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ORGANIZATION OF THE FINANCIAL SYSTEM IN THE AGENT MODEL
OF SECTORAL DEVELOPMENT OF THE RUSSIAN ECONOMY

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.L. Mashkova

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Orel State University named after IS. Turgenev, Orel, 95 Komsomolskaya St,
Belgorod National Research University, Belgorod, 85 Pobedy St,
Central Economics and Mathematics Institute, Russian Academy of Sciences,
Moscow, 47 Nakhimovsky Ave

E-mail: aleks.savina@gmail.com

Abstract
The report presents an agent-based model of the sectoral development of the Russian economy. The financial system in the model includes the Central Bank and commercial banks. In the work of commercial banks, two types of processes are distinguished: regular operations within the financial cycle and procedures for the allocation of the loan fund, involving analysis of the financial condition of borrowers, decisions on the volume and conditions of lending. Household credit requests are estimated based on data on their income and property, information about which is contained in the model database. Regional banks analyze this information, assessing the solvency of borrowers and the category of credit risk, and based on this, set the interest rate. Each type of organization in the model has its own accounting system. Accounting forms are used in assessing the financial condition of objects, calculating investment programs and lending schemes. The algorithm for considering credit applications of organizations includes assessing the probability of a bankruptcy of a borrower based on the Altman Z-model, analyzing the financial position of the borrower based on the borrower's financial statements, and calculating the interest rate. The volume of loans is determined by the amount of attracted deposits and loans from the Central Bank, which also determines the discount rate. As initial data for modeling financial structures and relations, data sets are used, presented in the annuals of the Federal State Statistics Service, on the website of the Ministry of Finance and the Central Bank.

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Keywords: agent-based model, sectoral structure of the economy, economic development, financial processes.

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-                                      [Ashraf Q., Gershman, B., Howitt, P., 2011; Napoletano M., Gaffard J.-L., Roventini, A., 2015; Popoyan L., Napoletano M., Roventini A., 2015; Raberto M., Teglio A., Cincotti S., 2008].

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[Cincotti S., Raberto M., Teglio A., 2010; Da Silva M. A., Tadeu Lima, G. 2015; Dawida H, Neugartb M., 2011; Delli Gatti D., Desiderio S., 2015].   ;
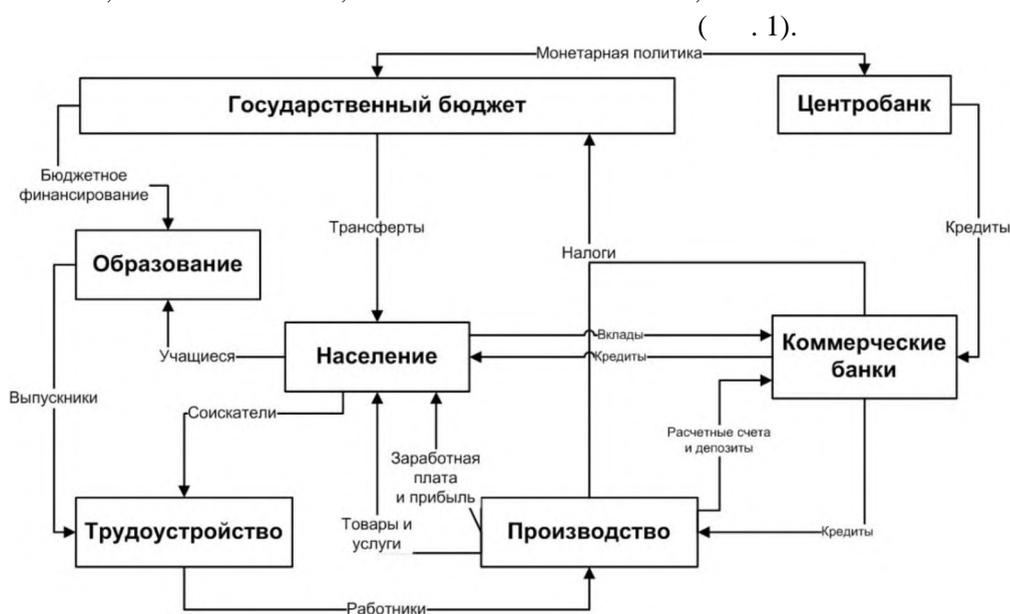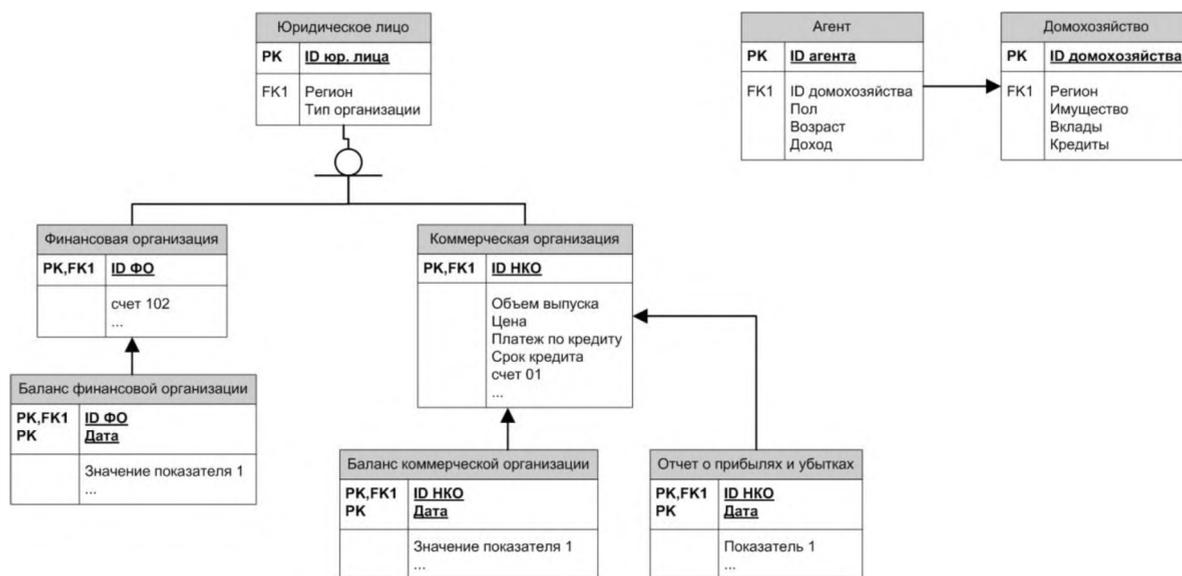
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Fig. 1. The modular structure of the model of industrial development of the Russian economy

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Fig. 2. A fragment of the model information support scheme

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Таблица 1
Table 1

The structure of the balance sheet of a non-financial commercial organization in the model

I		III	
	110		410
	120		470
I	190	III	490
II		IV	
	210		510
	220	IV	590
	240	V	
	250		610
	260		620
II	290	V	690
	300		700

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Table 2

Profit and loss statement structure of a non-financial commercial organization

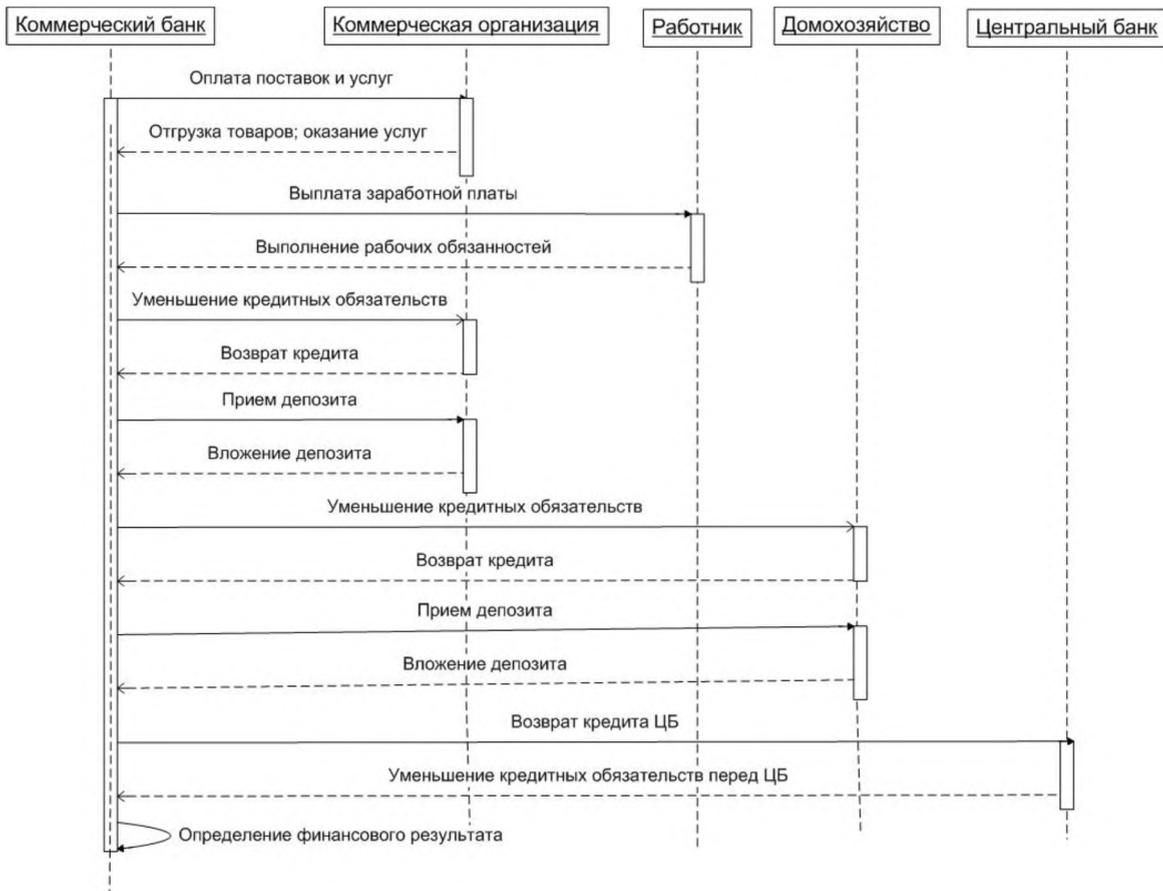|	
I	
	010
	020
	050
II	
	060
	070
	090
	100
( )	140
	150
( )	190

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[

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[, 2018].

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Table 3

The structure of the balance sheet of a commercial bank in the model

	202		102
	203		108
^{1}	441		301
	455		421
	604		423
	607		427
	109		

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Fig. 3 Interaction of a financial organization with counterparties in the financial cycle

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1. Z- [Altman, 2008]:

$$Z = 1,2 \quad \backslash + 1,4 \quad + 3,3 \quad \mathcal{3} + 0,6 \quad \mathcal{4} + \quad \mathcal{5}. \tag{1}$$

1 - ; -

; 3 -

; 4 -

; 5 - .

Z 1,81 ,

;

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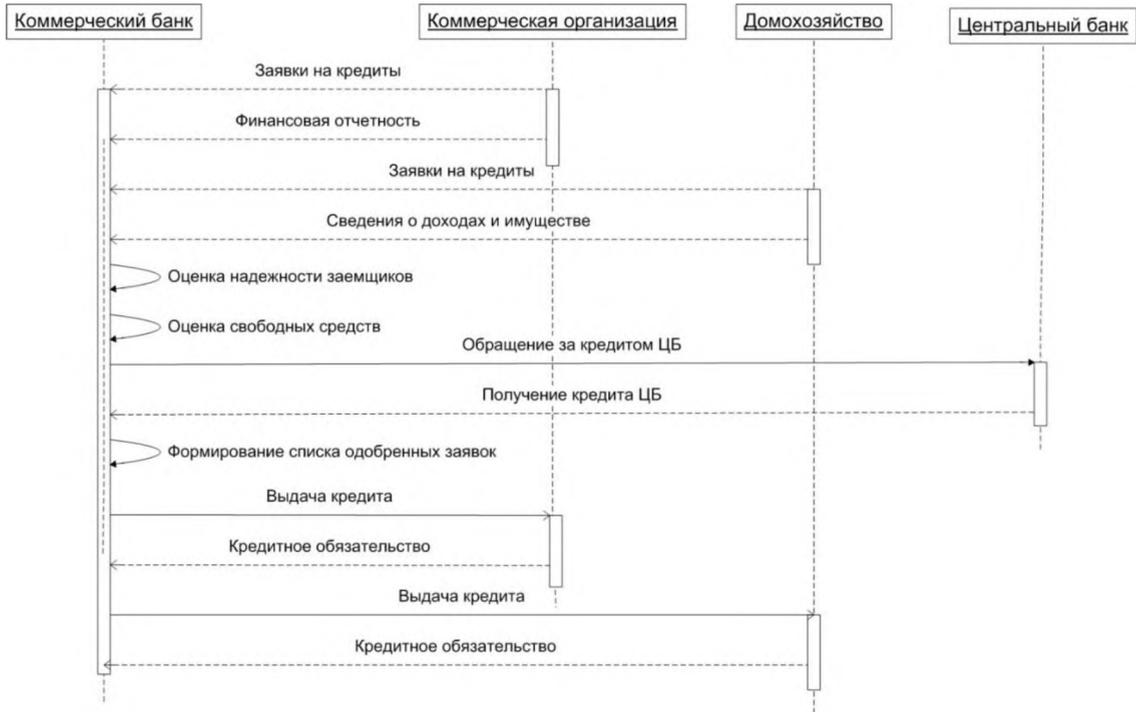
. 4

Fig. 4 Interaction of a financial organization in the process loan portfolio formation

2. ,
(1)
(2) [, 2004]:

2.1 \\

$$1 = \frac{(1.260)+(1.250)}{(1.690)} \tag{2}$$

1 - 1 ( ) ; 1.250, 1.260, 1.690 - (. 1).

2.2 2:

$$2 = \frac{(1.260)+(1.250)+(1.240)}{(1.690)} \tag{3}$$

1 - 1 ( ) ; 1.240, 1.250, 1.260, 1.690 - (. 1).

2.3 ^3:

$$3 = \frac{(1.290)}{(1.690)} \tag{4}$$

1 - 1 ( ) ; 1.290, 1.690 - (. 1).

2.4 4:

$$4 = \frac{(1.490)}{(1.690)} \tag{5}$$

1 - 1 ( ) ; 1.490, 1.690 - (. 1).

2.5 5:

$$5 = \frac{(2.50)}{(2.10)} \tag{6}$$

2 - 2 ( ) ; 2.50, 2.10 -
(. 2).

2.6 6\

$$= \frac{(\ 2.190)}{(\ 2.10)} \tag{7}$$

2 - 2 ( ) ; 2.190, 2.10 -
(. 2).

3. [2];
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4.
:

$$R = 0{,}05 \ \backslash + 0{,}10 \ 2 + 0{,}40 \ 3 + + 0{,}20 \ 4 + 0{,}15 \ 5 + 0{,}10 \ 6. \tag{8}$$

5. *R.*

6.
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1. .
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$$I = U + st + m + r, \tag{9}$$

I - ( ) , *U* - , *st* -
, *m* - , *r* - .

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( ) :

$$A = K * Sum, \tag{10}$$

- , - , *Sum* -
.

:

$$= \frac{i \bullet (1 + i)\,''n}{(i+t)''{-}i} \tag{11}$$

i - ; *n* - ,
( ).

3. -

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$$Pl = \frac{}{D},\tag{12}$$

Pl - , - , D -

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(11), - (12).

$$Im=\frac{}{Sum+start},\tag{13}$$

Im - , Sum - , start -

.

$$Im=\frac{}{Sum+sob},\tag{14}$$

Im - , Sum - , sob -

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(. 4).

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Table 4

Assignment of a credit class to an individual

1	< 0,5	< 0,5
2	< 1	< 0,9
3	>1	-
1	< 0,5	< 0,2
2	< 1	< 10
3	>1	-

6.

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$$R\_ipot=0,3Pl+0,7Im,\tag{15}$$

$$R\_potr=0,7Pl+0,3Im,\tag{16}$$

R_ipot - , R_potr

- , Pl -

, Im -

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7. R.

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