THE IMPACT OF LOANS AND INTEREST RATES ON ECONOMIC GROWTH IN THE REPUBLIC OF NORTH MACEDONIA

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Abstract: The subject of this paper is the impact of loans to the private sector and real interest rates on the nominal gross domestic product in North Macedonia, in the period from 2000 to 2018. The research is based on correlation analysis and descriptive statistics of variables, stationarity and cointegration tests, as well as evaluation of the VECM model. Additionally, based on the evaluated VECM model, a test for short-term cause-effect relationship was performed, i.e. Granger test for causality, as well as the function of the impulse response to variables in shock conditions, and decomposition of their variance. The evaluated VECM model, i.e. the equations within it, are statistically significant and have good adaptability, whereby all the assumptions of the method of ordinary least squares are met. In other words, it means that the results obtained are stable and reliable. The results show that lending to the private sector has a positive impact on GDP in North Macedonia in the analyzed period, in the short and long term, while real interest rates have a negative impact, also in the short and long term. Credits have increased the supply in the research period which has a positive impact on economic activity, while on the other hand, the relationship between interest rates and GDP growth gives us a negative direction of income distribution in the country.
Keywords: credit activity, interest rates, gross domestic product, economic growth.

1. INTRODUCTION

Lending to the private sector is a key financial determinant of economic activity, i.e. primarily economic growth. In many countries in transition, as well as in North Macedonia, the reforms in the banking sector and the distribution of capital have made it possible to place crucial importance on the financial sector and to increase their impact on economic activity. Also according to Utari et. al. (2012) excessive growth of loans can cause the growth of aggregate demand greater than potential production and contribute to overheating of the economy, i.e. contribute to increased inflation, current account deficit, and exchange rate appreciation. The subject of this research is the effects of private sector loans and real interest rates on the gross domestic product in North Macedonia for the period from 2000 to 2018. Hence, the following hypotheses can be derived: (1) Private sector lending has a positive impact on GDP in the short run; (2) Private sector lending has a positive impact on GDP in the long run; (3) Real interest rates have a negative impact on GDP in the short run, and (4) Real interest rates have a negative impact on GDP in the long run.

The purpose is to examine the effects of credit activity and interest rates on the macroeconomic development of the country, in the short and long term.

According to the empirical literature, there are different approaches to the impact of lending as financial activity and interest rates on economic growth, where some research confirms their positive/negative impact or individually their inverse mutual impact on economic activity. Cecchetti and Kharroubi (2018) examined the negative correlation between the credit growth rate and the output growth rate per worker, using a panel of 20 countries over 25 years, it turned out that there is a strong correlation: the higher the growth rate of credit, the lower the growth rate of output per worker. Examined that credit growth disproportionately harms labor productivity growth in industries that have either less tangible assets or are more R&D-intensive. The research of Matei (2020) explores the relationship between 11 Emerging European Countries in the period 1995-2016 using dynamic panel models. The findings suggest that financial development has positive effects on economic growth only in the short run; while in the hypothesis of nonlinearity of financial growth, the relationship has an inverted U-shape or financial development has a positive effect on economic activity to a certain threshold, after which the relationship becomes negative. Freriks and Kakes (2021) study the impact of negative interest rate policy on the interest rates of banks in the euro area, using data for the period 2007-2019. Their research confirmed that banks were not prepared to reduce the interest rate on household deposits below zero, therefore, the negative rates significantly reduced the total net interest margin of deposit-dependent banks compared to other banks.

2. MATERIALS AND METHODS

For this research, quarterly data from the databases of the World Bank (WB) and the International Monetary Fund (IMF) for the period 2000 to 2018 were used, or a total of 76 observations. The analysis takes into account the nominal gross domestic product of R. N. Macedonia, private sector loans, and real interest rates (Table 1). Private sector loans in MKD are calculated based on data from the World Bank, expressed as (%) of nominal GDP, as well as nominal GDP data obtained from the IMF database. The real interest rates used in the analysis are obtained by transforming their frequency (in the statistical software EViews), from annual to quarterly, using the quadratic method. This is because the data available from the IMF database are on an annual basis, while our sample is quarterly. This processing of statistical data enables their consistency, both in terms of units of measurement and in terms of their frequency.

Table 1: Variables

Tags	Variable
GDP	Nominal gross domestic product (MKD)
CREDIT	Private Sector Loans (MKD)
IR	Real interest rates (%)

Source: by the author

Since the variables are on a quarterly basis, with the season having a visible impact, they are seasonally adjusted before their modeling through the Census X12 method (additive). Additionally, because GDP and loans to the private sector are expressed in absolute terms (MKD), their logarithmic transformation was made. The final variables used in the analysis (seasonally adjusted and logarithmic).

The time series of variables are non-stationary, with GDP and private sector loans showing a positive trend, while interest rates, despite fluctuations and structural disturbances, show a pronounced downward trend. through time. To determine the order of identification of the time series, the Augmented Dickey-Fuller test, and the Phillips-Perron stationarity test is useful (automatic selection of lags in the Augmented Dickey-Fuller test based on the Schwartz information criterion). The results of these tests (Table 2) show that all the variables used are non-stationary from the first order, which practically fulfills the condition for further analysis of their possible long-term relationship (cointegration).

Table 2: Stability test of variables (p-values)

Variable	Included in the test	Dickey-Fuller		Phillips-Perron		Order of identification
		level	1st difference	level	1st difference	
lgdp	Intercept	0.9712	0.0001	0.9234	0.0001	I (1)
	Trend and intercept	0.3732	0.0001	0.1640	0.0001	
	None	1.0000	0.0020	1.0000	0.0000	
lcredit	Intercept	0.5900	0.0364	0.6694	0.0000	I (1)
	Trend and intercept	0.9891	0.0000	0.9690	0.0000	
	None	1.0000	0.2323	1.0000	0.0000	
ir_sa	Intercept	0.8705	0.0000	0.6961	0.0000	I (1)
	Trend and intercept	0.4239	0.0000	0.1225	0.0002	
	None	0.1803	0.0000	0.2776	0.0000	

Source: author calculations

The selection of the optimal number of time lags is crucial in the construction of VAR and VECM models in econometric analysis. The time lags are particularly significant, especially since they largely determine the number of degrees of freedom in the model. For example, for a VECM model with (k) endogenous variables and (p) time lags, the number of estimated coefficients for each of the equations is (k * p + 2), (section coefficient and cointegration coefficient). In our case, the sample we have is 71 observations, while the number of endogenous variables is 3. Given the nature of the data (quarterly data), the maximum number of time lags we would include in building the model is 8, including that period of 2 years. In such services, the Akaike information criterion, as well as several other information criteria, shows that the optimal number of lags in the model is 5. Because the optimal number of lag intervals is determined based on the VAR model for non-stationary variables, with a level of

differentiation in implementation of the Johansen Cointegration Test, as in the evaluation of the VECM model, one lag is lost. Hence, the number of lags that are taken into account in the analysis is 4, i.e. one year.
Using the 4-time lags specification, the Johansen Cointegration test, with an intercept included and without a trend in the cointegration equation, shows the presence of a single cointegration relation, at a significance level of 0.05. Based on this finding, we evaluate the VECM model, with 4-time lags and one cointegration relationship.

3. RESULTS AND DISCUSSIONS

Starting from the previously set methodology, we start the analysis by calculating the correlation coefficients between the endogenous variables, i.e. by analyzing their linear relationship. As can be seen from (Table 3), the gross domestic product has a strong positive linear relationship with private sector loans, as well as a strong negative linear relationship with real interest rates.

Table 3: Correlation coefficients

	LCREDIT	LGDP	IR_SA
LCREDIT	1	0.98	-0.83
LGDP	0.98	1	-0.84
IR_SA	-0.83	-0.84	1

Source: calculation by the author

In mathematical form, the estimated VECM model can be represented as in equations 1, 2, and 3. The coefficients β_0 denote the coefficient of segmentation in each of the equations, while the coefficients α_1 are the cointegration coefficients. According to econometric theory, cointegration coefficients need to be statistically significant and negative, indicating that the model tends to return to long-run equilibrium with a rate of adjustment equal to the cointegration coefficient and estimated cointegration coefficients in all equations are negative. The equation denotes the cointegration relationship between the variables. This equation $\log GDP_{t-1} - \delta_1 logCREDIT_{t-1} - \delta_2 IR_{sa_{t-1}} - \delta_0$ shows the long-run correlation of the variables this equation shows the long-run correlation of the variables. The short-run relationship, on the other hand, is expressed through the coefficients β_1, β_2, and β_3, respectively, through the lags (p) of each of the endogenous variables. The evaluation of this VECM model.

$$\Delta logGDP = \beta_{0.1} + \alpha_{1.1}\left(\log GDP_{t-1} - \delta_1 logCREDIT_{t-1} - \delta_2 IR_{sa_{t-1}} - \delta_0\right) + \beta_{1.p.1} \sum_{p=1}^{4} \Delta logGDP_{t-p} + \beta_{2.p.1} \sum_{p=1}^{4} \Delta logCREDIT_{t-p} + \beta_{3.p.1} \sum_{p=1}^{4} \Delta IR_{sa_{t-p}} + u_1 \quad (1)$$

$$\Delta logCREDITI = \beta_{0.2} + \alpha_{1.2}\left(\log GDP_{t-1} - \delta_1 logCREDIT_{t-1} - \delta_2 IR_{sa_{t-1}} - \delta_0\right) + \beta_{1.p.2} \sum_{p=1}^{4} \Delta logGDP_{t-p} + \beta_{2.p.2} \sum_{p=1}^{4} \Delta logCREDIT_{t-p} + \beta_{3.p.2} \sum_{p=1}^{4} \Delta IR_{sa_{t-p}} + u_2 \quad (2)$$

$$\Delta logIR_{sa} = \beta_{0.3} + \alpha_{1.3}\left(\log GDP_{t-1} - \delta_1 logCREDIT_{t-1} - \delta_2 IR_{sa_{t-1}} - \delta_0\right) + \beta_{1.p.3} \sum_{p=1}^{4} \Delta logGDP_{t-p} + \beta_{2.p.3} \sum_{p=1}^{4} \Delta logCREDIT_{t-p} + \beta_{3.p.3} \sum_{p=1}^{4} \Delta IR_{sa_{t-p}} + u_3 \quad (3)$$

From (Table 4) it can be seen that all the estimated equations are statistically significant (high F-statistics), and they generally have good adaptability. The interest rate equation has the best adjustment, i.e. the highest adjusted coefficient of determination, while the gross domestic product equation has the lowest adjustment. Regarding the cointegration coefficients, they are negative in all three estimated equations, but in the gross domestic product equation, this coefficient is not statistically significant. From the point of view of the fulfillment of the assumptions of the method of ordinary least squares, the diagnostic tests give the following results: in the GDP equation the residuals have a normal distribution, have no autocorrelation, and there is no presence of heteroskedasticity; In the credit equation, residuals have a normal distribution, have no autocorrelation, and there is no presence of heteroskedasticity, and in the interest rate equation, the residuals do not have a normal distribution (high value of the Jarque-Bera statistics), the presence of first-order autocorrelation is possible (high value of the Breusch–Godfrey LM statistics), and there is no presence of heteroskedasticity.

Table 4: Summary of the key statistical indicators from the evaluated VECM model

Indicator	D (LGDP)	D (LCREDIT)	D (IR_SA)
Intercept coefficient	0.02	0.04	0.19 *
Cointegration coefficient	-0.05 *	-0.13	-4.91
Determination coefficient	0.44	0.50	0.58
Adjusted coefficient of determination	0.31	0.38	0.48
F-statistics	3.48	4.34	6.02
Jarque-Bera test	1.3 *	2.61 *	287.43
Breusch–Godfrey test for autocorrelation (1st lag) - LM	0.30 *	2.11 *	3.27
White test - included White cross data	21.78 *	19.54 *	20.56 *
Note: The coefficients marked with * are statistically insignificant at the level of 0.05			

Source: author's calculation

Additionally, from the aspect of the condition for stationarity of the VECM model, it can be concluded that it is stationary, i.e. in the model, there are 2 inverse roots, which is by the rule number of inverse roots in the VECM model be equal to the number of endogenous variables minus the number of cointegration equations. Based on the evaluated VECM model, the Granger Causality Test was conducted, which allows us to examine the short-run correlation between endogenous variables. The results of this test (Table 5) show that there is a statistically significant two-way relationship between GDP and loans, as well as between GDP and interest rates. Additionally, the test shows the presence of a one-way relationship from loans to interest rates.

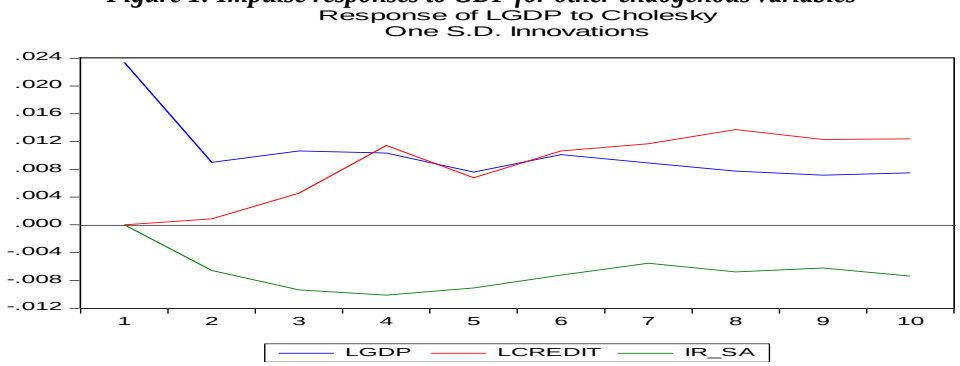
Table 5: Granger stationary test

		Dependent		
Independent	variables	Δlgdp	Δlcredit	Δir_sa
	Δlgdp	-	22.68 ***	11.02 **
	Δlcredit	8.46 *	-	17.46 ***
	Δir_sa	11.82 **	7.05	-
Note: ***, ** and * denote statistical significance at the level of 1%, 5% and 10% respectively				

Source: author's calculation

If in the context of the results of the Granger causality test we take into account the direction of the linear relationship between the variables, we can conclude that the direction of the relationship between GDP and credit is positive, while interest rates are negative. Additionally, in support of this statement is the fact that all assessed short-term credit ratios ($\beta_{2.p.1}$) are positive, while almost all assessed short-term interest rates ($\beta_{3.p.1}$) are negative. Hence, regarding the hypotheses of this paper, the conclusion is that: (Hypothesis 1) that there is a positive short-term relationship between loans and GDP is not rejected at the significance level of 0.1. (Hypothesis 3) that there is a negative short-term relationship between interest rates and GDP is not ruled out but at a significance level of 0.05.
Awad and Al Karaki (2019) confirm that the insignificant contribution of bank lending to GDP is attributed to the fact that banks due to the high degree of risk do not realize loans in the production sector in the economy, on the other hand, primary empirical evidence shows that bank lending does not cause economic growth, but growth economic triggers bank lending.
Regarding the stability of the system, we use the impulse response function to see how the endogenous variables would move in the event of a shock (from one standard deviation) to the other variables. (Figure 1), which shows the impulse responses to the variable LGDP (non-accumulated), can be seen that the credit shock will have positive effects on GDP starting from the second period, with a tendency to increase long term. On the other hand, an interest rate shock would have negative consequences for GDP from the first period, which after the first year would decrease slightly, but with a tendency to increase in the long run.

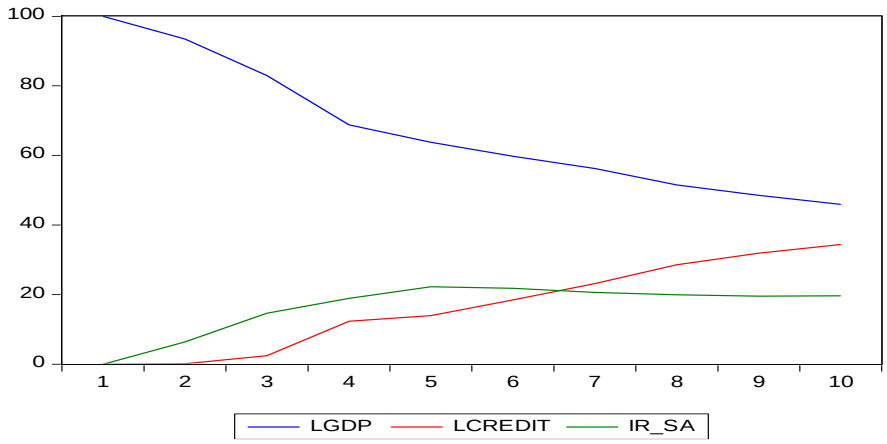
Figure 1: Impulse responses to GDP for other endogenous variables



Source: illustration by the author

Additionally, from the analysis of the variance of GDP (Figure 2), it can be seen that the impact of loans on GDP increases significantly over time, i.e. in the long run, reaching 34% of the variations in the tenth period. At the same time, interest rates increased their share in the variance of GDP until the fifth period, when they reached 22% of the variations, followed by a period of stagnation, stabilizing at a level of about 20% in the tenth period.

Figure 2: Decomposition of GDP variance



Source: illustration by the author

Hence, regarding the hypotheses, it can be concluded that: (Hypothesis 2) that there is a positive long-run relationship between loans and GDP is not ruled out at a significance level of 0.05; (Hypothesis 4) that there is a negative long-run relationship between interest rates and GDP is not ruled out, but at a significance level of 0.05. Hatmanu et. al. (2020) suggest that lowering the interest rate reduces the cost of lending and stimulates current consumption and supply, encouraging economic growth.

4. CONCLUSIONS

Based on the conducted research, it can be concluded that lending to the private sector in the Republic of North Macedonia has a positive impact on the gross domestic product, in the short and long term, while real interest rates have a negative impact, also in the short and long term. Such findings are based on the VECM model, with 4 lag intervals and one cointegration equation between endogenous variables, for the period from 2000 to 2018.

The evaluated VECM model, i.e. the equations within it, are statistically significant and have good adaptability, whereby all assumptions of the method of ordinary least squares are met. In other words, it means that the results obtained are stable and reliable. Credits have increased the supply in the research period which has a positive impact on economic activity, while on the other hand, the relationship between interest rates and GDP growth gives us a negative direction of income distribution in the country. Lee and Werner (2018) according to the economics of equilibrium of many economics schools and probably 95% of all publications in economics agree that lower interest rates stimulate economic growth, while higher interest rates slow economic growth. Werner (2012) confirms that

there is a model that meets the requirements of the differences between different bank loans, i.e. loans to increase GDP and loans to increase the price of assets that cause banking crises.

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