

Financial Engineering of Structural Products as a Tool for Credit and Tax Risk Management in Order to Ensure the Sustainability of Groups of Industrial Enterprises (Clusters)

N V Gryzunova¹, I A Kiseleva¹, N A Sadovnikova¹

¹Plekhanov Russian University of Economics, Moscow, 117997 Russia

E-mail: Gryzunova.NV@rea.ru

Abstract. Differences in the level and quality of Bank lending services should be due to the differentiation of companies by competitive and credit strategies, as well as industry conditions. The presence of imbalances in the territorial concentration of credit institutions has an impact on investment conditions, the cost of credit resources and the amount of credit and tax risks. To neutralize these factors, organizations of the non-financial sector are increasingly turning to financial engineering. The purpose of this article is to consider the changes in investment demand and the dynamics of the structure of the loan portfolio based on the combination of financial instruments for the implementation of the investment strategy of the business. To achieve this goal, the cluster approach is used to improve the financial stability of companies and credit institutions. Structural shifts in the global economy are transforming credit and investment resources and changing the nature of factors that influence investment decisions of market actors. In addition, structural shifts have exacerbated the problems of the monetary transmission, namely the growing reluctance of the banking sector to provide loans to companies in the non-financial sector, although the liquidity risk for banks has been overcome. The main method of risk research is based on the dynamic stochastic equilibrium (DSGE) model used for financial engineering to balance the negative correlation between credit and tax risk and profitability and competitiveness of cluster companies. The approach will strengthen the financial stability of enterprises belonging to the cluster and the cluster itself and carry out meso-economic forecasting.

1. Introduction

Financial engineering of structural products acts as a tool for managing credit and tax risk, both organizations and credit institutions. The activities of credit institutions are constantly adjusted by the competitiveness of customers and their needs. Thus, at present, the analysis of credit risk and business models of banking services development, as well as competitiveness assessment and legal protection are particularly in demand. This investment demand has generated supply - financial engineering, which generates a new type of securities. The increasing scale of the market of structured financial products, the expansion of their application by credit and non-financial organizations in the search for new non-traditional sources of financing, as well as the possibility of creating products with predetermined properties and ratios of "risk-return" led to the relevance of the topic of this area of financial engineering for the banking sector and for organizations-borrowers.

2. Relevance

Russian banks are characterized by a very high risk of operating activities, and in this situation - only standardized operations and banking products are appropriate. On the other hand, Basel III and the economic environment require an individual approach to companies in different sectors of the economy. So, at present, small and medium-sized businesses avoid working with Alfa Bank, and he was forced to change the tariffs. Of course, the conflict between Sberbank and Rosneft (its first and second stages) is indicative. In any case, we can say that investment demand is now important not only for the non-financial sector, but also for banks. Economic practice has identified several approaches. The first approach is the analysis of the dynamics of the Lerner index (A. Lerner,1969), which determines the degree of monopoly power, the ability of the Bank (or company) to dictate price conditions to organizations and the segment of customers, individuals of the retail category. The term "client – retail" means individuals with savings of up to 3 million rubles, and their income is now the main source of additional investments and the main tool in the competition. A. Lerner's index is used to assess the level of prices for banking services to non-financial companies. Analyzing the loan portfolio of the Bank, we can say that the share of loans to non-financial organizations accounts for approximately -51% of the total volume, of which the share of retail loans in the portfolio fluctuates at the level of -20.7% [17,19].

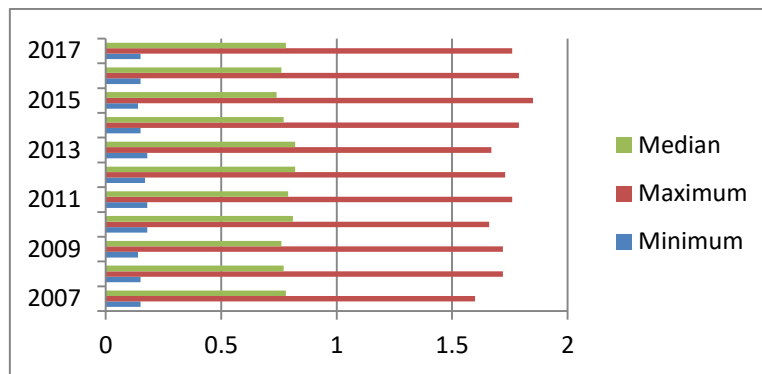


Figure 1. Integral indicator of provision of banking services (by regions of Russia: median, maximum, minimum). Source: Bank Of Russia.

The A. Lerner index can be calculated by several alternative methods, for example, as the ratio of the exclusive exchange rate element in the price of a banking product to its price. The higher the index value, the greater the Bank's monopoly power. An important point is the differentiation of the Bank's trading line by segments. The index should be compared with the dynamics of the integral indicator of the provision of banking services, Fig. 1. As can be seen, over the past ten years, the average and the index of security has not changed, which can not be said about the criteria of A. Lerner, see fig. 2.

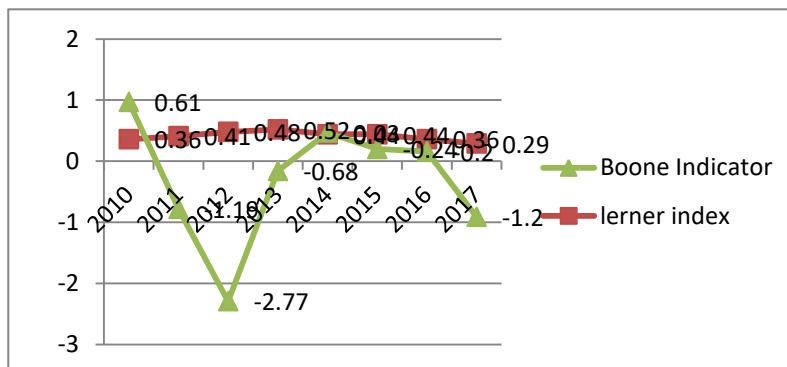


Figure 2. Lerner Index and Boone indicator. Source www.cbr.ru.

The second criterion is the Boone index (J. Boone, 2008) [5,6] . This indicator assesses how the position of the cost leader will be able to increase the sector of the Bank's operations or return on assets. When calculating marginal cost, it is useful to disaggregate by interest and transaction costs to improve the quality and accuracy of economic analysis. The Boone criterion has no boundary values as the Lerner index. If the indicator is negative, it means that the Bank uses an effective business model. Efficiency implies expedient work on the quality of management, and indicates that the credit system is quite competitive [2,13].

The Boone indicator is individual for each segment, which is relevant in the conditions of modern clustering trends. As can be seen from the graph in figure 2, banking business models are effective, but the banking sector has little money, so the competition is for the quality of transactions, not for the number. The Boone criterion reflects the downward phase of the credit cycle and the deterioration of credit portfolios. Banks are experiencing an increase in reputational risks. To stabilize the situation in the credit sector, the banks were divided into clusters with appropriate correction of functions, operations, reporting and levels of operational work with clients, see fig. 3.

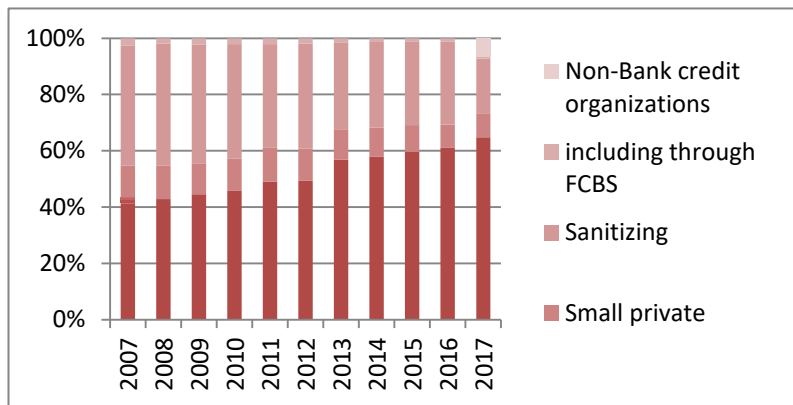


Figure 3. Structure of banking sector assets by clusters of credit institutions, % (at the end of the year). Data source: Bank of Russia.

3. Problem statement

In this regard, the regulator carried out clustering of credit sector organizations (see Fig.3), and reformed the process of obtaining ratings. All the latest measures are aimed at increasing cash flows in the economy. Clustering has long been the main tool for improving the competitiveness of non-financial sector organizations. It is easier for cluster companies to attract and secure investments. The development of financial engineering has led to the emergence of a new instrument: retail structured financial products, combining a conservative component in the form of highly liquid bonds, and a risky component represented by liquid shares or futures. The use of such a financial instrument allows the investor to save capital and provides an opportunity to receive additional income on the derivative financial instrument. In this sector of the economy, “Mechel”, as can be seen from tables 1, determines the competitive position for all other enterprises. However, the steel market was volatile, and, for example, company “Raspadskaya” significantly improved its competitive position, increasing the competitiveness index from 0.75 to 1.28 in 2016.

Each company determines the need for credit resources, and optimizes the capital structure and investment strategy, describing its state of the weighted average cost of capital, financial leverage interest coverage ratio and other criteria.

Table 1. Rating of cluster companies by competitiveness.

Cluster companies	2014		2015		2016	
	K	The position of the company	K	The position of the company	K	The position of the company
NorNickel.	1,78	2	1,71	3	1,37	3
NLMK	0,806	7	0,77	9	0,78	9
Severstal	0,813	6	0,82	7	0,82	7
ALROSA	1,54	3	1,24	4	1,65	2
RUSAL	0,86	5	0,67	10	0,60	10
Pole	0,67	10	1,72	2	1,34	4
MMK	0,80	8	0,79	8	0,81	8
VSMPO-AVISMA	1,09	4	1,18	5	1,10	6
Mechel	2,27	1	25,68	1	558,82	1
Raspadskaya	0,75	9	1,04	6	1,28	5

Financial engineering forms the credit portfolio of the organization from various groups of securities on the basis of negative correlation of credit and tax risks. One can observe the tendency of increasing the share of securities and alternative investments, see figure 4. Gradually, thanks to financial engineering, the share of net loans is reduced, and their place is replaced by surrogates and financial retail. Diversification of the loan portfolio has expanded the sources of growth of the local market and reduced banking risks. Thanks to the development of the financial market, for example, in 2019, the expected amount by source of financing in the industry, can exceed 4.0 trillion. RUB. [8,9] Since mid-2017, the steel industry has returned to stagnation. The main drivers of economic growth for this segment of the economy are the same as elsewhere, innovation and investment. The cost of economic growth impulses of the metallurgical cluster of Russia will cost up to 200-207 billion rubles per year.[8,9]

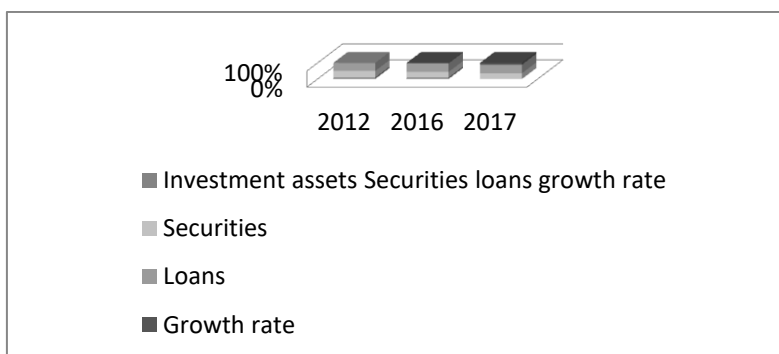


Figure 4. Structure of the loan portfolio of metallurgical companies.

Such needs imply a change in the technology of lending. The risk in this segment is assessed as moderate and, with a fixed tax risk, is approximately 25%. Bank credit risk is offset by economic capital. In recent years, market conditions, through the dynamics of interest rates "prepared" conditions for bond prospectuses. Funding processes are now more important than the key rate for the transmission. The market ceases to be a market place and imbalances are not eliminated. Credit risk, leveled by a bond loan, will allow "not to burn" borrowers. Corporate and exchange-traded bonds of the new model will also contribute to the repatriation of funds. Performance of corporate bonds

prospectus is formed in accordance with the current market situation. The bond issue prospectus is based on regulatory requirements¹:

The competitive status of the non-financial cluster (economic segment) is based on the assessment of the quality of investments, mobilization and strategic factors. The disproportions of the investment channel are caused by the shortage of funds in the economy, the shortage of own working capital, the specifics of investment alternatives. Therefore, Russian companies are forced to look for sources of financing not only in banking structures.[3,4,7] the Level of provision of organizations ' needs for credit resources by banks is shown in figure 5.

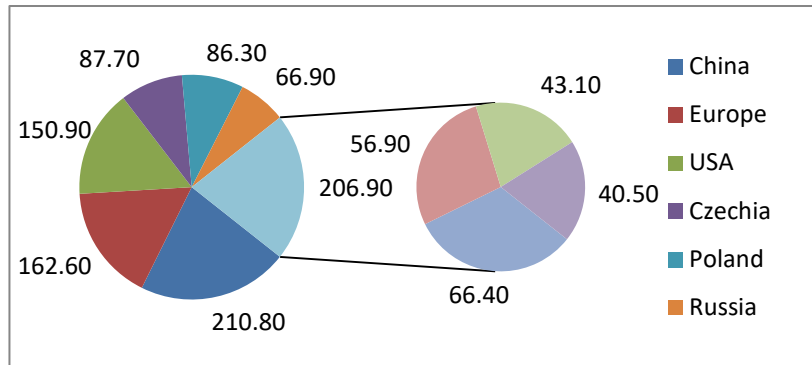


Figure 5. The share of loans issued by banks in the structure of loans to non-financial institutions. Data source: Bank of Russia.

This practice periodically arose in different countries, it affects, first of all, the management of the value of investment demand, stimulating, insuring the growth of value added. Nevertheless, it is necessary to manage the investment preferences of organizations, for this it is necessary to work with the investment demand. The constant need of monetary stimulus. Structural changes in the market and the growth of aggregate risk have led to a reduction in the practice of savings in the Anglo-Saxon style, that is, the share of shares in the portfolios of market entities is reduced and, accordingly, this causes a multiplicative change in corporate and Bank portfolios. The quality of management is determined by the volume of stock sales. In a weakly efficient market, it is possible to form a portfolio using stock ratios not only (β - risk index) but also (α -volatility from the equilibrium yield) within a certain risk matrix.

The economic role of the investment channel as an instrument of monetary policy is conditioned by the impulse of capital costs, which affects real and effective rates. In order to reduce this effect, as well as to slow down the rate of capital impairment, interest rates continue to diversify across all credit and stock transactions. Such changes from the standpoint of q-Tobin theory[18] lead to changes in investment decisions of potential investors. This indicator, according to many researchers, for example [11,14,16] is outdated, but the authors [1,12,15,20], believe that the indicator can be successfully used. If it is supplemented by other criteria. The Tobin coefficient is still used to assess the possibility of obtaining a market effect from each unit of investment or the investment potential of the company. It should be noted that over the past five years, this ratio has a negative trend for the metallurgical industry, due to the moral and physical deterioration of fixed assets, (more than 47%) obsolescence of technological potential and the deterioration of the global environment (reduced demand for the products of the industry). In this regard, it is necessary to change the investment portfolio of companies and financial strategies that affect investment demand. For organizations of the metallurgical industry, the bond project will be timely.

Method of research. In studies to determine the dynamics of the structure of the loan portfolio depending on risk factors, the yield of credit and tax burden, the life cycle is often referred to models DSGE,VAR, FAVAR [1,10,13]. Russian companies are forced to change the structure of sources of

¹ Federal Law No. 39 (ed. 03.08.2018) "On the Securities Market" http://www.consultant.ru/law/podborki/prospect_cennyh_bumag/

financial resources, which led to the expansion of financial engineering technologies. The proposed model of the corporate portfolio for the cluster company including restrictions and conditions both on the part of the Bank and the market has the form:

$$\left\{ \begin{array}{l} \sum_1^3 \{P_i\} * \{q_j\} \leq M_d \\ R_{p,i} = \frac{\sum_1^3 (R_{j,t} - R_{j,t-1} + D_{j,t}) * q_j}{\sum_1^3 R_{j,t-1} * q_j} \\ \sigma_p = \sqrt{\frac{1}{n} \sum_1^3 (R_{p,t} - R^*_p)^2} \\ \sigma_{\text{банка}} = A\{a_{ij}\} \rightarrow \min \\ K^* = \{k_{ij}\} \\ R_{pI} \rightarrow \max \\ \sigma_p \rightarrow \min \\ \sigma_p < \sigma_{\text{банка}} \\ q_{ij} \geq 0 \\ a_{ij} = \begin{bmatrix} A_1 & S_1 & S_{\dots} & S_N \\ A_{\dots} & a_{11} & a_{1.} & a_{1n} \\ A_M & a_{m1} & a_{m.} & a_{mn} \end{bmatrix} \end{array} \right. \quad (1)$$

Where is P_i the market rate of the i-th financial asset or investment;
 q_j - the share of the j-th securities in the portfolio;
 M_d - portfolio size, maximum return used for alternative assets or investments;
 R is the yield of the securities portfolio, respectively;
 σ_p - portfolio and Bank risk, respectively;
 $A\{a_{ij}\}$ - risk matrix of the Bank;
 $K^* = \{k_{ij}\}$ - cluster risk matrix for securities portfolio;
 $S_j (j = 1, 2, \dots, n)$ - many control actions.

The result of the transformation of the metallurgical cluster loan portfolio is shown in fig. 7. To include cluster structural differences in the model, you can enter dumping variables (S).

To determine the value of the economic capital of the Bank and build the distribution of credit risk is required:

- Identify risk factors and their relationship to the Bank's profit components;
- Select forecasting methods and use ad-hoc elements for each risk factor;
- Identify stochastic models that reflect possible deviations of risk factors from their average predicted values.

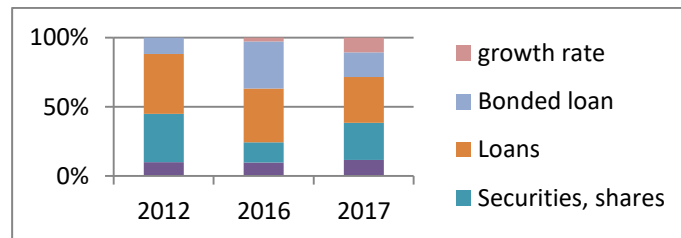


Figure 7. Structure of the corporate portfolio.

4. Summary

Russian companies have a chronic financial disease - a shortage of their own working capital. In this paper, it is proposed to expand the use of structural products as a tool for lending to cluster organizations in the context of a shortage of funding sources. Diversification of the company's portfolio should be balanced with the risk matrix of the Bank and the cluster in accordance with the desired "return-risk" ratio. The competitiveness of companies is traditionally the starting point for making decisions on investing in the development of enterprise complexes (clusters). As a result, the option of transformation of the loan portfolio, the main variational instrument in which should be bonds, was considered. The purpose of their use is to reduce risks for banks. The type of bonds is the last corporate and exchange prospectus in terms of changes in 2017. Such changes are caused by reforms in the banking sector in the last two years. A key factor in the development of the structured products market in Russia will be their fair pricing and transparency. It was concluded that unexpected non-structural changes in money market rates had a significant impact on companies' competitiveness and capitalization.

5. Acknowledgments

The article is the result of the research conducted by the authors on grant № 26.7067.2017/B4 with the support of Plekhanov Russian University of Economics (PRUE).

References

- [1] Andrews D 1993 Tests for Parameter stability and Structural Change with Unknown Change Point *Econometrica, economic Society* vol 61(4) 821-856
- [2] Banerjee A, Marcellino M, Masten I 2014 Structural FECM: Cointegration in large-scale structural FAVAR models 9858 CEPR Discussion Papers *C. E. P. R. Discussion Papers*
- [3] Beck T, De Jonghe O, Schepens G 2013 Bank competition and stability: Cross-country heterogeneity *Journal of Financial Intermediation* **22(2)** 218-244
- [4] Boivin J, Kiley M T, Mishkin F S 2010 how Has the Monetary Transmission Mechanism Evolved Over Time? *Handbook of Monetary Economics* ed. 1 vol 3 **8** 369-422 Elsevier <http://DOI: 10.4236 / ahs.2014.31006>
- [5] Boone J 2008 A new way to measure competition *the Economic Journal* **118** 1245-1261 <https://doi.org/10.1111/j.1468-0297.2008.02168.x>
- [6] Boone J, van Ours J C, Wiel H van der 2007 How (not) to measure competition *CentER Disc. Paper* **32** 40
- [7] Brissimis S N, Delis M D 2011 Bank-level estimates of market power *European Journal of Operational Research* **212(3)** 508-517
- [8] Carbo S, Humphrey D, Maudos J, Molyneux P 2009 Cross-country comparisons of competition and pricing power in European banking *Journal of International Money and Finance* **28** 115-134
- [9] Cheng X, Liao Z, and Schorfheide F 2014 Shrinkage Estimation of High-Dimensional Factor Models with Structural Instabilities NBER Working Papers 19792 *National Bureau of Economic Research Inc.* 19792
- [10] Del Negro M, Schorfheide F 2004 Priors from General Equilibrium Models for VARS *International Economic Review Department of Economics University of Pennsylvania and Osaka University Institute of Social and Economic Research Association* vol 45(2) 643-673 <http://DOI:10.1111 / j.1468-2354.2004.00139.x>
- [11] Einav L, Levin J 2010 Empirical Industrial Organization: A Progress Report *the Journal of Economic Perspectives* vol 24 **2** 145-162
- [12] Fernández-Villaverde J, Rubio-Ramirez J, Schorfheide F 2016 Solution and Estimation Methods for DSGE Models *Handbook of Macroeconomics* vol 2 21862-21 Preliminary draft <http://www.nber.org/papers/w21862>
- [13] Gryzunova N V, Ekimova K V, Zakharova D S, Danko T P, Sekerin V D 2018 Monetary policy

- and economy: Transmission channels and business competitiveness *Espacios* **39(19)** 1963-1970
- [14] Gryzunova N V, Tsertseil J S, Kookueva V V, Zaharova Dg S 2018 Monetary policy and clustering for achieving competitiveness in national business *European Research Studies Journal* **21(1)** 480-490
- [15] Kulish M, Pagan A 2014 Estimation and Solution of Models with Expectations and Structural Changes *Dynare Working Papers* **34** CEPREMAP
- [16] Lippi M, Luciani M 2014 Dynamic Factor Models, Cointegration and Error Correction Mechanisms *Working Papers ECARES ECARES* 14 ULB – Université Libre de Bruxelles https://dipot.ulb.ac.be/dspace/bitstream/2013/157568/1/2014-14-BARIGOZZI_LIPPI_LUCIANI-dynamic.pdf
- [17] Mishkin F 1999 Economic theory of money, banking and financial markets *M.: "ASPECT PRESS"* 821
- [18] Tobin D 2010 Monetary policy and economic growth *Moscow: Librocom* 272
- [19] Tsertseil J S, Kookueva V V, Gryzunova N V, Khashchuluun C 2017 Analysis and prospects of infrastructure development of innovation regional clusters in Russia through the example of specific economic zones of industrial production and technology innovation types *Journal of Applied Economic Sciences* **12(7)** 1896-1905
- [20] Zigarmi P, Zigarmi D, Samsonov P, Blanchard K 2018 Leadership and the One Minute Manager *Moscow: Albina press* 582 ISBN 978-985-15-3549-7, 978-985-15-2164-3, 0-688-03969