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MODELS OF CREDIT LIMIT-SETTING FOR COMPANIES AS A MEANS OF ENCOURAGING COMPETITIVENESS*

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Abstract. Monetary policy deals with a number of issues including improvement of the national business competitiveness, increasing the volume of internal credits, ensuring stability and sufficient reinvestments into the real sector of the economy. On the one hand, banks issue credits relying on the index of competitiveness. On the other hand, banks should encourage the growth of the organization's competitiveness. These tasks are interconnected, but the latter one is hardly considered by researchers. Administration of companies' competitiveness is a set of financial methods aimed at modifying the activity of regulatory institutions so that they can help companies achieve the required financial criteria. In order to solve the trilemma of competitiveness, monetary policy and credit limit-setting for a group of companies, robust management is necessary. Currently, banks have sufficient liquidity but prefer low credit exposure. Such an approach is conditioned by the recent financial shocks, dissatisfaction and disappointment with the existing methodology, which has not protected banks from risks. It leads to the necessity for banks to introduce credit limits for each company. The authors suggest a model of adjustment of competitiveness drivers for the real sector of the economy and ways to determine credit limits in order to support competitiveness.

Keywords: monetary policy; transmission mechanism; transmission investment channel; competitiveness; general equilibrium model; structured product

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JEL Classifications: O10, O14, O31, O35

1. Introduction

The mechanism of interaction between monetary policy and competitiveness of companies is one of the foundations of the economic system. It ensures the interrelated dynamics of monetary policy indicators and corporate financial performance, which determines the competitiveness of companies. This mechanism should be established in such a way that, on the one hand, banks are able to issue credits to a particular company relying on its competitive performance. On the other hand, banks should encourage improvement of a company's performance. These tasks are interconnected. Competitiveness is additive information as far as the transmission mechanism is concerned; it can influence the connections of the monetary system and reflect the hierarchy levels of the users' financial mechanisms.

The next dilemma is the definition of competitiveness. Presently, there is no unequivocal interpretation of this notion; it usually implies any created advantage, such as:

- 1) expanding the market share at the expense of competitors;
- 2) operational efficiency;
- 3) complex of elements providing growth of productivity, technological effectiveness, efficient use of resources etc.

In this regard another dilemma arises: on the one hand, a unified approach is necessary; on the other hand, one cannot ignore the specific features of different sectors of the economy.

2. Literature review

The main aspects of lending to companies, risk management, assessment of limits, competitiveness and guarantees for credit institutions, have been studied by a number of foreign scientists, such as Bauerschmidt, P.A., Studnitzer, A.L., Albert, W.J., Callaway, P.J., Farrell, J.W., & Thiruthuvadoss, A.S (2010), Delis M.D (2012), Aven, T., & Renn, O. (2010), Sutton. I (2014), Rutkauskas, A.V., & Stasytytė, V. (2010), Thomas, J.B., & McDaniel Jr, R. R. (2017), Thomas, J.B., McDaniel Jr, R.R. (2017), Ashmos, D. P., Duchon, D., & McDaniel Jr., R.R. (2007), Tvaronavičienė, M., Masood, O., Javaria, K. (2018), etc.

For example, Bauerschmidt, P. A., et al. (2010) are exploring methods that allow anonymous transactions, which are a centralized element of the credit risk management mechanism.

Delis, M. D. (2012) assesses the degree of market power at the banking level for 84 banking systems around the world and analyzes the sources of banking competition, focusing on the effectiveness of institutional financial reform. The author believes that the policy of financial liberalization reduces the market power of banks, but a certain level of institutional development is a prerequisite for the success of reforms aimed at improving the efficiency of banking markets on the basis of competition in the non-financial sector.

Aven, T., & Renn, O. (2010) concentrate on a combined credit limit and social risk perception.

Sutton I. (2014) wrote that an effective credit policy program was often based on foggy topics such as competitiveness and a company's reputation.

Rutkauskas, A. V., Stasytytė, V. (2010) wrote that the concepts of competitiveness, risk and guarantees were the three cornerstones of ensuring the safety of investors and lenders.

Thomas, J.B. and McDaniel Jr., R.R. (2017) emphasize the crucial role of the competitiveness of industrial companies in finding investors and lending technologies. They assess how managers interpret a company's competitiveness for understanding strategic actions, organizational change, and learning. In their study, 151 managers were interviewed to study how the same situation is interpreted from the perspective of factors of competitiveness and risk.

Ashmos, D.P., Duchon, D., McDaniel Jr, R.R. (2000, 2007) assess the guarantees and lending limits created as a manifestation of organizational spirituality and culture.

3. Problem statement

In the course of determining their regulatory and economic capital (used to neutralize risks), credit organizations currently use both unified methods of quantitative and specific risk assessment in accordance with Basel III. This is caused by the necessity to take into account the heterogeneity of borrowers: industrial, sector-wise, segmental and social. Thus, it is definitely worth using ad-hoc elements for planning, particularly when it comes to planning a credit portfolio. The standard approach to competitiveness assessment can be based on official statistics collected by information agencies, as well as financial statements of borrowing companies. Table 1 shows an example of official assessment of the global competitiveness of a representative company from the chemicals and petrochemicals economy sector.

Table 1. Akron PAO | 2018, Thomson Reuters Global Index - Market Cap filter: Top 25, Report: Summary, Currency: RUB

Name	Last	PE	Est. PE	EPS	DPS	Div. Yld (%)	ROE (%)	P/Book	P/Sales	Weight %	Mcap
Akron PAO	4,251.00	6.16	10.23	696.93	597	13.91	36.52	2.59	1.95	0	173,700,470,643.61
Index average (Mean)	--	52.75	23.94	75,643.75	317.13	2.79	14.77	4.9	4.79	0.52	24,078,176,585,480.80
Index median	--	21.52	16.04	249.32	104.85	2.14	12.48	1.88	3.37	0.48	18,686,506,212,866.60

Source: Compiled by authors

Overvaluation of securities has been typical for companies from this sector of the economy for a long time. Chemicals and chemical fertilizers sector has an inverse correlation with the oil and gas sector. However, a change in trend can be noticed nowadays, which is reflected in Figure 1. Overvaluation of the companies' shares is connected with a lengthy period of stock prices growth, high expectations of dividend payment, positive reports in the prior periods (in terms of profitability). China has resumed export of fertilizers, and other companies started offering high dividends, quarterly disbursements, and lower leverage. Therefore, since June 2017 Akron PAO's shares were continuously rising in price by more than 50% in dollar terms (Table 1 and Figure 1), but recently, there have been changes in this trend. Since the beginning of 2018 shares of Akron PAO have risen only by 10%, and the remaining return this year amounts to 4%.

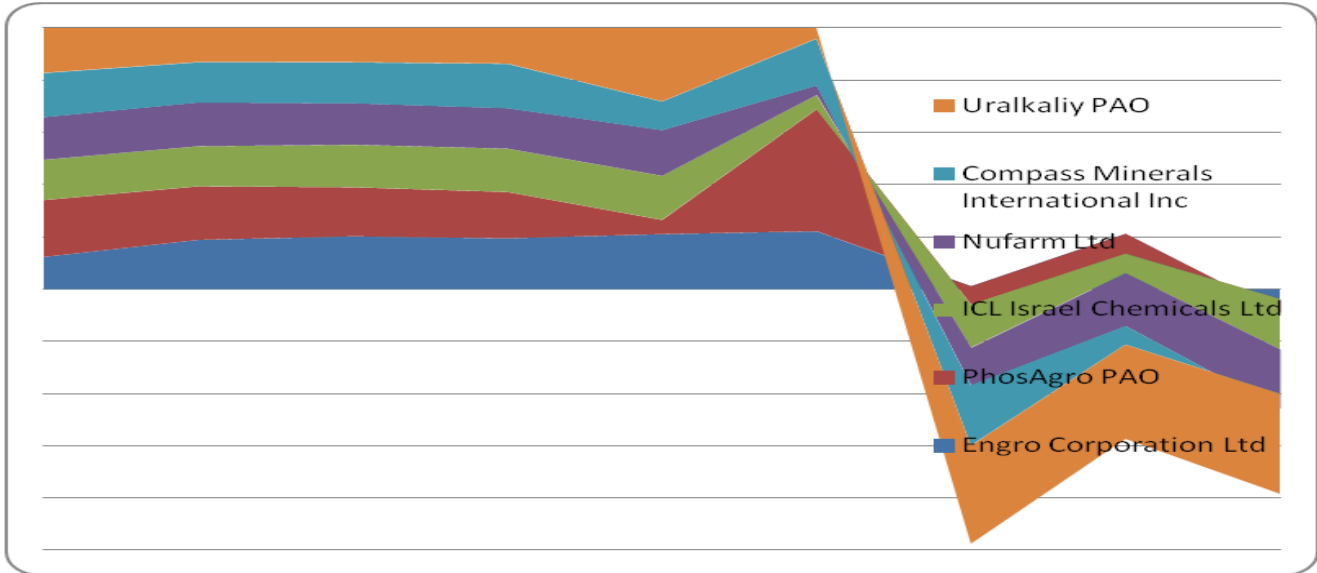


Fig.1. Index Competitors: Thomson Reuters Global Agricultural Chemicals Index — Cap filter: Top 25, Report: Relative Strength
 Source: Compiled by authors

Currently, in many countries, the most effective sector is a closed monopoly, i.e. organizations that get overprotection from the government, such as affordable credits, interest subsidies, and budget co-financing. As a rule, such situation is typical for strategic industries. In Russia and China, these are agricultural, pharmaceutical, space and defense industries. However, strategic industries are heterogenic, since the distribution of productive power is usually ministerial.

Currently, banks have sufficient liquidity (for example, in China, Russia, former Yugoslavian countries and the Czech Republic, there is non-earning excess liquidity), but they still prefer to maintain low credit exposure. Nowadays the sensitive point for oil and gas companies is the lack of working capital and investments. This situation calls for the necessity to introduce credit limits for banks, which would determine the size of credit they cannot refuse. Such sentiment in the banking sector is caused by the recent financial shocks, dissatisfaction with the methodology of the Basel Committee, and the failure of the "economic capital" instrument. These processes have stimulated banks to develop their own models of risk management and calculation of economic capital. Due to this banking regulators in many countries monitor the dynamics and structure of banking operations in order to adjust the work of the banking sector. As one can see in Table 2, companies from this sector of economy use credit debt in their work with counterparties very efficiently, and even the reduction of sales profits in 2016 (of course, together with the reduction of credit debt) has not affected the profitability ratio. Such performance justifies the introduction of the credit limit.

Table 2. Performance figures characterizing credit debt. Source: Thomson Reuters

Performance indicators	2015	2016	2017
Credit debt profitability ratio (based on sales profits), %	635.54%	964.24%	1,016.68%
Credit debt profitability ratio (based on net profit), %	86.89%	261.70%	603.34%

Source: Compiled by authors

Similar crediting guidelines at the macro-level were determined by Wicksell (2010) and Leontiev (1985). Evidently, the time has come to develop such guidelines for the meso-level as well. Management of competitiveness is of robust nature.

Administration of companies' competitiveness is a set of financial methods aimed at modifying the activity of regulatory institutions so that they can help companies achieve the required solvency and credit worthiness. If the object of financing and its characteristics are different from the reference model or not all of the monitored parameters are available, robust management is exercised. One of the goals of pursued by improvement of credit risk models set by Basel III is the introduction of predictive reservation model based on discounting of expected losses instead of the current approach based on incurred losses. It means that preference is given to transactions with future capital instead of current capital discounting, which implies a change of the financial policy. These requirements can be seen as a common approach to measuring all risks faced by the bank. Table 3 represents the competitiveness analysis of oil and gas companies. The analysis suggests that the market is concentrated, but the trend is descending

Table 3. Results of the competitiveness analysis

Classification by C* and MS*		Classification by MS			
		Leaders	High C*	Low C*	Outsiders
		20.58—30.10	10.00—20.58	2.95—10.00	1.36—2.95
Quickly improving C*	103.88—112.39	Sibur			
Improving C*	122.86—103.88			Akron PAO	
Declining C*	84.92—122.86	EvroHim	PhosAgro PAO	KuibyshevAzot, Nevinnomysskiy Azot	Dorogobuzh, Shchekinoazot
Quickly declining C*	72.64—84.92		Uralkaliy PAO	TOAZ	

References: C — competitiveness; MS — market share.*

Source: Compiled by authors

4. Methods

The authors use the dynamic stochastic general equilibrium model (DSGE) as the main instrument of analysis. This model was chosen due to its advantages described by Guerron-Quintana, P., A. Inoue & L. Kilian (2012), Christiano, L., Devis, R., Rostano, M.(2012), Kerk, L., Phillips, K. (2017) and Del Negro, Schorfheide, Smets & Wouters (2007):

- ✓ More accurate results;
- ✓ Introduction of specified utility functions advantageous for borrowing agents, which allows considering the effects of different types of macroeconomic interference into the agents' welfare;
- ✓ The advantage of choosing the prediction time lag.

As a rule, in order to analyze the processes in monetary policy, researchers use the classical minimum distance method. Examples of using this model, particularly impulse response function, can be found in the articles by Boivin & Giannoni (2006), Christiano, Eichenbaum & Evans (2005) and Schorfheide, F. (2010).

The novelty of the approach suggested in this article involves the balanced use of the portfolio theory by H. Markowitz, his T-portfolio and Tobin's Q theory. The latter reflects the possibility of changing the investment decisions made by the company. The model used for determining the minimum compulsory amount of credit to be issued is based on the balance between the bank exposure and the company's competitiveness. The guarantee

of general equilibrium for the bank should be created by analogy with structured products, which include different types of bonds, shares, and options allowing to change the level of assurance both for the creditor and the borrower. Since assets belonging both to the bank and the borrower have a multi-layer structure, the choice of the optimal credit portfolio is made with the use of iterative techniques. In order to calculate the amount of the bank's economic capital and work out the distribution of credit exposure it is required to do the following:

- Determine the risk factors and their connection with profit components;
- Choose the methods of prediction and use ad-hoc elements for each risk factor and profitability of banking operations;
- Determine stochastic models, which reflect possible deviations of risk factors from their average predicted values.

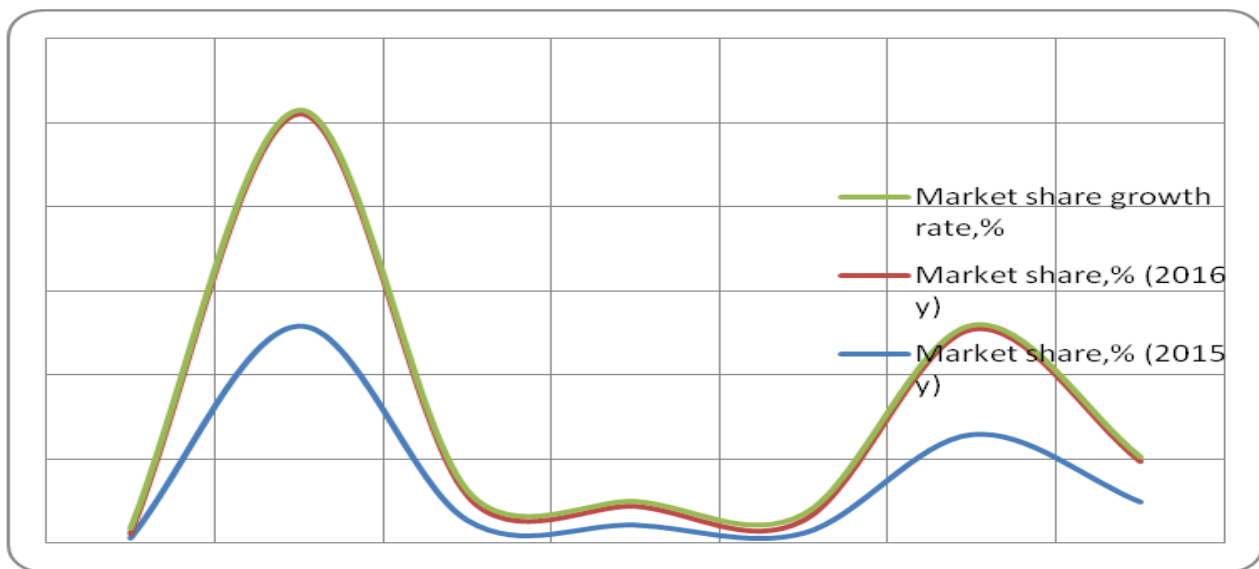


Figure 2. Banking segment, market growth and concentration parameters: Thomson Reuters: Top 25, Report
 Source: Compiled by authors

Table 4 shows the main characteristics of banks' competitiveness which are used for calculating economic capital at different management levels, while Figure 2 shows dynamic characteristics of the banking business.

Table 4. Index Competitors: Thomson Reuters Global Banking Segment Index — Cap filter: Top 25, Report: Relative Strength

Name	Last	PE	Est. PE	EPS	DPS	Div. Yld (%)	ROE (%)	P/Book	P/Sales
Bank Sankt-Peterburg PAO	57.45	5.91	4.18	9.76	1.05	1.82	--	0.48	0.83
Index average (Mean)	--	14.67	7.90	17.49	10.10	2.79	13.47	1.35	4.07
Index median	--	10.31	6.00	17.12	6.00	2.39	11.68	1.15	3.07
...
Sberbank Rossii PAO	259.36	10.31	7.36	25.05	6.00	2.32	--	2.05	3.37

Source: Compiled by authors

The distribution based on the available statistics was executed with the help of Thomson Reuters functionality. Arguably, in many countries, there is still an acute shortage of credit funds. However, the controversial nature of credit limits, both for the economy and banks, is obvious. First of all, it is important to plan distribution for first level portfolios. In order to calculate the credit limit based on competitiveness, one should determine the model using system (1).

$$Risk = -\Delta ROA_t * A_t - ROA_t * \Delta A_t = \frac{\Delta ROA_t}{ROA^t} * Profit_t - \frac{\Delta A_t}{A_t} * Profit_t$$

$$BRisk = \frac{\Delta A_t}{A_t} * Profit_t$$

$$-\Delta ROA^t * A^t = -(\Delta DCP^t - \Delta NR^t) * CP^t - \Delta DFP^t * FP^t + \Delta SP^t * P^t - \Delta DV^t * OVP^t - \Delta NOD^t * A^t + \Delta EX^t * A^t \quad (1),$$

$$KRisk = \Delta NR^t * CP^t = \frac{\Delta NR^t}{NR^t} * NR^t * CP^t = \frac{\Delta NR^t}{NR^t} * ReZ^t$$

$$LTC = NCA + PCA + sVCA \text{ or } CL = iVCA \text{ or } NWC = PCA + gVCA$$

$$C^* = aFP + \beta SP + \gamma FS + \delta CG$$

$$KRisk = \Delta NR^t * CP^t = \frac{\Delta NR^t}{NR^t} * NR^t * CP^t = \frac{\Delta NR^t}{NR^t} * ReZ^t$$

$$LTC = NCA + PCA + sVCA \text{ or } CL = iVCA \text{ or } NWC = PCA + gVCA$$

$$C^* = aFP + \beta SP + \gamma FS + \delta CG$$

where the absolute change in profit (or one of its components exposed to risk) compared with the previous period with the opposite sign is used as risk value (Rrisk);

t = 1, 2, 3 years of prediction time-frame, duration – 1 year, risk modeling step – 1 day.

Let us take a closer look at the first equation in the system (1). The first part of the differential reflects the influence exercised on risk by all factors affecting the unit profitability of assets, and the second part shows the volume of the banking operations depending on the ability of the credit organization to accumulate resources;

DCP^t, NR^t, CP^t – average profitability and rate of reserve and credit portfolio growth;

DFP^t, FP^t – average profitability (with allowance for revaluation) and volume of securities portfolios;

SP^t, P^t – average cost and amount of borrowings;

DV^t, OVP^t – unit profit margin of currency transactions (net foreign exchange position and its amount);

NOD^t – unit standard of net fee and commission income;

EX^t – volume of administrative expenses and other costs;

ROA^t – return on assets at a particular point in time (t);

A_t – bank assets;

ReZ^t – expenses for the creation of reserves;

VCA – variable component of the current assets;

NCA – non-current assets;

PCA – permanent component of current assets;

LTD – long-term debt;

LTC – long-term funding source.

NWC – level of net working capital defined as: $NWC = AAR + ZAP + G - AAP$;

AAR – accounts receivable;

ZAP – inventory and supplies;

G – cash and cash equivalents;

AAP – accounts payable;

FP – efficiency criterion of the company’s operational activity;

SP – efficiency of working capital management;

FS – efficiency criterion of sales and marketing operations;

CG – criterion measuring the competitiveness of goods.

$\alpha, \beta, \gamma, \delta$ — weight coefficients of the criteria.

Table 5 shows the components of the bank’s exposure in the chosen sector of the economy based on system (1).

Table 5. Credit portfolio indicators of a banking group

Performance indicators	Average term of overdue loans, days	Maximum credit period, days	Effective interest rate	Credit limit	ROA	VaR risk factor	Economic capital	Diversification coefficient
	3	120	52.26%	7.39	8.2%	0.10	0.63	82.4%

Source: Compiled by authors

The maximum amount of capital, which shareholders are ready to set as a limit, amounts to 7.3 bln roubles. Considering the overall financial risk, about 1 bln roubles will be sufficient to cover risks, which fully covers the economic capital.

5. Overview

There are a number of models used for determining the integral indicator of competitiveness. For example, General Electric developed the PIMS model in 1960, and its variant is still used by Thomson Reuters. J.-J. Lambin (2007), and M. Porter (2011) suggested a competitiveness assessment system based on comparison with the leading company in the market by identifying internal and external competitiveness factors etc. Charles Schwab Corporation started considering competitiveness from the perspective of credit organizations’ needs. K. Schwab (2016) described the structure of the global competitiveness index, while Baruönü Latif (2012) differentiated the assessment criteria for macro- and meso-levels. The authors suggest using competitiveness index, which consists of the following blocks: indicators of the efficiency of operational activity management; indicators of the efficiency of working assets management; coefficients of autonomy and solvency; indicators of marketing quality; indicators of quality-to-price ratio; investment criteria.

To a certain extent, competitiveness is a criterion of acceptable risk for the bank. Thus, M. Tiesset and Ph. Troussard (2007), as well as E. Karpova (2016), define economic capital as the amount of own funds necessary to cover actual risks for a particular credit organization. The authors regard economic capital as an instrument for

determining the level of credit limit within acceptable risks and as a means of stimulating competitiveness of the borrowing organizations. The amount of limit should be a structured product to provide opportunities for flexible risk management.

Capitalization is often considered as a criterion of competitiveness, for example, in Reuters, Bloomberg information bases. Such popularity, in particular, is connected with the positive experience of using the q-Tobin coefficient. Although this ratio is constantly criticized for the irrationality of the dynamics of this indicator. However, this indicator is still popular in financial analytics. For example, Xavier Gabaix. (2011) in its granular hypothesis proposes to consider capitalization within the business cycles of the largest companies. This paper proposes that specific shocks at the firm level can explain an important part of aggregated movements and provide a micro base for aggregated shocks. By James B. Thomas and Reuben R. McDaniel. (2017), De Backer, J Evans, R., Phillips, K. (2019) and Donde P Ashmos, Dennis Duchon, Reuben R McDaniel Jr. (2000), use approximation methods for dynamic general equilibrium stochastic models (DSGE), introducing competitiveness indicators into them. Of course, you cannot rely on only one criterion, you should use the system, each indicator becomes obsolete and accumulates deformation errors.

Bauerschmidt, P.A., Studnitzer, A.L., Albert, W.J., Callaway, P.J., Farrell, J.W., & Thiruthuvadoss, A.S. (2010) and Sutton, I. (2014) prefer integrated risk management.

Under conditions of uncertainty and a large number of factors, the stochastic general equilibrium model (DSGE) is becoming increasingly popular as a research tool. There is an extensive practice of its use, for example, Christiano, L., Devis, R., Rostano M. (2012) in Evans, R., Phillips, K. (2015 and 2017) proposed a linearization algorithm near the current state. Mojon B. (2000) and De Bondt, G.J. (2005) link the volatility of companies' competitiveness for financial institutions with the dynamics of interest rates.

Conclusions

The authors have suggested a model of competitiveness impact on monetary policy based on a general equilibrium model, which allows to go through and optimize technological aspects and investment criteria balancing between monetary performance and corporate financial indicators. The DSGE model has allowed balancing credit risk, economic capital, amount of working capital, competitiveness for of a group of companies or a cluster. The authors have suggested a block of information describing an integrated competitiveness indicator. These changes will allow expanding the inventory of impact instruments at the disposal of monetary policy. Credit calculated in the form of a structured product will ensure the flexibility of the bank's risk management. Using the information about the upper bound of the economic capital, the bank determines which combination of risk factors can lead to perverse effects and change the development scenario for the borrowing company.

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