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Financial Ratios and Probability of Default by Using the KMV-Merton Method in the Non-Financial Sector Listed on the Indonesia Stock Exchange

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ABSTRACT

This study **aims** to analyze the predictions of the default probability in the non-financial sector of the Indonesia Stock Exchange and the mutual influence between financial ratios. The KMV–Merton method was used for the calculations. The study was conducted on the example of data from 18 companies listed on the Indonesia Stock Exchange. The scientific materials and documentation were analyzed with the help of the EViews. The authors made the following **conclusions**: Return on Equity (ROE) has no effect on the probability of default; Current Ratio (CR) has no effect on the probability of default; Debt to Equity Ratio (DER) has a positive effect on the probability of default; Total Assets Turnover (TAT) has a negative effect on the probability of default.

Keywords: probability of default; KMV–Merton method; financial ratio; Indonesia Stock Exchange

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INTRODUCTION

The default happened in PT Mobile-8 Telecom Tbk in 2009 to 2010. This company failed to pay the 12th bond interest. In March 2009, IDX also suspended FREN stock and bonds because it could not pay the bond interest of Rp 675 billion due to the company's default; the rating agency PEFINDO downgraded the company's bonds from "CC" to "D". Defaults also occurred in PT Sunprima Nusantara Financing or SNP Finance. Previously, in December 2015 to November 2017, SNP Finance had an idA rating; then, in March 2018, the rating became idA. Finally, in May 2018, PEFINDO downgraded the SNF Finance rating to idCCC, then in the same month PEFINDO lowered its rating to idSD / selective default. In addition to SNP Finance, cases of default on bonds or interest that occurred in 2018 were also experienced by PT Express Transindo Utama and PT Tiga Pilar Sejahtera Food.

The default phenomenon experienced by many companies increasingly emphasizes the importance of measuring credit risk. The purpose of measuring credit risk is to estimate the default probability in a company when the obligation is due. There are two credit risk models, namely structural models and reduced models. The assumption of the structural model is that the company goes bankrupt when the value of the company's assets falls below the critical limit when due. The formation of structural models begins with the seminar paper by Black and Scholes in 1973. In 1974, Merton developed the model by creating a risk bankruptcy model for companies using Black-Scholes modification (Merton, 1974) [1]; so, the structural model is known as the Black-Scholes-Merton (BSM) method.

Olddrich Vasicek and Stephen Kealhofer modified and developed the Merton model to the VK model (Crosbie and Bohn, 2003) [2]. KMV (financial consulting company in the United States) then developed the VK model which finally became the KMV–Merton model. The advantage of the KMV–Merton model is that it can predict failure in quantitative form of financial ratios (Rudiyanto, 2012) [3]. With financial ratios, it can be seen whether the company has

achieved a good level of efficiency in achieving results and making optimal use of funds. By looking at the relationship between financial ratios and the possible risk of default, the interested parties can decide on the steps to see possible risks of default. In assessing bonds, rating agents are influenced by several factors, one of which is financial ratios.

Several studies on the probability of default, the KMV–Merton model and credit risk have been conducted by Hadad (2004), Fernandes (2005), Manurung (2007), Petra (2011), Asdriargo et al (2012), Konstituanto (2012), Muharam (2012), Saleh and Sudiyatno (2013), Agus et al (2014), Ayomi and Hermanto (2014), Pribadi et al (2014), Wendy (2015) and Wibowo (2017) [4–16]. Corporate credit risk in the agriculture sector using the KMV–Merton method shows that the KMV–Merton model can be used fairly well and is an early signal of credit risk and credit problems faced by public sector companies in Indonesia (Hadad, 2004) [4]. Current Ratio, Debt Service Ratio, Interest Cost and Productivity Ratio affect credit risk (Fernandes, 2005) [5]. Banks have a higher probability of default than other industry companies (Manurung, 2007) do [6]. Petra (2011), Asdriargo et al (2012), Pribadi et al (2014) [7, 8, 14] stated that the KMV–Merton model can be used in credit risk.

Several researchers, including Benos and Papanastasopoulos (2005) [17], Widarjo and Setiawan (2009) [18], Saleh and Sudiyatno (2013) [11], studied the effect of profitability on the probability of default and stated that profitability affects the probability of default. The results of research by Almilia and Kristijadi (2003) [19], Mulyaningrum (2008) [20], Konstituanto (2012) [9], and Agus et al (2014) [12] show that profitability has no effect on the probability of default. Research on the effect of liquidity on the probability of default by Almilia and Kristijadi (2003) [19], Fernandes (2005) [5], Pranowo (2010) [21], Konstituanto (2012) [9] showed that liquidity has an effect on the probability of default. The results of the study by Widarjo and Setiawan (2009) [18] and Saleh and Sudiyatno (2013) [11] did not show the effect of liquidity on the probability of default.

Research on the effect of leverage on the probability of default was conducted by Almilia and Kristijadi (2003) [19], Saleh and Sudiyatno (2013) [11]. The results of the study show that leverage affects the probability of default. The research results are inversely proportional to the results of the study by Widarjo and Setiawan (2009) [18], which states that leverage does not affect the probability of default.

Research on the effect of activity on the probability of default by Konstituanto (2012) [9], Jiming & Weiwei (2011) [22] states that activity influences the probability of default. Different results were received by Saleh and Sudiyatno (2013) [11] showing that the activity had no effect on the probability of default.

The difference in the results of the previous research is the basis of the current research. This research was conducted to reexamine the influence of financial ratios in predicting the probability of default in companies listed on the Indonesia Stock Exchange.

THEORETICAL FRAMEWORK

Signaling Theory

The signaling theory, according to Brigham and Houston (2001) [23], is the company's action in giving signals to investors about how the management views the company. The signaling theory explains how the signals of success or failure of the management (agent) are conveyed to the owner (principal). Encouragement in giving signals is due to asymmetric information between the company (management) and outsiders, where investors know that the company's internal information is relatively less and slower than that of the management. Prospective investors, who will invest in the company's bonds, need information about the condition of the bonds.

The company's management is expected to give signals in the form of information about the condition or quality of the bonds, whether they have the potential to default or not. The signaling theory in this study explains that the company's management is the party that gives signals in the form of corporate financial statements and non-financial information to rating agencies. This bond rating agency carries out the rating process so that it can issue bond ratings for these bond issuing companies. Bond ratings give a signal about the probability of the company's debt service failure.

Spence (1973) [24] argues that by giving a signal, the sender (owner of information) tries to provide relevant pieces of information that can be utilized

by the recipient. The recipient will then adjust his behavior according to his understanding of the signal. The signaling theory explains why companies strive to provide financial statements to external parties. Signals given by the managers aim to reduce information asymmetry between the company's management and external parties.

The KMV–Merton Model

Based on the Black–Scholes option theory, Merton (1974) [1] creates a structural valuation model, or Merton model. It was based on the assumption that the company's liabilities (equity and debt) are contingent claims for the company's purchases (Benos and Papanastasopoulos, 2007) [17]. According to Merton, corporate failure can be predicted with the help of the indicators of equity, total assets and corporate debt. According to Agus (2014) [12], the advantages of the KMV–Merton model compared to other models are applicable to public companies[1].

$$PD = 1 — N(DD).$$

Profitability Ratio (Return On Equity)

The company's ability to earn profits both in relation to total assets, sales and own capital is the understanding of profitability (Sartono, 2001) [25]. Return On Equity (ROE) is the ratio to measure net income after tax with own capital.

$$\text{Return on Equity (ROE)} = \frac{Net\ Income}{Equity}.$$

Liquidity Ratio (Current Ratio)

Current Ratio (CR) is the extent to which assets can be used smoothly to cover short-term liabilities or current debt (Kasmir, 2009) [26]. There is no absolute requirement regarding the level of Current Ratio, because it usually depends on the type of business the company is running, however a CR Level of 2 is considered good (Lukman, 2004) [27].

$$\text{Current Ratio (CR)} = \frac{Current\ Asset}{Current\ Debt}.$$

Leverage Ratio (Debt to Equity Ratio)

Leverage ratio is a ratio used to measure the extent to which a company's assets are financed by debt. The higher the Debt to Equity Ratio (DER) is, the less profitable it is because the higher is the risk or failure that may occur in the company (Kasmir, 2009) [26].

$$\text{Debt to Equity Ratio (DER)} = \frac{Total\ Debt}{Equity}.$$

Activity Ratio (Total Assets Turnover)

According to Hanafi and Halim (2009) [28], Total Assets Turnover (TAT) is a ratio to calculate the effectiveness of the use of total assets, so that a high ratio shows good management, otherwise a low ratio must make management evaluate its strategy, marketing and capital expenditure (investment).

$$\text{Total Assets Turnover (TAT)} = \frac{Sales}{Total\ assets}.$$

METHODOLOGY

The data used is secondary data, which is a combination of time series data for the period of 2013–2016 with cross data (cross section) for 18 companies namely, Adhi Karya, Tiga Pilar Sejahtera Food, Agung Podomoroland, Global Mediacom, Bumi Serpong Damai, Duta Anggada Realty, Intiland Development, Fast Food Indonesia, Indofood Sukses Makmur, Kimia Farma, Lautan Luas, Mitra Adiperkasa, Modernland Realty, Pembangunan Jaya Ancol, Nippon Indosari Corpindo, Summarecon Agung, Surya Semesta Internusa, and Telekomonikasi Indonesia[2]. This research was conducted on the non-financial sector companies listed on the Indonesia Stock Exchange for the period of 2013–2016 and issued bonds.

Processing and analysis are carried out as follows:

1. Analysis and calculation of the probability of default using the KMV–Merton method as follows:

Calculates the standard deviation of the growth of assets for each company.

[1] URL: http://www.pefindo.com/index.php/pageman/page/repdesc?t=desc&id=4087http://www.pefindo.com/index.php/pageman/page/repdesc?t=desc&id=6122 (accessed on 10.01.2020).

[2] URL: http://www.pefindo.com/index.php/pageman/page/repdesc?t=desc&id=4087 (accessed on 10.01.2020).

$$s = \sqrt{\frac{\sum_{t=1}^{n}(r_{t-}\bar{r})^2}{n-1}}.$$

Calculates the value of d1 formulated as:

$$d1 = \frac{\ln\frac{V_\tau}{B} + \left(r + \frac{1}{2}\sigma^2\right)\tau}{\sigma\sqrt{\tau}},$$

V_τ = is the value of total company assets at time to τ;

B = is the face value;

r = is the risk free interest rate;

τ = is the time to maturity ($T - t$);

σ = is the standard deviation calculated in the previous stage.

Calculates the distance to default formulated as follows:

$$DD = d1 - \sigma\sqrt{\tau}.$$

Calculates the probability of default from the Merton model, namely[3]:

$$PD = 1 - N(DD).$$

2. Panel data analysis was carried out with three approaches: the common effect approach, fixed effect approach and random effect approach. The panel data equation model is a combination of cross section data and time series data. This research model is as follows:

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + e,$$

$$PD = \alpha + \beta 1ROE + \beta 2CR + \beta 3DER + \beta 4TAT + e.$$

The dependent variable in this regression test is the default probability, while the independent variable is ROE, CR, DER, TAT. The formulation of the hypothesis is as follows:

H_1: Return On Equity (ROE) has a negative effect on the probability of default (PD).

H_2: Current Ratio (CR) has a negative effect on the probability of default (PD).

H_3: Debt to Equity Ratio (DER) has a positive effect on the probability of default (PD).

H_4: Total Assets Turnover (TAT) has a negative effect on the probability of default (PD).

[3] URL: http://www.pefindo.com/index.php/pageman/page/repdesc?t=desc&id=6122(accessed on 10.01.2020).

ANALYSIS AND DISCUSSION RESULTS

Panel Data Multiple Regression Test

Model selection

Two tests were carried: the Chow test and the Hausman test. The Chow test is used to choose between the common effect model and the fixed effect model. While the Hausman test is used to choose the random effect model or the fixed effect model. The results of the selected testing of the random effect model are used in the regression model to see the effect of financial ratios on the probability of default.

Classic assumption test

There is no violation of the assumption of heteroscedasticity and multicollinearity in classical assumptions. The results of heteroscedasticity and multicollinearity tests can be seen in *Table 1*.

The output results are provided in *Table 1*. Based on the heteroscedasticity test using the Glejser test, it appears that the value of the Prob. Chi-Square is 0.0922 greater than α 0.05. Thus, it can be concluded that heteroscedasticity did not occur in the data.

The multicollinearity test results can be seen in *Table 2*. If the Centered VIF value is <10, multicollinearity does not occur. Conversely, if the Centered VIF value is> 10, multicollinearity occurs. In this study, there was no high multicollinearity due to the Centered VIF of all variables smaller than 10, namely 1.156034, 1.107979, 1.211443 and 1.026463.

Significance test for the probability of default model

From the analysis of the significance tests — both t test and the statistical F test — the coefficient of determination test shows that the default probability of the model can be used.

1. Significance test t. *Table 3* shows that the probability value is (0.000) < α (α <0.05), so that the decision is sufficient evidence to reject H_0, which means that the independent variable affects the dependent variable.

2. Due to the statistical F test, it can be concluded that H_0 is rejected, there is at least one independent variable that affects the dependent variable.

3. The determination coefficient test shows that ROE, CR, DER and TAT influence 67.3687% of the default probability variables. The remaining 32.6313% is explained by other variables outside the research model.

According to *Table 4*, the significance of the regression coefficient test independent variable Return on Equity (ROE) shows a negative regression coefficient of –0.010913 with a significance level of 0.9153. The level of significance is greater than α = 10%. Therefore, it can be concluded that Return on Equity (ROE) does not affect the default probability. Current Ratio (CR) shows a positive regression coefficient of 0.012840 with a significant level of 0.3324; if a significance level is greater than α = 10%, it can be concluded that the Current Ratio (CR) does not affect the occurrence of the default probability. Debt to Equity Ratio (DER) shows a positive regression coefficient of 0.046588 with a significance level of 0.0704. With a significance level smaller than α = 10%, it can be concluded that Debt to Equity Ratio (DER) has a positive effect on the default probability. Total Assets Turnover (TAT) shows a negative regression coefficient of –0.160879 with a significance level of 0.0543. The significance level is smaller than α = 10%, so it can be concluded that the Activity Ratio (TAT) has a negative effect on the probability of default.

Table 1

Heteroscedasticity Test

Heteroscedasticity Test: Glejser			
F-statistic	2.101687	Prob. F(4,59)	0.0919
Obs*R-squared	7.981868	Prob. Chi-Square(4)	0.0922

Source: research data processed.

Table 2

Multicollinearity Test

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	1.694935	19.04133	NA
ROE	0.001213	4.097783	1.156034
CR	2.06E-05	7.714285	1.107979
DER	3.21E-05	5.474227	1.211443
TAT	3.25E-05	2.866493	1.026463

Source: research data processed.

DISCUSSION

The results of this study indicate that ROE has no effect on the probability of default. This means that the high or low value of Return on Equity (ROE) does not affect the company's ability to pay its obligations. The results of this study do not correspond to the proposed hypothesis that ROE negatively affects the default probability. If ROE is low, the company lacks the ability to use equity to generate profits and further complicates the company's finances in internal funding sources for investment.

The signaling theory states how the company should give signals to users of financial statements. The information in the form of the provision of published financial statements and bond ratings is expected to be a signal of the company's financial condition and illustrates the possibilities that occur related to the profits owned (Jogiyanto, 2013) [29]. The signaling theory suggests that the management can provide signals in the form of information about the quality or condition of bonds, whether bonds have the potential to default or not. The results of this study show that ROE has no significant effect on the possibility of default, so the signaling theory cannot help investors or creditors to learn about the condition of the company from the given signal. The results of this study are in line with the research by Konstituanto (2012), Agus et al (2014), Almilia and Kristijadi (2003), Mulyaningrum (2008) [9, 12, 19, 20]. However, this study contradicts the research by Saleh and Sudiyatno (2013), Benos and Papanastasopoulos (2005), Widarjo and Setyawan (2009) [11, 17, 18].

The results showed that CR did not significantly influence the probability of default, so the high and low CR values did not affect the probability of default. This is because the current ratio is a measure of liquidity for the short term while the probability of default is a prediction of the term long. The results of this study do not correspond to the hypothesis that CR has a negative effect on the probability of default. This study contrasts with the research conducted by Fernandes (2005), Konstituanto (2012), Almilia and Kristijadi (2003), Pranowo et al (2010) [5, 9, 19, 21], while the results of this study are in line with the results of the research conducted by Saleh and Sudiyatno (2013) and Widarjo and Setyawan (2009) [11, 18]. The number of current assets owned by non-financial sector companies taken as a sample is greater than the amount of current liabilities, so that it will be sufficient to cover the company's current liabilities. The more assets the company owns,

the company can invest in both current assets and fixed assets, the more market share will be achieved, which will then affect the company's profitability. The signaling theory states how companies should give signals to users of financial statements. The information in the form of the provision of published financial statements and bond ratings is expected to be able to signal the company's financial condition and illustrate the possibility of liquidity. The signaling theory suggests that the management can provide signals in the form of information about the quality or condition of bonds, whether bonds have the potential to default or not (Jogiyanto, 2013) [29]. The results of this study show that CR has no significant effect on the possibility of default, so the signaling theory cannot help investors or creditors to learn about the condition of the company from the given signal.

The results showed that DER had a positive effect on 6.5928% of the default probability. This means that the higher the DER is, the higher the probability of default is. The results of this study are in line with Jiming and Weiwei (2011) [22] who state that the debt to equity ratio can be used to predict the probability of bankruptcy of a company. However, this study does not support the results of the study by Widarjo and Setyawan (2009) [18] stating that the debt to equity ratio does not affect the probability of company bankruptcy. This ratio illustrates that the greater the ratio is, the greater the amount of company assets financed by debt is, so that the probability of default will also be higher. The high ratio shows that the company uses high financial leverage and the risk of the company will also be high (Hanafi and Halim, 2009) [28]. The results of this study show that DER has a positive and significant effect on the probability of default, according to the signaling theory, which can help investors or creditors to learn about the company's condition from the signals given. Spence (1973) argues that by giving a signal, the sender (owner of information) tries to provide relevant pieces of information that can be utilized by the recipient.

The results show that TAT has a negative and significant effect of –2.6038% on the default probability. This means that if the TAT value is high then the default probability value will be lower. The results of this study support the proposed hypothesis that TAT has a negative effect on the probability of default.

Table 3

Summary of Significance Tests for the Probability of Default Model

Statistic Criteria	Value
Probability	0.000 000
Prob. (F-statistic)	0.000 002
R Squared	0.673 687

Source: research data processed.

Table 4

***t* Test**

Variable	Coefficient	Prob.
ROE	–0.010 913	0.9153
CR	0.012 840	0.3324
DER	0.046 588	0.0704
TAT	–0.160 879	0.0543

Source: research data processed.

This study is in line with the research conducted by Konstituanto (2012), Jiming and Weiwei (2011) [9, 22] which state that the ratio of activity affects the probability of default. A high TAT indicates a more efficient use of assets by the company in generating sales and is expected to bring greater profit to the company. The better the financial performance achieved by the company is, the less the probability of default is. TAT has a negative and significant effect on the probability of default, so the signaling theory can help investors or creditors to learn about the condition of the company from the signals given.

CONCLUSION

The results of the analysis and discussion of the study indicate the following conclusions of the study:

1. Return on Equity (ROE) has no effect on the probability of default.
2. Current Ratio (CR) has no effect on the probability of default.
3. Debt to Equity Ratio (DER) has a positive effect on the probability of default.
4. Total Assets Turnover (TAT) has a negative effect on the probability of default.

SUGGESTION

The authors' suggestions for the development of future research:

1. It is necessary to compare models, for example, using the Z-Scoring method, if there is a difference between the influence of various financial ratios on the probability of default.
2. Increase in the number of research objects and a longer research period.
3. The next researcher can add other variables to the forecast of the probability of default, both financial ratios and non-financial ratios.

RESEARCH LIMITATIONS

1. The observation period used in this study was four years from 2013 to 2016.
2. The variables in this study are still limited (only ROE, CR, DER and TAT variables were used). Therefore, if this study is used as a reference for future research, other variables need to be added to get optimal results.

REFERENCES

1. Merton R.C. On the pricing of corporate debt: The risk structure of interest rates. *The Journal of Finance*. 1974;29(2):449–470. DOI: 10.2307/2978814
2. Crosbie P., Bohn J. Modeling default risk. New York: Moody's KMV Co.; 2003. 31 p. URL: https://www.moodysanalytics.com/-/media/whitepaper/before-2011/12–18–03-modeling-default-risk.pdf
3. Rudiyanto. Know how bond works 2. Bond Risk Analysis. 2012.
4. Hadad M.D., Wimboh S., Dwityapoetra S.B., Ita R. Probability of corporate default using the Merton model. Reseach Paper. Bank of Indonesia. 2004.
5. Fernandes J. Corporate credit risk modeling: Quantitative rating system and probability of default estimation. *SSRN Electronic Journal*. 2005. DOI: 10.2139/ssrn.722941
6. Manurung A.H. Company default probability. *Journal of Research Finance*. 2007.
7. Petru P.T. et al. Empirical study of the probability of default in case of Romanian companies listed on Stock Exchange. *Annals of the University of Oradea: Economic Science*. 2011;1(1):515–523.
8. Asdriargo A., Maruddani D.A., Hoyyi A. Credit risk measurement of bond prices using the KMV-Merton structural model approach. *Journal Gaussian*. 2012;1(1):11–20.
9. Konstituanto A., Sanim B., Manurung A.H., Hakim D.B. Bank default probability: Merton model. *Jurnal Manajemen*. 2011;15(3):293–307. (In Indones.).
10. Muharam H. Credit risk model: Approaches and factors that influence it. Seminar Nasional. 2012.
11. Saleh A., Sudiyatno B. The effect of financial ratios to predict the probability of bankruptcy in manufacturing companies listed on the Indonesia Stock Exchange. *Dinamika Akuntansi Keuangan dan Perbankan*. 2013;2(1). (In Indones.).
12. Agus S., Irwanto A.K., Maulana T.N.A. Analysis of the effect of financial ratios on the probability of bankruptcy of four banks in the LQ 45 group on the Indonesia stock exchange. *Widyariset*. 2014;17(1):163–174. (In Indones.). DOI: 10.14203/widyariset.17.1.2014.163–174
13. Ayomi S., Hermanto B. Systemic risk and financial linkages measurement in the Indonesian banking. *Buletin Ekonomi Moneter dan Perbankan = Bulletin of Monetary Economics and Banking.* 2014;16(2):103–125. (In Indones.). DOI: 10.21098/bemp.v16i2.24
14. Pribadi F., Susanto S. Merton model as predictor of failure probability of public banks in Indonesia. *Journal of Economics, Business, and Accountancy Ventura*. 2014;17(3):393–404. DOI: 10.14414/jebav.v17i3.361
15. Wendy. The credit risk assessment and failure model of the 1974 Merton model: A conceptual study. *Dinamika Akuntansi, Keuangan dan Perbankan*. 2015;4(2). (In Indones.)
16. Wibowo B. Method of bank probability bankruptcy measurement and analysis of its relationship with diversification of revenue sources: The case of Indonesian banking. *Jurnal Manajemen, Strategi Bisnis dan Kewirausahaan*. 2017;11(1):52–66. (In Indones.). DOI: 10.24843/MATRIK: JMBK.2017.V11.i01.p05
17. Benos A., Papanastasopoulos G. Extending the Merton model: A hybrid approach to assessing credit quality. *Mathematical and Computer Modelling*. 2005;46(1–2):47–68. DOI: 10.1016/j.mcm.2006.12.012
18. Widarjo W., Setiawan D. The effect of financial ratios on financial distress conditions in automotive companies. *Jurnal Bisnis dan Akuntans*. 2009;11(2):107–119. (In Indones.). DOI: 10.34208/jba.v11i2.174

19. Almilia L. S., Kristijadi K. Financial ratio analysis to predict the financial distres conditions of manufacturing companies listed on the Jakarta Stock Exchange. *Jurnal Akuntansi dan Auditing Indonesia*. 2003;7(2):183–210. (In Indones.).
20. Mulyaningrum P. Effect of financial ratios on bankruptcy in Indonesia Doctoral dissertation. Program Pascasarjana Universitas Diponegoro. 2008.
21. Pranowo K. et al. Determinant of corporate financial distress in emerging market economy: Empirical evidence from the Indonesian Stock Exchange 2004–2008. *International Research Journal of Finance and Economics*. 2010;(52):81–90. URL: http://achsani.blog.mb.ipb.ac.id/files/2010/11/irjfe_52_08.pdf
22. Li J., Du W. An empirical study on the corporate financial dstress prediction based on logistic model evidence from China's manufacturing industry. *International Journal of Digital Content Technology and its Applications*. 2011;5(6):368–379. URL: http://www.globalcis.org/jdcta/ppl/44_%20JDCTA_June-48.pdf
23. Brigham E., Houston J.F. Fundamentals of financial management. Transl. from Eng. Jakarta: Four Salemba; 2001. (In Indones.).
24. Spence M. Job market signaling. *The Quarterly Journal of Economics*. 1973;87(3):355–374. URL: https://msu.edu/~conlinmi/teaching/EC 860/signallingscreening/SpenceQJE 1973.pdf
25. Sartono A. Financial management theory and application. 4th ed. Transl. from Eng. Yogyakarta: BPFE; 2001. (In Indones.).
26. Kasmir. Analysis of financial reports. Jakarta: Rajawali Pers; 2009. (In Indones.).
27. Lukman, Syamsuddin. Corporate financial management. Jakarta: PT Raja Grafindo; 2004. (In Indones.).
28. Hanafi M.M., dan Halim A. Financial statement analysis. Yogyakarta: UPP STIM YKPN; 2009. (In Indones.).
29. Hartono J. Portfolio theory and investment analysis. 8th ed. Yogyakarta: BPFE; 2013. (In Indones.).

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ORIGINAL PAPER

Comparative Analysis of ARIMA and LSTM Predictive Models: Evidence from Russian Stocks

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ABSTRACT

The article **aims** to find the best time series predictive model, considering the minimization of errors and high accuracy of the prediction. The authors performed the comparative analysis of the most popular "traditional" econometric model ARIMA and the deep learning model LSTM (Long short-term memory) based on a recurrent neural network. The study provides a mathematical description of these predictive models. The authors developed algorithms for predicting time series based on the "Rolling forecasting origin" approach. These are Python-based algorithms using the Keras, Theano and Statsmodels libraries. Stock quotes of Russian companies Alrosa, Gazprom, KamAZ, NLMK, Kiwi, Rosneft, VTB and Yandex for the period from June 2, 2014 to November 11, 2019, broken down by week, served as input data. The research **results** confirm the superiority of the LSTM model, where the RMSE error is 65% less than with the ARIMA model. Therefore, an LSTM model-based algorithm is more preferable for the better quality of time series prediction.

Keywords: ARIMA; LSTM; predictive models; stocks; analysis; stock quote prediction; algorithms

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INTRODUCTION

Time series prediction is difficult, mostly due to unexpected changes in the economy and information asymmetry. Due to market volatility, the quality of regression predictive modeling has recently been a major concern. Therefore, it must be carefully evaluated.

A time series is a sequence of observation values taken at successive equally spaced points in time. Examples of a time series may include production output, number of insurance products sold, floods, etc. Time series are widely used in statistics, signal processing, pattern recognition, econometrics, finance, astronomy, engineering, and most other human activities, which involve temporal measurements. Time series analysis comprises methods for analyzing time series data in order to extract meaningful information to predict future values based on previously observed values.

Time series data have a natural temporal ordering. This makes time series analysis distinct from cross-sectional studies (e.g. explaining people's wages by reference to their gender). Time series analysis is also distinct from spatial data analysis (the dependence of wages on the region). Time series models reflect the fact that observations close together in time will be more closely related than observations further apart.

The aim of this work is the best time series predictive model, considering the minimization of errors and high accuracy of the prediction.

In the context of predicting financial time series, the ARIMA model (autoregressive integrated moving average model, sometimes called the Box-Jenkins model) is one of the

most popular and frequently used time series models [1]. Popular models of deep learning are RNN (recurrent neural network) [2] and its modification LSTM (long short-term memory), introduced by Z. Hochreiter and J. Schmidhuber in 1997 [3]. Deep learning allows you to find complex patterns in sequential spatial chains. For example, a recurrent neural network is used to recognize handwritten text and speech. The LSTM model, in particular, was used to predict the volatility of the S&P 500 index [4–6].

This article compares the ARIMA and LSTM models, and the criterion for comparison is minimizing the prediction errors. The ARIMA model was selected due to its ability to work with non-stationary data. Among other deep learning models, LSTM was chosen as the most suitable model for predicting time series with the capacity to preserve memory for a long period of time.

ALGORITHMIC TRADING

Over the past few decades, algorithmic trading has been actively developing due to a combination of factors: rapid development of machine learning methods, development of data processing and analysis technologies, growing capacities for more data storage and processing. Besides, the complexity of trading system algorithms used by market participants is growing, as they compete not only with those who do not use automated systems, but also with each other. Therefore, the study of applying various machine learning algorithms to algorithmic trading problems is an urgent issue. These studies are of interest not only to algorithmic trading companies, such as hedge funds, but also to the scientific community: applying machine learning algorithms to the field in question can bring new knowledge to the development of machine learning as a branch of computer science that can be applied to other subject areas.

The theoretical value of the work is the development of research on applying machine learning methods to algorithmic trading. Moreover, similar methods can be applied to other subject areas when searching for a strategy for the most accurate prediction of the next value of the time series to maximize profits. The practical value of the work is the possibility to create software products for stock trading based on the studied algorithms.

MACHINE LEARNING IN THE STOCK MARKET

Stock market is a public trading platform for buying and selling securities of various companies. The successful prediction of a stock's future price is an important economic task for a wide range of companies, since could yield significant profit. From the very beginning of stock markets, people have been looking for and developing ways to predict stock quotes as accurately as possible. As a result, there are three main approaches: fundamental analysis, technical analysis and technological methods. Sometimes, these approaches have mutually exclusive results within one task (some predict the future value; the others predict the direction of movement for a given period). However, all of them are used for trading on stock markets. Improving prediction accuracy remains relevant for all companies in stock markets. This paper is devoted to applying machine learning (including deep learning) to prediction in the stock market. Both classical machine learning and neural networks are employed as predictive tools. However, reinforced learning and genetic algorithms have not become so popular and developed as many classical algorithms (random forest, support vector method). A feedforward neural network and a backpropagation neural network (as a learning method) are one of the known types of neural networks. In trading on the stock market, neural networks can imitate the actions of an agent performing certain tasks. Data preprocessing is an important step in building neural networks. Many researchers propose their own solutions, since there are no standard procedures for preprocessing input data due to the wide variety of both data and types of preprocessing. On the contrary, output data within a specific task can be uniquely determined and take the form of financial or economic indicators. As for the

evaluation of the results, comparing the results of the algorithm with the values from the test sample is most common.

MACHINE LEARNING METHODS

The most traditional way to apply machine learning to algorithmic trading is to learn with a teacher (supervised learning). The target variable, whose value is predicted by the algorithm, is the change in the price of an asset over a certain period of time or, alternatively, market volatility. At the beginning, machine learning prediction on stock exchanges often used simple and well-studied decision trees of the support vector machine. Technical market indicators are usually the input features of such algorithms. After neural networks were successfully applied to other tasks, such as natural language processing, they were used in algorithmic trading, for example, to predict price changes in the market affected by emerging political or economic news. It became possible to extract market signals from unstructured information. Reinforcement learning is one of the fast-growing method of machine learning. It helped to achieve such results as the ability of a computer to play various games on the Atari simulator without knowing the game rules at a level exceeding the level of a person.

Reinforcement learning had been applied to the tasks of algorithmic trading before. However, supervised learning was more common, since it helped achieve better results. Recently, the success achieved through reinforcement learning in other areas has increased interest in applying this type of algorithms to algorithmic trading.

Genetic algorithms are successfully used in a wide range of application areas, for example, robotics. One can use genetic algorithms in generalized problems, such as building ensembles of machine learning algorithms to improve the accuracy of individual algorithms and building decision trees. Genetic algorithms also show their effectiveness in such tasks. In algorithmic trading, they were initially used mainly to generate the so-called trading rules. This method employs genetic algorithms to create functions of technical market indicators, the most accurate in predicting price changes of an asset over a certain period. Currently, genetic algorithms are used to build automated trading systems.

TIME-SERIES RESEARCH

Time-series analysis is an interesting field of research applied in numerous practical fields such as business, economics, finance and computer science. Time-series analysis aims to study its dynamics, to build a model describing data structure and, finally, to predict future values of the series. Building an effective model with the highest possible accuracy is critical.

Econometrics has traditionally been involved in time series prediction by various methods. The ARIMA model has long been considered the standard in this field. However, the common ARIMA model has some constraints. For example, it is difficult to model nonlinear relationships between variables by means of the ARIMA model. The model presupposes a constant standard deviation of errors, not observed in practice. An integrated approach with the GARCH model (Generalized auto-regressive conditional heteroscedasticity) helps ease this restriction, but building and optimizing the model becomes more difficult. In this sense, the GARCH model is intended to clarify volatility clustering in financial markets [7].

Traditional machine learning has suggested new approaches to prediction. Algorithms such as the Support Vector Machines (SVM) and the Random Forest (RF) are well-deserved attention of experts in many areas, including finance. Application of deep learning algorithms was the next step.

To predict time-series, deep learning most frequently uses the LSTM model, a special type of convolutional neural network. Despite the relative novelty of this method, the deep learning approach has gained widespread popularity among researchers. For example, K. Krauss and his colleagues used predictive approaches — deep learning, gradient-boosted-trees and random forest — to model the S&P 500 [8]. The

results are the conclusions about the low productivity of deep learning models and their difficulty. Various models were compared based on economic data [9, 10].

ARIMA AND LSTM MODELS AND PREDICTIVE CALCULATIONS

A mathematical description of the ARIMA and LSTM predictive models is following.

ARIMA is a generalized ARMA (Autoregressive moving average) model that combines AR (Autoregressive) and MA (Moving average) processes. As indicated in the acronym of the model, ARIMA (*p, d, q*) consists of the following parts [1, 11]:

AR — autoregressive. A regression model that uses the relationship between observations and the number of integrated observations (*p*);

I — integrated. To ensure stationarity by taking differences (*d*);

MA — moving average. An approach that analyzes the relationship between observations and residuals when applying the model to integrated observations (*q*).

A simple form of an AR model of order p, i.e., AR(*p*), can be written as a linear process given by:

$$x_t = c + \sum_{i=1}^{p} \varphi_i x_{t-1} + \in_i, \qquad (1)$$

where x_t — represents the stationary variable; c is the constant; φ_i — are autocorrelation coefficients; and $\in_i$ — the residuals, are the Gaussian white noise series with mean zero.

A simple form of an MA model of order *q*, i.e., MA(*q*), can be written as follows:

$$x_t = \mu + \sum_{i=0}^{q} \theta_i \in_{t-1}, \qquad (2)$$

where μ — is the mathematical expectation of the process (usually assumed to be equal to zero); θ_i — is weights; θ_0 — assumed to be equal to 1; $\in_t$ — is the Gaussian white noise with mean zero. The combination of these two models provides an ARIMA model of order (*p, q*):

$$x_t = c + \sum_{i=1}^{p} \varphi_i x_{t-1} + \in_i + \sum_{i=0}^{q} \theta_i \in_{t-1}. \qquad (3)$$

The parameters *p* and *q* are called the order of AR and MA, respectively. ARIMA allows predictions on non-stationary data due to the integration introduced into the model. This is achieved by taking differences — subtracting the levels of the time series from each other.

Given the seasonality of time series, short-term components are likely to make a significant contribution to the model. Thus, the model should also consider seasonality — seasonal ARIMA (seasonal ARIMA — SARIMA). The most important steps are to evaluate the coefficients of the model. If the variance grows over time, it is necessary to use stabilizing variance transformations and taking differences. Using the autocorrelation function and the private autocorrelation function, one should measure the linear relationship between the observations and *q*.

LSTM is a type of the convolutional neural network able to "remember" the values of the previous observations for future use. For more information about the LSTM model, we will provide some definitions and explanations [2, 3].

Artificial neural network is a neural network consisting of at least three layers: input, hidden and output. The number of variables in the dataset determines the dimension or number of nodes in the input layer. These nodes are connected by edges. Each edge carries some weight, on which it depends whether the signal can pass through the layer or not. When an artificial neural network learns, the weights based on the data are changing. In hidden layers, nodes use an activation function (for example, a sigmoid) on a weighted sum of input data to convert it to the output (in this case, predictions). The output layer generates a probability vector for various predicted values and selects one with the least error. Weights cannot be optimal immedi-

ately, so the neural network learns considering the result of the previous iteration. These iterations are called epochs, and the weights change until an optimal (given) value is reached.

Recurrent neural network (convolutional neural network) is a special neural network, aiming to predict the next observation in the series. The idea behind the RNN is the desire to extract useful information from a series of observations to make predictions. Therefore, it is necessary to remember earlier observations. In the RNN model, the inner layer serves to store information from previous observations of the series. The main problem is to remember a small number of previous observations, which is not suitable for long (financial, economic) periods. LSTM networks were developed to solve this problem.

Long short-term memory neural network is an artificial convolutional neural network used in the field of deep learning. Unlike standard feedforward neural networks, LSTM has feedback connections. It cannot only process single data points (such as images), but also entire sequences of data (such as speech or video). Therefore, LSTM is applicable to tasks such as handwriting recognition, speech recognition and anomaly detection in large data streams (network traffic, banking transactions). LSTM networks are well-suited to classifying, processing and making predictions based on time series data, since there can be lags of unknown duration between important events in a time series. This time lag leads to exploding and vanishing gradient problems that can be encountered when training traditional RNNs. Insensitivity to gap length is an advantage of LSTM over RNNs.

There are three layers in LSTM networks:

1. Forget gate — a number from 0 to 1 is output, where 1 indicates the need for complete storage, and 0 completely erases from memory.
2. Memory gate selects which data to store. First, a sigmoid layer helps select values to store.
3. Output gate selects information from each cell that has stored it.

COMPARATIVE ANALYSIS OF ARIMA AND LSTM MODELS

To compare the ARIMA and LSTM models, the authors conducted experiments on financial data in the form of time series. The main research question is which algorithm, ARIMA or LSTM, allows better time series prediction.

The authors collected[1] historical data on stock prices of Russian enterprises: Alrosa, Gazprom, KAMAZ, NLMK, QIWI, Rosneft, VTB and Yandex. Each data set contains values such as 'Open', 'High', 'Low', 'Close', 'Volume'. For analysis, we selected the 'Close' value for the period from June 2, 2014 to November 11, 2019, broken down by week. We also divided the data into training and test sets, in the ratio of 70% to 30%, not mixed. We used the training dataset to train the model, and the test set to assess the quality of its training. *Fig. 1* presents the graphs of the collected data.

The RMSE (Root Mean Square Error) is used to assess the quality of model prediction. It measures the difference between the true and predicted values. The formula of the indicator is as follows [12]:

$$RMSE = \sqrt{\frac{1}{N}\sum_{1}^{N}(x_i - \widehat{x_i})^2}, \qquad (4)$$

where N $_N$is the total number of observations; and $\sum_{1}(x_i - \widehat{x_i})$ represents the square of the sum of the differences of the true value and the prediction of the model. The main advantage is that the RMSE penalizes the largest errors.

DEVELOPMENT OF ARIMA AND LSTM ALGORITHMS

To predict time series, the authors developed the algorithms based on the "Rolling forecasting origin" [13]. The algorithm is based on pre-

[1] URL: https://www.finam.ru/profile/moex-akcii/gazprom/export/ (accessed on 14.11.2019).

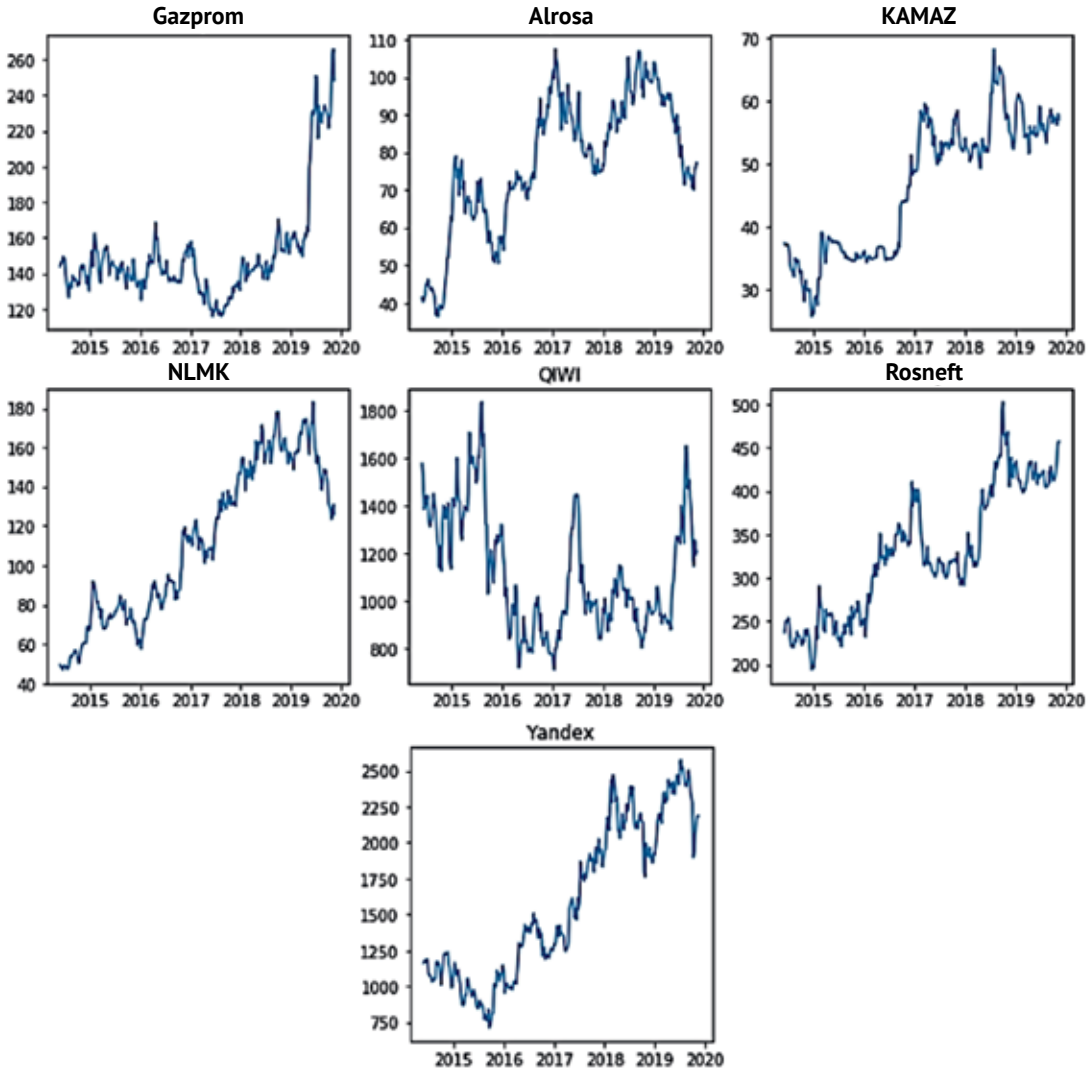

Fig. 1. **Stock performance of Russian companies**

Source: compiled by the authors.

dicting the next point in the time series of each data set. The approach uses training data sets, each containing one observation more than the previous one. There are several different variations of this algorithm, among which are:

1. One-step prediction without revaluation. The model evaluates a training set and then calculates the prediction one step ahead.

2. Multi-step prediction without revaluation. Similar to the previous one, however, the prediction is given for the next few steps.

3. Multi-step prediction with revaluation. The prediction is calculated several steps forward, however, the model is trained anew at each iteration before the prediction.

This article uses an algorithm building a new model every time new data comes in. The algorithms are implemented in Python[2] with the connected libraries Keras, Theano and Statsmodels.

Fig. 2 shows a sliding window algorithm for the ARIMA model. The ARIMA algorithm is divided into the following stages:

1) the input data (each financial time series) is divided into training and test sets;

2) additional structures are created (arrays where records are stored and changes are made

[2] URL: https://www.python.org/ (accessed on 15.01.2020).

```
# Rolling ARIMA
Input: time series
Output: forecast RMSE
# Splitting the data into training and testing datasets
# 70% for training and 30% for testing ones
1. size ← length(series) * 0.70
2. train ← series[0...size]
3. test ← series[size...length(size)]
# Data structure preparation
4. history ← train
5. predictions ← empty
# Forecast
6. for each t in range(length(test)) do
7. model ← ARIMA(history, order=(5, 1, 0))
8. model fit ← model.fit()
9. hat ← model_fit.forecast()
10. predictions.append(hat)
11. observed ← test[t]
12. history.append(observed)
13. end for
14. MSE = mean_squared_error(test, predictions)
15. RMSE = sqrt(MSE)
16. Return RMSE
```

Fig. 2. **Sliding window algorithm for ARIMA model**

Source: compiled by the authors.

about "current" historical data, predictions) to train the model;

3) the model is trained on the current data set and makes a prediction, which is then written to the predictions array and changes the history array;

4) the RMSE metric is calculated for the ARIMA model.

Fig. 3 shows a sliding window algorithm for the LSTM model.

Unlike regression models, there is a sequence of dependencies between input variables in the time data analysis. Convolutional neural networks capture such dependencies very well.

The LSTM algorithm is divided into the following steps:

1) the data is divided into training and test sets;

2) random_state parameter is fixed to reproduce the results;

3) fit_lstm function is defined, the data set, the number of epochs and the number of neurons are taken for arguments;

4) the hidden layer is created;

5) the optimization algorithm and loss function (Adam and MSE) are specified;

6) then, the model is trained, while its internal state is restored (code, line 12) to the original one each time;

7) a prediction is made and the RMSE metric is calculated for the LSTM model.

ALGORITHM PERFORMANCE RESULTS

Fig. 4 presents algorithm performance results. On the financial time series, the LSTM model performed better than the ARIMA model. The values of the RMSE models are 10.8 and 26.7, respectively. Using the LSTM model reduces the RMSE value by 65% compared to the ARIMA model.

CONCLUSIONS

The comparative analysis of the two algorithms based on the LSTM and ARIMA models determined the superiority of the LSTM model over the ARIMA model in terms of minimizing the RMSE standard error. The RMSE error value of

```
# Rolling LSTM
Inputs: Time series
Outputs: RMSE of the forecasted data
# Split data into:
# 70\% training and 30\% testing data
1. size ← length(series) * 0.70
2. train ← series[0...size]
3. test ← series[size...length(size)]
# Set the random seed to a fixed value
4. set random.seed(7)
# Fit an LSTM model to training data
Procedure fit_lstm(train, epoch, neurons)
5. X ← train
6. y ← train - X
7. model = Sequential()
8. model.add(LSTM(neurons), stateful=True))
9. model.compile(loss='mean_squared_error',
optimizer='adam')
10.for each i in range(epoch) do
11. model.fit(X, y, epochs=1, shuffle=False)
12. model.reset_states()
13.end for
return model
# Make a one-step forecast
Procedure forecast_lstm(model, X)
14. yhat ← model.predict(X)
return yhat
15. epoch ← 1
16. neurons ← 4
17. predictions ← empty
# Fit the lstm model
18. lstm_model = fit_lstm(train,epoch,neurons)
# Forecast the training dataset
19. lstm_model.predict(train)
# Walk-forward validation on the test data
20. for each i in range(length(test)) do
21. # make one-step forecast
22. X ← test[i]
23. yhat ← forecast_lstm(lstm_model, X)
24. # record forecast
25. predictions.append(yhat)
26. expected ← test[i]
27. end for
28. MSE ← mean_squared_error(expected,
predictions)
29. Return (RMSE ← sqrt(MSE))
```

Fig. 3. **Sliding window algorithm for LSTM model**

Source: compiled by the authors.

	Company name	LSTM RMSE	ARIMA RMSE	Reduction in RMSE, %
0	Alrosa	1.120	3.040	63.158
1	Gazprom	3.810	8.170	53.366
2	Kamaz	0.380	1.760	78.410
3	NLMK	1.190	5.340	77.715
4	QIWI	25.320	63.130	59.892
5	Rosneft	4.610	13.730	66.423
6	Yandex	39.190	91.670	57.249
7	Average	10.803	26.691	65.173

Fig. 4. **ARIMA and LSTM algorithm execution results**

Source: compiled by the authors.

the LSTM model is less than the corresponding error for the ARIMA model by an average of 65%.

Currently developing big data analysis technologies, machine learning algorithms and, in particular, deep learning algorithms are gaining popularity among researchers in various fields of science. The main issue is the accuracy and adequacy of new approaches compared to traditional methods. The article compares the prediction accuracy of the ARIMA and LSTM models, representing two different methods. Both models were applied on various sets of financial data — the time series of closing prices at the end of the week. The results show the superiority of the LSTM model.

There are numerous tasks of quality assessment of models. The authors mentioned only some aspects. Studying and applying new algorithms for processing big data based on neural networks, large graphs and machine learning seems appropriate to study the financial market instruments of Russian companies. In this sense, an aggregated approach combining different approaches and algorithms seems promising.

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REFERENCES

1. Magnus Ya.R., Katyshev P.K., Peresetsky A.A. Econometrics. Beginner course. Moscow: Delo; 2007. 504 p. (In Russ.).
2. Schmidhuber J. Habilitation. System modeling and optimization. Postdoctoral thesis. Munich: Technical University of Munich; 1993. 209 p. (In German).
3. Hochreiter S., Schmidhuber J. Long short-term memory. *Neural Computation*. 1997;9(8):1735–1780. DOI: 10.1162/neco.1997.9.8.1735
4. Brownlee J. Time series prediction with LSTM recurrent neural networks in Python with Keras. Machine Learning Mastery. 2016. URL: https://machinelearning mastery.com/time-series-prediction-lstm-recurrent-neural-networks-python-keras
5. Gers F.A., Schmidhuber J., Cummins F. Learning to forget: Continual prediction with LSTM. *Neural Computation*. 2000;12(10):2451–2471. DOI: 10.1162/089976600300015015
6. Kratovich P.V. Neural networks and ARIMA models for predicting quotes. *Programmnye produkty i sistemy = Software & Systems*. 2011;(1):95–98. (In Russ.).

7. Garcia F., Guijarro F., Moya I., Oliver J. Estimating returns and conditional volatility: A comparison between the ARMA-GARCH-M models and the backpropagation neural network. *International Journal of Complex Systems in Science*. 2012;1(2):21–26.
8. Krauss C., Do X.A., Huck N. Deep neural networks, gradient-boosted trees, random forests: Statistical arbitrage on the S&P 500. *European Journal of Operational Research.* 2017;259(2):689–702. DOI: 10.1016/j.ejor. 2016.10.031
9. Chung J., Lee D., Seo Y., Yoo C.D. Deep attribute networks. NIPS Workshop on Deep Learning and Unsupervised Feature Learning. 2012;3. URL: http://www.eng.uwaterloo.ca/~jbergstr/files/nips_dl_2012/Paper%2011.pdf
10. Fischer T., Krauss C. Deep learning with long short-term memory networks for financial market predictions. *European Journal of Operational Research*. 2018;270(2):654–669. DOI: 10.1016/j.ejor.2017.11.054
11. Eliseeva I.I., ed. Econometrics. Moscow: Finansy i statistika; 2006. 576 p. (In Russ.).
12. Armstrong J.S., Collopy F. Error measures for generalizing about forecasting methods: Empirical comparisons. *International Journal of Forecasting*. 1992;8(1):69–80. DOI: 10.1016/0169–2070(92)90008-W
13. Hyndman R.J., Athanasopoulos G. Forecasting: Principles and practice. 2nd ed. Melbourne: OTexts; 2018. 382 p.

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OVERVIEW

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Trends of Project Finance in the World Market and in Arab Countries

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ABSTRACT

Over the years, project finance has proved to be one of the innovative techniques in bridging the resource constraints faced by most governments in financing large developmental investments. In this regard, the current state and dynamics of indicators of the world project finance market, as well as the role and place of the Arab economy in this global phenomenon, are interesting. The **aim** of the article is to review the features of project financing in the world and in Arab countries, mainly in the GCC region. The article employed the **methods** of statistical analysis, regression modelling. The author analysed historical data on the volume, dynamics, and structure of project financing in the GCC countries. The study **revealed** the use of project finance in 18 Arab countries, primarily concentrated in three areas: energy and water supply, petrochemicals, and the oil and gas industry. The author **concluded** that there is a growing tendency to use Islamic project finance structure.

Keywords: project finance; Islamic project finance; Gulf Cooperation Council (GCC)

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INTRODUCTION

Project finance has over the years proved to be one of the innovative techniques in bridging the resource constraints faced by most governments in financing large developmental investments, it is an efficient way to fund capital-intensive and strategically important projects such as long-term infrastructure, industrial, or public services.

Despite the increasing trend in using project finance in the world, published empirical studies on the topic are limited [1]. The majority of these published articles and working papers are theoretical rather than practical studies, focusing primarily on a detailed examination of individual narrow aspects such as risk management, types of interaction schemes used between participants, contractual framework, and credit structure.

P. Nevitt [2] was one of the first authors who justified the concept of project financing, presenting the general theory of project financing. Many texts (S. Gatti, F. Fabozzi, A. Fight, M. Khan, R. Parra, M. Morrison) [3–7] contain detailed descriptions, analyses, and examples of project financing. The works by B. Esti [8, 9] are highly specialized and mainly devoted to risk analysis. While the materials published by international financial organizations, such as the World Bank [10], are mostly presented in the form of databases, which should be analyzed by the reader.

Kleimeier and Megginson [11] indicated that project finance is mainly used in infrastructure and the utilities sector, where it is easy to create project structures with clearly identified cash flow streams. Kleimeier and Versteeg [12] argued that project finance can offset the lack of institutional and financial development and it can be well adapted to the least developed countries. Based on empirical data analysis of data from 90 countries, they found that project finance was a powerful driver of economic growth in low-income countries.

The work by H. Davis [13] consists of 38 case studies of project financing covering energy, water, resources and infrastructure projects in a variety

of countries, which illustrate different aspects of project finance across the world.

Among the works devoted to project finance in Russia, it is necessary to note the works by I. Nikonova, A. Smirnov, G. Kalmykova, V. Kasatonov, D. Morozov, Eh. Fait, V. Fauzer, I. Rodionov, etc [14–19]. They examined the main features of project financing, presented practical examples of project financing in the CIS and abroad. The modern tools for managing risks arising from the implementation of large investment projects, and ways to minimize them are described.

Existing literature suggests many definitions of project finance. Triantis defines project finance as the art and skill of piecing together new business development elements, financial engineering techniques, and a web of contractual agreements to develop competitive projects and make the right decisions to raise funding for industrial or infrastructure projects on a limited/nonrecourse basis where lenders look to the cash flow for loan repayment and the project assets for collateral [20]. While Finnerty contends that project finance may be defined as the raising of funds on a limited-recourse or nonrecourse basis to finance an economically separable capital investment project in which the providers of the funds look primarily to the cash flow from the project as the source of funds to service their loans and provide the return of and the return on their equity invested in the project [21].

So, the principles of project finance can be summarized as [22]:

- The project usually relates to major infrastructure with a long construction period and long operating life. Therefore, the financing must also be for a long term (typically 15–25 years).
- Lenders rely on the future cash flow projected to be generated by the project to pay their interest and fees, and repay their debt.
- There is a high ratio of debt to equity ('leverage' or 'gearing') — roughly speaking, project finance debt may cover 70–90% of the capital cost of a project.
- The Project Company's physical assets are likely to be worth much less than the debt if they are sold off after a default on the financing, and in projects involving public infrastructure they cannot be sold anyway.
- The project has a finite life, based on such factors as the length of the contracts or licenses, or reserves of natural resources. So, the project-finance debt must be fully repaid by the end of the project's life.
- There are no guarantees from the investors in the Project Company for the project-finance debt. This is 'non-recourse' finance.

The synthesis and analysis of data on project financing is significantly complicated due to the difficulty of identifying compliance with the above characteristics. In fact, the only formalized source of information on a systematic basis is data on loans attracted for project purposes.

THE DEVELOPMENT OF PROJECT FINANCING IN THE WORLD

The analysis of the state of the global market for project finance allows us to state that in recent years there has been a clear trend of growth in the use of this type of financing.

The synthesis and analysis of data on project financing is significantly complicated due to the difficulty of identifying compliance with the above characteristics. In fact, the only systematic source of information that can be formalized is data on loans attracted for project finance purposes, which are often classified according to the purposes of obtaining a loan declared by the borrower. This information on transactions is available at several organizations including Thompson Reuters and Dealogic, which publish regular information of deal activity and compile league tables summarising the activities of the key players in the market. *Table 1* summarises the project finance market information for 1995–2018 from Thompson Reuters.

The analysis of the volume dynamics of project finance transactions in the global market allows us to state that in recent years, the use of project finance has grown dramatically from $ 23.33 bn per annum in 1995 to reach a peak of $ 282.7 bn in 2018, financing around 11000 transactions in 158 countries, with a total amount of project finance raised between 1995 and 2018 amounting to $ 3771 bn. The USA with

Table 1

Size and number of project finance transactions in 1995–2018

Year	Total loans ($ bn)	Annual change %	Number of transactions	Number of countries	Year	Total loans ($ bn)	Annual change %	Number of transactions	Number of countries
1995	23.33	–	–	36	2007	219.99	21.8%	616	75
1996	42.83	83.6%	–	36	2008	250.56	13.9%	689	77
1997	67.43	57.4%	–	49	2009	139.19	–44.4%	461	63
1998	56.65	–16%	–	57	2010	208.17	49.6%	598	62
1999	72.39	27.8%	–	56	2011	213.49	2.6%	615	70
2000	110.89	53.2%	–	55	2012	198.75	–6.9%	538	61
2001	108.48	–2.2%	314	66	2013	203.03	2.2%	584	69
2002	62.17	–42.7%	284	65	2014	260.25	28.2%	704	77
2003	69.56	11.9%	302	67	2015	277.73	6.7%	791	81
2004	116.44	67.4%	472	65	2016	236.46	–14.9%	770	75
2005	140.30	20.5%	513	67	2017	229.64	–2.9%	791	80
2006	180.61	28.7%	541	62	2018	282.68	23.1%	871	86

Source: author's calculations according to the PFI League Tables. URL: http://www.pfie.com/ (accessed on 05.12.2019).

$ 578.7 bn accounts for most project finance (followed by Australia $ 370.2 bn and the UK $ 313.3 bn).

The project finance market before the financial crisis from 2000 to 2008 can be characterized based on the following data:

- total project finance loans amounted to $ 1259 bn;
- a total of 4325 loans were granted to finance projects;
- the average annual growth rate of financing was 19.2%.

Using this type of financing had been a clear trend of growth until 2008, when this sector of the international financial market reached $ 250.6 bn. However, in 2009 the volume of project finance in the world fell back to the 2005 level, decreasing by 44% compared to 2008 due to the global financial crisis, amounted to $ 139.2 bn which was the lowest figure in the last 15 years.

The project finance market after the financial crisis from 2010 to 2018 can be characterized based on the following data:

- total project finance loans amounted to $ 2210.2 bn;
- a total of 6262 loans were granted to finance projects;
- the average annual growth rate of financing was 9.7%

This form of financing has also been used extensively in emerging economies such as in China ($ 34.7 bn) and India ($ 274.8 bn). Since 2005, India has been among the top ten countries attracting project finance. India ranked on top in the global project finance market in 2009, 2010 and 2011, accounting for 21.5%, 26.3%, 21.05% of the global project finance market respectively, ahead of the UK, Australia, and the USA.

According to Thomson Reuters, from an industry perspective on the international project finance market, the energy sector has been the leading sector in applying project finance since 1995. It has accumulated at least 30%, reaching a maximum of 53.5% in 2017, except 1997, when the telecommunication sector took first place (27.6%) ahead of the

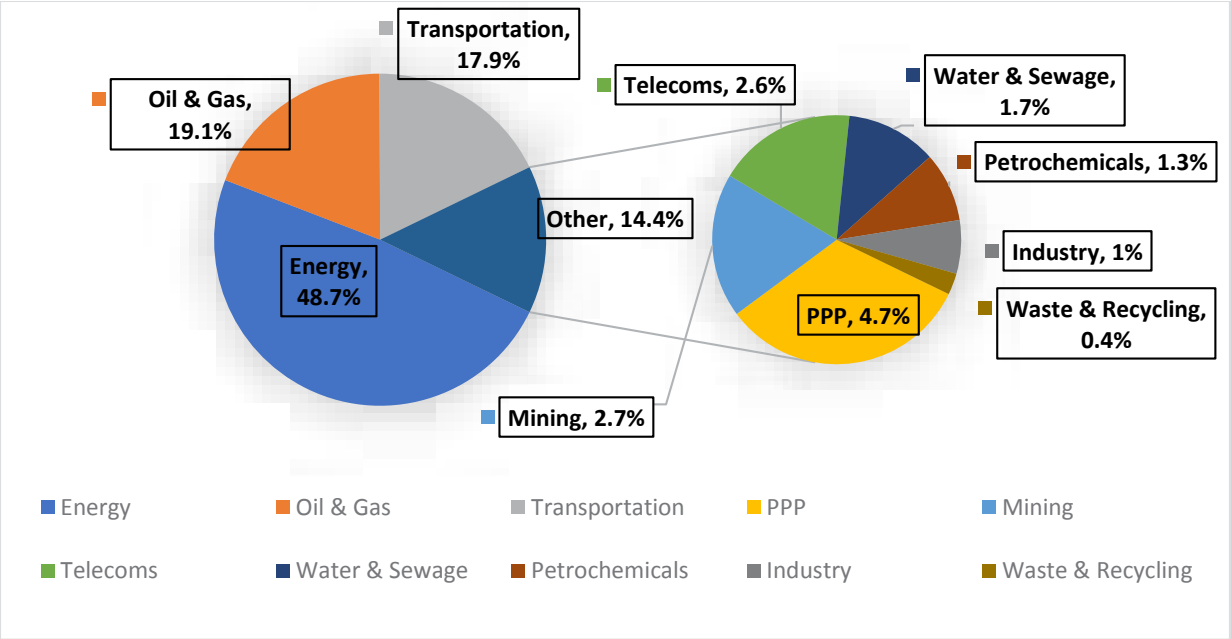

Fig. 1. **Sectoral structure of the global market for project finance in 2018**

Source: author's calculations according to the PFI League Tables. URL: http://www.pfie.com/ (accessed on 05.12.2019).

energy sector (24.9%). While in recent years, the oil and gas industry and the transport sector have shared the second place with an average value of 20% for both industries from 2009 to 2018.

In 2018, the main industries that used transactions involving project financing were the energy (48.7%, $ 137.63 bn), oil and gas (19.1%, $ 54.07 bn), and transport (17.9%) ones, as shown in *Fig. 1*. These fairly capital-intensive sectors form a significant part of the national infrastructure, have predictable sources of income, which makes them suitable for project financing [23].

On a regional basis, the distribution of the transactions by region is shown in *Fig. 2* for the period of 2007–2018. The market is divided into the Americas, EMEA (Europa, Middle East and Africa) and Asia Pacific. Until 2009, EMEA was the leader in the number and volume of project finance transactions followed by the Asia-Pacific region. Asian project finance activity has been particularly driven by infrastructure finance in India and the natural resources sector in Australia [24]. In 2011, India and Australia made up one-third of the project loans market. When the global financial crisis happened, the reduction in the volume of transactions in the European region and the Asia-Pacific region took the first place for the years from 2010 to 2012.

However, since 2013 and today, the sector of the EMEA region has again dominated, with an average of 41.19% of the global market for 2013–2018. The majority of transactions are conducted in UK, France, Turkey and Saudi Arabia. The project finance market in the Asia-Pacific region is mainly represented by Australia, India, Japan and Indonesia, while more than 60% of the project finance transactions in the Americas region take place in the USA.

Additionally, at this historical stage, applying the project financing mechanism is used as one of the sources of economic growth. We have proved this fact by regression analysis.

By comparing the data on the volume of world GDP in *Table 2* and on the volume of project financing from *Table 1* in the period from 2001 to 2018, arranging them in order of increasing factor x (the volume of project financing), it is possible to establish direct relationships between the studied characteristics. Such a study will allow us to establish a relationship between the growth of project financing and global GDP.

It can be assumed that the relationship between global GDP and project finance is direct, which can be described by the equation of the line. To establish the parameters of the linear regression equation

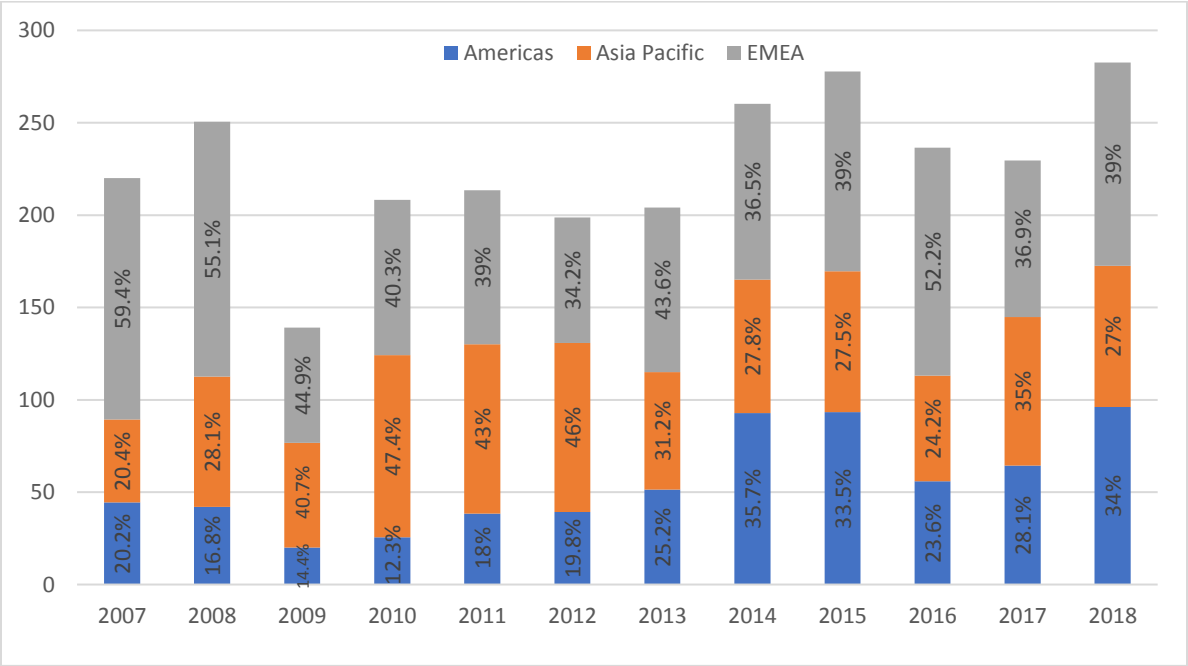

Fig. 2. **The distribution of project finance transactions by region for the period of 2007–2018 ($ bn)**

Source: author's calculations according to the PFI League Tables. URL: http://www.pfie.com/.

Table 2

Global GDP from 2001 to 2018 ($ bn)

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Global GDP	33 396	34 674	38 902	43 817	47 457	51 448	57 968	63 612	60 334
Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Global GDP	66 051	73 393	75 085	77 236	79 333	75 049	76 164	80 951	85 910

Source: World Bank data. URL: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD (accessed on 05.12.2019).

$y = a + b * x$, we used the built-in statistical function (linear), which allowed us to establish the value of coefficient b, coefficient a, determination coefficient R^2.

$$Y = 209 * X + 23508.$$

R^2 is 0.78, which is fairly good. It means that 91% of our values fit the regression analysis model.

THE DEVELOPMENT OF PROJECT FINANCING IN THE ARAB WORLD

Arab countries are not the most developed markets considering the examples of project financing compared to European countries or the USA. However, the Gulf countries stand apart. They have become a popular investment destination, given their extensive energy resources and rapidly growing population. There is still a huge need for infrastructure (including energy, water treatment and sewage) throughout the region.

Table 3 illustrates the evolution in the volume of transactions carried out in all Arab countries from 1995 to 2018 and their share in the global volume. The project finance market boomed in 1996 and rose from virtually nothing to about $ 5 bn with 11.5% of the global market. Then, the

Table 3

The annual volume and number of transactions of project finance in the Arab world from 1995 to 2018

Year	Total loans (billion, $)	Total number of transactions	Share among all countries, %	Year	Total loans (billion, $)	Total number of transactions	Share among all countries, %
1995	0.10	1	0.43%	2008	25.72	28	10.27%
1996	4.92	7	11.48%	2009	11.92	15	8.56%
1997	7.07	8	10.49%	2010	14.62	11	7.02%
1998	3.21	10	5.66%	2011	10.49	12	4.91%
1999	4.40	11	6.07%	2012	9.13	15	4.59%
2000	3.67	8	3.31%	2013	16.73	13	8.24%
2001	8.60	16	7.93%	2014	13.48	25	5.18%
2002	2.39	7	3.84%	2015	16.49	22	5.94%
2003	7.79	12	11.19%	2016	27.51	28	11.63%
2004	18.25	25	15.67%	2017	11.59	29	5.05%
2005	29.06	37	20.71%	2018	9.59	16	3.39%
2006	30.57	27	16.92%	Total	327.07	423	8.67%
2007	39.78	40	18.08%				

Source: author's calculations according to the PFI League Tables. URL: http://www.pfie.com/ (accessed on 05.12.2019).

market stayed almost stable with less than 10% of the global market share until 2004, when the project finance loan market increased by 134% compared to 2003 and jumped to $ 18.25 bn which was 15.7% of the global market. The volume of transactions continued growing in Arab countries until 2008. The 2008–2009 financial crisis had a sizeable impact on energy prices and, by association, on the development of energy and non-energy infrastructure where volumes decreased dramatically from about $ 40 bn in 2007 to just below $ 26 bn in 2008. A similar fall occurred in 2009, when the loan volumes dropped to about $ 12 bn. The volume of transactions fluctuated significantly in the last decade dropping off to 9.13 bn in 2012 and peaking at $ 27.51 bn in 2016. *Fig. 3* lists the total volume of project finance for each Arabic country from 1995 to 2018.

Project financing is booming in Saudi Arabia, leading Arab countries to transactions. About 32% of the projects took place in the Kingdom of Saudi Arabia, the largest economy in the region with 85 transactions worth more than $ 104 bn, followed by Qatar (17%), the United Arab Emirates (16%) and Oman (12.5%). Together, the Gulf Co-operation Council (GCC) account for 86% of the total Arabic project finance market.

Fig. 4 shows the volume of transactions in the Gulf Cooperation Council (GCC) region in the last 16 years. The Gulf Cooperation Council (GCC) region comprises fast-growing economies with government revenues fuelled by sizeable oil revenues. Investment in energy infrastructures is a crucial pillar of the GCC Governments policy strategies for regional economic development. Furthermore, GCC economies usually have specific tax legisla-

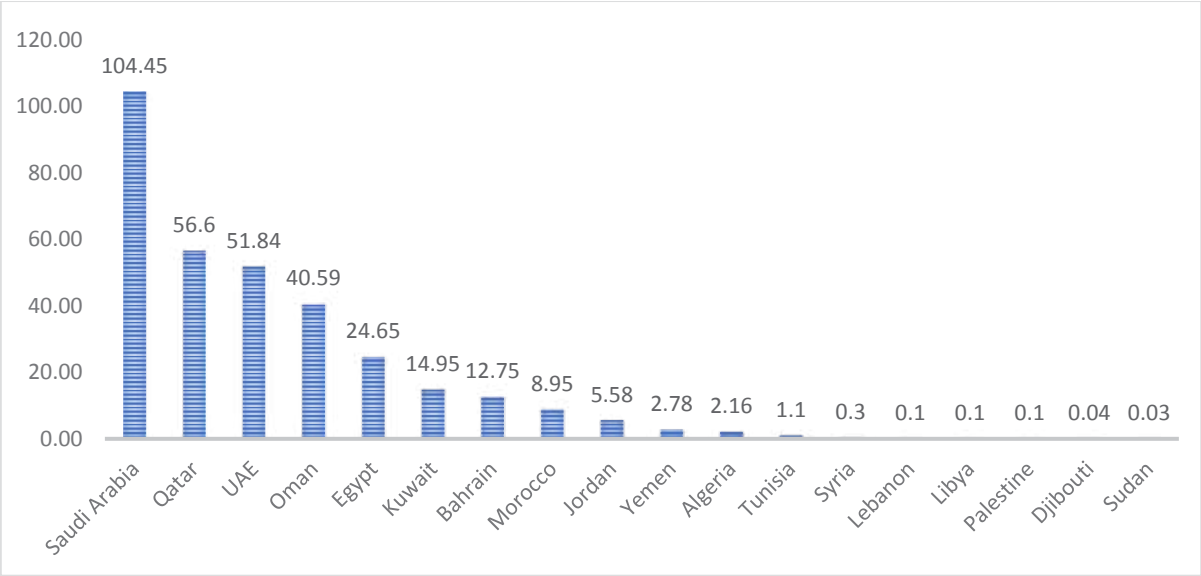

Fig. 3. **The total volume of project finance in each Arabic country from 1995 to 2018 ($ bn)**

Source: author's calculations according to the PFI League Tables. URL: http://www.pfie.com/ (accessed on 05.12.2019).

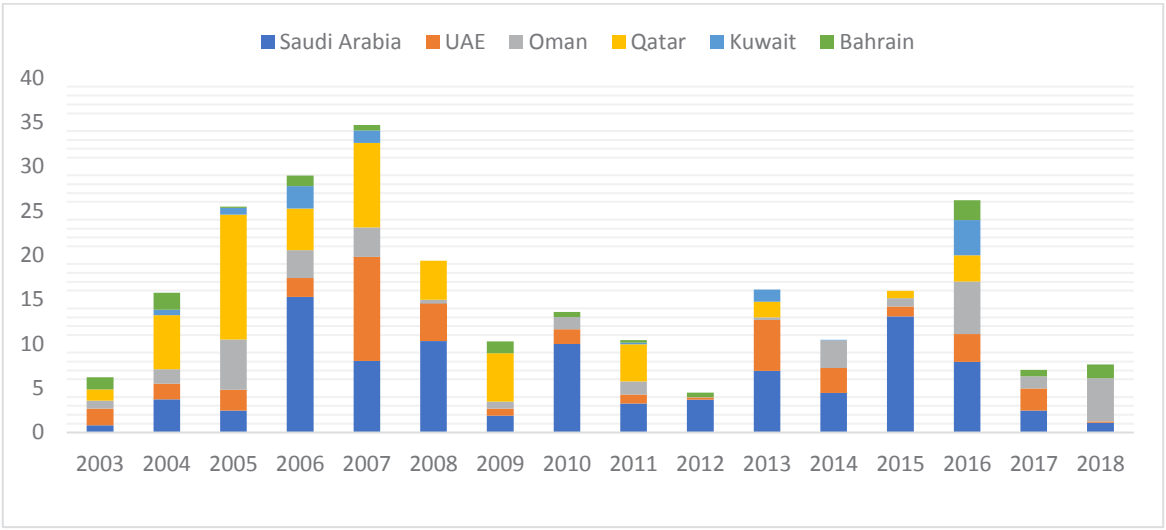

Fig. 4. **Project finance volumes in the GCC region since 2003 ($ bn)**

Source: author's calculations according to the PFI League Tables. URL: http://www.pfie.com/ (accessed on 05.12.2019).

tions that can influence on the capital structure of large investment projects. Except Oman, the GCC countries did not historically levy sizable corporate tax on locally owned domestic companies [25].

The project finance market of the Gulf Co-operation Council (GCC) reached its highest levels in 2005–2007 and recorded its maximum in 2007 with $ 34.7 bn because of high oil prices. However, since 2008, due to the global financial crisis, European fiscal crisis and political and economic instability after the Arab Spring have led to a sharp reduction in the GCC project finance market. The governments throughout the region are investing in energy, petrochemicals, oil and gas, transport and other industries, as they face a growing population and the need to diversify economic activities.

The data in *Table 4* show that for the period of 1995–2018, 214 projects were implemented in the GCC region with a total value of $ 281 bn distributed between 11 industrial sectors, including: utilities (energy & water desalination and wastewater treatment), oil and gas production, petrochemicals, mining, transport and other industries.

Table 4

Number of projects by industry and country from 1995 to 2018 (size in $ bn / number of financed projects)

Type of project	Saudi Arabia	Qatar	UAE	Oman	Kuwait	Bahrain	Total size and # of projects
Utilities (Energy & Water)	21 082 / 16	8376 / 7	27 198 / 23	9437 / 18	2196 / 3	5245 / 6	73 534 / 73
Petrochemicals	48 056 / 26	7359 / 6	80 / 1	6948 / 7	7797 / 2	123 / 1	70 363 / 43
Oil & Gas	14 332 / 5	26 205 / 11	3371 / 7	19 521 / 14	4212 / 2	1591 / 2	69 232 / 41
Mining	15 136 / 7	3309 / 2	14 580 / 5	1545 / 1	–	5793 / 3	40 363 / 18
Transport & Infrastructure	2615 / 6	11 346 / 7	425 / 1	1033 / 5	–	–	15 419 / 19
Telecoms	2350 / 1	–	1800 / 2	220 / 1	750 / 1	–	5120 / 5
Recreation & Real Estate	300 / 1	–	3187 / 4	105 / 1	–	–	3592 / 6
Agriculture & Forestry	280 / 1	–	487 / 3	1782 / 1	–	–	2549 / 5
Industry	300 / 1	–	709 / 3	–	–	–	1009 / 4
Total	104 451 / 64	56 595 / 33	51 837 / 49	40 591 / 48	14 955 / 8	12 752 / 12	281 181 / 214

Source: author's calculations according to the PFI League Tables. URL: http://www.pfie.com/ (accessed on 05.12.2019).

The Gulf has been a particularly prolific source of project finance opportunities in both refining and petrochemicals due to cheap and abundant raw material. Over the past few decades, the industrial cities of Jubail and Yanbu in Saudi Arabia have developed into large manufacturing sites for petrochemicals and refined products. The investment made into the downstream oil and gas sector in these cities has been enormous. Most of it has been funded through project finance loans. Qatar, Oman and Kuwait have, likewise, raised project finance for refining and petrochemical projects [24].

Project finance in Qatar had primarily been used in the area of oil and gas, energy and social infrastructure sectors. In 2012, Qatar's national gas companies (Qatargas and Rasgas) became the world's largest producer of LNG [26]. Qatargas operates 14 Liquefied Natural Gas (LNG) trains with a total annual production capacity of 77 million tonnes. The LNG industry in Qatar has been financed almost only by project finance. Project finance debt of about $ 14 bn has been successfully raised from a variety of sources for Qatargas and Rasgas. In addition, a host of international events, such as the FIFA 2022 World Cup, are increasing demand for infrastructure and facilities.

In the United Arab Emirates (UAE), project financing has been mainly concentrated in the energy and water sectors. Besides the energy and water sectors, there have been project financing in the heavy industries, including metallurgy. There have also been two PPP in the education sector: the

Sorbonne University Abu Dhabi and the campus of Zayed University. Over the past few years, there has been a lot of activity in the solar energy sector. In 2018, the financing of the waste-to-energy (WTE) plant in Sharjah was complete, the first one in the region.

Project financing in Oman has emerged as the preferred alternative to conventional methods of financing infrastructure and other large-scale projects in the field of oil and gas pipelines, refineries, electricity generating facilities and water and desalination projects.

Islamic finance made up nearly 40% of the total project finance market in the GCC in 2015 compared to just over 12.5% in 2006 [27]. Islamic project finance is basically the same as project finance — it is a financial technique that involves financing of the entire or partial capital needed to fund a project. However, Islamic project finance requires that the purpose of the project and the financial schemes are consistent with Sharia. For instance, investment objectives must not be related to gambling or sale of pork or spirits, which are prohibited by Sharia law. Also, financial schemes cannot involve interest-based lending, and cannot include unclear terms of contract. Islamic financial institutions therefore have to design their financial structure so that profit is generated from commissions and rental fees through actual trading, without collecting interest [28].

CONCLUSIONS

In light of the above analysis, the world market reflects wide variations in the field of project financing. The article sheds light on the Arabic experience in the project finance market. This mechanism has been used in 18 Arab countries, the member states of the Gulf Cooperation Council (GCC), given its extensive energy resources to be actively engaged in project finance transactions, enhancing their role in the global economy. The transactions have primarily been used in three areas: energy and water supply, petrochemicals, and the oil and gas industry. Moreover, one can notice that project finance in the GCC region is witnessing a growing trend of using Islamic project finance structure.

REFERENCES

1. Megginson W.L. Introduction to the special issue on project finance. *Review of Financial Economics*. 2010;19(2):47–48. DOI: 10.1016/j.rfe.2010.04.001
2. Nevitt P.K. Project financing. London: Euromoney Publications; 1983. 273 p.
3. Gatti S. Project finance in theory and practice: Designing, structuring, and financing private and public projects. Waltham, MA, London: Academic Press; 2012. 496 p.
4. Fabozzi F.J., de Nahlik C.F. Project financing. 8th ed. London: Euromoney Books; 2012. 550 p.
5. Fight A. Introduction to project finance. Oxford, Burlington, MA: Butterworth-Heinemann; 2005. 208 p.
6. Khan M.F., Parra R.J. Financing large projects: Using project finance techniques and practices. Singapore: Pearson/Prentice-Hall; 2003. 639 p.
7. Morrison R., ed. The principles of project finance. Aldershot: Gower Publishing, Ltd.; 2012. 528 p.
8. Esty B.C. Why study large projects? An introduction to research on project finance. *European Financial Management*. 2004;10(2):213–224. DOI: 10.1111/j.1354–7798.2004.00247.x
9. Esty B.C., Chavich C., Sesia A. An overview of project finance and infrastructure finance — 2014 update. HBS Case. 2014;(214083).
10. Ahmed P.A., Fang X. Project finance in developing countries. The World Bank Report. 1999;(23474). URL: http://documents.worldbank.org/curated/en/952731468331147256/pdf/multi0page.pdf
11. Kleimeier S., Megginson W.L. Are project finance loans different from other syndicated credits? *Journal of Applied Corporate Finance*. 2000;13(1):75–87. DOI: 10.1111/j.1745–6622.2000.tb00043.x
12. Kleimeier S., Versteeg R. Project finance as a driver of economic growth in low-income countries. *Review of Financial Economics*. 2010;19(2):49–59. DOI: 10.1016/j.rfe.2010.01.002
13. Davis H.A. Project finance: Practical case studies. London: Euromoney Publications; 1996. 223 p.

14. Nikonova I.A., Smirnov A.L. Project financing in Russia: Problems and directions of development. Moscow: Konsaltbankir; 2016. 216 p. (In Russ.).
15. Kalmykova G.S. Project financing: World experience and prospects for Russia. In: Economic and social problems of the global financial system. 2012. URL: http://projects.fa.ru/mnsk3/data/Fac-FM/InMen/Kalmykova.pdf (In Russ.).
16. Katasonov V. Yu., Morozov D.S. Project financing: organization, risk management, insurance. Moscow: Ankil; 2000. 270 p. (In Russ.).
17. Fight A. Introduction to project finance. Oxford, Burlington, MA: Butterworth-Heinemann; 2005. 208 p. (Russ. ed.: Fight A. Vvedenie v proektnoe finansirovanie. Moscow: Intelbook; 2008. 208 p.).
18. Fauzer V.V. Project financing: World experience and Russian practice. *Korporativnoe upravlenie i innovatsionnoe razvitie ekonomiki Severa: Vestnik Nauchno-issledovatel'skogo tsentra korporativnogo prava, upravleniya i venchurnogo investirovaniya Syktyvkarskogo gosudarstvennogo universiteta = Corporate Governance and Innovative Economic Development of the North: Bulletin of Research Center of Corporate Law, Management and Venture Investment of Syktyvkar State University.* 2007;(4):69. URL: http://koet.syktsu.ru/vestnik/2007/2007–4/7/7.htm (In Russ.).
19. Rodionov I., Bozh'ya-Volya R. Project finance. St. Petersburg: Aletheia; 2017. 338 p. (In Russ.).
20. Triantis J.E. Project finance for business development. Hoboken, NJ: John Wiley & Sons, Inc.; 2018. 398 p.
21. Finnerty J.D. Project financing: Asset-based financial engineering. Hoboken, NJ: John Wiley & Sons, Inc.; 2013. 560 p.
22. Yescombe E.R. Principles of project finance. San Diego, CA, London: Academic Press, 2013.
23. Ezangina I.A., Storozhilov N.A. Strengthening the role of development institutions in the mechanism of bank project finance. *Finansy: teoriya i praktika = Finance: Theory and Practice.* 2017;21(6):20–33. (In Russ.). DOI 10.26794/2587–5671–2017–21–6–20–33
24. Clews R.J. Project finance for the international petroleum industry. London, San Diego, CA: Academic Press; 2016. 414 p.
25. Atalla T., D'Errico M.C. Energy project financing in the GCC region: An empirical investigation. *Energy Transitions*. 2019;3(1–2):13–30. DOI: 10.1007/s41825–019–0011–9
26. Elbashir N.O. Introduction to natural gas monetization. In: Elbashir N.O., El-Halwagi M.M., Economou I.G., Hall K.R., eds. Natural gas processing from midstream to downstream. Hoboken, NJ, Chichester: John Wiley & Sons; 2018:1–15.
27. Islamic financial policy. In: Dar H., Azmi S., Bushra Shafique B., eds. Global Islamic financial report 2016. Berlin, London: Gerlach Press; 2016:259–278. URL: http://www.gifr.net/gifr2016/ch_08.pdf (accessed on 05.12.2019).
28. Lee K.H., Son S.H. Trends and implications of Islamic Project finance: A study on the GCC region. *SSRN Electronic Journal*. 2013. DOI: 10.2139/ssrn.2320959

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Institutionalization of Financial Literacy of the Adult Population of Russia*

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ABSTRACT

The relevance of the article is conditioned by the need to study institutionalization of financial literacy of the adult population, as well as to increase its level due to financial services and products emerging on the market (banking, investment, insurance, pension) and tools for their use. **The novelty** of this topic is associated with a systematic analysis of the institutionalization processes of financial literacy of the adult population, which makes a significant contribution to implementing national goals and strategic objectives of the development of the Russian Federation, and is also an important consumer of financial services. **The aim** of the article is a comprehensive scientific study of the institutionalization processes of financial literacy of the adult population. Techniques such as content analysis of references, verification, analysis, statistical and sociological methods (survey), crosstabulation, etc. were employed to analyze the data. Theoretical and methodological principles of institutionalization of financial literacy of the adult population were analyzed. The authors developed a conceptual model of its institutionalization. The study analyzed the state and dynamics of institutionalization of financial literacy of the adult population. The authors formulated the **conclusions** and recommendations on the sustainable development of institutional entities that contribute to improving the financial literacy of the adult population. The study calls for including the list of target population groups of citizens of retirement and pre-retirement age, as well as persons with disabilities, in the Strategy for Improving Financial Literacy in the Russian Federation in 2017–2023; making arrangements for financial education of the population within the national projects "Digital Economy", "Education", "Culture", "Demography"; supporting the creation of electronic platforms and online panels in educational organizations for systematic financial education of various target groups of the population of the Russian Federation, etc.

Keywords: financial literacy; financial behavior; financial culture; institutionalization of financial literacy of adult population; state and dynamics of institutionalization of financial literacy of adult population; processes of habitualization, typification, normatization and legitimization of institutionalization of financial literacy of adult population

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INTRODUCTION

The relevance of the study of institutionalization of financial literacy of the adult population of Russia is due to the further development of the institutional basis of the system of increasing and supporting financial literacy of the population of the Russian Federation in general and the adult population in particular. In addition, the significance of the research problem is due to the expansion of the list of financial products and tools requiring new competencies among consumers, the need for scientific support for implementing the Strategy for Improving Financial Literacy in the Russian Federation in 2017–2023[1]. In this regard, it is important to form financially competent behavior of target groups, including the adult population, which, in turn, will ensure the active inclusion of citizens in the processes of financial and economic development of the country.

Low financial literacy of the Russian population is due to the following issues:

- communications between the state and society regarding the effectiveness of financial literacy and its relationship with various components of the economic culture of the population are not mature;
- educational organizations do not have the professional competencies in the field of financial literacy that would protect the rights of consumers of financial services;
- population in civil society has no mindset to trust the financial system;
- low level of citizens' awareness of the legal mechanisms to protect the rights of consumers of financial services;
- citizens are not fully aware of the importance and significance of financial planning of their budget;[2]
- the vast majority of citizens do not know who to address to protect their rights if received unfair financial services. Many believe that Sberbank of Russia is responsible for that. Unfortunately, the Central Bank and Rospotrebnadzor (Federal Service for Supervision of Consumer Rights Protection and Human Well-Being) of Russia are rarely mentioned.

These problems caused the novelty of the topic related to the complex analysis of the institutionalization of financial literacy of the adult population. This target group makes a significant contribution to the implementation of the national goals and strategic objectives of the country's development[3] to ensure the conditions for active involvement of the population in the processes of socio-economic development, the formation of competencies of consumers of financial services. The provisions and conclusions are substantiated on the analytical materials of the comprehensive research project dedicated to obtaining qualitative and quantitative indicators of the effectiveness of the processes of institutionalizing financial literacy of the adult population of Russia.

To disclose the content of the phenomenon, it is necessary to solve the following tasks:

- to substantiate the theoretical and methodological provisions of the institutionalization of financial literacy of the adult population;
- to develop a conceptual model of institutionalizing financial literacy of the adult population;
- to describe the state and dynamics of institutionalization of financial literacy of the adult population;
- to make conclusions and recommendations on the sustainable development of institutional entities that contribute to improving the financial literacy of the adult population.

[1] On approval of the Strategy for Improving Financial Literacy in the Russian Federation in 2017–2023. Order of the Government of the Russian Federation of September 25, 2017 No. 2039-r; the action plan ("roadmap") for the implementation of the Strategy for Improving Financial Literacy in the Russian Federation in 2017–2023 dated 03.12.2018.

[2] For example, according to the National Agency for Financial Studies (NAFI), no more than 10% of Russian families plan their expenses for more than a month.

[3] Decree of the President of the Russian Federation of 07.05.2018 No. 204 "On National Goals and Strategic Objectives of Development of the Russian Federation for the Period up to 2024".

THEORETICAL AND METHODOLOGICAL PROVISIONS OF INSTITUTIONALIZATION OF FINANCIAL LITERACY OF ADULTS

Scientists have studied institutionalization of financial literacy in various scientific fields:

a) in the context of the financial behavior of the population, for example, by T. Yu. Bogomolova, T. Yu. Cherkashina [1]. A. V. Karavay, A. A. Tikhonov studied the features of financial attitudes and behavior of Russian workers [2]. Financial behavior in the context of socio-economic adaptation was studied in the work by P. M. Kozyreva [3]. The works by D. Kh. Ibragimova [4] and M. S. Shcherbal' [5] are devoted to saving aspects of population behavior;

b) financial literacy and its relationship with competence were studied in the following works. O. E. Kuzina considers the methodology for measuring financial literacy and its relationship with financial competence [6], as well as the financial competence of Russians according to the results of an international comparative study [7];

c) the scientific research by D. V. Moiseeva [8] is devoted to the sociological analysis of financial literacy. It defines two approaches to the concept of "financial literacy": the competency-based one that refers to financial literacy as a combination of financial knowledge, financial skills, financial goals; and the cultural one, referring to financial literacy as an element of financial culture, including knowledge, skills, norms, values, traditions;

d) the following works are devoted to the cultural aspects of financial literacy: D. A. Shevchenko and A. V. Davydenko examined the content of the relationship between the concepts of "financial literacy" and "financial culture" [9]. S. N. Silina and V. Yu. Stupin examined the relationship of financial literacy and financial culture [10]. I. K. Klyuchnikov and O. A. Molchanova [11] explored the essence, regularities and forms of credit culture. The work by A. V. Boranukov is devoted to social diagnostics of the economic culture of society, development of a theoretical model of economically rational behavior. In his opinion, "the main difference between the concept of financial literacy and the concept of economic culture is the lack of the first moral and ethical component in the content, the articulation of a purely competent, pragmatic beginning" [12].

The works by the authors of this article are important to develop a theoretical interpretation of the concept of "institutionalization of financial literacy of the adult population". They addressed the following issues: the state and dynamics of financial literacy of the adult population of Russia [13]; development of the institutional framework for the implementation of financial literacy programs of the adult population of Russia [14]; problems and prospects of implementing programs on financial literacy for the adult population at the Federal and regional levels [15]; relations of financial literacy and financial education [16].

The scientific provisions of the institutionalization of financial literacy of the adult population were tested at the roundtable discussion "Research results of the institutionalization of financial literacy of the population of the Russian Federation"[4]. Professor A. V. Ivanov also covered this topic in his speech at the II South Ural Financial Forum of the Ural branch of the Financial University "Financial literacy is the first step to success"[5].

Studies by foreign scientists are methodologically significant for the theoretical interpretation of the institutionalization of financial literacy of the adult population. For ex-

[4] Kuznetsov O.V., Ivanov A.V. Roundtable discussion "Research results of the institutionalization of financial literacy of the population of the Russian Federation" (Financial University under the Government of the Russian Federation. Moscow, October 11, 2019). URL: https://yadi.sk/i/cvpMZnuARmf1pQ (accessed on 17.01.2020).

[5] Ivanov A.V. Problems and prospects of implementing the educational program on financial literacy for the adult population. Speech at the II South Ural Financial Forum of the Ural branch of the Financial University under the Government of the Russian Federation "Financial literacy is the first step to success". (Chelyabinsk, May 15–16, 2019). URL: http://www.fa.ru/News/2019–05–20-yuff.aspx (accessed on 17.20.2020).

ample, W.L. Anthes (2004) [17] views financial literacy as the ability to analyze, manage, and interact with personal financial conditions that affect material well-being. L. Mandell (2007) [18] views it as the ability to evaluate new, complex financial instruments and make informed decisions. The work by foreign scientists A. Atkinson and F.A. Messy is dedicated to measuring financial literacy [19]. The work by Kempson E. and Perotti V. [20] is devoted to measuring financial capability of low- and middle-income countries. The work by J. Hastings, B. Madrian and W. Skimmyhorn discusses the dependence of financial literacy on economic outcomes [21]. A.L. Kiliyanni and S. Sivaraman [22] devoted their work to the perception-reality gap in financial literacy. The above analysis allows us to conclude that there are various approaches to determining financial literacy. At the same time, a person's ability to manage finances is common.

The institutional aspects of institutionalizing financial literacy are of great importance. They consider the study of financial literacy as a process of combining financial behavior and financial culture, manifested in their mutual influence. The main elements of this process are:

- financial knowledge and attitudes at the stage of their habitualization;
- typical financial skills (typification);
- consolidation of knowledge and sustainable practices in the field of financial literacy (normatization);
- regulatory legal consolidation of institutional entities for financial literacy in the context of their financially competent behavior (legitimization).

The considered theories allowed us to define the phenomenon under study. In our opinion, financial literacy is an indicator of awareness, knowledge, skills and behaviors according to which informed financial decisions are made. The criterion of these decisions is financially competent behavior in the context of the formed financial culture of the population. Therefore, the institutionalization of financial literacy of the adult population should be understood as the processes of developing sustainable practices (institutional entities); according to the practices, the adult population make informed financial decisions, whose criterion is financially competent behavior.

CONCEPTUAL MODEL OF INSTITUTIONALIZATION OF FINANCIAL LITERACY OF ADULT POPULATION

In our opinion, the institutional approach to the study of the financial literacy of the population is a combination of sociocultural elements (knowledge, skills, norms, values, traditions), considered in the specific cultural situation. To influence the level of financial literacy, the specifics of financial culture in financial education and in general when developing the concept of an effective institutional system for improving financial literacy involves: a) a description of key cultural archetypes that influence financial behavior and are reflected by financial literacy indicators; b) analysis of factors that formed these cultural archetypes; c) analysis of the current socio-economic context for its impact on the existing cultural tradition (if it fixes it or transforms it); d) analysis of the possibilities and directions for targeted correction of cultural tradition.

The above-said suggests that the structural elements of the institutionalization of adult financial literacy are:

- relations of financial education and financial literacy, called its basic elements, include: awareness, knowledge, skills, behavior, making informed financial decisions, financially competent behavior, financial literacy results;
- components of the economic culture of the population: social values and norms, perceptions, attitudes, behavioral stereotypes;
- the system of objective and indicative indicators of the institutionalization of financial literacy of the population, including

objective and indicative indicators of the institutionalization of financial literacy of the population;

- target populations: aged 25 to 30 years; aged 30 to 45 years; pre-retirement age (55–60 years); advanced age (over 60 years); retirement age;
- institutionalization processes of financial literacy: habitualization, typification, normatization and legitimization.

In general, the conceptual model of the institutionalization of financial literacy of the adult population of the Russian Federation is presented in the *Figure*.

Let us consider the structural elements of the institutionalization of financial literacy of the adult population. The components of economic culture include social values and norms, perceptions, attitudes, behavioral stereotypes that determine the behavior patterns of individuals and social groups in the production, distribution and consumption of material goods. The components of economic culture of the population should aim at forming behavior patterns associated with financial planning; fulfillment of obligations undertaken to the creditor; investment based on the use of investment products and services; saving behavior aimed at saving money ("safety cushion"); social protection of citizens on banking products and services. Financial behavior is based on the knowledge of a person and the attitudes s/he acquired in the process of socialization, and is determined by the social positions and social roles, as well as the activity and independence of the person in decision-making. When making financial transactions, a person acquires new knowledge. This is the next level — conscious knowledge that shows a person's competence in finance. If informed knowledge is acquired, financial behavior will also change.

The system of objective and indicative indicators of financial literacy of the population consists of: a) self-assessment of the respondent's financial literacy; b) financial knowledge, skills, attitudes in various subject areas of the financial sphere (for example, debt, savings, retirement behavior); c) components of the regional factor (indicators of social well-being, pace of socio-economic development, etc.). Financial literacy assessment should be based on correlation of the self-assessment of financial literacy with the identification of financial knowledge, skills, attitudes, typical for a social group and indicators characterizing the influence of a regional factor.

First of all, financial literacy is sufficient knowledge and skills in the field of finance that helps correctly assess the situation in the market and make reasonable decisions. Knowing and using key financial concepts enables a person to manage their money competently. That is, to keep records of income and expenses, avoid excess debt, plan a personal budget, save money, as well as to navigate the complex products offered by financial institutions, and to acquire them based on an informed choice. It should be noted that the economic development of the population largely depends on the general level of financial literacy. The low level of this knowledge leads to negative consequences not only for consumers of financial services, but also for the state, private sector and society as a whole. A high level of awareness of residents in the field of finance contributes to social and economic stability in the country. An increase in financial literacy leads to risk mitigation in excessive personal debt of citizens on consumer loans, risk mitigation in fraud by unscrupulous market participants, etc.

The following features of the institutionalization of financial literacy of adult population should be considered in the research:

- *population aged 25 to 30 years:* personal budget planning, ways to save and increase personal income; "smart" shopping (rules for reasonable purchase of household appliances, electronics, automobiles, etc.); proper use of credit resources; compliance with the rules of reasonable financial saving and forming a targeted saving strategy;

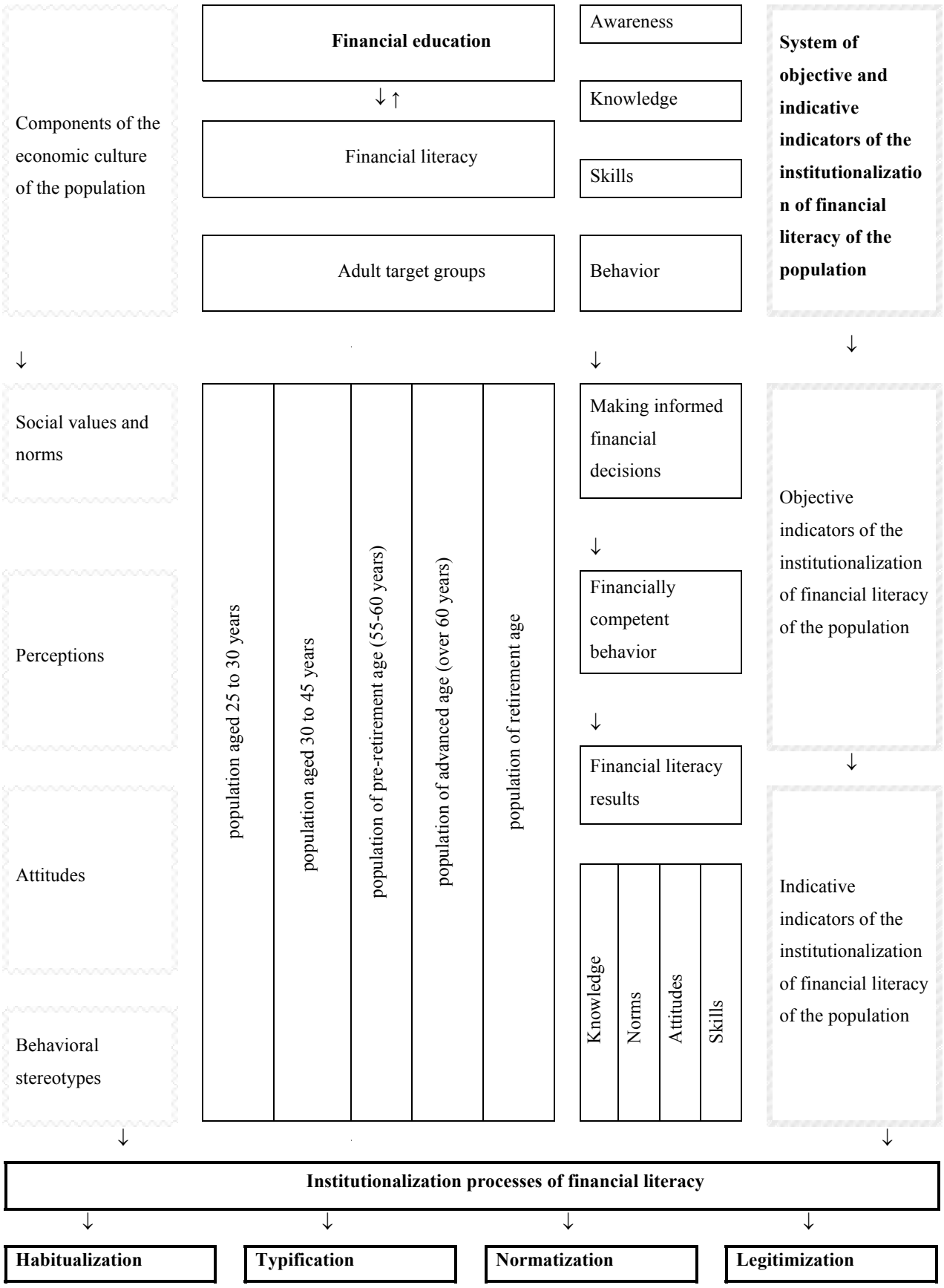

Fig. **Conceptual model of institutionalization of financial literacy of the adult population of Russia**

Source: compiled by the authors.

- *population aged 30 to 45 years:* personal financial planning: ensuring short-term and long-term financial goals; creating a financial "safety cushion" for life's unexpected events; solving the housing problem (including a mortgage loan); education for children (targeted fundraising strategy);
- *population of pre-retirement age (55–60 years):* retirement planning: developing a targeted fundraising strategy based on an understanding of the principles of the pension system functioning; compliance with the rules for the reasonable acquisition of property (for future personal use and as support to children) using credit resources;
- *population of advanced age (over 60 years) and retirement age:* budget management (benefits and subsidies); use of pension tools.

Institutionalization processes of financial literacy include habitualization as a habituation to financial behavior patterns. The next one is typification, which includes the development of citizens' attitudes towards typical actions in the generated financial behavior patterns. Normatization processes contribute to the consolidation of financial behavior patterns of citizens in the financial services market. Finally, legitimization processes consist in the legal support and institutional consolidation in terms of enhancing the financial literacy of the adult population.

STATE AND DYNAMICS OF INSTITUTIONALIZATION OF FINANCIAL LITERACY OF ADULT POPULATION

The current state of institutionalization of financial literacy of the Russian population was analyzed in the following areas.

First. Financial literacy of the Russian population in 2012–2015[6] was measured among users of financial services, as well as the retired. The research findings brought us to the conclusion that a significant part of Russians improved their understanding of pension basics, which is a positive trend in the field of financial literacy of the population.

Second. Studies of institutionalization of financial literacy of the adult population based on sociological surveys[7] of financial consultants[8] conducted by the authors in April 2019 (510 people were interviewed) and October 2019 (680 people were interviewed) in 45 regions of the Russian Federation.

The survey results are as follows:

- significant part of the respondents (64.7%) are satisfied with their knowledge of financial literacy;
- about 50% of the respondents note a high level of their financial literacy;
- more than 96% of the respondents believe that their financial literacy has increased in the result of the advanced training.

The adult population has some experience in financial consulting in the following areas:

- 17.3% applied for a mortgage loan;
- 18.8% opened a bank account;
- 21.6% prevented fraudulent schemes;
- 3.9% used microloans;
- 4.5% — applied for a car loan.

A comparative analysis of sociological surveys was carried out to determine the dynamics of data distribution. It helped make the following conclusions: from April to October 2019 the number of consultants advising on opening a bank account increased from 18.8% to 25.3%, and those advising on obtaining a mortgage loan — from 17.3% to 22.1%.

Third. Cross-tabulation analysis based on the surveys regarding the institutionalization of adult financial literacy. Cross-tabulation is as follows: satisfaction with knowledge of financial literacy of the population by age groups: youth (25–30 years) — 32.5%; adult

[6] URL:https://www.minfin.ru/common/upload/library/2017/07/main/Itogovyy_otchet_po_1.4_dlya_sayta_1.docx (accessed on 17.01.2020); https://www.minfin.ru/ru/om/fingram/directions/evaluation/ (accessed on 17.01.2020).

[7] The survey was held among: employees of banks, insurance companies, Pension Fund of Russia, private pension funds, university professors, government employees, employees of commercial organizations, school teachers, social workers.

[8] According to the Contract, methodological consultants receive advanced training in "Financial Consulting" at the Financial University under the Government of the Russian Federation.

Table

Behavioral aspects of financial literacy according to age groups

Behavioral aspects of financial literacy	Youth (25–30 years), %	Adult citizens (30–45 years), %	Citizens of pre-retirement age (45–60 years), %	Senior citizens (over 60 years old), %
Opening a bank account	14.6	61.5	22.9	0.0
Microcredit	10.0	50.0	40.0	0.0
Mortgage loan	19.3	60.2	17.0	3.4
Student loan	33.3	0.0	66.7	0.0
Car loan	4.3	69.6	13.0	13.0
Private medical insurance	16.1	61.3	12.9	9.7
Motor vehicle liability insurance	15.4	53.8	30.8	0.0
Voluntary housing insurance	30.8	53.8	15.4	0.0
Banking fraud prevention	20.9	46.4	28.2	4.5
Other	8.9	74.1	14.3	2.7

Source: compiled by the authors.

citizens (30–45 years) –– 59.6%; citizens of pre-retirement age (45–60 years) — 38.9%; senior citizens (over 60 years old) — 5.4%. The results show that the adult population is the most satisfied with the knowledge of financial literacy and the senior citizens are the least satisfied.

Satisfaction with knowledge of financial literacy by professionals is as follows: employees of a financial company (bank, insurance company, private pension fund, etc.) — 21.4%; entrepreneurs — 12.0%; civil servants — 11.2%; university teachers — 6.5%; school teachers — 5.1%; employees of a commercial organization — 12.5%. The employees of financial institutions are the most satisfied with their knowledge.

The table presents behavioral aspects identified in the field of financial literacy of the adult population.

The distribution above brings us to the following conclusions:

- behavioral aspects related to obtaining a student loan (33.3%), voluntary housing insurance (30.8%), and the prevention of fraudulent banking schemes (20.9%) are typical of young people (25–30 years);

• getting a car loan (69.6%), opening a bank account (61.5%), getting a mortgage loan (60.2%) and motor vehicle liability insurance (53.8%) are typical of adults (aged 30–45);

• getting a student loan (66.7%), microloans (40.0%), motor vehicle liability insurance (30.8%) are typical of citizens of pre-retirement age (45–60 years);

• getting a car loan (13.0%), voluntary health insurance (9.7%), etc. are typical of senior citizens (over 60 years).

The studies by the National Agency for Financial Research (2018) confirm the results of the sociological survey conducted by the authors[9]. For example, married people on average are significantly more competent than their single/unmarried peers. This takes place in every age group, but is especially evident among the 40–50 year-olds. Financial literacy is higher among working citizens. At the same time, for non-working pensioners, the Financial Literacy Index is significantly lower than the national average. The decline in older age groups is due to their exclusion from economic and financial activity.

CONCLUSIONS

The summarized study results on the institutionalization of financial literacy of the adult population provide with the following conclusions:

• studying theoretical principles of financial literacy contributed to the development of a conceptual model for the institutionalization of financial literacy of the adult population.

• the study of the state and dynamics of the institutionalization of financial literacy of the adult population of Russia shows its increase.

• institutional entities were established in the process of institutionalization of financial literacy — federal and regional centers of financial literacy.

• the article proved the value of carrying out main activities defined by strategic documents to improve the financial literacy of the Russian population.

The authors developed recommendations for the sustainable development of institutional entities that contribute to improving the financial literacy of the adult population:

• to consider updating the content of the Strategy for Improving Financial Literacy in the Russian Federation in 2017–2023 for a list of target population groups, including citizens of retirement and pre-retirement age, as well as persons with disabilities.

• it makes sense to include measures for the financial education of the population in the national projects "Digital Economy", "Education", "Culture", "Demography"[10] implemented in accordance with the Decree of the President of the Russian Federation of 07.05.2018 No. 204 "On National Goals and Strategic Objectives of the Development of the Russian Federation for the Period up to 2024"

• in the form of methodological recommendations, to regulate the standard agreements determining the interaction between the Bank of Russia and its territorial divisions, trade unions and the business community and other organizations on issues of improving financial literacy of various categories of the population.

It is reasonable to continue preparing financial consultants to increase the financial literacy of the adult population based on specified competencies due to changes in Russian legislation and the adoption of regulatory legal acts on strategic development issues.

It is advisable to support the creation of electronic platforms and online panels in educational organizations for systematic financial education of various target groups of the population of the Russian Federation.

[9] The respondents were personally interviewed at the place of residence. 1000 respondents were surveyed in every Russian region. The data was collected in July 2018. The methodology to measure the Financial Literacy Index was developed by the Organization for Economic Cooperation and Development (OECD).

[10] National project passports were approved by the Presidium of the Presidential Council for Strategic Development and National Projects on December 24, 2018 No. 16.

REFERENCES

1. Bogomolova T. Yu., Cherkashina T. Yu. Regional and behavioral aspects of the structure of non-financial wealth of Russian households. *Region: ekonomika i sotsiologiya = Region: Economics and Sociology*. 2015;(1):79–107. (In Russ.).
2. Karavay A.V., Tikhonov A.A. Features of financial attitudes and behavior of Russian workers. *Terra Economicus*. 2015;13(1):89–106. (In Russ.).
3. Kozyreva P.M. Financial behavior in the context of socio-economic adaptation of the population (sociological analysis). *Sotsiologicheskie issledovaniya = Sociological Research*. 2012;(7):54–66. (In Russ.).
4. Ibragimova D. Kh. Dynamics of trust in financial institutions and paradoxes of savings behavior of the population. *Bankovskoe delo = Banking*. 2015;(12):27–34. (In Russ.).
5. Shcherbal' M.S. Savings behavior of the population in conditions of instability. *Sotsiologicheskii zhurnal = Sociological Journal*. 2013;(2):65–71. (In Russ.).
6. Kuzina O.E. Financial literacy and financial competence: Definition, methods of measurement and results of application in Russia. *Voprosy ekonomiki*. 2015;(8):129–148. (In Russ.). DOI: 10.32609/0042–8736–2015–8–129–148
7. Kuzina O.E. Financial competence of the Russians: Results of an international comparative study. *Den'gi i kredit = Russian Journal of Money and Finance*. 2015;(5):64–68. (In Russ.).
8. Moiseeva D.V. Financial literacy of the population of the Russian region: Economic and sociological analysis. Cand. sociol. sci. diss. Volgograd: VolgSTU; 2017. 199 p. (In Russ.).
9. Shevchenko D.A., Davydenko A.V. On the content and relationship of the concepts "financial literacy" and "financial culture". In: Financial aspects of modernization of the Russian economy. Rostov-on-don: Sodeistvie-XXI vek; 2014:100–105. (In Russ.).
10. Silina S.N., Stupin V. Yu. From financial literacy to financial culture. *Vestnik Baltiiskogo federal'nogo universiteta im. I. Kanta. Seriya: Filologiya, pedagogika, psikhologiya = IKBFUs Vestnik: Philology, Pedagogy, and Psychology*. 2017;(4):71–79. (In Russ.).
11. Klyuchnikov I.K., Molchanova O.A. Credit culture: Essence, regularities, forms. St. Petersburg: St. Petersburg State University of Economics and Finance; 2011. 221 p. (In Russ.).
12. Boranukov A.V. Economic culture and financial literacy of the population (on the example of the southern Russian regions). Cand. sociol. sci. diss. Synopsis. Maykop: Adygea State University; 2014. (In Russ.).
13. Kuznetsov O.V., Ivanov A.V. The state and dynamics of financial literacy of the adult population of Russia. *Finansist*. 2017;(170):14–15. URL: https://issuu.com/financialuniversity/docs/170 (In Russ.).
14. Kuznetsov O.V., Ivanov A.V., Shevalkin I.S., Vorovsky N.V. Development of the institutional framework for the implementation of financial literacy programs of the adult population of Russia. *Upravlencheskie nauki = Management Sciences in Russia*. 2017;7(2):70–77. (In Russ.).
15. Kuznetsov O.V., Ivanov A.V. Problems and prospects of implementation of programs on financial literacy for the adult population at the Federal and regional levels. In: Development and implementation of the program to improve financial literacy of adults in the Rostov region. Proc. interreg. sci.-pract. conf. (Rostov-on-Don, Oct. 2018). Volgograd: Sfera; 2018:10–16. URL: http://portal-kmfg.ru/media/files/Materials/%D0%A1%D0%91%D0%9E%D0%A0%D0%9D%D0%98%D0%9A_%D0%BA%D0%BE%D0%BD%D1%84%D0%B5%D1%80%D0%B5%D0%BD%D1%86%D0%B8%D1%8F_%D0%A0%D0%BE%D1%81%D1%82%D0%BE%D0%B2.pdf(In Russ.).
16. Kuznetsov O.V., Rodionova M.E., Razov P.V., Kruglova E.L. Financial literacy and education as one of main priority state programms. GCPMED 2018: International scientific conference "Global challenges and prospects of the modern economic development". *The European Proceedings of Social & Behavioural Sciences*. 2018:730–737. DOI: 10.15405/epsbs.2019.03.72

17. Anthes W. L., Most B. W. Frozen in the headlights: The dynamics of women and money. *Journal of Financial Planning*. 2000;13(9):130–142.
18. Mandell L. Financial literacy of high school students. In: Xiao J. J., ed. Handbook of consumer finance research. New York: Springer-Verlag; 2008:163–183.
19. Atkinson A., Messy F.-A. Measuring financial literacy: Results of the OECD INFE Pilot Study. OECD Working Papers on Finance, Insurance and Private Pensions. 2012;(15). URL: https://www.oecd-ilibrary.org/docserver/5k9csfs90fr4-en.pdf?expires=1579526921&id=id&accname=guest&checksum=455AB 747D 0746822A330622BE 83497A1 (accessed on 13.12.2019).
20. Kempson E., Perotti V., Scott K. Measuring financial capability: A new instrument and results from low- and middle-income countries. The World Bank Working Paper. 2013;(79806). URL: http://documents.worldbank.org/curated/en/391291468152086725/pdf/798060WP020Mea0Box0379791B 00PUBLIC 0.pdf
21. Hastings J., Madrian B., Skimmyhorn W. Financial literacy, financial education and economic outcomes. NBER Working Paper. 2012;(18412). URL: https://www.nber.org/papers/w18412.pdf
22. Kiliyanni A. L., Sivaraman S. The perception-reality gap in financial literacy: Evidence from the most literate state in India. *International Review of Economics Education*. 2016;23(47–64). DOI: 10.1016/j.iree.2016.07.001

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Regulatory Arbitrage in the Retail Lending Market

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ABSTRACT

The **aim** of the article is to analyze the features of regulatory arbitrage between credit and microfinance organizations in the retail lending market in Russia and to develop proposals to improve existing regulations on the activities of professional lenders. The work employed the **methods** of analysis, synthesis, generalization, as well as comparative legal research. The author **found** that regulatory arbitration might aim to get benefit from imperfect legislation. Signs of regulatory arbitration may indicate the inefficiency and redundancy of current legislation concerning the regulation of consumer lending. The author developed the following **recommendations**: to reduce redundant regulation regarding the limits of the full loan value for point-of-sale loans and installment loans; to switch to licensing system of financial organizations, considering the scale of their activities and the produced risks.

Keywords: regulatory arbitrage; microfinance organizations; credit organizations; retail lending; POS loans; banking regulation; microfinance regulation; full loan value

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INTRODUCTION

Subject to certain regulatory limits, financial institutions may use methods of circumventing regulatory requirements consistent with current legislation to obtain certain advantages and benefits from different regulations in various market segments. The Russian retail lending market faces this problem, particularly, in the segment of POS loans. In general, it comes to affiliated microfinance organizations created by credit organizations (hereinafter — MFOs), which poses risk of using differences in regulation in these markets.

Regulatory arbitrage may testify to an organization's desire to increase its profits unfairly. However, such behavior can be forced due to imperfect regulation and deficiencies in legislation. The situation in the retail lending market is largely in favor of the second option. Before we proceed to analyzing the problems of regulatory arbitrage, it is necessary to discuss the differences in regulatory requirements that give rise to these contradictions. Yet, continual and often unsystematic complication of legislation, reporting and regulatory requirements, as well as increasing complexity of regulation, may lead to regulatory arbitrage.

The problem is not unique to Russia: the USA faces an increase in the regulatory burden on banks almost exponentially [1, p. 93]. Yet, the new requirements may not consider all the circumstances of the retail market functioning, and in some cases lead to a violation of existing mechanisms and good practices.

In general, the relevance of this issue is that, although consumer lending has less direct economic effect on GDP growth than the corporate one [2, p. 30], in modern conditions it is an important factor contributing to an increase in the slowdown in economic growth in Russia. Microfinance is viewed as an important element to fight against poverty [3, p. 191].

According to the Bank of Russia, in 2019 H1, unsecured consumer lending contributed to maintaining positive GDP dynamics[1]. At the same time, according to the Bank of Russia, increased risks for the banking system are associated with this form of lending[2].

Existing studies of regulatory arbitrage are mainly about the formation of bank capital due to deficiencies in the regulation of certain types of assets and liabilities [4, 29], as well as to unequal banking regulation in different countries. This allows for territorial regulatory arbitrage due to the choice of the transaction place by the financial institution, depending on the most favorable regulation [5, 26]. The issue of regulatory arbitrage between various forms of financial organizations is better addressed directly by regulators, perhaps due to the less specific nature and innovation of its modern forms.

In her speech at the European Money and Finance Forum in Helsinki in 2017, former Chair of the Supervisory Board of the ECB Danièle Nouy indicated that, besides territorial regulatory arbitrage and exploiting loopholes within one market legislation, banks may use the so-called cross-jurisdiction arbitrage. They can do it through the differences in the regulated and unregulated or poorly regulated sector of non-credit financial institutions[3]. In October 2019, at the Banking public-private sector regional policy dialogue in Washington, Fernando Restoy, the Chairman of the Institute for Financial Stability, Bank for International Settlements, pointed to blurring the distinctions between regulated and unregulated banking. They are different in form, but similar to the activities of fintech companies and startups that allow for exploit-

[1] Bank of Russia's policies in consumer lending push banks to build up capital to ensure resilience. Moscow, 2019. The official website of the Bank of Russia. URL: https://www.cbr.ru/Content/Document/File/72621/20190628_dfs.pdf (accessed on 17.10.2019).

[2] Financial stability review. No. 1 (14) • Q4 2018 – Q1 2019. Official website of the Bank of Russia. URL: http://www.cbr.ru/publ/? PrtId=stability (accessed on 17.10.2019).

[3] The official website of the European Central Bank. URL: https://www.bankingsupervision.europa.eu/press/speeches/date/2017/html/ssm.sp170915.en.html (accessed on 17.10.2019).

ing regulatory arbitrage by changing the form of a financial organization[4].

Discussions regarding regulatory arbitrage between individual financial market participants are also underway in Russia. In 2017, at the meeting of the Association of Russian Banks, Bank of Russia Governor Elvira Nabiullina stated that this issue had been discussed for a long time. To solve the problem, it is necessary to understand the exact difference between the products suggested by banks and by MFOs[5].

POS LOANS: FEATURES AND MECHANISM

A POS loan is a type of consumer lending[6]. Such loans can be provided both with overpayments for goods (classic loans) and without overpayments (installments).

Today, microfinance organizations can use soft limits on marginal interest rates. For better understanding, we consider the installment lending mechanism.

With the installment plan, the merchant actually subsidizes purchasing its own goods on credit: the customer is provided with a discount of interest paid to the lender. POS-lending under the installment plan consists in the fact that the customer purchases the goods without overpayments at the price offered by the merchant. The professional lender, who had signed the POS loan agreement with the customer, gives the merchant the money amounting to the price of the purchased goods minus the discount provided by the merchant, which amounts to the margin of the professional lender. The discount is not given to the customer when purchasing goods without non-leveraged money. With this discount, the customer does not overpay the original (before the discount) order value, since the total of all regular payments under the loan agreement is equal to the order value. It is also essential that usually the merchant pays the lender for the issuance of installments, and therefore, compensates a small part of the customer's "interest" payments (due to the lack of major overpayment for such products). With POS-lending, the merchant actually shares some income with the lender for financing the purchase of the product/service by the customer and transferring credit risk to them, which is similar to factoring (see *Appendix*).

The relevance and demand for installment products are associated with the following factors:

- an increase in the non-food retail turnover amid a decrease in real household disposable income[7], which leads to an increase in the credit turnover of trading enterprises;
- increased competition for the customer related to entering and scaling in the market of strong players with a clear advantage in the product economy due to the non-market value of funding (PAO Pochta Bank, PAO Sberbank);
- improving financial literacy of the population, and as a result, increasing the requirements of potential borrowers to the characteristics and quality of products offered by lenders.

Thus, this segment of consumer lending represents the relationship between the lender, seller and buyer, who are also the borrower. When regulating this industry, the Bank of Russia considers only the relationship between the lender and the borrower. The seller's role is almost missed, despite the fact that the trade relations, for which loan is just a means, result in the loan agreement. This restraint is the basic reason for defacing the regulatory

[4] Official site Bank for International Settlements. URL: https://www.bis.org/speeches/sp191017a.htm (accessed on 17.10.2019).

[5] Newspaper "Vedomosti". URL: https://www.vedomosti.ru/finance/articles/2017/05/29/691831-tsb-stoimost-kredita (accessed on 17.10.2019).

[6] Point-of-Sale are targeted consumer loans provided by transferring borrowed funds to the merchant to pay for goods (services) if there is a corresponding agreement with the merchant (including POS-loans).

[7] According to the Federal State Statistics Service. URL: http://www.gks.ru (accessed on 17.10.2019).

objectives and, ultimately, for the possibilities of regulatory arbitrage.

CURRENT REGULATION OF CONSUMER LENDING IN RUSSIA AND THE BASIC ASSUMPTIONS OF REGULATORY ARBITRAGE

Marginal cost of loan is a key feature of consumer lending in Russia. Part 11 of Art. 6 of the Federal Law dated December 21, 2013 No. 353-FZ (hereinafter — Law No. 353-FZ) limits the maximum total cost of a consumer loan (hereinafter referred to as "CL") determined on the date of the consumer loan agreement. The maximum total cost of a consumer loan of a certain category equals to the lowest of the following values: 365% annual interest or calculated in the previous calendar quarter, the average market value of the total cost of a consumer loan of the corresponding category increased by one third. The purpose of introducing this norm is to limit the ability of a professional lender to lend money at an unreasonably high, non-market interest rate. Additional regulatory requirements that do not consider the economic substance of the relations between the merchant, lender and buyer-borrower amid the installment plan, may lead to a change in these relations to avoid excessive regulation. However, the result will also be leaving the legal framework that protects the borrower [6, p. 145]. In particular, the installment mechanism can be implemented directly by the merchant through a hire purchase agreement. A bank or an MFO will do scoring, then purchase from the merchant concluded agreements with a discount considering the discount rate for interest, similar to factoring. However, such agreements will not be considered consumer loan agreements. Therefore, the rules on the protection of the borrower provided for by Law No. 353-FZ, particularly, on the marginal cost of loan, will not apply to such agreements.

The example above makes it clear that solely restrictive measures imposed without a full analysis of the economic relations will only lead to new forms of circumvention. Given the accelerated development of the financial sector technologies, the boundaries between individual financial products will blur. It will be more and more difficult to raise new regulatory barriers. Therefore, regulation should develop considering the essence of economic processes and repose on the dialogue with supervised organizations, since the complex mechanisms of market functioning often go out of sight of the regulatory body.

Another important feature of consumer lending is that CL marginal rates for banks and MFOs differ [7, p. 31]. This seems justified, since customers and MFO products traditionally have a higher risk, which determines the different cost of borrowed funds provided by such companies [8, p. 214].

As illustrated above, the cost of loan in the POS-lending depends on the merchant's discount. Thus, in installments, the margin of a professional lender (interest under the POS loan agreement) is determined not by an agreement with the borrower, the consumer of financial services, but with the merchant. This is because the margin of a professional lender depends on the discount that the merchant agrees to provide for the delivered goods (services). At the same time, the merchant may provide a larger discount than the maximum CL allows for credit organizations for the loan term. Moreover, the difference in regulatory norms between banks and microfinance organizations leads to the fact that MFOs are able to receive the entire amount of the discount with a similar loan. This contributes to an increase in the risks of regulatory arbitrage, i.e. a circumvention of legislative norms due to the various regulatory climate in various areas [9, p. 334; 10, p. 58].

The fact that some POS-lending credit organizations, such as PAO Sberbank, AO OTP Bank, AO Tinkoff Bank, have created corresponding MFOs is an indirect indicator of such tactics. Given the US experience and the so-called shadow banks [11, p. 472; 12, p. 85; 13, p. 51], two factors influence the emergence

of new financial organizations exploiting the difference in regulation: new technological opportunities, to which such organizations adapt their business models faster than big players, and the difference in the regulation of certain categories of such financial organizations.

Another problem of CL marginal values in POS-lending is that, according to Law No. 353-FZ, the CL average market values are calculated for the entire category of POS loans, regardless of whether there is an overpayment for the goods or not. Installment and classic loans have disparate economic models of interest rate formation (for classic loans — risk/income; for POS loans — the maximum discount added to the model that the partner merchant may provide for the goods/service). Therefore, a common calculation of weighted average values for the POS category is unreasonable. Since interest rates on installments are limited by the amount of the discount, they may lead to a bias in the weighted average values, especially given that organizations affiliated with banks operate in this segment and can have a significant impact on MFO rates due to the volume of issued installments. Since CL limits are imposed for the entire category of loans based on the weighted average values, low interest rates on installment products may lead to a general decrease in interest rates in this segment. Thus, rates in the category of POS microloans have sharply decreased since the beginning of 2018, while rates in other categories of microloans have not decreased so much or, conversely, have increased (*Table)*.

INTERNATIONAL PRACTICES OF CONSUMER LENDING REGULATION: GETTING THE BALANCE BETWEEN MARKET GROWTH AND PROTECTION OF CONSUMERS OF FINANCIAL SERVICES

Let us view this problem in the context of international practices. Approaches to such limits vary among countries, and sometimes within countries. For example, some of the US states have the so-called "usurious laws" that determine interest rate cap for various types of borrowers (individuals and legal entities) and various types of relations (loans issued with or without a written agreement, penalties, etc.)[8].

In 2014, the Reserve Bank of India has removed the 26% (per annum) interest rate cap on loans for microfinance companies. Instead, microfinance companies got the opportunity to set the rate at the their cost of funds plus a maximum 12% margin, or the average base rate of the five largest commercial banks by assets multiplied by 2.75 times, whichever is lower[9].

The maximum allowed legal rate in China is 36 percent annualized[10].

In some European countries, such as Denmark, Sweden, Austria, Croatia, Latvia, Luxembourg, Romania and Ireland, there are no marginal interest rate restrictions [14].

In France, any contractual loan granted at an annual percentage rate, which, at the time of its granting, is more than one third higher than the average percentage rate applied by the credit organizations during the previous quarter for loans of the same type presenting a similar risk factor, is considered usurious and prohibited by law. This wording gives more freedom due to putting loans into risk categories, which is comparable with the Russian practice[11].

In Germany, there are no interest rate restrictions on loan and borrowing rates; however, in legal practice, rates that are more than double the average market rates are ille-

[8] Legal portal Findlaw. URL: https://statelaws.findlaw.com/consumer-laws/details-on-state-interest-rate-laws.html (accessed on 17.10.2019).

[9] The Economic Times. URL: https://economictimes.indiatimes.com/news/economy/finance/rbi-removes-26-interest-rate-cap-on-mfi-loans/articleshow/30004542.cms (accessed on 17.10.2019).

[10] Reuters News Agency. URL: https://www.reuters.com/article/us-china-regulations-loans/china-cracks-down-on-online-micro-lending-firms-with-new-rules-idUSKBN 1DV4OU (accessed on 17.10.2019).

[11] French Consumer code. P. 133. URL: https://www.legifrance.gouv.fr/Traductions/en-English/Legifrance-translations (accessed on 17.10.2019).

Table

Dynamics of CL individual values, 2018 — Q2 2019

POS microloans	Change in CL weighted average values, %
POS microloans up to 30 thousand rubles inclusive	–22
POS microloans over 30 thousand rubles up to 100 thousand rubles inclusive	–18
POS microloans over 100 thousand rubles	–14
POS microloans over 365 days	–20
Microloans from 31 to 60 days inclusive, up to 30 thousand rubles inclusive	–1
Microloans from 61 to 180 days inclusive, up to 30 thousand rubles inclusive	7
Microloans from 181 days to 365 days inclusive, up to 30 thousand rubles inclusive	–4
Over 365 days, over 100 thousand rubles	10

Source: according to the Bank of Russia. URL: https://www.cbr.ru/analytics/consumer_lending/inf/ (accessed on 17.10.2019).

gal. This is a restriction based on the average level of rates in the market [14].

In the Netherlands, the interest rate cap is 14% a year, regardless of the loan term [14].

Italy, Portugal, Slovakia, Slovenia, and Estonia also have different rate restrictions depending on average market levels [15].

England has a system with rates limited only to high-risk payday loans with initial cost cap of 0.8% per day and a total cost cap of 100%[12].

In general, according to study [16], developed economies tend to use interest rate caps to prevent usury, while in developing economies interest rate caps are used to regulate cost of credit. Moreover, restrictions can be applied both to certain types of loans, such as credit cards and payday loans, and to all types of loans.

APPROACHES TO REGULATORY ARBITRAGE IN THE RETAIL LENDING MARKET

Approaches to the problem of regulatory arbitrage can be divided into those that seek to establish uniform restrictions for all participants in the credit market, and those who regulate certain forms of loans (usually high-risk), or individual lenders. The first solution, which essentially comes to combining CL interest rate caps for banks and MFOs, has several disadvantages: it may lead to the fact that MFO high-risk products, such as payday loans, which do not overlap with banking products, become unprofitable. While such changes will solve the problem of regulatory arbitrage, this will create significant difficulties for MFOs and in fact will be equal to a ban on microfinance activities. The negative consequences are obvious: MFOs will withdraw into the shadows, the number of illegal and unregulated lenders will grow, as well as denials of commodity loans in the POS-lending segment. The decrease in delinquencies and household debt load, the positive result of this solution, does not guarantee the same increase in delinquencies of former MFO customers in banks [17, p. 101]. Here is a paradox: the merchant is ready to finance the purchase of its products/services on credit, but the lender is not able to issue the loan because the CL marginal values do not allow for a rate sufficient to compensate for the corresponding transaction risk. Thus, the negative consequences, as well as the difficult decision (it will be necessary to amend all legal acts related to consumer lending) significantly exceed the positive effect.

In this regard, other countries apply particular interest rate caps depending on their form. For example, South Africa has 7 separate ceilings for mortgages, credit lines, unsecured credit operations, development loans, short-term operations, other credit and other loan agreements [18, p. 108–110]. A more productive approach to regulatory arbitrage, in the light of these practices, seems to have a more detailed division of the credit market segments, based on their semantic component.

Specified in Part 11 of Article 6 of Law No. 353-FZ, limits the maximum total cost of a consumer loan do not apply to consumer loans, which do not belong to any of the categories defined by the Bank of Russia in accordance with Part 9 of Article 6 of Law No. 353-FZ[13]. Therefore, this restriction does not apply to consumer purpose loans secured by a pledge, provided to a borrower who is not a payroll customer of a credit institution. POS-lending under the installment plan stimulate sales, which, in turn, leads to a positive multiplier effect for the economy as a whole. At the same time, they do not imply any overpayment by the borrower. A solution to regu-

[12] Financial Conduct Authority. URL: https://www.fca.org.uk/news/press-releases/fca-confirms-price-cap-rules-payday-lenders (accessed on 17.10.2019).

[13] Categories of consumer loans by Bank of Russia Ordinance No. 4927-U of 08.10.2018 "On the List, Forms and Procedure for Compiling and Presenting Reporting Forms of Credit Organizations to the Central Bank of the Russian Federation" (code of the reporting form of credit organizations under OKUD 0409126).

latory arbitrage may be eliminating the obligation of professional lenders to calculate the average market and weighted average values of the total cost of a consumer loan for such POS loans. As a result, they will not be subject to the restrictions specified in Part 11 of Article 6 of Law No. 353-FZ.

This solution also removes the contradiction of the calculation methodology for the CL marginal values for POS-lending: with abolition of restrictions for installment loans, the calculation will exploit only classic loans where the restrictions fulfill the envisioned consumer protection role. This approach will also contribute to the positive dynamics of economic growth through an increase in sales and consumer lending due to the product that has a lesser effect on delinquencies than classic loan products since there is no overpayment by the consumer.

Another problem of regulatory arbitrage in the installment segment is the requirement to credit institutions to calculate debt burden ratio (hereinafter — DBR) when issuing loans that came into force on October 1, 2019[14]. According to these documents, DBR is calculated as the ratio of income and payments of the customer on outstanding loans. Increased DBRs imply premiums to risk ratios when calculating bank capital adequacy ratios and downgrade MFO's internal funds. This initiative is relevant, since according to the Bank of Russia[15], the share of loans issued with DBR 80+ amounted to 9.7% in Q1 2019. Depending on the DBR, capital restrictions should reduce the growth rate of unsecured lending, as well as prevent a further increase in delinquencies and deterioration of the socio-economic situation of lenders with high DBR [19, p. 65].

Nevertheless, this approach does not consider that in case of installments, the merchant compensates part of the loan to the buyer in the form of a discount, thereby distorting the economic meaning of DBR. Depending on CL, premiums on risk ratios impose more stringent requirements for banks than for MFOs. Additional pressure on the capital of banks and MFOs operating in the installment segment will lead to a reduction in this form of lending and, as a result, to a deterioration in the availability of such financial services for the population [20, p. 959].

Another way to address the risks of regulatory arbitrage is to divide lenders and their affiliates into large and small. The US Consumer Financial Protection Bureau sets a criterion for classifying financial institutions as small lenders. Such organizations are not subject to a number of restrictions that large lenders must comply with, in particular, restrictions on high-risk lending. Since the definition of a small lender exploits information about affiliated parties, one big bank cannot create many individual small lenders. Thus, the issue of regulatory arbitrage can be resolved without detriment to the financial availability and multiplication of illegal lenders. Independent regulation will correspond to the risk-based approach imposing more significant regulatory requirements on organizations, whose asset size generates greater risk, since banks that developed from microfinance organizations have a lower level of interest and currency risks, due to portfolio diversification, and lower liquidity risk [21, p. 130].

Implementing these changes will aim to determine the asset size threshold. A financial institution beyond this threshold will be considered a large lender. There is an opinion

[14] Bank of Russia Ordinance of 02.04.2019 No. 5115-U "On Economic Standards for a Microfinance Company Attracting Money from Individuals, Including Individual Entrepreneurs and (or) Legal Entities in the Form of Loans, and a Microfinance Company Issuing and Placing bonds" for MFOs. Bank of Russia Ordinance No. 4892-U of 31.08.2018 "On Types and Characteristics of Assets for Which Risk-based Capital Buffers are Set and on the Methodology for Applying These Buffers to the Said Types of Assets for Credit Institutions to Calculate Their Capital Adequacy Ratios" for credit institutions.

[15] Accelerated growth of consumer loans in the structure of bank lending: causes, risks and measures of the Bank of Russia. The official website of the Bank of Russia. URL: https://www.cbr.ru/Content/Document/File/72621/20190628_dfs.pdf (accessed on 17.10.2019).

that the aggressive growth of microfinance companies leads to loss-making activities [22, p. 211]. However, if the threshold is set at a relatively low level, this will facilitate competition between numerous small companies. The ability of such companies to improve work efficiency will be limited by their size. A relatively high threshold may lead to creation of full-fledged banks in the form of small lenders, which will use more lenient regulation. Yet, they will not lose the advantages of a large financial organization.

In modern Russian practice, credit and microfinance organizations differ by the size of their funds. There are independent subcategories in the form of various types of banking licenses. Microfinance organizations also have their own subcategories. Russian legislation divides MFOs into two types: microfinance companies (hereinafter — MFCs) and microcredit companies (hereinafter — MCCs). The key difference is that MFCs have the right to raise funds from individuals who are not founders, but they are also subject to more stringent regulatory requirements, in particular a higher minimum level of equity and capital adequacy. Moreover, all MFOs are governed by self-regulatory organizations, representing a separate regulatory circuit [23, p. 119].

The introduction of appropriate restrictions seems appropriate, however, with the following reservations.

First, we advise to apply these standards only to organizations that finance their activities by the funds raised from individuals.

Second, these measures are primarily aimed at organizations engaged in unsecured consumer lending, characterized by increased risk.

Third, a financial organization's transition to another category should be voluntary, i.e. the organization should be able to remain in the current category through voluntary restrictions on portfolio growth.

Fourth, the threshold should be set based on the market size, but it should be dynamic, i.e. regularly reviewed, around the needs of each category for financial services.

CONCLUSIONS

Considering the international practices, the solution to the issue of regulatory arbitrage in the retail lending seems multifaceted. This problem is on planes of both the banking regulator (Bank of Russia) and beyond its competence (retail). When changing the regulation, we advise to consider the experience of China; in particular, the interagency company for regulating Internet finance [24, p. 8]. The company achieved success due to the coordinated interaction of various supervisory and regulatory bodies. On the one hand, all forms of credit relations where arbitrage may arise should be studied thoroughly to learn how much the existing restrictions consider the economic meaning of regulated relations.

CL restrictions on loans under installment plan miss a whole layer of contractual relations between the seller and the lender, while the most effective regulatory system considers market relations at their most [25, p. 35]. It is advisable to remove the restriction that fails to do its part due to insufficient elaboration. Contrary to protecting consumers, it restricts the possibility to get credit products. Accordingly, regulatory arbitrage may indicate excessive and ill-conceived regulation.

If, after the detailed study, the risks of arbitrage exceed the possible consequences of regulatory tightening, we recommend to amend the legislation considering that financial institutions fill in existing niches based on the need for these products and services; therefore financial availability should not be harmed by such restrictions. In the retail lending market, the lender decides on the loan issuance considering not only the risk profile of the borrower, but also the risk and economic feasibility of the transaction, as well as the costs associated with servicing the loan. Consequently, loans for small amounts and short terms may be impracti-

cal, since the cash flow from the return of the main debt and interest does not compensate the expenses of credit organizations for their servicing.

A certain combination of a person's need for a short-term loan with a large down payment or a small amount, issuing a loan to the same borrower with an appropriate risk may be economically inexpedient for a credit organization within the established CL restrictions. As a result, the list of CO loan products is reduced, since the profitability required for such borrowers/goods/sales channels does not meet the CO's requirements for economic feasibility.

MFOs lending to customers with such parameters is an alternative source of lending. Restrictions on the activities of such organizations should note that loans under certain conditions will not comply with the requirements of corporate bonds, and some customers will be unable to buy goods on credit/by installments, which will negatively affect financial availability.

Thus, distinguishing between financial institutions engaged in consumer lending (accordingly, regulatory requirements, including CL marginal values and restrictions when accounting for DBR), depending on the asset size, considers ensuring financial availability and reduces the risks of regulatory arbitrage. However, implementing such changes requires significant amendments to the current legislation on licensing financial organizations and their admission to financial markets. This will require consultation of supervisory authorities with both credit and microfinance organizations.

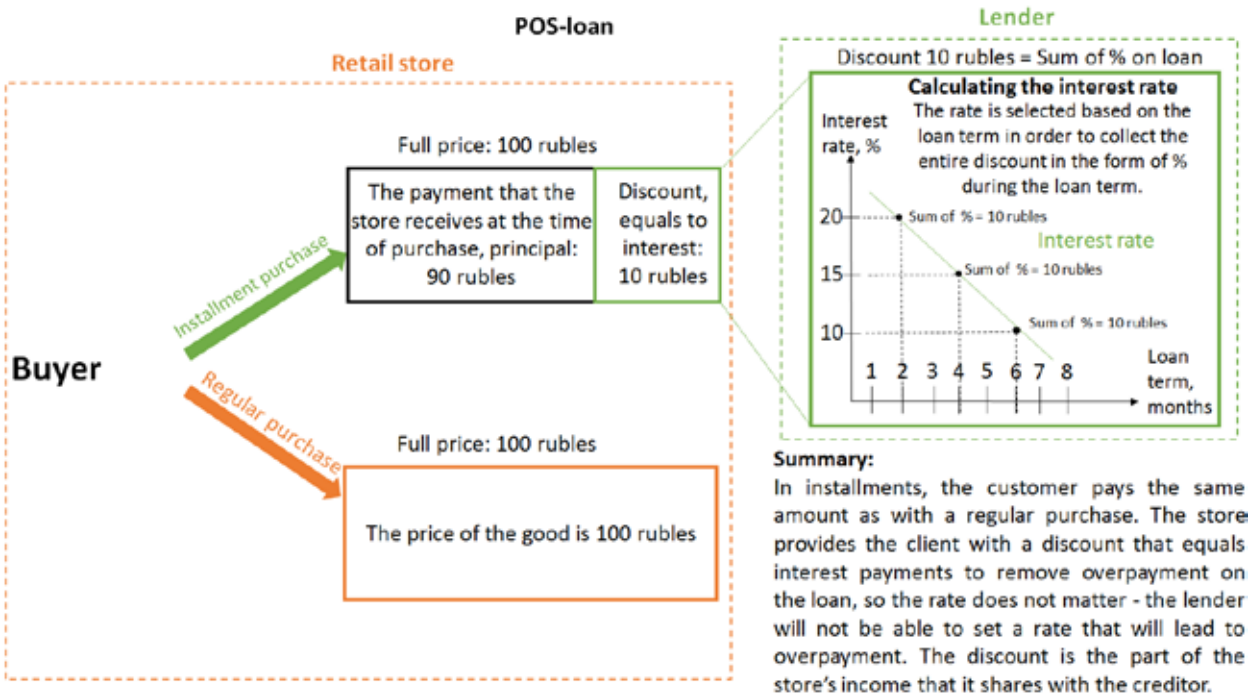
REFERENCES

1. Bordo M. D., Duca J. V., Koch C. Economic policy uncertainty and the credit channel: Aggregate and bank level U.S. evidence over several decades. *Journal of Financial Stability*. 2016;26:90–106. DOI: 10.1016/j.jfs.2016.07.002
2. Boyson N., Fahlenbrach R., Stulz R. Why don't all banks practice regulatory arbitrage? Evidence from usage of trust-preferred securities. *The Review of Financial Studies*. 2016;29(7):1821–1859. DOI: 10.1093/rfs/hhw007
3. Boyer P., Kempf H. Regulatory arbitrage and the efficiency of banking regulation. *Journal of Financial Intermediation*. 2017. DOI: 10.1016/j.jfi.2017.09.002
4. Guliev Sh. R. Assessment of the state of the banking sector and lending to SMEs. *European Science*. 2018;(10):30–32. (In Russ.).
5. Gutiérrez-Nieto B., Serrano-Cinca C. 20 years of research in microfinance: An information management approach. *International Journal of Information Management*. 2019;47:183–197. DOI: 10.1016/j.ijinfomgt.2019.01.001
6. Mamuta M.V., Sorokina O.S. Introduction to microfinance banking. *Global'nye rynki i finansovyi inzhiniring = Global Markets and Financial Engineering*. 2015;2(2):143–156. (In Russ.). DOI: 10.18334/grfi.2.2.539
7. Grigoryan S. A. Synergy of interaction between banking and microfinance systems. *Bankovskoe kreditovanie*. 2014;(6):27–38. (In Russ.).
8. Yunus M. Banker to the poor: Micro-lending and the battle against world poverty. 1st ed. New York: PublicAffairs; 1999. 288 p.
9. Demyanyk Y., Loutskina E. Mortgage companies and regulatory arbitrage. *Journal of Financial Economics*. 2016;122(2):328–351. DOI: 10.1016/j.jfineco.2016.07.003
10. Filippov D. I. Innovative regulating technologies: Revision of finance supervision. *Vestnik Rossiiskogo ekonomicheskogo universiteta im. G. V. Plekhanova = Vestnik of the Plekhanov Russian University of Economics*. 2018;(5):54–68. (In Russ.). DOI: 10.21686/2413–2829–2018–5–54–68
11. Buchak G., Matvos G., Piskorski T., Seru A. Fintech, regulatory arbitrage, and the rise of shadow banks. *Journal of Financial Economics*. 2018;130(3):453–483. DOI: 10.1016/j.jfineco.2018.03.011

12. Semeko G.V. Parallel banking sector: Features of development and consequences for financial stability. *Sotsial'nye i gumanitarnye nauki: Otechestvennaya i zarubezhnaya literatura. Ser. 2, Ekonomika: Referativnyi zhurnal*. 2019;(2):85–89 (In Russ.).
13. Gavrilin A.V., Uskova V.V. Discussion aspects of understanding the essence of shadow banking and its impact on the economy and the banking sector. *Economics*. 2017;(6):50–62. (In Russ.).
14. Faherty M., McCarthy O., Byrne N. Interest rate restrictions on credit for low-income borrowers. Cork: Centre for Co-operative Studies, University College Cork; 2017. 114 p. URL: https://sff.ie/wp-content/uploads/2018/11/irr.pdf (accessed on 17.10.2019).
15. Reifner U., Clerk-Renaud S., Knobloch M. Study on interest rate restrictions in the EU. Final Report for the EU Commission DG Internal Market and Services. Hamburg: Institut für Finanzdienstleistungen e.V.; 2010. 432 p. URL: https://www.cnb.cz/export/sites/cnb/en/supervision-financial-market/.galleries/legislation/cnb_opinions/download/urokove_sazby_studie.pdf (accessed on 17.10.2019).
16. Ferrari A., Macetti O., Ren D. Marginal interest rates: The theory and the practice. Policy Research Working Paper. 2018;(8398). URL: http://documents.worldbank.org/curated/en/244551522770775674/pdf/WPS 8398.pdf (accessed on 17.10.2019).
17. Desai C., Elliehausen G. The effect of state bans of payday lending on consumer credit delinquencies. *The Quarterly Review of Economics and Finance*. 2017;64:94–107. DOI: 10.1016/j.qref.2016.07.004
18. Devies R. Review of limitations on fees and interest rates regulations. *Government Gazette of South Africa*. 2015;(39379):106–111. URL: https://www.thedti.gov.za/gazzettes/39379.pdf
19. Prokofieva E.N., Strelnikov E.V., Istomina N.A. Retail crediting: Trends in the development of theory and practice. *Vestnik Omskogo universiteta. Seriya: Ekonomika = Herald of Omsk University. Series: Economics*. 2018;(2):58–68. (In Russ.). DOI: 10.25513/1812–3988.2018.2.58–68
20. Cull R., Demirgüç-Kunt A., Morduch J. Does regulatory supervision curtail microfinance profitability and outreach? *World Development*. 2011;39(6):949–965. DOI: 10.1016/j.worlddev.2009.10.016
21. Gietzen T. The exposure of microfinance institutions to financial risk. *Review of Development Finance*. 2017;7(2):120–133. DOI: 10.1016/j.rdf.2017.04.001
22. Yimga J. Microfinance expansion and its effects on cost efficiency. *The Quarterly Review of Economics and Finance*. 2018;69:205–216. DOI: 10.1016/j.qref.2018.03.006
23. Ershova I.V., Tarasenko O.A. Small and medium-sized enterprises: Transformation of the Russian crediting and microfinancing system. *Vestnik permskogo universiteta. Yuridicheskie nauki = Perm University Herald. Juridical Sciences*. 2018;(39):99–124. (In Russ.). DOI: 10.17072/1995–4190–2018–39–99–124
24. Xu D., Tang S., Guttman D. China's campaign-style Internet finance governance: Causes, effects, and lessons learned for new information-based approaches to governance. *Computer Law & Security Review*. 2019;35(1):3–14. DOI: 10.1016/j.clsr.2018.11.002
25. Kondrashin Yu., Khromov M. Development of proportional regulation of professional creditors in Russia, Brazil, India and Mexico. *Ekonomicheskoe razvitie Rossii = Russian Economic Developments*. 2018;25(11):31–35. (In Russ.).

Appendix

POS lending mechanism



Summary:
In installments, the customer pays the same amount as with a regular purchase. The store provides the client with a discount that equals interest payments to remove overpayment on the loan, so the rate does not matter - the lender will not be able to set a rate that will lead to overpayment. The discount is the part of the store's income that it shares with the creditor.

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Debt Burden, Local Fiscal Decentralization and Fiscal Incentives of Regional Authorities

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ABSTRACT

The author considers fiscal incentives of regional authorities in the system of federal intergovernmental relations. The **aim of the study** is to determine how the debt burden of Russian regions affects regional fiscal policy in the context of federal co-financing of expenditure obligations. The work employed the **methods** of grouping, one-dimensional cluster analysis, correlation analysis, and regression by generalized method of moments (system-GMM). **The study found that** the increase in the regional debt burden relates to a decrease in the level of local fiscal decentralization. Intensive debt financing of regional expenditures in 2013–2015 also reduces the willingness to regionally co-finance federal priorities. The author **concludes** that high debt burden reduces the fiscal incentives of regional authorities to co-finance federal initiatives and creates the risk of underfunding of national projects.

Keywords: intergovernmental transfers; North; public debt; subsidies; other intergovernmental transfers; general-purpose transfers; flypaper effect; national projects; correlation

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INTRODUCTION

The main features of the fiscal system of Russia — the centralization of tax powers in the decentralization of expenditure obligations — necessitate the widespread use of intergovernmental transfers.

The continuing resource dependence of the economy and high interregional differentiation keep down the growth of fiscal decentralization. It also affects the ability of intergovernmental transfers to balance between the positive and negative effects of the current decentralization model. For example, this happens when the central management of territorial systems entails imputed expenditures of refusing to identify local preferences due to high interregional disparities. A reduced quality of public sector management then impedes the processes of regional convergence. In this regard, the study of factors, roles and effects of intergovernmental transfers is relevant.

Today, we can identify circumstances that reinforce the need to study the effects caused by the structure, volume and method of distribution of federal transfers:

- increased importance of equalization transfers within the structure of federal intergovernmental transfers, related to the improved methodology to model a budget;
- reallocating earmarked intergovernmental transfers due to implementation of national goals in accordance with Presidential Decree No. 204[1];

[1] On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024 [Source of the electronic copy]: Decree of the President of the Russian Federation of 05.07.2018 No. 204 (as amended on 07.19.2018). Access from the reference legal system "Consultant Plus".

• debt sustainability concerns, despite the increased financial stability of the consolidated budgets of the constituent entities in recent years [1].

The area of research on intergovernmental relations is very diverse. For example, to increase the efficiency, M. L. Vasyunina [2] proposes to expand the allocation of subsidies and other types of intergovernmental transfers with clearly defined conditions for the efficient use. R. A. Alandarov [3] singled out the specific disadvantages of allocating transfers in the context of state programs.

Coupling intergovernmental transfer allocation and financial sustainability is also very popular in the literature. V. M. Kreindel' [4] found signs of soft budget constraints in the Russian budget system. Later, O. V. Suchkova and A. Yu. Chemis [5] obtained more encouraging results, revealing signs of sustainability of the public debt in relatively developed regions. V. F. Sharov and A. K. Karaev [6] modeled the limits of stability in the budget system as a whole. The work [7] discusses intergovernmental relations policy measures in terms of reducing the risks of regional financial stability. Yet, with all the variety of works on this topic, the analysis of the incentives incited by the federal intergovernmental transfer at regional authorities with accumulated debt in the region gets little attention in the literature.

The aim of the study is to determine how the past period of growth in the debt burden and the risks to financial stability of the budgets of the constituent entities of Russia can affect regional fiscal policy in the context of federal co-financing of expenditure obligations..

METHODS

This work calculates the public debt of the constituent entities of Russia as the ratio of the debt and own (tax and non-tax) revenues.

We analyze the impact of the accumulated debt on fiscal incentives of regional authorities upon receipt of federal intergovernmental transfers in four stages:

1. Breaking down the constituent entities of Russia into two groups by the average public debt for 2008–2018. We use a one-dimensional cluster analysis by calculating the Euclidean distance between the constituent entities by the value of this indicator. The first group includes the constituent entities with the smallest (average 0.23) public debt, and the second group — with the highest one (average 0.66).

2. Analyzing the public debt dynamics in 2008–2018 by groups of the constituent entities (federal districts[2], northern regions[3], first and second groups by public debt) and in Russia as a whole.

3. Calculating the paired linear correlation coefficients between the public debt and the indices of local fiscal decentralization in the expenditures and incomes. This stage aims to identify a criterion for grouping the constituent entities that is different from a sign of the public debt. The criterion is useful for a deeper analysis of the potential effects of the public debt on regional government incentives in the budget policy. Higher local decentralization may contribute to the development of fiscal incentives at the regional level upon the receipt of federal transfers.

4. Analyzing fiscal incentives by the following method.

We analyzed the outcomes from granting federal intergovernmental transfers to the budgets of the constituent entities of Russia from the perspective of the incentives aris-

[2] The designations of the federal districts of Russia are as follows: Central Federal District — Northwestern Federal District, Northwestern Federal District, Southern Federal District (excluding the Republic of Crimea and Sevastopol), North Caucasian Federal District — Volga Federal District, Ural Federal District — Ural, Siberian Federal District, Far Eastern Federal District — Far Eastern.

[3] The northern constituent entities are the regions whose entire territory belongs to the regions of the Far North and equivalent localities (except the Republic of Tuva): the Republic of Karelia, the Republic of Komi, the Nenets Autonomous Okrug, the Arkhangelsk Region, the Murmansk Region, the Khanty-Mansi Autonomous Okrug, the Yamalo-Nenets Autonomous Okrug, Republic of Sakha (Yakutia), Kamchatka Territory, Magadan Region, Sakhalin Region and Chukotka Autonomous Region.

ing for the regional authorities when making fiscal decisions (fiscal incentives) by the effect of a high dependence of public spending on intergovernmental transfers (known as the flypaper effect in foreign literature [8, 9]).

Public spending depends on transfers if the unit of growth of the transfer causes a greater increase in spending than the equivalent unit of growth of private income in the territory. Simply, this may indicate a fiscal regime favorable for the donor budget policy — the granted transfers are spent much more willingly than funds received from local taxation. In this case, the interests of the donor budget are mainly realized.

R. Logan [10] believes that granting transfers robs the system of financial resources due to the emergence of fiscal illusion. Growth in recipient spending to some extent compensates for this loss at the expense of the private sector of the economy. *The opposite case* is when the private income factor contributes to the regional expenditures more than the federal transfer does. This indicates that the budget, which receives budget funds through transfers, does NOT consider them as sources much different to its own tax revenues. The authorities of the recipient budget may well allocate part of the transfer funds to reduce the tax burden (which is in the interests of taxpayers-voters) or reduce the deficit/accumulated debt without increasing direct expenditures. In this case, for the recipient budget, the interests of local taxpayers are considered relatively more important than the interests of the donor budget.

Based on the approach presented by [11], we compare the coefficients α and β in model (1).

$$Expenditures_{it} = \Pr ivate\, income_{it}^{\alpha} * \\ * Federal\, transfer_{it}^{\beta} * \prod Intermediate\ \mathrm{var} iables_{it}^{\gamma} * \varepsilon_{it}. \quad (1)$$

The contribution of the variables is calculated through partial derivatives. For example, for the federal transfer variable, the contribution to the expenditure increase per unit of its own value is equal to:

$$\frac{\partial Expenditures}{\partial Federal\, transfer} = \beta * Federal\, transfer^{(\beta-1)} * \\ * \Pr ivate\, income^{\alpha} * \prod Intermediate\ \mathrm{var} iables^{\gamma}. \quad (2)$$

We analyzed the whole period of 2008–2018, as well as the sub-periods of 2011–2018 and 2014–2018. Division into sub-periods allows us to evaluate how the contribution of factors to costing has changed and how modern trends differ from the previous ones.

An indicator of private income is the average wage in the region (according to the Federal State Statistics Service), expenditures are the direct expenses of the budgets of the constituent entities of Russia (according to the Treasury of Russia), and federal transfers are all the main federal transfers[4].

The intermediate variables are:

1) the number of employees in organizations of state ownership, a share of the number of employees;

2) the population of working age, a share of the population;

3) unemployment rate.

These indicators are necessary to monitor factors increasing the budget expenditures of a constituent entity not related to the determinants of private income and transfer.

This work considers more types of transfers compared to [11] and significantly simplifies the model and calculations; however, it does not affect the main conditions to obtain reliable estimates. Including all types of intergovernmental transfers in the analysis excludes the arbitrary choice of a transfer as shown in [12]. Other main elements of the model should be the nonlinearity of the specification [13], as well as monitoring the endogene-

[4] All absolute indicators are recalculated based on the population of the regions, adjusted for the consumer price index in order to bring them to the level of 2017, and consider the value of the index of budget expenditures (IBE), designed to level inter-regional differences. The IBE is used in the federal methodology for distributing equalization grants.

ity — the influence of the dependent variable on one or more explanatory variables [14, 15]. Equation (1) is linearized through the natural logarithm and estimated by the generalized method of moments (system-GMM) [16], which suggests the elimination of the endogenous problem.

To interpret quantitative results, we calculate the difference between the contribution of the federal transfer factor and the contribution of the private income factor (the calculations are below in *Tables 3* and *4*). According to the method above, if the difference positive, we see the regional fiscal regime, relatively more favorable for the federal budget. If the difference is negative, the regime is relatively more favorable for the local/regional taxpayer.

We interpreted the obtained quantitative analysis results as follows.

If the difference in contributions of two factors (federal transfer and private income) is positive, the regional authorities are inclined to co-finance the priorities of the federal fiscal policy and increase overall budget expenditures. This also indicates unwillingness to reduce the public debt, as well as raise private income through lowering the regional tax burden and/or replacing income by federal transfers. In this scenario, regional authorities are ready to allocate financial resources to activities to achieve federal national projects. Considering the public debt in the calculations, this result may also indicate that the decisions on regional budget expenditures are independent from the debt.

If the difference in contributions of the two factors is negative, we can speak of the tendency to restrain general regional spending, which may underfund the implementation of federal policy. This also indicates the intention to lower the debt burden due to the transfer, the possibility of lowering the regional tax burden and/or replacing own income by federal transfers. Both actions reduce direct budget expenditures of the constituent entity and are opposite to the interests of the federal budget. An explanation for this scenario may be the fact that the public debt of the constituent entity has reached the level where the regional authorities are worrying about the risks to financial stability.

It should be noted that even if the regional authorities are ready to allocate financial resources to implement federal policy (a positive difference between the contributions of the two factors), a high public debt means risks for the sustainable development of the region's economy, primarily by restraining private regional investments [17, 18].

TRENDS OF INTERGOVERNMENTAL RELATIONS AND FEATURES OF ANALYSIS OF FISCAL INCENTIVES

The budget system of Russia currently faces revenue and expenditure *centralization* [19, 20]. It is explained by the distribution of tax revenues and the influence of the higher budget on expenditure obligations of the lower budget. The low local fiscal decentralization does not allow to realize the benefits of decentralization, and does not lead to a decrease in inter-regional differentiation [21]. *Fig. 1* shows the trends of reducing the share of the constituent entities in the consolidated parameters of Russia's budget system (including extrabudgetary funds) in 2008–2014 and the stagnation in 2015–2017. Today, revenues and expenditures of the consolidated budgets in Russia's constituent entities constitute approximately 35% of the total parameters of Russia's consolidated budget. At the beginning of the period under review, the indicator was approximately 40% of the revenues and expenditures of the total budget system.

Increasing oil prices and federal policy measures (intergovernmental equalization linked to individual agreements to restrain spending, as well as the allocation of budget loans) allowed the consolidated budgets of Russia's constituent entities to rebuild the values of the main parameters by the end of

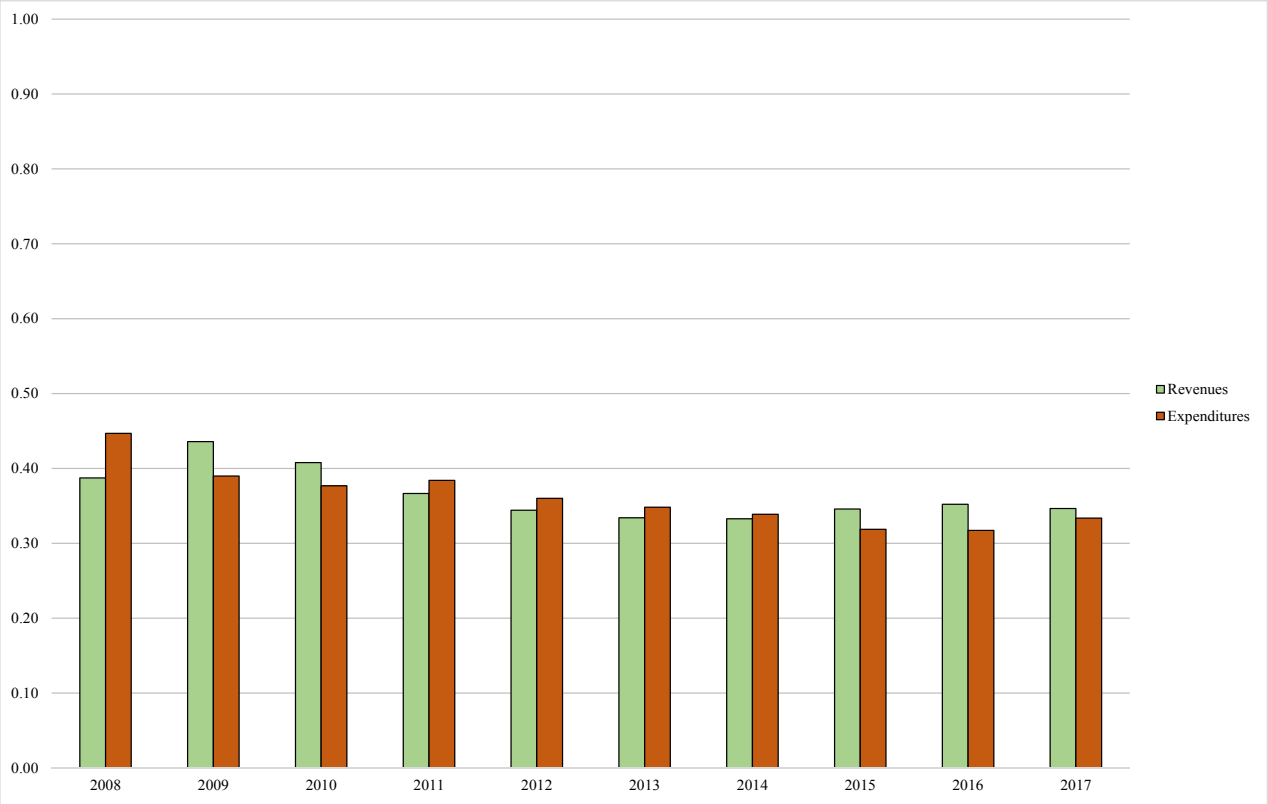

Fig. 1. **Share of revenues and expenditures of the consolidated budget of subjects in the parameters of the consolidated budget of Russia, units**

Source: Rosstat (collection "Finance Of Russia"), author's calculations.

Note: including extrabudgetary funds. Transfers belong to expenditures of a donor budget.

2018 (*Fig. 2*) [22]. According to the Bank of Russia, in 2018, there was a surplus of financial resources in the budget system (for the first time since 2012). The trend persisted in the first half of 2019[5]. However, regional debt is complicated by the high heterogeneity of the constituent entities, including in terms of the public debt, and the fact that the current surplus cannot provide a significant reduction in accumulated debt.

With the continuing centralization of the domestic budget system, intergovernmental relations become especially important, since they determine the distribution of tax and expenditure powers. Recommendations on efficiency growth of intergovernmental relations in the domestic academic literature are mostly based on the structure and conditions for granting intergovernmental transfers [23, p. 65]. In the literature, the main attention is paid to balancing, stimulating and equalizing functions of transfers [24]. As a rule, very little attention is paid to the analysis of the stimulating federal transfers in terms of their comparative advantage over the factor of private income in a particular region. It was one of the study motives, as well as the opportunity to analyze the influence of various types of federal intergovernmental transfers performing various functions. The last clarification is very conventional, since the functions of equalizing and stimulating the revenue growth can belong to a single type of intergovernmental transfer (for example, equalization grants in Russia's budget system) [25].

[5] Main directions of the unified state monetary policy for 2020 and the period 2021 and 2022. Approved by the Bank of Russia 10.25.2019. Published in the reference legal system "Consultant Plus".

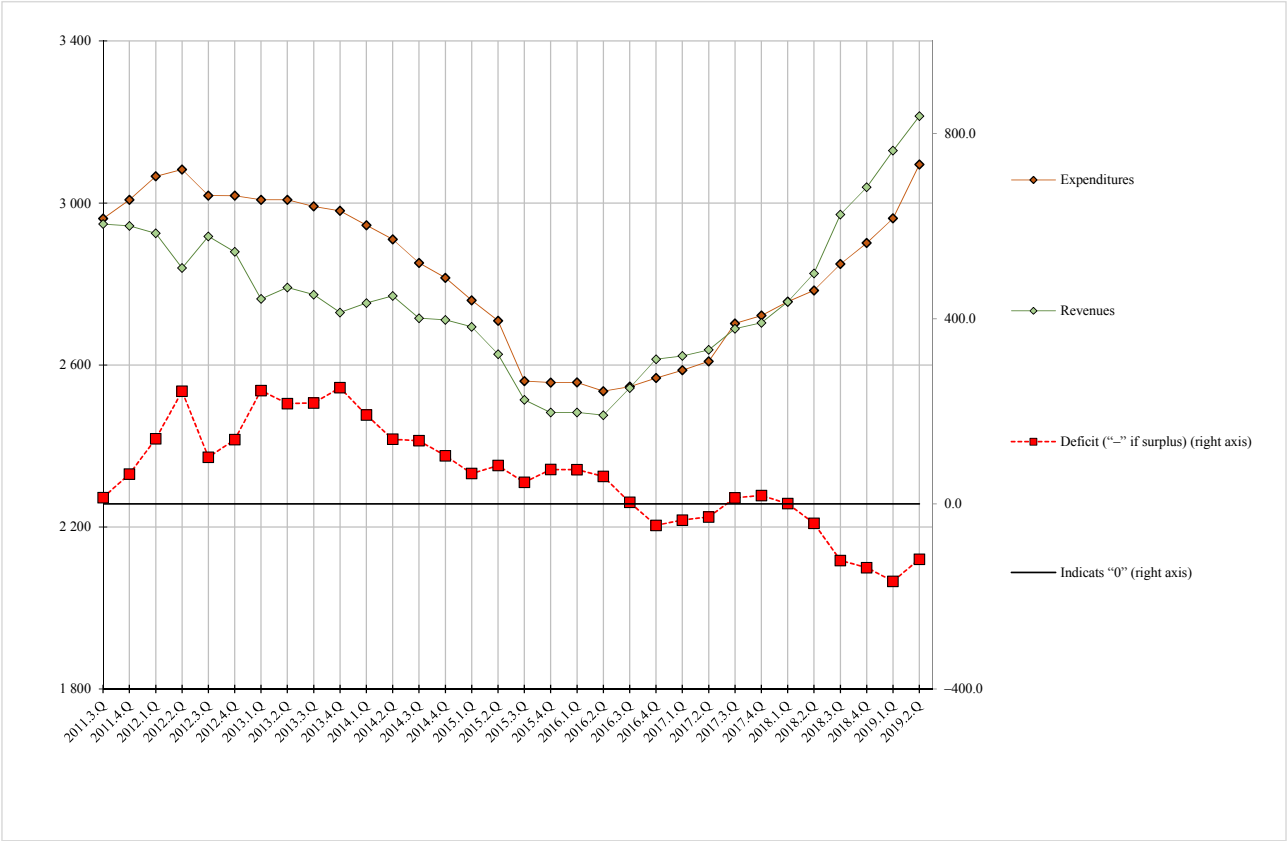

Fig. 2. **Dynamics of the main parameters of consolidated budgets of Russia's constituent entities, billion rubles**

Source: Ministry of Finance of Russia, author's calculations.

Note: cleared of seasonal and random fluctuations through the four-quarter moving average. Prices of 2017.

When analyzing the stimulation of regional revenues growth, including the results of classifying the constituent entities by a characteristic, it is very popular to divide regions by income or fiscal capacity [e.g., 26]. In *this* work, the constituent entities are grouped by the size of the public debt.

Basic studies of the role of the budget debt burden analyze its impact on economic growth and the dynamics of production factors. There is a search for channels of influence [27, 28], or threshold of public debt [29, 30]. M. P. Afanasiev and N. N. Shash [31] warn about debt financing of current expenditures in Russia, including at the regional level, since it underestimates the potential positive effect of fiscal policy. In a resource-dependent economy with an emerging market, the negative effects of the debt burden are combined with the detrimental effect of instable macroeconomic indicators. *This* work specifically studies the role of debt value when the government of the relevant constituent entity decides on the budget allocations in the context of federal co-financing.

Low financial independence of regional and municipal authorities most likely implies a relatively high impact of intergovernmental transfers on the expenditure decisions. This work considers the public debt value of a constituent entity of Russia as a mediating factor in the comparative analysis of private incomes and transfers. Today, it is important to know the dynamics of the sought coefficients and their value.

RESULTS

The public debt of Russian constituent entities has significantly increased for the period of 2014–2018 (*Fig. 3*). The highest public debt is in the regions of the Southern Federal

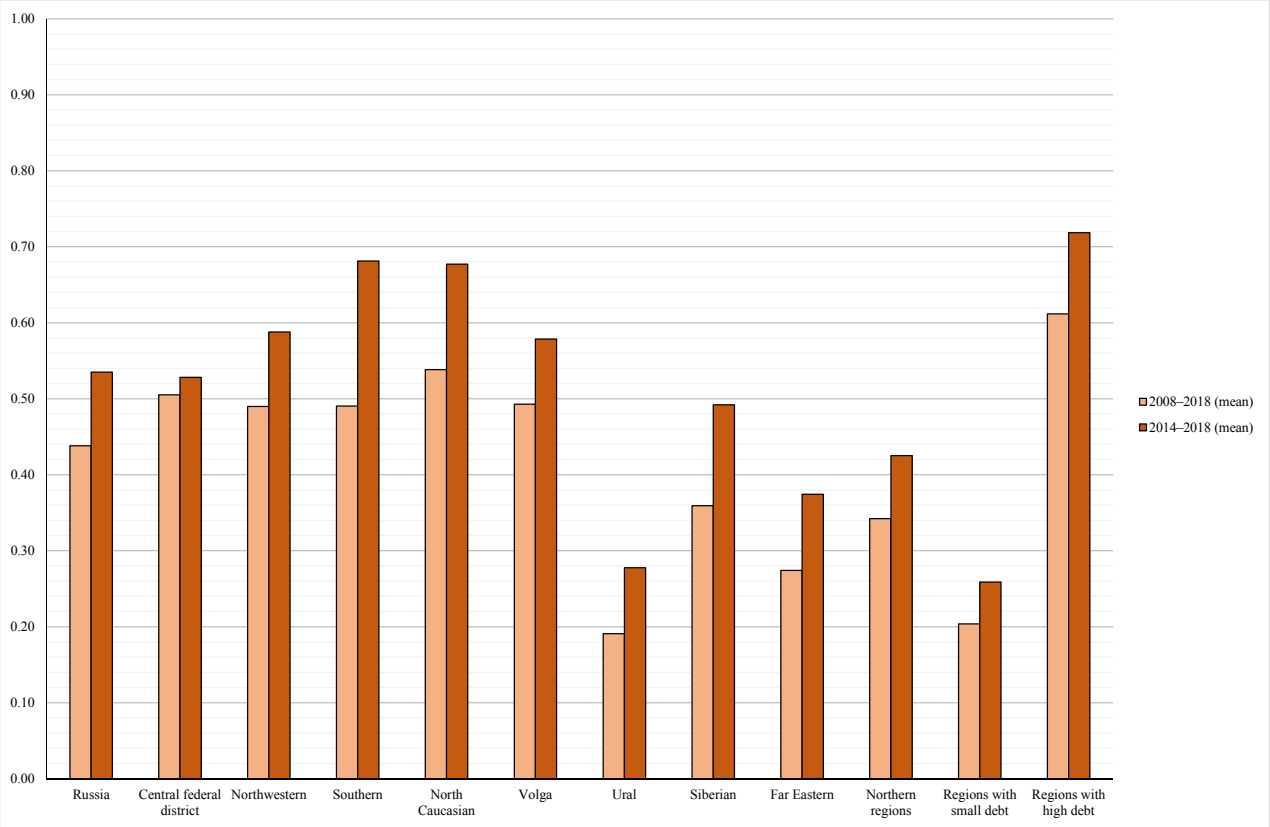

Fig. 3. **Weighted average public debt by Russia's federal districts and groups of constituent entities, units.**

Source: Treasury of Russia, author's calculations.

Note: the weight is the population of the constituent entities.

District and North Caucasus Federal District, the lowest is in the Ural Federal District. The northern regions of Russia, including wealthy regions of the Ural Federal District, have a relatively small debt. It should be noted that the increase in the public debt of the constituent entities with the highest average indicator was higher (in p.) than for the constituent entities with a relatively small public debt.

A large part of the constituent entities of Russia has a relatively high public debt (*Table 1*). Except the Ural Federal District, the Siberian Federal District and the Far Eastern Federal District (as well as the groups of the northern regions of Russia), most of the constituent entities of the federal districts have a high debt burden. The largest share of regions with a relatively high public debt is part of the North Caucasus Federal District.

In terms of public debt growth, the most unfavorable periods were the years of 2009 and 2013–2015 (*Fig. 4*). In 2016–2018, the debt value of Russian regions began to decline. For the regions with the highest debt, it was decreasing faster, which is a positive sign. The debt burden in the northern regions is noticeably less than the average for Russia. This is due to the better fiscal capacity and lesser need for loans.

The inter-district dynamics analysis of the public debt helps classify the federal districts of Russia (*Fig. 5*). Three groups of regions are distinguished. On the one hand, the North-West Federal District, the Southern Federal District and the North-Western Federal District have similar dynamics of the indicator, and on the other hand — the Ural Federal District, the Siberian Federal District, and the Far Eastern Federal District. For the Central Federal District, dynamics of the indicator is relatively independent. Yet, the trajectories of the dynamics of all federal districts are very similar.

Table 1

Groups of constituent entities depending on the size of public debt, by federal districts, units.

Group of regions	Group 1 (least debt)		Group 2 (greatest debt)	
	Number	Proportion of the number of regions in the federal district, %	Number	Proportion of the number of regions in the federal district, %
All subjects	34	41	49	59
Central	6	33	12	67
North-West	5	45	6	55
Southern	2	33	4	67
North Caucasus	1	14	6	86
Volga	4	29	10	71
Ural	5	83	1	17
Siberian	6	50	6	50
Far Eastern	5	56	4	44
Northern subjects	8	67	4	33

Source: author's calculations based on the data from the Treasury of Russia.

Note: The analysis does not involve the city of Sevastopol and the Republic of Crimea. Groups of constituent entities are distinguished by one-dimensional clustering (Euclidean distance between values by constituent entities). The results of grouping, including graphical analysis materials, are available upon a request to the author.

Relatively high expenditure budget decentralization is accompanied by a relatively small debt of the budgets of the constituent entities (*Table 2*). This is consistent with the conclusion that the widespread local authority has a beneficial effect on the commitment of fiscal discipline authorities [32, 33]. This thesis is especially pronounced in the case of expenditure budget decentralization.

The inverse relationship between debt burden and decentralization also means that if the debt increases, local powers are reduced. Therefore, the debt factor may partially explain the downward trend in local fiscal decentralization in Russia.

Quantitative estimates of the negative relationship between local expenditure decentralization and the public debt are approximately the same for all the groups. Yet, the effect of decentralization is noticeably weaker for the constituent entities with a relatively high debt. On the contrary, when considering revenue decentralization by local revenue structure, the analyzed relationship is very weak, and the group comparative analysis is inappropriate.

The expected positive effect of local fiscal decentralization on the public debt (namely, a relatively small debt and fiscal discipline with significant powers at the local level) is almost independent of its value or the geographical

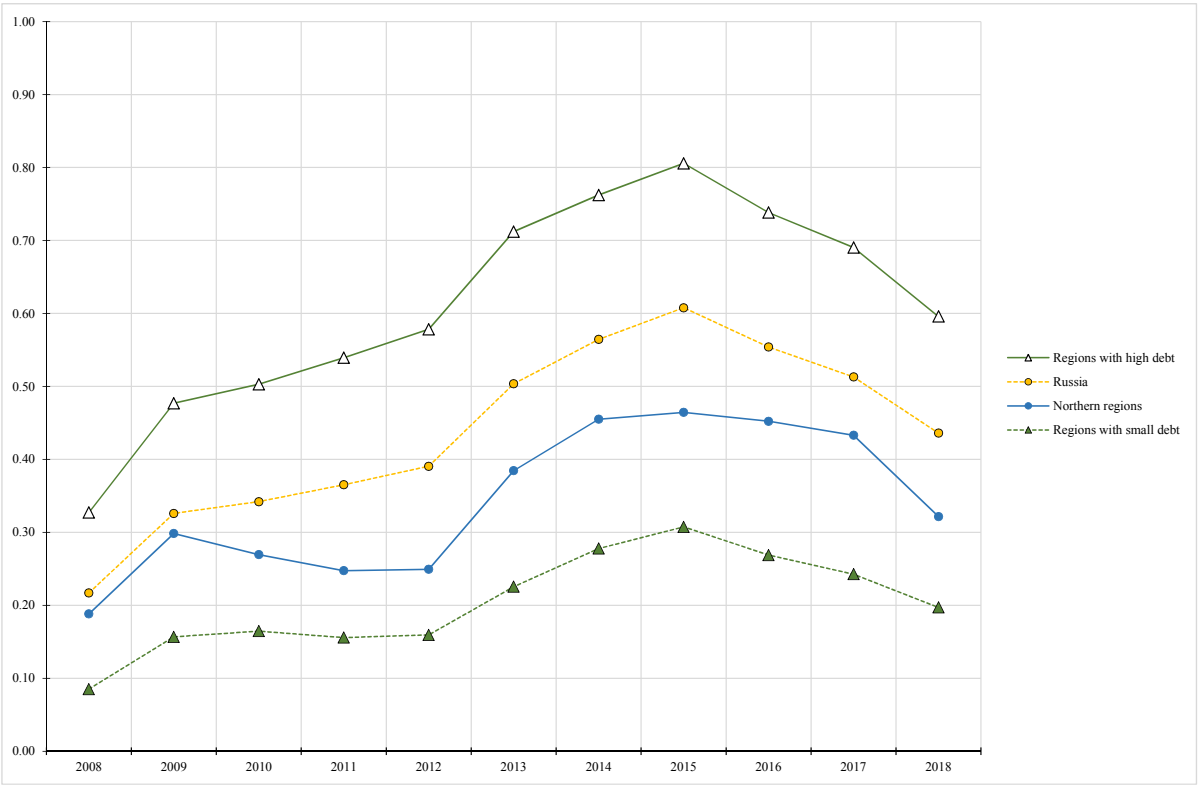

Fig. 4. **Dynamics of public debt by the groups of Russia's constituent entities in 2008–2018, units.**

Source: Treasury of Russia, author's calculations.

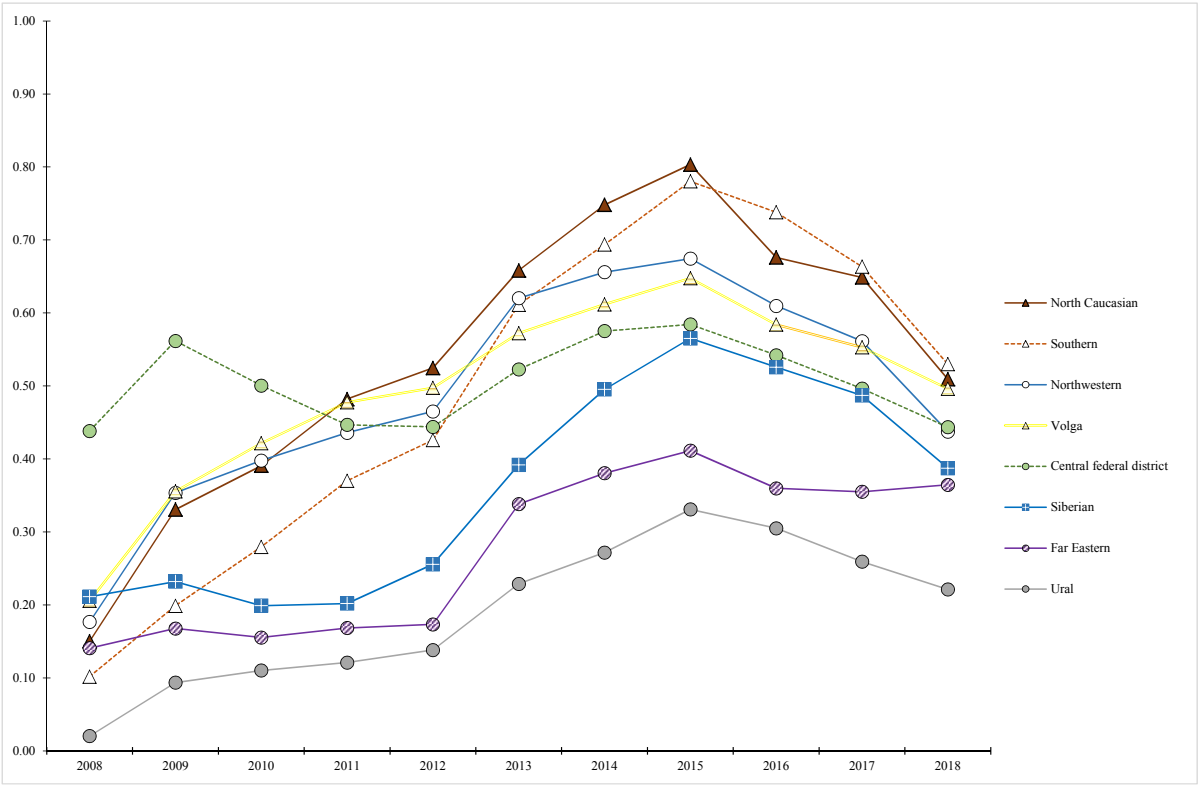

Fig. 5. **Dynamics of public debt of Russia's federal districts in 2008–2018, units.**

Source: Treasury of Russia, author's calculations.

Table 2

Paired correlation coefficients of the public debt and local budget decentralization indicators by groups of Russia's constituent entities, units

Local budget decentralization indicator	Russia as a whole	Northern constituent entities	Constituent entities with small public debt	Constituent entities with high public debt
Share of local budgets in consolidated expenditures of the region (subventions refer to the expenditures of the regional budget)	–0.41*	–0.48*	–0.42*	–0.30*
Share of own revenues of local budgets in the structure of overall revenues	–0.11*	0	0	–0.10*

Source: author's calculations, Treasury of Russia.

Note: * — the coefficient is statistically significant according to the Student's criterion. Based on data for all constituent entities, except Moscow, St. Petersburg, Sevastopol and the Republic of Crimea, 2008–2018.

location of the constituent entities. Thus, it is inappropriate to complicate model (1) regression analysis with additional consideration of various groups of the constituent entities by the size of local budget decentralization.

Table 3 summarizes the calculations by model (1) based on the data for Russia as a whole[6].

Fig. 6 illustrates the data of *Table 3*. Regardless of other intergovernmental transfers, the function of federal transfers, which consists in stimulating the budget expenditures of the constituent entity, decreases. In 2014–2018, it almost equaled to zero. Balancing grants completely replace the constituent entity's budget revenues, since the contribution of these transfers to expenditures is negative[7]. Subventions (0.043) and other intergovernmental transfers (0.060) are the largest relative contribution of the federal transfer. However, this indicator (for subventions) also decreases.

Thus, the stimulating function of federal intergovernmental transfers across Russia is currently decreasing. For regional authorities, the importance of federal priorities compared

[6] The details of the regression analysis are not provided, but are available from the author on request.

[7] It is equal to –0.014 in 2014–2018. The corresponding data for all types of transfers are not provided, but are available from the author on request.

Table 3

Difference between the contribution of the federal transfer factor and the contribution of private income

Type of transfer	2008–2018	2011–2018	2014–2018
All transfers	0.005	0.002	–0.001
Equalization grants	0.003	–0.001	0.000
Balancing grants	–0.001	–0.001	–0.015
Subsidies	0.009	0.000	–0.001
Subventions	0.043	0.031	–0.001
Other intergovernmental transfers	0.060	0.038	0.170

Source: author's calculations, Treasury of Russia.

Note: The difference greater than zero means that the impact of federal transfers on spending growth is stronger than the impact of private income factor in the constituent entity (there is a flypaper effect = the effect of high dependence of expenditures on intergovernmental transfers which is favorable for the donor budget policy).

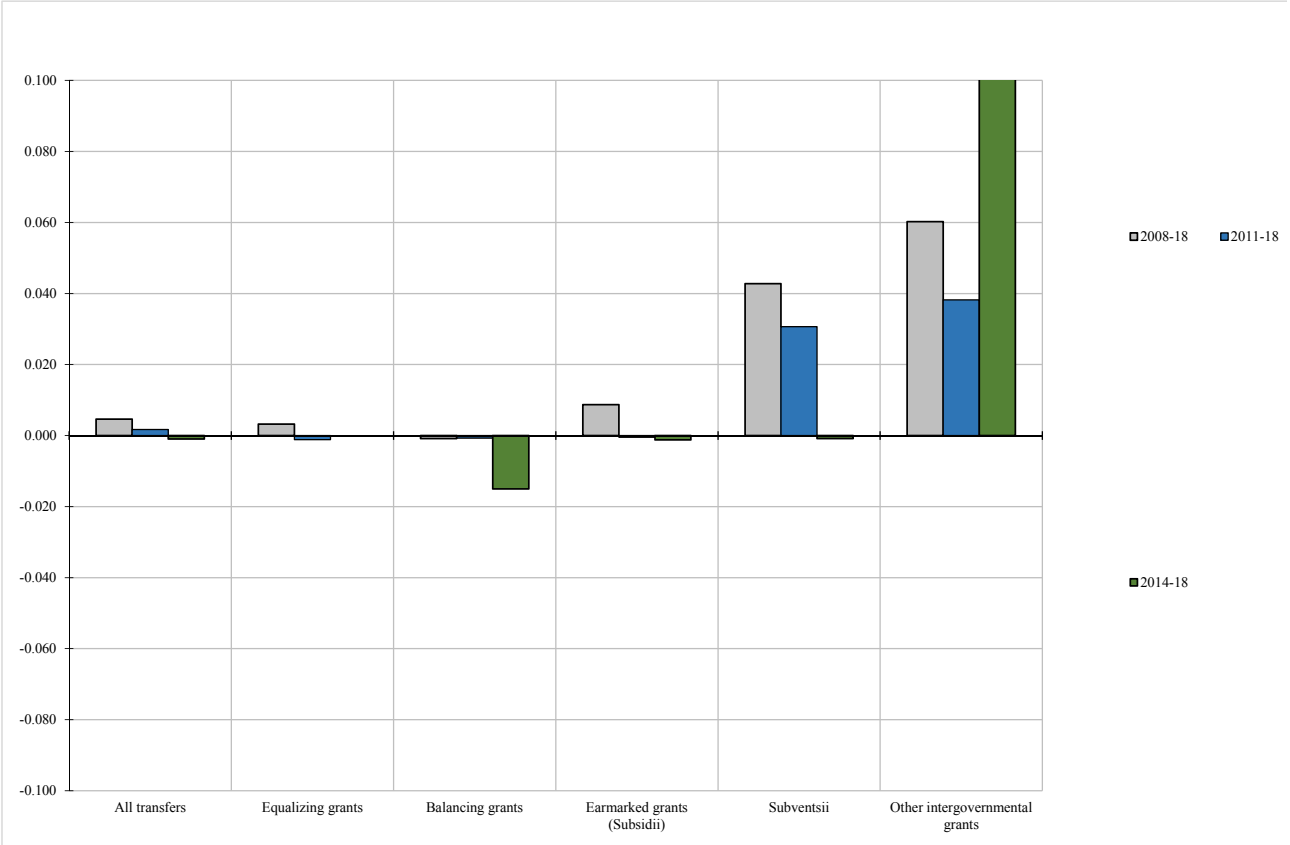

Fig. 6. **Difference between the contribution of the federal transfer factor and the contribution of private income factor, Russia as a whole**

Source: based on *Table 3*.

Table 4

Difference between the contribution of the federal transfer factor and the private income factor, groups of constituent entities

Type of transfer	Constituent entities with small public debt			Constituent entities with high public debt			Northern constituent entities		
	2008–2018	2011–2018	2014–2018	2008–2018	2011–2018	2014–2018	2008–2018	2011–2018	2014–2018
All transfers	0.002	0.000	0.000	0.055	0.046	0.011	0.006	–0.014	0.000
Equalization grants	0.008	–0.003	–0.007	0.000	0.000	0.000	–0.010	0.000	0.000
Balancing grants	–0.022	–0.025	0.000	0.000	–0.001	–0.001	0.000	0.000	0.000
Subsidies	0.000	0.000	0.000	0.078	0.092	0.018	0.028	–0.128	0.163
Subventions	0.000	0.029	0.000	0.068	–0.001	0.000	0.046	–0.246	0.000
Other intergovernmental transfers	0.072	0.044	0.166	0.080	0.084	0.064	0.083	–0.313	0.133

Source: author's calculations, Treasury of Russia.

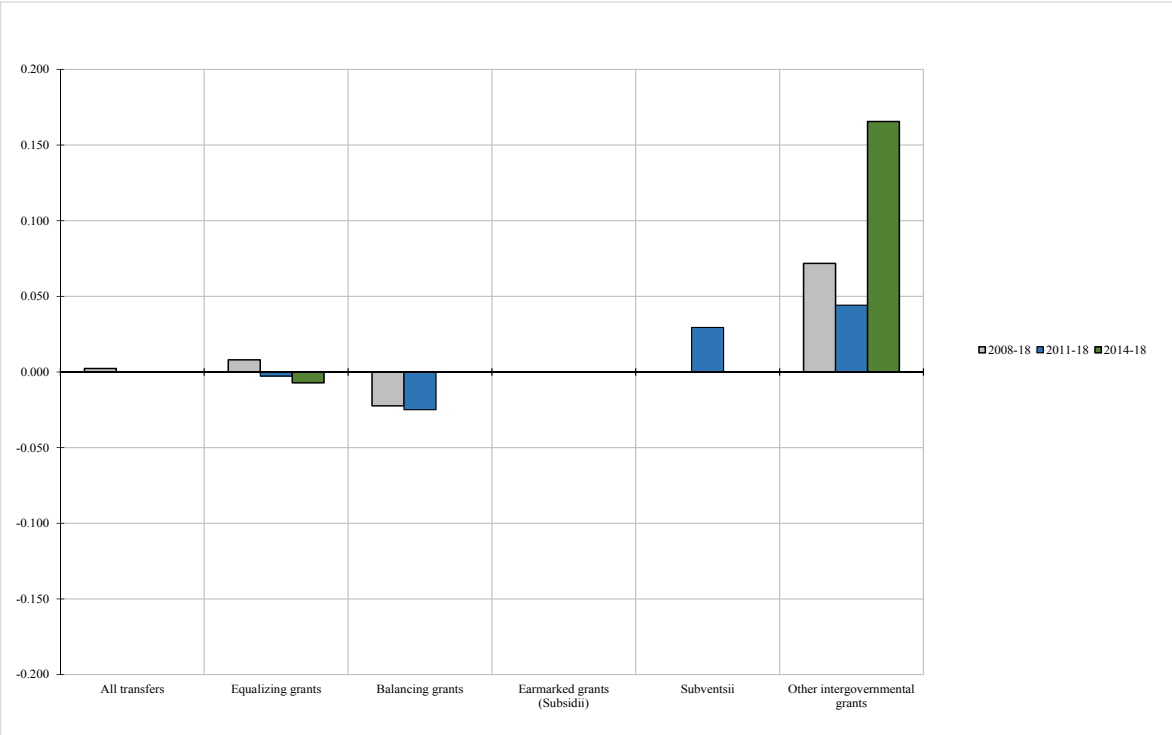

Fig. 7. **Difference between the contribution of the federal transfer factor and the contribution of private income factor, constituent entities with small public debt, average for 2008–2018**

Source: based on *Table 4*.

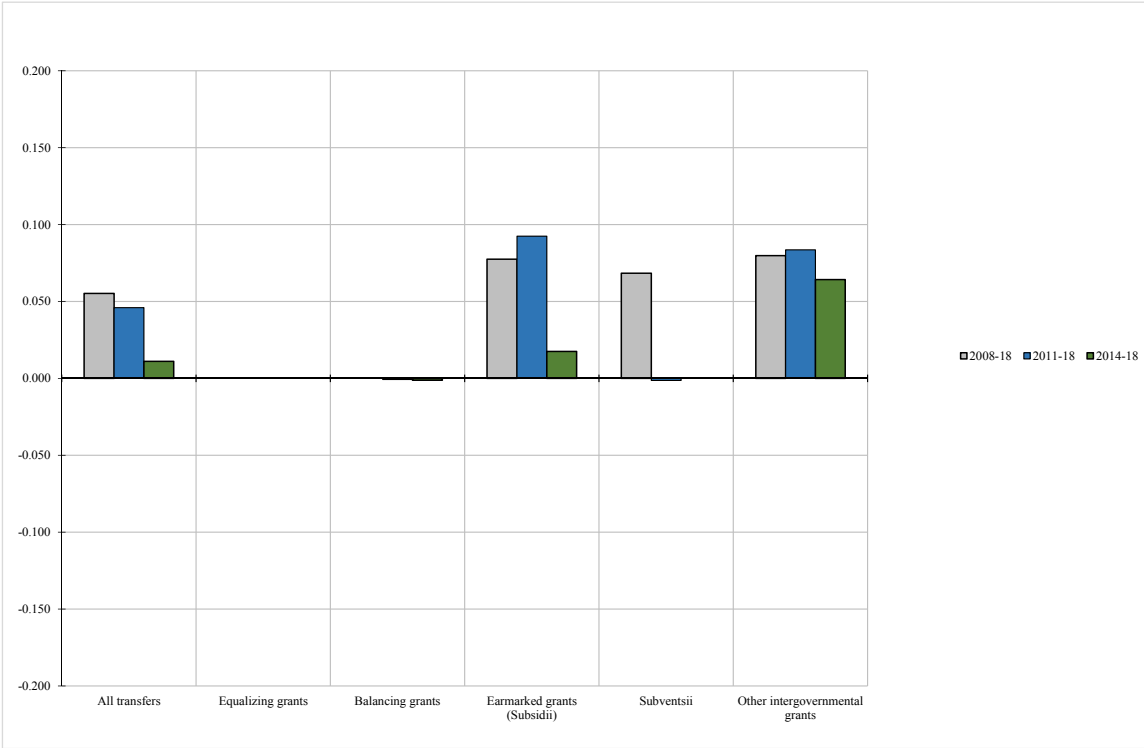

Fig. 8. **Difference between the contribution of the federal transfer factor and the contribution of private income factor, constituent entities with the highest public debt, average for 2008–2018**

Source: based on *Table 4*.

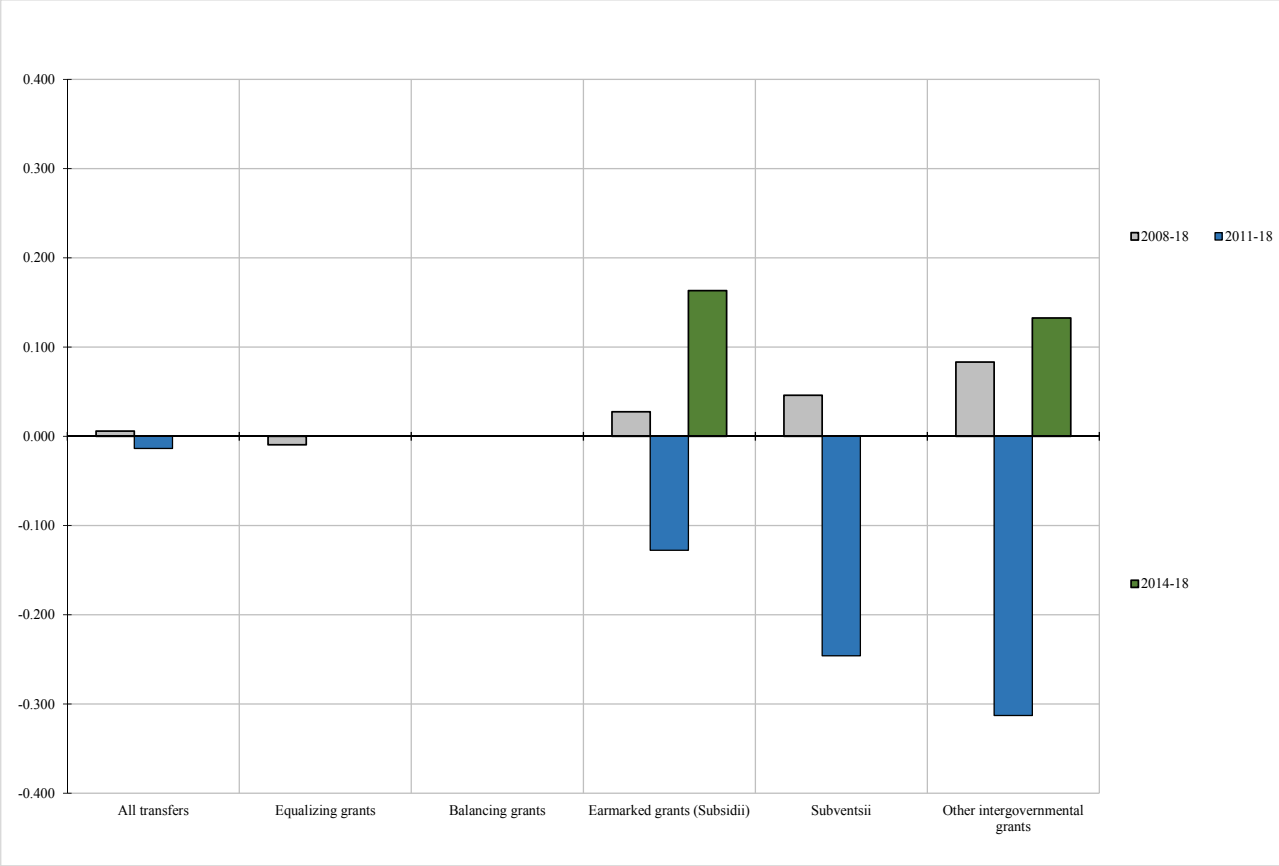

Fig. 9. **Difference between the contribution of the federal transfer factor and the contribution of private income factor, northern constituent entities**

Source: based on *Table 4*.

to the interests of local taxpayers to reduce the tax burden is lowering. This indicates a decrease in the regions of fiscal incentives, bringing together the interests of the federal and regional budgets in choosing the allocation areas and their adequate financing.

Another explanation is the continuing debt burden. Observed in recent years, debt financing of current expenditures may restrain the budgets of the constituent entities financed by their own revenues. In other words, federal transfers may replace own revenues/expenditures to reduce the accumulated debt. This may include a risk of underfunding of national project activities.

If the assumption about the influence of the public debt factor influences on reducing the influence of the federal budget on the budget parameters of the constituent entity is true, then the difference between the contributions of the federal transfer factor and private income should be more pronounced and reduced much more over the period under review in the constituent entities with a relatively high public debt, than in those with a relatively small debt.

Table 4 summarizes the calculations by model (1) in the context of groups of the constituent entities by the size of the public debt.

Comparing *Fig. 7* and *Fig. 8*, which illustrate the data in *Table 4*, confirms the hypothesis is true. Indeed, there was a noticeable reduction in the difference between the contribution of the federal transfer factor and the contribution of private income in 2014–2018 in the group of the constituent entities with a high public debt compared to the general period of 2008–2018.

The relatively high (compared to the contribution of private income) contribution of

other intergovernmental transfers to forming the budget expenditures of the constituent entity for all the constituent entities of Russia (see *Fig. 6*) is due to the constituent entities with a relatively small public debt (*Fig. 7*). On the contrary, for the regions with a relatively high public debt, the relative quantitative contribution of subsidies and other intergovernmental transfers is approximately the same. However, in 2014–2018, the importance of subsidies for regional expenditures sharply decreased. This confirms the hypothesis that a high debt slows down regional authorities to expand their own expenditures after federal co-financing. A negative consequence of these actions may be the increased risk of failure to achieve the most important goals of the implementation of national projects in the areas of human capital development, a comfortable environment and economic growth.

The fact that the reduction in the potential of federal transfers for the budget expenditures of the constituent entity is especially pronounced for federal subsidies is extremely negative for implementing national projects and other initiatives at the federal level, since the most significant part of financial assistance is allocated through subsidies.

For federal subsidies, as well as subventions, the contribution of the transfer factor is comparable to that of the private income factor in forming regional expenditures regardless of the public debt. This indicates the neutral nature of these types of transfers.

We should note the unique role of other federal intergovernmental transfers. They have the strongest influence on the growth of regional expenditures compared to the contribution of the private income factor. This thesis is true regardless of the group of the constituent entities.

By composition, the northern constituent entities are similar to the group of the constituent entities with a small public debt in terms of the total federal transfers (*Fig. 9*). The comparative contribution of a general-purpose transfer factor is insignificant and sometimes negative. Yet, the assessment of the role of earmarked transfers is ambiguous: they have a very strong stimulating component, including now. This is also true for subsidies, which is not typical of the constituent entities with a relatively small debt. On the other hand, the negative value of the difference in the contribution of the factors in 2011–2018 indicates a qualitatively different situation observed in 2011–2015. This finding probably requires further research of the causes for the identified phenomenon.

CONCLUSIONS

The study revealed that currently the stimulating function of federal intergovernmental transfers diminishes in the fiscal system of Russia. Therefore, this reduces the likelihood of regional authorities in generating fiscal incentives to choose and adequately (co-) finance the areas of budget spending that are closely consistent with the interests of the federal government.

The article confirmed the hypothesis why this trend takes place - a high debt burden of the constituent entities of Russia. Debt financing of expenditures of the previous periods can restrain current expenditures, financed by own budget revenues in the regions. Replacing own expenditures by federal transfers to reduce accumulated debt creates the risk of underfunding of activities of national projects.

Reduction of the potential of federal transfers and especially subsidies for the budget expenditures of the constituent entity is negative, since it increases the risk of underfunding the implementation of national projects at the regional level. Unlike subsidies, other intergovernmental transfers have the strongest influence on the growth of regional expenditures, which is observed regardless of the group of the constituent entities.

In terms of a comparative analysis of the contribution of the transfer factor and the private income factor, the northern constitu-

ent entities of Russia are similar to the general group of the constituent entities with a small public debt. Yet, the contribution of the general-purpose transfer factor is insignificant, but that of earmarked transfers, including subsidies, is positive.

The practical conclusions are as follows:

- Only subsidies and other intergovernmental transfers perform the function of stimulating regional spending according to the priorities of the federal budget. On the contrary, for both types of general grants and subventions, the contribution of transfer and private income factors to forming a constituent entity's budget expenditures is comparable. Therefore, the allocation and structure of subsidies and other intergovernmental transfers should be paid particular attention, including the reform of other intergovernmental transfers.
- To preserve incentives for the constituent entities to expand own budget expenditures in terms of implementing federal development priorities, we advise to protect discretionary actions of the recipient budget authorities when they use federal targeted transfer funds aimed at realizing the clearly set goal (in other words, to preserve the stimulating function for regional expenditures, it is advisable to further implement the concept of a block earmarked transfer).
- At the same time, to reduce the risk of replacing a federal transfer by paying off a regional government debt, it is worth considering the measures to reduce the level (coefficient) of federal co-financing for the constituent entities with a relatively high public debt. Despite a sharp decrease in the function of federal incentives, the contribution of the federal transfer factor to total regional expenditures in the regions with a relatively high debt is still noticeably higher than in the regions with relatively small public debt. Reducing the debt burden at the regional level can be solved more effectively through the federal debt policy instruments, compared to the measures for allocating intergovernmental transfers (for example, regulating budget loans, compliance with the federal budget rules for the public debt at the regional level).

REFERENCES

1. Deryugin A.N. Regional budgets for the first four months of 2019: Maintaining trends. *Ekonomicheskoe razvitie Rossii = Russian Economic Developments*. 2019;(6):81–85. (In Russ.).
2. Vasyunina M.L. Evaluation of the effectiveness of inter-budget transfers to constituent entities of the Russian Federation. *Ekonomika. Nalogi. Pravo = Economics, Taxes & Law.* 2017;10(2):38–43. (In Russ.). DOI: 10.26794/1999–849X-2017–10–2–38–43
3. Alandarov R.A. Assessment of the correspondence of intergovernmental relations to the strategic development goals of the Russian Federation. *Ekonomika. Nalogi. Pravo = Economics, Taxes & Law.* 2017;10(1):75–82. (In Russ.). DOI: 10.26794/1999–849X-2017–10–1–75–82
4. Kreindel' V.M. Diagnostics of the dominant regime of budget policy of the subjects of the Russian Federation. *Ekonomicheskaya politika = Economic Policy*. 2008;(1):141–151. (In Russ.).
5. Suchkova O.V., Chemis A. Yu. Assessment of the sustainability of public debt of Russian regions. *Vestnik Rossiiskogo ekonomicheskogo universiteta im. G.V. Plekhanova = Vestnik of the Plekhanov Russian University of Economics*. 2019;(4):72–84. (In Russ.). DOI: 10.21686/2413–2829–2019–4–72–84
6. Sharov V.F., Karaev A.K. Stability of the budget system and problems of recovery of growth of the Russian economy. *Finansy: teoriya i praktika = Finance: Theory and Practice*. 2014;(5):73–83. (In Russ.).
7. Stroev P.V., Vlasyuk L.I. Debt burden of regions and regional policy. *Finansy: teoriya i praktika = Finance: Theory and Practice.* 2017;21(5):90–99. (In Russ.). DOI: 10.26794/2587–5671–2017–21–5–90–99
8. Filimon R., Romer T., Rosenthal H. Asymmetric information and agenda control: The bases of monopoly power in public spending. *Journal of Public Economics*. 1982:17(1):51–70. DOI: 10.1016/0047–2727(82)90025–1

9. Inman R. P. The flypaper effect. NBER Working Paper. 2008;(14579). URL: https://www.nber.org/papers/w14579.pdf
10. Logan R. Fiscal illusion and the Grantor government. *Journal of Political Economy*. 1986;94(6):1304–1318. DOI: 10.1086/261434
11. Timushev E. N. Revenues, grants and fiscal incentives: Assessment and causes of the effects of decentralization of the budget system of the Russian Federation. *Voprosy ekonomiki*. 2018;(1):71–90. (In Russ.). DOI: 10.32609/0042–8736–2018–1–71–90
12. Hines J. R., Thaler R. H. Anomalies: The flypaper effect. *The Journal of Economic Perspectives*. 1995;9(4):217–226. DOI: 10.1257/jep.9.4.217
13. Becker E. The illusion of fiscal illusion: Unsticking the flypaper effect. *Public Choice*. 1996;86(1–2):85–102. DOI: 10.1007/BF00114876
14. Slack E. Local fiscal response to intergovernmental transfers. *The Review of Economics and Statistics*. 1980;62(3):364–370. DOI: 10.2307/1927103
15. Megdal S. B. The flypaper effect revisited: An econometric explanation. *The Review of Economics and Statistics*. 1987;69(2):347–351. DOI: 10.2307/1927243
16. Blundell R., Bond S. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*. 1998;87(1):115–143. DOI: 10.1016/S 0304–4076(98)00009–8
17. Zouhaier H., Fatma M. Debt and economic growth. *International Journal of Economics and Financial Issues*. 2014;4(2):440–448. URL: https://pdfs.semanticscholar.org/bb4c/477bba8787f3739c9f6f6ee3afd1673ca650.pdf
18. Chudik A. et al. Is there a debt-threshold effect on output growth? *Review of Economics and Statistics*. 2017;99(1):135–150. DOI: 10.1162/REST_a_00593
19. Yushkov A. O., Savul'kin I.L., Oding N. Yu. Intergovernmental relations in Russia: Still a pendulum? *Voprosy gosudarstvennogo i munitsipal'nogo upravleniya = Public Administration Issues*. 2017;(5):38–59. (In Russ.). DOI: 10.17323/1999–5431–2017–0–5–38–59
20. Zulkarnay I. U. Why Russia has again been sliding from federalism to unitarianism. *Voprosy gosudarstvennogo i munitsipal'nogo upravleniya = Public Administration Issues*. 2018;(5):116–132. (In Russ.). DOI: 10.17323/1999–5431–2018–0–5–116–132
21. Klistorin V. I. Interlevel financial flows in the budgetary system of the Russian Federation. *Region: ekonomika i sotsiologiya = Region: Economics and Sociology*. 2018;(2):33–51. (In Russ.). DOI: 10.15372/REG20180202
22. Deryugin A. Regional budgets in 2017. *Ekonomicheskoe razvitie Rossii = Russian Economic Developments*. 2018;25(4):89–94. (In Russ.).
23. Mamedov et al. Problems of intergovernmental relations in Russia. Moscow: Gaidar Institute Press; 2012. 188 p. (In Russ.).
24. Bozhechkova A. et al. Stabilization properties of transfers allocated to Russian regions from the federal budget. Moscow: Gaidar Institute Press; 2018. 68 p. (In Russ.).
25. Bukharsky V. V., Lavrov A. M. Assessment of leveling and stimulating effects of intergovernmental transfers to the subjects of the Russian Federation. *Nauchno-issledovatel'skii finansovyi institut. Finansovyi zhurnal = Financial Research Institute. Financial Journal*. 2017;(1):9–21. (In Russ.).
26. Tumanyants K., Cecina Yu. Expenditures on social policy of the Russian regions in the coordinates "cost-benefit". *Ekonomicheskaya politika = Economic Policy*. 2017;12(5):128–149. (In Russ.). DOI: 10.18288/1994–5124–2017–5–07
27. Proaño C. R., Schoder C., Semmler W. Financial stress, sovereign debt and economic activity in industrialized countries: Evidence from dynamic threshold regressions. *Journal of International Money and Finance*. 2014;45:17–37. DOI: 10.1016/j.jimonfin.2014.02.005

28. Berben R.-P., Brosens T. The impact of government debt on private consumption in OECD countries. *Economics Letters*. 2007;94(2):220–225. DOI: 10.1016/j.econlet.2006.06.033
29. Checherita-Westphal C., Rother P. The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area. *European Economic Review*. 2012;56(7):1392–1405. DOI: 10.1016/j.euroecorev.2012.06.007
30. Baum A., Checherita-Westphal C., Rother P. Debt and growth: New evidence for the euro area. *Journal of International Money and Finance*. 2013;32:809–821. DOI: 10.1016/j.jimonfin.2012.07.004
31. Afanasiev M. P., Shash N. N. Macroeconomic consequences of growing public debt for the Russian economy. *Voprosy gosudarstvennogo i munitsipal'nogo upravleniya = Public Administration Issues*. 2016;(5):46–59. (In Russ.).
32. Alexeev M. et al. Fiscal decentralization, budget discipline, and local finance reform in Russia's regions. *Public Finance Review*. 2019;47(4):679–717. DOI: 10.1177/1091142118804245
33. Neyapti B. Fiscal decentralization and deficits: International evidence. *European Journal of Political Economy*. 2010;26(2):155–166. DOI: 10.1016/j.ejpoleco.2010.01.001

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M&A Market Efficiency in Russia: Problems and Prospects

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ABSTRACT

The **aim** of the article is to study the effect of M&A transactions in Russia for shareholders and investors of an acquiring company. The **objectives** of the study were to develop methods for efficiency evaluation, to conduct a general analysis of the M&A market in Russia, to develop recommendations based on the results. **The framework of the study** was the market-based approach to the analysis of transaction efficiency. The authors investigated the key indicators: the value of the company EV (Enterprise Value) and the market value of the company MV (Market Value). They analyzed three time points for each transaction and the change of the indicators in-between: six months before the transaction, at the time of the transaction and six months after the transaction. The data obtained allowed for calculating the growth rates of stock prices, the values of the companies and the average values for the market. Based on the study results, the authors **concluded** that the M&A market has a weak effect on the Russian economy as a whole, but at the same time there is a decreasing effect for shareholders. The majority of M&A transactions aim to expand corporate finance, to increase the company's capitalization, and to maximize business value. The **results** are of use to predict the further dynamics of the company's value, a key indicator for portfolio and institutional investors, as well as to analyze the efficiency of acquisitions followed by evaluation of investment attractiveness of the company.

Keywords: mergers and acquisitions; M&A market in Russia; corporate finance; tender transactions; hostile takeover

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INTRODUCTION

Globalization of economic relations, significant changes in regulating financial and economic activities of companies and digital forms of cross-border capital flows create new opportunities for free financing of international mergers and acquisitions. The global economic space provokes companies to transform dynamically by quickly modifying economic processes and activating the processes of cooperation in the capital market. Here, business reorganization is one of the effective tools to survive. It has many various forms: from reengineering of internal processes to modernization, technical re-equipment and company restructuring. In Russia, reorganization of a company is usually a merger where a new legal entity arises based on previous companies-participants [1].

The Russian legislation defines five forms of business reorganization: merger, accession, transformation, division and spin-off. Internationally, reorganization is understood as mergers and acquisitions. The overseas term "merger" focuses on emerging a new company, and Russian "merger" is a "termination of one or more companies" [2].

Merger and Acquisition (hereinafter — M&A) is a radical but effective way to increase the value of an acquiring company. It gained

ground in the 1990s. M&A transactions play a dual role in corporate finance. On the one hand, it is an effective way to increase the enterprise value, and on the other, it displays unfair competition. According to Chinese colleagues, the success or failure of an M&A depends on whether both parties in the transaction have a consistent understanding of the quality and risks of the assets being merged, which is specifically manifested in the ability of both parties to reach a consensus in terms of valuable consideration and payment guarantee [3].

The M&A market in Russia is not well studied, and it is very difficult to determine its role for the national economy, since most of the transactions are tender offers. These are merger transactions, characterized by special hostility and direct intention to take over another's business [4]. It is important to understand what effect the acquiring company and its shareholders will receive from this transaction.

Devoted to the analysis of the reasons for expanding a business, the need to diversify a business and the problems of entering new markets, the fundamental work by Patrick Gaughan "Mergers, Acquisitions and Corporate Restructurings" puts a special emphasis on achieving a synergistic effect from complete M&As and various types of operating and financial synergies [5].

Post-announcement market prices reflect beliefs about both merged and standalone firm values, and the likelihood of either outcome. Acknowledged expert Paul Borochin writes: "Stock prices alone do not contain sufficient information to identify these latent beliefs." By adding exchange-traded stock option data, he delivers a clear decomposition of observed value change into two parts: 1) value creation and 2) new information about standalone value. Previous research has struggled to disentangle the two. This decomposition provides a strong and practical measure of the market's expectations about value creation in a merger [6].

The key parameter of business performance is a constant increase in its stock value. Therefore, the questions arise: what effect does the tender offer have on the stock value? do tender transactions attract potential investors? is investing appropriate at this point? how does the total market value of the company change after transactions?

The relevance of this work is confirmed by the need to consider the M&A market characteristics in Russia based on statistical data, which will allow for a more detailed study of this problem.

DEVELOPMENT OF RESEARCH METHODS

M&As are the mechanisms to form alliances and new companies influenced by competition and changes in macroeconomic conditions. M&As should be considered as an opportunity for strategic development of the company's business. While developed countries are used to M&A transactions, the Russian M&A market has such initiated the practice [7]. It is not surprising: in Russia, M&A processes started in the mid-90s of the last century [1, p. 122]. The M&A market in Russia is relatively young and developing. However, during this time, many efficient and inefficient transactions took place. Efficient transactions are the transactions that showed a positive synergistic effect or increased the company's value in the market, which turned out to be beneficial for the owners. There are two basic approaches to determine the efficiency of M&A transactions. In the first approach the efficiency evaluation of the of M&A transactions is based on the analysis of stock value and return on equity. In this case, ROE is calculated separately for the shareholders of the merged company and for the shareholders of the acquiring company. In reality, the acquiring company, as a rule, may end up with both a positive and a negative result. The second approach is the analysis of financial indicators calculated based on the published official financial statements of the

company before and after the M&A transaction. This study used the first approach and evaluated the efficiency of M&A transactions from the perspective of increasing the value of the company's equity. Evaluating economic benefits from a transaction is very important to determine the M&As relevance. Economic benefits may result in economies of scale, vertical integration, increased efficiency, better use of tax considerations, a combination of complementary resources, etc. [8].

In Russia, M&A transactions are characterized by significant government participation in creating new corporations in the oil and gas and financial sectors of the economy. An important aspect of the activities of international financial and production corporations, states, transnational corporations and private investors is a reliable efficiency evaluation of reorganization transactions and market development monitoring. There are three basic approaches to evaluate efficiency of transactions [9]: accounting, market and the combined one. The authors used the market approach, which involves analyzing quotes for a certain period before and after the transaction, as well as analyzing changes in the EV (Enterprise Value) and MV (Market Value) indicators during and after the transaction. Since the data for the evaluation by the accounting method is not available and the publication frequency of accounting reports is low, the market approach is the most appropriate.

It is generally accepted that stock value[1] changes immediately after the transaction is announced and considers all investment decisions of market participants regarding a particular security in a short term. However, we should note that all investment decisions have already been made by the time of the transaction, and the stocks do not show any obvious movement. Time alone is not enough to obtain a synergistic effect. According to the synergetic theory, M&A transactions transform companies into a new business with a number of advantages, whose effect exceeds the total of companies' capabilities. Moreover, the merger leads to an increase in the value of the business, and the acquiring company acts to gain the welfare of the owners [10].

The financial and policy implications of M&A are varied. From an investor's perspective, the long-term adjusted gain from M&A depends not only on the immediate growth of wealth, but also the fact that such a growth would accompany reduced rate of volatility persistence [12]. Since the current stock price considers the expectations of investors regarding further price movements [12], it can be assumed that in an efficient market, stock prices take into account all possible expectations from a synergistic effect in the future [13]. We investigated the moment of the transaction, when the key changes are taking place in the target company. The strategic development of the business and its investment attractiveness will depend on how the merger will go.

The transaction effect is not immediate, so we observed it over a six month-period. During this period, the insider information is completely distributed, and all investment decisions regarding further price movements are made.

Donald DePamphilis claims that the stock price of the acquiring company for a certain period before the transaction declines, and the target company's stock price increases. We tested this statement for Russia and made conclusions about the similarity of the domestic and foreign markets. We did the measurements six months before the transaction and analyzed the data obtained.

For the study, we identified 15,643 M&A transactions, of which 6979 were selected with a change in the ownership of the target company (a transaction with a majority stake). Then, we

[1] There is a difference between a stock value and a stock price. Value and price are two different categories. Analysts form the stock price on the stock market. This is a certain value, based on which stocks are traded in the short term. In the long run, the stock value is important for investors. They should correctly determine the stock value, which will affect their decision to buy or sell.

selected the companies that completed more than 5 M&A transactions during the study period. We also picked 72 companies that met the selection criteria. The analysis of quotes required that the research units were listed on the stock exchange and were functioning at that moment. Therefore, we did a re-sampling and selected 30 companies. We took all data on transactions and companies from Bloomberg[2] and EMIS[3] information databases.

ANALYSIS OF M&A MARKET IN RUSSIA

E. A. Fedorova, P. I. Rybalkin, N. R. Mikhelashvili evaluated the efficiency of transactions in the Russian market and the stability of the company after the transaction [14]. In the work "New financial technologies change our world", the authors substantiate the need to study M&A banking transactions [15]. The authors draw attention to factors that influenced the volume of the M&A market and the main trends in its development [16]. At the same time, stock evaluation as the main indicator of business performance remains aloof.

Various foreign studies prove the impact of M&A transactions on the company value [17–21]. In particular, the authors examined the impact of the transactions on shareholder capital and the abnormal return on their implementation. They evaluated the impact on the type of transaction: friendly or hostile [22]. The results of the study showed a return of about 20% for shareholders in the case of friendly acquisitions.

According to Thomson Reuters, in 2016, the announced M&A transactions volumes involving Russian assets amounted to 39.2 billion US dollars. According to AK&M agency, in 2016, the market size amounted to 41.76 billion US dollars [23]. According to the Deloitte annual research, the Russian M&A market almost doubled in the first half of 2019 compared to the same period in 2018 — up to 33.8 billion US dollars [24], i.e. it declined compared to 2016. In 2019, the number of transactions slightly increased and amounted to 169 (in the first half of 2018, there were153 transactions). Nobody has yet conducted a major study of the Russian market. This is most likely because it has been functioning not so long ago. Yet, the volume of transactions conducted in Russia is sufficient for a statistical study.

Along the analysis, it turned out that not all companies were listed on the stock exchange when the transactions took place; therefore, some companies were withdrawn from the sample, and we used the largest transactions for the analysis. As a result, we selected 50 transactions to analyze price changes and 40 transactions to analyze changes in enterprise value.

From 2000 to 2018, over 16 thousand transactions with a total amount of $ 603.66 billion took place, of which we identified 6916 transactions of a tender nature. *Fig.1* and *2* show the dynamics of the volumes of tender transactions and their total value, considering inflation. Here, we should note two large M&A waves in 2008 and 2011. Now, the market is in a recession, and the growth in transaction volume is unlikely.

It is also worth noting that large purchases were made at the peak of stock market growth, a year before the crisis. This is due to the need for company development. At the same time, companies often overpaid at such moments. For example, in 2011 the EV/EBITDA multiplier (the ratio of Enterprise Value to Earnings before interest, taxes, depreciation and amortization) was 51.26 times, which indicates an overvaluation of the market.

A large transaction volume does not always involve large investments to buy a company. The largest investments into the M&A market were in 2007 and 2012. First of all, these data are due to mega transactions (over 10 billion US dollars) in the market.

The analytical information agency EMIS provides data on the average indicator "Enterprise

[2] Access obtained in the laboratory of the Financial University.
[3] Analytical agency. Access obtained in the laboratory of the Financial University.

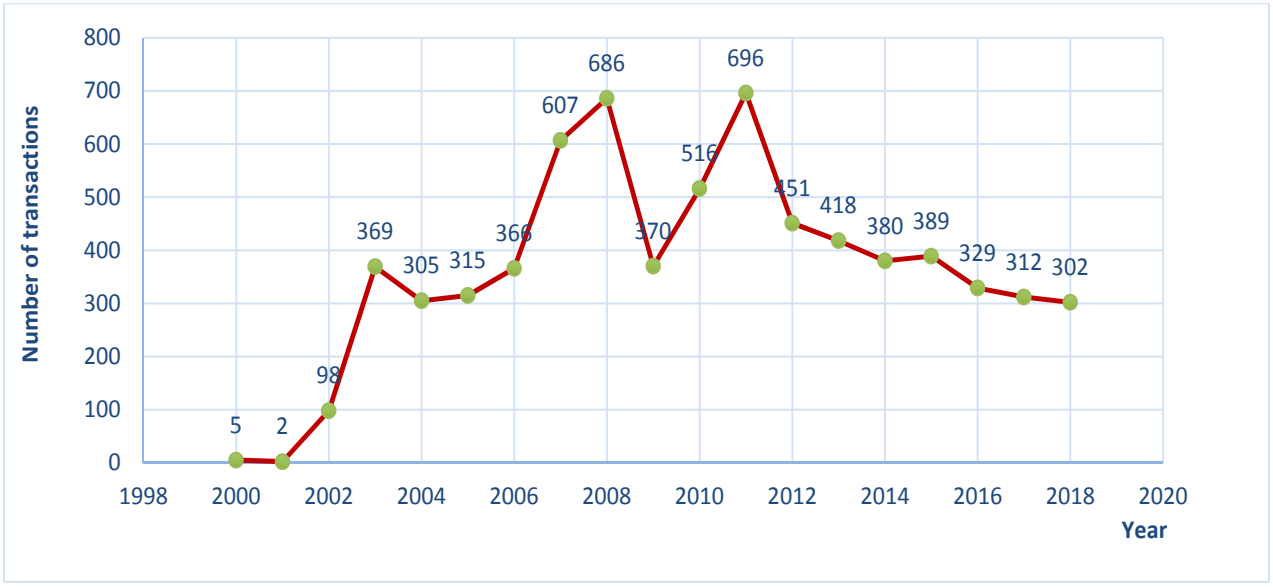

Fig. 1. **Dynamics of the volume of M&A transactions in the Russian Federation for 2000–2019**

Source: compiled by the authors based on data from the analytical agency EMIS.

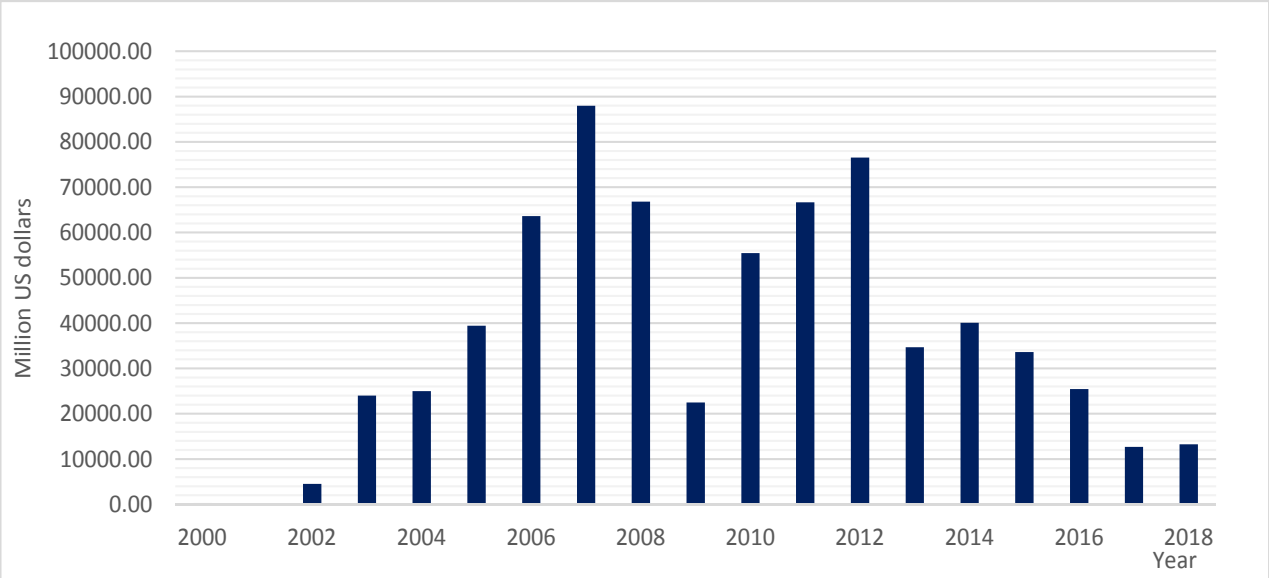

Fig. 2. **Dynamics of M&A transactions adjusted for dollar inflation in Russia in 2000–2018**

Source: compiled by the authors based on data from the analytical agency EMIS.

Value / Sales" and "Enterprise Value / EBITDA" over the past 19 years. These indicators show how much the buyer overvalued the transaction. On average, business value was estimated at 59 revenue indicators of the target company and 12.57 EBITDA indicators represented in *Fig. 3*.

Thus, we can conclude about the high value of target companies in relation to the income that they generate. This can be caused either by a high revaluation of target companies by investors, or by overconfidence in the future profitability of a business.

There are large players in the studied market, as elsewhere. Based on the sample received, we identified ten largest companies by the number of transactions, and diversified the acquiring companies by industry (see *Table 1*).

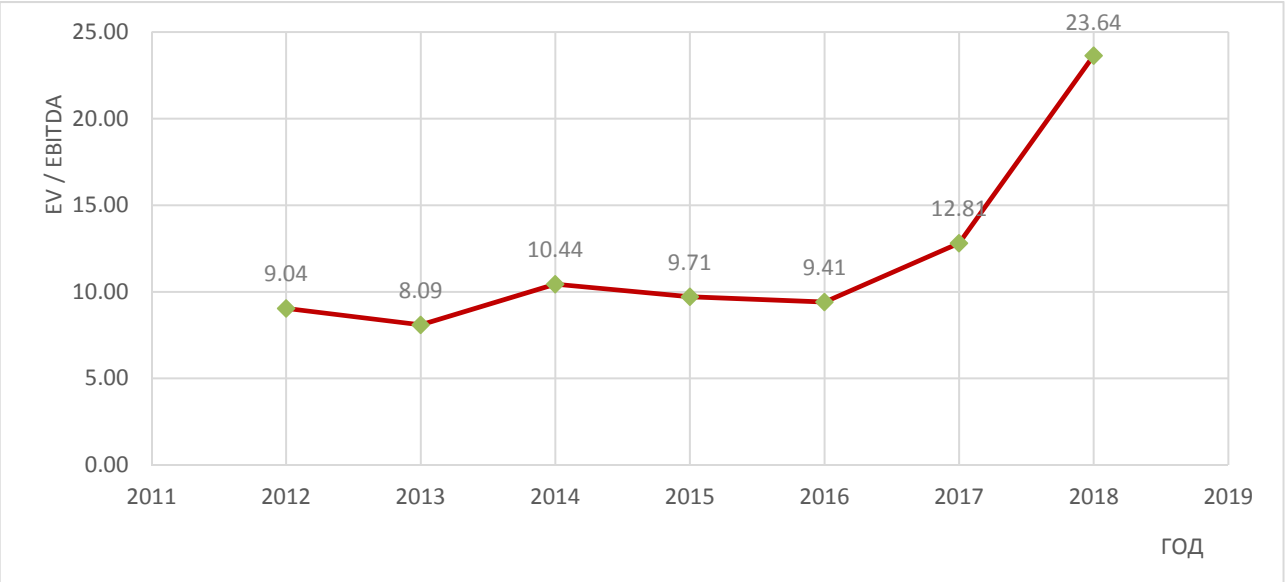

Fig. 3. **Dynamics of the average EV / EBITDA value for M&A transactions in Russia in 2012–2019**

Source: compiled by the authors based on data from the analytical agency EMIS.

Table 1

Ten largest companies in Russia by the number of transactions in 2000–2019

No.	Company	Number of transactions
1	Mobile telesystems (MTS)	40
2	Rosneft	37
3	Sberbank	23
4	AFK Sistema	21
5	Lukoil	19
6	Mechel	19
7	Severstal	19
8	X5 Retail Group	19
9	Gazprom	17
10	VTB Bank	17

Source: compiled by the authors based on data from the analytical agency EMIS.

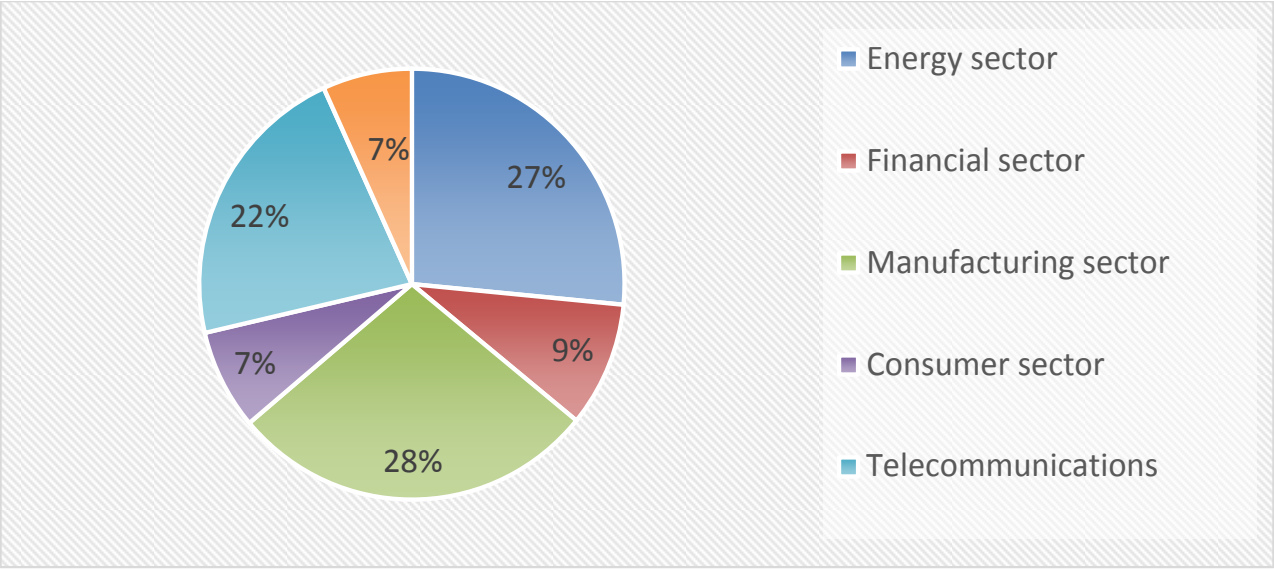

Fig. 4. **Share of M&A transactions by sectors in the Russian Federation in 2000–2019**

Source: compiled by the authors based on sample observation.

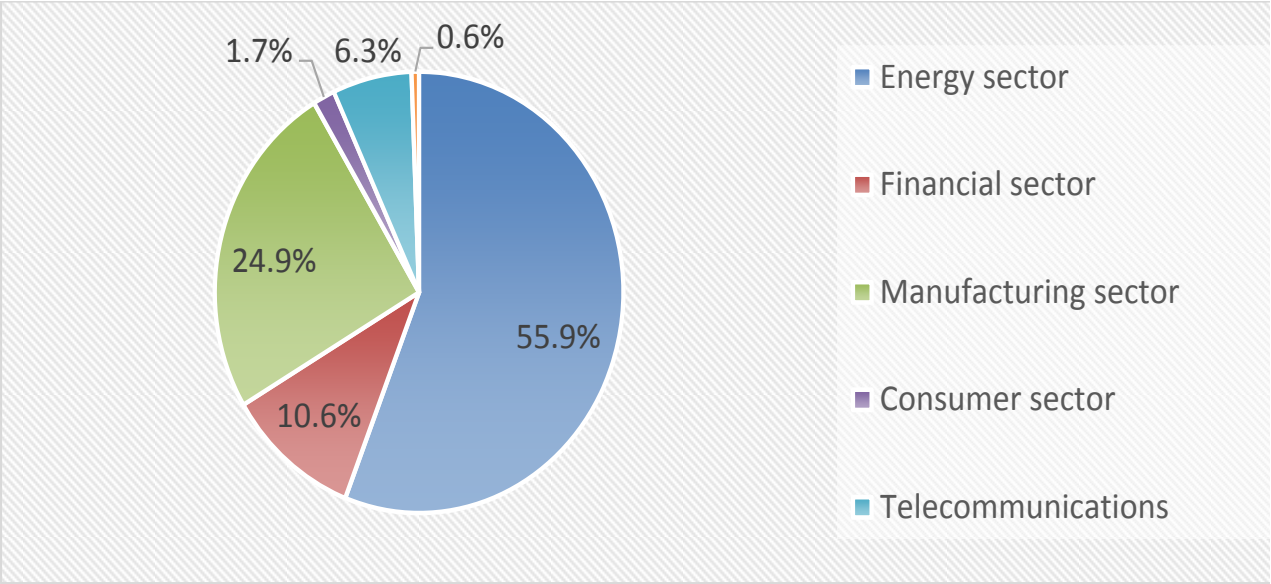

Fig. 5. **Cost of M&A transactions by sectors in the Russian Federation in 2000–2019**

Source: compiled by the authors based on sample observation.

The largest number of transactions was carried out by MTS, which is a special case for the Russian economy. Most transactions took place in the manufacturing sector. The energy sector leads by the investments in transactions, with PAO "Rosneft" leading in this sector. It conducted 37 transactions; the largest is worth $ 27,730.00 million.

The industry differentiation of transactions allows us to conclude about the most frequent sectors for the M&A market, as well as the distribution of investments by these sectors. *Fig. 4* and *5* show the shares of the number and volume of investments in M&A tender transactions by industry based on the selected sample of companies. The data indicate only transactions conducted by public companies, and do not consider transactions by state and private non-public firms, therefore, the findings represent only the public sector of the economy.

Table 2

Results of the study of market prices, EV and MV 6 months before and 6 months after the transaction

Indicator	Before the transaction	After the transaction
Stock Price Research		
Average stock price change	–3.20%	–2.95%
Negative changes	29	24
Positive changes	21	26
Enterprise Value Research (EV)		
Average change in EV	5.13%	2.27%
Negative changes	18	19
Positive changes	22	21
Company Market Value Research (MV)		
Average change in MV	5.19%	0.14%
Negative changes	18	16
Positive changes	22	24

Source: compiled by the authors.

RESEARCH RESULTS

After the market research, we analyzed the overall performance of transactions based on price dynamics and changes in enterprise value (see *Table 2)*.

The study revealed the following results:

- on average, stock prices of companies decline by 3.2% for 6 months before the transaction. Stocks of companies also decline 6 months after the transaction by 2.95%;
- 58% of transactions showed negative dynamics of price changes 6 months before the transaction. At the same time, 52% of transactions showed positive dynamics in prices;
- the enterprise value increases by an average of 5.23% 6 months before the transaction. After the transaction, it also grows by an average of 2.27%;
- the market value of stocks increases by 5.19% 6 months before the transaction. 6

months after the transaction, the market value grows by an average of 0.14%;

• in 55% of cases, the enterprise value grows 6 months before the transaction and in 52% of cases it increases 6 months after the transaction.

It is important that the data on the market value (MV) showed a positive dynamics when stock prices were declining. First of all, this is due to the fact that the MV indicator consists of two components: the market value of equity and debt. Therefore, the rate of change of the MV indicator and stock prices do not match.

CONCLUSIONS

The research results allow for the following conclusions.

The M&A market in Russia is still developing and has already experienced two major waves of acquisitions. They result in a slowdown of the market value of the company after the transaction, as well as the EM indicator. This may be due to low-quality transactions or goals that selected for the acquisition.

Before the transaction, the company value grows at fast rate. It is likely due to generating additional funds to purchase another company, since in Russia LBO[4] is not widespread.

Despite the steady development of the M&A market in Russia over the past decades, we can hardly call it established. The 2008 crisis and the political transformations of 2014 led to certain shocks and made significant adjustments to its development. Based on the research results, as well as other studies on investments and capital markets in Russia[5], we can assume that the market is not yet ready to increase transactions due to the current economic situation. State transformations in the tax segment, changes in inflation and a decrease in FDI (foreign direct investment) in the Russian economy reduce the likelihood of an increase in transactions in 2019–2020. The volume may fall to the level of 290–300 transactions.

In addition, the study results provide a brief description of the Russian M&A market. Thus, the market is characterized by:

• high level of overpayment for target companies;

• a decrease in the volume of transactions over the last 7 years, as well as a decrease in the total investment in transactions;

• an increase in the value of companies before the transaction and at the same time a decrease in the stock price of these companies;

• low efficiency of transactions from the point of view of shareholders.

This study has revealed issues and problems that may be considered in the future. In particular, it identified the reasons for the decrease in the growth rate of companies after the transaction compared to the growth rate before the transaction. The study analyzed opportunities for the market development and what additional benefits these efforts can bring to the economy; it compared the Russian market and the M&A market of developed and developing countries, including features, trends, key differences and many other things.

[4] LBO, Leveraged Buy-Out, is a type of activity of the private investment sector companies, in which the company is purchased at the expense of borrowed funds.

[5] Overview of the M&A market in Russia. KPMG Investment and Capital Markets Research in Russia and the CIS. M&A market in Russia in 2018, KPMG. 2019. URL: https://assets.kpmg/content/dam/kpmg/ru/pdf/2019/02/ru-ru-ma-survey-feb-2018.pdf (accessed on 15.09.2019).

REFERENCES

1. Botalova V. V. Theoretical bases for mergers and acquisitions in Russia and abroad. *Rossiiskoe predprinimatel'stvo = Russian Journal of Entrepreneurship.* 2013;(10):76–87. (In Russ.).
2. Pashtova L. G., ed. Business reorganization: Mergers and acquisitions. Moscow: KnoRus; 2018. 206 p. (In Russ.).

3. Sun S., Zhao H., He X., Zhang Y. The impact of accounting standards convergence on Chinese firms' overseas mergers and acquisitions. *China Journal of Accounting Research*. 2019;12(3):231–250. DOI: 10.1016/j.cjar.2019.05.001
4. DePamphilis D. Mergers, acquisitions, and other restructuring activities: An integrated approach to process, tools, cases, and solutions. London; San Diego, CA: Academic Press, 2003. 770 p. (Russ. ed.: DePamphilis D. Sliyaniya, pogloshcheniya i drugie sposoby restrukturizatsii kompanii. Protsess, instrumentarii, primery iz praktiki, otvety na voprosy. Moscow: Olymp-Business; 2007. 960 p.).
5. Gaughan P.A. Mergers, acquisitions, and corporate restructurings. Hoboken, NJ: John Wiley & Sons, Inc.; 2003. 639 p. (Russ. ed.: Gaughan P.A. Sliyaniya, pogloshcheniya i restrukturizatsiya kompanii. Moscow: Alpina Business Books; 2004. 741 p.).
6. Borochin P.A. When does a merger create value? Using option prices to elicit market beliefs. *Financial Management*. 2014;43(2):445–466. DOI: 10.1111/fima.12026
7. Fedorova E.A., Rybalkin P.I. Assessing the impact of the effectiveness of the buyer company on the profitability of mergers and acquisitions. *Bankovskoe delo = Banking*. 2015;(9):78–82. (In Russ.).
8. Myers S.C. A framework for evaluating mergers. In: Myers S.C., ed. Modern developments in financial management. New York: Frederick A. Praeger, Inc.; 1976:633–645.
9. Meshcheryakova A.A. Analysis of the main approaches to assessing the effectiveness of mergers and acquisitions. *Ekonomika i predprinimatel'stvo = Journal of Economy and Entrepreneurship*. 2016;(2–1):983–985. (In Russ.).
10. Lakhmetkina N.I. Synergy in mergers and acquisitions. *Ekonomika i predprinimatel'stvo = Journal of Economy and Entrepreneurship*. 2018;(5):829–831. (In Russ.).
11. Fama E.F. Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics*. 1998;49(3):283–306. DOI: 10.1016/S 0304–405X(98)00026–9
12. Rao U., Mishra T. Posterior analysis of mergers and acquisitions in the international financial market: A re-appraisal. *Research in International Business and Finance*. 2020;51. DOI: 10.1016/j.ribaf.2019.101062
13. Tvardovskii V., Parshikov S. Secrets of stock trading. Trading stocks on stock exchanges. Moscow: Alpina Publisher; 2012. 551 p. (In Russ.).
14. Mikhelashvili N.R. Mergers and acquisitions: Causes and ways of preventing failures. *Finansovaya analitika: problemy i resheniya = Financial Analytics: Science and Experience*. 2017;10(2):215–225. (In Russ.). DOI: 10.24891/fa.10.2.215
15. Maslennikov V.V., Fedotova M.A., Sorokin A.N. New financial technologies change our world. *Finansy: teoriya i praktika = Finance: Theory and Practice*. 2017;21(2):6–11. (In Russ.). DOI: 10.26794/2587–5671–2017–21–2–6–11
16. Abdulkadyrova D.Z., Baisarova A.M. Mergers and acquisitions in the banking sector: International experience and Russian practice. *Vektor ekonomiki*. 2018;(5):34. (In Russ.).
17. Zollo M., Meier D. What is M&A performance? *Academy of Management Perspectives*. 2008;22(3):55–77. DOI: 10.5465/AMP.2008.34587995
18. Ghosh A., Lee C. Abnormal returns and expected managerial performance of target firms. *Financial Management*. 2000;29(1):40–52. DOI: 10.2307/3666360
19. Jarrell G.A., Brickley J.A., M. Netter J.M. The market for corporate control: The empirical evidence since 1980. *Journal of Economic Perspectives*. 1988;2(1):49–68. DOI: 10.1257/jep.2.1.49
20. Schwert G.W. Markup pricing in mergers and acquisitions. *Journal of Financial Economics*. 1996;41(2):153–192. DOI: 10.1016/0304–405X(95)00865-C
21. Mulherin J.H., Boone A.L. Comparing acquisitions and divestitures. *Journal of Corporate Finance*. 2000;6(2):117–139. DOI: 10.1016/S 0929–1199(00)00010–9
22. Leeth J., Borg J. The impact of takeovers on shareholder wealth during the 1920s merger wave. *The Journal of Financial and Quantitative Analysis*. 2000;35(2):217–238. DOI: 10.2307/2676191

23. Losevskaya O. Mergers and acquisitions boom is expected in Russia. 3 Apr. 2017. URL: https://www.dp.ru/a/2017/04/02/Ozhidaetsja_bum_slijanij_i_p (accessed on 19.07.2019). (In Russ.).
24. Koroleva A. Many merged: The volume of the Russian market of mergers and acquisitions in annual terms has doubled. Expert Online. Aug. 29, 2019. URL: https://expert.ru/2019/08/29/v-rossii-bum-sliyanij/ (accessed on 25.01.2020). (In Russ.).

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On the Issue of Predicting Global Financial and Economic Crises

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ABSTRACT

Assumptions about the impending new global crisis, which are increasingly found in expert discussions, have intensified the search for reliable crisis predictors, despite the existing theoretical consensus on the fundamental impossibility of forecasting crises. **The purpose** of the article is to describe the most popular "new" crisis predictors and evaluate their predictive properties. The primary **research method** was monitoring the confirmation of signals supplied by predictors, indicators of macroeconomic dynamics based on retrospective data. As a **result** of the study, we clarified the classification of types of financial crises to determine the predictors that best predict certain types of financial crises, which in current conditions are very likely to be the starting stage of a new kind of financial and economic crisis. We analysed financial condition indices (FCI); VIX ("fear index"); yield spreads between US treasury bonds of different maturities; investor sentiment indices and risk premium indicators; CAPE (Schiller coefficient). We analysed the signals from the "new" crisis predictors about the possible onset of the crisis. The authors **concluded** that various predictors show good results concerning crises of a particular type (the starting point of which were different segments of the financial sector). The analysis of the predictor time of various predictors made it possible to build them in a certain sequence depending on the time interval between the predictor signal and the onset of the crisis. Based on combining the linking of predictors with the types of crises that they predict better, with a sequence of predictors arranged according to the time of the predictions, we proposed a flow chart for monitoring external crisis predictors.

Keywords: financial and economic crisis; classification of financial crises; foresight; crisis predictors; financial markets; financial conditions index; VIX; yield spreads; risk premiums; Schiller coefficient; prediction time.

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INTRODUCTION

By this article, we did not intend to contribute to the theory of cycles and/or crises, as well as to their predicting method. We aim to solve an applied problem: to describe the key proposals to construct crisis predictors and evaluate (based on retrospective data) their predictive power. Moreover, an attempt to follow in line with any group of theories of the cycle or crisis involves the adoption of one or another thesis of these theories, in particular, regarding the explanation of the causes of crises (here, the theories are completely different [1, pp. 6–42]). Such an approach seems unproductive when finding best indicators to predict the onset of a crisis, regardless of its causes. Strictly speaking, even the attempt to construct a crisis predictor contradicts many theoretical provisions that make it impossible to predict a crisis.

The thesis about the fundamental impossibility to predict a crisis has a rationale based on a description of specifics of a crisis as a social and economic development phenomenon. "A crisis cannot be predicted: it simply ceases to be a crisis if everyone expects it to happen tomorrow" [1, p. 6].

Researchers offer various interpretations why the signs of an impending crisis are not recognised. According to Reinhart and Rogoff, investors suffer from "this time is different" syndrome, failing to see crises coming because they do not recognize similarities among the different pre-crisis bubbles. As a result, every crisis surprises investors [2]. The assumption that investors do not see the difference between the low probability of causes of a crisis being realized and the zero probability of such a realization became the base for the psychological theory of neglecting risk and financial crises proposed by Nicola Gennaioli, Andrei Shleifer and Robert Vishny [3]. Andrei Shleifer also pointed out that at each new stage of development, new (newly emerging) risks significantly differ from those previously observed [4].

As seen from the examples above, researchers with almost opposite views on the reasons for not recognizing the signs of an impending crisis (some believe that there is a similarity among different crises, but investors do not recognize it; others believe that new crises bear fundamentally different risks), believe that crisis is impossible to forecast.

Nevertheless, it is possible to measure the likelihood of changes that could lead to a crisis. Observing the formation of causes of a crisis, accumulated in various irrationalities, helps assess the changing probability of the development of crisis phenomena. Despite the existing theoretical consensus about the impossibility to forecast crises, some central banks and many financial institutions facing the practical need to have crisis forecasting tools are actively working on developing crisis predictors.

The interweaving of financial and economic crises, typical of the 2007–2009 crisis and, apparently, for future crises, as well as the fact that in these new types of crises a financial crisis is followed by an economic one, enhance the relevance of the classification of types of financial crises.

There are many options to classify types of financial crises. Right after the 1997–1998 crisis, The International Monetary Fund (IMF) proposed the most comprehensive and detailed classification: financial crises fall into currency crises, banking crises, systemic financial crises, and external debt crises[1]. V. A. Tsvetkov groups financial crises into monetary (banking), currency and exchange [5, p. 338–347]. M. Dabrowski highlights banking, public debt and balance-of-payments crises [6].

The classification should obviously correspond to the aim of the work. Therefore, we use the classification of financial crises depending on the sector of the financial market where crisis phenomena first appeared. This classification makes it possible to identify the groups of the most effective crisis predictors

[1] World economic outlook. Washington: International Monetary Fund, 1998. URL: http://www.imf.org/external/pubs/ft/weo/weo0598/pdf/0598ch4.pdf (accessed on 17.02.2020).

for each type of financial crisis. In this context, three types of financial crises should be distinguished:

- the crisis begins on the stock market, and its immediate causes are most often violations of investor rights or corporate governance inefficiencies;
- the crisis begins in the debt market (debt crisis), its causes are most often defaulted by sovereign or corporate borrowers;[2]
- the crisis begins in the foreign exchange market (currency crisis), its causes are a sharp depreciation of a currency or a group of interdependent currencies.

This classification has helped us link various crisis predictors to the type of financial crisis related to which it can be most effective. Assessing accumulated risks in various segments of the financial sector, it allows targeted monitoring of crisis predictors.

THE SUMMARY OF SUGGESTED REASONS FOR THE FAILURE OF PREVIOUS GENERATION OF CRISIS PREDICTORS

After the development of the 2007–2009 crisis, it became clear that the previously suggested indicators aimed at predicting the crisis (crisis predictors) did not live up to expectations; a lot of literature appeared on the analysis of the causes of their failure. Among these works, two should be especially highlighted. Work [7] provides an analysis and mathematical modeling of the causes of errors in IMF forecasts. In [8], the authors analyze an analysis of the evolution of theories and models used to predict recessions. Both works were prepared by the IMF staff, which indicates that this organization is actively analyzing the causes of failure of its own crisis prediction models.

There are also domestic works in Russian on crisis predictors and forecasting problems. M. A. Shchepeleva studied global models of analysis of financial contagion [9]. The author classified the crisis distribution channels among countries, with particular attention to the mechanisms for transmitting risks through financial markets. For the first time in Russian-language literature, this work briefly described several crisis predictors, including financial condition indexes, the largest family of crisis predictors by now.

Crisis forecasts have two typical types of errors: type 1 error — a recession happened but was not forecast; and type 2 error — a recession did not happen but was falsely forecasted.

Work [8] carried out a panel analysis of recession cases. The results of this analysis show that 148 of 153 recessions were missed by IMF analysts a year before the recession. This indicator declines over time; but even in the year when the recession started, 35 recessions were missed. Moreover, forecasts are revised in more than 80% of cases of recession.

Until 2007, the IMF's methodological toolkit on the Early Warning Exercise (EWE) was considered the most advanced predictive mechanism aimed at warning of financial and economic crises[3]. However, the 2007–2009 crisis revealed many of its weaknesses, including:

- impossible to predict the timing of crises;
- the results are not available to the general public and, accordingly, are subjective in their interpretation;
- permanent revision of the methodology [10].

In our opinion, the importance of EWE as a crisis predictor was significantly discounted:

- the duration of the analysis (3 months) and a six-month cycle in the presentation of the results;
- a large number of models within the EWE (about 30 models, grouped in sections, but not interconnected) that gave conflicting signals that were not summarized in integral indicators.

[2] In this classification, banking crises, which often stand out as a separate type of financial crisis (see, for example, [5, p. 338]), fall into the category of debt crises.

[3] The IMF-FSB Early Warning Exercise. Design and Methodological Toolkit. IMF; 2010.

The natural response to the failure of an entire generation of crisis predictors was the intensive construction of new predictors, attempting to consider the revealed weaknesses of the previous predictors.

"NEW" CRISIS PREDICTORS

General patterns of designing and using a new generation of crisis predictors

The most important feature of using crisis predictors after 2008 is the reorientation to integrated indicators based on a large number of primary indicators. This, of course, increases the probability of crisis prediction (even if only mathematically). Another feature is the kick start of designing indicators that measure investor sentiment online based on modern communication tools. These tools allow conducting numerous surveys of a wide range of investors; the results can be presented to the public as quick as possible.

The world and Russian economic literature offers many indicators promoted as leading indicators of economic transition from stationary development to turbulence. In this article, we kept to the most debated crisis predictors based on information generated in financial markets. This very information is most often used to form forecast indicators, including crisis predictors, since financial markets perform their prognostic function.

Based on information from financial markets, the crisis predictors seem to most focus on analysing crisis symptoms, which determines their value. Symptoms of the crisis are visible (captured by available indicators) evidence of hidden processes, predetermined by the causes of the crisis. They may not be associated with triggers that open the way to the crisis, but they reflect, directly or indirectly, the accumulated (due to the fundamental causes of the crisis) imbalances. This is why numerous forecasting mechanisms used by investment bank analysts most often analyze the symptoms of the crisis.

At the same time, these crisis predictors have a natural weakness, which is in focusing on financial shocks. Given that the recent global crises can be more characterized not as purely economic, but financial and economic, this weakness is becoming less significant. In conditions of financialization of the economy, the most severe shocks of the economic system do not form in goods and services markets, but in capital flows and financial asset markets. Therefore, it becomes more likely that economic crises do not occur outside financial crises, taking on the nature of financial and economic crises.

In this article, we focused on analyzing a limited number of crisis predictors based on financial market indicators:

- financial condition indexes (FCIs);
- VIX (the so-called "fear index");
- yield spreads between US treasury bonds of varying maturities;
- investor sentiment indexes and risk premium indicators;
- CAPE (Schiller coefficient).

The choice of these crisis predictors is determined by the following factors:

- these indicators are widely discussed in the economic expert community after the 2007–2009 crisis, which suggests that they are considered by many experts and politicians as indicators that should be paid special attention when developing government policies considering the need to prevent or stop crises;
- most of these indicators have the necessary fundamental justification, which allows reckon on obtaining results that go beyond the analysis of crisis predictors, but appeal to a wider range of issues in economic theory;
- these indicators have certain positive results of testing on the data of previous financial and economic crises;
- this set of indicators can be the basis for the formation of integrated crisis management systems used in the operational management of the national economy.

Financial conditions indexes (FCIs)

A financial conditions index (FCI) summarizes the information about the future economic

situation contained in these current financial variables[4]. Ideally, a FCI should measure financial shocks — exogenous shifts in financial conditions that influence or otherwise predict future economic activity [11]. Many of these indicators are developed by investment banks, US Federal Reserve Banks, international financial organizations and research centers in relation to individual countries. The most known predictors of this family, calculated since the early 1990s, are:

1) the Bloomberg Financial Conditions Index is an equally weighted sum of three major sub-indexes: money market indicators, bond market indicators, and equity market indicators. Each major sub-index is then made up of a series of underlying indicators, which receive an equal weight in that sub-index (10 variables in total);

2) the Goldman Sachs Financial Conditions Index is a weighted sum[5] of a short-term bond yield, a long-term corporate yield, the exchange rate, and a stock market variable;

3) the Federal Reserve Bank of Kansas City Financial Stress Index consists of 11 financial indicators that can be divided into two categories: yield spreads and asset price behavior;

4) the OECD Financial Conditions Index is a weighted sum of six financial variables, where the variables are weighted according to their effects on GDP over the next four to six quarters. Weights are assigned to indicators depending on the regression coefficients in the model, whose dependent variable is the dynamics of GDP.

Table 1 presents the key features of the most frequently used FCIs, including those listed above.

FCIs are a large family of crisis predictors, united by common approaches to the design. Creating these indexes aims to overcome the limited predictive capabilities of individual indicators previously used as crisis predictors. They have better predictive power than the individual indicators of the situation of financial markets included in their composition. At least some of the FCIs listed above predicted, to various levels of accuracy, one or more previous economic crises (recessions as defined by the US Bureau of Economic Research).

This technology of forming crisis forecasting tools attracted attention of users after it identified the failure of crisis predictors developed by the IMF and other international financial organizations before the 2007–2009 crisis. Instead of searching for individual new predictors of the crisis, "miraculously" capable of predicting a new crisis, it uses the "portfolio" technology to search for pre-crisis signals. Used when calculating FCI, the indicators of the situation of the financial sector are selected based on theoretically correct considerations. The FCI calculation includes the financial variables that are the channels of capital transfer.

The increased attention to FCIs provoked an intensive process of constructing new FCIs mainly for those countries where these tools were not previously calculated. Work [12] attempted to predict the Norwegian GDP using a FCI. Work [13] showed that FCIs can predict inflation based on Singapore data. In work [14], the IMF staff constructed the FCI for South Africa. In work [15], in 2013, the Asian Development Bank constructed an FCI for five Asian countries. In work [16], an FCI was constructed for China; it included the interest rate, exchange rate, stock market quotes and housing prices. The index was constructed based on the principal component method and the dynamic factor method.

There is a significant correlation between the indexes considered in *Table 1*. It is quite logical, since they intersect in the composition of indicators used in the calculation. The Kansas City Financial Stress Index (KCFSI) and the Chicago FED (CNFCI) are most correlated because they contain the same variables

[4] A number of indexes related to this family of indicators are called financial stress indexes.

[5] The Federal Reserve Board's macroeconomic model (the FRB/US model) is used to determine the weights (general equilibrium model of the U.S. economy that has been in use at the Federal Reserve Board since 1996).

Table 1

Key features of the most famous FCI

Organization calculating FCI	Public access	Calculation frequency	Start of FCI calculation	Calculation methodology	Composition (indicators used)
Bloomberg (BFCI)	No	Day	1991	An equally weighted sum with equal weights	10 variables of money, debt and stock markets
Chicago FED (CNFCI)	Yes	Week	1971	Principal component method	105 variables of money, debt and stock markets
IMF	No	Month	1990	Dynamic factor method	16 variables, including interest rate, spreads, credit growth, stock market returns, exchange rate and VIX
Kansas City Financial Stress Index (KCFSI)	Yes	Week	1990	Principal component method	11 variables, including interest rate, yield spread, exchange rate and inflation variables
OECD	No	Quarter	1995	Weighted average with weights based on the effect of the variable on GDP	6 variables, including short-term rate, high-yield bond spread, lending standards, real exchange rate, stock market capitalization
Goldman Sachs (GS or GSFCI)	No	Day	1995	Weighted average based on the effect of the variable on GDP (with lag –1)	5 variables: the FRB rate, 10-year bond yield, spread between BBB rating bond yield and the FRB rate, S&P 500 index and TWI effective exchange rate index
The St. Louis Fed Financial Stress Index (STLFSI)	Yes	Week	1993	Principal component method	18 variables, including 7 interest rate indicators, 6 yield spreads and 5 other indicators (VIX, S&P 500, bond market indexes)

Source: compiled by the authors.

and are calculated by the same method — the principal component method. All indicators correlate with VIX (but it should be borne in mind that the STLFSI, KCFSI, CNFCI and BFCI indexes include VIX in the composition of the indicators used).

Including VIX in the financial condition indexes seems entirely justified. Obviously, VIX has certain predictive capabilities, but it is quite difficult to use through formalized procedures. When this indicator is included in a wider list of crisis predictors, it becomes possible (due to the confirmation of the signals of this indicator by other indicators) to use simple logical constructions such as "if X > a, then ...".

VIX as an independent crisis predictor

The very name of "fear indexes" reflects the desire to identify signs of panic within the financial market environment. They are calculated based on the results of trading options on stock indices. VIX stands out among such "fear indexes". Since 1993, it has been calculated based on an analysis of put and call options on the S&P 500 stock index with different (from more than 23 days to less than 37 days to fulfillment) expiration (execution) periods traded on the Chicago Board Options Exchange (CBOE) and out-of-the-money, i.e. having zero "intrinsic value" [17, p. 276].

VIX has long been regarded as one of the most reliable market predictors in financial markets. How much can this indicator be an independent strong crisis predictor, without considering its use in calculating wide integrated crisis predictors? We think to answer this question it is important to consider the results in work [18]. Based on the Markov switching model, it investigated the role of US macroeconomic variables as leading indicators of regime shifts in the VIX index using a regime-switching approach. The authors found that there are three distinct regimes in the VIX index during the 1990 to 2010 period:

1) tranquil regime with low volatility;
2) turmoil regime with high volatility;
3) crisis regime with extremely high volatility.

The three modes have quantitative descriptions, including the probabilities of switching from one regime to another. According to the authors, the probability of the regime shift from the tranquil to the turmoil regime is significantly predicted by interest rate spreads. Lower term spreads indicate a high probability of the VIX index shift from the tranquil to the turmoil regime. The FRB rate indicator also has a statistically significant coefficient of shift from the tranquil to the turmoil regime.

Yield spreads between US treasury bonds of varying maturities

Yield spreads between US treasury bonds of varying maturities are currently the most popular and most debated crisis predictor in the wider investment community. In recent decades, the disappearance of the spread (or even its value turning negative) always occurs before crises (usually, it happens 12–18 months before a crisis). Therefore, the existing consensus of analysts regarding the predictive capability of this spread is plausible. For instance, the Federal Reserve Bank of San Francisco employees consider it as a reliable predictor of recessions. They concluded that the difference between ten-year and three-month Treasury rates is the most useful term spread for forecasting recessions [19, p. 3]. The less predictive power of the term spread is between ten-year and one-year Treasury yields, ten-year and two-year Treasury yields, as well as between 6-quarter and 3-month forward yields [20]. In Russia, in recent years, the most widely discussed the spread between the ten-year and two-year US Treasury yields and between the five-year and two-year US Treasury yields. It is stated that the spread became negative 15–20 months before a cyclical downturn in the US economy [21][6].

[6] The time gap from fixing negative spreads to the onset of a recession depends on the length of yield bonds to calculate the spreads. In addition, this gap varies for different recessions.

Being crisis predictors, yield spreads have a certain theoretical justification. Initially, the theory of term structure of interest rates claimed that they were predictors of changes (in this case, decrease) in interest rates [22]. First the idea of the predictability of the yield spread for output dynamics appeared in 1989 [23], much later than its predictability for future interest rates and for inflation. Since 1991 (when the first work was published [24]), numerous studies have also offered empirical evidence of the value of the yield spread as a predictor of economic growth and economic recession.

As for T-bond yield spreads as a crisis predictor, we find another issue more interesting: how does the activity of the US Federal Reserve affect it? We studied the spreads between the yields of ten-year and two-year US Treasury bonds, as well as the spreads between the yields of five-year and two-year US Treasury bonds. It turned out that the yield spread has negative correlation with the target and effective rates of the US Federal Reserve on federal funds. At the same time, the correlation is quite significant: the correlation coefficient is –0.86 between the yield spread of two-year and five-year bonds and the target rate, and it is –0.88 between the yield spread of two-year and ten-year bonds and the target rate. The correlation coefficients with the effective rate are, respectively, —0.85 and –0.88 [25].

The obtained results make raise a "blasphemous" question about the predictability of the US Federal Reserve rate. Indeed, if there is a high correlation between yield spreads recognized as reliable predictors of recessions and the US Federal Reserve rate, it is logical to conclude that the US Federal Reserve rate is also a good predictor of recessions. Given that a group of people sets the FRB target rate, it provides the hypothesis that any crisis is man-made.

However, we believe that there are no "conspiracy theories" here: both the FRB, by setting the target rate, and yield spreads respond to the same processes in the economy and in the financial sector.

Investor sentiment indexes and risk premium indicators

Numerous simple indicators measure investor sentiment in the financial markets[7]. They have been used in predicting the movements of these markets for a long time. All these indicators have a certain predictive power, but first, they predict market movements for individual financial assets (in a best-case scenario — classes of financial assets). Second, they predict only relatively short-term (from several minutes to several weeks) market fluctuations, which are natural market moves within the periods of their stable stationary development.

Therefore, more stable investor sentiment indicators are required to predict financial and economic crises that would forecast only long-term market fluctuations. These indicators, in our opinion, include risk premium indicators. As an indicator of the risk premium, the stock market uses the ratio of annual earnings per share to its value (the inverse of the P/E ratio) minus the risk-free rate. As a risk premium in debt (bond) markets, DRP (debt risk premium; bond risk premium) is usually used, equal to the difference between the yield to maturity of the corporate bond portfolio and the FRB rate. In Russian literature, work [26] described these crisis predictors in detail.

In historical series, risk premiums sometimes show very good results as predictors. Therefore, in the last 2–3 years, they intensified the study of investor sentiment using various indicators of risk premiums, but not historical market data, but investor perceptions about the current value of risk premi-

[7] For example, they include deviations of the futures market prices from their fundamental (theoretical prices); the put-call ratio; the bid-to-cover ratio; the buyer-to-seller ratio; the ratio between the current market price of a financial asset and the moving average of this price (market momentum); the ratio between the stocks at annual price highs and the stocks at annual price lows (stock price strength).

ums. To this end, investor surveys determine their assessment of the risk premiums used in making investment decisions regarding various asset classes. According to a global survey conducted among 1836 investors from 84 countries (the authors of the review limited the analysis to 69 countries, as they considered only countries with at least 8 answers), a group of Spanish scientists prepared a review of risk-free rates and market risk premiums used in March 2019 [27, p. 11]. Based on the data on changes in risk premiums, it will be possible to form crisis predictors with high predictive power. Introducing telegram channels into human communication opens up immense possibilities for developing this class of indicators.

Another group of tools for assessing investor sentiment, used as crisis predictors, is those analyzing the difference between the behavior of qualified and unskilled investors. Thus, the investment bank Goldman Sachs uses as a crisis predictor a comparison of net ETF inflows of professional investors (Professional Equity ETFs) with net inflows to all equity ETFs, including funds for retail investors. In 2018, this indicator turned out to be a good predictor of the decline in stock markets. Since January 2018, professional funds recorded an outflow of investor funds (i.e. professional investors started selling stocks) amid continued flow of funds to all funds (i.e. retail investors kept buying stocks, offsetting the sales of professional investors). A few months later, at the end of 2018, all this ended in a significant drop in stock indexes.

Not to challenge the predictive capabilities of this indicator, it should, however, be noted that it does not predict an economic recession, but a decline in stock markets. Bearing in mind that the decline in stock markets classically precedes the economic collapse, this indicator may be used as a predictor of economic recessions. Unfortunately, a more detailed study is impossible due to the closed (non-public) nature of the predictive power of this indicator.

CAPE (Schiller coefficient)

CAPE (cyclically-adjusted price-to-earnings) ratio, or Shiller P/E (Schiller coefficient), the ratio of the current capitalization of the stock market to the average profit of listed companies over the past 10 years, adjusted for inflation. The modernization of the well-known market P/E ratio is due to the following consideration. In a recession, stock prices fall; at the same time, company profits also fall, which may temporarily increase the P/E ratio. A high value of the P/E indicator indicates that stock prices are still high, although in fact this is no longer the case, as the cyclical nature of the economy will bring future profits back to corresponding levels. To avoid this distortion, Robert Schiller proposed smoothing out the companies' profit indicator: instead of the current annual profit, the average profit for the previous 10 years is calculated, adjusted for inflation. A high CAPE indicates that the stock prices are too high because it does not correlate with profit margins, which means that the market is overvalued, and there is a risk of lower stock prices in the near future.

The time horizon (10 years) over which profit is averaged was selected on the assumption that this period includes both high-profit years (obtained during periods of good economic situation) and relatively low-profit years (years with poor economic situation).

The Schiller coefficient on retrospective data performed well as a predictor for the Great Depression and the 2000–2002 crisis, as well as in a less explicit form — for the crises of 1938, 1946, and 1987. Moreover, before the 2007–2009 crisis, it was not possible to predict the crisis based on the Schiller coefficient's behavior. Thus, the Schiller coefficient is predictive only regarding some crises. By analyzing the nature of these crises, it can be assumed that this indicator is a good predictor of only the crises resulting in "bubbles" in the stock market. The crises that arising for other (including debt) reasons, to a lesser extent can be predicted using the Schiller coefficient.

Robert Schiller calculates CAPE not only for the US market, but also for other major national or regional stock markets. However, it is precisely the Schiller coefficient for the USA after the 2007–2009 crisis that grows much faster than similar ratios in other countries. Robert Schiller admits that it is impossible to pin down the full cause for such a noticeable separation of the United States from other countries. He points to this phenomenon as an example of a situation that should remind all investors of the importance of diversification, and that the overall U.S. stock market should not be given too much weight in a portfolio. Another feature of the behavior of Schiller coefficients after the 2007–2009 crisis he calls a significant variation in their performance across stock markets of various countries [28].

ANALYSIS OF THE "NEW" CRISIS PREDICTORS SIGNALLING THE LIKELIHOOD OF A CRISIS

Comparing crisis predictors with types of financial crises

We analyzed cases of "new" crisis predictors signalling the likelihood of a crisis. It turned out that different predictors can better predict different types of crises. Since the crisis predictors in question are based on information from financial markets, they, as a rule, primarily signal financial crises. Above, we proposed a classification of financial crises based on what segment of the financial sector such crises began. We seem to have established a certain connection between the type of a financial crisis and crisis predictors that catch impending crises better than others do.

When the financial crisis triggered an economic recession, the recessions were usually characterized by the complex nature of the financial crisis accompanying the recession. With a decline in production, deterioration in debt servicing, sharp moves in the exchange markets, and sharp fluctuations in stock markets take place. However, the starting (initial) point in each crisis period usually differs from the starting points in other crises. In this case, by the starting (initial) point of the crisis, we understand the events that happen immediately after the event, which will subsequently be described as a trigger for the crisis. Speaking about financial and economic crises, as a rule, these events focus on a certain, more or less limited part of the financial sector.

Thus, the latest crisis (2008) began in the debt market; initially, it was of a debt nature. Others, earlier crises, had other launch pads and a different initial nature of crisis events.

The 2001–2002 crisis — "dot-com crisis" — began on the stock market. It was immediately caused by poor corporate governance (including disclosure) in a number of corporations of the "new economy".

Initially, the 1997–1998 crisis had the nature of a currency crisis. It then developed into a currency-debt crisis in emerging markets (in this case, in 1997, at the very beginning of the crisis period, some countries had crisis phenomena in corporate governance accompanied by the decline in some emerging stock markets).

Table 2 presents the results of our assumptions about the comparability of the nature of the crisis and the most adequate (corresponding to the given nature of the crisis at its initial point) crisis predictors.

There seem to be a certain logic in which predictors responded better to certain crises. Thus, the Schiller coefficient sent stronger signals before the 2002 crisis. This may be because the starting point of the crisis was the events on the stock market, i.e. directly affecting the parameters used in the calculation of this indicator. Indicators of financial cycles better signal crises with an element of the debt crisis at the starting point, etc.

In this article, we consider the crisis predictors that have long been discussed by the expert community. We also constructed an original crisis predictor based on information from the American financial and real estate markets; using retrospective data, it signalled quite well the crises of 1980–1982, 1990–1991, 2001–2002, and 2008. This predic-

Table 2

The crisis predictors that most adequately signaled the largest crises of the last 40 years

Crises	Global reach	Starting point of crisis		Most effective predictors
		Nature of crisis	Market segments	
1980–1982	The United States and developed countries	Corporate governance crisis	Stock market	DRP; FCI
1991–1992	The United States and developed countries	Currency and debt	Exchange and debt markets	Separate FCI; yield spreads
1997	Developing countries	Corporate governance crisis	Stock market	ERP; VIX
1998		Currency crisis followed by the debt one	Exchange and debt markets	Separate FCI; VIX
2001–2002	The United States	Corporate governance crisis	Stock market	Shiller coefficient CAPE; ERP; VIX; separate FCI; yield spreads
2008	Global crisis	Debt crisis	Debt markets	Yield spreads; FCI; VIX

Source: compiled by the authors.

Note. Corporate governance crisis; ERP — equity risk premium; DRP — debt risk premium; FCI — financial conditions indexes; yield spreads — yield spreads between US treasury bonds of varying maturities.

tor is the spread between the real estate price index and the thirty-year mortgage rate index in the United States, whose various presentation forms were predicted by all recent crises in the United States.

Based on the critical analysis of new indicators proposed as crisis predictors, including the assessment of their response to various types of financial crises, we made assumptions about their possible use as predictors of various types of financial crises (*Table 3*).

Based on the analysis results, among all, we picked the most promising indicators from their use perspective as crisis predictors:

- financial conditions indexes;
- US Treasury bond yield spreads;
- risk premiums and assessments of investor sentiment.

General trends in the development of a new generation of crisis predictors

The analysis of indicators proposed as new crisis predictors also allowed for more general considerations.

First, there is a great increase in attention paid to integrated indicators, based on a large number of primary indicators of the state and development of financial markets; each of them has a certain predictive power. Another important feature is the increased use of indicators

Table 3

Assessment of the possibility of using the analyzed indicators as crisis predictors

Analyzed indicators	Can be used			
	a separate indicator, or together with other predictors	only together with other predictors: for forecasting		
		any crises	debt crises	stock market crises
Financial conditions indexes	+	+	+	+
"Fear index" (VIX)	–	+	+	+
T-bond yield spreads	–	+	+	+
Risk premiums and assessments of investor sentiment	+	–	+	+
Schiller coefficient	–	–	–	+

Source: compiled by the authors.

Note. Any crises are financial crises of any of the three types (currency; debt; in the stock market).

measuring investor sentiment that can consider the opinions of investors around the world and be presented to the public as soon as possible.

Second, among crisis predictors based on indicators of financial markets that are more or less successful in predicting crisis phenomena in the economy and/or in financial markets, very few have good predictive power against debt crises. Considering that many researchers recognize debt nature as the most probable one of a future global financial and economic crisis (or a local crisis that could trigger a global crisis), the existing set of developed crisis predictors may not be very effective in predicting the next crisis.

Third, some predictors show a close correlation with the rate of the US Federal Reserve (besides T-bond yield spreads, many risk premium indicators also apply to such predictors). In our opinion, this is becoming a significant problem in the modern financial world: many key parameters of the situation of financial markets depend on the decisions of one authority (people who may make mistakes) which indicates an additional systemic risk factor.

Fourth, some crisis predictors that can be used as part of practical work to anticipate the crisis are limited in public use. At the same time, many of these indicators are very successful crisis predictors in the financial markets (for example, the above-mentioned Goldman Sachs bank indicator).

Fifth, the function of creating crisis predictors passed from the IMF and other international financial organizations actively involved in this before the 2007–2009 crisis to central banks, private financial institutions, and even individual researchers.

Table 4

Crisis predictors, taking into account the assessment of the prediction time from historical data (previous crises), months

Crisis (year) in the USA	Financial conditions indexes			Yield spreads		VIX	Prediction range	Average prediction time
	KCFSI	CNFCI	STLFSI	between 2-year and 5-year	between 2-year and 10-year			
1973	N/a	7	N/a	N/a	N/a	N/a	7	7.0
1980	N/a	2	N/a	N/a	N/a	N/a	2	2.0
1981	N/a	3	N/a	N/a	N/a	N/a	3–6	5.0
1990	Not predicted	9	N/a	4/3	4/2	Not predicted	3–9	4.6 / 4.0
2001	15	2	2	12/2	13/2	0.5	2–15	8.1 / 5.1
2008	4	3	3	18/3	22/2	2	2–4	7.9 / 2.9
Prediction range	4–15	2–9	2–3	12–18/2–3	13–22/2	2		2–15
Average prediction time	9.5	4.3	2.5	15/2.5	17.5/2	1.5		4.2

Source: compiled by the authors.

Note. Financial conditions indexes: KCFSI — the Kansas City Financial Stress Index; CNFCI — the Chicago Fed National Financial Conditions Index; STLFSI — the St. Louis Fed Financial Stress Index. Yield spreads; between 2-year and 5-year — between 2-year and 5-year US Treasury bonds; between 2-year and 10-year — between 2-year and 10-year US Treasury bonds.

Estimation of prediction time by various crisis predictors

We used the graphs of crisis predictors combined with the temporal boundaries of recessions to analyze the prediction time for various crisis predictors (regarding the recessions of the past 50 years in the USA). *Table 4* presents the analysis results.

Table 4 presents two versions of data on the prediction time for the US Treasury bond yield spreads. We believe, the first signal is observed at the moment when spread data become stable negative, and the second signal — at the moment when these indicators leave the negative range and begin their steady growth.

Besides the results in *Table 4*, one should consider the result from work [29] regarding the predictive power of indicators of the national financial cycle. With reservations (related to the obvious fact that not every economic crisis is predicted by the financial cycle indicators, i.e., recession), however, in some cases, the financial cycle peak with an approximately 2-year lag precedes the economic recession.

As of December 2019, most of the examined crisis predictors do not signal a possible impending crisis. The exceptions are yield spreads between US treasury bonds of varying maturities (they indicate a possible impending crisis in the middle — end of 2020), the Schiller index (indicates the American Stock Market Overvaluation), and individual assessments of investor sentiment.

PREDICTING GLOBAL CRISES — SPECIFICS OF RUSSIA

Due to its commodities exports, Russia is currently doomed to be highly dependent on the situation of global markets. Thus, according to the estimates in work [30], the shocks of the world oil market describe about 26% of the variance of the ruble exchange rate and 20% of inflation, and the dynamics of the VIX "fear index" determines 16% of the spreads of sovereign Russian credit default swaps and 13% of the industrial production.

The lag of the Russian financial sector development from socio-economic development as a whole, also mentioned by the World Economic Forum competitiveness ranking[8], objectively lowers Russia's resistance to external shocks in the context of the financialization of the global economy. While China and India benefit from the financialization process by increasing attracted investment resources, Russia, with the weak national financial sector, is becoming increasingly vulnerable to external shocks [31].

Besides, the deterioration in Russia's financial structure since 2008 [32] has also increased the vulnerability of the Russian financial sector to external shocks. In their work, Yu. Danilov, O. Buklemishev and A. Abramov noted that "... the countries with the largest gap between the development of the banking sector and the non-banking financial sector are the most vulnerable to a crisis in the global financial market. This is because the banking sector translates external shocks; while institutional investors, the core of the non-banking financial sector, on the contrary, absorb external shocks, reducing their impact on the real sector of the economy" [33].

These circumstances predetermine the increased vulnerability of the Russian economy to external shocks; increase the likelihood of infection of the Russian financial system with risks from the global market. Therefore, predicting global crises is especially relevant for our country. Currently, the Bank of Russia is monitoring a relatively small number of indicators that could assess the accumulation of internal risks and the potential for translating external shocks.

The latest financial stability review by the Bank of Russia[9] indicates mainly the pro-

[8] Russia ranks 43rd in the Financial Sector in 2019; and it ranks 95th in the world — see The Global Competitiveness Report 2019. Geneva: WEF; 2019.

[9] Bank of Russia. Financial Stability Review. Information and analytical material. No. 1 (14). Q4 2018 — Q1 2019. M.: Bank of Russia; 2019.

cesses in the Russian banking sector as the key vulnerabilities in the Russian financial system. They may lead to increased risks of insolvency of bank borrowers, insolvency of the banks themselves, as well as risks of the foreign currency and time structure of bank liabilities[10]. Besides, this report addresses selected issues of macroprudential policy and systemic risks of financial institutions.

This approach does seem to be complex. Many indicators should be integrated into financial stability monitoring. Given the fundamental increased vulnerability to external shocks, Russia should raise the profile of indicators assessing external risks. Among them, crisis indicators with strong predictive power should take a special place. It would be useful if the Russian financial authorities constantly monitored reliable crisis predictors, and the results of this monitoring were available online to all economic agents.

CONCLUSIONS

Given the identified sequence of crisis predictors, the authors built a block scheme to monitor external crisis predictors. It combines the behavior analysis of predictors in terms of prediction time with the analysis of predictors in terms of predicting the nature of the starting point of a future crisis. A basic block-diagram may be as follows:

1. *If the signal of the financial cycle indicators is recorded*[11] *(financial cycle break point, the maximum point of the financial cycle passed), then:*

1.1. The period of possible start of a future crisis is determined (2 years after the maximum point was passed).

1.2. Debt market indicators, including default risk assessments, get heightened attention.

2. *If T-bond spreads become negative, then:*

2.1. The period of possible start of a future crisis is determined (12–18 months after the spreads become negative).

2.2. The period of a possible confirmation signal from this group of crisis predictors is determined.

2.3. The period for enhanced monitoring of other crisis predictors, as well as the list of these predictors, are determined[12].

3. *If the signal financial conditions indexes is recorded, then:*

3.1. The period of a possible start of a future crisis is specified (3–4 months after the signal is received).

3.2. The probability of the onset of the crisis is specified (considering the crisis predictors that worked and did not work earlier).

3.3. Particular attention is paid to indicators of debt burden, interest and currency risks.

3.4. Requested is an in-depth analysis of the dynamics of other crisis predictors, whose prediction time is close to financial conditions indexes.

4. *If the signal of the Schiller coefficient and stock indexes is recorded, then:*

4.1. The period of a possible start of a future crisis is specified (0–2 months after the signal is received).

4.2. The nature of the initial period of the crisis is determined — the stock market crisis.

If all of the above signals are triggered, there is little doubt about the onset of the crisis. Then, the government should begin implementing the previously outlined countermeasures against the crisis.

[10] The vulnerabilities indicated in the Review by the Bank of Russia are as follows: the rapid growth of the household debt burden against the excessive growth of consumer lending; banking sector dollarization and dependence on external financing (understood as the dollarization of household deposits and dependence on foreign investors); growth in short-term funding of banks; growing concentration of banks' loan portfolio on selected largest borrowers with high debt burden.

[11] In this article, we did not consider these indicators, since the financial cycle has a significantly longer duration than the business cycle, and no downward movement of the long-term financial cycle is expected in the near future.

[12] Financial conditions indexes — approximately 8 months after the spreads become negative; the spread between the mortgage rate and the real estate price — approximately 9 months after the spreads become negative; stock indexes and the Schiller coefficient — about 6 months after the spreads become negative; etc.

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REFERENCES

1. Entov R.M. Some problems of business cycle research. In: Gaidar E.T., ed. The financial crisis in Russia and in the world. Moscow: Prospekt; 2009:6–42. (In Russ.).
2. Reinhart C.M., Rogoff K.S. This time is different: Eight centuries of financial folly. Princeton: Princeton University Press; 2009. 512 p.
3. Gennaioli N., Shleifer A., Vishny R. Neglected risks: The psychology of financial crises. *American Economic Review*. 2015;105(5):310–314. DOI: 10.1257/aer.p20151091
4. Shleifer A. The transformation of finance. Presentation. January 2011. American Finance Association. URL: https://scholar.harvard.edu/files/shleifer/files/transformation_of_finance_afa_jan2011.pdf
5. Tsvetkov V.A. Cycles and crises: Theoretical and methodological aspect. Moscow, St. Petersburg: Nestor-Istoriya; 2012. 504 p. (In Russ.).
6. Dabrowski M. Can emerging markets be a source of global troubles again? *Russian Journal of Economics*. 2019;5(1):67–87. DOI: 10.32609/j.ruje.5.35506
7. Eicher T.S., Kuenzel D.J., Papageorgiou C., Christofides C. Forecasts in times of crises. *International Journal of Forecasting*. 2019;35(3):1143–1159. DOI: 10.1016/j.ijforecast.2019.04.001
8. An Z., Jalles J.T., Loungani P. How well do economists forecast recessions? *International Finance*. 2018;21(2):100–121. DOI: 10.1111/infi.12130
9. Shchepeleva M.A. Financial contagion: Global transmission of systemic risk. *Mirovaya ekonomika i mezhdunarodnye otnosheniya = World Economy and International Relations*. 2017;61(1):17–28. (In Russ.). DOI:10.20542/0131–2227–2017–61–1–17–28
10. Rottier S., Véron N. An assessment of the G20's initial action items. Bruegel Policy Contribution. 2010;(8). URL: https://bruegel.org/wp-content/uploads/imported/publications/pc_2010_08_fin_reg.pdf
11. Hatzius J., Hooper P., Mishkin F., Schoenholtz K., Watson M. Financial conditions indexes: A fresh look after the financial crisis. NBER Working Paper. 2010;(16150). URL: https://www.nber.org/papers/w16150.pdf
12. Ørbeck A., Torvanger M. A financial conditions index for Norway: Can financial indicators predict GDP? Master thesis. Oslo: Norwegian University of Life Sciences; 2011. 73 p. URL: https://nmbu.brage.unit.no/nmbu-xmlui/bitstream/handle/11250/187215/Masteroppgave.pdf?sequence=1&isAllowed=y
13. Chow H.K. Can a financial conditions index guide monetary policy? The case of Singapore. Research Collection School of Economics. 2013. URL: https://ink.library.smu.edu.sg/soe_research/1484
14. Ho G., Lu Y. A financial conditions index for Poland. IMF Working Paper. 2013;(252). URL: https://www.imf.org/external/pubs/ft/wp/2013/wp13252.pdf
15. Debuque-Gonzales M., Gochoco-Bautista M.S. Financial conditions indexes for Asian economies. ADB Economics Working Paper Series. 2013;(333). URL: https://www.adb.org/sites/default/files/publication/30163/economics-wp333-financial-conditions-indexes.pdf
16. Zheng G., Yu W. Financial conditions index's construction and its application on financial monitoring and economic forecasting. *Procedia Computer Science*. 2014;(31):32–39. DOI: 10.1016/j.procs.2014.05.242
17. Klepach A.N., ed. Strategic management of the development of the Russian economy in conditions of global turbulence. Analytical report. Moscow: Center for Economic Policy Research, Faculty of Economics, Moscow State University; 2016. 289 p. (In Russ.).

18. Baba N., Sakurai Y. Predicting regime switches in the VIX index with macroeconomic variables. *Applied Economics Letters*. 2011;18(15):1415–1419. DOI: 10.1080/13504851.2010.539532
19. Bauer M. D., Mertens T. M. Information in the yield curve about future recessions. FRBSF Economic Letter. 2018;(20). URL: https://www.frbsf.org/economic-research/files/el2018–20.pdf
20. Bauer M. D., Mertens T. M. Economic forecasts with the yield curve. FRBSF Economic Letter. 2018;(7). URL: https://www.frbsf.org/economic-research/files/el2018–07.pdf
21. Tremasov K. V. Is it possible to predict the global crisis and how to make money on it? The Bell. 2018. URL: https://thebell.io/professional/tremasov-analytics (In Russ.).
22. Mishkin F. S. The information in the term structure: Some further results. *Journal of Applied Econometrics*. 1988;3(4):307–314. DOI: 10.1002/jae.3950030406
23. Stock J. H., Watson M. W. New index of coincident and leading indicators. In: Blanchard O. J., Fischer S., eds. NBER Macroeconomic Annual. Cambridge: MIT Press; 1989;4:351–409. URL: https://www.nber.org/chapters/c10968.pdf
24. Estrella A., Hardouvelis G. The term structure as a predictor of real economic activity. *The Journal of Finance*. 1991;46(2):555–576. DOI: 10.2307/2328836
25. Danilov Yu.A., Pivovarov D. A., Davydov I. S. Some results of research on new crisis predictors. *Voprosy ekonomiki*. 2020. (In press). (In Russ.).
26. Movchan A., Kireu E. Barometers for the crisis. Leading indicators of the dangerous conditions of financial markets: History and current situation. Moscow: Carnegie Moscow Center; 2018. 26 p. (In Russ.).
27. Fernández P., Martinez M., Acin I. Market risk premium and risk-free rate used for 69 countries in 2019: A survey. *SSRN Electronic Journal*. 2019. DOI: 10.2139/ssrn.3358901
28. Shiller R. The world's priciest stock market. Project Syndicate. Jan. 23, 2018. URL: https://www.project-syndicate.org/commentary/us-stock-market-highest-cape-ratio-by-robert-j — shiller-2018–01
29. Borio C., Drehmann M., Xia D. Predicting recessions: Financial cycle versus term spread. BIS Working Papers. 2019;(818). URL: https://www.bis.org/publ/work818.pdf
30. Tiunova M. G. The impact of external shocks on the Russian economy. *Finansy: teoriya i praktika = Finance: Theory and Practice*. 2018;22(4):146–170. (In Russ.). DOI: 10.26794 / 2587–5671–2018–22–4–146–170
31. Dubinin S. K. Financialization of economic growth and the Russian national financial system. *Finansy: teoriya i praktika = Finance: Theory and Practice*. 2017;21(4):6–21. (In Russ.). DOI 10.26794 / 2587–5671–2017–21–4–6–21
32. Danilov Yu.A., Pivovarov D. A. Financial structure in Russia: Conclusions for state policy. *Voprosy ekonomiki*. 2018;(3):30–47. (In Russ.). DOI: 10.32609/0042–8736–2018–3–30–47
33. Danilov Yu., Buklemishev O., Abramov A. On the need to reform financial markets and the non-banking financial sector. *Voprosy ekonomiki*. 2017;(9):28–50. (In Russ.). DOI: 10.32609/0042–8736–2017–9–28–50

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Coordination of Fiscal and Monetary Regulation in Armenia

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ABSTRACT

The aim of the study is to reveal if there is a coordination of fiscal and monetary policies in Armenia, as well as to assess its impact on economic growth in the country. **Methods used**: statistical analysis, logistic regressions, mathematical modeling. The authors analyzed the economic growth rates and annual GDP growth per capita in Armenia from 1990 to 2018. They described the model of coordination of fiscal and monetary regulation. The relationship and interdependence between the monetary and fiscal regulation mechanisms are represented by mathematical equations. Provided are the calculations for the optimal values of fiscal and monetary indicators, as well as economic indicators for Nash equilibrium. **The study results** showed that fiscal and monetary regulation in Armenia is ineffective; there is no coordination of regulatory mechanisms, which is detrimental to the economic growth rate. The authors **conclude** that it is necessary to revise approaches to monetary and fiscal policies for a greater emphasis on coordination and harmonization of macroeconomic regulation instruments to ensure sustainable economic growth in the long term.

Keywords: monetary regulation; fiscal policy; coordination of monetary and fiscal policies; fiscal regulation

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INTRODUCTION

The main objective of state regulation is to achieve a high level of prosperity of the population. The experience of many countries shows that harmonization of fiscal and monetary policies, as well as the focus on sustainable economic growth, lead to an increase in the level and quality of life in the country. Besides the common goal, monetary and fiscal policies pursue conflicting goals. Thus, public debt management always defeats the purpose of monetary regulation, aimed at ensuring price stability in the economy.

The theoretical and practical foundations of the balance between fiscal and monetary regulation are well disclosed in the world scientific literature. Yet, exploring a particular group of countries, various authors come to many contradictory conclusions. The main area of research is to find a compromise between GDP growth and unemployment, on the one hand, and ensuring stable and low inflation, on the other hand. Moreover, we take the hypothesis about the need to dominate in either fiscal or monetary policy as a basis.

As a rule, the theory states that the dominance of monetary regulation is preferable. However, the experience of some countries proves that the excessive independence of the Central Bank and its focus on low inflation leads to a slowdown of economic growth. In this regard, the experience of Armenia is as a vivid example [1].

We think that the emphasis should be made on ensuring balanced and coordinated policy by the Central Bank and the government, rather than on fiscal or monetary goals.

In the framework of this study, the task is to determine a coordination model of monetary and fiscal regulation, which will consider the peculiarities of the Armenian economy, and will also be focused on ensuring sustainable economic growth rates.

LITERATURE REVIEW

A wide range of literature is devoted to the issues of coordination of monetary and fiscal policies, including in terms of achieving higher and more sustainable economic growth rates. It is obvious that both instruments of macroeconomic regulation frequently pursue contradictory tasks. In particular, the problem of public debt and its financing mechanisms usually

becomes an obstacle between fiscal and monetary policies. A high public debt can have a significant impact on the relationship between fiscal and monetary authorities [2]. Laurens and de la Piedra also point to public debt and budget deficits as a key factor in the interaction between fiscal and monetary policies [3]. They emphasize that the Central Bank's strategy can affect, for example, the capacity of the government to finance the budget deficit by affecting the cost of debt service and by limiting or expanding the available sources of financing.

Many authors considered the relationship between inflation and budget deficits. Thus, Sargent and Wallace [4] argued that in the short term, budget deficits should not cause inflation. However, in 2003, the study results by L. Katao and M. Terrones [5] spanning 107 countries over 42 years proved that the budget deficit has an impact on price changes not only during high- or hyperinflation, but also in its moderate ranges, even if the consequences in the second case are much weaker. The study showed a strong positive association between deficits and inflation among developing economies, but not among low-inflation advanced economies. On the other hand, many authors [6–8] argue that in the face of inflationary pressures caused by instability in world markets, the task of ensuring price stability comes to the fore. This fact puts monetary policy objectives in the foreground, which implies monetary dominance in the economy [9].

However, both authorities can influence economic growth. Both fiscal and monetary policies have a sufficient range of instruments that could influence GDP elements. In this case, the main task is to find a balance between the goals and the policies of the central bank and fiscal authorities [10, 11].

Typically, coordination of monetary and fiscal policy is fraught with great difficulties. Christian Beddies [12] offers an approach to the coordination problem between monetary and fiscal policy. He divides all literature in this field into three strands: the first is the time inconsistency problem and suggestions for its solution; the second is the institutional models of monetary policy, and the third part is the interaction of fiscal and monetary authorities. As for the third part, he notes that with the inconsistent formation of two separate policies for regulating the economy, it is necessary to define common concepts in order to identify the results of the interaction between these policies. He also notes the importance of a compromise between unemployment/GDP and inflation.

In his work, Alan Blinder (1982) [13] supplements the mentioned reasons with two more important factors: different ideas about objectives important for society and different forecasts about the likely affects of fiscal and/or monetary policy actions on the economy.

In this regard, finding a balance between fiscal and monetary policies is possible to a higher extent by determining the most favorable positions in terms of economic growth and development.

There are several approaches to solving the problem of the interaction of monetary and fiscal regulation in the literature. **The first approach** implies the absence of any interaction. At the same time, both fiscal and monetary policies are completely independent from each other, and decision-making takes place without knowing each other's decisions. In the scientific literature, this approach is known as the Cournot model [14].

The second approach, known as the Stackelberg model, involves the dominance of one of the tools of macroeconomic regulation, either fiscal or monetary policy [15]. The Cournot model is taken as a basis of this approach, but the assumption of the equality of macroeconomic regulation instruments is replaced by more realistic scenarios where one of the instruments is dominant. This approach involves the selection of the priority goals from the point of view of macroeconomic regulation, which relates to either fiscal or monetary policy.

Finally, **the third approach** involves the coordination of fiscal and monetary policies to ensure economic growth [11]. By such coordination, we can understand the ongoing process of interaction between fiscal and monetary authorities, in order to solve the tasks of macroeconomic regulation. Some studies [3] prove that in the absence of coordination and matching goals of fiscal and monetary policies, a significant increase in interest rates is highly probable in the financial market or an increase in the country's public debt in the economy.

In their study "Some Unpleasant Monetarist Arithmetic", Sargent and Wallace [4] conclude that, given absolute rational expectations, a decrease in money supply growth can lead to higher inflation. In other words, the implementation of tight monetary and soft fiscal policies can lead to an increase in the inflationary

background. At the same time, considering the cases of the dominance of one of the policies, the authors conclude that coordination of monetary and fiscal policies should be accompanied by a certain level of stimulation or restriction from regulatory instruments. It is only in this case, when it will lead to positive shifts in ensuring sustainable economic growth.

In her work "Equilibrium strategies in a fiscal-monetary game. A simulation analysis" [16], Irena Woroniecka-Leciejewicz concluded that the actions of fiscal and monetary authorities have a positive impact on the economy provided that instruments are applied in a certain interval of values. The effectiveness of their actions decreases with very high or low values of instruments, which are the result of radically restrictive or expansive policy. The choice of the optimum fiscal policy depends upon the decision of monetary authorities, and this dependence is inversely proportional. That is, the more restrictive the monetary policy, the more expansive, in response, the fiscal policy, and vice versa. Similarly, the response of monetary authorities depends on fiscal policy. For example, carrying out an expansive monetary policy, the central bank must limit its policy to avoid an undesirable increase in inflation. However, this work is based on the assumption that monetary authorities want to achieve the desired level of inflation, and the fiscal ones seek economic growth.

Modern studies on the coordination of fiscal and monetary policies place a great emphasis on the crisis conditions, which force to some extent the revision of the goals and objectives of both fiscal and monetary policy [17]. In particular, the authors focus on the key issues of our time from the point of view of the interaction of fiscal and monetary policies. They note that the global financial crisis forced to rethink the role of the central bank in terms of solving fiscal problems, especially in the field of investments in state treasury bonds or setting negative interest rates on financial resources, which obviously affects the results of fiscal policy.

Other authors [18] considered the interaction between monetary and fiscal policies and used a data sample for the period from 1991 to 2016 for 42 countries, given the cyclical nature of monetary and fiscal policies. Countries were also classified by institutional and structural characteristics. The main conclusion made by the authors is that the implementation of inflation targeting, as well as the independence of "monetary authorities", is usually due to counter-cyclical monetary and fiscal policies, as well as coordination between them.

Some analysts of the European Parliament have a totally new view [19]. In their opinion, the coordination of fiscal and monetary policies is only possible in theory, meaning that those responsible for macroeconomic regulation should not try to achieve a balance between the two authorities.

Recent studies have examined fiscal and monetary policies in the context of economic stabilization [20–22]. At the same time, the authors, for the most part, come to the conclusion that fiscal policy, rather than monetary policy, can become an economic growth driver. First of all, this conclusion is due to a recession in the global money market, negative interest rates and increased risks on world stock exchanges.

However, in a developing economy, a poorly developed financial system, as well as high interest rates, coordination of fiscal and monetary policies is still relevant. In this regard, at the next stage of the study, we identified a model that is most adaptable to the conditions of the Armenian economy.

DESCRIPTION OF THE COORDINATION MODEL OF FISCAL AND MONETARY REGULATION

As part of the study, we took the coordination model described in the study by Irena Woroniecka-Leciejewicz "Equilibrium strategies in a fiscal-monetary game. A simulation analysis" (2015) [16]. She estimated the key parameters characterizing the effectiveness of fiscal or monetary policy instruments and analyzed the impact of monetary and fiscal regulation on key macroeconomic objectives. The main hypothesis is that, ceteris paribus, an increase in the budget deficit causes an increase in GDP growth.

The model consists of two logistic regressions that have the same independent and different dependent variables that describe monetary and fiscal policies, and reveal the connection and interdependence between the mechanisms of monetary and fiscal regulation.

The original model consists of two equations:

$$y_{ij} = f\left(b_i, r_j\right) = \frac{\alpha_1}{1+\beta_1 e^{-\chi_1 b_i}} + \frac{\alpha_2}{1+\beta_2 e^{-\chi_2 r_j}} + \delta_1,$$

$$p_{ij} = f\left(b_i, r_j\right) = \frac{\alpha_3}{1+\beta_3 e^{-\chi_3 b_i}} + \frac{\alpha_4}{1+\beta_4 e^{-\chi_4 r_j}} + \delta_2,$$

where y is inflation; p — is economic growth; b — is budget deficit growth; r — is interest rate.

The calculation results of the parameters were presented by a matrix (see *Table*).

The matrix represents the correlation between inflation and economic growth, which in turn corresponds to the values of the interest rate and the budget deficit growth. The study by Irena Woroniecka-Leciejewicz revealed a pattern according to which the lowest inflation and the lowest economic growth rates correspond to the most stringent restrictive measures of regulation, and conversely, high inflation and GDP growth were accompanied by expansive policy.

The study considers two cases:

- in the first case, it is assumed that fiscal authorities try to maximize GDP growth, while monetary authorities try to minimize inflation;
- in the second case, it is assumed that monetary and fiscal authorities determine specific goals, that is, the desired level of inflation and some planned GDP dynamics.

In the first case, fiscal authorities choose the optimal fiscal response $i^*(j)$ to each monetary strategy j, which maximizes the GDP growth rate. Monetary authorities act similarly: monetary authorities respond with the corresponding strategy $j^*(i)$ to each strategy i chosen by fiscal authorities to minimize the inflation rate.

In such a situation, fiscal authorities have a dominant strategy, which is the optimal response to the government, regardless of the decisions made by the central bank concerning the interest rate. The dominant strategy of fiscal authorities is the most expansive fiscal policy. Similarly, the most radically restrictive monetary policy is the dominant strategy for monetary authorities, which means the optimal one, no matter which fiscal strategy the government chooses.

Thus, the equilibrium in the game is achieved by dominant strategies that motivate the combination of the most restrictive monetary policy and the most expansive fiscal policy.

In the second case, we assumed that fiscal and monetary authorities try to minimize the deviations of GDP growth and inflation from the desired values of y^* and p^*. It is still assumed that for each monetary strategy j, fiscal authorities choose the optimal fiscal response $i^*(j)$, and for fiscal strategy i, monetary authorities choose the optimal monetary response $j^*(i)$. Thus, the optimal responses of fiscal policy characterize the reaction of fiscal authorities to the potential moves of the central bank. Conversely, the optimal monetary responses describe the reaction of monetary authorities to various fiscal strategies.

For the case when fiscal and monetary authorities want to minimize quadratic deviation from the desired values between real economic growth and inflation, the calculations were carried out under various assumptions. The location of the equilibrium point was no longer obvious and was dependent on the efficiency of fiscal and monetary policies, as well as on the priorities of the government and the central bank. In this study, we presented the results of the analysis corresponding to these two factors.

The table shows the optimal fiscal actions for each possible monetary policy, based on minimizing the quadratic deviation of GDP growth from the desired value. Similarly, it shows the optimal measures of monetary authorities, representing the optimal response to potential fiscal strategies. Monetary policy limitation was dependent on the government's choice of fiscal policy. The wider the fiscal policy, the more restrictive is the monetary policy adopted by the central bank in response to avoid excessive inflation. Similarly, the optimal actions of monetary authorities represent a reaction to potential fiscal strategies. It should be noted that the limits imposed by monetary policy depends on the government's choice of fiscal policy. The broader the fiscal policy, the more restrictive is the central bank's monetary policy to avoid excessive inflation. Similarly, the restriction or expansion of fiscal policy depends on the central bank's monetary policy. The more restrictive the monetary policy, the "broader" is the response by fiscal policy. Since the desired economic growth (at higher interest rates) is achieved, a more expansive fiscal policy, characterized by a higher budget deficit, is required. Conversely, in respond to a broader monetary policy, the government pursues a correspondingly more restrictive policy.

Picture 1 shows the optimal values of fiscal and monetary indicators, as well as the indicators of economic objectives for Nash equilibrium (GDP growth = 3.5%, CPI = 2.5%).

The author admits minor, close to zero, changes to the fiscal policy instrument (Δb_i) and the monetary policy instrument (Δr_i). Due to the illustrated wider

Table

Monetary-fiscal game — Payoff matrix

Government — fiscal policy		Central Bank — monetary policy ←*Restrictive Expansive*→							
		Monetary strategy M_1 (interest rate r_1)		Monetary strategy M_2 (interest rate r_2)		...	Monetary strategy M_n (interest rate r_n)	
← *Restrictive Expansive* →	Fiscal strategy F_1 (budget deficit b_1)		p_{11}		p_{12}	...		p_{1n}
		y_{11}		y_{12}		...	y_{1n}	
	Fiscal strategy F_2 (budget deficit b_2)		p_{21}		p_{22}	...		p_{2n}
		y_{21}		y_{22}		...	y_{2n}	
						...		
	Fiscal strategy F_m (budget deficit b_m)		p_{m1}		p_{m2}	...		p_{mn}
		y_{m1}		y_{m2}		...	y_{mn}	

Source: [18, p. 76].

range of changes in their values, the specifics of the impact on the economy, including GDP growth and inflation, are more evident. Within a certain range of values of fiscal and monetary policy instruments, called "effective" values, the influence of instruments on the economy is tangible and corresponds to the equilibrium in the fiscal-monetary game. You can also notice that, within the effective range of values of mixed-policy instruments, the choice of the optimal fiscal policy depends on the decision of monetary authorities: as already mentioned, the more restrictive the monetary policy is, the more expansive the fiscal policy becomes, and vice versa.

However, outside this range, when fiscal authorities are prone, for example, to radically restrictive policies, the optimal response of the other no longer changes under the influence of further radicalization of monetary policy of the central bank. For example, if one moves toward an extremely broad monetary policy, the optimal fiscal response will no longer respond to a further weakening of monetary policy. To summarize, we can say that in countries with extremely limiting or extremely wide interest rate strategies, the optimal fiscal response turns into a dominant strategy.

ANALYSIS OF THE EFFECTIVENESS OF MONETARY AND FISCAL REGULATION IN ARMENIA

The effectiveness of monetary and fiscal regulation determines the effectiveness of the entire macroeconomic policy in the country. In fact, the welfare of the population directly reflects the effectiveness of fiscal and monetary policies. In turn, effective policy of fiscal and monetary authorities is essential for the coordination of these instruments of macroeconomic regulation.

However, Armenia's experience indicates little success in achieving both sustainable economic growth and higher GDP per capita. As we can see in *Fig. 2*, the last decade was accompanied by a recession. In particular, there is slow economic growth, as well as a lack of growth in per capita income. As mentioned above, the effectiveness of both fiscal and monetary policies directly affects economic growth in general.

Considering the abovesaid, we will first analyze the effectiveness of fiscal and monetary regulation in Armenia.

ANALYSIS OF FISCAL POLICY INDICATORS IN ARMENIA

A key indicator of the effectiveness of fiscal policy in a developing economy is a balanced state budget. A negative balance is usually the result of inefficient budget allocation, as well as fiscal policy. Of course, a negative budget balance is an inherent part of the modern economy of almost all countries of the world. With rare exceptions, almost all countries today are characterized by a budget deficit.

However, when it comes to developed economies, a negative budget balance, as a rule, does not entail

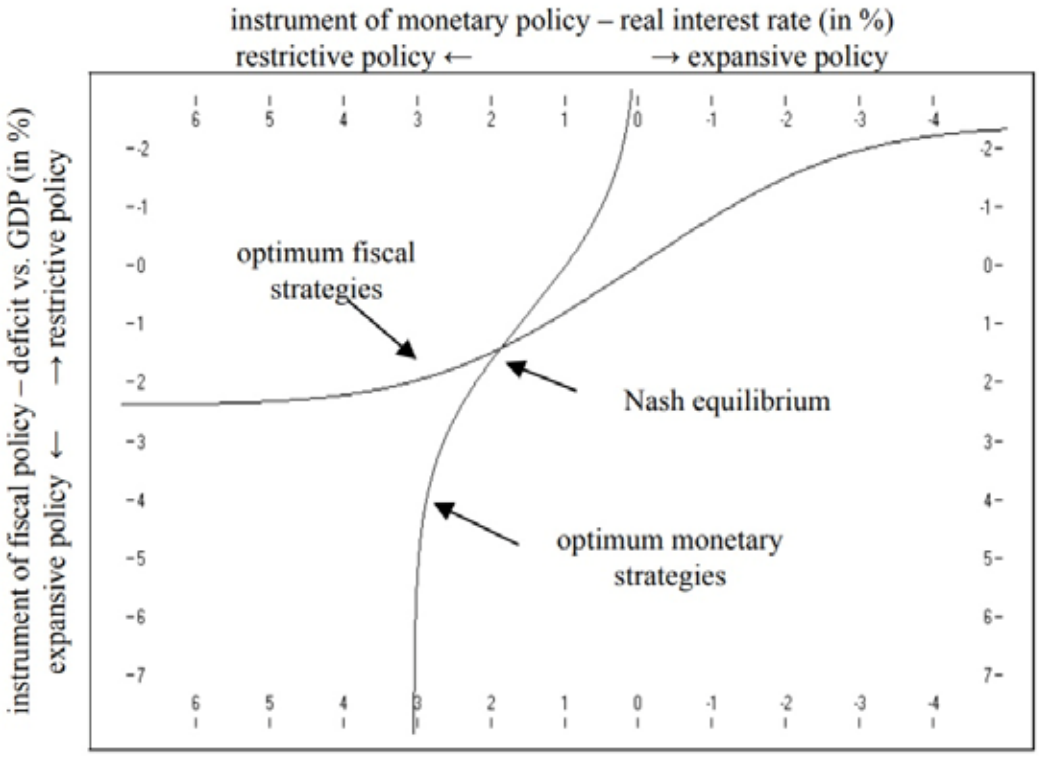

Fig. 1. **Optimum fiscal and monetary strategies**

Source: [10, p. 85].

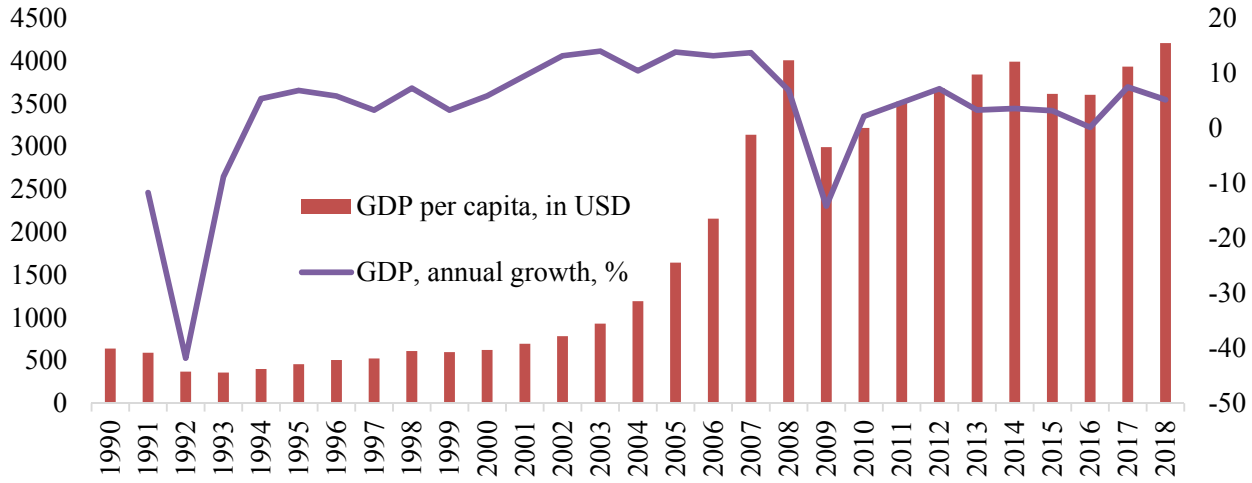

Fig. 2. **Economic growth rate in the Republic of Armenia (in %) and GDP per capita (in USD)**

Source: Database of the National Statistical Service of the Republic of Armenia. URL: https://www.armstat.am/ru/ (accessed on 20.01.2020).

further negative outcomes. In most cases, the budget deficit is covered by domestic public debt, which in general, to some extent, even has positive outcomes. For example, the development of the financial sector in the country.

A negative budget balance in a developing economy have different outcomes. The budget deficit is usually covered by external sources of credit, which leads to negative outcomes, including a slowdown in economic growth in the long term.

In this sense, the experience of Armenia is a prime example. The chronic budget deficit over the past 23 years has been accompanied by a steady increase in external public debt. As we can see in *Fig. 3*, the highest budget deficit is observed in the period of 1998–2002, as well as from 2009 up to this day. Since 2009, the

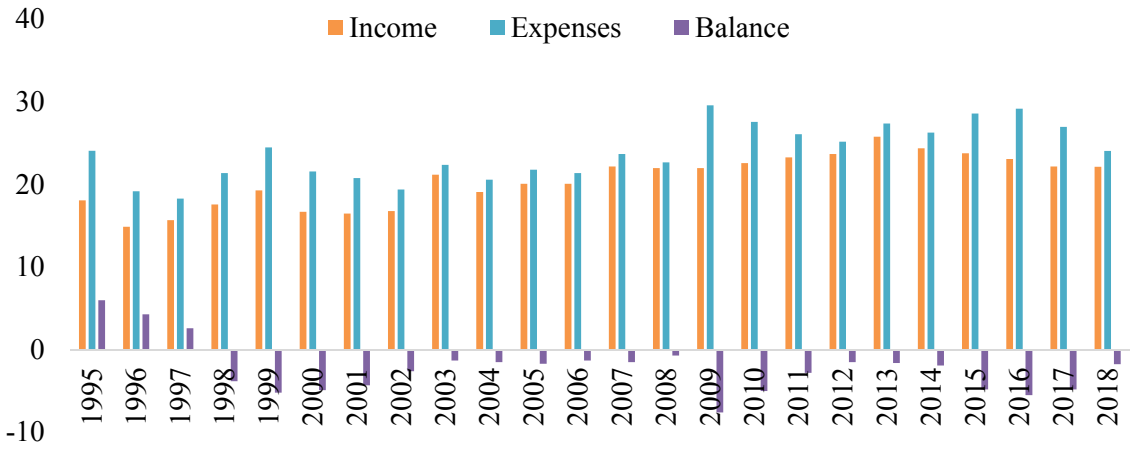

Fig. 3. **State budget of the Republic of Armenia, % of GDP**

Source: Database of the National Statistical Service of the Republic of Armenia. URL: https://www.armstat.am/ru/ (accessed on 20.01.2020).

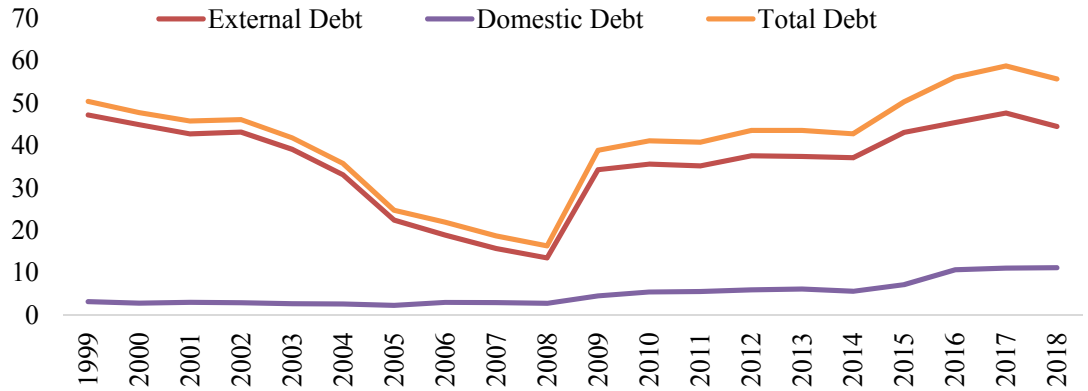

Fig. 4. **Public debt of the Republic of Armenia (in % of GDP)**

Source: Database of the National Statistical Service of RA. URL: https://www.armstat.am/ru/ (accessed on 20.01.2020).

public debt of Armenia, both internal and external, has been characterized by constant growth (see *Fig. 4*). As of 2018, the total public debt was 55.7% of GDP and almost reached the critical value established by the Armenian Constitution. The external debt amounted to 44.5% of GDP, which is the dominant position in the total debt of the country.

However, these are not the only indicators that speak of an unhealthy system of public finance in the country. The key issues of fiscal regulation include the dominance of indirect taxes in the structure of budget tax revenues, the not-so-efficient tax administration system, the inflexible system of tax burden distribution, and many other problems. It should be noted that the list of the reasons for the insolvency of Armenia's fiscal policy is not complete; however, it includes key factors that lead to a slowdown in economic growth over the past ten years.

ANALYSIS OF ARMENIAN MONETARY POLICY

The Central Bank of Armenia pursues inflation targeting policy for thirteen years. The nominal anchor of monetary policy has been reviewed only three times since 2006, and at the initial implementation stage of the inflation targeting policy. *Fig.5* illustrates the implementation results of monetary regulation by the Central Bank of Armenia within the inflation targeting. As we can see, neither the actual value of the cumulative Consumer Price Index, nor Core Inflation (the main target of the Central Bank of Armenia) fall into the target range during most of the periods under consideration (see *Fig. 5*). Thus, it is difficult to talk about the successful implementation of the inflation targeting policy due to the dynamics of inflation indicators in Armenia [23].

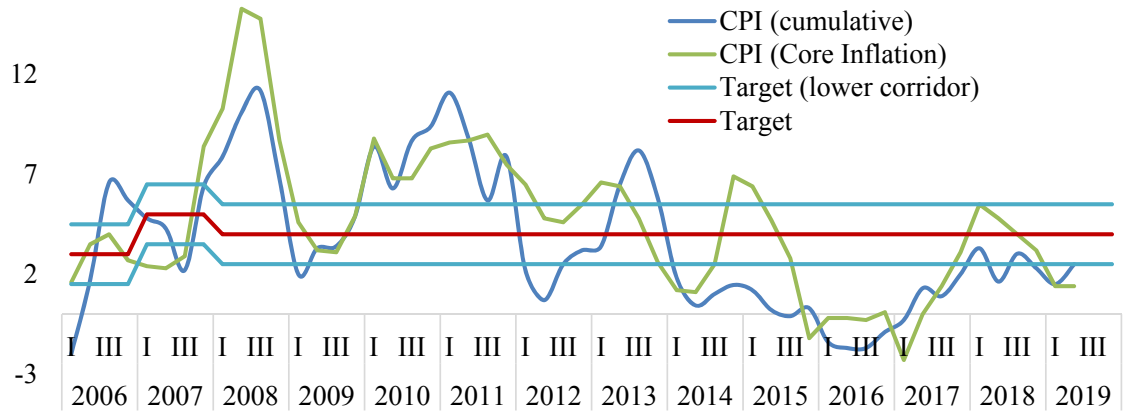

Fig. 5. **Central Bank of Armenia's target and the actual value of the CPI, %, quarterly**

Source: Database of the Central Bank of the Republic of Armenia. URL: https://www.cba.am/ru (accessed on 20.01.2020).

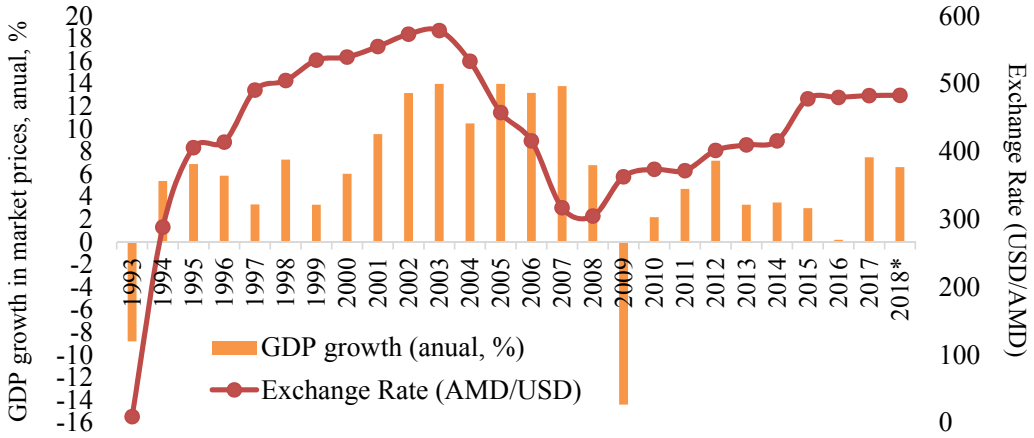

Fig. 6. **Economic growth and exchange rate USD/AMD, 1993–2018**

Source: Database of the Central Bank of the Republic of Armenia. URL: https://www.cba.am/ru, Database of the National Statistical Service of the Republic of Armenia URL: https://www.armstat.am/ru/ (accessed on 20.01.2020).

The study proves that the current policy has a negative effect on economic growth, especially in the last decade (see *Fig. 6*). In particular, foreign exchange regulation, which is aimed to maintain stable dynamics of the exchange rate of the Armenian dram, led to a slowdown in economic growth, as well as to many other negative structural outcomes in the country's economy [1, 24].

We cannot call Armenia's monetary regulation efficient.

One of the reasons for the inefficiency of the policies implemented both by the Central Bank of Armenia and fiscal authorities is the lack of balance and coordination between these two instruments of macroeconomic policy. Thus, it seems relevant to estimate coordination of fiscal and monetary policies. In this regard, the objective of the study was to estimate coordination of monetary and fiscal policies in Armenia.

ADAPTATION OF THE COORDINATION MODEL OF FISCAL AND MONETARY REGULATION. CASE OF ARMENIA

We took two regression equations as a basis for the coordination model of monetary and fiscal regulation in Armenia. Here, the dynamics of the Dram exchange rate is the dependent variable characterizing monetary regulation, and the dynamics of the GDP growth rate of the Republic of Armenia is the indicator of fiscal policy effectiveness.

The quarterly data from 2004 to the first quarter of 2019 of the following indicators served as the database for the Armenian economic model: exchange rate — AMD/USD, GDP, foreign debt, direct investment, remittances, export and import in absolute terms of the

* The source: Data base of the Central Bank of Armenia. URL: https://www.cba.am (accessed on 20.01.2020).

CPI*. All data adjusted for seasonality. Then we logarithmed the data and calculated the first differences; we checked the data for normality of distribution by the Shapiro-Wilk and Shapiro-Francia tests (see *Appendix, Table 1*).

At the first stage of the study, as was mentioned above, the Consumer Price Index and External Debt were taken for independent variables. The regression analysis helped obtain the following equations:

$$1)\ ExR = const - b_1 * CPI - b_2 * ED\ Equation; \quad (1)$$
$$2)\ GDP = const + c_1 * CPI - c_2 * ED\ Equation. \quad (2)$$

However, the regression analysis revealed that the External Debt in both models is an insignificant variable, since at the significance level of 5%, the hypothesis that the coefficient b_2 is 0 is confirmed with a probability of 25.5% for Equation (1) (see *Appendix, Table 2*), and with a probability of 46.5% for Equation (2) (see *Appendix, Table 3*). For a model with a dependent variable Exchange Rate of Dram at the significance level of 5%, the CPI is insignificant with a probability of 92.5%, and for Equation (2), the regressor is significant at the significance level of 10%, with a probability of 8.9%. Thus, it was proved that changes in the External Debt of Armenia do not affect either the country's GDP or the dynamics of the national currency, and with the probability higher than 90%, inflation does not affect the country's exchange rate.

In this regard, the independent variables were changed to Private Cash Transfers and Direct Investments.

$$1)\ ExR = const + b1 * Trans - b2 * D.\ Inv\ Equation; \quad (3)$$
$$2)\ GDP = const + c1 * Trans + c2 * D.\ Inv\ Equation. \quad (4)$$

The new model revealed that Direct Investment with a probability of 46.6% for the first (Equation 3) (see *Appendix, Table 4*) and with that of 26.7% for the second regression is an insignificant regressor, and Transfers is an insignificant factor in Equation 4 (see *Appendix, Table 5*).

At the next stage, we carried out another regression analysis, including the following independent variables: External Debt, CPI, Direct Investment, Transfers, Exports, and Imports (see *Appendix, Tables 6 and 7*).

We compared both models with the main indicators of fiscal and monetary policies at the significance level of 10%. As a result, no indicators were identified that would have an impact on both monetary regulation indicators and fiscal policy indicators in Armenia.

CONCLUSIONS

The analysis carried out in this work allowed us to formulate the following main conclusions:

Considering the growth indicators of the Armenian economy, as well as the per capita income, it is possible to question the effectiveness of the implementation of both fiscal and monetary policies in the country. At the same time, the analysis shows that the results of both fiscal and monetary policies negatively affect the rate of economic growth. In particular, high public debt, as well as the structure of revenues and expenditures of the state budget, have been a significant factor in slowing down the economy for at least the last ten years. On the other hand, tight monetary regulation, which restrains the growth of money supply in the last ten years, also negatively affects the achievement of sustainable and long-term rates of economic growth.

On the example of Armenia, the coordination model of monetary and fiscal policies showed no dependence between all the considered factors. This, in turn, indicates non-market regulatory mechanisms present both in fiscal regulation and the Central Bank's policy, and on the other hand, indicates the lack of coordination between the two regulators of the economy at present. Summarizing the model analysis results, the following can be noted: changes in external debt, inflation, and foreign direct investment flows do not affect the exchange rate volatility of the dram, but the volume of transfers to the country affects it. In addition, neither external debt, nor inflation, foreign direct investment, nor transfers affect the country's GDP growth rate. Analysis of coordination of monetary and fiscal regulation in Armenia showed that at this stage, policies are unbalanced, which means they cannot contribute to sustainable economic growth in the near future.

The conclusion is that a need was proved to review the implementation of monetary and fiscal policies in Armenia in terms of both relevance and the allocation of the key and common objective to achieve sustainable economic growth in Armenia in the long term.

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REFERENCES

1. Voskanyan M.A., Sandoyan E.M. Modernization of currency regulation in Armenia in the context of economic crises of 2008–2009 and 2014–2015. Yerevan: Russian-Armenian University; 2017. 152 p. URL: http://science.rau.am/uploads/blocks/0/6/695/files/Monografiya.pdf (In Russ.).
2. Kirsanova T., Stehn S.J., Vines D. The interaction between fiscal policy and monetary policy. *Oxford Review of Economic Policy*. 2005;21(4):532–564. DOI: 10.1093/oxrep/gri031
3. Laurens B., de la Piedra E.G. Coordination of monetary and fiscal policy. IMF Working Paper. 1998;(25). URL: https://www.imf.org/external/pubs/ft/wp/wp9825.pdf (accessed on 15.09.2019).
4. Sargent T.J., Wallace N. Some unpleasant monetarist arithmetic. *Federal Reserve Bank of Minneapolis Quarterly Review*. 1981;5(3):1–17. URL: https://www.minneapolisfed.org/research/qr/qr531.pdf (accessed on 20.12.2019).
5. Catão L., Terrones M.E. Fiscal deficits and inflation. IMF Working Paper. 2003;(65). URL: https://www.imf.org/external/pubs/ft/wp/2003/wp0365.pdf
6. Wagner H. Implications of globalization for monetary policy. IMF Working Paper. 2001;(184). URL: https://www.elibrary.imf.org/view/IMF001/03448–9781451859362/03448–9781451859362/03448–9781451859362_A001.xml?redirect=true
7. Wildasin D. Factor mobility and fiscal policy in the EU: Policy issues and analytical approaches. *Economic Policy*. 2000;15(31):338–378. DOI: 10.1111/1468–0327.00064
8. Cecchetti S. The new economy and the challenges for macroeconomic policy. NBER Working Paper. 2002;(8935). URL: https://www.nber.org/papers/w8935.pdf
9. Issing O. The role of fiscal and monetary policies in the stabilisation of the economic cycle. Speech in Mexico City, November 14, 2005. URL: https://www.ecb.europa.eu/press/key/date/2005/html/sp051114.en.html (accessed on 18.12.2019).
10. Bhattarai S., Lee J.W., Park W.Y. Monetary-fiscal policy interactions and indeterminacy in postwar US data. *American Economic Review*. 2012;102(3):173–178. DOI: 10.1257/aer.102.3.173
11. Davig T., Leeper E.M. Monetary fiscal policy interactions and fiscal stimulus. *European Economic Review*. 2011;55(2):211–227. DOI: 10.1016/j.euroecorev.2010.04.004
12. Beddies C.H. Selected issues concerning monetary policy and institutional design for central banks: A review of theories. IMF Working Paper. 2000;(140). URL: https://www.imf.org/external/pubs/ft/wp/2000/wp00140.pdf (accessed on 18.12.2019).
13. Blinder A.S. Issues in the coordination of monetary and fiscal policy. NBER Working Paper. 1982;(982). URL: https://www.nber.org/papers/w0982.pdf
14. Cournot A. Recherches sur les principes mathématiques de la théorie des richesses. Paris: Chez L. Hachette; 1838. 198 p.
15. Scherer F. Heinrich von Stackelberg's Marktform und Gleichgewicht. *Journal of Economic Studies*. 1996;23(5/6):58–70. DOI: 10.1108/EUM0000000004272
16. Woroniecka-Leciejewicz I. Equilibrium strategies in a fiscal-monetary game. A simulation analysis. *Operations Research and Decisions*. 2015;(2):75–100. DOI: 10.5277/ord150205
17. Jazbec B., Banerjee B., eds. Rethinking monetary-fiscal policy coordination: Proceedings of a seminar jointly organized by the Bank of Slovenia and the International Monetary Fund. Ljubljana: Bank of Slovenia; 2017. 161 p. URL: https://bankaslovenije.blob.core.windows.net/publication-files/gdgetvYjjjfi_rethinking_monetary-fiscal_policy_coordination.pdf

18. Demid E. Fiscal and monetary policy: Coordination or conflict? *International Economic Journal*. 2018;32(4):547–571. DOI: 10.1080/10168737.2018.1534133
19. Gros D. Does a single monetary policy need a single fiscal counterpart? Policy Department for Economic, Scientific and Quality of Life Policies, Directorate-General for Internal Policies. Brussels: European Union; 2018. 17 p. URL: http://www.europarl.europa.eu/RegData/etudes/IDAN/2018/626095/IPOL_IDA(2018)626095_EN.pdf
20. Caballero R.J., Farhi E., Gourinchas P.-O. The safe assets shortage conundrum. *Journal of Economic Perspectives*. 2017;31(3):29–46. DOI: 10.1257/jep.31.3.29
21. Bernanke B.S. Monetary policy in a new era. Brookings Institution. 2017. URL: https://www.brookings.edu/research/monetary-policy-in-a-new-era/
22. Ramey V.R. Ten years after the financial crisis: What have we learned from the renaissance in fiscal research? *Journal of Economic Perspectives*. 2019;33(2):89–114. DOI: 10.1257/jep.33.2.89
23. Voskanyan M.A. Problems and prospects of monetary and currency regulation in Armenia. Yerevan: Russian-Armenian University; 2016. 242 p. (In Russ.).
24. Voskanyan M.A., Galstyan A.G. The trap of inflation targeting and its impact on economic growth: The case of Armenia. *Upravlenets = The Manager*. 2017;(5):72–88. (In Russ.).

APPENDIX

Table 1

Shapiro-Wilk and Shapiro-Francia tests for normality of data

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
exr	60	0.96807	1.736	1.189	0.11728
gdp	60	0.98244	0.954	-0.101	0.54018
ed	60	0.96953	1.656	1.087	0.13847
cpi	60	0.98629	0.745	-0.634	0.73691
di	60	0.97274	1.482	0.848	0.19827
exp	60	0.98260	0.946	-0.120	0.54760
imp	60	0.98578	0.773	-0.555	0.71057
trans	60	0.96632	1.831	1.303	0.09624

Shapiro-Francia W' test for normal data

Variable	Obs	W'	V'	z	Prob>z
exr	60	0.96284	2.236	1.539	0.06194
gdp	60	0.98195	1.086	0.157	0.43750
ed	60	0.97711	1.377	0.612	0.27032
cpi	60	0.99114	0.533	-1.202	0.88540
di	60	0.96646	2.018	1.342	0.08972
exp	60	0.98008	1.199	0.346	0.36453
imp	60	0.98725	0.767	-0.507	0.69389
trans	60	0.96223	2.273	1.570	0.05821

Table 2

Equation 1

```
. reg exr cpi ed
```

Source	SS	df	MS	Number of obs	=	60
				F(2, 57)	=	0.74
Model	.001638075	2	.000819037	Prob > F	=	0.4835
Residual	.063429626	57	.0011128	R-squared	=	0.0252
				Adj R-squared	=	-0.0090
Total	.065067701	59	.001102842	Root MSE	=	.03336

exr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpi	-.0202973	.2149117	-0.09	0.925	-.4506506	.4100559
ed	-.1611133	.1400409	-1.15	0.255	-.4415404	.1193137
_cons	.0023811	.0060813	0.39	0.697	-.0097964	.0145587

Table 3

Equation 2

```
. reg gdp cpi ed
```

Source	SS	df	MS	Number of obs	=	60
				F(2, 57)	=	1.55
Model	.022701338	2	.011350669	Prob > F	=	0.2211
Residual	.41741537	57	.007323077	R-squared	=	0.0516
				Adj R-squared	=	0.0183
Total	.440116709	59	.007459605	Root MSE	=	.08557

gdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpi	.9539452	.5513129	1.73	0.089	-.1500399	2.05793
ed	-.2643653	.3592469	-0.74	0.465	-.9837449	.4550142
_cons	.0341137	.0156003	2.19	0.033	.0028746	.0653528

Table 4

Equation 3

```
. reg exr trans di
```

Source	SS	df	MS	Number of obs	=	60
				F(2, 57)	=	3.19
Model	.006550646	2	.003275323	Prob > F	=	0.0486
Residual	.058517055	57	.001026615	R-squared	=	0.1007
				Adj R-squared	=	0.0691
Total	.065067701	59	.001102842	Root MSE	=	.03204

exr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
trans	-.0259843	.0106029	-2.45	0.017	-.0472162	-.0047525
di	-.0038367	.0052241	-0.73	0.466	-.0142979	.0066245
_cons	-.0017687	.0041468	-0.43	0.671	-.0100726	.0065352

Table 5

Equation 4

```
. reg gdp trans di
```

Source	SS	df	MS	Number of obs	=	60
				F(2, 57)	=	2.09
Model	.030102077	2	.015051039	Prob > F	=	0.1328
Residual	.410014631	57	.007193239	R-squared	=	0.0684
				Adj R-squared	=	0.0357
Total	.440116709	59	.007459605	Root MSE	=	.08481

gdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
trans	-.0463965	.028066	-1.65	0.104	-.1025978	.0098048
di	.015496	.0138285	1.12	0.267	-.0121951	.043187
_cons	.0257304	.0109768	2.34	0.023	.0037497	.0477111

Table 6

Equation 5

```
. reg exr ed cpi di trans exp imp
```

Source	SS	df	MS	Number of obs	=	60
				F(6, 53)	=	1.30
Model	.008329317	6	.001388219	Prob > F	=	0.2748
Residual	.056738384	53	.001070536	R-squared	=	0.1280
				Adj R-squared	=	0.0293
Total	.065067701	59	.001102842	Root MSE	=	.03272

exr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ed	-.1409364	.1389253	-1.01	0.315	-.4195854	.1377125
cpi	-.0148495	.2153626	-0.07	0.945	-.4468122	.4171133
di	-.0054163	.0056413	-0.96	0.341	-.0167313	.0058986
trans	-.0239945	.0111017	-2.16	0.035	-.0462618	-.0017273
exp	.0320741	.0549892	0.58	0.562	-.0782202	.1423685
imp	-.0431319	.0661985	-0.65	0.518	-.1759094	.0896455
_cons	.002615	.0062641	0.42	0.678	-.0099491	.0151791

Table 7

Equation 6

```
. reg gdp ed cpi di trans exp imp
```

Source	SS	df	MS	Number of obs	=	60
				F(6, 53)	=	3.05
Model	.112979393	6	.018829899	Prob > F	=	0.0123
Residual	.327137316	53	.006172402	R-squared	=	0.2567
				Adj R-squared	=	0.1726
Total	.440116709	59	.007459605	Root MSE	=	.07856

gdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ed	-.0999741	.3335861	-0.30	0.766	-.7690632	.569115
cpi	.713522	.5171267	1.38	0.173	-.3237027	1.750747
di	.0026343	.0135458	0.19	0.847	-.0245351	.0298036
trans	-.0333936	.0266574	-1.25	0.216	-.0868615	.0200744
exp	.4058788	.1320395	3.07	0.003	.141041	.6707165
imp	-.2564307	.1589553	-1.61	0.113	-.5752546	.0623933
_cons	.0251164	.0150412	1.67	0.101	-.0050524	.0552852

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