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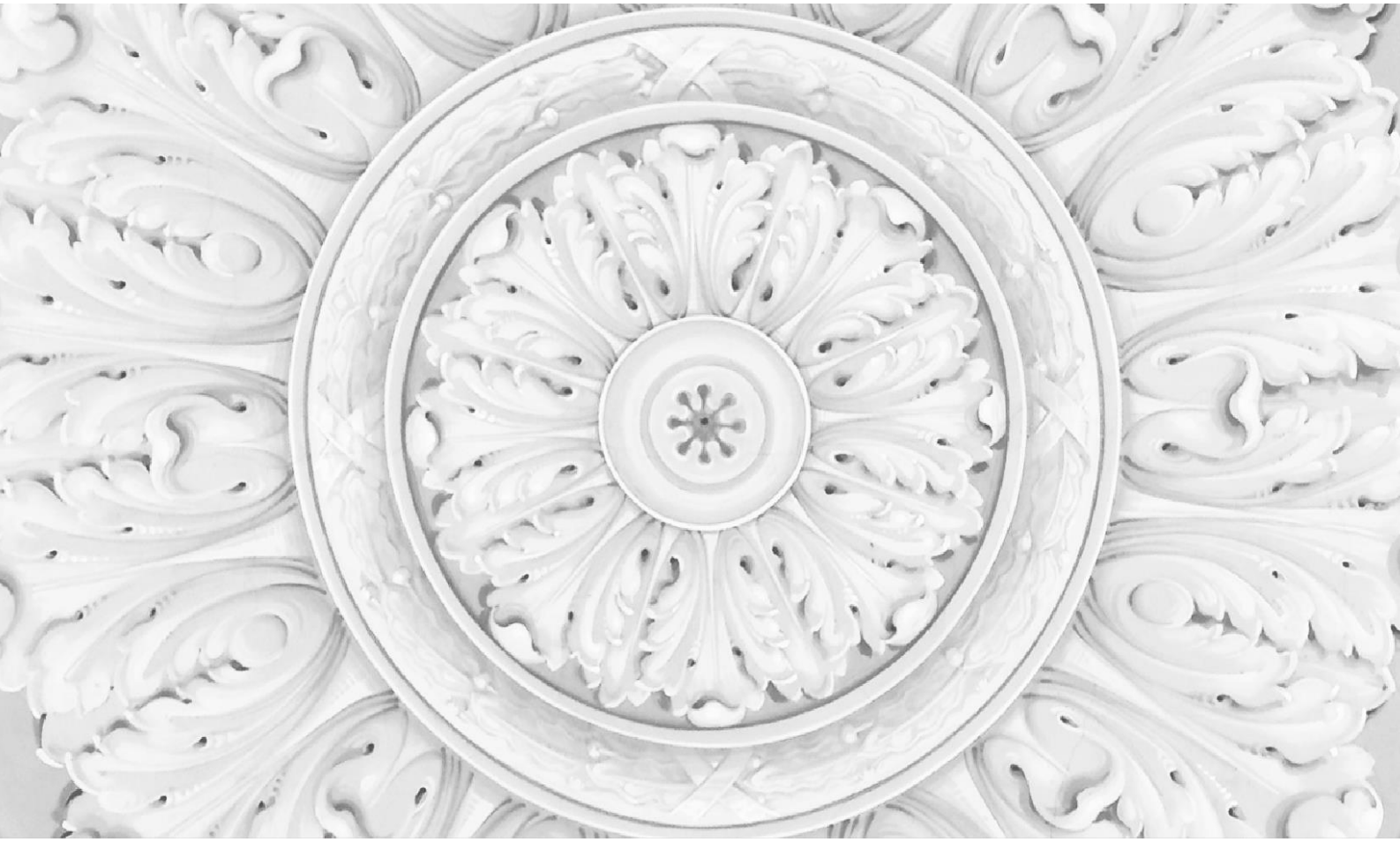

WORKING PAPER SERIES

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Long-term forecasting of the size and structure of the Russian financial sector

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Abstract

This paper attempts to provide a long-term forecast of the size and structure of the financial sector in Russia. For this purpose, the approach of constructing empirical models using the 2-Stage Least Squares Bayesian Model Averaging (2SLS-BMA algorithm) was used on cross-country comparable data. The authors created a database for the period covering 1980–2015 across 63 countries, including Russia. For long-term forecasting of the characteristics of Russian financial sector (up to 2035), the authors developed a set of three economic scenarios (target, pessimistic, and institutional inertia). It was established that in all scenarios (even the pessimistic one) the expansion of supply of all key financial instruments in the domestic market is expected at rates that outperform the growth of the domestic economy to a greater or lesser extent (with the exception of private loans in the pessimistic scenario). The fastest growth may be expected from non-bank financial institutions and non-credit financial instruments. The latter will be driven by an increasing level of wealth and the achievement of greater price stability (compared with the current situation). The structure of financial instruments will see positive changes, such as de-dollarization and longer tenors.

Keywords: financial sector depth, financial sector structure, model uncertainty, long-term forecasting, Russia

JEL classification: G17

CONTENTS

INTRODUCTION

The Russian financial sector is relatively young, with less than 30 years of history, a decade of which coincided with the turbulent period of the transition from a planned system to a market economy. This substantially limits the methods of forecasting the sector's development. While a short- or medium-term forecast (up to three years) could be confined to building empirical models of a given financial sector segment based on time series related only to Russia, this approach is not applicable to long-term forecasting (15–20 years or more). The reason is that a model based on the Russian data will account for only Russia's experience, which is too limited. And since a long-term forecast period is comparable to the entire history of the development of the Russian financial sector, it gives rise to a significant uncertainty as to what direction it will take and how long this process will last. Furthermore, several authoritative foreign studies show that a long-term development path depends substantially on qualitative changes in demographic, institutional, and other spheres (Japelli, Pagano, 1992; Demirgüç–Kunt, Maksimovic, 1996; La Porta, Lopez-De-Silanes, Shleifer, 2006; Djankov, McLiesh, Shleifer, 2007; Allen et al., 2017; et al.) that usually do not happen instantaneously. Therefore, the long-term forecasting of the Russian financial sector at this stage of the research was performed using empirical models built on comparable data across countries, including developed and emerging markets, in particular, Russia, and country clustering outcomes obtained by Solntsev et al. (2017)[1].

At this stage the objectives of this research may be defined as follows:

1) To determine the role of various drivers of the size and structure of the financial sector. This requires building econometric models based on cross-country (panel) comparable data, including those related to Russia, taking the institutional and demographic growth data and microeconomic and financial indicators as explanatory variables.
2) For each constructed model describing the size and structure of the financial sector, to analyse to what extent the model evaluated based on the panel data explains the current state of the Russian financial sector.
3) To develop long-term forecasts of the development of the Russian financial sector (up to 2035) based on model outcomes and the quality of the explanation of Russian data depending on the most probable scenarios of key factor (including institutional and demographic factors) dynamics.

The following indicators of financial sector *size* were reviewed (% of GDP):

1) Private loans;
2) Stock market capitalisation;
3) Independent pension fund assets;

[1] Four clusters of countries were identified: 'autonomous', which includes Russia; 'overheated leaders'; 'well-balanced leaders'; and 'junior partners'.

4) Gross profit of the non-financial sector;
5) Domestic corporate bonds;
6) External corporate debt;
7) Gross foreign portfolio equity investment;
8) Insurance sector assets;
9) Life insurance (premiums);
10) Non-life insurance (premiums);
11) Mutual fund assets (equity funds);
12) Factoring;
13) Financial sector contribution to GDP.

The following indicators of financial sector *structure* were reviewed:

1) The ratio of long- and short-term liabilities of the banking system;
2) Price competition in the banking system (the Lerner index, which reflects the pricing monopoly markup on banking services);
3) The banking system concentration ratio (the share of the assets of the top 3 banks in the aggregate assets of the banking system, CR_3);
4) Dollarisation of banking system loans;
5) Dollarisation of banking system liabilities;
6) The share of foreign banks' assets in aggregate banking system assets;
7) The cost-to-income ratio of the banking system.

Regression equations based on panel data, including Russia, were built for each of 13 size variables and 7 structure variables (see Section 3 for further methodology details) for quite a long period, from 1980 to 2015 (the latest available point in the cross-country databases of the World Bank, IMF, etc., Section 4). In each such equation, four groups of factors were tested: institutional, demographic, macroeconomic, and financial. The factors were selected based on the review of literature related to the relevant segments of developed and emerging financial markets (Section 2).

1. Literature review

In this section we give some description of the main papers covering the research of different financial market segments (Table 1). The analysis of existing sources allowed us to identify the key determinants in cross-country research of the depth and structure of the financial sector.

Table 1. Key works related to modelling the size and structure of the financial sector

Dependent variable	Source references
Panel 1: financial sector depth indicators	
Loans, % GDP	Japelli & Pagano (2002 JBF), Djankov, McLiesh & Shleifer (2007 JFE), Allen et al. (2017 JCF)
Stock market capitalisation, % GDP	Demirgüç–Kunt & Maksimovic (1996 WB Economic Review), La Porta, Lopez-De-Silanes & Shleifer (2006 JoF), Narayan, Mishra, Narayan (2011 JBF), Pradhan, Arvin, Hall, & Bahmani (2014 RFE), Alda (2017 IRFA)
Life insurance premiums, % GDP	Outreville (1996 JRI); Beck, Webb (2003 WB Economic Review); Lee, Chang (IREF 2015)
Non-life insurance premiums, % GDP	Browne, Chung, Frees (2000 JRI); Esho, Kirievsky, Ward, Zurbruegg (2004 JRI)
Mutual funds, % GDP	Khorana et al. (2005 JoFE); Chan et al. (2005 JoF); Ferreira et al. (2013 RoF)
Gross portfolio investment, % GDP	Berkel (2007 JoM); Driessen, Laeven (2007 JBF)
Factoring, % GDP	Mian, Smith (1992 JoF); Fisman, Love (2003 JoF)
External corporate debt, % GDP	Bittencourt (2015 EMFT)
Corporate bonds, % GDP	La Porta, Lopez-De-Silanes, Shleifer, Vishny (1997 JoF)
Financial sector contribution to GDP, %	Bangake, Eggoh (2011 ES); Bhattacharyya, Hodler (2014 WD)
Gross non-financial sector profit, % GDP	Madhou et al. (2015 RoPBFMP); Cherchye, Verriest (2016 IBR)
Panel 2: financial structure depth indicators	
Dollarisation of bank liabilities, %	Ize, Yeyati (2003 JIE); De Nicolo, Honohan, Ize (2005 JBF), Neanidis, Savva (2009 JBF)
Price competition (the Lerner index, % of price) and banking sector concentration	Claessens & Laeven (2004 JMCB), Claessens & Laeven (2005 JEEA), Turk Ariss (2010 JBF), Andrievskaya & Semenova (2016 JFS), Mirzaei & Moore (2014 JIFMIM)
Foreign banks' penetration into the banking sector	Bonin, Hasan, Wachtel (2005 JBF), Yeyati, Micco (2007 JBF), Mian (2006 JoF), Lensink, Meesters, Naaborg (2008 JBF)
Cost-effectiveness in the banking sector	Berger, Hannan (1998 RES), Altunbus, Evans, Molyneux (2001 JMCB), Bonin, Hasan, Wachtel (2005 JBF), Maudos, De Guevara (2007 JBF), Fiordelisi, Marques-Ibanez, Molyneux (2011 JBF)

Credit market depth. In Japelli and Pagano (2002), the effects of the disclosure of borrowers' information through private credit bureaus and government registers on loan market development are investigated. The authors carry out a special survey of credit bureau managers in different countries and find that improved information disclosure has a positive effect on the credit market depth (measured as the average ratio of private bank loans to GDP for 1994–95.) Their cross-country spatial models include such customary predictors as the 1994–94 GDP logarithm, average GDP growth rate in 1970–1993, the rule of law index, the degree of creditor rights protection, and the type of legal system.

In Djankov et al. (2007), cross-country spatial models assessed by average data on 129 countries for 1999–2003 are used to analyse the effect of credit market institutions on market depth. The main conclusion is that while the degree of creditors' rights protection is important for credit development in more developed countries with a common-law system (based on agreements between various groups of individuals), for emerging countries with civil-law systems based on state regulation, the degree of disclosure of information about borrowers (credit bureaus) seems more important.

In Allen et al. (2017), the effect of bank property and different financial crisis types on the lending activity of financial intermediaries are studied based on panel data related to more than 400 banks of the Central and Eastern Europe in 1994–2010. The authors use GDP growth and inflation rates as control macroeconomic variables; the work also includes an extensive pool of controls specific to separate banks: profitability, sustainability, liquidity, bank size, etc. The main conclusion is that the effect of the bank property type on lending dynamics depends on the source of financial instability (domestic or foreign financial crisis).

Stock market capitalisation. In Demirgüç–Kunt & Maksimovic (1996), various relationships between the stock market development level and the financial choices of firms in 30 developing and industrial countries in 1980–1991 were analysed. The authors show that in countries with a developed stock market the further development of the market gives rise to the substitution effect, which means a decrease in equity financing and an increase in debt financing. In countries with an emerging stock market, on the contrary, the effect of risk sharing was observed, meaning that the increased usage of one financing instrument leads to higher usage of the other. While the subsample of developed stock market countries showed a close negative correlation between the depth of the credit and stock markets, in emerging stock markets this correlation was insignificant.

In La Porta, Lopez-De-Silanes & Shleifer (2006), the data on 49 countries was used to show that the stock market development requires more than just self-regulated market mechanisms; it needs legislative work with regard to securitisation and rules for the disclosure of information of market participants. This paper reasons that institutional characteristics are among the most important predictors of the stock market. Similar findings related to the development of the credit market are provided in Djankov, McLiesh & Shleifer (2007).

In Narayan, Mishra, Narayan (2011), the data for 120 countries for 1980–2008 was used to test the idea of convergence relative to the depth of stock market development. The authors review per capita GDP, inflation, interest rate spread, credit market development, foreign trade, foreign direct investment (FDI) inflow, and the level of primary and secondary education as convergence determinants.

In Alda (2017), the relationship between pension fund development and stock market depth in 13 European countries from 1999 to 2014 is tested. The authors consider the share of the population aged 14 to 65 years and the population aged 65 or older, as well as the old dependency ratio as indicators that could influence the relationship between pension funds and the stock market. The paper shows that pension fund growth facilitates the deepening of the stock market in Europe. This positive effect increases with the growth of all three demographic indicators mentioned above. Along with the effect of population ageing, the effect of the youth dependency ratio is also expected to be present. According to Bernanke & Rogoff (2002), households with more children are less willing to take risks in generating their savings.

Life insurance premiums. In Beck, Webb (2003), the influence of factors on demand for life insurance in 68 countries from 1961 to 2000 is discussed. The authors came to the conclusion that life insurance markets are better developed in countries with high income, low inflation, and a well-developed banking sector (which is also true for emerging economies). Institutional development explains some differences in life insurance product consumption in different countries. Furthermore, the authors found that consumers prefer life insurance to other savings options in countries with low inflation and a large share of senior residents. The more savings residents generate, the less the share of life insurance savings becomes.

In Chien-Chiang Lee and Chi-Hung Chang (2015), the impact of new financial reforms on the life insurance market in a sample of 50 countries is researched. The authors failed to discover any significant independent influence of such financial reforms on the insurance market. They found that the economic development level and the structure of the financial sector are important drivers for the life insurance market. Along with the above variables, other important factors include the loosening of control over interest rates as interest rate liberalisation will allow insurers to apply more flexible pricing in line with cyclical changes in the economy. Besides, in accordance with La Porta (1998) and Beck and Levine (2003, 2004), this study found that common law states protect private investor's rights better than civil law states, which is beneficial to financial development in general and the life insurance market in particular.

In Outreville (1996), based on 48 countries, the disposable household income and financial sector maturity were identified as key determinants of the life insurance sector growth. Other important factors include efficiency of government regulation of the market and insurance market competition (monopolistic markets are less mature than competitive ones). The author emphasises that emerging markets must rely on the services of other countries as they face challenges related to the lack of experience.

Non-life insurance premiums. In Browne, Chung and Frees (2000), two insurance sectors, vehicle insurance and general liability insurance, are reviewed. Only OECD member states are included in the sample. As in the studies on life insurance, the authors of this paper conclude that household income and wealth have the greatest impact on insurance growth. The authors considered the share of foreign insurance companies in the domestic market making it possible to approximate insurance service prices as an additional factor that affects the insurance market. It is assumed that higher barriers for foreign companies entering the domestic market lead to higher prices and lower quality of insurance services. Consequently, such factors in total have a negative effect on the insurance market. However, according to the empirical research, such logic applies only to general liability insurance. In contrast, vehicle insurance depends negatively on the share of foreign insurance companies in the domestic market.

Of all insurance market drivers (based on property damage insurance), in Esho, Kirievsky, Ward, and Zurbruegg (2004), institutional factors, in particular, legal and political variables, are highlighted. Property rights protection and independent court judgements decrease transaction costs incurred in insurance contracts. Furthermore, the authors account for the risk aversion of individuals, which is determined by education (it is assumed that well-educated people are better aware of the need to maintain insurance).

Mutual funds and gross portfolio equity investment. In Khorana et al. (2005), based on data related to 56 developed and emerging economies from 1996 to 2001, it was determined that financial awareness of residents is positively correlated to their willingness to invest in innovative financial segments. This paper also showed the defining role of the quality of legal institutions in ensuring the development of the financial markets themselves. Investors are willing to put upin countries that protect their rights; therefore, the institutional environment is important for investor confidence in the fulfilment of contracts and reflects the favourable attitude of the state toward business.

In Ferreira et al. (2013), based on data for 27 developed countries from 1997 to 2007, it is shown that more developed financial markets are characterized by higher liquidity and lower transaction costs. This is important for investors who put up in mutual funds (or portfolio investments) and their development. Traditionally, in the empirical literature the ratio of stock market capitalisation to GDP is used as a proxy variable for financial market development. A similar conclusion was reached in Berkel (2007) based on the study of 38 countries from 1997 to 2001 and in Chan et al. (2005) based on a sample of data on 26 countries from 1999 to 2000.

In Driessen and Laeven (2007), based on data sampling across 52 countries from 1985 to 2002, it was found that high real interest rates in the economy due to low inflation encouraged speculative capital inflow into financial markets and boosted innovative segments of the stock market, including mutual funds and portfolio investments.

Factoring. In Mian and Smith (1992), 600 U.S. companies were studied and it was found that the acceleration of the economic growth rate approximated by the real GDP growth boosted factoring transactions as it is usually accompanied by the development of financial mediation, factoring being one of its forms. Factoring is also boosted by the growth of bank assets as commercial banks are key players in the factoring segment in most countries.

In Fisman and Love (2003), the results of the study of the influence of the institutional environment on factoring services in 43 countries from 1970 to 1998 are described. The authors discovered that higher quality of government regulation of the private sector and adequate protection of property rights help factoring businesses by boosting their potential number of clients and facilitating the collection process if the risk of default by debtors (buyers of goods and services) realizes.

External corporate debt. In Bittencourt (2015), the determinants of external debt in nine countries of South America in 1970–2007 are studied. Explanatory variables include GDP growth rates, inflation rates, trade transparency, the ratio of monetary aggregate to GDP, population size, the share of the public sector in GDP, and other factors. The (negative) GDP growth rate appears to be the most stable factor; therefore, the author concludes that the revival of business in the region prevents the excessive growth of debt burden. The paper failed to identify any stable statistically significant influence of other factors commonly used in the literature (inflation, inequality, and restrictions on company management actions).

Issued corporate bonds. In La Porta et al. (1997), the authors study institutional and legal determinants of different external financing types: debt and equity financing. The key finding of the empirical research is that the legal framework type and the protection of creditors' rights influence the development of financial markets (equity financing models show the most pronounced results). The paper shows that the French type of legal framework restrains the development of debt markets (the amount of banking and bond debt). Furthermore, this type of legal framework provides the worst protection of investor rights, which is unfavourable for the expansion of this financing type. The authors do not consider the corporate bond segment separately in their analysis; however, they include it as part of the debt market (along with bank loans). The key determinants of the amount of debt financing in La Porta et al. (1997) include the GDP growth rate, the GDP logarithm, the rule of law index, the legal framework, and the creditor rights protection level.

Financial sector contribution to GDP. In Bangake and Eggoh (2011), based on a sample of data for 71 countries from 1960 to 2004, it is shown that the financial sector's contribution to a country's GDP primarily depends on commercial banks, which are the key players responsible for financial intermediation. The latter is approximated by the ratio of loans issued by banks to their liabilities (deposits). The 'loan-to-deposit' ratio is a kind of 'efficiency factor' for banks, which convert their financial resources to assets that generate economic growth. Furthermore, a larger share of participation of individuals in the bank's capital enhances its contribution to the financial sector since private banks face constant pressure from their state-owned competitors due to unequal access to funding, administrative leverage, etc. For this reason the managers of private banks have more incentives for successful growth, which enables them to show better performance in the long run.

In Bhattacharyya and Hodler (2014), based on a sample of data for 133 countries from 1970 to 2005, the effect of financial sector growth on the economy is directly related to the simultaneous development of the institutions responsible for investor property rights protection, which make investments in a certain country more attractive. The share of revenue coming from

the export of natural resources in the GDP also makes its contribution because its growth discourages incentives to the search for finance-driven models of economic development.

Gross profit of the non-financial sector. In Madhou et al. (2015), based on the analysis of data for Australian companies from 2003 to 2008, it is shown that the depreciation of national currency provides a competitive advantage in the foreign markets to non-financial companies focused on product exports in the form of reduced costs, which enables them to increase demand and generate extra profits. This effect increases if exports are dominated by mining companies, and the economy has a high share of revenue from natural resources in the GDP. In contrast, inflation growth means increased production costs for real sector companies and a decrease in their gross profits.

In Cherchye and Verriest (2016), based on the analysis of the activity of more than 10,000 manufacturing companies in 53 developed and emerging economies from 1996 to 2006, the negative impact of capital flow restrictions imposed by the state on real sector companies' gross profits is demonstrated as they disrupt or halt (in the worst-case scenario) foreign investments in production expansion to generate extra profit.

Dollarization of bank assets and liabilities. In De Nicolo, Honohan, and Ize (2005), the authors investigate asset dollarisation based on data on 100 countries, including developed, emerging, and transitional economies. Economic agents view foreign deposits as an alternative asset to national currency savings; their attractiveness is high in unstable macroeconomic conditions with high inflation rates and volatile foreign exchange rate (see Ize, Yeyati (2003)). Besides macroeconomic stability, development of institutions is also important as it minimises risks related to financial contracts in local currencies and thus reduces the share of liabilities denominated in the foreign currency in the total amount of liabilities.

Loan dollarization is reviewed in Brown, Ongena, and Yesin (2011). The authors analyse the influence of macroeconomic variables and company characteristics in 25 transitional economies based on data for 3,100 companies. The research determined that the companies' desire to receive foreign currency loans is related primarily to their business features (e.g., exporters, which receive income in a foreign currency, are more interested in obtaining foreign currency loans) rather than macroeconomic conditions (domestic and foreign interest rate differences and inflation volatility).

Competition level. In Claessens and Laeven (2004), the authors tested factors that affected competition in 54 countries between 1994 and 2001. Their main conclusion is that competition is the highest in countries where the banking system has fewer entry barriers for foreign banks and fewer bank activity restrictions (permission to engage in insurance and real estate transactions, investment banking, and asset securitisation in addition to traditional banking intermediary services). The authors show that the Panzar-Rosse H-statistics (Panzar

and Rosse, 1987) used to measure competition in the banking sector[2] have no statistical correlation with the concentration index in the same systems. The research also tested other financial, institutional, and macroeconomic determinants of banking system competition. First, the authors assumed that the increased depth of other financial market segments should intensify interindustry competition. They used variables that reflected stock market capitalisation and annual life insurance premiums. However, these data did not confirm the hypothesis. Secondly, the authors tested the influence of the institutional environment by using data related to property rights protection but failed to find any significant effects. Thirdly, they suggested that competition tends to decline when inflation is high because prices and interest rates for banking services become less informative. But the data used did not confirm this hypothesis either.

Similar conclusions related to the influence of foreign banks on competition in the domestic banking market are contained in Yeyati and Micco (2007) based on the Latin American data.

Foreign banks and cost-efficiency. In Bonin, Hasan, and Wachtel (2005), one of the most cited works on forms of bank property and their effect on cost-efficiency in the banking sector, it is shown that bank privatisation in transitional economies does not in itself guarantee increased cost-effeciency as state-owned banks are no less efficient than private banks. To ensure increased efficiency, the banking market must be open to foreign players, which cause spillover effects of high-quality service, especially if such banks have a strategic foreign owner.

In Lensink, Meesters, and Naaborg (2008), the authors argue with the above conclusions and show that in 105 countries between 1998 and 2003 the relationship between foreign banks and banking efficiency was on average negative. The exception was countries with more mature institutions, where such negative relationship was less significant. The paper is based on the theoretical model set out in Mian (2006), which states that banking system efficiency in less developed countries will go down rather than going up as a result of foreign players from developed countries entering the market. Differences in the institutional environment and failure to adapt to them quickly offset the positive spillover effects mentioned in Bonin et al. (2005).

The work of Turk Ariss (2010), based on 60 emerging economies between 1999 and 2005, shows that the Lerner index and GDP per capita have the best explanatory power in modelling cost-effeciency in the banking sector. Price competition characterises the ability of banks to set their interest rates at a level higher than the marginal costs, and GDP per capita reflects differences in the level of wealth of bank service users. Similar conclusions related to the link between competition and efficiency in the U.S. banking sector are contained in Berger and

[2] H-statistics show the response of consolidated incomes of the banking system to changes in production factor prices, including borrowed funds, physical capital, and personnel. According to the theory of New Empirical Industrial Organisation (NEIO), a zero response of incomes to production factor prices is typical of monopolistic banking systems, a response of one is characteristic of perfect competition, and a response between zero and one is typical of monopolistic competition.

Hannan (1998). In Turk Ariss (2010), it is concluded that the presence of foreign banks in the market and laws regulating collateral relations between banks and borrowers and bankruptcy proceedings (Djankov et al., 2007) have no influence on cost-efficiency in the analysed sample.

3. Empirical Research Concept

The main purpose of this stage of the research is to develop a set of models that will allow us to make long-term forecasts of the depth and structure of Russia's financial sector. Since the financial sector is relatively young in Russia, and structural changes in demographics, institutional characteristics, macroeconomics, and finance are possible in the long term, such a set of models and the forecasting based on it should include international experience and rely on the method of analysing cross-country data. Such methods include regression analysis of cross-country data, within the framework of which a standard model of the following type:

$$Y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it}, \quad (1)$$

where Y_{it} is the consideredprocess (financial sector depth or structure) for country i at time t; α_i is the fixed effect that characterises the permanent difference between the objects (countries) throughout the time period in question; X_{it} is the set of explanatory variables (demographic, institutional, macroeconomic, and financial characteristics); and ε_{it} is the regression error.

Two types of uncertainty arise when the model set is consructed based on (1): fixed effects uncertainty $\alpha_i$and model uncertainty X_{it}.

The first type of uncertainty is related to the fact that the fixed effect may change over time at least for a part of the objects in the sample. This may especially apply to samples that contain objects in a disequilibrium state. In Egert, Backe, and Zumer (2006), it is shown that this problem arises in modelling credit market depth based on a sample of 11 transition economies. The fixed effect may be expected to be consistent in the long-term only for countries in equilibrium. Countries still in the process of moving toward equilibrium are characterised by 'fixed' effects that change over time. For each transitional object, we can calculate a confidence interval within which the 'fixed' effect may vary when the country is moving toward equilibrium. This confidence interval may be based on estimates of fixed effects typical of equilibrium states. In Egert et al. (2006), such countries include small developed economies in OECD. Since Russia is classified as a developing country with a transitional economy, fixed effects may be expected to change over time as long as the country is adjusting to a new equilibrium.

The second type of uncertainty is related to the fact that the number of potential explanatory variables in groups of demographic, institutional, macroeconomic, and financial variables could be too large (50 or 60) to be included in the single regression equation. The expert selection of some

indicators is vulnerable to omitted variable bias. In this case, Bayesian Model Averaging (BMA) or LASSO (Least Absolute Shrinkage and Selection Operator) may apply. For this research, the approach based on BMA, which is widely used in empirical growth models (finance-growth nexus, Sala-I-Martin, Doppelhofer, Miller, 2004; Durlauf, Kourtellos, Tan, 2008; Hasan, Horvath, Mares, 2016), was selected. BMA assesses all possible combinations of explanatory variables 2^K, where K is responsible for the number of explanatory variables, such as in typical regression (1). This enables us to obtain a distribution of coefficient estimates and, most importantly, the posterior probability of each factor being included in the end model (Posterior Inclusion Probability (PIP)), the share of models where each factor is statistically important. All explanatory variables may be further ranked by PIP criterion in descending order, so that only variables with $PIP \geq 0.5$ are left. The drawback of this approach is standard for statistical methods: the positive or negative sign of a significant coefficient may contradict economic theory. Thus, the explanatory variables in the final model require expert adjustment even after the application of BMA algorithm.

Another barrier to assessment of the equation (1) is endogeneity concerns between the dependent variable and some explanatory variable groups. The depth and structure indicators of the financial sector may in turn affect macroeconomic and financial development indicators (institutional and demographic variables are assumed to be exogenous). The 2SLS-BMA algorithm may be used to remedy this problem (Hasan et al., 2016). In this algorithm, BMA assesses a two-step support version of the regression (1), where endogenous variables X_{it} are instrumentalised by those variables that are independent of Y_{it}. For simplicity, it is possible to take the first lags of the variables X_{it} as such instrumental variables.

Once endogeneity is eliminated, the next feature of the analysis is the need to create a cross-country model that would give an acceptable explanation for the change in the dependent variable Y_{it} both for an average country in the sample and for Russia, since the forecast focuses on Russia. This requires the expert adjustment of 2SLS-BMA outcomes: the final model should include such variables X_{it} that are insignificant for the country panel (their $PIP < 0.5$) but may influence Y_{it} in Russia.

The final model may be further validated by a standard out-of-sample forecasting algorithm. The model estimated for all countries between 1980 and 2015 is reviewed on a shorter horizon, such as between 1980 and 2007. Then a 2008–2015 forecast is made based on available paths of explanatory variables. If such forecast is acceptable in the sense of comparison with the actual explanatory variables for the relevant time horizons, the model is accepted; otherwise it is revised until an acceptable out-of-sample forecast is reached. Then we can eturn to the long-term forecast, which is the final part of the research.

The concept in question may be formalised as follows:

1) 2SLS-BMA algorithm. The definition of such a subset of explanatory variables X_{it} that would have a sustainable statistical link with Y_{it} in most specifications:
   - Regression of each endogenous X_{it} on its first lag X_{it-1} → a model value $\widehat{X}_{it}$.
   - Intragroup transformation X_{it} and $\widehat{X}_{it}$ → exclusion of fixed effects $\widetilde{X}_{it} = X_{it} - \overline{X}_i$ and $\widetilde{\widehat{X}}_{it} = \widehat{X}_{it} - \overline{\widehat{X}}_i$.
   - Estimation of 2^K of regressions Y_{it} on $\widetilde{X}_{j,it}$ (exogenous) and/or $\widetilde{\widehat{X}}_{j,it}$ (endogenous), where $j = 1 \dots K$.
   - PIP calculation: $\forall\, \widetilde{X}_{j,it}$ and/or $\widetilde{\widehat{X}}_{j,it}$ we get PIP and rank them between 1 and 0.
2) Basic GMM assessment. The assessment of instrumental regression for Y for subsampling of factors X of 2SLS-BMA:
   - Robust 2-Step GMM regression assessment of each Y_{it} for all $\widetilde{X}_{j,it}$ and/or $\widetilde{\widehat{X}}_{j,it}$ with $PIP \geq 0.5$
   - Determination of adjustment quality for the average sampling in general and Russia in particular
3) Extended GMM assessment. The adjustment of the instrumental regression assessment from step 2 by including such factors $\widetilde{X}_{j,it}$ and/or $\widetilde{\widehat{X}}_{j,it}$, which were not selected under 2SLS-BMA but which help to improve the adjustment quality of data with the Russia-based model, in the model for Y_{it}. Model validation:
   - Model revaluation without fixed effects and calculation of model values for Russia (how important is the fixed effect?)
   - Fixed effects uncertainty: exclude Russia from the sample, review the model, calculate confidence intervals for Russia based on the distribution of fixed effects estimates across the remaining sample countries. Next, calculate model values for Russia based on the model evaluated without Russia. This means the out-of-sample forecast for the object, including uncertainty related to the fixed effects (does the model value for Russia fit into the interval of the minimal and maximal fixed effects?)
   - Out-of-sample (in time) forecast: model re-evaluation based on short data and sample-end forecast (how close is the model value to the actual value, and what is the role of any possible inconstancy detected in the forecast error?)

The typical regression is modified from equation (1) to the following:

$$FI_{j,\,it} = \alpha_i + I_{\{inert\}} \cdot \rho_j \cdot FI_{j,\,it-1} + \sum_{m=1}^{M} \delta_m \cdot MACRO_{m,it} + \sum_{n=1}^{N} \delta_n \cdot FINANCE_{n,it} + \sum_{p=1}^{P} \delta_p \cdot INSTITUTION_{p,it} + \sum_{q=1}^{Q} \delta_q \cdot DEMOGRAPHY_{q,it} + \varepsilon_{it}, \quad (2)$$

where for country i ($i = 1 \dots N$, developed and developing countries, including Russia) during time t ($t = 1980, 1981, \dots, 2015$):

$FI_{j,\,it}$ (Financial Indicator) is the j_{th} indicator of financial development or the financial sector structure;

$I_{\{inert\}}$ is the binary indicator of the inclusion of the factor of inertia of the explanatory variable in regressors: 0 = no inertia is included, and static panel estimators are applied (robust OLS or ML, if explanatory variables are exogenous, and GMM, if they are endogenous); 1 = inertia is included, and dynamic panel estimators are used (1-Step or 2-Step Difference or System GMM developed by Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998);

$MACRO_{m,it}$, $FINANCE_{n,it}$, $INSTITUTION_{p,it}$, $DEMOGRAPHY_{q,it}$ are control factor groups that reflect macroeconomic, financial, institutional, and demographic development;

α_i is the fixed effects that reflect constant cross-country differences for each of the four dependent variables in question;

ε_{it} is the regression error.

4. Cross-Country Data and Formats

For the modelling of different financial sector segments the following data sources were used (seeTable 2).).

Table 3. Data Sources

	Variables			
Databases	Macroeconomic	Financial	Demographic	Institutional
World Bank	■	■	■	■
IMF		■		
Fraiser Institute				■
Bankscope		■		
Heritage Foundation				■

All variables in this paper were divided into the following groups: macroeconomic, financial, demographic, and institutional. The World Bank data was used as the source for macroeconomic and demographic variables. For data on financial markets and development, the main data

sources included the World Bank (the Global Financial Development Database), the International Financial Statistics, and the Financial Soundness Indicators databases of the International Monetary Fund, while Bankscope by Bureau van Dijk was used to obtain additional information on bank performance. Institutional variables were collected from the World Bank and analytical institutions (Fraiser Institute and Heritage Foundation) focused on international and state political research.

This paper is based on a sample of 63 developed and emerging economies, including commodity exporters. The sample included only countries where the share of omitted values in terms of all indicators was 5% or less. The observation period for our sample is 35 years on average (from 1980 to 2014 (2015)), which allows us to track financial sector development in the long term. The last observation date varies by country and variable as it depends on data availability.

Descriptive statistics for variables for all countries are presented below (Table A1, Appendix).The descriptive statistics include the average, maximum, and minimum values, the standard deviation, and the number of observations for each variable for better visualisation of the large data arrays.

Furthermore, descriptive statistics on variables for Russia are presented (Table A2, Appendix).

5. Regression Analysis Summary

Regression results allow to find out that institutional characteristics related to the financial sector[3] are the most important for the modelling of financial sector *size* indicators. This is completely in line with the literature related to the relationship between finance and institutions (La Porta, Lopez-De-Silanes, Shleifer, 2006; Djankov, McLiesh, Shleifer, 2007). Institutional indicators have additional explanatory power in the models where other indicators of the financial sector (credit quality of the banking sector, banking cost-effeciency, etc.) have already been used. The indicators that reflect the wealth of economic agents and monetary and macroeconomic conditions proved to be the most functional in most specifications, along with institutional and other financial indicators. On the contrary, the indicators that characterised the demographic situation in national economies and, quite unexpectedly, the balance of payments and foreign exchange market proved to be less significant in the models.

Similar conclusions apply to the modelling of financial sector *structure* indicators. The only substantial difference is that in this case balance of payments and foreign exchange indicators play a greater role than for the modelling of financial sector size. There is no surprise here as the structure

[3] To save space, no coefficient estimates are shown in models for each of the 13 depth and 7 structure indicators of the financial sector. The exception is credit market depth, for which the Appendix presents 2SLS-BMA results and final instrumental regressions (Table A3 and A4, respectively) and model validation results (Figure A1). Other results are similar and are available upon readers' request.

indicators included the dollarization of bank assets and liabilities and the ratio between the short- and long-term liabilities of the banking system. For the latter, the study showed that a stable foreign exchange rate lead to longer tenors of bank liabilities and price stability (by increasing private investors' trust.)

6. Scenario-Based Forecasting of the Depth of Development and Structure of Russia's Financial Sector

6.1. Test long-term scenarios of socio-economic development

For the long-term forecasting of the domestic financial sector (up to 2035), we have developed a set of scenarios which are expected to cover the whole range of possible options for socio-economic development with the meaningful possibility of realization, from the maximally optimistic to the maximally pessimistic scenario.

The maximally optimistic (target) scenario combines high macroeconomic dynamics with gradual institutional quality improvement and stabilisation of demographics.

The pessimistic scenario contemplates sluggish near-stagnation dynamics, the virtual freezing of current institutional quality, and pessimistic demographic conditions.

The institutional inertia scenario involves a purely hypothetical variant where positive (as in the target scenario) macroeconomic dynamics combine with the stagnation of institutional quality (as in the pessimistic scenario). However artificial, this assumption is made to assess the 'pure' effects of institutional development on the growth of the domestic financial sector in the long term. While the quality of public and market institutions is much more affected by the state than external economic and social and demographic factors, the difference in the results of financial sector development in this and the target scenario may be viewed as a potential contribution by government policy to this development.

The target scenario of socio-economic development is based on the following assumptions:

1) Moderately positive raw hydrocarbon markets: rising nominal global oil prices in proportion to the global inflation with the target of 55 USD/barrel by 2018, 60 USD/barrel by 2023, and slightly below 80 USD/barrel by 2035.
2) Gradual improvement of the quality of general economic and financial institutions by 2025 to levels approximating the current average institutional development levels of CEE and to levels comparable to the current levels of 'peripheral' developed economies.
3) Demographic changes consistent with the average demographic forecast of Rosstat, which predicts overall population growth up to 2025 (a high migration balance will offset moderate natural population decrease) and gradual decrease by 2035 (accelerated population decrease); an increasing the burden of young population on the working-age population up to 2025 and a gradual decline in this ratio by 2035; and continuous growth of the senior population.

4) A significant decrease in net capital outflow and a small net inflow by the end of the forecast period; positive changes in capital flows will be partially caused by higher quality of institutions.
5) Positive changes in capital flows and moderate nominal -oil price growth and gradual increase in non-commodity exports will lay the foundation for the long-term stabilisation of the ruble.
6) The ruble's stability will be beneficial for a long-term decrease in inflation up to 2.5% annually after 2030.
7) Favourable institutional and capital flow changes will accelerate the investment growth in 2020s to the average rate of 6.2%–6.3% per year; this will invigorate the GDP growth to 3.8%–4.1% per year boosting both the supply and demand sides of the economic growth (higher labour productivity).
8) By late 2020, the investment growth will begin to decelerate to rates close to the GDP growth; non-commodity exports, which will expand due to capacity upgrading and economic modernisation during the preceding period, will become a new economic driver.
9) Relatively high level of wealth reached by the middle of the forecast period (average GDP per capita at the current rate will be close to that in Italy, Spain, and Korea) will give - additional incentive to the development of institutions.

The pessimistic scenario of socio-economic development is based on the following assumptions:

1) Unfavourable oil markets will lead to global oil prices stabilising at 50 USD/barrel, which means price reduction in real terms.
2) The quality of general economic and financial institutions will be fixed at the level of 2015–2016, which is even below the previous historic maximum figures for some indicators.
3) Demographic changes in line with the low version of the Rosstat demographic forecast, which means near-stagnation population dynamics over the upcoming years and gradual population decline after 2020; a slightly higher burden of young population on the working-age population than in the target scenario.
4) Significant capital outflow will continue, which will put downward pressure on the ruble in combination with low hydrocarbon prices (nominal decrease by approximately 4%–5% per year and real decreaseapproximately by 2% per year).
5) The continuous weakening of the ruble will keep long-term inflation at about 4% per year.
6) The absence of favourable changes in the institutional environment and unstable exchange rates will cause low investment growth at 2%–3% per year.
7) Low economic modernisation and export diversification rates will cause low GDP growth at 2.0%–2.5% per year; production will be decelerated by negative demographic growth.

8) Due to low GDP growth and devaluation pressure, growth of wealth will be low (the average GDP per capita will be close to that of Latvia, Lithuania, and Slovakia).

The Institution Inertia Scenario is a synthetic variant where a positive macroeconomic and stable demographic growth combines with low institutional development levels. Theoretically, this combination could be explained by the assumption of additional external positive shocks (such as those related to changes in geopolitical risks).

6.2. Specific results of long-term forecasting

Private loans. Credit market depth is expected to grow in Russia under all scenarios other than the pessimistic one during the forecast period. By 2035, private bank loans will grow up to 73% of GDP in the target scenario and up to 57% in the inertia scenario (for reference, this figure was 59% in 2014). In the pessimistic scenario our model predicts the stabilisation of the credit market at the current level. In the target and inertia scenarios, the key driver of private lending growth in the long term will be the improvement of the structural characteristics of the economy, namely, growth of the development level (size of the economy) . The target scenario adds progress in the area of institutional indicators to macroeconomic growth: enhanced financial freedom and improved disclosures in the credit market (improved information transparency) due to increased credit coverage of borrowers. In the pessimistic scenario there are no favourable changes, both in macroeconomic and institutional development.

Stock market capitalisation. All three scenarios predict increase of stock market depth in Russia during the forecast period up to 2035. By 2025, the capitalisation may grow up to 66% of GDP under the target scenario, up to 56% under the institution inertia scenario, and to 48% under the pessimistic scenario (for reference, this figure was 28% in 2014). By 2035, stock market depth could reach 84% under the target scenario, 66% under the inertia scenario, and 58% under the pessimistic scenario. The growth of stock market capitalisation during the reviewed period will be primarily caused by improved structural economic characteristics: higher level of economic freedom, increased wealth of society characterised by the GDP per capita, increased net FDI inflow, decreased natural resources revenue, and increased demand for private pension systems. The deepening of the stock market will be encouraged by the strengthening of the ruble in -addition with the deepening of the credit market (through M&A financing channels and the diversification of credit risks of legal entities raising funds for business projects).

Pension fund assets. All scenarios anticipate the growth of pension fund assets in Russia during the forecast period. By 2035, the ratio of pension fund assets to GDP will grow up to 9.8% under the target scenario, up to 9.2% under the inertia scenario, and up to 7.9% under the pessimistic scenario (for reference, this figure was 2.5% in 2012). Key drivers of pension fund savings and assets under their management are the ageing of the population (high demand for pension fund services) and decreased inflation. The inertia and target scenarios anticipate increased de-

velopment of the economy, which is characterised by its size. Under the two best options, institutional improvements (the quality of legal framework and property rights protection) will make positive contributions to pension market growth.

Equity financing sources of the real sector. Over the forecast horizon up to 2035, we expect changes in the non-financing sector's gross profit in Russia depending on the development scenario. By 2025, the profit may grow up to 20.7% of GDP under the target scenario, up to 20.8% under the institution inertia scenario, and up to 22.9% under the pessimistic scenario (for reference, this figure was 20% in 2014). By 2035, stock market depth may reach 18.9% under the target scenario, 19.2% under the inertia scenario, and 23.7% under the pessimistic scenario. The key drivers of the gross profit of the non-financial sector in the long term will include the dependency of the Russian economy on the demand for energy products in the foreign markets and the transition rate to a domestic-based economic growth model, which will translate into changes in the share of natural resources revenue in the GDP and changes in the exchange rate of the national currency (ruble), which affects the technological modernisation of production facilities through the import of the required equipment.

Corporate bonds. All scenarios anticipate the growth of issued corporate bonds in Russia during the forecast period. By 2035, the private domestic market of corporate bonds may grow up to 35% of GDP under the target scenario, up to 23% under the institution inertia scenario, and up to 16% under the pessimistic scenario (for reference, this figure was 6% in 2014). The key drivers of issued domestic corporate bonds are the ageing of the population (the demand for long-term investments with acceptable risk level) and decreased inflation rates (growing predictability of the return on investment in the financial market). The target and inertia variants anticipate the growth of development depending on the size of the economy. The target option will lead to higher financial freedom (institutional improvements). Under the two favourable scenarios, market depth will be facilitated by the expansion of the domestic credit market (the complementary effect).

External corporate debt. During the forecast period, the target scenario anticipates an increase in the share of external corporate debt of Russian borrowers in the GDP, while the inertia and pessimistic scenarios anticipate its stabilisation. By 2035, the external corporate debt may grow up to 22% of GDP under the target scenario, up to17% under the institution inertia scenario, and up to 16% under the pessimistic scenario (for reference, this figure was 17% in 2015). The key reason for growing external corporate debt under the target scenario is improved institutional indicators: enhanced financial freedom. The economic effect of other factors is insignificant, which explains the stability of external corporate debt share in the economy under the other two scenarios.

Foreign portfolio investments. All three scenarios anticipate increased gross portfolio equity investments in Russia during the forecast period up to 2035. By 2025, their size may grow up to 0.7%

of GDP under the target scenario, up to 0.4% under the institution inertia scenario, and up to 0.3% under the pessimistic scenario (for reference, this figure was 0.2% in 2014). By 2035, this indicator may reach 1.1% under the target scenario, 0.5% under the inertia scenario, and 0.4% under the pessimistic scenario. The key growth mechanisms of gross portfolio foreign equity investments during the analysed period include increased capitalisation of Russia's stock market, development of investors' property rights protection mechanisms, and support of the real interest rate in the economy at a high level to encourage the inflow of foreign speculative capital and investments.

Insurance assets. In all three scenarios we expect the growth of insurance companies' assets in relation to the GDP in Russia over the forecast horizon up to 2035. By 2035, the insurance market size may reach 8.2% under the target scenario, 7.8% under the inertia scenario, and 7.5% under the pessimistic scenario (for reference, this figure was 1.7% in 2014). Financial sector growth (that is, the expansion of the stock and credit markets) will be the key driver of the insurance market during the forecast period. The contribution of the institutional environment (legal framework development) will also play an important role.

Life insurance. In all three scenarios we expect the growth of life insurance premiums in Russia during the forecast period up to 2035. By 2035, this indicator may reach 1.9% under the target scenario, 1.1% under the inertia scenario, and 0.94% under the pessimistic scenario (for reference, this figure was 0.15% in 2014). The key life insurance growth mechanisms during the analysed period include the growth of Russia's stock market capitalisation and the formation of a more independent judicial system.

Other insurance types. In all three scenarios we expect the stagnation of non-life insurance premiums in Russia during the forecast period up to 2035. By 2035, this indicator may reach 1.06% under the target scenario, 0.96% under the inertia scenario, and 0.89% under the pessimistic scenario (for reference, this figure was 0.9% in 2014). The key drivers of non-life insurance premiums during the forecast period include the growth of the wealth of society along with credit market development.

Mutual funds. In all three scenarios we expect the growth of mutual fund assets in Russia during the forecast period up to 2035. By 2025, their size may grow up to 1.6% of GDP under the target scenario, up to 0.9% under the institution inertia scenario, and up to 0.7% under the pessimistic scenario (for reference, this figure was 0.2% in 2014). By 2035, this indicator may reach 2.6% under the target scenario, 1.1% under the inertia scenario, and 0.9% under the pessimistic scenario. The key growth drivers of gross portfolio foreign equity investments during the analysed period include the growth of capitalisation of Russia's stock market, the development of investors' property rights protection, and the maintenance of low inflation over a long period to stimulate investments.

Factoring. In all three scenarios we expect the growth of factoring segment in Russia during the forecast period up to 2035. By 2025, its size may grow up to 2.6% of GDP under the target scenario, up to 2.3% under the institution inertia scenario, and up to 2.2% under the pessimistic scenario (for reference, this figure was 1.9% in 2014). By 2035, stock market depth may reach 3.4% under the target scenario, 2.8% under the inertia scenario, and 2.6% under the pessimistic scenario. The key growth mechanisms in the development of the factoring segment during the analysed period are improvements in the structural characteristics of the economy: the growth of the wealth of society, the development of the institutional environment to protect property rights, and the regulation of the private sector of the economy.

Financial sector contribution to GDP. Over the forecast horizon up to 2035, the financial sector's contribution to GDP is expected to grow or stagnate at the current level, depending on the scenario. By 2025, this indicator may grow up to 4.3% of GDP under the target scenario or decrease to 4.1% under the institution inertia scenario or to 3.9% under the pessimistic scenario (for reference, this figure was 4.2% in 2014). By 2035, this indicator may grow even more (to 5%) under the target scenario or remain at the current level (4.3% or 4%) under the inertia and pessimistic scenarios, respectively. The key mechanisms of the decrease in the concentration level during the analysed period include, first, the reduced dependency of the Russian economy on foreign market demand for energy products and the transition rate to a domestic-based economic growth model, which will translate into changes in the share of natural resource revenues in the GDP. Secondly, it is improved protection of investors' property rights, which will encourage them to invest in assets in the Russian financial market.

Maturity of liabilities in the banking system. In two out of three scenarios we expect an increase in the ratio of long- and short-term liabilities in the banking system over the forecast horizon up to 2035. By 2025, this ratio may increase up to 0.22 under the target scenario and up to 0.18 under the inertia scenario (for reference, this figure was 0.16 in 2014). By 2035, the indicator may reach 0.28 under the target scenario and 0.21 under the inertia scenario. The pessimistic scenario anticipates this indicator to stagnate at the 2014 level throughout the forecast period. The key growth mechanisms of the ratio of long- and short-term liabilities of the banking system during the analysed period include the expected decrease of the portion of non-performing and bad loans supported by growing trust of depositors. This process will be supported by the expected strengthening of the ruble, which will also maintain depositors' trust in the banking system, and a decrease in the share of natural resources revenue in the GDP. Furthermore, the expected deepening of the stock market will encourage the extension of banking system liabilities (risk diversification model associated with long-term savings).

Price competition in the banking system. In all three scenarios we expect the weakening of price competition (growth of Lerner index, that is, the monopoly markup in the price of banking

services) in Russia's banking system over the forecast horizon up to 2035 to the pre-crisis level of 2005–2008. By 2025, Lerner index may grow up to 23% under the target scenario or decrease to 22% under the institution inertia scenario or to 19% under the pessimistic scenario (for reference, this figure was 5% in 2014). By 2035, Lerner index may grow up to 28% under the target scenario or decrease to 27% under the institution inertia scenario and remain the same (19%) under the pessimistic scenario. The key mechanisms of the monopolistic competition growth during the analysed period include the expected recovery of wealth of economic agents, increased banking cost-effeciency (decreased cost-to-income ratio), and slowdown of inflation. This process will be restricted by the deepening stock market (interindustry competition) and improvements in institutional development.

Dollarization of bank liabilities. In all three scenarios we expect a decrease in the portion of bank liabilities denominated in foreign currency over the forecast horizon up to 2035. By 2035, the dollarization of liabilities may reach 21.5% under the target scenario and 27.5% under the inertia scenario and remain at the 2025 level (28.1%) under the pessimistic scenario (for reference, this figure was 34.7% in 2014). The key drivers of the decreased dollarization of bank liabilities during the analysed period include: slowdown of inflation and institutional development, in particular, the improvement of property rights protection.

Foreign bank penetration. In all three scenarios we expect a slightly greater penetration of foreign banks into the Russian banking sector over the forecast horizon up to 2035. By 2025, the portion of non-resident controlled assets in the aggregate banking system assets may grow up to 14% under the target scenario, up to 10% under the inertia scenario, and up to 10% under the pessimistic scenario (for reference, this figure was 8% in 2014). By 2035, the indicator may grow up to 18% under the target scenario or decrease to 12% under the institution inertia scenario and remain the same (12%) under the pessimistic scenario. The key growth mechanisms of foreign bank penetration into the bank service market during the analysed period include, first, slowdown ofinflation , which will increase the informativeness of interest rates in the economy. Secondly, improvements in the institutional development gap between Russia and developed countries, which banks may be interested in buying assets in Russia. Thirdly, growing solvency of economic agents increases the business income base and encourages foreign banks to purchase assets in Russia.

The cost-to-income ratio in the banking system. All three scenarios anticipate the decrease in the cost-to-income ratio in the banking system over the forecast horizon up to 2035. By 2025, this ratio may go down to 67% of GDP under the target scenario, to 70% under the institution inertia scenario, and to 71% under the pessimistic scenario (for reference, this figure was 92% in 2014). By 2035, the indicator may go down further to 65% under the target scenario or to 69% under the institution inertia scenario or remain the same (71%) under the pessimistic scenario.

The key mechanisms in decreasing bank cost-ineffeciency in Russia during the analysed period include, firstly, a decrease in the share of non-performing loans, allowing banks to close some provisions for losses. Secondly, deepening credit market will create preconditions for an increased flow of interest payments amid increased credit quality. Thirdly, stronger ruble will lead to the absence of large amounts on banks' balance sheets due to revaluation of funds denominated in foreign currencies and increasing their costs.

6.3 Long-Term Forecast Summary

For the forecast period, all scenarios (even the pessimistic one) anticipate the expansion of supply in the domestic market of all key financial instruments at rates that more or less outperform the growth of the domestic economy (except for private loans in the pessimistic scenario; see Table 4).

The fastest growth may be expected from non-bank financial institutions and non-credit financial instruments. The latter will be encouraged by improved wealth (at any rate), higher price stability (compared with the current situation), and the ageing population. All other things being equal, this will give rise to a 'demand' for the development of the pension and insurance financial segments and enhance the number of long-term institutional investors.

We expect that the financial instrument structure will have positive changes, such as de-dollarization and longer tenors.

The target scenario, which anticipates the significant improvement of quality of institutions, all mentioned changes will be stronger.

The pessimistic scenario, featuring worse macroeconomic dynamics, fails to take full advantage of the stimulating and refining influence of the benefits of the diversification of the economy, wealth growth, and price stability on the financial sector development.

Table 4. Long-Term Forecast Summary for the Size and Structure of Russia's Financial Sector

	Dimension	2010	2014	2025	2035
Panel 1: financial size indicators					
Private loans, actual	as a % of GDP	44.5	58.9		
Forecast, target				60.1	72.9
Forecast, institutional inertia				51.5	56.7
Forecast, pessimistic				47.9	48.7
Independent pension fund assets, actual	as a % of GDP	1.9	2.7		
Forecast, target				7.6	9.8
Forecast, institutional inertia				7.3	9.2
Forecast, pessimistic				6.9	7.9
Corporate bonds, actual	as a % of GDP	6.1	5.9		

	Dimension	2010	2014	2025	2035
Forecast, target				21.5	34.6
Forecast, institutional inertia				16.4	23.4
Forecast, pessimistic				13.3	15.8
Mutual fund assets (stock funds), actual	as a % of GDP	0.3	0.6		
Forecast, target				1.6	2.6
Forecast, institutional inertia				0.9	1.1
Forecast, pessimistic				0.7	0.9
Gross foreign portfolio equity investment, actual	as a % of GDP	0.3	0.2		
Forecast, target				0.7	1.1
Forecast, institutional inertia				0.4	0.5
Forecast, pessimistic				0.3	0.4
Insurance sector assets, actual	as a % of GDP	1.8	2.4		
Forecast, target				6.7	8.2
Forecast, institutional inertia				6.6	7.8
Forecast, pessimistic				6.6	7.5
Insurance companies – life insurance (premiums), actual	as a % of GDP	0.0	0.1		
Forecast, target				1	1.9
Forecast, institutional inertia				0.7	1.1
Forecast, pessimistic				0.7	0.9
Insurance companies – non-life insurance (premiums), actual	as a % of GDP	0.9	0.9		
Forecast, target				1.0	1.1
Forecast, institutional inertia				1.0	1.0
Forecast, pessimistic				0.9	0.9
Stock market capitalisation, actual	as a % of GDP	57.5	27.8		
Forecast, target				65.9	84.4
Forecast, institutional inertia				56.2	66.1
Forecast, pessimistic				49.1	58.0
Factoring, actual	as a % of GDP	1.1	1.9		
Forecast, target				2.6	3.4
Forecast, institutional inertia				2.3	2.8
Forecast, pessimistic				2.2	2.6
Financial sector contribution to GDP, actual	as a % of GDP	3.8	4.2		
Forecast, target				4.3	5.0
Forecast, institutional inertia				4.1	4.3
Forecast, pessimistic				3.9	4.0
Gross profit of the non-financial sector, actual	as a % of GDP	22	20		
Forecast, target				20.7	18.9
Forecast, institutional inertia				20.8	19.2
Forecast, pessimistic				22.9	23.7
Panel 2: financial structure depth indicators					
The ratio of long- to short-term liabilities	times	0.18	0.16		

	Dimension	2010	2014	2025	2035
of banks					
Forecast, target				0.22	0.28
Forecast, institutional inertia				0.19	0.21
Forecast, pessimistic				0.16	0.16
Price competition in the banking system Lerner index)	Return on assets share	0.00	0.05		
Forecast, target				0.23	0.23
Forecast, institutional inertia				0.22	0.22
Forecast, pessimistic				0.19	0.19
Banking system concentration ratio (Top 3 banks' share in the aggregate assets of the banking system, CR3).	% of banking system assets	29.6	33.3		
Forecast, target				19.5	19.2
Forecast, institutional inertia				19.9	19.8
Forecast, pessimistic				20.2	20.1
Share of foreign banks' assets in the total amount of banking system assets	% of banking system assets	10.0	8.0		
Forecast, target				14.4	14.8
Forecast, institutional inertia				10.1	10.3
Forecast, pessimistic				10.4	10.6
Cost-inefficiency in the banking system (cost-to-income ratio*)	% of income and net interest income	98.9	91.1		
Forecast, target				67.0	66.8
Forecast, institutional inertia				69.9	69.7
Forecast, pessimistic				70.7	70.8
The ratio of external to domestic corporate debt (private loans and corporate bonds)	times	7.3	3.5		
Forecast, target				2.8	2.1
Forecast, institutional inertia				3.1	2.4
Forecast, pessimistic				3.6	3.1
The ratio of debt (private loans, corporate bonds, and factoring) to equity (stock market capitalisation) financing	times	0.9	2.4		
Forecast, target				1.3	1.3
Forecast, institutional inertia				1.2	1.3
Forecast, pessimistic				1.3	1.2
Ratio of bank assets (private loans) to non-bank assets (insurance assets, NPFs, mutual funds)	times	11.1	10.3		
Forecast, target				4.0	3.5
Forecast, institutional inertia				3.5	3.1
Forecast, pessimistic				3.4	3.0
Non-market alternative financing (the ratio of non-finance companies' profits to loans and corporate bonds)	times	0.05	0.31		
Forecast, target				0.25	0.18
Forecast, institutional inertia				0.31	0.24
Forecast, pessimistic				0.37	0.37
Share of bank liabilities denominated in foreign currency	% of total liabilities	28.2	34.7		

	Dimension	2010	2014	2025	2035
Forecast, target				25.9	21.5
Forecast, institutional inertia				27.9	27.5
Forecast, pessimistic				28.1	28.1
Share of bank loans denominated in foreign currency	% of total loans	27.0	29.4		
Forecast, target				21.2	17.4
Forecast, institutional inertia				21.3	18.0
Forecast, pessimistic				21.8	20.1

Short-term and credit financial instruments do not have the same development potential as long-term and equity financing, at least because they have used this potential earlier. Risk-tolerant equity instruments are expected to show the highest expansion rates, which is generally beneficial in terms of meeting the challenge of faster growth of fixed capital investments compared with the overall economic growth.

In all scenarios, except for the pessimistic one, we predict that the financing of Russian companies in foreign markets will decrease, at the same time in the domestic market it will be slightly increased.

In all scenarios, except the pessimistic one, we anticipate that the role of self-financing of companies from their profits will reduce.

The target scenario (a little sooner) and inertia scenario (a little later) show that, for practically all indicators, Russia's financial sector will reach the average level of other clusters ('junior partners' and 'well-balanced leaders') with a higher degree of development by the middle of the forecast period.

The step-by-step (by year) identification of Russia's cluster affiliation under the EM-algorithm (Solntsev et al., 2017) shows that Russia's financial sector was close to entering the 'junior partner' cluster as early as in 2014 (see Table 5) but was driven back by the financial disruption.

Table 5. Step-by-step (by year) identification of Russia's cluster affiliation under the EM-algorithm with a Bayesian extension

Year	Cluster	Uncertainty in cluster categorisation
2004	1 ('autonomous')	0.000
2005	1 ('periphery')	0.000
2006	1 ('autonomous')	0.000
2007	1 ('autonomous')	0.001
2008	1 ('autonomous')	0.002
2009	1 ('autonomous')	0.000
2010	1 ('autonomous')	0.000
2011	1 ('autonomous')	0.010
2012	1 ('autonomous')	0.037
2013	1 ('autonomous')	0.153
2014	4 ('junior partners')	0.013

CONCLUSION

This paper attempts to provide a long-term forecast of the size and structure of the financial sector in Russia. For this purpose we have constructed empirical models on comparable data across countries, including developed and emerging markets, in particular, Russia, and country clustering outcomes received by Solntsev et al. (2017).

We proposed a three-step procedure to forecast the size and structure of the development of the Russian financial sector. At the first step we used the 2SLS-BMA algorithm (2-Stage Least Squares – Bayesian Model Averaging) for each parameter of the financial sector size and structure, which allowed us to eliminate uncertainties related to the set of explanatory variables in the cross-country regression analysis (model uncertainty). The second step involved the construction of basic instrumental regressions for each modelled parameter of the financial sector size and structure estimated on cross-country data that contains factors identified by the previous step under the 2SLS-BMA algorithm. This allowed us to obtain a preliminary version of the quality of explanation of data on Russia by models measured by cross-country data. The third step involved the creation of expanded versions of instrumental regression for each estimated parameter of the size and structure of the financial sector to improve the quality of explanation of the data on Russia.

For this analysis we designed a database on 63 countries, including Russia, for the period between 1980 and 2015, which included depth and structure variables of different financial sector segments and macroeconomic, demographic, and institutional factors. The set of key information sources included the World Bank, IMF, and Bankscope databases as well as statistical and analytical data of Fraiser Institute and the Heritage Foundation.

Regression calculations show that institutional characteristics related to the financial sector are the most important for the modelling of the financial sector size indicators. This is completely in line with the literature related to the relationship between finance and institutions (La Porta, Lopez-De-Silanes, Shleifer, 2006; Djankov, McLiesh, Shleifer, 2007). Institutional indicators have additional explanatory power in those models that have included other indicators of the financial sector (credit quality of the banking sector, banking cost-efficiency, etc.). The indicators that reflect the wealth of economic agents and monetary and macroeconomic conditions proved to be the most significant in most specifications, along with institutional and other financial indicators. On the contrary, the indicators that showed the demographics and, quite unexpectedly, the balance of paymentsand foreign exchange market proved to be less important in the models of financial sector structure. The modelling of the financial sector structure showed that the institutional environment is critical here as well as for the financial sector size. The only substantional difference is that such balance of payments and foreign exchange indicators are more important for this purpose than for the modelling of the financial sector size. This is no surprise as the structure indicators included the dollarization of assets and liabilities of the banking system and the ratio between the long- and short-term liabilities of the banking system. With regard to the latter, it was shown that the stable foreign exchange rate leads to longer tenors of bank liabilities and helps improve price stability (by increasing private investors' trust).

For the purpose of the long-term forecasting of the domestic financial sector (up to 2035), we have developed a set of scenarios, which seem to cover the whole range of possible options for socio-economic development with meaningful possibility of realization, from the maximally optimistic to the maximally pessimistic.

It was identified that in all scenarios (even in the pessimistic one) the expansion of supply of all key financial instruments in the domestic market is expected at rates that outperform the growth of the domestic economy to a greater or lesser extent (with the exception of private loans in the pessimistic scenario). The fastest growth may be expected from non-bank financial institutions and non-credit financial instruments. Such growth will be encouraged by improved wealth (at any rate), higher price stability (compared with the current situation), and the ageing population. The structure of financial instruments will see positive changes, such as de-dollarization and longer tenors. In the target scenario, which anticipates a significant improvement in institution quality, all mentioned changes will be more vivid.

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APPENDIX I

Table I.7. Descriptive Statistics of a Sampling of 63 Countries

Variable	Number of Observations	Average value	Standard Deviation	Minimum	Maximum
Macroeconomic					
Inflation, %	2067	32.4	256.1	–4.5	7481.7
Current account balance/GDP, %	1937	–0.895	5.559	–25.549	32.543
Nominal exchange rate	1914	198.1	991.7	0.0	13389.4
GDP growth rate	2087	3.23	4.15	–22.93	33.74
GDP per capita, USD	2100	13982	15137	153	88003
Natural resource revenue/GDP, %	2060	3.36	5.97	0.00	63.56
Real interest rate, %	1612	5.75	10.61	–91.72	93.94
Financial					
Short/long-term liabilities of the banking system	1569	240	3912	0	138955
Costs/incomes of the banking sector	1185	57.6	14.4	0.0	218.1
Bank capital/asset ratio	1003	8.41	3.12	1.50	24.00
Bank crises (dummy)	2016	0.125	0.331	0.000	1.000
Factoring, % GDP	1059	3.22	4.10	0.00	43.99
Dollarization of bank liabilities (% of total liabilities)	259	28.9	20.0	2.8	89.9
Dollarization of bank loans, % of total lending	256	27.2	19.8	1.1	92.7
Net FDI inflow	2025	3.35	5.78	–16.07	87.44
Financial sector contribution to GDP, %	446	4.88	1.86	1.70	12.80
Share of foreign banks' assets in the total assets of banking system	561	34.5	31.1	0.0	100.0
Gross portfolio investment, % GDP	895	20.6	38.6	0.0	295.9
Bank concentration (share of top 3 banks' assets), %	1150	65.9	19.5	17.3	100.0
Insurance companies' assets/GDP, %	1034	23.8	25.6	0.3	113.8
Life insurance premiums/GDP, %	1402	2.25	2.62	0.00	15.78
Non-life insurance premiums/GDP, %	1465	1.60	0.90	0.00	13.62
Deposit insurance coverage/GDP	667	8.9	41.9	0.1	447.3
Stock market capitalization/GDP, %	1678	56.3	86.4	0.0	1086.5
Lerner Index	1089	0.227	0.150	–1.609	1.076
Private loans, % of GDP	1885	0.627	0.422	0.000	3.111
Mutual funds, % GDP	863	28.8	71.2	0.0	616.9
Gross non-financial sector profit, % GDP	488	24.35	6.90	7.00	49.00
Net interest margin in the banking sector	1180	3.63	2.58	0.12	21.29
Non-interest income/Total income of the banking sector	1185	36.23	12.55	0.00	80.01
Overdue loans in total bank loans, %	1010	6.52	7.08	0.10	48.60
Domestic corporate bonds/GDP, %	939	27.84	29.81	0.00	197.13
Pension fund assets/GDP	834	24.59	31.84	0.00	184.14
Profit (after tax)/aggregate assets of the banking sector	1191	9.773	19.868	–308.601	239.321
Demographic					
Dependency ratio (seniors)	2268	15.9	7.1	5.1	43.3
Dependency ratio (juniors)	2268	38.8	16.2	15.8	88.9
People (25+) with secondary or higher education, %	2135	88.4	16.4	15.8	100.0
Estimated life expectancy at birth, years	2205	72.8	6.5	45.5	84.0
Institutional					
State control of capital flows index	2062	4.31	3.33	0.00	10.00
Economic freedom index	1972	6.58	1.27	2.47	9.15
Financial freedom index	1382	60.0	17.9	10.0	90.0
Court independence index	1222	5.5	2.0	0.5	9.7
Political stability index	1071	0.190	0.929	–2.806	1.663
Property rights protection index	1147	6.00	1.88	0.87	9.61
Rule of law index	1071	0.562	0.956	–1.991	2.120
Government regulation quality index	1071	0.713	0.818	–1.858	2.263

Table I.2. Descriptive Statistics for Russia

Variable	Number of Observations	Average value	Standard Deviation	Minimum	Maximum
Macroeconomic					
Inflation, %	23	75.9	188.2	5.1	874.6
Current account balance/GDP, %	22	5.90	4.40	–0.21	17.47
Nominal exchange rate	23	24.4	13.9	0.992	60.9
GDP growth rate	26	0.626	6.807	–14.53	10.0
GDP per capita, USD	27	6067	4664	1331	15552
Natural resource revenue/GDP, %	24	13.7	4.74	4.56	21.8
Real interest rate, %	21	6.36	23.23	–18.95	72.26
Financial					
Short/long-term liabilities of the banking sector	23	183	661	4.34	3176
Costs/incomes of the banking sector	19	70.1	17.2	45.2	98.9
Bank capital/asset ratio	16	11.9	1.9	7.3	14.6
Bank crises (dummy)	32	0.156	0.369	0.000	1.000
Factoring, % GDP	13	1.17	0.83	0.05	2.74
Dollarization of bank liabilities (% of total liabilities)	7	29.2	4.0	25.1	34.7
Dollarization of bank loans, % of total lending	7	26.6	3.6	21.3	30.2
Net FDI inflow	24	1.81	1.30	0.17	4.50
Financial sector contribution to GDP, %	11	3.67	0.46	2.80	4.40
Foreign banks' asset share in the total assets of banking system.	9	10.0	1.7	7.0	13.0
Gross portfolio investment, % GDP	16	0.128	0.112	0.003	0.321
Bank concentration (share of top 3 banks' assets), %	19	37.8	13.3	22.5	64.3
Insurance companies' assets/GDP, %	8	2.04	0.34	1.67	2.66
Life insurance premiums/GDP, %	19	0.448	0.509	0.040	1.752
Non-life insurance premiums/GDP, %	23	0.782	0.349	0.274	1.372
Deposit insurance coverage/GDP	12	1.75	0.70	0.66	2.58
Stock market capitalization/GDP, %	22	35.9	26.6	0.0	100.8
Lerner Index	19	0.171	0.103	0.000	0.352
Private loans, % of GDP	22	0.274	0.159	0.086	0.589
Mutual funds, % GDP	13	0.237	0.162	0.068	0.571
Gross non-financial sector profit, % GDP	11	22.5	2.7	18.0	26.0
Net interest margin in the banking sector	19	5.17	2.25	1.34	12.87
Non-interest income/Total income of the banking sector	19	49.6	17.1	9.4	74.5
Overdue loans in total bank loans, %	17	6.64	3.93	2.40	17.30
Domestic corporate bonds/GDP, %	10	5.09	1.74	2.13	7.33
Pension fund assets/GDP	11	1.53	0.66	0.43	2.46
Profit (after tax)/aggregate assets of the banking sector	19	13.8	15.4	–1.1	67.2
Demographic					
Dependency ratio (seniors)	36	17.3	1.8	14.6	19.5
Dependency ratio (juniors)	36	28.0	5.4	20.4	34.4
People (25+) with secondary or higher education, %	35	95.7	3.3	91.3	99.1
Estimated life expectancy at birth, years	35	67.4	1.8	64.5	70.4
Institutional					
State control of capital flows index	35	1.99	2.24	0.00	6.15
Economic freedom index	20	5.75	0.95	4.33	6.67
Financial freedom index	23	39.6	13.6	30.0	70.0
Court independence index	20	3.39	0.72	2.50	5.18
Political stability index	17	–1.022	0.223	–1.462	–0.736
Property rights protection index	20	2.71	0.89	1.56	3.89
Rule of law index	17	–0.861	0.110	–1.126	–0.711
Government regulation quality index	17	–0.343	0.118	–0.564	–0.113

Table I.3. Private bank loans/GDP: 2SLS-BMA algorithm

No.	Regressors:	Ratio	Standard error	t-stat	PIP
	PIP ≥ 0.5:				
1	Dependency ratio (juniors)	0.018	0.004	4.360	1.00
2	GDP logarithm (current USD)	0.199	0.047	4.220	0.99
3	Financial freedom index	0.005	0.002	1.930	0.87
4	Natural resource revenue/GDP, %	0.010	0.007	1.450	0.76
	PIP < 0.5:				
5	Dependency ratio (seniors)	0.010	0.013	0.780	0.44
6	Legal framework and property rights index	0.021	0.030	0.720	0.40
7	Costs/incomes of the banking sector, %	–0.002	0.004	–0.570	0.30
8	GDP growth rate (per year, %)	–0.002	0.006	–0.340	0.15
9	Real exchange rate growth rate (%)	–0.002	0.006	–0.340	0.14
10	Political stability index	0.012	0.039	0.320	0.13
11	Economic freedom index	–0.004	0.013	–0.280	0.11
12	Rule of law index	0.016	0.062	0.250	0.10
13	Interest rate spread between loans and deposits, p.p.	0.001	0.003	0.250	0.10
14	Population	0.000	0.000	–0.200	0.07
15	Property rights protection index	0.001	0.008	0.180	0.07
16	Net interest margin/Banking sector assets (%)	0.002	0.008	0.200	0.07
17	Population coverage by credit bureaus, %	0.000	0.000	0.180	0.07
18	Inflation (CPI, %)	0.000	0.000	0.150	0.06
19	Corruption control index	0.004	0.028	0.130	0.06
20	Dummy variable of banking crisis (1=crisis, 0=no crisis)	0.003	0.022	0.160	0.06
21	Banking sector concentration (share of the top 5 banks in assets, %)	0.000	0.001	–0.100	0.06
22	Share of foreign banks' assets in banking sector assets (%)	0.000	0.001	0.110	0.05
	Constant	0.084	0.043	1.940	1.00
	Number of Observations	171			
	Number of models	2^{22} = 4 194 304			

Note: 2SLS – 2-Step Least Squares BMA – Bayesian Model Averaging PIP – Posterior Inclusion Probability, 2SLS-BMA — BMA algorithm

Table I.4. Private bank loans/GDP: measurement by cross-country data

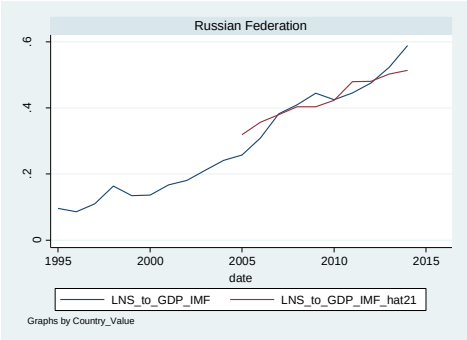
	BMA (base)	BMA (final)	BMA (final)		
			without FE	without Russia	up to 2011
	I	II	III	IV	V
1. Macroeconomic variables:					
GDP logarithm, current USD	0.283***	0.086***	0.112***	0.082***	0.146***
	(0.019)	(0.023)	(0.010)	(0.023)	(0.047)
Natural resource revenue/GDP, %	0.010***				
	(0.003)				
2. Financial variables:					
Banking sector concentration (share of the top 5 banks in assets, %)		0.003	0.007***	0.003	–0.007
		(0.002)	(0.001)	(0.002)	(0.006)
3. Demographic variables:					
Dependency ratio (juniors)	0.015***				
	(0.002)				
4. Institutional variables:					
Financial freedom index	0.003***	0.003***	0.011***	0.003***	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Population coverage by credit bureaus, %		0.002***	0.001	0.002***	0.001*
		(0.000)	(0.000)	(0.000)	(0.001)
Constant			–3.463***		
			(0.307)		
Number of Observations	1161	527	527	517	383
R^2 for sample	83%	96%	42%	96%	96%
R^2 for Russia	72%	89%	69%	92%	68%

Notes

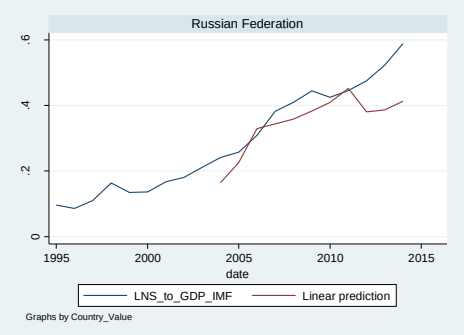
1. In specifications I-V the dependent variable is the ratio of long- to short-term liabilities of the banking system. All specifications are estimated by a two-step method of summarised moments (2-Step GMM) with or without fixed effects (FE, fixed effects). I is the model with explanatory variables selected under the BMA-algorithm (Bayesian Model Averaging) based on PIP ≥ 0.5 (posterior inclusion probability). II is the model I with an additional explanatory variable with PIP < 0.5 but improving the explanation quality of data for Russia. III is the model II without FE. IV is the model II measured without Russia and used for an out-of-sample forecast for Russia. V is the model II measured before 2007 and used for an out-of-sample forecast for 2008–2015.

2 ***, **, * – Estimated coefficient is statistically significant at 1%, 5%, and 10% levels, respectively. Robust standard errors of estimated coefficients are in brackets.

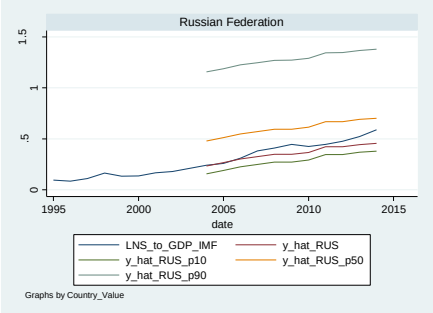
1) BMA (base)



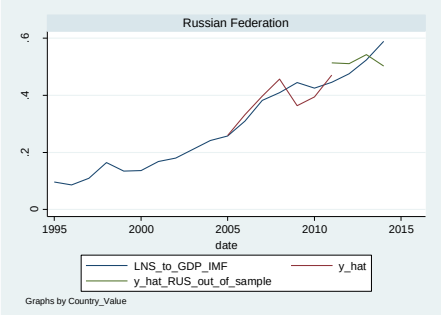
2) BMA (final)



3) BMA (final) without FE (*fixed effects*)



4) BMA (final) without Russia (*fixed effects uncertainty*)



5) BMA (final) up to 2011 (*out-of-sample forecast*)

Figure I.3.1 Private bank loans/GDP.