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Impact of the Debt Sustainability of State-Owned Companies on Russia's Corporate External Debt under Sanctions

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ABSTRACT

The subject of the research is the influence of the debt burden of state-owned companies on the dynamics of Russia's corporate external debt. The **relevance** is due to the unprecedented combination of sanctions in 2022, which created default risks of national companies. The **goal** of the article is to identify factors influencing changes in the amount of external debt. Based on a quarterly sample for 2010–2019 (37 observations), using the least squares **method** (LSM), a regression model was built for the dependence of corporate debt dynamics on micro– and macroeconomic factors (debt service ratio and credit rating of companies, foreign assets, ACRA financial stress index, rate changes of USD/RUB, credit default swap (CDS), export volume, balance of payments). An analysis of their credit risk was carried out by comparing the dynamics of the debt sustainability ratio (DSR) with the rating and cost of CDS, and the quarterly income support of debt was calculated. As a **result** of testing the hypotheses, a positive relationship was revealed between DSR and ratings of state-owned companies for changes in banks' external debt, while for enterprises they do not play a key role. It was concluded that the growth of loan premiums in 2014–2015 was due to political factors, and by the new crisis, the companies had accumulated reserves for absorbing the shock. Measures are proposed to reduce debt risks — coordination of debt policy, debt "import substitution", monitoring of new financial indicators of companies, control of cross-border capital flow, etc.

Keywords: external debt; CDS; credit rating; default; sanctions; risk management

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INTRODUCTION

After recovering from the COVID-19 crisis, the Russian financial system has faced new challenges — sanctions that have not been imposed on any country in the world before. Financial shock in early 2022 was much stronger than forecasts in risk scenarios of the Bank of Russia[1]: the prices of many shares of Russian companies have fallen to historical lows, and volatility has increased dramatically; after the blockage of the "bridge" by European depositories with MOEX bonds on external debt markets lost liquidity, and the panic of investors led to a record outflow of capital — more than 240 bln dollars.

To restore financial stability, the Bank of Russia was forced to raise the interest rate to 20%, temporarily paralyzing domestic debt markets, but only by correcting the yield curve of Federal loan bond (FLB), in September the RGBI index began to decline again.

Despite a significant change in macro environment, Russian companies still have significant external debt. Disconnection of both the Ministry of Finance and national companies from the international payment system SWIFT prevented its use to service its obligations. It was a paradoxical situation for agents with reserves (although many assets were frozen) to fail to make scheduled payments, leading to a de jure default.

At the same time, the local crisis may be exacerbated by the approaching global. Government support to many countries in the COVID-19 period smoothed the economic recession with excessive monetary and fiscal stimulus, which, together with anti-Russian sanctions, led to record inflation— in the USA, it rose to 8.3%.[2] In turn, the reciprocal sharp monetary tightening of central banks carries the risks of a debt crisis for all markets and could lead to a deep global recession.

New threats once again called into question the possibility of stable development of the Russian economy, which is subject to regular actions of various kinds of "turbulence". In the current Economic Security Strategy of Russia, the main threats include "exposure of the financial system to global risks",[3] that depends to a significant extent on the sustainability of state companies — organizations with a high share of state ownership in the share capital (shareholding — 50% + 1 share or more) studied in this work.

FINANCIAL STATUS OF RUSSIAN CORPORATIONS

Were our companies prepared for such events? Liquidity shortage in the market and declining incomes during macroeconomic shocks often force the State, including private companies, to insure with its reserves: during the 2008 crisis, the government refinanced such debts with the Reserve Fund — about 50 bln dollars. The Russian crisis of 2014–2015 was characterized by the fact that prior to this period, companies were freely occupied in the world market, and after the sanctions restrictions they experienced an acute liquidity shortage — in 2014–2017, the company needed to be on-lending by about 112 bln dollars, while the issue volume of Eurobonds decreased by almost 90% [1, p. 88]. And this time, the idea of purchases of corporate debts and their payment by the State was put forward, but the government managed to stabilize the situation with the help of reserves [2, p. 53]. According to the statistics of the Bank of Russia, the peak debt of credit organizations on operations repurchase agreement in foreign currency reached 35.39 bln dollars. (*Fig. 1*) and continued until the end of 2017. As a result of sanctions, corporate debt began to decline from its peak in the Q1 of 2014 and at the beginning of the Q3 of 2022 it amounted to 381 bln dollars.[4]

[1] Monetary Policy Report. Moscow: Central Bank of the Russian Federation; 2019;2. 93 p.

[2] Consumer Price Index Summary. URL: https://www.bls.gov/news.release/cpi.nr0.htm (accessed on 29.10.2022).

[3] Decree of the President of the Russian Federation No. 208 "Economic Security Strategy of the Russian Federation to 2030". URL: https://www.garant.ru/products/ipo/prime/doc/71572608 (accessed on 29.10.2022).

[4] External debt of the Russian Federation. URL: https://cbr.ru/vfs/statistics/credit_statistics/debt/debt_new.xlsx (accessed on 29.10.2022).

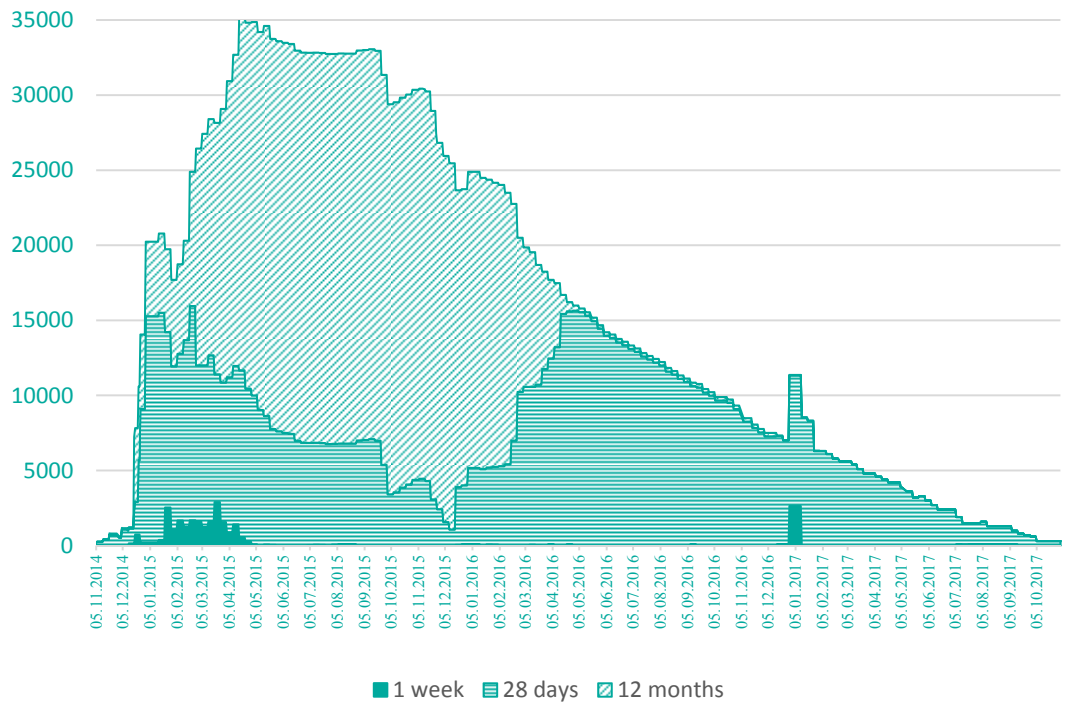

Fig. 1. **The volume of funds provided by the Bank of Russia to credit institutions under the first leg of REPO transactions in foreign currency, USD mln.**

Source: Bank of Russia data. URL: https://www.cbr.ru/hd_base/repo_debtusd (accessed on 29.10.2022).

The current crisis has a slightly different scenario for external corporate debt shocks — it is the sovereign who has been subjected to the most severe sanctions and has been forced to "insure" national companies. So far, Russian government measures have smoothed the shock, but Western governments are forcing Russian companies to artificial default. An additional negative factor — is the freezing of assets of State-owned companies, which will negatively affect the state reserves and the budget, like previous crises due to their "quasi-State" nature [3, p. 117]. Organizations that experienced instability in 2014–2015 significantly improved currency imbalances in assets and liabilities (aggregate effective currency mismatch — AECM).[5] As a result, since the Q3 of 2016, assets have fully covered the entire amount of external debt (*Table 1*), and the country's gold reserves covered all corporate debt and at the beginning of 2022 amounted to 630.6 bln dollars.

From the Q2 of 2014 to the Q1 of 2022[6] *banks'* assets declined from 288.67 to 182.7 bln dollars, but debt declined further — from 208.86 to 80.4 bln dollars, net external debt — 102.23 bln dollars (*Fig. 2*).

Assets of *non-financial enterprises* grew from 249.68 to 340 bln dollars, debt decreased from 450.56 to 303.78 bln dollars, net external debt was 22.01 bln dollars (*Fig. 3*), while before the crisis they had significant currency imbalances AECM.

Despite the improved balance sheet, after the sanction arrest of about 300 billion reserves of the Bank of Russia and the companies' assets, solvency has deteriorated significantly. The fact is that the period of low interest rates (2020–2021) allowed not only to refinance the debt, but also to accumulate excess liabilities.

[5] Net external debt of the Russian Federation. URL: https://www.cbr.ru/vfs/statistics/credit_statistics/debt_sector/61–debt_sector_20.xlsx (accessed on 29.10.2022).

[6] After the start of special military operation, the Bank of Russia decided not to publish detailed statistics.

Table 1

Change in net position on external debt, USD bln.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Banks	–36.9	–48.4	–79.81	–101.6	–87.19	–97.51	–77.81	–111	–105	–102.2
Organizations	143.9	211.5	200.8	108.45	93.32	70.41	36.07	10.626	8.057	–36.17
Total	107.02	163.1	121	6.851	6.137	–27.1	–41.74	–100.4	–96.97	–138.4

Source: Net External Debt Position of the Russian Federation by Sector. URL: https://cbr.ru/statistics/macro_itm/svs (accessed on 29.10.2022).

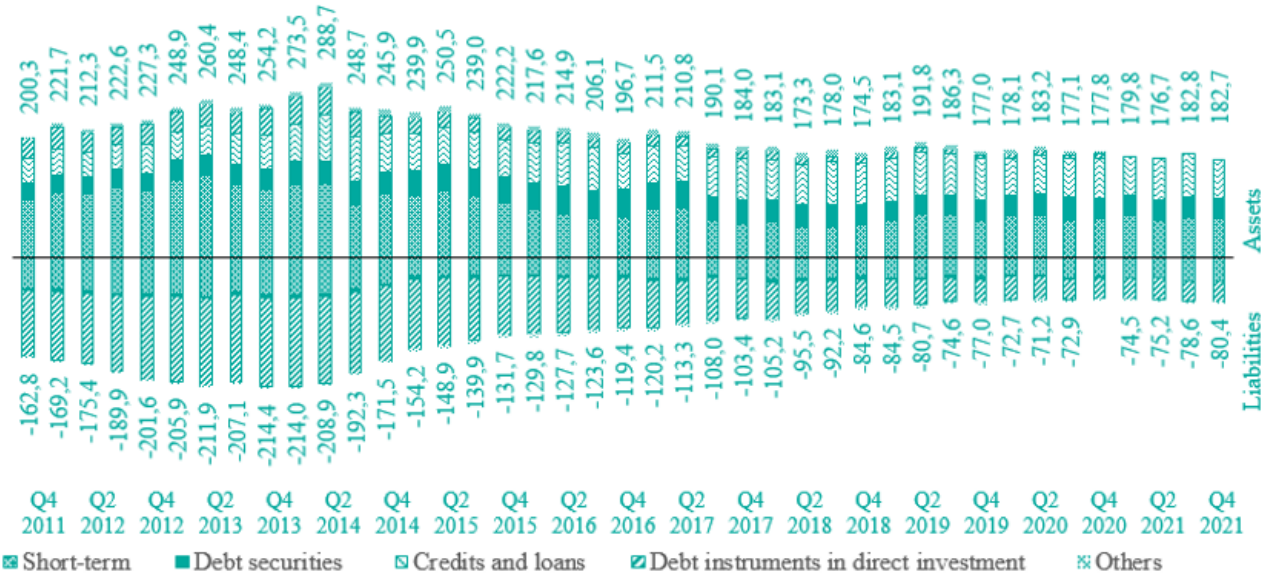

Fig. 2. **External assets and liabilities of Russian banks, USD bln.**

Source: Net external debt position of the Russian Federation by sector. URL: https://cbr.ru/statistics/macro_itm/svs (accessed on 29.10.2022).

Now the start of a new phase of sanctions confrontation with the West, after the start of a special military operation in Ukraine, negatively affects the debt sustainability of companies and may lead to a chain of defaults due to the embargo, asset freezes, problems with payment and depository infrastructure. All this forces to research the factors that influence the debt volumes and to develop the state risk management of corporate debts.

OVERVIEW OF RISK ASSESSMENT TOOLS

In this article we are contributing to the discussion about the factors that contribute to the accumulation of external debt in a small open export-oriented economy,[7] on the example of Russia. In domestic studies, there is a lack of attention to the analysis of debt risks of state-owned companies, and proposals to regulate debt levels require detailed study. Estimates are not quantified, some works are written for the experience of the 2008 crisis and require updating, in turn, the world experience must be adapted to Russian conditions.

[7] After the sanctions of 2022 "openness" has deteriorated significantly, but we expect external and internal financial repression to weaken over time.

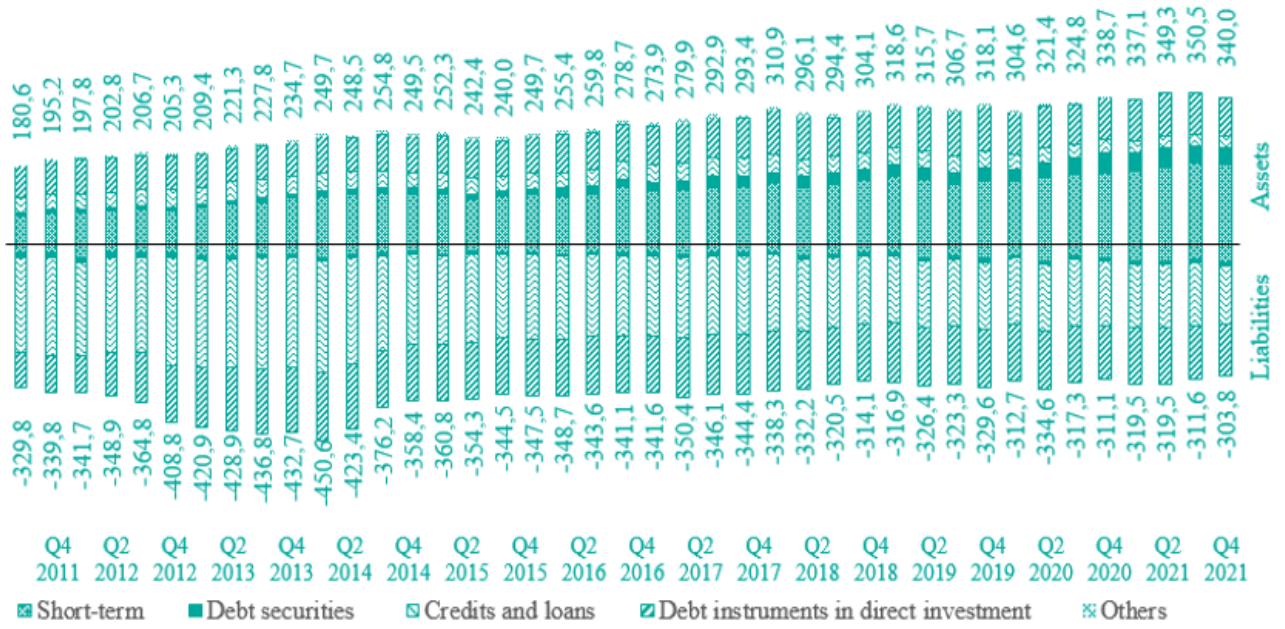

Fig. 3. **External assets and liabilities of Russian enterprises, USD billion**

Source: Net external debt position of the Russian Federation by sector. URL: https://cbr.ru/statistics/macro_itm/svs (accessed on 29.10.2022).

Is external debt a positive or negative characteristic of the country? Such borrowing goes beyond the creditor-debtor relationship, as it relates to the degree of liberalization of capital markets and, consequently, their international flows, the relative value of the national currency, the state of the country's balance of payments. On the one hand, access to foreign markets contributes to investment and economic growth, as additional financing from a large number of creditors expands production in the context of limited domestic loan capital. On the other hand, due to the weak diversification of commodity economies, the rising prices of exported goods have led to increased foreign exchange inflows and high credit rates in local financial markets. Since the prices of these goods (oil, metals, wheat, etc.) are determined in the world markets, it is considered as an exogenous income transfer. High export costs dampen risk premiums and further boost capital flows to these countries [4, p. 8]. Strong correlation of credit and commodity cycles can lead to a sharp deterioration in the quality of banks' loan portfolio due to reduced solvency of borrowers and create systemic risk [5, p. 42], when there is a price shock and a reverse capital outflow.

These risks are typical for developing countries, with the channels of shock being the interest rate, currency mismatch on companies' balance sheets, financial leverage and limited working capital [6, p. 39]. Often not even the fact of debt, namely, currency mismatch becomes the cause of crisis. Low interest rates and sharp increases in central bank balances contribute to facilitating of finance, particularly by increasing borrowing in foreign currency. Such monetary policy may change the incentives of companies to issue short-term bonds, thereby increasing the refinancing risk at the expense of future financial stability [7, p. 7].

The mismatch between national and foreign currencies occurs when an enterprise balance sheet or income flows are sensitive to exchange rate. According to the concept of "original sin", introduced by B. Eichengreen, R. Hausmann and U. Panizza, borrowers from developing countries cannot borrow abroad in their national currency (although after the sanctions of 2022 Russia urgently replaces euro bonds with ruble bonds),

which naturally leads to currency mismatches on their national balance sheets. How serious the problem depends on a country's "net" foreign currency position (called MISM), i.e. excluding the balance between assets and liabilities against non-residents, which is calculated as follows [8, p. 15]:

$$MISM = \frac{Foreign\ currency\ of\ Total\ debt}{export\ /GDP}. \quad (1)$$

Another indicator — aggregate effective currency mismatch (AECM) — is important for the dollar economy. Although the foreign currency debt ratio (FC% TD) may be large, the degree of risk also depends on the net foreign exchange on external debt. Therefore, countries with a strong positive position on net foreign exchange assets can more easily stand commodity price shocks. AECM is calculated using the following formula:

$$AECM = \frac{Net\ foreign\ currency\ assets}{Export} * \\ * Foreign\ currency\ of\ Total\ debt. \quad (2)$$

As for Russia, the above processes are accompanied by shocks of price and non-price factors of influence on the debt policy. On the one hand, as a result of the rise in political risks, the revision of credit ratings and the change in the degree of inclination of foreign investors to risk (observed in 2014–2015), there was a reduction in external financing. On the other hand, non-price factors — different types of sanctions have not only influenced by an increase in the risk premium, but have effectively closed access to long-term financing in global debt markets [9, p. 96].

Due to the need to respond to the 2008 crisis, Central Banks and supervisory authorities around the world gained new powers to ensure financial stability, which pursued the following objectives [10, p. 8]:

- improving the financial system's resilience to shocks by creating buffers of foreign exchange reserves;
- AECM currency mismatch limits for open currency positions and currency asset type restrictions;
- controlling the risk accumulation of systemically important organizations by limiting leverage.

However, exactly the last point concerns state-owned companies, the debt portfolio of which in our economy sufficiently significant and high debt burden can threaten the economic security of the country, make it vulnerable to external crises [11, p. 22]. If we formulate the concept of economic security (in the context of debt relations), then it is such *a set of characteristics (volume, urgency, currency structure) of debt, in which the State is able to ensure the continuity of the financial market and the sustainability of the budgetary system, while at the same time making efficient use of borrowing, timely servicing and repayment, preserving the country's financial sovereignty and credit rating* [12, p. 66].

How to assess debt risks? The globalization of financial markets has led to the need to harmonize methods for comparing credit risks of enterprises, banks and States. One such tool is *credit ratings*, which provide standardized, easily perceived, consistent, independent assessments and reflect the credit quality of the counterparty, issuer or investment product.[8] They include such indicators as: financial sustainability, transfer risk, elements of state support. The development of macroprudential tools that are implemented in response to systemic shocks made ratings an important benchmark for asset risk group. For example, in 2014 the Bank of Indonesia created a requirement for companies which borrows on foreign markets: their rating from international agencies should be at least BB. A relatively high financial sustainability is required because of the above-mentioned cyclicality. However, changes in ratings are delayed towards the credit cycle — "at the moment of the crisis,

[8] Increasing the sustainability of the banking sector. Basel Committee on Banking Supervision. Moscow: Bank of Russia; 2009. 107 p.

Table 2

Comparison of the ratings used

	Ratings used									
Scale	11	10	9	8	7	6	5	4	3	2
S&P	BBB+	BBB+ n.f.	BBB	BBB n.f.	BBB–	BBB– n.f.	BB+	BB+ n.f.	BB	BB n.f.
Moody's	Baa1	Baa1–	Baa2	Baa2–	Baa3	Baa3–	Ba1	Ba1–	Ba2	Ba2–

Note: on the Moody's scale "–" — negative forecast, in S&P "n.p.", in other cases — the forecast is "stable".

Source: Bloomberg Terminal.

ratings are relatively high" [13, p. 154], and a sudden downturn in the coming recession often leads to a sale of securities by investors.

Over the past decade, Russia has pursued a consistent policy of macroeconomic stability, reduced the impact of oil price volatility and increased resilience to external shocks. As a result, the agencies upgraded sovereign and corporate ratings to investment grade (Fitch's highest level — BBB with stable outlook). In the article uses the types of ratings that most closely characterize credit risk on foreign liabilities (if there is a rating):

1. *Probability of default* — opinion on the probability of default.[9]
2. *Foreign currency issuer credit* — opinion on the ability and willingness of the borrower to meet its obligations in foreign currency.[10]
3. *Foreign long-term bank deposits* — opinion on the bank's ability to discharge its foreign currency deposit obligations in full and on time.

Comparison of rating scales is given in *Table 2*.

Another risk measurement tool is CDS — credit default swap. This is an agreement between the two parties under which the former pays the second insurance amount if the debtor has a credit case. A credit event can be an issuer default, coupon/denomination delay or default, bond price or credit rating collapse, debt restructuring [14, p. 634]. Unlike periodic rating updates, the market price of CDS reacts instantly to changes in risk.

The methodology of credit default swap pricing is widely described in the foreign academic literature, and the most famous in terms of practical application are the model of bank JP Morgan CreditGrades and the model of the company that specialized in credit risks, KMV (Kealhofer, McQuown, and Vasicek — as of now unit of the Moody's agency) [15]. The CreditGrades model was first used in the work [16, 17] which studied the risks of low-rating developing country instruments. This study uses five-year CDS 5Y awards for each of the companies under review at the end of the quarter.

Bank for International Settlements [18, p. 23] and IMF[11] proposed another risk measurement methodology with a debt service ratio (further — DSR). Its economic meaning is to determine the ratio of profit to debt service. In this article, this indicator is calculated as the ratio of operating income to interest expense per quarter. Such models of assessment of solvency are similar to stress tests,[12] the purpose of which is to identify unstable organizations by assessing the balance under extreme macroeconomic scenarios, for example in "serious economic downturn or liquidity

[9] Moody's Rating Symbols&Definitions. URL: https://www.moodys.com/sites/products/ productattachments/moodys%20rating%20symbols%20and%20definitions.pdf (accessed on 29.10.2022).

[10] S&P Global Ratings Definitions. URL: https://www.standardandpoors.com/en_US/web/guest/article/–/view/sourceId/504352#ID 993 (accessed on 29.10.2022).

[11] Global Financial Stability Report. Potent Policies for a Successful Normalization. IMF. 2016. 204 p.

[12] Review of BCBS supervisory and internal stress testing procedures. Moscow: Bank of Russia; 2017. 72 p.

shortage in financial markets" [19, p. 88]. As the default risk increases during shocks, the critical level is the company's lack of current income to service short-term liabilities: DSR < 2.

Another frequent tool to assess the issuer's risk on foreign borrowing (for the model, the article prefers CDS tool) is the spread between Eurobond yields. In recent years, the Russian economy has experienced several crises and naturally, the dynamics of spreads have been volatile — sharp "spikes of profitability to the level of 400 p.p. alternated with reaching the level of a safe haven" [20, p. 202].

Summarizing the review of the literature, let us propose two research hypotheses:

H1: Growth of debt sustainability ratio (DSR) of state-owned companies negatively affects the debt policy of the entire corporate sector.

H2: Change in the credit rating of state-owned companies is a signal of growth / reduction of external corporate debt.

THE DSR MODEL INTERCONNECTION OF STATE COMPANIES AND EXTERNAL DEBT

The above problem sets the task of building an econometric model, which would help to identify the relationship and nature of the impact of macro- and microeconomic (primarily — the debt burden of major state companies) the dynamics of Russia's total external corporate debt. To this end, a sample of state-owned companies with the largest external debt (covering more than 60% of quasi-public debt) was selected. Selection criteria are justified by the particularly high probability of government support in case of temporary financial insolvency (*Table 3*) during macroeconomic shocks.

The work uses quarterly consolidated accounting statements (IFRS) of companies for the period from Q1 2010 to Q1 2019 (37 observations). Main data source — Bloomberg Terminal and Bank of Russia website. Structure — panel data, calculations were made in Stata 14.2 software package.

In the first stage graphical analysis of ratings dynamics, CDS and DSR was conducted. He showed that credit rating does not always objectively assess the sustainability of companies and, of course, lags behind in comparison with permanent pricing of CDS. Ratings were barely adjusted until the 2014 sanctions, and after the economic recovery and adapting to the limitations (2017–2018), they remained at relatively low levels. Their collapse in 2014–2015 was largely due to political circumstances and does not fully reflect the dynamics of financial sustainability of companies such as Sberbank or Gazprom (if you estimate stability by DSR). On the other hand, calculations of the debt service ratio showed that some companies often faced difficulties in servicing the debt (e.g., VEB and Inter RAO), but the rating could not change. The detailed dynamics of the studied indicators are shown on *Fig. 4*.

By the least squares method (LSM), the debt dynamics are related to the micro and macro variables (data are divided both for each organization and separately by sector). The total amount of external debt of the banking sector and of non-financial enterprises separately is selected as the regressor, and the regressors are: total debt service ratio, credit rating on foreign currency liabilities (if any), volume of foreign assets of banks and enterprises, Bank of Russia reserves, five-year default swap premium for each organization, ACRA FSI[13] financial stress index, export value and balance of payments. The full set of variables is given in *Table 4*.

The unloading of the base model showed that correlation analysis was needed to identify redundant variables. High positive association between banks' assets and their debt — 0.859, international reserves and rating of banks — 0.872, reserves and assets of banks — 0.824, between CDS banks and enterprises — 0.793, ruble exchange rate and ACRA index — 0.812, between reserves and exports — 0.870 (*Table 1, Appendix*).

[13] ACRA Financial Stress Index for Russia. URL: https://www.acra-ratings.ru/research/index (accessed on 29.10.2022).

Table 3

Sample of companies for research

	Name of the company	Share of state participation,%	Debt, USD million	Sanctions	ICR < 2 (out of 37 quarters)
Financial institutions	VEB	100	10 337.25	fin 1, fin 2	25
	Sberbank	52	8294.12	fin 1, fin 2	4
	VTB	70	6726.85	fin 1, fin 2	5
	Russian Agricultural Bank	100	500	fin 1, fin 2	21
	Gazprombank	50	1404.73	fin 1, fin 2	9
Enterprises	Gazprom	50	41 804.1	tech	2
	Rosneft	50	15 379.67	fin 2, tech	5
	Inter RAO	63	46.51		21
	RusGidro	70	257.11		0
	RZD	100	6440		5

Source: author's calculations based on Bloomberg Terminal for Q2 2019.

Note: fin 1 (ban on financing or transactions with new debt for a period of more than 14 days), fin 2 (ban on buying securities), tech (supply of technology).

The variance inflation factor (VIF) was calculated to test multicollinearity by the formula:

$$VIF_j = \frac{1}{1-R^2}\, j\epsilon\{2,\ldots,k\}, \quad (3)$$

where R^2 — determinism coefficient in regression factors.

Exclusion from the model of redundant variables (whose index >10) corrected the average VIF, which amounted to 2.86 and 3.38 (*Table 2, Appendix*), i.e. the multicollinearity between model parameters is statistically insignificant.

To improve the predictive force was logarithmically part of the variables (*Table 5*). The null hypothesis of H_0 is that all coefficients for explanatory variables are zero.

Note that the *F*-statistics of the constructed bdebt model (bank data) is 68.24, while the critical value of 1% for this dataset is 1, which rejects the zero hypothesis and the regression model is generally recognized as significant. For the cdebt model (business data), F-statistics are 38.11, which is higher than the critical value of 0.99 and also indicates the importance of the model.

Next, check for heteroskedasticity (no unstable variance of random model errors) in models where:

$$H_0 : \sigma_i^2 = \sigma^2 \text{for} \forall\, i \text{ (homoscedasticity)}, \quad (4)$$

$$H_1 : \exists i,\ j : \sigma_i^2 \neq \sigma_j^2 \text{ (heteroskedasticity)}. \quad (5)$$

The results of the Breusch–Pagan test showed that the value of the calculated statistics $\chi^2 = 5.43$ for *bdebt model* more critical, therefore rejecting the homoscedasticity hypothesis H_0 and requiring further model correction. A similar test for the *cdebt model* showed no heteroskedasticity — the value of statistics $\chi^2 = 2.23$.

INTERPRETATION OF THE RESULTS

Two sectoral models show the relationship between external debt from micro- and macroeconomic factors:

1. *For bank debt (bdebt)* it explains 79.8% (R-squared) volatility. Key variables at 1% level are: credit rating (factor change per standard deviation 1 σ = 7.1 points), which characterizes the financial stability of the

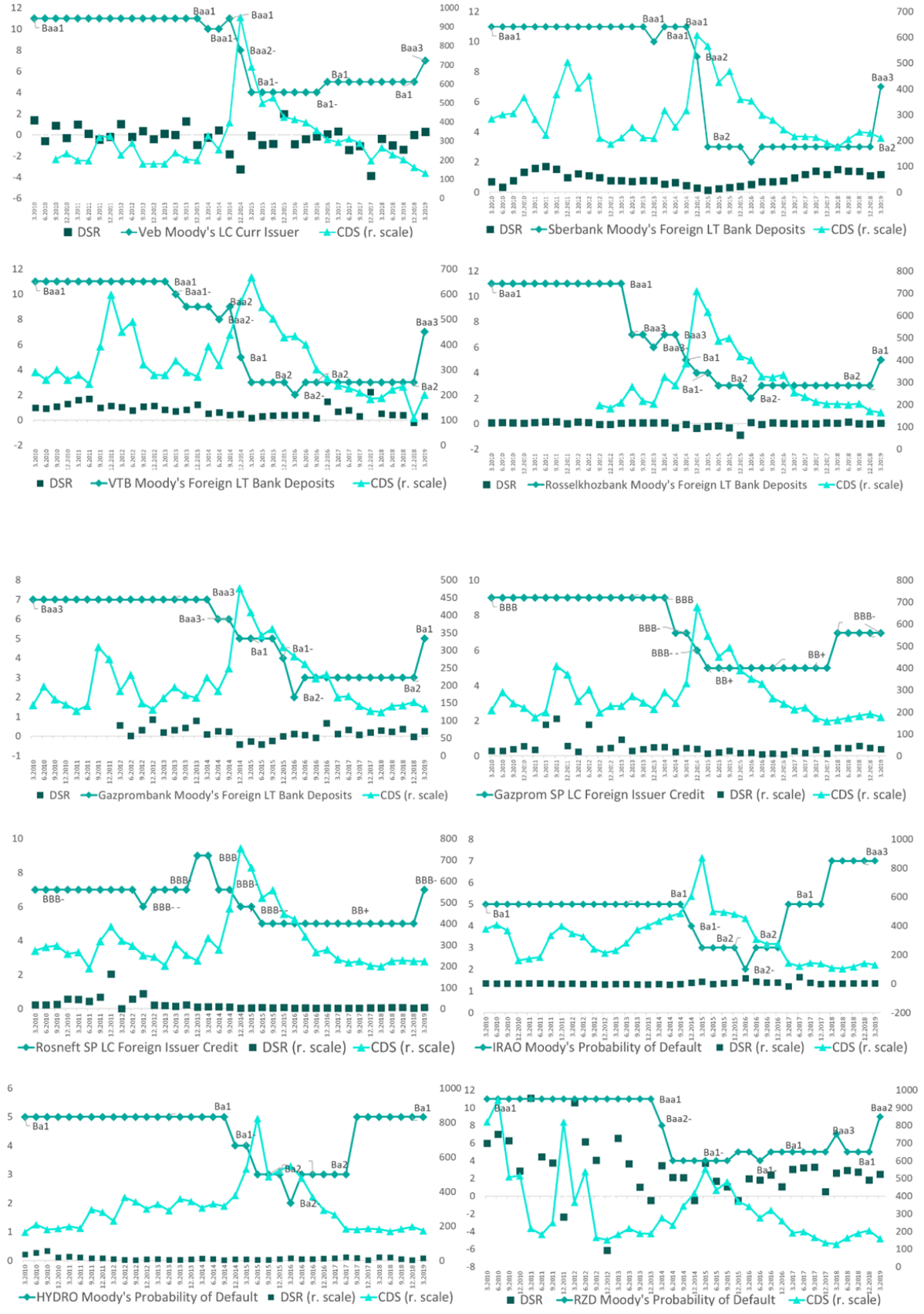

Fig. 4. **Dynamics of DSR, credit rating and CDS for 2010–2019**

Source: author's calculations based on Bloomberg Terminal.

Table 4

Set of regression model variables and their descriptive statistics

Variable	Designation	Measure	Obs	Mean	S. D.	Min	Max
Microeconomic variables (for 10 sample companies)							
Bank debt service ratio	bdsr	points	175	0.92	1.92	−6.156	11.10
Enterprise debt service ratio	cdsr	points	185	0.93	53.54	1	185
Bank credit rating	brating	points	185	6.78	3.43	2	11
Enterprise credit rating	crating	points	185	6.064	2.22	2	11
Bank credit default swap	bcds5y	points	173	291.21	133.35	108.25	949.85
Enterprise credit default swap	ccds5y	points	185	308.15	154.3	105	944
Macroeconomic variables							
Bank external debt	bdebt	bln dollars	185	87.556	25.86	50.607	137.76
Enterprise external debt	cdebt	bln dollars	185	121.02	26.49	81.995	170.87
Foreign assets of banks	bassets	bln dollars	165	217.68	3.08	173.31	288.67
Foreign assets of enterprises	cassets	bln dollars	165	256.58	39.96	180.6	318.63
Financial stress index	acra	points	185	0.988	0.701	0..204	3.858
Reserves of the Bank of Russia	reser	bln dollars	185	582.92	72.6	486.0	698.4
Export	export	bln dollars	185	136.29	25.49	81.906	173.01
Balance of payments	pbalance	bln dollars	185	16.186	11.46	−3.323	39.28
Course change for USD/RUB	rub_vol	%	185	−0.302	0.487	−1.123	1.319

Source: author's calculations in Stata.

bank; foreign assets of the sector are significant (1 σ = 0.3 bln dollars); ruble rate logarithm (1 σ = −7.7 percentage points); two variables, which characterizes foreign exchange inflows — export log (1 σ = −5.1 bln dollars) and balance of payments log (1 σ = 31.7 bln dollars). Less significant variables: at 5% — debt ratio (1 σ = −1.99 points), and at 10% — financial stress index (1 σ = 2.73 points). The logarithm of credit-default swap (1 σ = 1.48 points) remained insignificant in the model, but its exclusion reduces the predicted strength of the model.

2. *For business debt (cdebt)* explains 68.9% (R-squared) volatility. The key variables at 1% were: variables characterizing foreign exchange earnings of enterprises — foreign assets (1 σ = 19 bln dollars), exports (1 σ = −17.18 bln dollars) and balance of payments (1 σ = −5.99 bln dollars); another set of variables assesses uncertainty in the economy — financial stress index (1 σ = 7.1 points), ruble rate logarithm (1 σ = −5.4 percentage points); financial sustainability risks — credit default swap (1 σ = 11.88 points) of the studied enterprise.

Summarizing the results presented, some features of the influence of variables have been identified. In the model for banks, a significant debt service ratio and rating, while for enterprises they do not play a key role, but the dependence on the credit-default swap premium was found. This confirms the H1 and H2 hypotheses for banks and refutes for enterprises. In this case, the CDS variable is only relevant for enterprises, which may be due to its continuous pricing in comparison with some delay of rating change. The ACRA index is less significant for banks, while the ratio and importance for enterprises is higher. Similar situation with international assets — enterprise coefficient greater. The positive balance-of-payments effect on banks' debt volumes and the negative impact on enterprises' debt is anomalous. In general, both built models have good predictability, are stable and recognize the relevance of the set of explanatory variables.

The final equation *for banks* is as follows (i — number of object, t — time):

$$bdebt_t = -12{,}29 - 1{,}039*bdsr_{it} - 2{,}079*brating_{it} + \\ + 0{,}963*bassets_t + 3{,}897*acra_t - 15{,}92* \\ * LN\_rub\_vol_t + 3{,}595*LN\_cds5y_{it} - \\ - 25{,}58*LN\_export_t + 2{,}769*LN\_pbalance_t. \quad (6)$$

The final equation *for business* is as follows:

$$cdebt_t = -195{,}436 - 0{,}00535*bdsr_{it} - \\ - 0{,}711*crating_{it} + 0{,}459*cassets_t + 10{,}17*acra_t - \\ - 11{,}22* LN\_rub\_vol_t + + 0{,}0774*cds5y_{it} - \\ - 0{,}674*export_t - 0{,}523*pbalance_t. \quad (7)$$

CONCLUSIONS AND RECOMMENDATIONS

The analysis showed that domestic companies significantly reduced their dependence on external debt markets and improved their balance sheets. However, the historically unprecedented scale of sanctions requires the achievement of full financial sovereignty. Two main objectives for further action in this regard can be identified: to limit the accumulation of excess debt and to ensure sustainability through the creation of reserves. What measures will reduce risks? IMF and Bank for International Settlements documents pay insufficient attention to the principles of control of corporate liabilities, but on the basis of recommendations for sovereign debt management, we will formulate some proposals.

Loan policy coordination. A medium-term joint development strategy is needed to control external borrowing (for the moment "Main directions of the State debt policy of the Russian Federation" were developed last time in 2016). To do this, it is necessary to formalize the list of systemically significant organizations (primarily non-financial). This activity may be regulated by the Ministry of Finance, but the corporations themselves must clearly plan the details of borrowing — the timing, currency, volumes must comply with the strategy.

Table 5

Assessment of model parameter significance

	(1)	(2)
VARIABLES	**bdebt**	**cdebt**
dsr	−1.039**	−0.005
	(0.513)	(0.020)
rating	−2.079***	−0.711
	(0.531)	(0.662)
assets	0.1***	0.5***
	(0.053)	(0.1)
acra	3.897*	10.17***
	(2.037)	(2.384)
LN_rub_vol	−15.92***	−11.22***
	(3.656)	(4.276)
LN_cds5y	3.595	
	(3.803)	
cds5y		0.077*** (0.012)
LN_export	−25.58***	
	(9.144)	
export		−0.674***
		(0.102)
LN_pbalance	2.769***	
	(1.000)	
pbalance		−0.523***
		(0.108)
Constant	−12.29	−195.436***
	(48.49)	(26.7)
Observations	143	165
R-squared	0.798	0.689

Standard errors in parentheses

Source: author's calculations in Stata.

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Debt risk monitoring and control of company financial performance: leverage, ratio of net external debt to EBITDA (total debt is recommended to be kept at no more than 3.5), percentage of interest payments in cash flow, ROA, share of short-term debt in total debt, share of net flow in total cash. At the same time, according to the research, control over the debt burden of Russian banks is more important, as it is a trigger of growth or reduction of external debt of the entire economy. Measures to accumulate short-term debt may also be used (a reserve requirement that penalizes such borrowing). The Reserve Bank of India applies such rules, limiting the term and full cost of lending (loan with a repayment period of 3–5 years — 6-month LIBOR + 300 p.p., for a loan with a maturity of 10 years — 66-month LIBOR + 500 p.p., loans of less than three years are prohibited). The Bank has created a list of companies that are allowed to borrow in foreign markets, loan objectives, requirements for hedging foreign exchange risks. According to IMF, these measures significantly balanced the debt portfolio of companies.

Creation a legal restriction both volumes (debt threshold) and external financing instruments. It is important to note that its own debt is not a problem if its growth rate is below the growth rate of profit: over time, the debt-to-GDP ratio may rise, but companies will remain stable enough to service it. Restrictions such as the DSR we used to be aimed at increasing the resilience of borrowers and thus indirectly increase the resilience of lenders.[14]

When thresholds are reached, the regulator may: to establish allowances to risk factors when lending, to suspend the registration of prospectuses of issue of Eurobonds, to ban short positions on currency, to raise the rate of banks' mandatory reserves, to lower the key rate (in case of growth of currency debt, in case of ruble — to raise). Differentiated limits are necessary for organizations without an internal risk management system and low debt servicing capacity. Such time limits may be imposed by government regulations, but their adoption will be constrained by the lobbying power of companies.

Debt "import substitution". Sanctions isolation forces Russia to accelerate investments, but for this it is necessary to realize a qualitatively new "debt economy". In terms of development of instruments of the domestic currency source of refinancing and taking into account the problems with the foreign payment infrastructure, it is proposed to replace foreign debts with Russian capital: assets of the National Welfare Fund and repatriation of surplus foreign assets of the same state-owned companies. At the same time, the revenue of the State in this part will be doubled, and organizations will receive tangible benefits from the reduced rate. Given the ban on the provision of rating services to Russian companies — replacement of the rating process by national agencies.

Integration of stress testing into current activities as a basic procedure, namely: introduction of risk assessment in the process of developing business plans, model risk management policies and scenarios, involvement of management in risk assessment.

Capital controls. Save domestic savings and reduce capital outflows. At the same time, care should be taken to maintain a high level of confidence in the Bank of Russia, crime prevention and "grey" withdrawal schemes, maintain competition in the domestic market and maintain the effectiveness of market mechanisms.

[14] Elements of Effective Macroprudential Policies. IMF-FSB-BIS. 2016. 22 p. URL: https://www.fsb.org/2016/08/elements-of-effective-macroprudential-policies (accessed on 29.10.2022).

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REFERENCES

1. Petrov M.V. Financing companies in the context of economic slowdown and sanctions. *Finansy: teoriya i praktika* = Finance: Theory and Practice. 2018;22(3):84–99. (In Russ.). DOI: 10.26794/2587–5671–2018–22–3–84–99
2. Senchagov V.K., Mityakov S.N. Evaluation of economic crises using short-term indexes and average indexes of economic security of Russia. *Studies on Russian Economic Development.* 2016;27(2):148–158. (In Russ.: *Problemy prognozirovaniya*. 2016;(2):44–58.).
3. Krasavina L.N. The risks in the foreign loan sphere and problems of modernizing the debt policy of Russia. *Studies on Russian Economic Development*. 2010;21(4):426–433. (In Russ.: *Problemy prognozirovaniya*. 2016;(4):116–126.).
4. Khotulev I., Styrin K. Optimal monetary and macroprudential policies for financial stability in a commodity-exporting economy. Central Bank Working Paper Series. 2019;(52). URL: https://www.cbr.ru/Content/Document/File/87579/wp-52_e.pdf
5. Tiunova M. Commodity and financial cycles in resource-based economies. *Russian Journal of Money and Finance*. 2019;78(3):38–70. DOI: 10.31477/rjmf.201903.38 (In Russ.: *Den'gi i kredit.* 2019;(3):38–70. DOI: 10.31477/rjmf.201903.38).
6. Shousha S. Macroeconomic effects of commodity booms and busts: The role of financial frictions. 2016. URL: https://www.bcb.gov.br/content/about/eventsdocs/AITS/2016/SMETASXVIII-%20Samer%20Shousha.pdf
7. Fisher P. Interactions of sovereign debt management with monetary conditions and financial stability: Lessons and implications for central banks. Bank for International Settlements. CGFS Papers. 2011;(42). URL: https://www.bis.org/publ/cgfs42.pdf
8. Chui M, Kuruc E., Turner P. A new dimension to currency mismatches in the emerging markets: nonfinancial companies. BIS Working Papers. 2016;(550). URL: https://www.bis.org/publ/work550.pdf
9. Sholomitskaya E. Influence of key macroeconomic shocks on Russian investments. *Ekonomicheskii zhurnal Vysshei shkoly ekonomiki* = The HSE Economic Journal. 2017;21(1):89–113. (In Russ.).
10. Galati G., Moessner R. Macroprudential policy — a literature review. BIS Working Papers. 2011;(337). URL: https://www.bis.org/publ/work337.pdf
11. Miklashevskaya N.A. External debt: Recent theoretical and practical issues. Vestnik Moskovskogo universiteta. Seriya 6: Ekonomika = Moscow University Economics Bulletin. 2013;(1):19–35. (In Russ.).
12. Porokhovskii A.A., ed. The debt problem as a phenomenon of the 21st century. Moscow: MAKS Press; 2014. 288 p. (In Russ.).
13. Karminsky A.M., Dyachkova N.F. Empirical study of the relationship between credit cycles and changes in credit ratings. Zhurnal Novoi ekonomicheskoi assotsiatsii = Journal of the New Economic Association. 2020;(4):138–160. (In Russ.). DOI: 10.31737/2221–2264–2020–48–4–6
14. Berzon N.I., Mezentsev V.V. Application of structural and reduced models to evaluate credit default swaps for Russian companies. In: Proc. 12th Int. sci. conf. on problems of economic and social development. Bk. 1. Moscow: NRU HSE; 2012:633–642. (In Russ.).
15. Kealhofer S. Quantifying credit risk I: Default prediction. Financial Analysts Journal. 2003;59(1):30–44. DOI: 10.2469/faj.v59.n1.2501
16. Crosbie P., Bohn J. Modeling default risk. New York: Moody's KMV Co.; 2005. 31 p. URL: https://www.moodysanalytics.com/-/media/whitepaper/before-2011/12–18–03-modeling-default-risk.pdf (accessed on 29.12.2021).
17. Murphy A. An empirical analysis of the structure of credit risk premiums in the Eurobond market. Journal of International Money and Finance. 2003;22(6):865–885. DOI: 10.1016/S 0261–5606(03)00050–0
18. Drehmann M., Juselius M. Do debt service costs affect macroeconomic and financial stability? BIS Quarterly Review. 2012;(Sep.):21–35. URL: https://www.bis.org/publ/qtrpdf/r_qt1209e.pdf
19. Savvina O.V. Management of systemic financial risks in the context of globalization. Doct. econ. sci. diss. Moscow: Plekhanov Russian University of Economics; 2016. 398 p. (In Russ.).
20. Belyakov I.V. On the determinants of sovereign Eurobond spreads in Russia. Ekonomicheskaya politika = Economic Policy. 2017;12(1):200–225. (In Russ.). DOI: 10.18288/1994–5124–2017–1–08

APPENDIX

Table 1

Correlation matrix of model parameters

	bdebt	cdebt	bdsr	cdsr	brating	crating	bassets	cassets	bcds5y	ccds5y	acra	rub_vol	reser	export
bdsr	–0.08	–0.138	1											
cdsr	–0.02	0.0129	–0.059	1										
brating	0.461	0.145	0.145	0.0144	1									
crating	0.273	0.0835	–0.117	–0.016	0.362	1								
bassets	0.859	0.637	–0.003	–0.035	0.672	0.363	1							
cassets	–0.45	–0.150	–0.163	0.0481	–0.755	–0.201	–0.694	1						
bcds5y	0.163	0.230	–0.085	–0.095	–0.023	–0.411	0.163	–0.298	1					
ccds5y	0.315	0.390	–0.153	0.104	–0.051	–0.394	0.272	–0.300	0.793	1				
acra	0.136	0.248	–0.185	0.0221	–0.208	–0.291	0.0805	–0.050	0.700	0.644	1			
rub_vol	0.013	0.120	–0.179	0.0416	–0.272	–0.325	–0.016	–0.031	0.739	0.659	0.812	1		
reser	0.661	0.355	0.113	–0.057	0.872	0.549	0.824	–0.703	–0.127	–0.086	–0.21	–0.299	1	
export	0.423	0.115	0.0592	–0.062	0.757	0.550	0.600	–0.492	–0.222	–0.231	–0.2	–0.330	0.870	1
pbalance	–0.35	–0.427	0.169	–0.028	0.075	0.112	–0.275	–0.022	0.0034	–0.061	–0.01	–0.0042	0.003	0.195

Source: author's calculations in Stata.

Table 2

Correction of multicollinearity using variance inflation factor

VIF	bdebt	VIF	cdebt
LN_export	4.04	reser	9.00
LN_rub_vol	4.01	export	5.87
brating	3.56	LN_rub_vol	3.77
bassets	2.99	cassets	2.89
LN_cds5y	2.89	acra	2.46
acra	2.64	ccds5y	2.44
LN_pbalance	1.68	crating	1.66
bdsr	1.09	pbalance	1.30
		cdsr	1.02
Mean VIF	2.86	Mean VIF	3.38

Source: author's calculations in Stata.

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