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MODELLING THE DEMAND AND SUPPLY OF LOANS IN BULGARIA

Econometric modelling of demand and supply of bank loans in Bulgaria, introduced in this scientific paper, can help not only decision makers in the public and private sector, but can also support researchers and analysts in revealing the determinants of lending, being a major factor for the economy dynamics. The bank loans' demand and supply determinants are parameterized using the Johansen (1988) and the two-step Engle and Granger (1987) approaches to cointegration and error correction dynamic modelling. The main results reveal that the demand for loans in the long run depends mainly on the economic activity, capital inflows, deposits and loans to deposits ratio of the non-financial sector. In the short term these determinants are complemented by imports of goods and services. The supply of loans, however, in all time frames is influenced primarily by changes in banks' liquidity, net interest income, capital adequacy and the producer prices dynamics, but in the long term consumer prices, market concentration and foreign ownership are supplementing the supply of loans' drivers.

JEL: C32; E32; E44; E47; E51; G01

Lending dynamics in Bulgaria has been much intense in the period from the onset of the new millennium and until the latest global financial crisis spreads out to the Bulgarian economy in late 2008. The rates of credit growth exceed by several times the rates of real GDP growth. During this prosperous time span the Bulgarian economy experienced an economic boom, with personal income, overall wealth, foreign investments, imports of final consumption and investment goods, gross capital formation, exports and employment increasing year after year. The economy grew in line with overall positive global trends at that period. Bank privatization and penetration of foreign ownership in the financial system helped local banks to improve their effectiveness, and also are among the main factors for capital inflows and their intermediation in the economy. During the 2000-2008 period commercial banks have improved their operative and financial performance by much. However, robust economic growth and parallel bank indicators improvement is accompanied by a severe system risk accumulation, such as increased internal and external indebtedness. Systemic risk have materialized with the beginning of the 2008 global financial crisis, when internal and external demand decreased considerably, especially in the first quarter of 2009, and this process was "supported" by drying up of capital inflows. In the post-crisis period by the end of 2012 lending and general economic activity deteriorated, while banks started accumulating deposits, capital and liquid buffers. Banks are the main source of external financing for households and firms and it is natural consumption and investment activity to sharply decline, especially in periods of overall economic distress.[1]

[1] European commission data reveals that in 2013 there are about 280 thousand small and medium enterprises (SMEs), representing 98% of all active enterprises. SMEs are generating 63% of gross value added and 67% of employment.

In general in the capitalist economy banks decide which project to be financed, i.e. realized (e.g. Minsky, 1992). Schumpeter (1946) suggests that credit is crucial for better future, while Keynes (1936/1997 ed.) sees in credits the opportunity for the economy to run on a higher gear. According to Mishkin (1997) banks possess the necessary qualification and expertise to avoid and overcome asymmetric information effects. Bank loans can be the cure for the disease of insufficient economic activity and underdevelopment, however, bank loans can also lead to economic overheating and to systematic risk accumulation, and eventually can be a reason for financial bubbles and collapses.

The dual economic meaning of bank lending has been scrutinized over 150 years ago in the works of Bagehot (1873). This concept, especially the meaning of bank credits to the downward economic trend and their ability to build and burst economic bubbles, has been elaborated in the financial instability hypothesis by Minsky (1980; 1992) and in the debt-deflation theory of the great depression by Fisher (1933).

Robinson (1952) is building more conservative approach to the financial sector, clarifying that the real economy is leading the tendencies in the financial sector. Lucas (1972, 1988) goes even further, assuming, that the financial institutions play a restrictive role in economic development, and bank lending has a negative effect on growth.

Banks can promote growth through financing investment and consumption through their loans, but can be also seen as an instability factor with the ability for imbalances buildup. Namely the dual meaning and the importance of the bank lending to the local economy motivates this research (the ratio of non-financial private sector bank loans to GDP grew from 12% in 2000 to 69.8% in 2008 and declined to 69.3% in 2012), aiming to decipher the factors influencing the bank lending to the non-financial private sector dynamics on the demand and supply side. Defining the main lending parameters can help decision makers from the public and private perspective, analysts and researchers as well.

Bulgarian loan demand and supply determinants (a brief literature review)

In last two decades the number of research on the problems of credit demand and supply rose progressively. This fact confirms the theoretical and applicable dimensions of the problem, but also stresses the importance of the topic nowadays. Different approaches and factors inferred in empirical research reveal the inability of a single solution.

Among the first authors to decipher the credit demand and supply are Bernanke and Blinder (1988). Their paper “Credit, Money, and Aggregate Demand” unleashed a wave of new research on the matter. Bernanke and Blinder (ibid.) reveal that credit demand is in positive association with economic activity, past lending patterns and the price level, while the spread between lending and deposits rates affects negatively the dependent variable.

As opposed to credit demand credit supply is to bigger extent dependent on central banks' policy (capital adequacy, liquidity, minimal reserves required, reserves on marginal lending growth rates, open market operations, collateral requirements, etc.) The pass-through effect of monetary policy through commercial banks on the real economy is even defined as a black box, e.g. by Bernanke and Gertler (1995). Bernanke and Blinder (1988) conclude that bank loans supply to bigger extent is influenced by the risk appetite measure, as the loans to total assets ratio is, by bank reserves and is negatively associated with yield to maturity of bonds.

Concentrating on the bank lending in Bulgaria, it has been analyzed in the works of Hristov and Mihailov (2001), Frömmel and Karagyozova (2008), Erdinc (2009), Stattev (2009) and not so many other authors. The analysis of Bulgarian lending determinants is also performed by Égert et al. (2007), Guo and Stepanyan (2011) and Peshev (2014) within a more complex analysis covering more countries.

Hristov and Mihailov (2001) using disequilibrium model for assessing the functions of demand and supply of credit and market disequilibrium, are not only deriving determinants but also analyze whether credit supply or demand factors dominate the market and in which period, hence the dynamics. Authors infer that credit demand is a function mainly of general economic variables and interest rates while supply depends to a large extent on bank- specific factors, revealing risk aversion and ability to lend, such as credit capacity (ratio based on the share of liquid assets in total assets) and net interest margin. From 1997 to early 2000, banks accumulate reserves and investments in foreign securities. Their behavior was caused by the severe local financial crisis in the nineties. In the period from early 2000 to late 2001, the demand for credit is greater than supply and to that moment banks' capacity to lend is large.

According to the empirical study of Frömmel and Karagyozova (2008) property prices are in a strong positive association with the demand for credit by households and businesses in the long term. In the short term, however, the change in deposits and net foreign assets of commercial banks have a greater contribution to explaining the lending depression, but due to the short time lag the conclusions could not be considered reliable enough.

As part of a large-scale study of the relation real - financial sector in Bulgaria Stattev (2009) demonstrates that since 1997 private and domestic credit have a positive impact on economic activity however, there is a long-term two-way causality, i.e. economic growth causes loan growth, but also is caused by the growth in loans.

Erdinc (2009) conducted panel econometric study of 30 Bulgarian commercial banks. According to him in the period of 1999 – 2006 they motivated to the largest degree the supply of loans with their capital adequacy, lending in the previous periods, liabilities and market share. The hypothesis is confirmed, that loan supply mostly depends the specific bank indicators, i.e. on the state of bank balances.

Valev (2008) presents a study from a different point of view, in which he classifies and synthesizes the results from interviews with bank managers in

Bulgaria in 2006. From the results it is clear that Bulgarian banks lack sufficient control of credit risk and long-term vision, although their behavior does not differ much from international practice to pursue short-term results at the expense of increased risk. It turns out that loan officers are occupied mainly with new credit and the pursuit of market share, rather than tracking the quality of already extended loans. Banks are forced to work in conditions of significant information asymmetry. The discrepancy between the actual financial situation of firms and households and presented by them for tax purposes is great, which indicates a high share of the informal economy. It is quite challenging for a credit institution to lend effectively and soundly in the environment of large informal sector, credit boom, and banks striving to reach a higher market share.

Égert et al. (2007) study the private credit in 43 OECD countries and emerging economies of Asia, America and Central and Eastern Europe (CEE), including Bulgaria. The conclusion of the CEE countries and Bulgaria in particular is that the economic activity and prices appear to be essential factors for private sector lending. As expected credit demand increases with increasing economic activity and reducing consumer prices.

Emphasizing on the supply-side of bank loans Guo and Stepanyan (2011) model lending in 38 emerging economies, including Bulgaria. For the CEE countries before the crisis credit growth depends mainly on external liabilities, while in the post-crisis period, the capital outflows are a major contributor to the depressive state of the lending that is also supported by weak internal demand. They also conclude that bank deposits, consumer prices and GDP also have considerable and proportional impact on credit dynamics.

Data and methodology[2]

The empirical analysis is based on quarterly data from the first quarter of 2000 to the fourth quarter of 2012 (each time series consists of 52 units). This time span is sufficiently remote from the financial crisis in the second half of the 90s of last century and so that the Bulgarian banking system has the characteristics of modern banking systems, which is related to the privatization process and imported know-how. The analyzed time period also covers a full economic cycle, consisting of a period of strong economic growth, deep recession and a period of gradual economic recovery. Thus makes it possible to check the ability of the same factors to motivate loan dynamics in the different phases of the business cycle.

Different macroeconomic and bank-specific macroeconomic variables have been used in the analysis, obtained through the public-available data from statistical databases of Bulgarian National Bank, National Statistical Institute and European Central Bank.

[2] In the analysis following terms are used interchangeably: credit, loans, bank credit, bank loans, private sector credit/loans, loans to the private non-financial sector, credit to the non-financial sector. All of them have the same meaning, i.e. households and non-financial bank loans, unless other specified.

In this paper dynamic error correction models under the approaches of Engle and Granger (1987) and Johansen (1988, 1991) has been used for determining the long- and short-term relations between bank loans (the dependent variable) and regressors (explanatory variables). Employing both approaches has the only aim for achieving confirming solid results and implications.

Bank loan demand and supply functions are from the following form:

(1) $Loans_D = f(r, p, EA, Supplementary)$

(2) $Loans_S = f(r, p, BS, Supplementary)$, where:

Loan is the dependent variable with subscript D for demand and S for supply (stock value of loans to the non-financial private sector, new business on loans to the non-financial private sector, or domestic credit, or one of the three measured as ratio with GDP);

r **–** interest rates on loans and/or deposits;

p **-** inflation (consumer or producer price index);

EA **–** economic activity indicators;

BS **–** bank specific indicators (e.g. liquidity, capital adequacy, net interest revenues, etc.);

Supplementary – other variables (dummy variables, foreign ownership in the banking sector, bank concentration and other variables not included in above-classified).

Either one of the approaches can be summarized to an equation of the following form:

(3) $\Delta Y_t = \alpha + \beta.\Delta Y_{t-m} + \gamma.\Delta X_{t-n} + \delta.ECT_{t-1} + \zeta.Trend + \eta.Exogs + u_t$, where:

α is constant (a drift), if the model is following a random walk path without a drift, then its value is zero;

ΔY_t – first differences of the dependent variable;

ΔY_{t-m} – lagged first differences of the dependent variable, with the minimum lag length being able to take the value of one;

ΔX_{t-n} - first differences of the explanatory variables, with the minimum lag being able to take the value of zero. However, under the Johansen cointegration approach the minimum lag is set to one, i.e. m and n≥ t-1.;

ECT_{t-1} – an error correction term, possessing a negative sign of the coefficient representing the error correction mechanism towards a long-term equilibrium of the model with each additional lag;

Trend – deterministic trend (if included);

Exogs – dummy variables and other exogenous variables;

u_t **–** white noise term.

The econometric evaluation of loan demand and supply functions follows the following path:

First, A data selection process is underway, with selecting variables being deflated by the GDP deflator or by the CPI, and seasonally adjusted through the

Census X12 software (interest rates and ratio with GDP in the denominator variables are not deflated).

Second, Augmented Dickey-Fuller and Philips-Perron unit root tests are performed, showing that all of the variables are non-stationary in their levels I(0) and stationary in their first differences I(1).

Third, A cointegration test is performed. Under the approach of Engle and Granger the residual of level variables (representing the long-term relation, i.e. the cointegration equation) is tested for stationarity via the Augmented test of Dickey-Fuller test and the critical values of Davidson and McKinnon (1993)**.** Under the approach of Johansen a standard approach, implemented in the Eviews econometric software has been applied.

Fourth, Building error correction models. Models with higher explanatory power has been summarized, with the selection process depending on highest R^2 adjusted, t- and F-stat, and on lowest Schwarz, Akaike and Hannah-Quinn information criteria.

Fifth, Individual and group coefficient tests are performed. The residual of the error-correction models are tested for serial correlation, normality of the distribution and heteroscedasticity.

Results

In the following paragraphs results from evaluation of the demand and supply function of bank loans are analyzed, with being commented the demand and supply results under the both approaches, i.e. the two-step Engle and Granger (1987) approach and the Johansen (1988, 1991) approach. Models have been arranged in tables by their explanatory power in terms of R^2 adjusted. Econometric models discussed are presented at the end of the paper in Table 1 to 4 in the appendix section (see the Annex) The upper part of each table reveals the dynamic error-correction model, while at the bottom of each table cointegration equations/ vectors have been revealed.

In all demand and supply models the error correction term is in negative association with the regressed variable, thus reducing the model imbalances with each additional lag.

Loan demand models

Five models of loan demand under the two-step Engle and Granger (ibid.) approach and three under the Johansen (ibid.) cointegration approach has been presented and analyzed. All econometric results are revealed in tables in the appendix section. All eight models have R^2 adjusted coefficient in the range of 0.56 - 0.98, i.e. over 50% of the variation in the dependent variable is explained by so structured models. In some models different indicators for bank loans, i.e. the dependent variable, are used.

Economic activity is the biggest contributor to the variation of the demand for loans in the long term, and is having a strong positive effect on the dependent

variable. These results, however, don't negate an opposite causal relationship, as found in the monographic work of Stattev (2009). In the short term, economic activity is in a positive relationship with the dependent variable in lag zero, while lagged gross domestic product and gross value added with lag bigger or equal to one quarter are having a negative impact on the dependent variable. It is a common pattern short-term and long-term behavior of households and non-financial firms to be motivated in a different manner by the same factors. It can be assumed that after an positive change in GDP in past one/ two/ three quarters economic agents are anticipating a slowdown and diminish their short-term demand for bank loans.

Interest rates on loans and interbank lending rates are having negative impact on long-term demand for loans, despite it is a smaller one than the economic activity, concluding it from the size of the coefficient ceteris paribus. One should be aware that interest rate variability is much larger compared to economic activity for example. It is not an exception, in time of a shock interest rates to change by more than 100% (percentage change), making them one of the most import factors for lending dynamics. Short-term results reveal that interest rates in the current quarter have also negative effect on the dependent variable, while quarterly lags 1-5 are leading to mixed inferences because of their coefficients' sign variably, especially to the three models under the Johansen approach (Table. 2).

Interest rates on deposits of non-financial private sector are in positive association with loan demand in the long- and short term. Lower interest rates on deposits stimulate economic agents to finance their spending and investments through accumulated savings and other sources of financing, alternative to the bank loans. It can also be assumed that higher interest rates on deposits make economic agents more confident, and trigger the wealth effect, thus increasing loan-demand.

Price dynamics measures, such as harmonized consumer price index and producer prices index lead to smaller values of the dependent variable in the long term. Prices have negative effect on the demand for loans in the works of Égert et al. (2007), Blundell-Wignall and Gizycki (1992) and Pazarbasioglu (1996). Higher price level reduces the disposable income of economic agents, and eventually leads to lower demand for loans. Short-term results for the price dynamics variable are inconclusive.

Gross external bank indebtedness leads to smaller dependent values in the short- and long term, and vice versa. Foreign bank liabilities are a risk proxy and economic agents anticipate that each additional indebtedness to foreign creditors of banks, mainly parent banks, will trigger repayment of interest and principal in the future, thus making servicing of loans more expensive and leads to decreased demand for loans. According to a different interpretation higher external indebtedness for banks means improved conditions for alternative to bank loans financing.

In the long term loan demand depends negatively on capital inflow, with capital and financial account balance leading to smaller loan demand. The first assumption is that economic agents find alternative financing to bank loans provided by local commercial banks, even in the form of external investments in local debt and

equity. It is possible that in the long run households and firms reduce the demand for bank loans from rational motives, anticipating that a wave of capital inflows will be followed by an ebb of capital flows, urging banks to increase interest rates, because of their big share in capital flows. Short-term results are not so clear.

The bank deposits of the non-financial sector variable lead to larger loan demand, both in the short- and in the long run. Larger wealth, measured through bank deposits, stimulated economic agents' confidence and lead to higher demand for loans.

A risk proxy, such as the credit to deposit ratio, is in a strong positive association with the dependent variable in the long-term, while the short-term results are not so clear.

Johansen's models reveal that imports lead to lower dependent's value in the short-and long term. A possible explanation of this result is that drain of foreign exchange reserves out of the country, because of the imports of goods and services, reduces confidence of economic agents for their future ability to service loans, and eventually leads to lower credit demand.

House prices in the long run are in a negative association with loan demand, white the opposite relation is revealed in the short term. From a rational point of view economic agents reduce credit demand with higher house prices, probably because of future decline of the house prices with the downturn of the economy, making debt servicing more difficult. In the short term, however, higher house prices boost confidence of economic agents in relation to their ability to service principal and interest payments.

The Johansen's test suggests that only one cointegration equation per model exists in the three analyzed models (Annex, Table 2). Error correction terms are obeying the self-correcting mechanism of the model, being in a negative association with regressed variable.

The dummy variable for the crisis has a distinctive negative effect in the dynamic models of loan demand (Model E in Table 1 and Models A and B in Table 2), meaning that crisis has a strong negative effect by itself, without even showing its effect through a shock in other variables.

Loan supply models

Seven models of loan supply under the two-step Engle and Granger (1987) approach and three under the Johansen (1988, 1991) approach are suggested and analyzed in this paper, and are presented in details at the appendix section (Tables 3 and 4 in the Annex).

Net interest income is a strongly positive factor of credit supply in the short- and long run. Banks are gaining confidence when their main source of net income increase, as the net interest income is, which stimulates their loan supply.

Capital adequacy and liquidity are in a strong negative association with supply of loans in both time frames (see models B to G in Table 3 in the Annex), but

models B and C in Table 4 don't share the same long-term interdependency for the liquidity variable, having a positive meaning to the variation in the regressed variable in the long-term. Short-term results of both approaches, however, suggest that liquidity is in negative association with loan supply. An assumption, that banks increased their risk aversion, with litmus of the process being the increased capital adequacy and liquidity, is justified by lower supply of loans ceteris paribus induced by lesser willingness of credit institutions to take risks. Long-term results under the EG approach, presented in Table 3, are more viable, because of the greater explanatory power of the EG approach models. A positive interaction also has a its reasoning, especially when banks increase liquidity and capital adequacy in an anticipation of positive lending dynamics.

Higher interest rates on loans lead to higher supply of loans in the both time frames. Naturally, banks increase supply with higher prices, nevertheless, a negative association would be accepted as well if it were evident, with higher interest rates banks will suffer higher non-performing loans as well, due to asymmetric information reasons.

Lower consumer prices lead to lower supply of loans in the long term, and in the short-term the opposite relation is evident. In the long run higher consumer prices, especially when prompted by higher aggregate demand, lead to higher ability of debt servicing and banks are stimulated by positive economic dynamics and perspectives. In the derived by De Mello and Pisu (2009) and Guo and Stepanyan (2011) results inflation is also in a positive association with credit demand, supporting this paper' findings. Short-term results reveal that banks reduce supply of loans with higher consumer prices, because of the transfer of real wealth from creditors to debtors. Producer prices also are in negative association with credit supply in both time frames, as suggested by the Johansen cointegration approach models in Table 4. The same logic applies, for the transfer of real wealth from lenders to debtors.

In the long run banks are guiding their loan supply in the opposite direction of bank concentration, measured through a Herfindahl-Hirshman index for the assets of biggest 5 banks and by the market share of the assets of biggest five banks. With banks getting bigger they start competing less with other banks and decrease their supply of loans, respecting more their efficiency and profitability. In the short term banks have contrarian behavior, i.e. larger market share leads to additional supply of loans, with banks looking for even bigger market share through their lending and eventual assets increase.

Foreign ownership of banking assets leads to higher supply of loans in the long-run, probably, because of the imported and implemented know-how. Foreign ownership immunizes banks from relationship banking and reduces this type of risk considerably, however increases the volatility resulting from global economic tendencies.

Gross external debt leads to higher bank lending in the long run. Banks external debt is having considerable share of the gross external debt, and when parent banks supply their local subsidiaries with inexpensive and abundant funds

the only thing left for local banks is to increase their lending. Higher gross indebtedness means also that it is easier for local companies, banks inclusive, to accumulate funds for lending, and usually gross external debt increase during good economic times, signaling that banks have better options to manage their liabilities.

Non-performing loans lead to smaller bank lending in the long term. Banks decrease their supply of loans when their assets quality deteriorates.

The construction index is in positive long-term association with supply of loans. Higher construction activity signals more quality security and guarantee for funds lent and usually is associated with higher value of mortgages.

Credit to deposits ratio is a risk appetite proxy, as in the credit demand models, and in the long run lead to higher supply of loans, signaling lower risk aversion, while short-run results are inconclusive.

Higher/lower values of bank deposits, naturally, lead to higher/lower supply of loans. When banks potential lending is better secured with funds (deposits) banks are getting more inclined to lend.

Loan supply is also in positive relation with its past values, meaning banks are acting pro-cyclically.

The Johansen cointegration test suggest that two cointegrating equations exist in each of the three models build under the Johansen approach. The coefficient of the first error correction term, i.e. ect(-1), is having a negative sign and larger value compared to the coefficient of the second error-term ect(-2) (Table 4 in the Annex), thus fulfilling the error correction mechanism with each additional lag passed.

As in the demand models the dummy variable has strong negative effect of the supply of banking loans.

Stability of the models

All of the models discussed and presented in tables 1-4 pass successfully the tests for normality, but model C (Table 3) fail to accept the Jarque-Bera normality test's null hypothesis and in model G (Table 3) it is accepted with a low probability of 12%. However, both type of models pass the other stability tests and bring valuable information. Tests on the residuals confirm the absence of serial correlation and heteroscedasticity, with Breusch-Godfrey serial correlation LM test, Correlogram, Q-statistic of Ljung and Box, and DW stat are considered for assuming that residuals are homoscedastic, while ARCH test and White test are used for testing for heteroscedasticity. If some of the serial correlation and heteroscedasticity tests fail to reject the null hypothesis additional tests are performed.

In model B and C in Table 1 four coefficients are statistically significant with p-values between 9 and 13%. In model A and F in Table 3 three coefficients are significant with p-value at 6, 13 and 13%. P-values of the rest of the coefficients' p-values are below 5%. However, Wald tests with a null hypothesis all of the coefficient in a single model to be equal to zero is rejected much below 5% threshold.

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This paper reveals the complexity of factors which in a cycle of booming economy followed by a recessionary environment influence the demand and supply of loans in Bulgaria in the period between 2000 and 2012. Economic activity and interest rates are among the strongest factors for the credit demand dynamics, while net interest income, capital adequacy and liquidity are among the biggest contributors to credit supply variation. However, different set of factors in addition to these benchmark demand and supply factors are justified by the results.

The empiric results demonstrate, that the 2008 crisis has a significant direct impact on demand and supply, and indirect influence through the changes in other factors.

Consumer prices, house prices, capital flows and foreign gross bank indebtedness are among the other factors driving the credit demand dynamics. The loan supply is also driven by market concentration, foreign ownership, non-performing loans, external bank indebtedness, civil construction, bank deposits, risk taking proxies, interest rates on loans

A pro-cyclical patterns of credit demand and supply are revealed, driven by general economic factors on the demand side and by profitability, access to domestic and international financing and by past credit supply values on the supply side. Lending dynamics has the potential to amplify economic cycles and to be an important factor for economic growth, which can be verified in a separate research in the future.

A coordinated anticyclical policy of monetary and other economic authorities is need for limiting the process of imbalances generation and accumulation and for easier overcoming external economic shocks.

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Annex

Table 1

Two-step Engle and Granger method demand for loans models

		MODEL A		MODEL B		MODEL C		MODEL D		MODEL E	
Error correction dynamic model	Regressed variable →	Δ(log(loans))		Δ(log(loans))		Δ(log(loans))		Δ(log(loans))		Δ(log(loans))	
	Regressors ↓	Coef	p-val	Coef	p-val	Coef	p-val	Coef	p-val	Coef	p-val
	constant	0.01	0.00			0.02	0.08	0.08	0.00		
	ect(-1)	-0.37	0.00	-0.64	0.00	-0.14	0.05	-0.15	0.03	-0.64	0.00
	Δ(log(yr))	0.84	0.00	0.37	0.11	0.59	0.13	1.63	0.00	3.33	0.00
	Δ(rl)									-0.09	0.00
	Δ(rd(-1))							0.08	0.00		
	Δ (log(pi(-3)))	-0.31	0.02								
	Δ(cfged_bkstoy(-2))									-2.72	0.01
	Δ(cfbp_kfatoy)							1.07	0.00		
	Δ(cfbp_kfatoy(-3))							-0.55	0.07		
	Δ(ctod)	0.86	0.00	0.85	0.00						
	Δ(ctod(-1))			-0.25	0.03						
	Δ (log(dep))	0.67	0.00	0.49	0.00	0.72	0.00				
	Δ(log(loans(-1)))			0.21	0.01						
	Δ(log(loans(-2)))			0.09	0.11	0.21	0.02				
	Δ(log(loans(-3)))							0.24	0.07		
	trend					0.00	0.09	0.00	0.00		
	dummy									-0.04	0.09
	R^2 adj.	0.92		0.87		0.72		0.62		0.58	
	F-Stat	115.72		76.60		26.30		10.75		14.95	
	DW stat	1.69		1.90		2.1		1.93		1.96	
	Breusch-Godfrey SC LM	51% (6 lags)		63% (4 lags)		29% (6 lags)		62% (5 lags)		40% (4 lags)	
	ARCH Test	75% (6 lags)		12.7% (5 lags)		11% (6 lags)		12% (12 lags)		17% (4 lags)	
	Jarque-Bera Test	68%		35%		33%		83%		66%	
Cointegration equation (ECT)	Regressed variable →	log(loans)		log(loans)		log(loans)		log(loans)		log(loans)	
	Regressors ↓	Coef	p-val	Coef	p-val	Coef	p-val	Coef	p-val	Coef.	p-val
	constant	-7.03	0.00	-10.39	0.00	-5.61	0.09	-38.33	0.00	-39.23	0.00
	log(yr)	1.53	0.00	0.80	0.00	1.24	0.01	5.17	0.00	6.46	0.00
	rl	-0.01	0.01	-0.01	0.02			-0.03	0.04	-0.10	0.00
	rd							0.03	0.05		
	log(p)									-2.59	0.00
	log(pi)	-0.87	0.00	-0.74	0.00	-1.56	0.00				
	ctod	0.84	0.00	0.90	0.00						
	log(dep)	0.54	0.00	0.42	0.00	1.4	0.00				
	cfged_bkstoy									-1.91	0.00
	cfbp_kfatoy							-2.59	0.00		
	trend	0.02	0.00	0.02	0.00	0.02	0.00				

Table 2

Johansen cointegration method demand for loans models

		MODEL A		MODEL B		MODEL C	
Error correction dynamic model	Regressed variable →	Δ(log(loans))		Δ(log(loans))		Δ(log(loans))	
	Regressors ↓	Coef.	p-val	Coef	p-val	Coef	p-val
	constant	0.35	0.00	0.17	0.00	0.19	0.00
	ect(-1)	-1.10	0.00	-0.51	0.00	-0.15	0.00
	Δ(log(yr(-1)))			-4.47	0.00	-2.00	0.00
	Δ(log(yr(-2)))			-4.25	0.00		
	Δ(log(yr(-3)))			-1.27	0.05		
	Δ(log(yr(-5)))					-1.67	0.00
	Δ(log(gvar(-1)))	-3.25	0.00				
	Δ(log(gvar(-2)))	-2.64	0.01				
	Δ(log(gvar(-3)))	-2.88	0.00				
	Δ(log(impr(-1)))					-0.29	0.00
	Δ(log(impr(-2)))					-0.39	0.00
	Δ(log(impr(-3)))					-0.35	0.00
	Δ(log(impr(-4)))					-0.14	0.06
	Δ(rl(-1))	-0.06	0.03	0.02	0.03	0.02	0.01
	Δ(rl(-2))			0.02	0.07		
	Δ(rl(-3))	0.07	0.03	0.04	0.00		
	Δ(rl(-4))	0.08	0.03				
	Δ(rl(-5))					0.02	0.01
	Δ(rd(-3))			-0.15	0.00		
	Δ (log(pi(-3)))					0.92	0.03
	Δ(log(hpr(-1)))	1.15	0.01	1.16	0.00		
	Δ(log(hpr(-3)))			0.45	0.02		
	Δ(log(hpr(-4)))	1.86	0.00				
	Δ(log(loans(-3)))	0.29	0.01			-0.27	0.04
	Δ(log(loans(-5)))	-0.16	0.10				
	trend					0.00	0.00
	dummy	-0.80	0.00	-0.15	0.00		
	R^2 adj.	0.71		0.69		0.56	
	DW stat	1.62		2.41		2.33	
	ARCH Test	92% (8 lags)		0.49% (6 lags)		96% (8 lags)	
	Jarque-BeraTest	57%		71%		20%	
CI vector (ECT)	ect1(-1)	log(loans(-1)) - 4.55*log(gvar(-1))*** + 0.06*rl(-1)*** + 0.4*log(hpr(-1))*** + 30.63		log(loans(-1)) - 7.77*log(yr(-1))*** + 0.12*rib(-1)*** + 0.49*log(hpr(-1))*** + 0.05*rl(-1)*** - 0.13*rd(-1)*** + 0.03*@trend*** + 58.57		log(loans(-1)) - 2.56*log(yr(-1))*** + 0.09*rl(-1)*** - 3.71*log(impr(-1))*** + 3.58*log(pi(-1))*** - 0.01*@trend***	

Table 3

Two-step Engle and Granger method supply for loans models

		MODEL A		MODEL B		MODEL C		MODEL D		MODEL E		MODEL F		MODEL G	
Error correction dynamic model	Regressed variable →	Δ(log(loans))		Δ(log(loans))		Δ(log(loans))		Δ(log(loans))		Δ(log(loans))		Δ(log(loans))		Δ(log(loans))	
	Regressors ↓	Coef	p-val	Coef	p-val	Coef	p-val	Coef	p-val	Coef	p-val	Coef	p-val	Coef	p-val
	constant	0.02	0.04	0.01	0.03	0.06	0.00	0.02	0.02			0.01	0.13	0.01	0.04
	ect(-1)	-0.72	0.00	-0.76	0.00	-0.79	0.00	-0.53	0.00	-0.69	0.00	-0.46	0.00	-0.52	0.00
	Δ(log(netii))			0.48	0.00	0.35	0.00	0.49	0.00	0.46	0.00			0.32	0.01
	Δ(cap)			-3.46	0.00			-3.46	0.00	-4.47	0.00				
	Δ(liq)			-1.07	0.00	-0.85	0.00	-0.85	0.00	-0.99	0.00	-0.83	0.00		
	Δ(log(liq))													-0.85	0.00
	Δ(ctod)	0.72	0.00												
	Δ(ctod(-1))	-0.67	0.00												
	Δ(rib)											-0.02	0.06		
	Δlog(log(p(-1)))					-1.13	0.00								
	Δ(log(loans(-1)))	0.26	0.06												
	Δ(log(loans(-2)))	0.31	0.00	0.21	0.02			0.21	0.03	0.29	0.00			0.26	0.01
	Δ(log(dep_tl))											0.45	0.00		
	d(ms5(-1))					1.06	0.00								
	d(ms5(-2))					1.16	0.00								
	dummy	-0.02	0.13			-0.03	0.02								
	R^2 adj.	0.73		0.72		0.68		0.68		0.63		0.53		0.52	
	F-Stat	22.44		26.10		13.49		20.96		23.62		15.34		13.97	
	DW stat	2.04		1.98		1.91		1.89		1.94		1.98		2.04	
	Breusch-Godfrey SC LM test	31% (4 lags)		90% (4 lags)		44% (4 lags)		96% (4 lags)		99.7% (9lags)		78% (4 lags)		94% (4 lags)	
	ARCH Test	22% (4 lags)		75% (4 lags)		99% (4 lags)		12.5% (4 lags)		94.6% (4 lags)		26% (4 lags)		16% (4 lags)	
	Jarque-BeraTest	34%		31%		0%		89%		99%		26%		12%	
Cointegration equation (ECT)	Regressed variable →	log(loans)		log(loans)		log(loans))		log(loans)		log(loans)		log(loans)		log(loans)	
	Regressors ↓	Coef	p-val	Coef	p-val	Coef.	p-val	Coef	p-val	Coef	p-val	Coef	p-val	Coef	p-val
		3.73	0.00	6.56	0.00	-7.44	0.00	6.58	0.00	8.13	0.00	-7.68	0.00		
	log(netii)	0.28	0.00	0.40	0.00	0.57	0.00	0.62	0.00	0.44	0.00			0.49	0.00
	cap			-1.59	0.01			-2.66	0.00	-5.54	0.00				
	liq			-1.71	0.00	-1.44	0.00	-1.61	0.00	-1.70	0.00	-0.77	0.00	-0.74	0.00
	ctod	0.47	0.00												
	bdtof_h_tl	-0.72	0.00												
	rl											0.02	0.01		
	rib							0.02	0.01			-0.05	0.00	-0.02	0.02
	log(p)	0.76	0.00			0.87	0.00							1.55	0.00
	log(constr)			0.28	0.00										
	log(extdtoy)									0.69	0.01				
	log(dep_tl)											0.69	0.00		
	ms5					-0.58	0.01								
	trend	0.02	0.00	0.02	0.00			0.02	0.00	0.01	0.00				

Table 4

Johansen cointegration method supply for loans models

		MODEL A		MODEL B		MODEL C	
Error correction dynamic model	Regressed variable →	Δ(log(loans))		Δ(log(loans))		Δ(log(loans))	
	Regressors ↓	Coef.	p-val	Coef.	p-val	Coef.	p-val
	constant	0.30	0.00	0.23	0.00	-0.16	0.00
	ect1(-1)	-0.60	0.00	-0.70	0.00	-0.67	0.00
	ect2(-1)	0.43	0.02	0.50	0.00	0.34	0.00
	Δ(log(liq(-1)))	-1.75	0.00	-1.59	0.01	-1.46	0.02
	Δ(log(pi)(-1))	-2.08	0.00				
	Trend					0.01	0.00
	Dummy	-0.73	0.00	-0.60	0.00	-0.59	0.00
	R^2 adj.	0.64		0.63		0.60	
	DW stat	1.84		1.76		1.76	
	Breusch-Godfrey SC. LM test	41% (4 lags)		42% (4 lags)		32% (4 lags)	
	ARCH Test	67% (4 lags)		81% (4 lags)		71% (4 lags)	
	Jarque-BeraTest	37%		77%		79%	
CI vectors (ECT)	ect1(-1)	log(loans(-1)) - 0.52*log(netii (-1))*** + 2.13*log(pi(-1))*** - 0.074*@trend*** - 12.8		log(loans(-1)) - 1.05*liq(-1)* + 0.001*hhi5(-1)*** - 2.9*fown(-1)*** - 0.05*@trend*** - 4.47		log(loans(-1)) - 0.31*liq(-1) + 2.32*ms5(-1)*** - 2.1*fown (-1)*** - 0.02*@trend - 6.52	
	ect2(-1)	liq(-1) + 0.084*log(netii(-1)) + 1.17*log(pi(-1))*** - 0.015*@trend* - 5.99		log(netii(-1)) - 0.74*liq(-1)*** - 0.001*hhi5(-1) - 4.76*fown (-1)*** - 0.027*@trend*** - 1.12		log(netii(-1)) - 0.80*liq(-1)*** - 0.41*ms5(-1) - 4.86*fown (-1)*** - 0.02*@trend - 1.03	

Note on Tables 1-4:

*** **-** p-value<0.01;** - p-value 0.01-0.05;* - p-value 0.05-0.1; *log* - natural logarithm; *constant* – constant(drift); *trend* – time trend; *ect* – error correction term (there are two ECTs in Table 4); Δ – first differences operator; *(-1), (-2), (-n)* – number of lags in quarters; *dummy* – latest global financial crisis dummy variable; *loans* - a loans variable (the dependent (regressed) variable); *y* – real GDP; *gvar*- real gross value added; *impr*- real value of quarterly imports; *p* – harmonized consumer prices index; *pi* – producer prices index; *rl* – long- and short-term interest rates on non-financial private sector loans (weighted average); *rd* – long- and short-term interest rates on non-financial private sector deposits (weighted average); *rib* –weighted average of denominated in BGN and foreign currency quarterly interbank interest rates; *ctod* – non-financial private sector loans to deposits ratio; *dep* – non-financial private sector deposits (stock value); *extdtoy* – gross external debt to GDP ratio; *cfbp_kfatoy* – capital and financial account to GDP ratio; *cfged_bkstoy* – gross external bank debt to GDP ratio; *bdtof_h_tl* – non-performing private non-financial sector loans overdue by 90 day to gross loans ratio; *constr* – construction index; *netii* – net interest income; *cap* – equity to assets ratio; *liq* – liquid assets to total assets rato; *hhi5* – Herfindahl-Hirschman index for the biggest 5 banks by assets size; *fown* – share of foreign ownership of assets; *ms5* – market share of the assets of biggest 5 banks.

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