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THE IMPACT OF THE COVID-19 PANDEMIC ON THE BANKING SYSTEM AND CREDIT RISK

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Abstract

This paper reviews the impact of the coronavirus on the banking sector and, more specifically, the credit risk and identifies ways in which future research can contribute to limiting this risk. When the coronavirus pandemic struck, its human and economic repercussions were felt in almost every corner of the world. Indeed, Covid-19 has plunged many individuals or companies into risk situations of unpaid debts that credit organizations must manage. It has become evident that financial institutions need to rethink how they assess credit risk and country risk. However, the perception and methods of calculating and measuring risk could be more reliable and complex. This is the first review to analyze the covid-19 effect on the banking sector (2020- 2022). Through this research work, we wanted to see more closely the impact of this pandemic on the banking sector and, more specifically, the credit risk. Moreover, what are the new repercussions and scenarios that were born to no longer be in the same situation in the future? The pandemic will therefore accelerate advances in digitalization, teleworking, and significantly advances in data and technology in the credit risk model.

Keywords: Banking sector, credit risk, COVID-19

1. INTRODUCTION

When the coronavirus pandemic struck, human and economic repercussions were felt in almost every corner of the world (Hidajat, 2020). Financial institutions, insurance companies, and banks have worked hard to support their clients during this unprecedented crisis by providing them with financing and protection to help them fill liquidity gaps. It has become evident that financial institutions need to rethink how they assess credit risk and country risk (Liu et al., 2020). The global economy has faced recessionary pressures in 2020 and will continue to feel the effects in 2021, as pressure on the gross domestic product of many developed and developing countries continues.

Credit risk (or default risk), the likelihood of a partial or complete default on loans by the customers due to multiple credit events (Harb et al., 2022), is viewed by specialists from a new perspective. Since, in their opinion, can we trust a quality credit rating that pre-dates COVID-19? Do the 2019 financial statements provide an accurate picture of the business in 2020?

This question then arose since the repercussions of the containment caused the domino effect; the repercussions affected workers, supply chains, and suppliers unable to perform their contracts due to the containment. Moreover, the question arises: does confinement constitute a force majeure? All sectors heavily affected by the pandemic, such as aviation, shipping,

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tourism, and retail, have been classified in the red. Other heavily affected sectors, such as oil and gas, autos, commodities, and construction, saw their activity slow. However, the perception and methods of calculating and measuring risk were found to be unreliable and overly simplistic. In fact, it was possible to identify companies in a strong position in almost all industries compared to those with data-weaker fundamentals.

Examining sectors is just one variable. Two thousand nineteen financial reviews and corporate ratings are essentially worthless. It is necessary to obtain provisional data and an up-to-date rating outlook to assess credit. In credit insurance and cross-border trade finance, an additional element comes into play when assessing credit risk - the country of risk. Much of the unique credit risk in credit insurance relates to credit to developing countries. Countries dependent on oil revenues or tourism were the first to come under pressure. The international community's response to such crises is sometimes difficult to predict when assessing credit, but it significantly impacts the bottom line.

Research from the past demonstrates that COVID-19 has a significant and detrimental effect on bank risk (e.g., Elnahass et al., 2021). We add to the growing body of COVID-19 literature, which primarily focuses on the various impacts of the pandemic on banks' financial performance (Duan et al., 2021).

Our contribution is that this paper is the first literature review dealing with the impact of the covid-19 health crisis on bank credit risk.

Through this work, we will see the impact of covid-19 on banking systems and various risks, in particular, credit risk. Moreover, we will present the lessons from this crisis, its impacts, and the new provisions that must be taken into account in the future. During times of crisis, these findings have significant ramifications for banking institutions and regulators.

Our work will present, in the first part, the financial risks that have been affected by the pandemic, and in the second part, we will present the impact of covid-19 on the banking credit risk. Finally, the conclusion, to through we will present the consequences and the lessons to be drawn from the impact of this health crisis on the credit risk of banking institutions.

2. METHODOLOGY

The literature review is “the most common technique in management research” (Denyer & Tranfield, 2006, p. 216), based on “detailed and well-grounded knowledge of the issue” (Petticrew & Roberts, 2008, p. 10). To this end, we have analyzed the articles dealing with the subject, focusing on the keywords: banking sector, credit risk, and crisis. Searches are mainly in the Web of Science (WoS) database, Science Direct, Emerald, and MDPI.

As shown in Table 1, several articles have been published in the last three years based on the research method (Kotb et al., 2020):

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Table 1: Literature Review Analysis (2020-2023)

Study	Focus	Objective	Scope
Miklaszewska et al. (2022)	How the covid-19 pandemic affects bank risks and returns	This study aimed to examine banks' strategic adjustments to the challenges brought about by the COVID-19 pandemic. It examines how deep and pressing the necessary transformations are, based on an analysis of the banking sectors of Central, Eastern, and Northern European countries (CENE): the Czech Republic, Hungary, Poland, Slovakia, Estonia, Latvia, and Lithuania.	EU Members in Central, Eastern, and Northern Europe
Hengguo (2022)	Banking Systemic Risk Estimating Of China's Banking Industry during The Covid-19 Pandemic	In this paper, Chinese bank networks in different COVID-19 periods were constructed using the CoVaR model and least absolute shrinkage and selection operator (LASSO) regression, and the characteristics and risk changes of the proposed bank networks were analyzed based on complex network theory.	Chinese bank
Makafui and Felix (2023)	Regulatory Capital and Bank Risk-Resilience Amid The Covid-19 Pandemic	The authors address a long-standing policy question of whether higher levels of regulatory capital, ex-ante, and make banks risk-resilient in times of severe economic downturns. Using the Covid-19 crisis as an exogenous shock to the banking system in a difference-in-difference setting, the results indicate that banks with robust pre-crisis regulatory capital ratios are less risky (have a lower insolvency risk) relative to less-capitalized banks amid the crisis period. Further analyses provide evidence consistent with a potential credit supply channel.	450 U.S. commercial banks
Sean et al. (2022)	Covid-19, Credit Risk Management Modeling, and Government Support	The authors investigate rating and default risk dynamics over the covid-19 crisis from a credit risk modeling perspective	U.S Region
Ender et al. (2021)	Banking Sector Reactions to Covid-19	This paper examines the impact of bank-specific factors and variations in the context of stringency of government policy responses on bank stock returns because of the COVID-19 pandemic.	1,927 publicly listed banks from 110 countries
Muhammad et al. (2020)	Systemic Risk and Covid-19	This study investigates how COVID-19 impacted the systemic risk in the banking sectors of eight of the most COVID-19-affected countries.	Canada, China, France, Italy, Germany, Spain, UK and USA

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Anil et al. (2022)	The Authors Present A New Dataset on Non-Performing Loans (Npls) Dynamics during 92 Banking Crises since 1990.	The authors present a new dataset on the dynamics of non-performing loans (NPLs) during 92 banking crises since 1990.	Worldwide
Eduard et al. (2022)	Systemic Risk in The Global Banking Sector	The authors propose a new systemic risk index based on the interdependence of extreme downside movements of stock returns using the cross-quantilogram and network analysis approach.	24 countries covering three regions (America, Europe, and Asia)
Duan et al. (2021)	Bank Systemic Risk around Covid-19: A Cross-Country Analysis	The authors conduct the first broad-based international study of the effect of the pandemic on bank systemic risk. They find that the pandemic has increased systemic risk across countries. The effect operates through government policy response and bank default risk channels.	Worldwide
Gönül and Özde (2021)	The Impact of Covid-19 Pandemic on Bank Lending	The authors evaluate the influence of the pandemic on global bank lending and identify bank and country characteristics that amplify or weaken the effect of the disease outbreak on bank credit.	Worldwide

3. COVID-19 AND FINANCIAL SYSTEM RISKS

The pandemic that has affected the financial sector has had very significant repercussions regarding risk. The risks that have arisen are as follows:

-Credit Risks: is the risk of loss given default that does not meet its obligation under the contract conditions and thus causes the holders of creditor's loss. These obligations arise from lending, trade and investment activities, payment, and settlement of securities trading on its own and foreign accounts. (Erika et al, 2015; Jílek, 2000). It is essential to calculate credit risk. Credit risk measurement is done to estimate prospective losses from credit operations. Since the amount of losses is never known with certainty, estimation is required.

The gross indebtedness of companies rose sharply in the spring of 2020, at the start of the health crisis. While a concomitant rise in savings has kept net indebtedness stable since March, it may nonetheless mask a growing divergence in financial positions. The deterioration in credit creditworthiness varies from sector to sector and depends on the speed of the activity recovery and measures to support businesses (Dubinova et al., 2021). This situation affected the cost of risk and had consequences on the profitability of banks and even on their solvency (Mirza et al., 2020).

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For banks, the solution then lies in strengthening the equity capital of variable companies, which will be necessary to support investment and foster a sustainable economy.

New budget support measures linked to the pandemic continued to worsen national public deficits, which added new debt issuances (Augustina et al., 2021).

Regarding households, their repayment burden will remain high, given the level of their indebtedness. Moreover, in the event of a marked increase in unemployment, their solvency deteriorated.

Also, the Covid-19 crisis has affected the acquisition: increased bad loans, reduced new bookings, and deteriorating portfolio quality. Another problem with credit risk is the problem of account management: an increase in segments with high impairments, elevated delinquencies, and credit losses across lending portfolios. For reserving and capital planning, the crisis period was characterized by an unprecedented increase in expected credit losses because of the magnitude and speed of macroeconomic deterioration and the risk-weighted asset impact because of higher volatility (Mehmood & Luca, 2023).

-Market risks refer to the risk of loss on balance and off-balance sheet positions due to changes in market prices. This risk comprises various elements: interest rate, currency, and commodity risk (Mansour & Zouari, 2018).

With the rapid central bank intervention and budgetary support measures, the prices of the European stock index increased. The response of central banks and governments has so far been to remove certain activities from the market. Massive support to non-financial firms and financial intermediaries through programs whose terms do not reflect any market-based assessment is evidence that some risks cannot be fully addressed by the market (Chenet et al., 2021).

-Risks associated with structural changes: The crisis has undoubtedly accelerated digitization and forced traditional financial players to structurally and rapidly change their working methods and tools. The changes in the financial and banking market then converged with the pandemic, which may have encouraged the development of teleworking and the rise of online commerce (Marseto, 2021).

Also, the Covid-19 crisis has introduced a wide range of risks in the financial sector, including currency risk, liquidity risk, risk management, and interest rate risk. Each of these risks can have a significant impact on the stability of financial markets if not appropriately managed. For instance, currency risk can arise from changes in exchange rates, causing losses for international investments (Lulia and Klakow, (2022).). Liquidity risk can occur when there is an unexpected demand for cash or a lack of access to liquidity in the marketplace. Grill et al. (2022) concluded, according to a free panel of European open-ended mutual funds, the level of cash holdings that act as a liquidity buffer when sudden net redemptions occur, potentially reducing the need for a fund for fire sales or suspensions of redemptions (Chernenko & Sunderam, 2020).

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As the world continues to grapple with the repercussions of the Covid19 pandemic, financial institutions have been forced to evaluate and mitigate various risks. Financial institutions must address the various risks to remain competitive in an uncertain economic landscape. Risk management tools and techniques have been developed to help financial organizations assess and manage these risks efficiently and effectively. In addition, regulators have enacted a series of stringent regulations requiring financial institutions to meet higher standards regarding risk management.

4. IMPACTS AND SUPPORT MEASURES FACING THE COVID-19 CRISIS

4.1. Emergency Support Measures

The Support measures have helped to ensure the continuity of business financing, but the issue of solvency is becoming critical. Indeed, in Europe and especially France, a series of measures have been adopted to allow the financial resources of the French economy to be maintained. This situation puts pressure on their cash flow. The economy's financing continues to be secured by banks, the non-banking sector, under conditions favorable to the borrower. The economic downturn and the necessary relief measures caused public debt to rise sharply. The health crisis has led to the implementation of significant budgetary measures to cushion its economic impact and promote the subsequent recovery. In Europe, the European Commission estimated more than €2.190 billion in authorized State aid at the beginning of June 2020, mainly loans with subsidized interest.

The public deficit in the euro area increased from 0.6% in 2019 to 8.8% of GDP in 2020, compared to a record deficit of 6.4% recorded at the end of 2009. In France, on December 29, 2020, the fiscal law for 2021 stipulates a public deficit of 8.5% of GDP (compared to the fiscal law of December 29, 2020, for 2021, (with 3% in 2019). The performance forecast for 2020 remains at 11.3%. The crisis is undermining the profitability of banks and insurers, who benefit from a solid solvency situation: the case of French banks. The Covid-19 crisis reinforces expectations of a prolonged low exchange rate scenario, which remains a major structural issue for French financial intermediaries.

French banks have solid solvency and liquidity positions. For example, the average solvency ratios of the six large French banks have shown a solid solvency and solvency situation. As of September 2020, this ratio has increased thanks to the cumulative impact of 2019's full reserve results and supportive measures implemented under supervision. In addition, the reduction in weighted risk between the first, second, and third quarters of 2020 positively impacts the solvency ratio. Finally, the financial leverage ratio decreased in the first quarter and second quarter and then stabilized in the third quarter; Debt ratio is affected more than the solvency ratio after asset increases benefit from low or zero risk weight. The liquidity situation of banks also proved to be solid. Problems with different types of bank debt increased at the beginning of the second quarter of 2020 and reached 50 billion euros by the end of September. The first tension appeared in late February 2020, with the primary bond market closing.

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As a result, conditions became very favorable, provided by euro-denominated refinancing operations, with the European System, and incentivized banks to sign up for substantial purchases.

The balance sheet size of the six major French banking groups from the end of 2019 to September 2020 increased from 7,895 to 8,005 billion euros. This increase is due to the following:

- An increase in cash and balance in the central bank's current account, increasing from 590 to 1.014 billion euros, an increase of + 72%. They make up 13% of the total balance sheet.

- Loans and advances to non-financial corporations increased by 8% to €1,552 billion (i.e., + €116 billion compared to €120 billion EMP allocation in the same period), with a 2% increase for household accounts. This consideration explains the increase in corporate bank debt. However, when this balance sheet is risk-weighted, the increase in risk borne by French banks appears to be more limited. Thus, in the first months of 2020, between the increase in volume and the first decline in the quality of exposed loans, the credit risk-weighted outstanding balances of France's six major banking groups have risen. However, this increase has been mitigated by various measures, such as the introduction of Capital Requirements Regulations that reduce the credit risk-weighted assets of loans to SMEs. On the other hand, a deterioration in the financial position of non-financial corporations can also lead to a corresponding increase in risk-weighted assets.

4.1.1. Banks' Net Results Fall

The NBI (net banking income) of France's four major banking groups fell moderately at the end of September 2020. Despite a reduction in operating expenses, net income fell, given the rise in the cost of risk. Compared to September 2019, the annualized return on equity (ROE) at the end of September 2020 fell in France to 5.9% and the United States to 9.4% (Albulescu, 2020).

4.1.2. An Increase in the Cost of Risk for Banks

The deteriorating macroeconomic outlook led to increased risk costs, which dampened banks' operations in the first months of 2020. During this period, the cost of risk stood at 11.5 billion euros. 6.2 billion. Banks partly drive this increase in risk costs due to provisioning for large files in default. The cost of risk continues to affect banks' safety and accounting indicators (in the short and medium-term) due to the tightening of health measures. This increase in the cost of risk contributed to the deterioration in pre-tax income, which fell compared to 2019.

4.2. Impact of Covid-19 on the Banking Sector

The COVID-19 outbreak, therefore, triggered unexpected tests for almost every function of a bank in the following ways:

- Adjusting credit risk models in response to the COVID-19 pandemic.

-Credit risk models need to incorporate new data related to the covid-19 pandemic to ensure the validity of their results.

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-Relevant information can be obtained by leveraging significant data sources and using new technologies

The COVID-19 pandemic crisis has triggered a challenge for all sectors of the economy and, in particular, the banking sector (Hari & Shaleh, 2020; Mansour & Ben Salem, 2020). In this context, the most affected function is credit risk management, which was not the top priority at board meetings. "Among three main types of risk present in the activities of banks, such as credit risk, market risk, and operational risk, the credit risk was the highest." (Kozak, 2021). At this level, it is essential to mention the importance of the size of the banks on credit risk management, confirmed in the study by Borri and di Gorgio (2021), conducted on a sample of European listed banks. Colak and Oztekin, in a study of banks in 125 countries, noted that large banks were more exposed to credit risk due to the intervention of public authorities in the Covid-19 crisis, the institutional environment, and banking market structure.

Faced with this crisis, risk experts must develop an immediate response. This is because current prudential models were developed for the risk of an economic downturn but not for a sudden halt in supply and demand chains.

Experts must also ask themselves about the relevance of data for forward-looking credit analysis.

Today, post-covid effects vary by industry and geography, and sectorial and regional dynamics will undoubtedly impact the unemployment rate, which is very important to credit risk. Within this framework, for businesses, government-backed loan programs can mitigate short- and medium-term defaults, but they will increase leverage. For consumers, paid vacations and new (remote) work methods have mitigated tardiness or absenteeism.

4.2.1: Credit Models and COVID-19

Prudential regulations and credit models have always been subject to regular in-depth governance. However, the various models have been unable to predict or correct the problems associated with the global pandemic because most traditional models have been built on historical data without considering current developments. Hence the problem is that the credit models were based on macroeconomic forecasting data using concepts from classical economic theory. With the pandemic, containment and social distance disrupted the consumption of goods and services. Despite government interventions, such as income support, this only exacerbated the problem of economic forecasting. This has only highlighted the limitations of existing credit models in the current environment.

4.2.2: Search for New Early Warning Indicators

Credit risk models aim to distinguish between healthy and distressed exposures. The data sources typically used (financial and behavioral) need to capture the complexity of the current economic environment. In general, financial information indicators on borrowers are often lagged, and currently, some indicators need to be more accurate by the proposed COVID-19 assistance programs. On the other hand, transaction data provide a reliable real-time indicator of the financial health of portfolios, which can improve the credit components. Similarly,

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incoming and outgoing payments analysis can provide relevant information on credit capacity, quality, and behavioral changes. Analysis of current transaction flow (level, frequency, and volatility) relative to pre-Covid-19 levels can also help track the performance (and risk) of SMEs and firms in the post-Covid-19 period, allowing for targeted intervention. Hence, traditional financial indicators could be replaced by a financial index based on transactional data. In the future, therefore, banks should explore opportunities to obtain better information using new data sources, such as health data, value chain data, e-commerce, e-revenue, and credit statements.

As technology develops, the relevance of data management systems will increase. Therefore, institutions must align themselves to ensure the necessary banking change. Efforts to strengthen customer data protection, and third-party risk management, should provide the framework to facilitate this trend. It is essential to design approaches and methods that are up-to-date and that limit the short-term correlations of current data.

4.3. Covid-19 and Its Impact on Credit Risk Management

Optimizing their capital is one of the significant objectives of banks and credit organizations. Credit risk management has a substantial impact on this purpose. Between the Covid-19 health crisis, which increases the uncertainty about the probabilities of default, and the IFRS 9 standard, which complicates the requirement of operational rigor, all banks and credit organizations must accelerate their transformation; otherwise, they will see their current tools are no longer sufficient to make the right decisions in an accelerated timeframe. With the health crisis, we can fear that delays in loan repayment deadlines will intensify. Banks and credit organizations must anticipate the possibility of a significant increase in the number of defaults of their customers in the coming months. Risk analysts are under pressure to simulate all probable scenarios and calculate their impacts. However, today's most widely used analysis tools are too limited: they need to take into account more risk factors, and it takes them several hours to perform a complete simulation of a single scenario. This is far too long and imprecise at a time when leaders can be called to make significant decisions in just a few minutes. Having "real-time" tools has become essential. In addition to this crisis, there are reinforced regulatory constraints. For two years, the accounting standard IFRS 9 (International financial reporting standards) has required companies to review their credit risk provisioning rules, which until then were based on observed defaults. It now requires incorporating the principle of expected credit losses (ECL). This standard substantially impacts the amounts to be provisioned for banks and credit organizations and, therefore, their cash flow and capital ratio. Therefore, controlling its credit risk is crucial for these organizations to optimize their provisioning and free up room for maneuvering for performance. Currently, the probability of default on credit is assessed by rating the counterparty on the day it is contracted. The new standard mandates that this probability is periodically reevaluated and considered by the accounting provisions. Above all, it must be mitigated; that is to say, analysts must be able to detect risks as early as possible to remedy them by offering solutions to their clients: bridging loans with deferred.

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4.3.1. The Management of Non-Performing Loans 2020

The regulator is interested in "Non-Performing Loans" (NPL). These so-called "non-performing" loans are characterized by the borrower's difficulty repaying the principal and interest on a loan outstanding over more than one quarter. These loans, known as "in default," are among the largest sources of credit risk for a financial organization. In its fight against risks, the regulator asked banks to reduce the number of NPL loans, automate management as much as possible to limit manual interventions, and strengthen reporting. For this reinforcement, the EBA requested developments regarding NPLs in Financial Reporting, also known as FINREP. This financial statement is produced quarterly for the European Central Bank (ECB). The requested modifications are of two types:

-Module 1 plans to strengthen the information usually provided in this report, particularly on the breakdown, counterparties, and restructurings, defer, and guarantees of these NPL loans.

-Module 2 adds five new parts for banks with a ratio greater than 5% of loans in NPL.

They must provide many details on the composition and management of these NPLs. Thus with this new reporting, the massive shift from the deferral of loan maturities, changes in monthly payments, or other types of restructuring to facilitate credit transactions for companies and individuals will generate a new charge in these reports but also raises a risk concerning the volatility of the solvency ratios of credit institutions.

4.3.2. The Management of Non-Interest Income

Non-interest income includes accrued interest earned on investments, amortization receipts, and other financial derivatives. It also includes investment valuation and instrument adjustments, such as changes in fair value due to exchange rate movements. In this context, the credit risk generated by financial institutions has been a significant contributor to their earnings.

Banks are exposed to credit risk because of the debtors and the management of the bank. Firstly, if there is a poor assessment of the creditworthiness of debtors (Hunjra et al., 2020), and secondly, if debtors cannot repay the amount borrowed at the desired time. Both situations will cause a multiplication of non-performing accounts and create a banking stability problem. Hence, banks have been trying to diversify income sources lately (Duho et al., 2020).

The growing emphasis on income diversification stemmed from the global financial crisis of 2008 and was highlighted by COVID-19. There are different views on the relationship between non-interest income and credit risk. For example, some researchers find no negative impact (Abedifar et al., 2018), others find a positive relationship (Calmès & Théoret, 2015), and some find that an increase in non-interest income decreases credit risk (Dang & Dang, 2021).

Mehmood and Luca (2023), in a study based on listed banks in 14 Asian emerging markets. They find that non-interest income has a positive impact on bank credit risk. Interestingly, the magnitude of the effect is higher before the pandemic period, while the volume decreases significantly during the pandemic period.

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Dang and Dang (2021), based on a panel of Vietnamese banks during 2007-2017, found that banks more involved in non-interest income activities have less credit risk. Also, private banks could obtain more diversification benefits from credit risk reduction. The results did not show nat we have no evidence to support the notion that non-interest income leads to bank stability through the impact of credit risk transmission.

4.3.3. The New Definition of Default for 2021:

This solvency ratio was already in the sights of the EBA. Indeed, the regulatory calendar included the implementation for January 2021 of the "New Definition of Default" (NDOD, or in French, the New Default). This is a harmonization of the notion of "defect." For now, being specific to each financial institution, this definition makes the overall supervision of financial markets more difficult (Baker et al., 2021). Compliance with prudential ratios - particularly that of solvency - is also becoming more uncertain. If the solvency ratio is similar to the debt ratio for an individual, it is essential to have shared and general definitions of resources and charges. In the current context, a more significant number of defaulting loans, therefore, has a direct impact on the bank's solvency ratio. To maintain their ratio despite the increase in their financial commitments, credit institutions should increase their funds by the same amount, i.e., equity and other equity, shareholder investment, or profits generated annually not donated or reinvested. In April 2020, a specific Covid-19 clarification was provided by the EBA to define the procedure to be followed in the differentiated treatment of defaults related to the current context and details on the loans that could be considered as being in default or those who will only be classified as "Moratorium Covid-19". Which in turn will have to report a new reporting effort. The economic impacts of Covid-19 on the credit risk market will have implications for this crisis's short, medium, and long-term management. Today, credit organizations are responding by supporting the economy. Furthermore, in the future, they could keep the market's confidence by communicating their solvency.

5. CONCLUSION

The issue addressed in this article is extremely important from the point of view of assessing the situation of banks during the COVID-19 crisis, especially the credit risk. The crisis was the source of the various actions at the global level. The closing of borders and the halt of economic activity affected different sectors, especially banking and risk management.

The COVID-19 pandemic has had a significant impact on credit risk. Governments have had to take measures to support businesses and households, which in turn has increased sovereign credit risks. This has been compounded by the fact that many businesses have been forced to close or reduce their operations, leading to a decrease in revenue and an increase in debt levels. Additionally, the pandemic has caused a decrease in consumer spending, which has further impacted credit risk.

The short-term effects of the COVID-19 pandemic on credit risk include an increase in delinquencies, a decrease in loan origination, and an increase in bankruptcies. Additionally, the pandemic has caused a decrease in consumer spending, which has led to an increase in debt

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levels and a decrease in revenue for businesses. Furthermore, the pandemic has caused an increase in unemployment, which has further impacted credit risk.

The long-term effects of the COVID-19 pandemic on credit risk are likely to be significant. The pandemic has caused a decrease in consumer spending, leading to an increase in debt levels and a decrease in business revenue. This has resulted in an increase in default rates and a decrease in credit ratings. Additionally, the pandemic has caused an increase in unemployment, which has further impacted credit risk. Furthermore, the pandemic has caused a decrease in economic activity, which has led to an increase in bankruptcies and a decrease in loan origination.

Today, with the development of technology, implementing a credit risk prediction system based on artificial intelligence is the best solution. These modern data science and analysis technologies exist, are installed in many banks, and are already deployed in other departments (Dastile, 2020). The challenge is to adapt them as quickly as possible to the credit risk control function, even before the onset of a crisis.

The health crisis has accelerated the adoption of technologies on a large scale, which has represented an issue favoring orientation toward financial activities through telework and remote services. This brutal development is risk-prone if we do not adopt control of cyber risk. Therefore, as long as the attacks have not been able to reach a systemic level, this does not threaten financial stability (Abhijit & Mohan, 2021; Reinders et al., 2020). This is why the European Systemic Risk Board has developed a conceptual analysis framework applied to historical scenarios to assess under what circumstances cyber risk can become a source of systemic risk for the financial system. Moreover, a large-scale cyber incident affecting the financial sector could create disruptions with serious negative consequences on financial markets and the real economy. National and international financial authorities, and to contain cyber risk, are required to identify cyber vulnerabilities and transmission channels to mitigate the impacts of a significant cyber incident. In addition, the authorities must define good management and recovery practices during a cyber-crisis for financial institutions. In addition, several recent exercises carried out within the Eurosystem have made it possible to strengthen the operational capacity of the financial authorities and the leading players concerned (banks, payment systems, market infrastructures, other public authorities, etc.) to deal with a very large-scale cyber incident affecting the financial sector and identify several areas for improvement currently being implemented. At the European level, the draft regulation Digital Operational Resilience Act, proposed by the European Commission, aims to establish digital operational resilience and cover the management of third-party risk.

The authors take into account the fact that this study has limitations. In particular, they have focused the study on the banking sector, although credit risk is also linked to the situation of households which has the power to influence the overall economy.

The authors believe that the expansion of research and the application of statistical methods contribute to a better understanding of the factors influencing the assessment of bank credit risk during and after the pandemic.

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