsourcing of alert tool calculations to dedicated services.

2. METHODOLOGICAL AND OPERATIONAL IMPACTS

2.1 EXPANSION OF THE INFORMATION UNIVERSE IN THE LOM GUIDELINES

The EBA Guidelines on Loan Origination and Monitoring report the indications of the Regulator regarding the shared strategies that banks should adopt when granting and monitoring in order to ensure sound standards for credit risk management, enhancing the existing framework.

IV. Internal Governance
Section 4 focuses on the role and methods of participation of Governance in the granting and monitoring processes, and in particular provide for a decision-making process (reported in Annex 1 of LOM Guidelines) for the granting of credit, with some KPIs to be re-evaluated in Monitoring.

V. Credit Granting
Section 5 defines the best practices to be followed in the phase of granting credit for the Credit Worthiness Assessment in terms of Data Collection (reported in Annex 2 of LOM Guidelines), differentiated requirements for homogeneous clusters, parameters and indicators differentiated by type of customer and product, with the objective of evaluating the factors that could impact the creditor's repayment capacity (current and prospective).

VI. Pricing
Section 6 illustrates the expectations for determining the pricing of loans based on the risk assumed by lenders, including the prospect of profitability and risk linked to the characteristics of the product, its competition and prevailing market conditions.

VII. Guarantees evaluation
Section 7 focuses on the requirements for the valuation of collateral (real estate and securities) that banks must take into consideration throughout the credit granting cycle.

VIII. Monitoring Framework

Section 8 defines a framework that continuously monitors the performance of a dataset of Financial Statements' KPI (reported in Annex 3 of LOM Guidelines) with some to be detected already starting from the origination phase divided by clusters identified by sector, geographical area, and size of the debtor, significant for the EWS Modules.

The EBA Guidelines on LOM provide new identifications for the credit-granting processes within the FIs for the relevant phases of Data Collection, Evaluation, Risk Sensitivity Analysis and Granting Decisions.

The whole process has impacts on the FIs Infrastructures as in the first phase (Data Collection) specific information is required for reviewing lending procedures and redefining the process on specific criteria with reference to the Client Asset Classes and the Product Type offered by banks. Subsequently, the credit assessment must include a complete view of the borrower, including prospective information related to the analysis of the financial position, business plan, and debtor strategies on alert scenarios. This, particularly, can be considered the link with the Bankruptcy law developed in Italy through the Codice della Crisi d'Impresa e dell'Insolvenza.

A further step regards the stressed creditworthiness analysis to measure the resilience in adverse scenarios including ESG related factors and adopting an approach for micro clusters according to levels of customization related to specific context and market. The analysis is then completed by the production of a clear, adequate and comparable documentation proving the creditworthiness assessment to be used as a basis for the subsequent disbursement, thus exceeding the admissibility of that certain degree of judgment admitted by the EBA for the COVID emergency in 2020.

On the monitoring side, the FIs should develop systems capable of facing the evolution of infrastructures and data for the collection, and the analysis and the processing of information in accordance with the current purposes based on Financial, Profitability, Development, Debt, Liquidity, and Prejudicial Evaluation Modules.

The integration of the database with external sources and the introduction of new parameters (such as quantitative ones) in combination with predefined and performance indicators, should be developed in synergy with the credit-concession processes. The subsequent monitoring should then be implemented using the evolution of the Early Warning systems with the potential introduction of specific indicators at cluster level.

2.2 NEWLY EARLY WARNING PROCEDURES FOR ENTERPRISES

The new Early Warning System procedures will be outlined using a Hierarchical Approach in 3 levels. The first level regards the DSCR (sentinel indicator of Red Flags of the Bankruptcy law described above), if available. If the data necessary for its determination is deemed not sufficiently reliable (Level 1) as long as the crisis situation has not already been intercepted by the Assets Net Negative or by the presence of Repeated and Significant Delays (Level 2) occurs the combined use of a series of five indices (Level 3) with different thresholds a depending on the sector of activity, which must all alert together.

Following the criteria introduced by DSCR, the recent reform of Italy's Bankruptcy Law approved with Law No. 155/2017 and confirmed by D. Lgs. 14/2019, that will enter into force in 2022, has included, among the main innovations, the introduction of the 'Red flags alert regime' to identify in advance situations of potential crisis and to prevent cases of default:

- Sustainability index of financial charges in terms of the ratio of financial and turnover charges
- Capital adequacy index in terms of the ratio of shareholders' equity and total debts
- Liquid return index of assets in terms of cash flow and asset ratio
- Liquidity ratio in terms of ratio between short-term assets and short-term liabilities
- Social security and tax debt ratio in terms of the ratio between social security and tax debt and assets

The Bankruptcy law requires leveraging on new indicators to measure the borrower's ability to repay the loans acquired, through the evolution of the metrics of an index-based assessments perspective and through the introduction of a sensitivity analysis to account for adverse scenarios.

The regulator, thanks to the new alert tools to be properly defined, is expected to promptly intercept a possible crisis of the borrower, and thus providing greater sustainability of the National Banking Sector.

2.3 COLLATERAL EVALUATION BETWEEN LOM & CALENDAR PROVISIONING

Following the adjustments made with the entry into force of the New Definition of Default in 2020, the EBA Guidelines intervened in the area of Guarantees regarding the management of impaired loan write-downs in a harmonized perspective of the Calendar Provisioning, with the provisions included in section VII of the EBA Loan Origination and Monitoring Guidelines, dedicated to the most adequate evaluation of the Guarantees right from the Concession phase.

The EBA LOM Guidelines and the Calendar Provisioning emphasize the joint review of the management methods of Lending Strategies and NPEs with predefined provisions, starting from the Origination phase and configuration of the product and of the customers taking the guaranteed loans in two different risk classifications (current risk and prospective risk) during the monitoring phases of the positions, supporting the definition of the most adequate strategies between the recovery and sale of non-performing loans.

2.4 CHALLENGES FOR CREDIT MONITORING

The areas of evaluation for monitoring the current Engines of Early Warning generally structured in Modules:

- Negative Events (Prejudicial, Judicial Procedures, Central Risks)
- External (Budget)
- Internal performance (renewed)

It will be necessary to update according to the new classification topics in order to carry out a renewal of the traditional structure of Scorecard Models.

The news will therefore concern all areas of evaluation of Classification Forms, which will otherwise be revised following the entry into force of the EBA LOM GL on application of Monitoring metrics (Annex 3) and related regulations:

- EBA GL (on Past Due and UTP Trigger) in light of the New DoD and Addendum on Calendar Provisioning
- Bankruptcy law (with respect to insolvency alert indicators with a careful look at harmonization towards the Indicators already adopted by the Significant Banks in the Asset Quality Review (AQR) by the ECB)
- The assessment of the creditworthiness of the Government Measures of *Decreto Cura Italia – FCG* for SMEs

The news will also concern the comparison and everything that has been already included within the traditional Rating Models on the Financial Statements Module.

3. REPLY'S APPROACH TO MEET REGULATORY EXPECTATIONS

The European regulators' expectations, with both managerial and regulatory purposes, are addressed to the usage of a forward-looking approach for both organizational and monitoring phases. Through the identification of key indicators, the regulators suggest the adoption of a new data paradigm and methodologies which make the optimization of the credit processes possible. Based on our expertise and experience, analyses of credit strategies, in order to make them as risk-driven as possible, can require important effort for processes and ancillary technologies. A considerable amount of data, besides leading to high acquisition costs, also requires an elaboration of new methodologies in order to analyze and interpret the data in a more efficient way. The use of forward-looking indicators can represent a trade-off able to simplify the acquisition processes and provide a robust benchmarking

base on which the single decisions can rely for all the process phases, from the origination to the carry-out. The choice of the forward-looking indicators' catalog can leverage the guidelines provided by the regulators: the indicators which can be used as triggers for the identification of the 'unlikely to pay' and the indicators suggested by the EBA Guidelines for the origination and monitoring processes can be an ideal information base not only for the purposes for which they were suggested, but also for a 360° management of the entire credit lifecycle. The regulatory constraints to which both companies and banks are subjected can therefore turn into opportunities for both categories that would benefit from basing their strategic choices on the continuous exchange of information flows, especially in the periods of variation and instability in the competitive context.

Countries where Loan Origination and Monitoring indicators are equivalent to those specifically explicit in their Bankruptcy law (i.e. Italian case, as reported in the previous section) have the opportunity to formalize and digitalize the management practices of Enterprises and to improve their financial culture: a qualitative leap that the business system does not seem capable of doing on its own. An important role can be played by the banking system, which could integrate in its alert system the assessment tools adopted by companies to comply with the reform. The availability of significant digitized information flows coming from electronic invoicing or from the movements of current accounts thanks to PSD2 could reduce data acquisition costs and make this step easier. In fact, for a long time, the banking system had to develop suitable procedures for the timely identification of the first signs of difficulty of the companies, directing its activity towards a proactive management of customers who show signs of difficulty in repaying the loans received. Therefore, in an increasingly precise manner, banks (also following the introduction of IFRS9) apply a forward looking approach in assessing the creditworthiness and economic and financial analysis of the company, in order to foresee any elements of difficulty in the fulfillment of contractual obligations and to manage them in advance.

3.1 A PROPOSAL FOR A MACHINE LEARNING APPLICATION

The information required by the regulations, if properly internalized by the bank, provides the indicators of the company's performance promptly so as to suggest appropriate policies for optimizing the financial structure of the company, with a consistent use of the available financial resources (capital, debt, etc.). Adequate tools also allow stress tests from both sides (FI and borrower) to be used to anticipate and predict periods of turbulence and to identify how to manage them from a strategic perspective. In this context, it is essential for banks to integrate their databases with the information provided by companies, and to implement suitable IT procedures which produce a large set of indicators useful both for the prompt identification of the occurrence of a possible crisis, and to fulfill the new regulation requirements.

In case the information is not available with a satisfying level of detail for the forward-looking analysis of the creditworthiness, in our view the bank could apply predictive models capable of simulating the indicators' performance based on different scenarios. The simulation approach proposed, already widely used for the cash flow projections for the evaluation of the financial balances, could evolve both in methodologies that, for instance, foresee the adoption of machine learning techniques (e.g. Support Vector Machine - SVM, Random Forest, Neural Network) and in contents, by spreading its scope of application. Innovative data management approaches indeed allow for interesting challenges in the processing and analysis of data: the available Machine Learning technique catalogue is ample and allows for application of various purposes.

We strongly suggest using Machine Learning techniques: highly capable to enable real-time processing of huge volumes of data, deliver precise predictions of various types, such as recommending products, customer segmentation, detecting fraud and risks, and customer retention. Real-time and highly scalable predictive/cognitive models, using fully automated methods, make data scientists' tasks easier. With regards to the credit's processes, the Machine Learning techniques could be applied in forecasting risk and business indicators, in identifying the indicators with the highest levels of predictivity for the origination and monitoring phases, and for bringing customers back to a specific cluster. Furthermore, those techniques could be useful to enhance the data quality processes, ensuring full effectiveness in the construction of databases to support benchmarking and predictive analyzes.
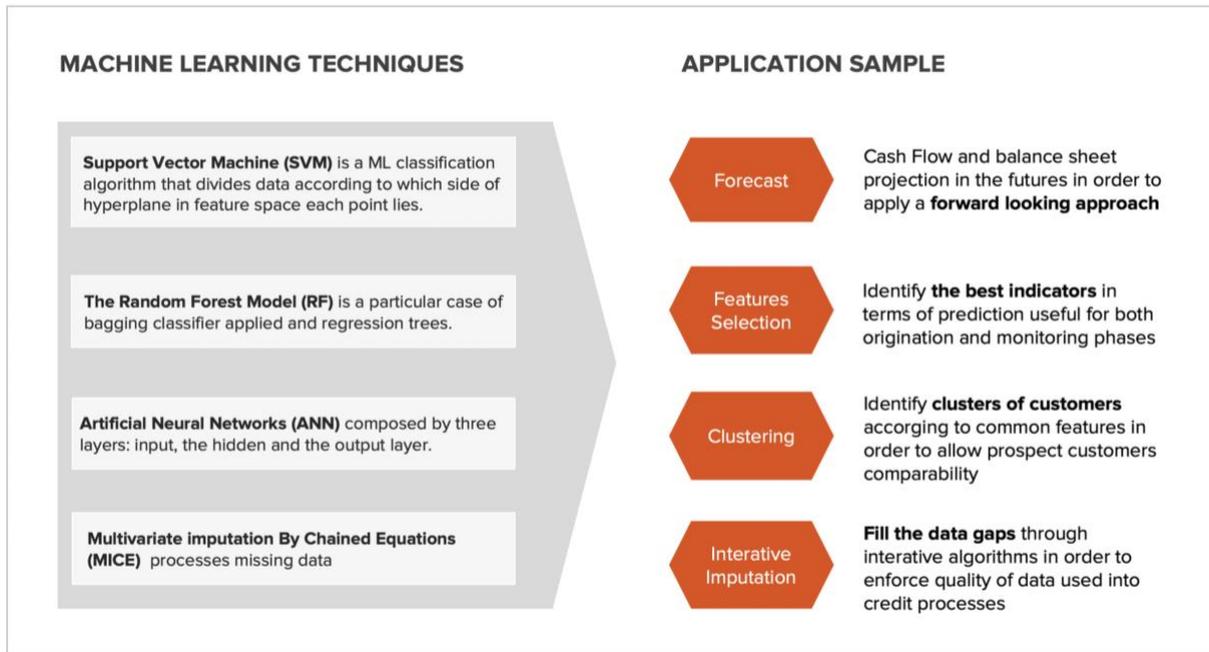
FIGURE 3 - MACHINE LEARNING SUGGESTED APPLICATIONS

According to the model proposed by Reply, once a sufficiently large benchmark of cases based on historical data has been created, the data analysis models would identify the indicators that have the highest level of prediction for both the origination and monitoring phase and could be used for the subsequent trend simulation for several business scenarios, evaluating their correlation with macro-economic variables.

This approach would allow to extend the creditworthiness analyses also to new customers by minimizing the set of information required during the credit investigation phase. It is important to underline that, according to this approach, for the preliminary phase, the only information requested of the new customers would be that necessary for the identification of the customer's cluster and the funding needs, with certainly positive repercussions on the bank's strategic positioning.

For instance, given an SME customer for whom the only information available is related to a few financial statements and personal variables, this could be used as an input for the application of strategies in the origination and monitoring phases. A practical example of the implementation of this advanced and extensive approach applied to the LOM can be shown in the following figure.
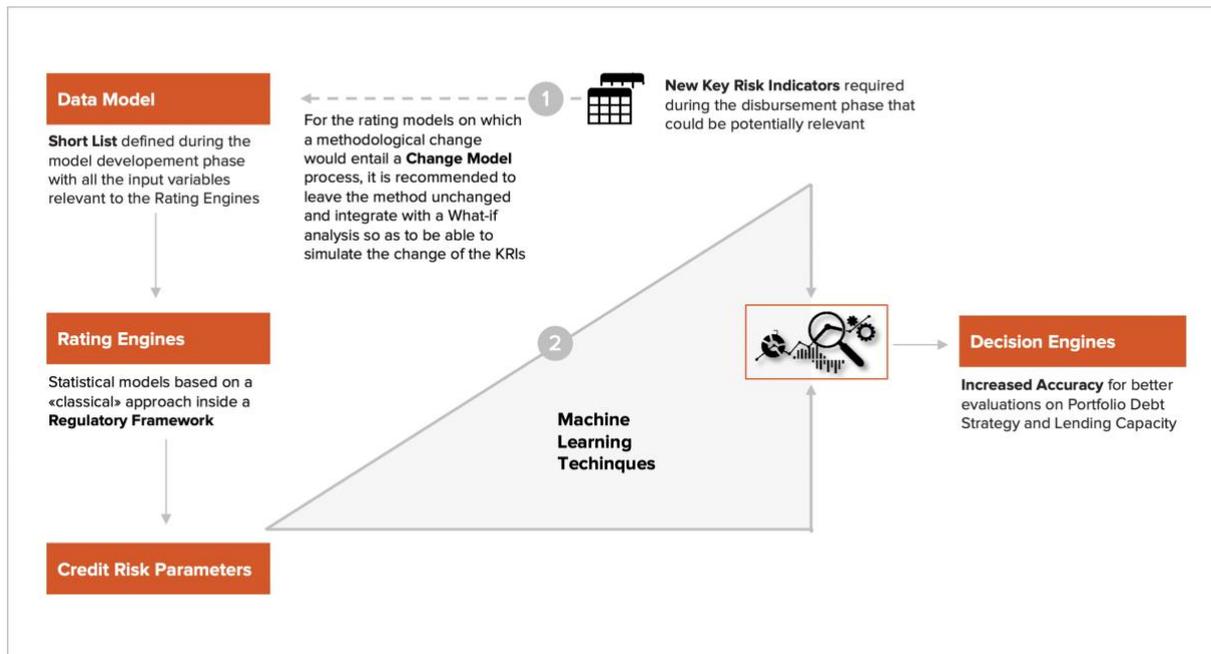
FIGURE 4 – REPLY'S MACHINE LEARNING APPROACH

Initially, the Data Model is defined starting from a Long List of variables, properly refined into a Short List which is specifically the list of Input Variables for the calculation of the Rating. The calculation itself takes place in the Rating Engine that provides the Ratings through the use of Statistical Models within a Regulatory Framework. Subsequently, the Credit Risk Parameters (PD, LGD, CCF) obtained are considered as Key Risk Indicators and are utilized within the Machine Learning Technique approach to obtain the Evaluation of the counterparties in a decision engine, which brings the user to decide on a proper Debt Strategy.

The application for a Machine Learning algorithm to be effective takes into account 3 main aspects:

- Presence of an adequate internal IT infrastructure (On premise or Cloud)
- Availability of an adequate data set (training, validation and test set)
- Definition of a clear objective of the model and of the best Machine Learning algorithm

A possible ML application to the LOM, carried out through trials on a set of samples, brought to evidence that adequate results are obtained using the so-called 'Random Forest'. This approach, with respect to the recent pandemic, can be used to appropriately discriminate the counterparts that had credit deterioration due to the Covid-effect.

Classification Machine Learning Supervised algorithms identify the combination of explanatory variables that maximize the probability of classifying in a correct way the phenomenon under estimation.

Reply's approach analyzes different algorithms that are able to analyze the problems' classification, with a relevant level of accuracy in predictions, ensuring a significant level of explainability (no black box effect) and predictivity. The application of the model can be summarized as follows.

Selection of the Explanatory variables including:

- Segmentation
- Socio-Demographic variables
- Credit Risk Parameters at origination (PD,LGD, CCF)
- Key Risk Indicators

Machine Learning Application through:

- Application of Random Forest Model built on a Training Set
- Evaluation of the Key Risk Indicators in terms of importance as explanatory variables

- Validation of the Set used, in order to assess the model performance at different cut-off values (through ROC curve and Confusion Matrix)

Building of several classification models using different parameters related to the Random Forest

In order to validate the results obtained, here below two different output analyses are exemplified. The first regards the Importance Plot, which gives a graphical view of the most relevant KRI to be used in the Random Forest. The second provides model performance results at different cut-off values.
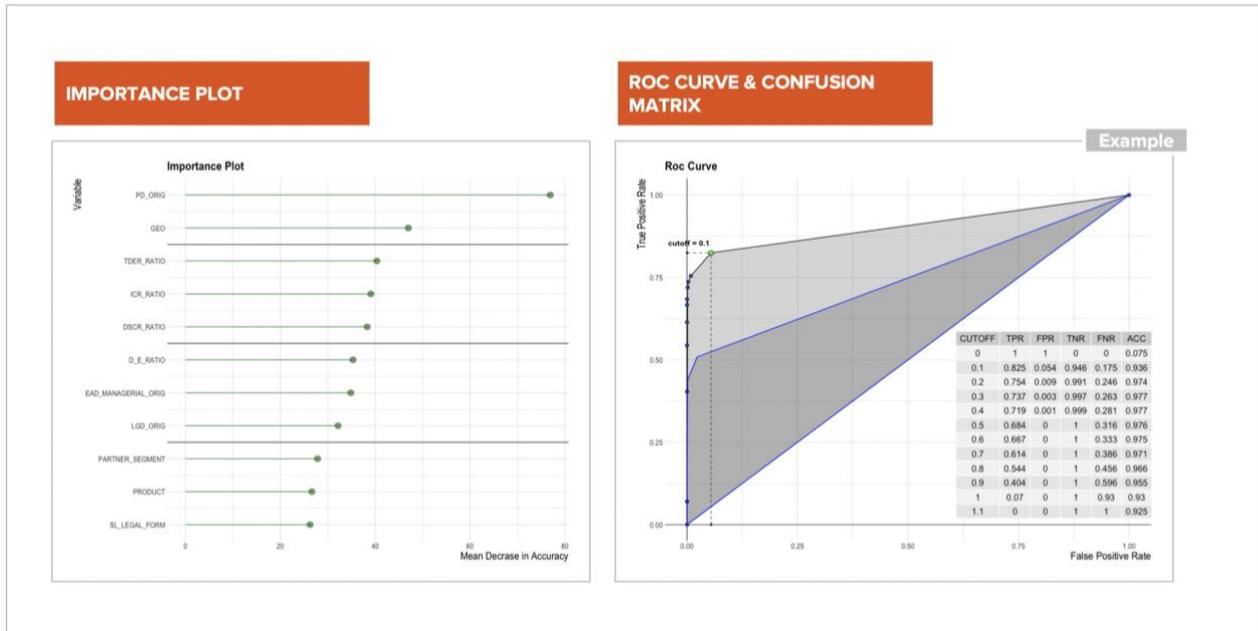
FIGURE 5 – EXAMPLE OF MACHINE LEARNING APPLICATION OUTPUT EVALUATION

The application showed that the use of Key Risk Indicators in combination with Credit Risk Parameters and ML techniques could lead to a powerful decision support tool, with possibility to enhance the analysis with:

Extension of Perimeter
Application on a more representative sample in order to obtain more robust results

Reverse Process
Possibility to include in the LOM analysis counterparties for which a new loan was not granted, in order to assess the impact of the KRIs in the decision

Delta Analysis
The use of time series allows to evaluate the correlation between PD variations and KRIs variations

Fine Tuning
Application of further advanced Machine Learning techniques (missing imputation, unbalanced sample problems, etc…)

This process, applied in the Decision Engine, allows to enhance the performance of the decision support in the Loan Origination and Monitoring phases.

4. CONCLUSIONS

Due to the recent development of the European and Italian regulation on Loan Origination and Monitoring, in addition to the current economic scenario characterized by the recent pandemic and by a Banking Market which comes out of a year of limited development by the traditional players and by tough competition carried out by the newly established fintechs, it is necessary for Financial Institutions to re-think their credit processes by enhancing the innovation of the technology in order to optimize the various processes.

One of the main banking processes where it is possible to implement these new Machine Learning techniques is mainly related to the EWS, which is not the subject of the Validation Process by the regulator, and this allows to evaluate the application of Machine Learning algorithms so as to optimize the monitoring processes.

As for innovation using ML techniques, the FIs are called to improve their available technology following three main steps:

- Enhance their internal IT infrastructure or make it available using external providers (Cloud);
- Provide the availability of an adequate training and validation set;
- Define a clear objective of the ML technique as to precisely identify the risks.

If the Machine Learning techniques on the one hand improve the models enhancing the predictive power, they may on the other hand increase the costs linked to the technological development. This trade-off could be managed considering that, in the next years, the regulators' aim is to improve the advancement in Innovation by the FIs. The earlier this process takes place, the better it would be for the Banks to test, implement and verify the validity of these techniques, which can be considered part of the next Credit Processes evolution.