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Macroeconomic and bank-specific determinants of bank loans to private sector: The case of North Macedonia

Abstract: *The main aim of this paper is to identify the macroeconomic and bank-specific determinants of bank loans to private sector in North Macedonia during the period from Q4 2007 to Q3 2019. Economic growth theory and empirical studies indicate that bank loans to private sector is an important factor of economic growth, which is especially pronounced in countries where the financial system is dominated by banks. For that purpose, we develop a single-country regression analysis with the ARDL model using quarterly data to examine the effect of the identified determinants from both the demand and supply sides. The results show that deposits and bank efficiency have the most significant impact on bank loans to private sector, while non-performing loans negatively affect bank loans growth to private sector.*

Keywords: *bank loans to private sector, economic growth, ARDL model, North Macedonia*

Makroekonomske i specifične bankarske determinante kreditiranja privatnog sektora: Slučaj Severne Makedonije

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Apstrakt: *Glavni cilj ovog rada je da se identifikuju makroekonomske i specifične determinante kreditiranja privatnog sektora u Severnoj Makedoniji u periodu od Q4 2007 do Q3 2019. Teorija ekonomskog rasta i empirijske studije ukazuju da su krediti privatnog sektora važan faktor ekonomskog rasta, što je posebno izraženo u zemljama u kojima finansijskim sistemom dominiraju banke. U tu svrhu sprovedena je regresiona analiza za jednu zemlju sa ARDL modelom, koristeći kvartalne podatke, kako bi se ispitao efekat identifikovanih determinanti sa strane potražnje i ponude. Rezultati pokazuju da depoziti i efikasnost banaka imaju najznačajniji uticaj na kredite privatnih banaka, dok nenaplativi krediti negativno utiču na rast kredita privatnih banaka.*

Ključne reči: *kredit privatnog sektora, ekonomski rast, ARDL model, Severna Makedonija*

1. Introduction

This paper examines macroconomic and bank-specific determinants that impact bank loans to provate sector in North Macedonia. The empirical literature on the finance-growth nexus is abundant and indicates that financial activities have a significant positive impact on economic growth (e.g. King & Levine,1993; Levine, 1997; Levine & Zervos, 1998; Levine, Loayza & Beck, 2000). Furthermore, Hausman et al. (2006) explain that the limited access to finance and high cost of finance for private sector as a result of undeveloped and uneffecient financial sector negatively affect investment and economic growth.

Taking into cosidaration the importance of financial activities for economic growth, the paper explores the determinants of private sector credit in North Macedonia as a country with bank-specific financial system. In order to identify the determinants, a single-country regression analysis with the ARDL model is conducted to study both the demand and supply sides during the period from Q1 2007 to Q3 2019. The analysed period was marked with different episodes of macroeconomic developments that greatly impacted the trajectory of private sector credit, beginning with a credit crunch as a result of the financial crisis in the late 2000s, through gradual recovery during the period with very low interest rates during the 2010s and ending with an inflation surge during the early 2020s.

Our intent is to test two main hypotheses regarding the nature of the identified variables. Firstly, economic growth has positive impact on private sector credit as it leads to higher economic development and favourable affects the development of the financial system, whereas the inflation rate adversely affects private sector credit through raising interest rates and restraining

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financial activities. Secondly, the robustness of the financial system as measured through bank performance positively affects private sector lending as well-standing banks would be more prone to engage in excessive lending.

The paper enriches the existing economic literature in multiple ways. Firstly, it connects the macroeconomic with bank-specific indicators in a comprehensive analysis of credit growth, which allows one to estimate the future bank crediting trajectory based on the movements in various macroeconomic and bank-specific indicators. Secondly, the analysed period captures different episodes of macroeconomic and financial developments, which gives a better overall image about the long-run movement of bank crediting. Thirdly, it employs a model that enables to get information about the intensity of the effect by its distribution over different periods. The rest of the paper is structured in the following way. Section 2 makes a brief literature review related to financial intermediation determinants. Section 3 sheds light on the main developments and trends regarding credit growth and financial development in North Macedonia. The empirical analysis is elaborated in Section 4, including the explanation of the models, data, as well as the results and discussion, while Section 5 presents and discusses the main results from the analysis. Section 6 concludes the paper with some general remarks about the analytical approach.

2. Literature review

There are many empirical studies that have found a positive relationship between financial intermediation and economic growth for different countries and regions (e.g. King & Levine,1993; Levine, 1997; Levine & Zervos, 1998; Levine, Loayza & Beck, 2000). For instance, Hoffman (2004) finds a significant positive relationship between bank credit and real GDP for 16 industrialised countries using a cointegrating VAR model, while Cottarelli et al. (2005) identify long-run relationships between bank loan to the private sector and real GDP using a panel regression model for a group of non-transitional developing and industrialised countries.

Access to finance and cost of finance are the main determinants of investment, while investment is the main driver of economic growth. The growth diagnostic approach based on the HRV model indicates that the cost of finance and the quality of financial intermediation could be one of the most binding constraints to economic growth (Hausman et al., 2006). On the other hand, access to finance and cost of finance in countries with a bank-based financial system are determined by bank performancthe – that is, the ability to mobilise deposits, the market structure of the banking sector, the size of the banking sector, the risks of banking crises – and by banking sector efficiency – that is, the operating

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costs of the banking sector, non-performing loans and bank profitability (Bikker & Bos, 2008).

A large body of empirical studies within the litrature analyse the determinants of access to finance meausered by the bank credit activity in different countries using time series or panel regression models. One group of studies analyses the determinants of credit activity from the supply side (Qayyum, 2002), while another group of studies analyses the bank-specific factors (bank capital adequacy, bank efficiency and profitability, interest rate, stock market index) and macroeconomic determinants of credit activity (inflation rate, macroeconomic instability, monetary policy, economic growth, credit activity in the previous period) from the demand side (Imran & Nishat, 2013).

Cantu et al. (2022) investigate how bank-specific factors have affected credit growth in five Latin American countries in the pre- and post-crisis periods and found that large and well-capitalised banks with low risk have higher credit growth, while Karmakar & Mok (2015) found a moderate relationship between bank capital ratios and business lending. Qayyum, (2002) shows that private sector performance is significant factor of the demand for bank credit in Pakistan, implying that the main focus should be put on improving the business sector performance. Furthermore, the study shows positive correlation between the bank interest rate and credit demand by the business sector indicating that monetary authorities can support the private sector investments by expansion monetary policy. Abuka and Egesa (2007) assess the evolution of private sector credit in the East African Community using panel regression, which shows that the level of urbanisation, the quality of infrastructure and the performance of the manufacturing sector play a significant role in bank credit to the private sector. At the same time, the study found a negative correlation between government borrowing from banks and bank credit to the private sector, which confirmed the crowding out effect).

Imran and Nishat (2013) investigate the factors which impact on the bank credit to the businesses in different financial environments and global challenges by applying ARDL econometric approach using annual data from the period 1971 to 2010 for Pakistan. The study indicates that the foreign liabilities, domestic deposits, economic growth, exchange rate, and the monetary conditions are significantly associated with bank credit to the private sector in Pakistan. Additionally, Aysun and Hepp (2016) explore the global bank lending determinats by using bilateral lending data from 15 countries and found that bank lending within the country depen on the global bank loans.

Pan and Wang (2022) explore how the relationship between bank lending and the main factors that determinant the bank lending depends on various threshold variables by applying dynamic panel threshold model.

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There are many other studies investigating the bank credit determinants for countries in the region of South and East Europe. For example, Shijaku and Kalluci (2013) identify the long-run determinants of bank credit to the private sector in the case of Albania by employing a Vector Error Correction Mechanism (VECM) approach based on demand and supply indicators, while Magud et al. (2012) explore the macro-specific factors of bank crediting for 25 developing countries of Central, Eastern and Southeastern Europe. The study found that the exchange rate regime has a statistically significant negative impact, while capital inflows and deposit base positively affect bank credit.

Guo and Stepanyan (2011) examine changes in bank credit across a wide range of emerging market economies by using time-sersies and gross- section models for many emerging market economies. The study reveals that domestic and foreign financing contribute positively and symmetrically to bank loans growth. The results also show a strong positive link between economic growth, credit growth and high inflation, while increasing nominal credit is detrimental to real credit growth. The study also finds that loose domestic monetary circumstances result in more bank activity to private sector. Takáts (2010) investigates the cross-border bank lending drivers for 21 emerging market economies in the period 1995-2009 using a panel regression framework, and finds that both demand and supply factors have significant role for bank lending, but the impact of supply side factors is stronger on the bank credit activity.

3. Developments of bank loans to private sector in North Macedonia

This section presents some stylised facts on the historical developments and main trends regarding bank loans to private sector in North Macedonia during the analysed period from Q4 2007 to Q3 2019. Bank loans to to private sector grew at very high two-digit rates during the credit expansion in the late 2000s, which resulted in an average growth rate of 25.6% in the period from Q1 2007 to Q4 2009, and the highest growth rate recorded being 35.0% in Q2 2008. In this period, the credit growth was mainly driven by the favourable financial conditions and the high economic growth. However, the effects of the ensuing financial crisis and economic recession significantly changed the credit growth trajectory during the 2010s. Despite the fact that the economic growth swiftly recovered in the early 2010s and the financial sector remained stable and robust to the accumulated external vulnerabilities, banks remained overly prudent and drastically constrained their credit activity, which led to modest credit growths that averaged only 4.5% during the 2010s. In general, this period was characterised by minor and brief ups and downs, and there was even a

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period of credit decline from Q2 2016 to Q3 2017, with the highest decrease rate being 7.2% in Q1 2017.

Figure 1. Bank loans to private sector growth rates (in %) in North Macedonia from Q4 2017 to Q3 2019
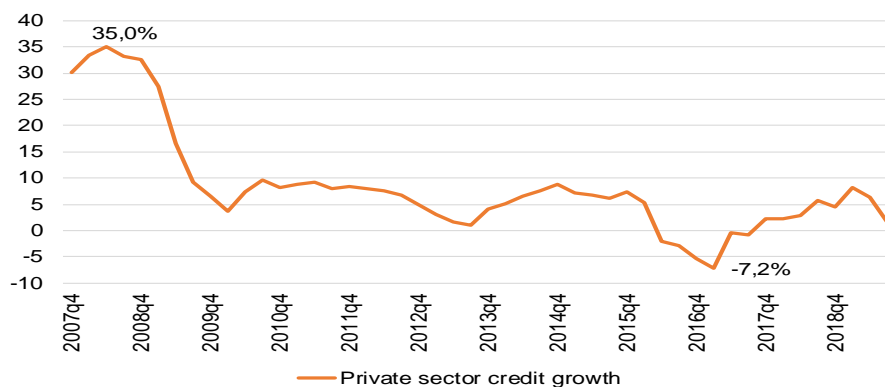
Source: National Bank of the Republic of North Macedonia

The financial development indicator, calculated as a share of the private sector credit to GDP, shows that Macedonia is fairly below the level of the European Union even though there is a clear convergence over the analysed period.

Figure 2. Share of private sector credit to GDP (in %) in North Macedonia and the European Union from 2007 to 2019
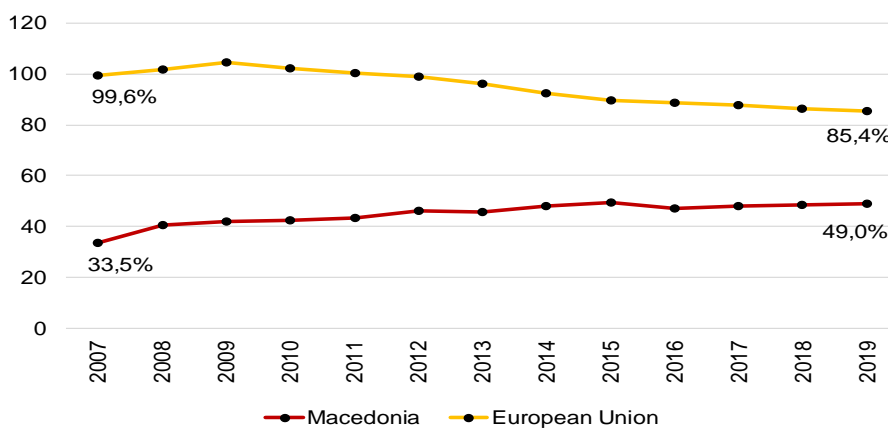
Source: National Bank of the Republic of North Macedonia and World Bank database.

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For instance, the share in 2007 was 33.5% for North Macedonia and 99.6% for the European Union, whereas in 2019 it was 59.0% for Macedonia and 85.4% for the European Union. In essense, the development of the Macedonian financial system recorded a gradual increase over time due to the higher credit growth than economic growth.

4. Empirical analysis

Single-country regression analysis based on OLS and ADRL model have been applied with combined approaches where the influence of supply and demand side factors of bank credit to private sector were analysed simultaneously. However, the number of determinants is limited due to the unavailability of data for some variables and due to the short time series limiting the possibility of using many variables.

Our intent is to test two main hypotheses regarding the nature of the identified variables. The first hypothesis is that bank specific factors (solvency rate, inefficiency and profitability) have significant influence on bank loans to private sector in North Macedonia.

H1: The bank specific factors have significant influence on bank laons to private sector.

The robustness of the financial system as measured through bank performance positively affects private sector lending as well-standing banks would be more prone to engage in excessive lending.

The second hypothesis is that macroeconomic factors (economic growth rate, inflation and bank deposit growth) have significant influece on bank loans to private sector.

H2: The macroeconomic factors have significant influence on bank laons to private sector.

Firstly, economic growth has positive impact on private sector credit as it leads to higher economic development and favourable affects the development of the financial system, whereas the inflation rate adversely affects private sector credit through raising interest rates and restraining financial activities.

The empirical analysis is based on aggregated quarterly data at the banking sector level, for the period from Q4 2007 to Q3 2019, including a total of 64 observations. All data for the dependent and independent variables are taken from the official statistical database by the National Bank of the Republic of

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North Macedonia, which refer to the aggregate data of the indicators for the banking system based on quarterly reports for the real and monetary sectors.

The basic linear regression model is represented by the following equation:

$$credit_t = \beta_0 + \beta_1 GDP_t + \beta_2 deposit_t + \beta_3 CPI_t + \beta_4 NPL_t + \varepsilon_t \tag{1}$$

where the dependent variable is the growth rate of bank credits to private sector (credit growth), as a variable that measures the credit activity of the banks. The explanatory variables that determine credit activity are:

- *Economic growth rate (GDP_t)* reflects the total economic activity and performance. Economic growth determines consumption and investment demand and thus affects credit demand. Higher economic growth has a positive impact on credit activity, but at the same time, credit activity can have a positive impact on economic growth. Due to potential double causality (endogeneity), a lagged value of economic growth is included in the model (Guo & Stepanyan, 2011; Tan & Floros, 2012).
- *Deposit growth rate ($deposit_t$)* is considered as the main source of credit activity. The increase in deposits expands the availability of funds of the banks, thus enabling them to better perform the function of financial intermediation, which de facto leads to the growth of credit activity (Barajas et al., 2013).
- *Inflation rate (CPI_t)* is measured through the consumer price index (CPI). The impact of inflation on the credit activity of banks is debatable. Namely, if the banks expect a higher inflation rate in the next period, they will currently increase their creative activity. However, rising inflation today has a disincentive effect on credit activity, as rising prices lower the real interest rate (which is the difference between the nominal interest rate and the expected inflation rate).
- *Non-performing loans rate (NPL_t)* is an approximate variable that measures the quality of extended credit, whereby the growth of non-performing loans reduces and limits the credit activity of banks (Gabrisch, 2015; Barajas et al., 2013; Guo & Stepanyan, 2011). In our case, we see that the high rate of non-performing loans is the key factor on the supply side that limits the lending activity of banks.

In addition, the basic model includes a set of determinants of banks' credit activity from the supply side (solvency rate, inefficiency and profitability), so the extended equation is of the form

$$\begin{aligned} credit_t = \beta_0 + \beta_1 GDP_t + \beta_2 deposit_t + \beta_3 CPI_t + \beta_4 NPL_t + \beta_6 CAR_t \\ + \beta_7 CIR_t + \beta_8 ROAA_t + \varepsilon_t \end{aligned} \tag{2}$$

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- *Solvency rate (CAR_t)* measures the capital adequacy of banks, indicating that banks that have a sufficient level of capital to cover potential losses, i.e. better capitalised banks have a greater capacity for lending. Solvency ratio can also be related to moral hazard. Namely, bank managers in conditions where the bank is less capitalised may increase lending activity by loosening credit conditions, thus increasing credit risk (Bergera & DeYoung, 1997).
- *Inefficiency ratio (CIR_t)* measures the cost efficiency of banks through the cost-income ratio. Banks that have higher costs relative to income, possibly as a result of high wage costs, more employees or a larger branch network may need an increase in lending activity (Barajas et al., 2010). On the other hand, the inefficiency rate can increase the cost of capital and limit credit activity.
- *Profitability rate ($ROAA_t$)* is measured by the rate of return on assets (ROAA) and it demonstrates that banks with higher profitability have greater ability to increase credit activity. According to Albertazzi & Gambacorta (2006), the reduction of profitability in conditions when the capitalisation of the bank is at a low level can seriously reduce the credit activity, so that the capital adequacy requirements are not violated.

Before elaborating the approach used in the empirical analysis, in Table 1 we present the descriptive statistics for the variables included in the model over the analysed period.

Table 1. Descriptive statistics for the variables from Q4 2007 to Q3 2019

Variable	Mean	Median	Standard deviation	Minimum	Maximum
Credit growth rate	8.3	6.6	10.0	-7.2	35.0
Economic growth rate	2.8	2.8	2.9	-3.7	9.9
Deposit growth rate	9.6	8.4	6.4	-0.3	32.3
Inflation rate	1.8	1.4	2.7	-1.7	10.2
Non-performing loans rate	8.8	9.3	2.4	5.0	12.3
Solvency rate	16.4	16.5	0.6	15.0	17.5
Inefficiency ratio	60.1	60.6	6.8	46.0	73.7
Profitability rate	1.0	0.8	0.7	-0.3	3.1

Source: Authors' calculation.

The private sector credit growth rate averaged 8.3% over the analysed period. This is substantially above the mean growth rate of 2.8% and accounts for the gradual increase of financial development as measured by the share of private sector crediting to GDP. Nevertheless, private sector credit grew at a lower rate than deposits, which increased by 9.6% on average, thus indicating that banks were hesitant in extending more loans and directed the collected funds to other type of assets. With regards to the inflation rate, it averaged 1.8% and remained around the targeted level. NPL rates remained relatively low in the range from 5.0% to 12.3% and averaging 8.8% with a standard deviation of only 2.4%, which points out to a relatively stable and predictable movement over the analysed period. Concerning the bank-specific variables on the supply side of private sector credit, a common characteristic for all of them is the low standard deviation, which indicates that banks were fairly stable and prone to external shocks. For instance, the solvency rate was 16.4% on average with all banks abiding by the Basel III requirements; the mean inefficiency ratio was 60.1% in the range from 46.0% to 73.7%; and the average profitability rate amounted to 1.0%, ranging from -0.3% to 3.1%.

Considering that time series are used in the empirical analysis, there is a need to first identify the integrative characteristics of the series, i.e. to test the stationarity of the variables. The most commonly used tests for stationarity of time series are Augmented Dickey Fuller (ADF) and Phillips Peron (PP) tests. The null hypothesis examined by both tests is that the time series has a unit root (the time series has more than one trend), i.e. non-stationary. However, the alternative hypothesis is that the time series is stationary. A series can be considered stationary if its mean and variance are constant over time and the value of the covariance between two time periods depends only on the gap or lag distance between the two time periods and does not depend on the actual time at which the variance is calculated.

Significance levels of 1% and 5% are used in this paper as critical value to determine whether the time series is stationary or not. The results of the two stationarity tests in Table 2 below indicate that all the determinants of credit activity considered in the basic econometric model are stationary at the indicated level, which means that they are integrated of the same order. The rate of non-performing loans is stationary at the level, but it is also calculated on the first difference because in the specification of the model it is taken as the first difference.

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Table 2. Integrative characteristics of time series

Determinants	Augmented Dickey Fuller - ADF тест		Phillips-Perron – PP тест		Conclussion
	Level t-Stetistics	First difference t-Statistics	Level t-Statistics	First Difference t-Statistics	
$deposit_t$	-4.459***	/	-4.312***	/	I(0)
GDP_t	-7.603***	/	-7.632***	/	I(0)
CPI_t	-6.642***	/	-6.708***	/	I(0)
NPL_t	-4.914***	/	-4.807***	/	I(0)
CAR_t	-5.263***	/	-5.222***	/	I(0)
CIR_t	-4.389***	/	-4.299***	/	I(0)
$ROAA_t$	-3.107**	/	-3.289**	/	I(0)

Source: Authors' calculation

The results obtained from the regression analysis for the determinants of credit activity in the Republic of Macedonia for the period from the fourth quarter Q4 2007 to Q3 2019 with the application of a linear OLS regression model, are presented in Table.4. We decided to use a linear regression model due to the fact that all time series are stationary and integrated of the same order.

The obtained empirical results indicate several conclusions. As expected, the growth rate of credit activity shows continuity throughout the entire period. Namely, the lagged value of the rate of loans to the private sector for one period has a positive statistical impact on lending activity in the current period. The rate of inflation has also a statistically significant positive impact on the credit activity of banks. Namely, in the case when banks expect a higher inflation rate, they increase the current credit activity.

More importantly, the results of the econometric analysis indicate that economic growth is the most significant determinant of credit activity of banks, as a factor on the demand side, while the rate of non-performing loans is the most significant determinant of credit activity, as a factor on the supply side. Namely, the increase in the rate of economic growth by 1% increases the rate of growth of loans to the private sector by 0.25%. On the contrary, the rate of non-performing loans has a negative statistically significant impact on the credit activity of banks, indicating that every impairment of the quality of credit placements by 1% limits the credit activity of banks and reduces the growth rate of loans to the private sector by 0.31%.

Table 3. Estimated results of bank credits to private sector determinants

Variable	Basic model		Model 2		Model 3		Model 4	
	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value
$L1.credit_t$	0.272***	0.010	0.281***	0.007	0.275***	0.010	0.308**	0.026
$deposit_t$	0.405**	0.000	0.351***	0.002	0.399***	0.000	0.401***	0.007
GDP_t	0.252***	0.010	0.243***	0.011	0.264***	0.011	0.260**	0.033
$L1.GDP_t$	0.155*	0.093	0.125	0.191	0.153*	0.104	0.144	0.143
CPI_t	0.234**	0.038	0.237**	0.033	0.204	0.124	0.221**	0.012
CPI_t	-0.307*	0.079	-0.322*	0.062	-0.346*	0.084	-0.277	0.219
CAR_t			0.406	0.125				
CAR_t					0.027	0.672		
$ROAA_t$							0.437	0.602
Constant	-0.293	0.586	-6,989	0.112	-19,546	0.622		
$Adj. R^2$	0.698		0.752		0.691		0.705	

Note: *** , ** and * indicate statistical significance level of 1%, 5% and 10%, respectively.

Source: Authors' calculation

This only confirms the hypothesis that the poor structure of credit placements, i.e. the high rate of non-performing loans, is one of the reasons and explanation for the relatively low credit activity of banks and the high cost of capital, which in turn are identified as potential growth limiting factors.

Finally, the results for the supply-side determinants are expected according to existing empirical studies. Namely, the solvency rate measured through the capital adequacy rate and the profitability rate have a positive impact, while the inefficiency rate has a negative impact on credit activity. However, the obtained results indicate that these relationships are statistically insignificant, indicating that the most important determinants of the credit activity of banks in the Republic of North Macedonia are the growth rate of deposits and the rate of non-performing loans.

To check the quality of the econometric models and the reliability of the obtained results, several diagnostic tests were performed, which are presented in the table below.

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Table 4. Diagnostic tests of the basic model

Tests	(p-statistics)
Jarque Bera test H_0: The residuals are normal	0.3831
Breusch-Godfrey Serial Correlation LM test H_0: The residuals are not serially correlated	0.3512
Durbin-Watson avtocorrelation test H_0: The residuals are not serially correlated	1.8289
Breusch–Pagan test H_0: The residuals are not heteroskedastic	0.1703
Ramsey RESET test H_0: the model has no omitted variables	0.105
Test for multicollinearity (Variance inflation factors for the independent variables) mean value of VIF	1.32

Source: Authors' calculation

The diagnostic analysis showed that the residuals have no serial correlation, the residuals are normally distributed and have no heteroscedasticity, which indicates that the obtained results are not biased. In addition, a test was made to identify whether the model is well specified, ie whether the model has omitted a significant variable, and it was determined that the model has no omitted variables. Also, a test was made to check whether there is multicollinearity (potential dependence of the explanatory variables), which means that it was found that there is no perfect multicollinearity.

What is very important in the empirical analysis of the determinants of credit activity is to see if the time series in the model are integrated among themselves. Cointegration is the condition when two or more time-series share the same stochastic trend (Stock & Watson, 2020). To check whether there is cointegration of the determinants of banks' credit activity, we use the method proposed by Engle and Granger (1987), according to which the hypothesis of the existence of a unit root of the residuals is tested using the Augmented Dickey Fuller (ADF) test. The residuals were previously obtained by estimating the basic model using the method of least squares (Ordinary Least Squares - OLS). The results of the test indicate that the determinants of credit activity do not have a single root, that is, they are integrated among themselves.

The decision was made using a 1% level of significance.In order to test the reliability of the obtained results by applying the linear method of least squares (OLS), in the following we will expand the empirical examination of the determinants of the credit activity of banks as a potential limiting factor for the growth of the Macedonian economy by applying Autoregressive Distributed Lag

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Modeling Approach (ARDL) developed by Pesaran (1997), Pesaran and Shin (1995, 1999), and Pesaran et al. (1996). This model is more suitable for small samples consisting of 30 to 80 observations and it allows testing of time series cointegration (the long-term equilibrium relationship of two or more determinants), different from the procedure proposed by Engle and Granger (1987) which faces several weaknesses (Banerjee et al., 1986).

In addition, the ARDL model allows tests of dependencies and in the case when the independent variables are endogenous (Pesaran and Shin 1999; Pesaran et al., 2001), allows the variables to have different optimal number of lags and provides an opportunity to examine the short-term dynamics of the model against the long-term relationship of dependent and independent determinants. The basic ARDL model can be represented by the following equation:

$$
\begin{aligned}
credit_t = \alpha_0 &+ \sum_{i=0}^{p} \alpha_{1j}\Delta credit_{t-i} + \sum_{i=0}^{p} \alpha_{2j}\Delta deposit_{t-i} \\
&+ \sum_{i-1}^{p} \alpha_{3j}GDP_{t-1} + \sum_{i-1}^{p} \alpha_{4j}\Delta Inf_{t-i} + \sum_{i=0}^{p} \alpha_{5j}\Delta NPL_{t-i} \\
&+ \sum_{i=0}^{p} \alpha_{6j}\Delta Sol_{t-i} + \sum_{i=0}^{p} \alpha_{7j}\Delta Ineff_{t-i} + \sum_{i=0}^{p} \alpha_{8j}\Delta ROAA_{t-i} \\
&+ \sum_{i=0}^{p} \beta_{1j}\Delta credit_{t-i} + \sum_{i=0}^{p} \beta_{2j}\Delta deposit_{t-i} \qquad (3)\\
&+ \sum_{i=0}^{p} \beta_{3j}GDP_{t-i} + \sum_{i=0}^{p} \beta_{4j}\Delta Inf_{t-i} + \sum_{i=0}^{p} \beta_{5j}\Delta NPL_{t-i} \\
&+ \sum_{i=0}^{p} \beta_{6j}\Delta Sol_{t-i} + \sum_{i=0}^{p} \beta_{7j}\Delta Ineff_{t-i} \\
&+ \sum_{i=0}^{p} \beta_{8j}\Delta ROAA_{t-i} + \varepsilon_t
\end{aligned}
$$

where the symbols $(\alpha_1 - \alpha_8)$ in the first part of the equation indicate the short-term coefficients, the symbols $(\beta_1 - \beta_8)$ indicate the long-term coefficients, p indicates the optimal number of time lags, and the symbol, Δ indicates the first difference of the corresponding variable.

Our first task is to calculate the long-term coefficients of the determinants (the first part of the equation). But before that, it is necessary to determine the optimal number of lags that will be included in the ARDL model in order for the

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results to be statistically valid and to determine whether there is a long-term relationship between the determinants.

In order to examine whether there is a long-term relationship between the dependent variable and the independent determinants in the model, i.e. whether there is a statistically significant cointegration between the time series, we use the so-called "bound testing", an approach developed by Pesaran and Pesaran (1997) and Pesaran et al. (2001).

The null hypothesis is that there is no statistically significant cointegration or long-term relationship between the dependent variable and the independent determinants (Ho: $\beta1 = \beta2 = \beta3 = \beta4 = \beta5 = 0$), as opposed to the alternative hypothesis that at least one long-term coefficient is different from zero, which implies existence of at least one long-term relationship between a dependent and independent variable (Ha: $\beta1 \neq \beta2 \neq \beta3 \neq \beta4 \neq \beta5 \neq 0$).

The ARDL limit test is based on the Wald test (F-statistic). The asymptotic distribution of the Wald test is non-standard under the null hypothesis when there is no cointegration between the determinants. Pesaran and Pesaran (1997) and Pesaran et al. (2001) determined two critical values (lower and upper bounds) for testing cointegration. The lower critical bound value assumes that all variables are integrated to the first degree I(1), while the upper bound critical value assumes that the determinants are integrated from the zero degree I(0). Thus, if the obtained F-statistic exceeds the upper critical value, then the null hypothesis is rejected, ie the alternative hypothesis that there is cointegration is accepted.

Conversely, if the obtained F-statistic does not exceed the lower critical value, then the null hypothesis indicating the absence of a cointegration relationship cannot be rejected. Additionally, if the obtained F-statistic is located between the two limit values then the results cannot give an unequivocal decision to accept or reject the null hypothesis (Wooldridge, 2002).

The obtained test results presented in the table below indicate that the null hypothesis can be rejected, which means that there is a long-term relationship ie cointegration between the determinants in the model. The obtained F-statistic is 8,623 which exceeds the critical value of the upper limit determined according to Pesaran et al. (2001) with seven regressors (k=7) at 1% significance level.

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Table 5. Diagnostic tests of the basic model

10%		5%		2.5%		1%	
Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit
2.03	3.13	2.32	3.50	2.60	3.84	2.96	4.26

Source: Authors' calculation

Before proceeding to the calculation of the long-term coefficients of the basic ARDL model, it is necessary to determine the optimal number of lags. For this purpose, we use the so-called Akaike information criterion (AIC) as a measure of the explanatory power of the regressions. According to the decision based on the AIC criterion, the selected model is ARDL (1 0 1 1 2 2 0 0).

The results of the above specified ARDL model with determined optimal numbers of lag variables are presented in Table below.

Table 6. Long-term coefficients based on ARDL

Dependent variable: credit growth			
Independent variables	Coeficient	t-statistics	p-value
$L1.credit_t$	0.132	0.97	0.342
$deposit_t$	0.257	1.76	0.091
NPL_t	-0.103	-2.13	0.043
$L1.NPL_t$	-0.1430	-2.67	0.013
GDP_t	0.382	3.31	0.003
$L1.GDP_t$	0.146	1.16	0.256
CPI_t	-0.027	-0.17	0.866
$L1.CPI_t$	-0.204	-1.16	0.257
$L2.CPI_t$	0.328	2.35	0.027
CAR_t	-0.408	-1.21	0.239
$L1.CAR_t$	0.270	1.04	0.310
$L1.CAR_t$	0.663	2.79	0.010
CIR_t	0.214	2.03	0.053
$ROAA_t$	0.494	0.46	0.652
Constant	-22.631	-2.93	0.007

Source: Authors' calculation

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The conclusion based on the obtained results do not differ from the previous conclusions based on the linear regression model. Namely, in this model as well, economic growth has a positive and statistically significant impact on the lending activity of banks. Also, the results indicate that the growth rate of non-performing loans reduces the lending activity of banks to the private sector, while the growth rate of deposits encourages lending to the private sector by banks in the Republic of North Macedonia. Namely, every increase in the rate of non-performing loans of companies in total loans by 1%, reduces the growth rate of loans to the private sector by 0.1%. On the other hand, the magnitude of the positive impact of deposits on the credit activity of banks is significant (the coefficient is 0.257), indicating that deposits are a fundamental factor for dynamizing the credit activity of banks. In addition, the results indicate that the share of capital in total assets, that is, the solvency rate of banks with a delay of two quarters has a statistically significant (at 1% level) positive coefficient (0.494), while in the model no statistically significant relationship was found between profitability and the credit activity of banks.

Below the short-term dynamics of the model is presented together with the adjustment coefficients.

Table 7. Short-term coefficients based on ARDL

Dependent variable: $\Delta credit_t$			
Independent variables	**Coeficient**	**t-statistics**	**p-value**
$\Delta deposit_t$	0.275	1.84	0.077
ΔNPL_t	-0.102	-2.14	0.041
ΔGDP_t	0.322	2.88	0.008
ΔCPI_t	-0.025	-0.16	0.873
$\Delta L1.CPI_t$	-0.259	-1.88	0.070
ΔCAR_t	-0.357	-1.07	0.292
$\Delta L1.CAR_t$	-0.789	-3.51	0.002
ΔCAR_t	0.222	2.25	0.032
$\Delta ROAA_t$	0.248	0.25	0.804
Constant	-26.132	-3.58	0.001
Error correction term (EC-1)	-0.864	-6.40	0.000

Source: Authors' calculation

On the basis of the obtained results, a conclusion could be drawn that we obtain similar results in the short-term dynamics, as well. Namely, economic growth

remained a key factor on the demand side (macroeconomic determinant), while short-term inflation has a negative impact on banks' lending activity to the private sector. On the other hand, bank deposits and the rate of non-performing loans remain the most significant supply-side factors (bank-specific determinants).

In addition, the results indicate that capital adequacy in the short term slows down banks' lending to the private sector, while cost efficiency remains with a positive coefficient that can be explained by the fact that in conditions when banks face higher operating costs, they are forced to increase their credit activity in order to cover those costs.

The error correction term (ECt-1) is negative and statistically significant at the 1% level (-0.535) confirming that the long-term relationship is stable and the disequilibrium created in the short term is temporary and will be overcome in a very short period. In fact, the value of the coefficient shows us that all variables (86.5%) for a very short period converge to the long-term equilibrium, indicating that the obtained results of the model in the short term are valid.

5. Conclusion

The main aim of the paper is to investigate factors that determine bank credit activity to the private sector in North Macedonia as an important driver of economic growth. In the first part of the paper we explore the link between bank credit to private sector and economic growth, showing that there is a significant positive relation of bank credit activity to the private sector to the real GDP growth of the country. In the same time, the comparative analysis shows that the country has made significant increase (from 35% in 2007 to approximately 50% at the end of 2019) in financing private investments by banks in the past period.

This contributed to moving forward the country in the group of Western Balkan countries with the most developed banking sector, measured according to this indicator. However, the financial sector is facing many challenges in the coming period in the intention and direction of becoming the main engine and accelerator of the growth of the Macedonian economy. Namely, the banking sector is still too conservative in its credit activities towards the real sector, despite some monetary loosening that resulted in a slight reduction in interest rates. The comparative analysis shows that the real sector faces a rather high cost of capital that limits investment activity and thus generates limiting effects for economic growth.

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According to our findings, there are at least three reasons that explain the high cost of financing: 1) the low level of liquidity of the financial sector, 2) the small banking market, the low level of competition and insufficient efficiency, and 3) the high credit risk.

All the weaknesses of the financial sector in North Macedonia addressed above, limit the lending activity of banks to the private sector and thus have a restrictive effect on economic growth. We test this hypothesis by applying a linear regression analysis (method of least squares - OLS) and ARDL (Autoregressive Distributed Lag) model where we analyze the determinants of the rate of loans to the private sector, for the period of the fourth quarter (Q4) of 2007 year to the third quarter (Q3) of 2019, comprising 48 observations.

The obtained results from both models are similar and lead to some common conclusions. Namely, the rate of economic growth through the final demand of households and the investment demand of firms has a strong and statistically significant positive impact on the growth rate of bank loans to the private sector in all four linear regression models, and in the ARDL model, both in the long and short term. The inflation rate as a macroeconomic determinant has a positive and statistically significant relationship with the growth rate of loans to the private sector, only in the first two linear regression models.

Additionally, the results of the ARDL model are quite inconsistent in the short and long term. In the short term, a negative significant relationship was found between the inflation rate of the first lag and credit activity, while a positive long-term relationship was found between the inflation rate of the second lag and credit activity.

In addition, in summarizing the obtained results from the bank specific determinants (factors on the supply side), we derive a conclusion that bank deposits and capital adequacy have a positive and statistically significant impact on the rate of bank loans to the private sector. What is perhaps most important considering the basic hypothesis that we verified in the paper is the relationship between the rate of non-performing loans among enterprises and the rate of bank loans to the private sector.

The results confirm our hypothesis that there is a negative and statistically significant relationship between the growth rate of non-performing loans in enterprises and the growth rate of bank loans to the private sector. No statistically significant relationship was found between the profitability rate of banks and the growth rate of bank loans to the private sector in any of the models. Diagnostic tests confirm that the models are well specified, which means that the obtained results are valid and unbiased. In addition, the coefficient of dynamic adjustment in the short-term dynamics of the ARDL model has a negative sign (-0.864) and is statistically significant at the 1% level.

It shows that in a relatively short time (one quarter), the long-term equilibrium of the determinants of the model is reached.

The estimated results indicate that bank specific determinats (bank deposits and bank efficiency) have the most important significant impact on bank credit to the private sector, compare with macroeconomic specific factors. Based on the estimated results we can conlsude that access to finance for private sector as important factor for economic growth in North Macedonian is related with the bank performance and the ablitiy of banks to mobilize and realocate the financial resources on an efficant way.

However, there are several limitations which are opportunities for further research. First, the paper has not investigated the relationship between the structure of bank deposit and credit activity, nether the relationship between bank credit activity to private sector and structure of gross investments. Second, the paper does not include the period from 2020 to 2022 as a period with many challenges as a result of COVID-19 and the current energy crisis in Europe.

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