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Credit Risks of Russian Commercial Banks: New Approaches to Management

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ANNOTATION

In the realities of the modern domestic economy, the process of risk management of commercial banks associated to credit corporate customers, acquires new content. The assessment of what place in the company's activity has a work that contributes to solving the most pressing problems of our time: environment, social and general corporate governance comes to the fore. As a result, the focus is on a group of lending risks known as ESG. Since the areas of work of clients — legal entities, with which these risks are associated, and described mainly by qualitative, non-formalized characteristics, a difficult task for modern bank risk-management becomes normalizing the process of their evaluation when making specific decisions on the loan. This explains the interest and **relevance** of this research, the **object** of which is the risk management subsystem for lending to corporate clients by commercial banks, the **subject** is the consideration of ESG factors in this process. The **purpose** of the paper is to develop the basics of decision-making tools in the management of bank credit risks, with this group of factors. The authors apply **methods** of both general scientific (induction, deduction, analysis, synthesis) and special: system and retrospective analysis of existing developments in the field of justification of decisions of bank risk management. The theoretical significance of the research **results** consists in a complex analysis of the role and place of ESG-risks in the overall risk landscape and the integration of environmental, social and managerial factors into credit risk assessment. Basic principles of construction of phenomenological model, used to support credit decisions by banks of corporate clients taking into account ESG-factors that influence their activity, have been developed.
Keywords: bank lending; credit risks; ESG risks; phenomenological modeling; management decision-making

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INTRODUCTION

According to the Global Progress Report of the Sustainable Banking Network (SBN)[1] [1] in the coming years one of the priority directions of development of "green" financing will be identification and management of ESG-risks. Note that the share of loans provided by the global banking community in 2016 for the purpose of "green" financing was 7% (22 trillion USD) of the total volume of issued loans. By 2030, however, this figure could rise to 30% (44.5 trillion USD)[1], indicating an investment potential in the transition to sustainable development policies. In the Russian market, experts predict a volume of 1.3 trillion rubles of "green" and SDG-oriented credits to 2030, while maintaining current trends [1]. One of the challenges for Russian banks is the development of methodology for ESG-risk management. In order for domestic banks to be able to take into account the ESG risks associated with their business when making decisions on lending to corporate clients, they must have tools, which allows you to model economic systems with a lot of complex and poorly formalized relationships. Phenomenological models that have long proven themselves in natural science and technical sciences are a promising basis for such tools. Their essence consists in describing the reactions of the simulated system to external control effects, but without the task of identifying the underlying mechanisms of these reactions. The end result of this is a short-term solution that should result in either a new phenomenological model for use in the next short-term interval, or a model that explains in detail the work of the system under study and provides a basis for longer-term solutions [2]. At present, the experience of applying phenomenological models for substantiation of managerial decisions in economic spheres, including financial and banking, has an eclectic character, and there is a need to systematize it, which determined the structure of this paper. Its purpose is — to develop the basic principles of construction of phenomenological models used to substantiate decisions on lending to corporate clients by banks, taking into account ESG-indicators that affect their activities.

To achieve to this goal set specific goals:

1) summarize the role and place of ESG-risks in the overall risk landscape, which are taken into account when making decisions on lending to corporate clients by modern Russian banks and present ESG-risk indicators when assessing the creditworthiness of a client — legal person;

2) to develop an algorithm of building a phenomenological model of the situation related to the provision of credit by the domestic bank to a corporate client whose activity is under the influence of ESG-indicators.

The object of the study are the decision-making processes on lending corporate clients by domestic banks with consideration of ESG-risks; subject — application of phenomenological models of relationships between the state of corporate clients-borrowers with ESG-indicators when making such decisions. The theoretical and methodological basis of the study are the works of domestic and foreign specialists in the field of banking, lending, credit risk management, enterprise economy, application of mathematical and phenomenological modeling in the economy.

METHOD

The methodological basis of the study has two components. Research related to credit risk management by modern banks of corporate clients on the basis of the ESG-approach, which are based on the work of foreign scientists on this topic, presented in libraries and scientific

[1] Accelerating sustainable finance together: Global progress report of the Sustainable Banking and Finance Network. Evidence of policy innovations and market actions across 43 emerging markets. Washington, DC: International Finance Corporation; 2021. 117 p. URL: https://sbfnetwork.org/wp-content/uploads/pdfs/2021_Global_Progress_Report_Downloads/SBFN_D 003_GLOBAL_Progress_Report_02_Nov_2021.pdf (accessed on 18.04.2022).

databases Scopus and Wo S. Research related to the application of phenomenological models in bank lending and risk management to account for factors of volatile and non-standard factors (due to Russian specificity) based on developments in the application of systems analysis and modelling in the economy. These developments have been created by scientific schools of the Financial University under the Government of the Russian Federation, the Central Institute of Economics and Mathematics of the Russian Academy of Sciences, the Saint Petersburg HSE and Management, the Volga Federal University to date. The central part of the approach developed in the study to substantiation of decisions on lending by banks of corporate clients with consideration of influence of ESG-indicators on their business is the method of construction of phenomenological models of these situations. The problem is that existing methods of constructing phenomenological models have developed within the framework of the natural sciences and their particular, subject area, so it is necessary to adapt them to the specifics of the description of the subject area of bank lending.

RESULTS

Result 1

ESG risk assessment becomes an important element of strategic planning, decision-making and risk management especially in the banking sector when assessing the creditworthiness of corporate clients. This is evidenced by the approaches of the European Banking Authority to lending, the purpose of which is to provide reliable and reasonable standards of lending, covering factors and ESG-indicators both when issuing a loan and assessing creditworthiness, and when monitoring loans issued. A lot of research has been done on the impact of ESG-risks on various aspects of operations. The authors of [3] prove that the inclusion of ESG-risk assessment indicators increases the effectiveness of forecasting the volatility of traditional financial risk measures. The study [4] confirms that the implementation of ESG-principles reduces the risk of financial default. The paper [5] concludes that socially responsible human resource management has a positive impact on the level of corporate environmental responsibility, which in turn affects the financial performance of the company. A similar study was conducted by the authors [6]: implementation of ESG-principles in the company's activities ensures improvement of the company's business reputation in the society and trust of investors; results in efficient use of resources and preservation of competitiveness [7]. The study [8] proves that a higher commitment of the company to ESG-principles is closely related to the reduction of credit risk of the corporate customer. ESG-risks — a concept primarily socio-economic, it cannot be considered in isolation from the national economy and the features of its development. These risks should be seen as a system consisting of three blocks: environmental, social, corporate governance.

Environmental block. ESG-principles are based on knowledge about ecological problems of society, responsible behavior of market participants in making investment decisions, conscious investment in the segment of "green" sustainable development and environmental risk reduction. Environmental risk[2] — the probability of events with adverse effects on the natural environment and caused by negative impacts of economic and other activities, natural emergencies and technogenic character. Unfortunately, the share of Russian investors does not have to be a formal ESG-principles, despite the active promotion of this direction, is not yet enough: for 2020, out of 66 Russian public joint stock companies analyzed, 44 disclosed non-financial information in the annual report (total of about 1000). Obviously,

[2] Russian Federation. Laws. On environmental protection: No. 7: text with amendments and additions as of 26 March 2022: [adopted on 10 January 2022]. Legal reference system "Consultant Plus". URL: Федеральный закон «Об охране окружающей среды» от 10.01.2002 № 7-ФЗ (последняя редакция). КонсультантПлюс (consultant.ru) (accessed on 08.07.2022).

it is necessary to cultivate among national investors and consumers of financial services responsible behavior that creates the basis for the sustainable development of the country for future generations, including actively using tax and other incentives.

Social block is characterized by social risk — the risk that creates, produces, provokes society itself. According to research [9, 10], companies with high ESG-ratings have a high future return on shares. An important component of ESG-indicators is the social aspect: the higher the index of social norms, the higher the level of investment of institutional investors in ESG-companies, which leads to their higher financial performance in the stock market and increase in the market value of the company. In turn, the authors of the paper [11] in the analysis of 65 socially responsible banks from 18 countries came to the conclusion that socially responsible banks have significantly higher financial performance than "socially not responsible banks".

Corporate governance block covers the system of relationships in the company between all stakeholders. However, in both Russian and international practice, most issues related directly to corporate governance are not legal but ethical. For example, rules of civil legislation establish the possibility to rely on the requirements of reasonableness, integrity and fairness in some cases. Therefore, it seems important to base corporate governance on the principle of sustainable development of society, definition of the company's mission and the introduction of corporate values, which will become a tool for all stakeholders of the company to achieve strategic goals.

Based on the analysis and summarize of the literature, it can be concluded that when assessing the creditworthiness of the client — legal entity, it is necessary to take into account the indicators of ESG-risks indicated in the *Table 1*.[3]

Of course, quality ESG-policy risk management is an important aspect of ESG-banking. Accordingly, it seems necessary to integrate ESG factors into the risk management process as *seamlessly* as possible and to consider ESG-risks in the overall risk system. From this point of view, our article contributes to the development of ESG-practice in the banking sector, offering a theoretical and methodological framework for the effective integration of ESG-factors in the analysis of creditworthiness of clients — legal entities.

Result 2

The complexity of the mechanisms by which ESG-factors operate, makes the discussion about the development of special tools to take them into account in the development of decisions on lending to corporate clients by banks.

For Russian banks accounting for ESG-risks when lending customers is complicated by factors that are caused by the overlap of two large bifurcation processes in the national economy (*Fig. 1*).

Thus, the mechanisms of functioning of the Russian economy as macrosystems at present are extremely difficult to understand and deepen in their essence, including the mechanisms of influence of ESG-factors on the development of business of domestic enterprises, borrowing banks.

In this regard, for Russian banks, tools based on phenomenological models appear to be very effective in taking these factors into account when lending enterprises. This type of model came into economic management science and practice from technical disciplines [12, 13].

The main question remains the creation of a unified approach to the construction of phenomenological models, applicable specifically to economic systems, taking into account their specificity compared to technical. The paper [15] suggests the primary principles of such an approach, based on the provisions of

[3] Methodology of assigning credit ratings to financial and non-financial companies. Expert RA. URL: https://raexpert.ru/ratings/methods/current/ (accessed on 18.04.2022). ESG assessment methodology. URL: https://www.acra-ratings.ru/criteria/2072/ (accessed on 18.04.2022).

Table 1

Index and Indicators of EGS-Risks

Index	Indicator	Positive/negative adjustment of indexes in assessing the creditworthiness of the client
Direction: Environment		
Water and energy management	Used water from all sources (million cubic meters) Volume of turnaround and repeatedly-consecutive water supply from all sources (million cubic meters). Consumption of fuel and energy resources, including heat, fuel, electricity (toe) Share of renewable energy (RES) in total energy consumption (%)	Existence of programmes to improve energy and water efficiency, adaptation to climate change Availability of ISO 50001 certificate Integration agenda into the global climate change business model An industrial accident resulting in the freezing of the company's assets and compensation for damage Impacts with socio-economic and economic damage, caused the public resonance Non-compliance with environmental legislation was identified Presence of repetitive requirements by public authorities Existence of a disputed environmental situation involving a company or its contractors Insufficient information transparency: the company does not provide up-to-date information on the disputed environmental situation
Waste management and environmental	Discharge of contaminated wastewater into surface water bodies, including transfer for treatment (million cubic meters) Generated waste I–IV hazard classes (total and separately by classes) (thous. tons) Waste management I–IV classes of hazard, including disposed of, defused of, buried, given to other persons/ received from others (thous. tons) Emission of pollutants in atmospheric air from stationary sources (thous. tons) Greenhouse gas emissions (thous. tons of CO2 equivalent)	High quality environmental management Availability of ISO 14001certificate Unit gross emissions of pollutants, greenhouse gases to the atmosphere, carbon footprint show a decreasing trend over the last year/two/three years Availability of programs on rubbish and waste removal An industrial accident resulting in the freezing of the company's assets and compensation for damage Repeated prescriptions by public authorities Existence of a disputed environmental situation involving a company or its contractors Insufficient information transparency: the company does not provide relevant information on the disputed environmental situation

Table 1 (continued)

Index	Indicator	Positive/negative adjustment of indexes in assessing the creditworthiness of the client
Finance environmental projects	Environmental costs, including: air protection and mitigation; collection and treatment of wastewater; waste management; conservation of biodiversity and protection of natural areas (thous. rub.)	Existence of a programme and policies on land reclamation, biodiversity conservation, atmospheric air protection and mitigation, wastewater collection and treatment Incident, that caused a public outcry related to the financing of environmental projects Availability of supporting documents for financing environmental projects
Direction: Social		
Conditions of work	Social costs per staff Higher pay (%) Annual additional paid leave (calendar days) Reduced working time (hours) Personnel development costs per staff Number of courses offered and advanced training Number of recreation centers, clinics, etc. Workers: men, women, persons under the age of 18, persons with disabilities, older workers, refugees Structure and gender distribution of posts Results of current activities of the employee, unit (KPI) Number of employee proposals and initiatives (un.) Positive evaluation of eNPS measurement, engagement, project activity, motivational climate	Availability of employee social support Availability of feedback mechanisms for staff Availability of social investments in the development of the regions of the company's presence Existence of human rights policies and standards Failure to comply with labour legislation Existence of a contentious situation with a public impact on the observance of human rights The company participates in court proceedings related to workers' conditions Insufficient information transparency
Local communities	Investments in local communities (thous. rub.) Consumer Satisfaction Index (CSI) Customer Acquisition Costs (CAC) Customer Retention Rate (CRR) Customer Lifetime Value (CLTV) Customer loyalty index Responsible marketing Share of defective goods Percentage of orders delivered on time Order completion (%) Responsible products/services Responsible supply chain Percentage of complaints (refunds) by quality	Availability of investment in local communities Existence of supporting documents that show that the company imposes requirements on the counterparties in the field of responsible business; respect for human rights

Table 1 (continued)

Index	Indicator	Positive/negative adjustment of indexes in assessing the creditworthiness of the client
Health and safety	Number of accidents per 1000 employees Number of workplaces at which the factors of production environment and labor process have been assessed: light environment, gravity of labor process, tension of labor process, etc.	Existence of health and safety policies and standards/ Incident resulted in loss of life Incident resulted significant damage and public outcry. High industrial injuries
Direction: Governance		
Business ethics	Number of offences (by sector and industry)	It was found that the company did not comply with the constituent and internal documents The company participates in court proceedings, has claims from the state authorities High level of disclosure and quality of non-financial information Risk identification and risk management framework for sustainable development in place Presence of a unit or staff responsible for sustainable development Integration of ESG-factors into long-term strategy Implementing Disclosure Recommendations (in the TCFD)
Corruption and theft	Share of independent board members; Share of open market shares; Top management reward	The facts of participation of top management/ beneficial owners of the company in illegal activities were revealed Revealed evidence of excessively risky activity, leading to the possibility of damage to customers, contractors, and hence the business reputation of the company High level of disclosure and quality of financial information

Source: Compiled by the authors according to [1]; Accelerating sustainable finance together: Global progress report of the Sustainable Banking and Finance Network. Evidence of policy innovations and market actions across 43 emerging markets. Washington, DC: International Finance Corporation; 2021. 117 p. URL: https://sbfnetwork.org/wp-content/uploads/pdfs/2021_Global_Progress_Report_Downloads/SBFN_D 003_GLOBAL_Progress_Report_02_Nov_2021.pdf (accessed on 18.04.2022).

classical and modern management theories, in which the problem area of modeling during the development of the solution is characterized by 16 indicators of resource exchange — 4 of their kind in 4 subsystems (*Fig. 2*).

Management decision is considered as an act, as a result of which in a managed system all 16 indicators of resource exchange are transferred from old values to new, and the decision itself is characterized by 4 parameters of changes introduced into the system by the decision maker (on the scheme they are marked beech "*d*" (*decision*) with the symbols of resource exchanges. All three groups of indicators of resource exchanges: before and after a management decision and the changes it introduces are linked by a system of equations:

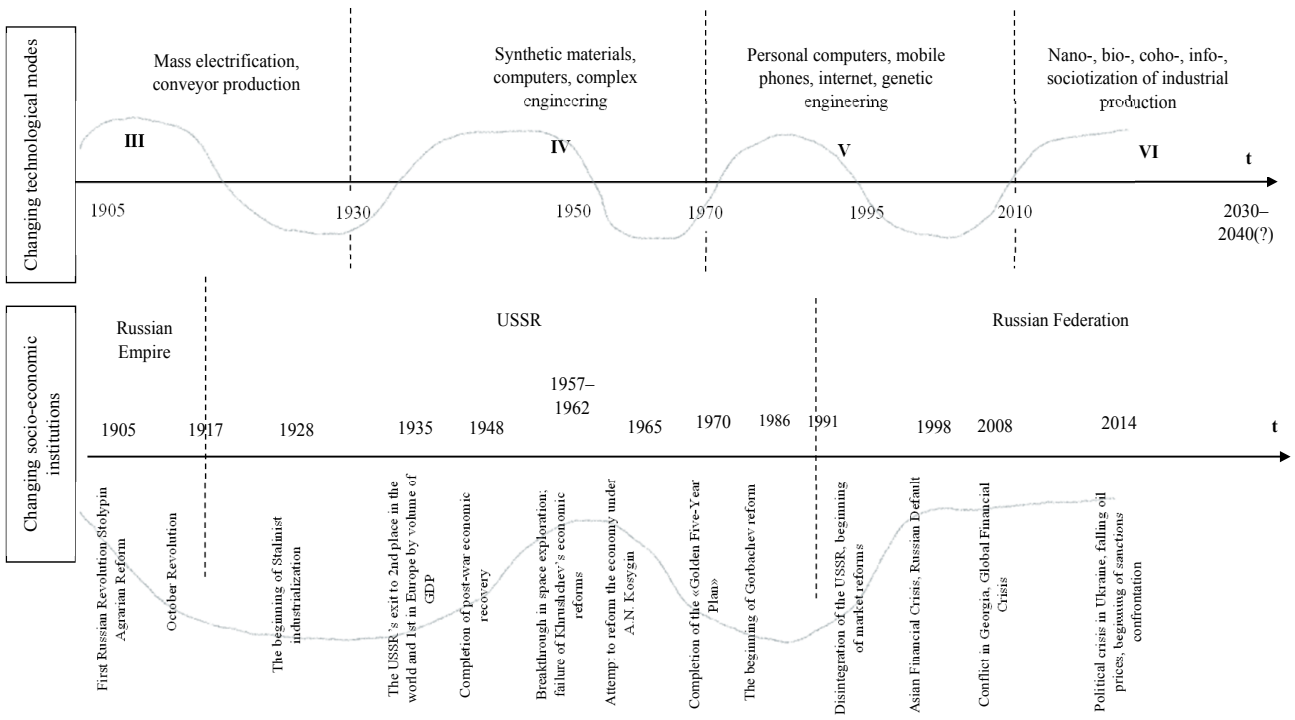

Fig. 1. **Synergy of Bifurcations Provided with Changing Technological Modes and Social-Economic Institutions in Russia of the Early XXI Century**

Source: Compiled by the authors.

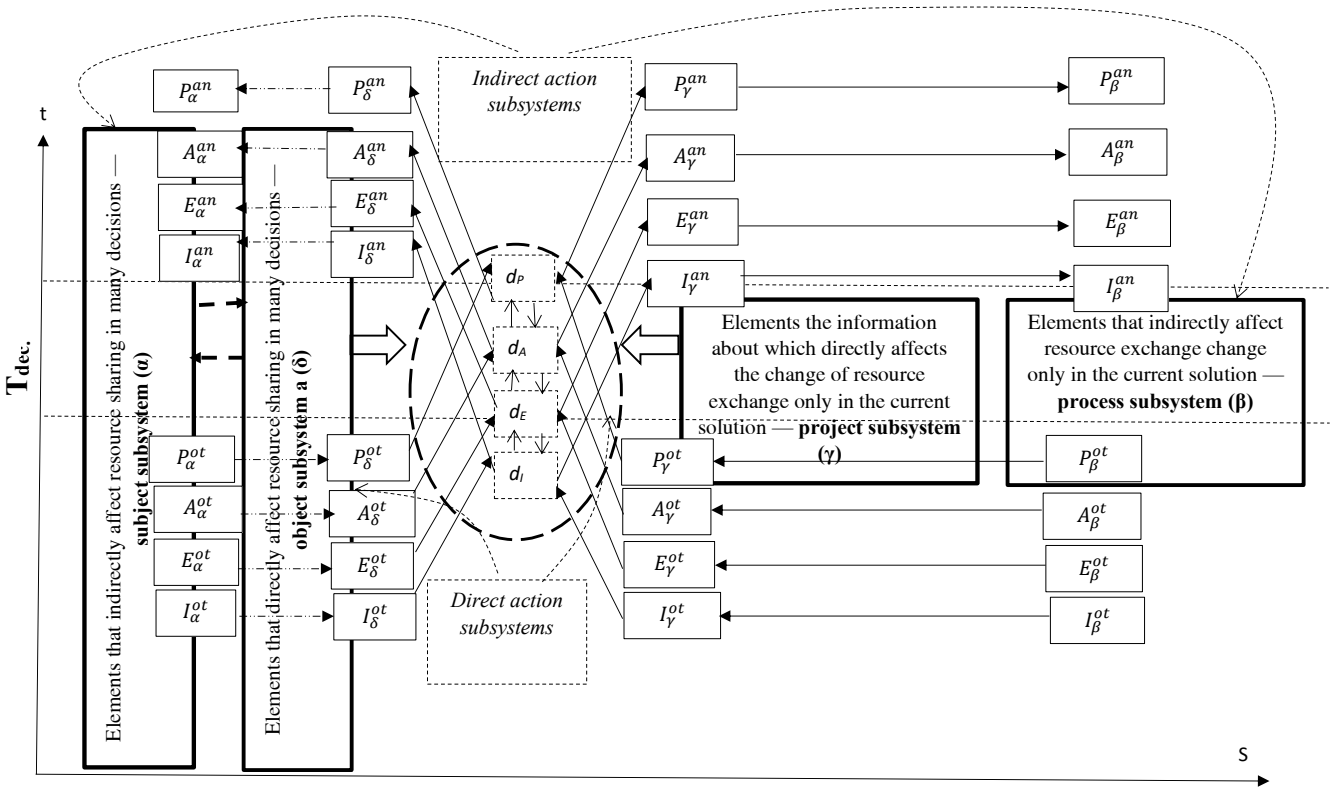

Fig. 2. **Area of Creating Phenomenological Model During Managerial Decision-Making in the Economic Systems**

Source: Compiled by the authors.

$$\begin{cases} \dfrac{\Delta P_{\delta}^{an} + g_P\left(d_A, d_E, d_I\right)}{\Delta P_{\alpha}^{an}} + \dfrac{\Delta P_{\gamma}^{an} + g_P\left(d_A, d_E, d_I\right)}{\Delta P_{\beta}^{an}} = \dfrac{\sum_{i=2}^{n}\left(\dfrac{\Delta P_{\delta}^{ot.i}}{\Delta P_{\alpha}^{\partial p.ii}} + \dfrac{\Delta P_{\gamma}^{ot.i}}{\Delta P_{\beta}^{\cdot}}\right)}{n-1} \\ \dfrac{\Delta A_{\delta}^{an} + g_A\left(d_P, d_E, d_I\right)}{\Delta A_{\alpha}^{an}} + \dfrac{\Delta A_{\gamma}^{np} + g_A\left(d_P, d_E, d_I\right)}{\Delta A_{\beta}^{an}} = \dfrac{\sum_{i=2}^{n}\left(\dfrac{\Delta A_{\delta}^{ot.i}}{\Delta A_{\alpha}^{ot.i}} + \dfrac{\Delta A_{\gamma}^{ot.i}}{\Delta A_{\beta}^{ot.i}}\right)}{n-1} \\ \dfrac{\Delta E_{\delta}^{an} + g_E\left(d_P, d_A, d_I\right)}{\Delta E_{\alpha}^{an}} + \dfrac{\Delta E_{\gamma}^{an} + g_E\left(d_P, d_A, d_I\right)}{\Delta E_{\beta}^{an}} = \dfrac{\sum_{i=2}^{n}\left(\dfrac{\Delta E_{\delta}^{ot.i}}{\Delta E_{\alpha}^{ot.i}} + \dfrac{\Delta E_{\gamma}^{ot.i}}{\Delta E_{\beta}^{ot.i}}\right)}{n-1} \\ \dfrac{\Delta I_{\delta}^{an} + g_I\left(d_P, d_A, d_E\right)}{\Delta I_{\alpha}^{an}} + \dfrac{\Delta I_{\gamma}^{an} + g_I\left(d_P, d_A, d_E\right)}{\Delta I_{\beta}^{an}} = \dfrac{\sum_{i=2}^{n}\left(\dfrac{\Delta I_{\delta}^{ot.i}}{\Delta I_{\alpha}^{ot.i}} + \dfrac{\Delta I_{\gamma}^{ot.i}}{\Delta I_{\beta}^{ot.i}}\right)}{n-1} \end{cases}$$

Details of the conclusion of this formula are contained in the paper [15]. Further considered questions of its practical application. The main point of the phenomenological model is that in the absence of full knowledge of the factors influencing the problem to be solved, the controlling subject must make the parameters of the system such that they are not very different from those what was before the solution, and the system as a whole retained the existing trajectory of development and did not come to collapse. This approach has shown its effectiveness in making decisions in Russian commercial banks about crediting enterprises in situations where it is difficult to identify the mechanisms of influence of all factors (including ESG) on the state of their business.

Example. In 2014–2017, the branch of the Investment Trade Bank in Kazan credited the work on the refinery complex "Tatneft" to create and implement a new progressive technology — heavy residue conversion (HRC) of refined oil. At the end of the planned period, it became apparent that further R&D was required. The enterprise appealed to the lending bank for additional cash resources, and the management of the bank faced a non-trivial task of developing a decision on the parameters for issuing a new loan. Because there is insufficient information to understand in depth how all environmental, social and management factors affect the outcome of R&D credits. To develop a solution, a phenomenological model of a solvable problem situation was applied, where indicators of resource exchange acquire economic meaning, presented in the *Table 2*.

Based on the model, the following banking solution parameters were calculated: to issue a loan to "Tatneft" enterprise in the amount of 500 million rubles for 20% of annual interest for 12 months, as a pledge the enterprise should provide fixed assets worth 200 million rubles. Throughout the year there was debt service, and at the beginning of 2019 "Tatneft" completely repaid it. Both the bank and the enterprise the issuance of this loan allowed to increase the performance of their activity.

CONCLUSION

Factors related to the environmental, social and managerial components of enterprises' business play an increasingly important role, but there is currently no formalized and unified tools for their accounting during the lending of enterprises by banks. This is particularly difficult for domestic commercial

Table 2

Indicators of Phenomenological Model Used in Making-Decision on Crediting the Activities of "Tatnefteproduct" Provided with Creating Deep Processing of Heavy Residues

Resource exchange type Subsystem	*P*	*A*	*E*	*I*
Subject (α)	*P*α: total loan portfolio of the banking system (TLP_{bs})	*A*α: base interest rate (BIR)	*E*α: average weighted loan period in the banking system (AWL_{bs})	*I*α: level of collateral coverage in the banking system (LCV_{bs})
Object (δ)	*P*δ: loan portfolio of the bank- creditor (LP_{bc})	*A*δ: profitability of bank- creditor loans $(Pr_{bc} = \frac{IL_b}{LP_{bs}})$, where IL_b – loan bank interest money	*E*δ: weighted average period of bank-lender loans $(\frac{\sum_{i=1}^{k} AmCr_i * AvCr_i}{LP_{bs}})$, k – number of loans in the bank's portfolio	*I*δ: loan bank collateral level $(\frac{Db}{LP_{bs}})$, where D_b – value of all loan bank deposits
Project (γ)	*P*γ: enterprise borrower output (E_{bo})	*A*γ: gross profit of the borrowing enterprise (GP_{be})	*E*γ: contract duration remaining with the counterparties (CDM_0)	*I*γ: value of all fixed assets of the borrower enterprise (FA_b)
Process (β)	*P*β: enterprise debt to banks (ED_b)	*A*β: interest paid by the borrowing enterprise (IP_{be})	*E*β: weighted average duration of use of loans by the borrowing enterprise $(\frac{\sum_{i=1}^{m} AmL_i * AvL_i}{ED_b})$, m – enterprise credit number	*I*β: Value of the borrower's fixed assets (VFA_b)
Rate of change in resource exchange	P_{ch}: credit amount (Am_{cr})	*A*ch: loan interest rate (L_{ir})	E_{ch}: loan term (L_t)	*I*ch: loan collateral value (C)

Source: Compiled by the authors.

banks and their corporate borrowers due to many historical backgrounds.

Thus, the study conducted a formalized complex analysis of the role and place of ESG-risks in the overall risk landscape and integration of ESG-risk factors into credit risk assessment. Adaptation of the general methodology of construction of phenomenological models to the description of crediting processes by commercial banks

of enterprises under the conditions of ESG-factors was carried out and basic principles of phenomenological modeling of bank-enterprise interaction were formulated the borrower under the conditions of ESG-factors. As a result, an algorithm of substantiation of decisions on lending by banks of corporate clients with consideration of ESG-factors influencing their activity was developed.

Phenomenological modeling has demonstrated its effectiveness in substantiating the decisions of domestic banks to credit enterprises under the conditions of complex and poorly formalized factors. From this point of view, our paper contributes to the development of ESG-practice in the banking sector, offering a theoretical and methodological basis for the effective integration of ESG-factors in the analysis of creditworthiness of customers under the conditions of growth of turbulence of the domestic economy.

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