Scenario Model of the Movement of Bank Capital Between Institutional Sectors in the Sverdlovsk Region

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ABSTRACT

The paper presents a projected model and forecast scenarios for the movement of bank capital between institutional sectors in the Sverdlovsk region. These sectors, according to the System of National Accounts, include financial corporations (banks, insurance organizations, pension funds and investment companies), non-financial corporations (enterprises of various economic activities), the general government sector, households and foreign institutions. The projected scenario model, which reflects the influence of factors on the formation of banking capital in the region, the relationship of institutional sectors in the processes of its movement between sectors for various investment instruments, as well as modeling the socio-economic consequences of its movement, can be used to form a variety of alternative forecast scenarios. The model made it possible to establish negative patterns in the processes of transferring bank capital, form the most probable scenarios for its movement between sectors, assess the socio-economic consequences of their implementation, and also identify key factors for the transition to the most favorable scenario.

Keywords: *Scenario Modeling, Banking Sector, Institutional Sectors, Forecast Scenarios.*

1. INTRODUCTION

The banking sector of the economy plays a key role in the socio-economic development of territorial systems. It is the link between the institutional sectors, which, according to the methodology of the System of National Accounts, include financial and non-financial corporations, the general government sector, households and foreign institutions. Banks accumulate and redistribute financial resources between sectors, provide the real sector of the economy with the necessary resources for modernization and technological renewal of production processes. Research by S.Yu. Glazieva [1], A.G. Aganbegyan and I.N. Rudensky [2], A.I. Milyukov [3] and a number of foreign researchers, such as B. Urosevic, B. Zivkovic, M. Bozovic [4], show the key role of bank investments and loans attracted to the manufacturing sector to overcome the crisis and revive the Russian economy. Investments made by credit institutions in debt securities (government agencies, constituent entities of the Russian Federation and municipalities), lending to their public debt, as shown by C.T. Nguyen, L.T. Trinh [5], Md.S. Alam, M.R. Rabbani, M.R. Tausif, J. Abey [6] and I. V. Naumov [7] contribute to an increase in the budgetary provision of territories.

The Russian banking sector has great investment potential, however, unfortunately, it is not used to overcome the crisis in the economy. Instead of actively supporting enterprises in the real sector of the economy and the most important strategic projects for the socio-economic development of territories during periods of economic downturns, banks carried out a speculative policy, channeling a significant part of their resources for investments in foreign currency, equity and debt securities of foreign issuers. This policy contributes to the active outflow of the financial resources of the institutional sectors accumulated by the banks abroad and the deterioration of their economic situation. The investment potential accumulated by the banking sector can play a key role in stabilizing the financial and economic situation of territorial systems. However, this requires the development of effective mechanisms for attracting bank capital to the economy, as well as research and multivariate forecasting of the processes of transferring financial resources between institutional sectors. In this regard, the main goals of this work are the formation of a model and forecast scenarios for the movement of bank capital between institutional sectors in the Sverdlovsk region, assessment of the socio-economic consequences of their implementation. The model being formed will make it possible to design the optimal scenario for the transfer of bank capital between institutional sectors to increase the economic stability of

the region and determine the mechanisms for its implementation.

2. METHODS

Для To form a scenario predictive model of the movement of bank capital between institutional sectors at the regional level, we used a previously developed methodological approach, which is presented in [8]. This approach is based on the principles of double entry, the structure of accounts of institutional sectors and investment instruments of the System of National Accounts, a methodology for designing forecast scenarios using controlled variables, as well as methods of regression analysis and ARIMA modeling and forecasting. At the initial stage, this approach involves the formation of balanced matrices of the movement of financial resources between the banking and other institutional sectors of the region for various investment instruments for the period from 1998 to 2019. The principle of double entry of the System of National Accounts used at this stage makes it possible to display the sources and directions of transferred financial resources, to identify threats to the financial stability of institutional sectors in the region.

At the next stage of the study, it is planned to form a scenario model of the movement of bank capital in the form of a system of functional equations characterizing the relationship between the banking and other institutional sectors for each investment instrument. For the design of this model, it is assumed the use of regression analysis by the method of least squares. This toolkit will also be used in modeling the influence of external and internal environmental factors on the processes of formation of the banking capital of the region. It is supposed to study such factors as: interest rates of the Central Bank of the Russian Federation, weighted average interest rates on loans and deposits for individuals and legal entities, quotes of precious metals, foreign currency, stock market volatility indices, RTS and MICEX indices, corporate bonds index, as well as a system of indicators that characterize the economic development of the region (GRP volume, consumer price index, prices in the primary housing market, for non-food products, the cost of fixed assets). The investigated factors are controllable variables, the use of which is necessary for the design of active predictive scenarios.

The formation of a scenario model also presupposes an assessment of the socio-economic consequences of the realized scenarios for the movement of bank capital between sectors. The use of regression analysis to solve this problem will make it possible to assess the impact of the bank capital transferred to the institutional sectors on the indicators of their socio-economic development. So, for example, in the course of modeling, it is planned to assess the impact of attracted bank capital in the sector of non-financial corporations on the level of unemployment

and income of the population, the balanced financial result of the activities of organizations, the degree of depreciation of fixed assets, the volume of export of products and, in general, on the volume of the gross regional product. It is planned to study the influence of the attracted bank capital in the public administration sector on the consolidated budget revenues of the constituent entity of the Russian Federation. The constructed scenario model will become the basis for designing a whole system of various forecast scenarios for the movement of bank capital between institutional sectors in the Sverdlovsk region. For the formation of predictive scenarios, it is assumed to use ARIMA-modeling of the dynamics of change in controlled variables. Understanding the most probable trajectories of movement of financial resources between sectors in the future will make it possible to assess the prospects for changes in the financial stability of the sectors, predict the socio-economic consequences of their implementation and develop mechanisms for regulating emerging negative trends.

3. FORECASTING SCENARIOS OF THE MOVEMENT OF BANKING CAPITAL BETWEEN INSTITUTIONAL SECTORS IN THE SVERDLOVSK REGION AND THEIR SOCIO-ECONOMIC CONSEQUENCES

Formed as a result of approbation of the presented methodological approach, the matrices of the movement of bank capital between institutional sectors in the Sverdlovsk region in dynamics for the period from 1998 to 2019. made it possible to identify threats of loss of financial stability of institutional sectors during periods of economic downturns. During these periods, banks pursued a speculative policy. The resources of institutional sectors accumulated by banks and other financial corporations were actively moving abroad in the form of investments in foreign currency, debt securities of foreign issuers, lending to foreign institutions, and placing deposits in foreign banks. So, for example, the matrix formed according to the data of 2009 made it possible to identify the outflow of bank capital of the Sverdlovsk region abroad in the form of investments in debt securities of foreign issuers in the amount of 5535 million rubles, foreign currency (1,348 million rubles), monetary gold (198 million rubles), placement of deposits in foreign banks in the amount of RUB 2018 million. The level of lending to foreign enterprises was also significant (8182 million rubles). The banking sector actively invested in high-risk derivative financial instruments (RUB 566 million). Instead of financial support for the real sector of the economy and government institutions during periods of economic downturns, credit institutions in the region actively reduced investments in shares and reduced the share of participation in their authorized capital. These trends

were observed in almost all regions of Russia during the periods of economic downturns in 2003, 2008-2009, 2014-2015, 2018-2019. These trends have created serious threats to the financial stability of institutional sectors. During periods of growing crisis in the economy, the financial potential of certain sectors, for example, government, households, and financial corporations declined sharply. During the periods of economic recovery, opposite patterns were observed.

Formed in dynamics for the period from 1998 to 2019 the matrices were used to design a scenario model for the movement of bank capital between institutional sectors in the Sverdlovsk region (Table 1). This model displays the relationship between the banking and other sectors in the processes of movement of financial resources for investments in monetary gold, foreign currency, debt

securities, stocks, fixed assets, operations with deposits and lending and other investment instruments in the form of a system of equations.

As a result of regression modeling for each investment instrument, we have established control variables that have the strongest impact on the processes of bank capital formation. For example, it was found that the volume of deposits placed with banks is influenced by the interest rate of the Central Bank of Russia, the interest rate on deposits of individuals and legal entities, and the quotes of the stock market volatility index affect the investments of banks in debt securities (tab. 1). The constructed model showed that the volume of bank lending is influenced by the size of the weighted average interest rate on loans issued to enterprises and individuals, and the growth of indices of the Russian

Table 1. Scenario model of the movement of bank capital between institutional sectors in the Sverdlovsk region

Investment instruments	Financial corporations			Public administration (PA)	Non-financial corporations (NFC)	Households (H)	The rest of the world (RW)
	Central Bank (CB)	Banking sector (BS)	Financial organizations (FO)				
1. Investment in monetary gold (G)	$CBg=-0,316*BSg$	$BSg=-0,284*IP$	$FOg=-0,338*BSg$	$PAg=-0,173*BSg$	$NFCg=-0,173*BSg$		
2. Investments in foreign currency (C)		$BSc=-28,889*DV$	$FOc=-0,17*BSc$				$RWc=-1,17*BSc$
3. Deposits (D)	$CBd=-0,121*BSd$	$BSd=-748,065*RR-1928,02*IRDI+2696,66*IRDO$	$FOd=-0,339*BSd$	$PAd=-0,089*BSd$		$Hd=-0,451*BSd$	
4. Investments in debt securities (DS)	$CBds=-0,147*BSds$	$BSds=-407,988*V$	$FOds=-0,254* BSds$	$PAds=-0,194* BSds$	$NFCds=-0,197* BSds$	$Hds=0,02* BSds$	$RWds=-0,228* BSds$
5. Loans issued (L)		$BSl=2892,59*RLO-2002,41*RLI$	$FOl=-0,118*BSl$		$NFCl=-0,085*BSl$	$Hl=-0,797*BSl$	
6. Investments in derivatives (ID)		$BSid=-114,075*IV+38,598*RR-269,104* ICBI+2,089*RTS+5,436*IRTS$	$FOid=-BSid$				
7. Investments in stocks (S)	$CBs=-0,009*BSs$	$BSs=-81,965*IRTS+88,246*IM$	$FOs=-0,188*BSs$	$PAs=-0,199*BSs$	$NFCs=-0,227*BSs$	$Hs=-0,231*BSs$	$RWs=-0,164*BSs$
8. Accounts receivable / payable (A)	$CBa=0,012*BSa$	$BSa=0,0268*FR-0,0033*GRP$		$PAa=-0,156*BSa$	$NFCa=-0,393*BSa$	$Ha=-0,463*BSa$	
9. Taxes and duties payments (T)		$BSt=0,0113*BSds+0,0094*BSs$		$PAt=-BSt$			
10. Payroll payments (PP)		$BSpp=0,00017*GRP-0,00136*FR$		$PApp=-0,124*BSpp$		$Hpp=-0,876*BSpp$	
11. Settlements with suppliers (SS)		$BSss=-0,0305*GRP+0,2479*FR$			$NFCss=-1,005*BSss$		$RWss=0,005*BSss$
12. Fixed asset investments (FA)		$BSfa=-0,00045*CFA$	$FOfa=-0,034*BSfa$	$PAfa=-0,162*BSfa$	$NFCfa=-0,633*BSfa$	$Hfa=-0,171*BSfa$	

Note: **IP** – absolute increase in the cost of one gram of platinum, rubles; **DV** – the value of the US dollar, rubles; **RR** – the size of the refinancing interest rate of the Central Bank of Russia as of January 1,%; **IRDI** – absolute growth of the interest rate on deposits of individuals,%; **IRDO** – absolute increase in the rate on deposits of non-financial organizations in rubles as of January 1,%; **V** – S&P500VIX stock market volatility index,%; **IV** – absolute growth of the volatility index,%; **RLO** – interest rate on loans issued to enterprises,%; **RLI** - interest rate on loans to individuals,%; **ICBI** - absolute growth of the corporate bond index as of January 1, rubles; **RTS** – the size of the RTS Index as of January 1, rubles; **IRTS** – absolute growth of the RTS Index, rubles; **IM** – absolute growth of the MICEX index, rubles; **BSds –** the volume of Bank investments in debt securities, million rubles; **BSs** – the volume of Bank Investments in stocks, million rubles; **GRP** - the volume of the gross regional product in current prices, million rubles; **FR** – the size of the balanced financial result of the activities of enterprises in the Sverdlovsk region, million rubles; **CFA** – the cost of fixed assets of enterprises of the Sverdlovsk region, million rubles.

Table 2. Regression model of the influence of the banking capital transferred to the institutional sectors on the indicators of the socio-economic development of the regions

Central Bank of Russia (CB)	Public administration (PA)	Nonfinancial corporations (NFC)	Households (H)
GRP = 458203+0,231*CB	IPI = -3,038-0,00000037*PA	U = 8,686-0,00000013*NFC	U = 8,7-0,0000000026*H
		PI = 21,7-0,00000021*NFC	
		FR = 63835,5+0,22* NFC	
	ICB = 63746,5-0,236*PA	DD = 44,89-0,00000021*NFC	AI = 13804,4-0,0078*H
		GRP = 452123+0,29*NFC	
		E = 3367,08+0,01*NFC	

Note: **GRP** - the volume of the gross regional product in current prices, million rubles; **IPI** – absolute growth of the consumer price index (December of the current year to December of the previous year),%; **ICB** – incomes of the consolidated budget of the constituent entity of the Russian Federation, million rubles; **U** – unemployment rate,%; **PI** – the share of the population with incomes below the subsistence level,%; **FR** – balanced financial result of organizations, million rubles; **DD** – the degree of depreciation of fixed assets (at the end of the year),%; **E** – the volume of exports of a constituent entity of the Russian Federation, million dollars; **AI** – Average per capita monetary income of the population, rubles

Table 3. Basic forecast scenarios for the movement of bank capital between institutional sectors in the Sverdlovsk region by 2023, million rubles

Investment instruments		Financial corporations			Public administration	Non-financial corporations	Households	The rest of the world
		Central Bank	Banking sector	Financial organizations				
1. Investment in monetary gold	IS	-56	178	-60	-31	-31		
	PS	-45	142	-48	-25	-25		
	OS	-68	215	-73	-37	-37		
2. Investments in foreign currency	IS		-2114	-359				2 473
	PS		-2893	-492				3 385
	OS		-1334	-227				1 561
3. Deposits	IS	6 515	-53845	18254	4 792		24 284	
	PS	13 105	-108307	36716	9 639		48 847	
	OS	-75	617	-209	-55		-278	
4. Investments in debt securities	IS	1 195	-8131	2 065	1 577	1 602	-163	1 854
	PS	1 711	-11640	2 957	2 258	2 293	-233	2 654
	OS	679	-4618	1 173	896	910	-92	1 053
5. Loans issued	IS		-24512	2 892		2 084	19 536	
	PS		-12623	1 490		1 073	10 061	
	OS		-36380	4 293		3 092	28 995	
6. Investments in derivatives	IS		-46349	46 349				
	PS		-70388	70 388				
	OS		-22310	22 310				
7. Investments in stocks	IS	-238	-26465	4 975	5 267	6 008	6 113	4 340
	PS	-568	-63095	11 862	12 556	14 323	14 575	10 348
	OS	91	10165	-1 911	-2 023	-2 308	-2 348	-1 667
Balance of financial potential	IS	7 469	-174 253	74 247	12 147	23 094	48 693	8 604
	PS	14 215	-304 657	122 984	25 826	51 976	73 432	16 224
	OS	722	-43 824	25 506	-1 533	-5 790	23 937	982

Note: **IS** - Inertial scenario; **PS** - Pessimistic scenario; **OS** - Optimistic scenario

stock exchange (RTS and MICEX) affects banks' investments in shares.

Regression analysis based on panel data for the period from 1998 to 2019 for all constituent entities of the Russian Federation also made it possible to establish key indicators of the socio-economic development of the regions, which were influenced by the bank capital displaced to the institutional sectors, balanced across all investment instruments (Table 2). The constructed models formed the basis for assessing the socio-economic consequences of the implementation of various

scenarios for the movement of bank capital between sectors. The projected scenario model, which reflects the influence of factors on the formation of bank capital in the region, the interconnection of sectors in the processes of its movement through various investment instruments, as well as modeling the socio-economic consequences of its movement, was used by us to form the basic, most probable forecast scenarios (tab. 3).

The inertial scenario, assuming that current trends continue in the future, made it possible to predict by 2023 the outflow of bank capital abroad in the form of

investments in foreign currency (RUB 2,47 million), debt securities (RUB 1,85 million), shares (RUB 4,34 million), as well as an increase in investment of the banking sector in derivative financial instruments to the level of 46349 million rubles. We have identified the factors contributing to the implementation of this scenario in 2023. These factors include: the growth of dollar quotes to the level of 73,2 rubles, the interest rate of the Central Bank of the Russian Federation to 12,3%, the weighted average rate on deposits for individuals up to 7,1% and enterprises up to 6,9%, a decrease in the level of volatility in the stock market to 19,9%, an increase in the weighted average interest rate on loans to individuals to 12,7% and to enterprises to the level of 2009 (30,6%), a decrease in the RTS index to the level of 2015 (843 rubles) and the MICEX to the level of 2017 (RUB 2,21).

The pessimistic scenario of the movement of bank capital between sectors may lead to an even more significant outflow of financial resources abroad in the form of investments in foreign currency (RUB 3,39 million), debt securities (RUB 2,65 million), shares (RUB 10,35 million), speculative operations with derivatives (70,39 million rubles), a significant reduction in lending to non-financial corporations (up to 1,07 million rubles) and households (up to 10,06 million rubles), as well as an outflow of funds from bank deposits in the amount of 108.3 billion rub. This creates serious threats to the loss of financial stability of the credit sector of the economy. The implementation of this scenario by 2023 will be facilitated by the growth of dollar quotes to the level of 100,2 rubles, the size of the key refinancing rate to the level of 2000 (34,9%), the weighted average rate on deposits for individuals up to 15,3% and enterprises up to 15,5%, an increase in the level of volatility in the stock market to the level of 2009 (28,5%), an increase in the weighted average rate on loans to individuals to the level of 2000 (47,5%) and enterprises (20,6%), a decrease in the index RTS to the level of 2002 (249 rubles) and the MICEX to the level of 2006 (985 rubles).

The implementation of the pessimistic scenario of the movement of bank capital between sectors will lead to a decrease in the gross regional product in the Sverdlovsk region compared to 2019 by 5,9 times (to 467,2 billion rubles), a decrease in the consolidated budget revenues of the region by 5,4 times (to 57,6 billion rubles), an increase in the unemployment rate by 2,1 times to 8,7%, the share of the population with incomes below the subsistence level by 2,4 times (up to 8,9%), depreciation of production assets of enterprises to 44,9%, a decrease in exports of products by 1,9 times (to $ 3887 million), a decrease in the average per capita income of the population by 2,9 times. The implementation of the pessimistic scenario of the movement of bank capital between sectors will lead to a 5,9-fold reduction in the gross regional product in the Sverdlovsk Region compared to 2019 (to 467,2 billion rubles), a 5,4-fold

reduction in the consolidated budget revenues of the region (to 57,6 billion rubles), an increase in the unemployment rate by 2,1 times to 8,7%, the share of the population with incomes below the subsistence level by 2,4 times (up to 8,9%), depreciation of production assets of enterprises to 44,9%, a decrease in exports of products by 1,9 times (to $ 3887 million), a decrease in the average per capita income of the population by 2,9 times. To prevent the implementation of this scenario, it is necessary to change the policy implemented by the Central Bank in regulating the activities of credit institutions in the region. To restore the economy, it is necessary to limit the speculative activities of banks, namely, a reduction in the volume of their investments in foreign currency, debt and equity securities of foreign issuers, attraction of bank capital in shares of industrial enterprises and government agencies, debt securities. The implementation of this optimistic scenario by 2023 is possible with a decrease in the dollar quotes to 46,2 rubles, average weighted interest rates on deposits to 3,5%, the level of volatility in the stock market to 11,3%, with an increase in the RTS index to 1,44 rubles. and MICEX up to 3440 rubles. It is especially important during periods of economic downturns to provide enterprises in the sector of non-financial corporations and households with loans necessary for development and to reduce the volume of lending to foreign institutions. The attraction of credit resources to the Russian economy will be facilitated by the reduction of the interest rate of the Central Bank to 2%, the weighted average interest rates on loans to individuals to 13% and to enterprises to 4,8%. The speculative policy of investing in high-risk derivative financial instruments, which is currently being implemented by banks, should, in our opinion, be replaced by a policy of supporting the manufacturing sector of the economy and the general government sector. The attraction of bank capital to these sectors will allow solving the problems of technological renewal and modernization of production processes at enterprises, increasing the competitiveness of their products, will increase the budgetary provision of the regions to solve the most important problems of socio-economic development and the implementation of strategic programs.

4. CONCLUSIONS

1. The formed matrices of the movement of bank capital between institutional sectors in the Sverdlovsk region made it possible to establish investment instruments for which there was an outflow of financial resources abroad, as well as the volume of reduction in the financial potential of institutional sectors during periods of economic downturns.

2. The projected scenario model made it possible to establish the factors of formation of bank capital for various investment instruments in the region, to model the processes of its movement between institutional sectors.

3.   ARIMA-modeling, forecasting of the factors of formation of bank capital and the developed scenario model made it possible to generate the most probable forecast scenarios for the movement of bank capital between sectors, assess the threats of loss of financial stability of these sectors and socio-economic consequences in the event of a scenario.

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