

Research on the Long-Term Correlation between Financial, Economic Growth and Macroeconomic Stability in Developing Countries

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Abstract: *The paper is devoted to assessing the non-linear forms of links between the indicators of the depth of development of the financial sector, on the one hand, and the rate of economic growth and macroeconomic stability at the level of national economies, on the other hand. As indicators of financial depth, the following were used: the domestic credit market, the domestic market for corporate bonds and the market for external corporate borrowings. The results of calculations show that the influence of the depth of each of the three segments of the financial sector on growth can be described by an inverted U-shape, and their influence on the growth volatility can be described by a straight U-shape. This made it possible to identify the trajectories of the movement of countries in the coordinates "growth - stability of growth" while deepening each of the three segments of the financial sector. The optimum depth of the considered segments of the financial market was characterized, characterized by the achievement of the maximum rates of economic growth and their minimum volatility.*

Keywords: non-linear, development, economic growth

1. Introduction

Is there an optimal depth of development for the financial sector, ensuring the achievement of maximum rates of economic growth and contributing to maintaining macroeconomic stability? On the one hand, a more developed financial inter-mediation sector is able to more effectively transform savings into investments (Goldsmith, 1969), redistribute risks between economic agents (Levine, 2005), ensure the exchange of economic information and thus stimulate economic growth (King, Levine, 1993 ; Beck et al., 2000; Levine et al., 2000). However, on the other hand, as the experience of the global crisis of 2007–2009 showed, an excessive (significantly faster development of the real sector of the economy) increase in the depth of the financial sector can also be fraught with certain dangers: the formation of "bubbles", the systematic underestimation of risks, the increasing fragility of the financial system and its vulnerability to shocks¹. The resulting financial instability has a negative impact on economic activity.

In recent years, many empirical evidence has been obtained for the non-linear effect of financial development on economic growth (see Arcand et al., 2015; Law, Singh, 2014; Cecchetti, Kharroubi, 2012; Sahay et al., 2015, etc.). For example, according to various studies, the threshold level of the ratio of credit to the private sector to GDP, after which negative macroeconomic effects are realized, is in the range of 80–100%.

Continuing to study the nonlinear impact of financial development on macroeconomic dynamics, we applied the methodology developed by other authors not to one but to several segments of the financial system at the same time. We examined three segments of the private sector debt market: the domestic market for bank credit, the domestic market for corporate bonds, and the external corporate debt

market². Based on econometric models on panel data for 63 countries over five-year periods from 1980 to 2014, we estimated the threshold levels of these segments of the financial market, after reaching which their further expansion will negatively affect key macroeconomic indicators. In the number of optimized macroeconomic indicators along with long-term rates GDP growth was considered an indicator of the volatility of these rates, as in the work of Beck et al. (2014) and Sahay et al. (2015). In contrast to these two works, we are interested in the trajectory of development of national economies in the coordinates "economic growth - growth volatility" while deepening each of the three identified segments of the financial market. This allows us to estimate the optimal depth parameters of each of the segments (given the relative preferences of the regulator), at which a reasonable compromise is achieved between the goals of increasing economic growth and ensuring its stability.

The work is structured as follows. Section 2 analysis of the relationship between finance, growth, and macroeconomic volatility. In Section 3 reveals the design of the empirical part of the study. The cross-country data used and their formats are described in Section 4. Regression results and their discussion are contained in Section 5. The Conclusion interprets the findings of the study.

2. Analysis of the relationship between finance, growth, and macroeconomic volatility

Bank loans to the private sector: Not all types of loans can contribute to economic growth. In the work of Beck et al. (2012) the author, comparing the effects of the development of various segments of the credit market for economic growth, comes to the conclusion that an increase in enterprise lending has a positive effect on the development of the economy, since corporate loans are used to finance

investment in production own assets. At the same time, the development of retail lending (primarily mortgage) often leads to the formation of speculative financial “bubbles”, thereby adversely affecting economic growth rates.

Domestic Corporate Bonds: In the work of Abbas and Christensen (2007), the authors, assessing the relationship between economic growth and the development of domestic corporate bond markets on a sample of 93 developing countries over a 30-year period (1975–2004), conclude that it is statistically insignificant. In an article by Thumrongvit et al. (2013) based on the analysis of information provided for 38 developed and developing countries from 1989 to 2010, it was revealed that the nature of the impact of the bond market on economic growth changes from negative to positive as the scale of the domestic financial system increases and its structure diversifies.

External corporate debt: In the work of Choong et al. (2010) the authors make the following conclusion: the growth in private foreign debt, in contrast to the inflow of foreign direct investment, has a negative impact on economic growth - since external debt, as a rule, is short-term and speculative, respectively, it creates risks of macroeconomic instability. However, the presence of a highly developed stock market allows the economy to benefit from both the

influx of speculative foreign capital and long-term foreign investment.

3. Empirical Research

Questions that we want to get answers on the results of empirical analysis can be formulated as follows:

- 1) How does the depth of the financial sector affect (1) economic growth and (2) macroeconomic instability (volatility of economic growth rates)? 2. If the influence is non-linear, then what is its shape and how do the points at which optimum values for (1) growth and (2) instability are correlated?
- 2) What is the trajectory of the movement of countries in the plane (1) - (2) while deepening the financial sector? What is the optimal depth of the financial sector, in which the maximum growth and minimum volatility is reached?
- 3) What is the distance of one country to this optimum point of the depth of the financial sector? What is the distance of the other group countries? To answer these questions, we use standard regression equations used in nonlinear relationships between finance and growth (Arcand et al., 2015; Sahay et al., 2015; etc.) In particular, the type of regression for growth (k=1) and growth volatility (k=2):

$$Y_{k,it} = \alpha_{k,i} + \beta_{k,1} \times FD_{j,it} + \beta_{k,2} * FD_{j,it}^2 + \sum_{m=1}^M Y_{k,m} \times controls_{m,it} + \varepsilon_{k,it} \text{ Or:}$$

Linear mixed model

$$Y_{it} = \alpha_1 + \beta_1 X_{1,it} + \dots + \beta_k X_k + \varepsilon_{it} \beta = \begin{pmatrix} \beta_1 \\ \vdots \\ \beta_k \end{pmatrix} X = \begin{pmatrix} X_1 \\ \vdots \\ X_k \end{pmatrix}$$

Where for a country i (i= 63, countries with an income not lower than the average) over a 5 year period t(t=1980-1984, 2014-2018

$FD_{j,it}$ (Financial Development) j-financial development indicator (% of GDP):

1. Loans to the private sector (j=1);
2. Domestic corporate bonds (j=2);
3. External corporate debt (j=3);

$Controls_{m,it}$ groups of control factors reflecting macroeconomic, financial, institutional, demographic development, and others (from the review by Durlauf et al., 2005);

$\alpha_{k,i}$ fixed effects reflecting time-constant inter-country differences in growth dynamics (k=1) and its volatility (k=2)

$\varepsilon_{k,it}$ regression error.

To estimate the parameters of the regression equations (1), a two-step generalized method of moments (2-Step GMM, Generalized Method of Moments) was used to solve the problem of endogenous. The first lags of explanatory variables and (optionally) current and lagged values of institutional and demographic variables were used as instrumental variables.

4. Cross-country data and its formats

This work is based on a sample of 63 developed and developing countries (with a level of development not lower than the average), which includes countries that are exporters of raw materials. In general, the sample included only those countries for which the share of missing values in the context of all indicators did not exceed 5%.

Table 1: Descriptive statistics for a sample of 63 countries

Variable	Num. observations	The average value	Standart reject	Min	Max
Dependent variables (macroeconomic)					
GDP growth rate,%	409	3.2	2.8	-12.3	11.5
Volatility of GDP growth rates,%	409	2.8	2.1	0.3	12.7
Explaining Variables					
Panel 1: Macroeconomic Variables					
GDP per capita, USD	410	13658.3	14776.5	214.3	83183.5
Inflation %	412	43.3	218.2	-2.3	23813.1
The share of government consumption in GDP,%	375	16.8	4.9	4.5	38.7
Resource rent / GDP,%	402	3.4	5.8	0.001	47.3
The share of fuel exports in the export of goods,%	409	12.1	19.6	0.001	97.8
Exchange rate volatility,%	384	94.8	462.3	0.001	4957.4
Panel 2: Financial Variables					
Credits to the private sector,% of GDP	391	62.5	41.4	2.9	235.1
The volume of domestic corporate bonds,% of GDP	210	27.7	29.3	0.1	173.7
External corporate debt,% of GDP	149	9.4	11.9	0.04	73.5
Net FDI,% of GDP	399	3.3	4.6	-3.2	40.4
Capitalization of the stock market,% of GDP	367	52.6	82.0	0.01	1042.6
Stock market volatility,%	300	23.4	12.5	5.0	104.1
Panel 3: Demographic Variables					
Population growth rate,%	441	0.9	1.0	-1.5	3.7
Coefficient dem. loads (elderly)	441	15.8	7.0	5.1	38.9
Coefficient dem. loads (young)	441	39.0	16.3	15.9	86.6
Percentage of people (25+) with secondary or higher education,%	427	10.3	6.7	0.2	34.8
Mortality rate, per 1 thousand people	441	8.8	2.8	4.0	18.8
Panel 4: Institutional Variables					
Index of economic freedom	395	6.6	1.3	2.5	9.1
Court Independence Index	231	5.9	2.3	0.4	9.8
Index of the legal system and protection of property rights	395	6.3	1.7	2.2	9.3
Government consumption index	407	5.6	1.9	0.5	9.9
Private equity index in banks	359	7.3	2.6	2	10

The table presents the results of model estimation for two dependent variables: the average for five years annual rates of GDP growth and the average for five years volatility of annual rates of GDP growth. For each dependent variable, two model specifications are presented (base and extended). In the extended specification, in addition to the main financial and macroeconomic variables, additional factors, including institutional and demographic factors, are taken into account.

4. Results of the Regression Analysis

On the basis of the sample obtained, a set of regression type equations was described, describing the effect of three different segments of the financial sector on the rates of economic growth and on their volatility. The table presents

the results of model estimation for two dependent variables: the average for five years annual rates of GDP growth and the average for five years volatility of annual rates of GDP growth. For each dependent variable, two model specifications are presented (base and extended). In the extended specification, in addition to the main financial and macroeconomic variables, additional factors, including institutional and demographic factors, are taken into account.

The first segment of the financial sector: the domestic credit market

The results of a search for non-linear effects of the impact of the depth of the domestic credit market on economic growth and on macroeconomic stability are presented below

Table 2: The impact of the depth of the credit market on GDP growth rates and the volatility of GDP growth rates: an estimate of cross-country data

	Growth rates GDP		Volatility in GDP growth	
	I	II	III	IV
	Basic	Extended	Basic	Extended
1. Financial variables				
Bank loans to the private sector / GDP in log.,%	17.155*(9.548)	17.355*(9.612)		
Bank loans to the private sector / GDP (square) in log.,%	-1.975*(1.081)	-1.945*(1.088)		
Bank loans to the private sector / GDP,%			-0.108**(0.047)	-0.126**(0.060)
Bank loans to the private sector / GDP (square),%			0.0004*(0.0002)	0.001*(0.000)
2. Macroeconomic variables				
Inflation (CPI, log.),%	-0.826***	-0.560*(0.324)		
GDP per capita (lag = 1) in the log., USD	-2.095***(0.483)	-2.748***(0.575)		
GDP per capita, thous.			0.27(0.028)	-0.031(0.060)
Resource rents / GDP (lag = 1) in log.,%		-0.162(0.223)		

Exchange rate volatility, units nat shaft. per USD			0.009(0.006)	0.006*(0.004)
Fuel export / GDP,%				0.058**(0.026)
3. Demographic variables				
Population growth rate,%	0.390(0.351)			
Coefficient dem. load (children) in the log.	-3.5788***(1.423)			
Coefficient dem. loads (elderly)				0.209(0.195)
4. Institutional variables				
The number of observations	267	249	277	272
Inflection point	76.875***(15.384)	86.519***(18.547)	121.039***(19.604)	104.443***(16.442)

Notes:

1) The table shows the results of estimating the regression equations for two dependent variables: GDP growth rates and their volatility. For each dependency variable, two model specifications are presented: basic and extended, in which additional factors of economic growth, such as demographic and institutional, are taken into account. All models are estimated using the two-step generalized method of moments (2-Step GMM) with fixed effects (FE, fixed effects) for the period 1980–2014 (averaged over five years). **U-shaped forms of communication and the trajectory of financial development in the coordinates of "economic growth - macroeconomic stability." BRIC countries comparison.** Below are graphs of estimated U-shaped dependencies of GDP growth rates and the volatility of GDP growth rates on the level of financial development. In addition, the set of points in the coordinates "GDP growth rates - volatility of GDP growth rates" are presented at different levels of financial depth (Figures 1, 2, 3).

Volatility of GDP growth rates, p.p. (on average over 5 years)

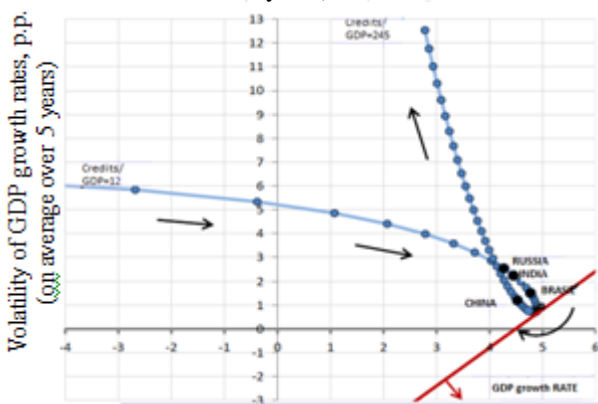


Figure 1: The relationship of GDP growth rates and the volatility of GDP growth rates at different levels of the depth of the credit market

As follows from the constructed trajectories, in the depth of the domestic market of bank credit to the private sector, other BRIC countries are superior to Russia. At the same time, India and Brazil have not yet reached the optimum point, but they are closer to it than Russia, and China has already "skipped" this point.

Volatility of GDP growth rates, p.p. (on average over 5 years)

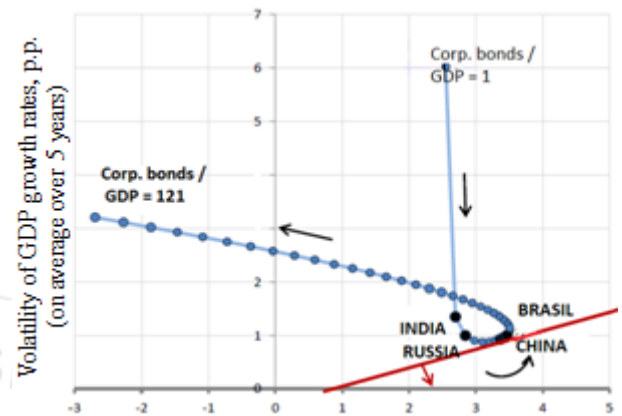


Figure 2: Interrelation of GDP growth rates and volatility of GDP growth rates at various depth levels of the domestic debt market

Among the BRIC countries, India is lower than Russia in the depth of development of the domestic corporate bond market. Brazil and China are ahead of Russia and at the same time they are near the optimal level.

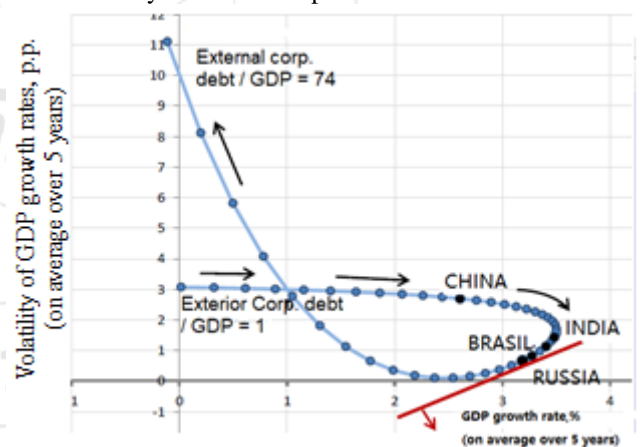


Figure 3: The relationship between GDP growth rates and the volatility of GDP growth rates at various levels of external corporate debt

As for the relation of external private debt to GDP, by this indicator Russia is higher than other BRIC countries and is the closest to the optimum point.

5. Conclusion

This paper is devoted to the search for non-linear forms of connection between indicators of the depth of development of the financial sector, on the one hand, and economic growth rates and macroeconomic stability at the level of national economies, on the other hand. The search for thresholds and the assessment of the trajectories of the movement of national economies in the coordinates

“growth - stability of growth” while deepening the financial sector can be useful in terms of building an optimal economic policy. Three segments of the financial sector were considered as indicators of financial depth: the domestic credit market, the domestic market for corporate bonds and the market for external corporate borrowings. These indicators were tested for the presence of quadratic effects on growth and growth volatility in standard regression equations on panel data collected from the World Bank, IMF, Fraser Institute and Bankscope databases for the period 1980–2018 averaged over five years. Only economies with a welfare level no lower than the world average (all 63 countries) were included in the sample.

The results of the calculations indicate that the influence of the depth of each of the three segments of the financial sector on growth can be described by an inverted U-shape, and their influence on the growth volatility can be described by a straight U-shape. This made it possible to reveal nontrivial trajectories of the movement of countries in the coordinates “growth - stability of growth” while deepening each of the three segments of the financial sector. For each segment, these trajectories depend on the ratio of optimum points in the growth model and in the growth volatility model. In models with a credit market and with an external corporate debt market, the optimum points on growth are lower than the optimum points on growth volatility; and in models with a domestic corporate bond market - the opposite. As a result, in the first case, with the deepening of both segments of the market, first (up to the first point of the optimum), there is an increase in growth rates and a reduction in the volatility of these rates; then (from the first to the second point of the optimum) growth begins to slow down, but its volatility continues to decrease and, finally (after the second point of the optimum), the least favorable period occurs, in which the growth rate and increase in their volatility occur simultaneously. In the second case, the difference is only in the intermediate position (from the first to the second point of the optimum): instead of reducing the growth rates of the economy and reducing their volatility, the growth persists, and the reduction of volatility does not. Thus, for each segment of the financial market (assuming that the weights for each of the two goals are $\frac{1}{2}$), its optimal depth was estimated - it is between the first and second points of the optimum. In private FINANCIAL SECTOR, ECONOMIC GROWTH AND MACROECONOMIC STABILITY Economic Research Reports Series

For the credit market, it amounted to 96% of GDP, for the corporate bond market — 22% of GDP, and for the market for external corporate borrowings — 15% of GDP.

As an empirical exercise on the constructed trajectories, points corresponding to the BRIC countries were noted. The results show that, among the BRIC countries, Russia is characterized by the smallest depth of the domestic market for bank loans to the private sector. At the same time, India and Brazil have not yet reached the optimum point (96%), but they are closer to it than Russia, and China has already “skipped” this point. Further, India is lower than Russia in the depth of development of the domestic corporate bond market. Brazil and China are ahead of Russia and at the same time are near the optimal level (22%). As for the

relation of external corporate debt to GDP, by this indicator Russia is higher than other BRIC countries and is the closest to the optimum point (15%).

In conclusion, an assessment was made of the economic effects of the development of the three studied segments of the financial market in Russia in the long term. The results show that structural changes in the financial sector can increase the long-term potential for economic growth and its sustainability in Russia. In the long term (until 2035), Russia has the possibility of approaching the optimal combination of financial market parameters. First, the greatest positive macroeconomic effect is expected from the expansion of the segment of domestic corporate bonds; The effect is achievable in the long term. Secondly, a tangible positive macroeconomic effect is also expected from the expansion of the segment of domestic loans to the private sector; but this effect is not achievable in the long term (until 2035). Third, a near-zero macroeconomic effect is expected from the expansion of the external corporate debt segment (as it is located near the optimal point); in the long run, it is possible to go beyond the optimum, and therefore a restrictive policy is needed on the part of the regulator.

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