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RESEARCH ARTICLE

Mechanism and Methods of Early Prevention of Bank Insolvency

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Early detection of the financial condition of commercial banks is especially relevant in modern conditions of economic turbulence related to the global COVID-19 pandemic. The article provides a brief overview of the applied methods in the early detection of financial problems and prevention of bank insolvency. This study also explains the use and purpose of systems such as CAMELS and multivariate analysis models.The article illustrates the necessity of the complex use of multivariate analysis models and averaging simulation results in obtaining the most reliable results.A mechanism is offered for organizing the process of early prevention of bank insolvency.When implementing this mechanism, seven of the most well-known multivariate models, selected according to the criteria of successful application in the world practice and the compatibility of their results, were used. For better compatibility of the results, some of them have been modified using the logistic function.Several mechanisms and methods were used to analyze the condition of a number of Russian banks to identify those banks which are highly likely to go bankrupt in the coming years.According to the suggested methods,practical use of these developments demonstrated thatthe analysis depicts the truthful overview of the bank's condition and can be one of the good bank insolvency early prevention tools.

Keywords: Bank, Insolvency, Model, Finance, Mechanism, Early Prevention

Bank insolvency has beenidentified as one of the major significant problems worldwidefor almost three decades. History has recorded several failures in line with banks, both in developingand developed countries (Hanson et al., 2005; Triantis et al., 1993; Caprioet al., 1996; Kryzanowski et al., 1993).Bank failures are also identified in those countries with high transactional economies (Sink, 1989;Deb &Dube, 2020). In more than 50countries, the majority of the banks were closed, especially during the period of 1997 and 2002 (Franks et al., 1996). At this moment, it is important to note that the issue of bank insolvency has been increased recently, and it has adversely impacted several countries with less significant losses.

Insolvency occurs when any company, organization, individual, or firmfails to pay the debts and thus end in double due (Turkina et al., 2018; Miyan, 2017). In short, failing to meet financial obligations such as paying debts is known as insolvency (Anant & Mishra, 2018;Jain, 2020).Since the late 1970s, bank insolvencies have become increasingly common. Where thesefailures are systemic, they can drain a country's financial, institutional, and policy resources resulting in large losses, misallocated resources, and slower growth. Using a new database covering some 86 episodes of insolvency, this article examines the causes and effects of these crises and how governments have responded (Joseph & Prakash, 2014). It finds that both macroeconomic and microeconomic factors have figured in bank crises and that, based on the criteria developed here, few governments have responded well to these episodes (Campbell, 2007;Tiwari et al.,2021;Xie et al.,2021).

To better manage insolvencies, policymakers must develop a regulatory framework that allows banks to respond more robustly to shocks and ensures proper management and oversight. That bankers have not regularly planned for shocks suggests that they have not had the incentive to do so.When banks become insolvent, many of these adverse consequences can be deferred (Demyanyk & Hasan, 2010). The most important factor accounting for this difference is that the output and production processes of nonfinancial firms often are more transparent than those of banks, reflecting both the information-intensive nature of banking and its intertemporal quality.Most bank products or services include a promise to pay in the future, meaning that it can take time for a bank's inability to fulfill its contracts to become evident. Banks can conceal problems by rolling over bad loans or raising more deposits, and increasing the size of their balance sheets (Mayes, 2004).

When banks with a low or negative net worth remain open, bank owners or senior managers are less motivated to monitor them, so bank staff and officers have an ideal opportunity to engage in a variety of defalcations (Tensingh & Suresha, 2019). The resulting tendency for insolvent banks to increase their losses has been widely noted and suggests the need for prompt, corrective action.Thus, the importance of bank insolvency relative to that of nonbanks can be distinguished by the possibility of a systemic crisis(Chatterjee et al., 2018; Zahariev et al., 2020). The real cost of bad loans to the economy, whether as part of a generalized crisis or anisolated problem, is the misallocation of resources. Although much of the lending supported by insolvent banks arethought to be underwriting productive investments, these banks' losses are evidence that this is not always the case. Systemic bank insolvency also drives resources out of the formal financial sector and into less productive uses (Hugonnier & Morellec, 2017). In addition to a direct budgetary impact, widespread bank insolvencies can have the added cost of changing government policy in a negative direction, such as by derailing stabilization programs or by retarding or reversing financial and nonfinancial sector reforms (Gupta,2018; Sane, 2019). Developing and transition economies, in particular, are hard-pressed to deal with bank insolvencies because they lack deep capitalmarkets, which can spread the costs of insolvency over a number of years. Without this buffer and with a more limited tax base, developing countries are more likely to resort to an inflation tax to finance banks' losses (Hugonnier & Morellec, 2017).

Early detection of trends towards insolvency has always been a vital issue in bank management. The solution to this problem has resulted in the creation of many diagnostic models. Based on such models, the current condition analysis shows results that are close to reality. But often, this is not enough to assert the insolvency of the analyzed bank. First, the seemingly best model may show results that are not entirely correct. Secondly, to make reliable forecasts of the unfolding situation, it is necessary to analyze the condition of a bank in a certain period, and the longer this period is, the more reliable the forecast. This article proposes a mechanism and methods to improve the early preventionof bank insolvency (The Quarterly Newsletter of the Insolvency and Bankruptcy Board of India, 2018).

Javish Valecha andAnkita Anupriya Xalxo, in their paper, "Overview of the Insolvency and Bankruptcy Code, 2016 &the Accompanying Regulations" (2017),explainedthe different facets of the Insolvency and Bankruptcy Code, 2016 (new code). Initially, the authors explained the flaws in the existing regime andsegmented that into different sections. Theylaterexplainedabout the new code and corporate insolvency, its scope of applicability, its legal considerations, and the recent developments. Choudhuri (2017)focused on the applicability of the 'Limitation Act '1963 on the Insolvency and

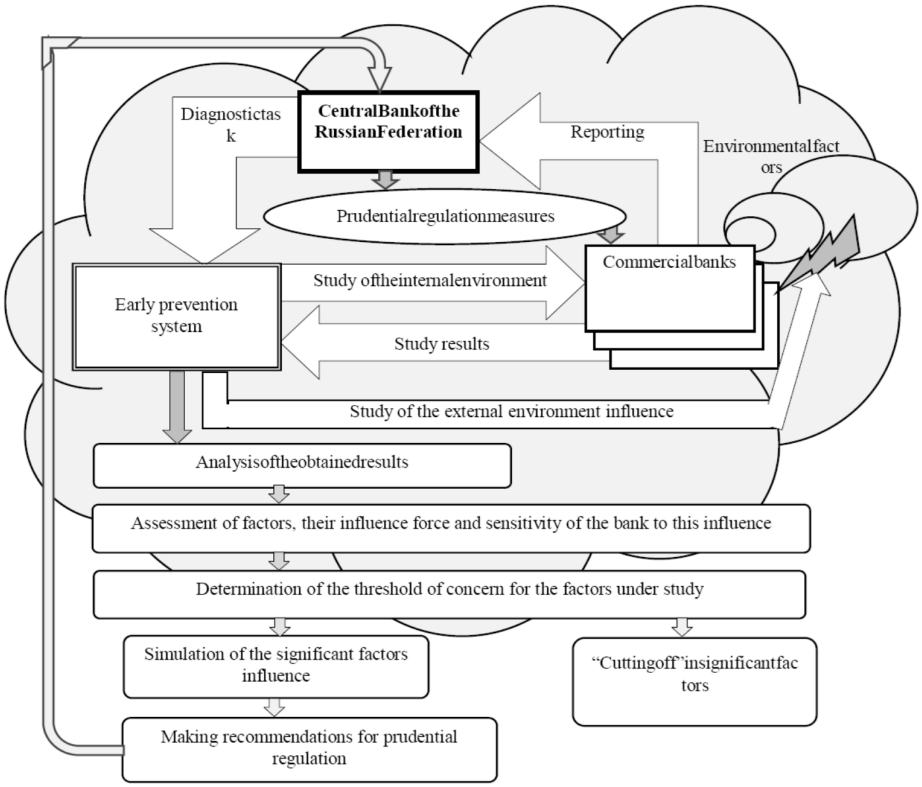
Bankruptcy Code, 2016. The paper also focussedon the different types of insolvency laws in India, along with the basic features of corporate insolvency and the various recommendations made by the Balakrishna committee. It also talkedabout the main controversy behind the applicability of the Limitation Act and how it originated. The reasons why some statutes are not covered by the Limitation Act havealso been explained (Srivastava & Gupta, 2010; Chaudhary & Sharma, 2011). Lastly, the paper deals with whether the National Company Law Appellate Tribunal was right in exempting the Insolvency and Bankruptcy Code, 2016 from the shackles of the Limitation Act' 1963.

Methodology and Findings

The type of research conducted is quantitative, and the population chosen for the study is the world commercial banks, both private and public. The period of study is sixyears. The type of data used for this research is secondary data collected from relevant websites such RBI, economic survey articles, and journals. Currently, there is a need to develop and use systems for early diagnostics of the financial condition of commercial banks. This problem has become especially acute in an uncertain economic environment in connection with the global pandemic COVID-19 and the ensuing decline in economic activity. Various internal and external factors can influence the banks' financial condition changes.

Differences between banks according to their asset structure, capital stock, professional field, funding bases, and so forth make it difficult to create aunified methodology for early diagnosis of bank insolvency. As far as foreign diagnostic models are concerned, they are mostly built on the CAMELS system basis. Basically, the expert nature of this approach allows, with the involvement of a large number of experts, to make a more or less true verdict, but a small set of indicators of banking activity can cause errors in forecasting the financial condition of some banks.

At the same time, financial problems early detection models and bank insolvency prevention have not only theoretical but also major practical value. They allow us to understand what factors lead a bank to bankruptcy, how to counteract banking troubles, and



(Source: Author's development)

Figure. 1. Diagram of the Mechanism for Organizing the Early Prevention of Bank Insolvency

what methods of regulation can be used before the onset of critical events and the irreversible deterioration of the bank's financial situation.Once, I. Pirogov said, "The future belongs to preventive medicine" (year, p. #). In implementing preventive measures, two main directions are distinguished—the formation of a healthy lifestyle and the early diagnosis of diseases and risk factors for their development with subsequent timely correction. This position is suitable not only for the human body but for any complex system that develops over time.

Considering early prevention mechanisms, it is necessary to use modeling developments from other, different sectors of the economy and public life. Foreign researchers noted that for the most reliable forecast of the probability of adverse changes, it is necessary to analyze the currency and banking sectors. One cannot but agree with such statements because the interconnections between these sectors are quite significant, and currency crises can deepen banking crises.When studying the causes of instability in the financial condition of banks, it is necessary to identify and analyze as many factors as possible that affect the state of the diagnosed "body,"that is, bank as a complex system of interweaving the structure and functional interaction of structural elements on the one hand and the interaction of the system as a whole with the external environment, on the other.

Besides, such studies should be built taking into account the probability of the occurrence of a particular event as an influencing factor, the possible force of such an influence, and the sensitivity of the banking system to such influences. In this case, critical values are determined; the influence can be considered insignificant and can be ignored without further consideration.A diagram of such a process mechanism is shown in Figure1.For example, Patrick Honohan (2005)suggestedusing a set of variables with a threshold that, if crossed, can more or less successfully predict situations leading to a banking crisis.

This approach involves the intervention of the regulator, the use of procedures and methods of expert opinion, as well as procedures for prudential regulation. Such methods have already been introduced into the daily banking practice of most countries.A significant contribution to predicting the probability of the onset of banking crises and the development of measures to counter them was made by Sink (1989). He adapted Altman's model for predicting banking crises within the framework of multiple discriminant analysis. Sink (1989) used variables such as composition and asset structure, portfolio credit quality, capital adequacy, sources of income, return on assets, and profitability as reliable indicators of the banking crisis.Most of these variables are used in the CAMELS system, developed in 1979 and improved by the FRS in 1995 (The Federal Reserve System is an independent federal agency specially created on December 23, 1913, to perform the functions of a central bank and to exercise centralized control over the commercial banking system of the United States of America.)

The system uses a set of reporting-listed indicators that make it possible to carry out a rating assessment of the financial condition and operations of banks. Currently, this approach is widely used to identify banking problems and is applied in most countries of the world.The financial crisis of 2008–2009 encouraged interest in banking crisis prediction, so many researcherstriedto improve the CAMELS system. For example, some researchers added six more indicators describing the state of internal control in a bank and the quality of audit. They believed that using these indicators allows for an improved predictive estimate.

Many foreign researchers argue that structurally successful early prevention systems should include: indicators of the bank's core activities, indicators of investment investments, macroeconomic variables describing the state of the national banking system, and predictive analysis based on the CAMELS system. Analysts Thompson et al. (2018), using the logit/probit models, showed that the CAMELS system indicators of bank vulnerability are quite reliable for identifying potential problems of commercial banks.

The Central Bank of Russia has recommended that commercial banks use the expanded CAMEL system to assess their economic situation. The instruction of the Bank of Russia dated 03.04.2017 No.4336-U focuses on conducting a detailed analysis of the bank's activities using indicators of capital, assets, profitability, liquidity, interest rate risk, concentration risk, mandatory standards, management quality, and transparency of the bank ownership structure. The result of the analysis is the assignment of banks to one of five qualification groups. The first group includes banks, the condition of which is quite stable and does not cause concern for the time being, and the fifth group includes banks that are threatened with

termination of their activities in the banking services market.

At the same time, this system is not generic for all Russian commercial banks. It provides for strict requirements only for systemically important commercial banks. For the proportional regulation of Russian commercial banks, lower regulatory requirements are established for banks with basic licenses. When assessing the economic situation of banks, the resulting risk profiles are poorly taken into account.The content of Instruction 4336-U has not yet translated the principles of improving the methodology of the approach to assessing credit risk based on the system of internal ratings.

Foreign practice shows that recognizing a disaster event should be timely enough to have a cushion of time for organizing interference and correcting the situation. Therefore, for a bank's early prevention system to be useful to regulatory agencies or owners-policymakers, it must operate continuously to ensure a quick response. Despite posing significant risks for the growth of the global economy, the COVID-19 pandemic has a negative impact on the Russian economy. According to VTB (year), due to the coronavirus pandemic, the Russian banking sector may face loan defaults from affected industries and, as a result, lose up to 2.5 trillion roubles. Besides, the weakening rouble and fall in oil prices can reduce the financial results and profitability of Russian banks.That being said, it can be concluded that in the context of the above risks, the need for early diagnosis of bank insolvency increases.

Let us consider the problem from the point of view of the possible bankruptcy of the bank, or rather, its presence in the danger zone.The problem of assessing potential bankruptcy is on the agenda of all economicsectors. It is especially relevant for the banking sector, which plays a significant role in national development and ensuring economic growth. The task of early insolvency prevention systems' assessing the verge of bankruptcy of Russian banks is of prime importance at this stage of development because both banks and regulatory agencies lack experience of functioning in a mature market economy (Pasechnik et al., 2011).

Any system is subject to change during its life cycle. Even at the growth stage, conditions can be created for the bankruptcy of an organization (bank). Drawing biological and technical analogies, one speaks of "diseases of growth,""latent defects" in the organizational structure, and the structure of planning and management. "Microcracks" of drawbacks and shortcomings lead to "fatigue" of the entire structure of the bank, or manifestations of "immunodeficiency" and, as a consequence, the development of "internal diseases" and a decrease in resistance to environmental influences. Crises that arise need to be recognized in time.Translating it into the sphere of the organization's life cycle, let us note that to prevent possible complications, it is necessary to carry out constant diagnostics of the state of the system and predict the development of the changes.

The use of multivariate analysis models, which are also applicable to banks, is recognized as one of the most effective methods for detectingan organization's insolvency. Multivariate analysis models provide an approximate understanding of their current condition. If you make a lot of calculations over a certain period of time (monitoring), those data dynamics can show which distribution law the state of the studied object obeys and calculate the values of the system's reliability.The use of several models makes it possible to achieve higher credibility of predictions, as the opinion of several experts makes it possible to develop a truer picture of the changes taking place than the assessment of one expert.

Thus, we will further rely on the integrated application of several models of multivariate analysis. Such multivariate analysis models provide an approximate understanding of the current condition of a bank. If you make a lot of calculations over a certain period of time (monitoring), those data dynamics can show which distribution law the state of the studied object obeys and calculate the values of the system's reliability.

For further research to be more rigorous, let us select the models close to the principles of analysis and lead to comparable results or results that can be brought to the same type for subsequent comparison. According to the criterion of comparability of results, seven models were selected from the most popular ones: E. Altman's four and five-factor models, E. Altman's seven-factor models, R. Haldeman's, P. Narayanan's, E. Altman-G. Sabato's model, J. Olson's model, D. Fulmer's model, and R. Taffler's and G. Tishaw's models.

The analytical procedure is shown in Figure2.As can be seen in the diagram, the results obtained for a number of previous years are used to calculate the trend of the events for the coming years according to

various data smoothing scenarios.In other words, we create various forecasting options forthe bank's state development for the coming years. To increase the reliability of the forecast, we average the most probable scenarios of the banks' state development.

Discussion

The suggested mechanism and methods for organizing the early prevention of bank insolvency were used to analyze the state of several Russian banks. Analysis of financial reporting, which showed the steady-state of Sovcombank ("green zone,"according to Altman's definition), precarious but not critical state of the Russian Agricultural Bank ("grey zone"),and the critical state of the Moscow Industrial Bank ("red zone").For greater consistency of the results, some were modified using the logistic function because it displays the growth curve of the probability of the event under study, which is necessary forthe analysis performed.

The results obtained by the models differ from each other, sometimes quite strongly. This once again indicates that research should not rely on just one model. None of them is as universal as to consider all the nuances that may arise in real life. Therefore, the most promising is the chosen way of assessment with the help of several models and finding a compromised, averaged option.An analysis carried out over six years, between 2015 and 2020, revealed financial condition trends of such banks asSovcombank, Russian Agricultural Bank, andMoscow Industrial Bank.

The identified trends have made it possible to conclude that:

1. Sovcombank's stable presence in the "green" zone, that is, in an area of bankruptcy probability, is low.
2. The unstable condition of the Russian Agricultural Bank staying in the "grey" zone is in an area with a medium bankruptcy probability.
3. The Moscow Industrial Bank is in the critical "red" zone, that is, in an area with a high bankruptcy probability.

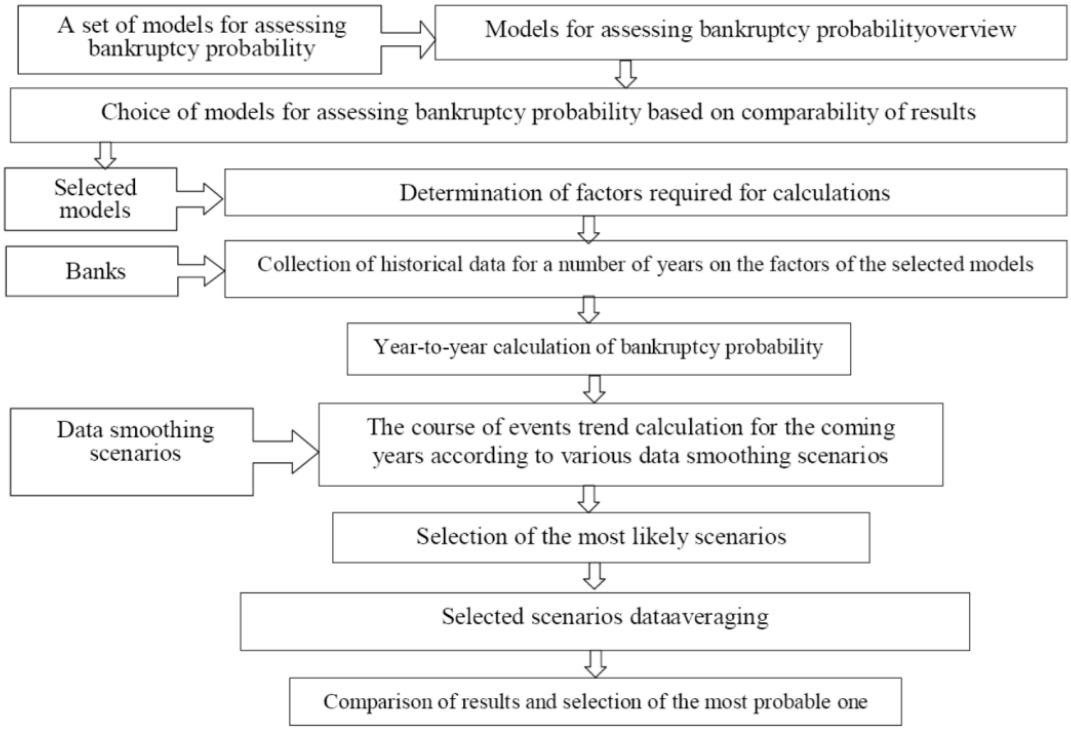


Figure 2. Bank Bankruptcy Probability Analytical Procedure

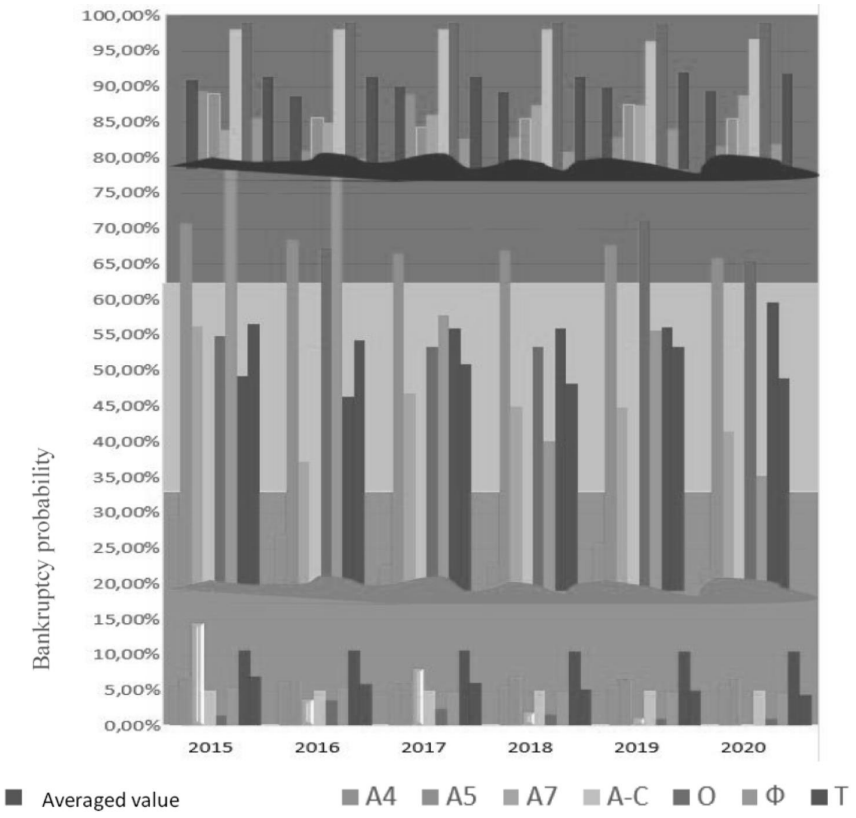


Figure 3. Sovcombank Bankruptcy Probability Assessment for the period 2015–2020

Figure 3 shows the positions of the listed banks on the bankruptcy probability scale.

There are abbreviations in the chart keyword for the multivariate models used:

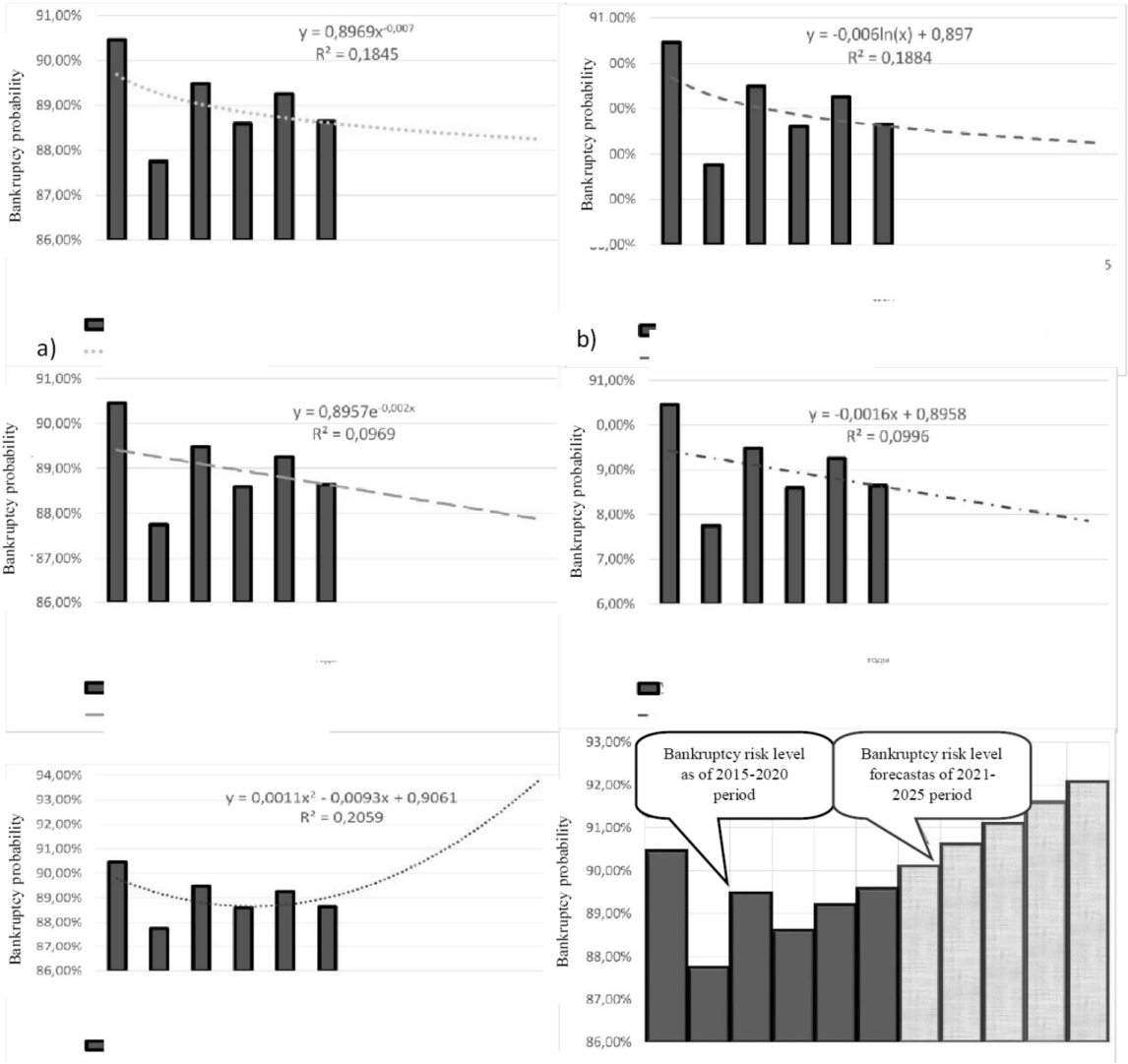
A4 - Altman's four-factor model;
A5 - Altman's five-factor model;
A7 - Altman's seven-factor model;
A-C - Altman-Sabato model;
O - Olson›s model;
Ф - Fulmer›s model;
T - Tuffler's model.

Forecasts up to 2025 were made using various types of data smoothing (see Figure 4).

In the formulas shown in the figures, *x* takes on the values of the ordinal number of the year, starting from 2015. It should be noted that the trends shown by exponential, logarithmic, power, and linear trend lines are very close, and power and logarithmic ones (Figures 4a and 4b), as well as exponential and linear (Figures 4c and 4d) virtually coincide. That is, the credibility of this scenario is quite high. However,one cannot ignore the trend shown by the polynomial trend (Figure 4e) that is leading to bankruptcy in the next 3–5 years. With such a closeness to collapse, it cannot be ruled out that some external or internal minor environment negative changes can lead to a sharp change in the state of the bank and, as a result, to complete bankruptcy.

Figure 4f shows the average forecast of the scenario, taking into account the prevailing trend of the last three years for the Moscow Industrial Bank, which is in the most critical condition among the studied banks.

Thus, the studies carried out on the use of the suggested mechanism and methods for diagnosing bank insolvency confirmed the prospects of the proposed approach. This statement is confirmed by the fact that in August 2020, the reorganization of the Moscow Industrial Bank and a complete renewal of its board of directors were announced. The Central Bank of Russia allocated 128.7 billion roubles for additional capitalization, and now the Bank of Russia almost wholly owns the Moscow Industrial Bank.



Conclusions

The article offers mechanisms and methods for the early detection of bank insolvency. The early prevention system, which is the central component of the mechanism, is based on the principle of the integrated application of multivariate analysis models with subsequent averaging of the results obtained. Monitoring of bankruptcy probability over a number of years made it possible to forecast the state of banks for the coming years, to take measures for eliminating a threat of bankruptcy.

To makethe results comparable, a logistic function is used to show the bankruptcy probability for the models where the scoring is used.Practical studies, which confirmed the prospects of these developments, have been carried out. Among the studied banks, the Moscow Industrial Bank was found in the danger zone with a high probability of bankruptcy. Initial data obtained at the beginning of 2020, for the period from 2015–2019, were confirmed by further events: bank resolution measures and the allocation of significant funds for additional capitalization.

References

Anant, S., & Mishra, A. (2018). A study of insolvency and bankruptcy code and its impact on macro environment of India. *SAMIKSHA, 1.*

Campbell, A. (2007). Bank insolvency and the problem of nonperforming loans.*Journal of Banking Regulation,9*(1), 25–45.

Caprio, G., & Klingebiel, D. (1996, April). Bank insolvency: bad luck, bad policy, or bad banking? *In Annual World Bank conference on development economics* (Vol. 79, pp. 1-26).

Chatterjee, S., Shaikh, G., & Zaveri, B. (2018). An empirical analysis of the early days of the insolvency and Bankruptcy Code, 2016. *National Law School of India Review*, *30*(2), 89–110.

Chaudhary, K., & Sharma, M. (2011). Performance of Indian public sector banks and private sector banks: A comparative study. *International Journal of Innovation, Management and Technology,2*(3), 249–xxx.

Deb, S., & Dube, I. (2020). Insolvency and Bankruptcy Code 2016: Revisiting with market reality. *International Journal of Law and Management, x*(x), xx–xx.

Demyanyk, Y., & Hasan, I. (2010). Financial crises and bank failures: A review of prediction methods. *Omega,38*(5), 315–324.

Franks, J. R., Nyborg, K. G., & Torous, W. N. (1996). A comparison of US, UK, and German insolvency codes. *Financial Management*, *x*(x), 86-101.

Hanson, Honohan, P., & Majnoni, J. (Eds.). (2005).*nfs* World Bank. Gupta, A. (2018). Insolvency and Bankruptcy Code, 2016: A paradigm shift within insolvency laws in India. *The Copenhagen Journal of Asian Studies*, *36*(2), 75–99.

Hugonnier, J., & Morellec, E. (2017). Bank capital, liquid reserves, and insolvency risk. *Journal of Financial Economics*, *125*(2), 266–285.

Jain, S. (2020). Analysing the overriding effect of the insolvency and Bankruptcy Code, 2016. *NUJS L. Rev*., *13*, 39–xx.

Joseph, A. L., & Prakash, M. (2014). A study on analyzing the trend of NPA level in private sector banks and public sector banks. *International Journal of Scientific and Research Publications,4*(7), 1–9.

Kryzanowski, Lawrence, and Gordon S. Roberts. 1993. Canadian Banking Solvency,1922-1940.*Journal of Money, Credit, and Banking* 25 (August): 361-76.

Mayes, D. G. (2004). Who pays for bank insolvency?*Journal of International Money and Finance*, *23*(3), 515–551.

Miyan, M. (2017). A comparative statistical approach towards NPA of PSU and private sector banks in India. *International Journal of Advanced Research in Computer Science,8*(1), xx–xx.

Tiwari, M., Tiwari, T., Santhose, S. S., Mishra, L., MR, R.,&Sundararaj, V.(2021). Corporate social responsibility and supply chain: A study for evaluating corporate hypocrisy with special focus on stakeholders. *International Journal of Finance & Economics, x*(x), xx–xx.

Moscow Industrial Bank. Official site. [Electronic source]. – Available at: https://minbank.ru

Pasechnik, A.A.,Pasechnik, D. A., &Lukash, E. N.(2011). Application of econometric binary choice models for assessing the probability of Russian banks bankruptcy. *Young Scientist*, (10), 137–148. https://moluch.ru/archive/33/3705/

Russian Agricultural Bank. Official site. [Electronic source]. – Available at: https://www.rshb.ru

Sane, R. (2019). *The way forward for personal insolvency in the Indian Insolvency and Bankruptcy Code*. Publisher.

Sink, D. S. (1989). *Performance management:Planning, measurement and evaluation, control and improvement*. Publisher.

Sovcombank. Official site. [Electronic source]. – Available at: https://sovcombank.ru

Srivastava, V., & Gupta, S. K. (2010).A study on non-performing assets of Indian banks. *GYANPRATHA-ACCMAN Journal of Management*, *5*(2), xx–xx.

Tensingh, E., & Suresha, B. D. (2019). A study on the impact of insolvency and Bankruptcy Code 2016 on Indian commercial banks—A pre and post event analysis. *International Journal of Emerging Technologies and Innovative Research,6*(6), 68–75.

Organization Name. (2018). *The Quarterly Newsletter of the Insolvency and Bankruptcy Board of India*, *6*(January – March). Triantis, G. G. (1993). The effects of insolvency and bankruptcy on contract performance and adjustment. *The University of Toronto Law Journal*, 43(3), 679-710.

Xie, Q., Sundararaj, V., & Mr, R.(2021). Analyzing the factors affecting the attitude of public toward lockdown, institutional trust, and civic engagement activities. *Journal of Community Psychology, x*(x), xx–xx.

Ye, D., Turkina. Five practical differences in bank accounting between the standards of Russia and the United States at the present stage of economic development // Science and business: ways of development. 2018. No. 12 (90). 156 – 157 pp.

Zahariev, A., Prodanov, S., Radulova, A., Zaharieva, G., Pavlova, M., Angelov, P., & Marinova, K. (2020). The bank insolvency: From Lehman Brothers to COVID-19. *Journal Name*, *x*(x), xx–xx