MACROECONOMIC DETERMINANTS OF NON-PERFORMING LOANS IN THE REPUBLIC OF NORTH MACEDONIA

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Abstract

One of the main indicators of the banks' financial performance is non-performing loans. The level and dynamics of the non-performing loans mean facing the direct consequences of credit risk. Namely, the problem with the non-performing loans leads to greater restriction of the banks' performance on the credit market, thus limiting investments and consumption, and threatening economic growth and even financial stability. Accordingly, to manage non-performing loans efficiently, it is crucial to analyze their determinants. The main objective of the study is to examine the macroeconomic determinants of non-performing loans in the Republic of North Macedonia for the period from 2006 to 2021. The study is based on a time series analysis of secondary data obtained from reports issued by relevant institutions, through the development of an Auto-Regressive Distributed Lag (ARDL) model, to investigate the dependence of non-performing loans to total loans ratio as a target variable on several macroeconomic variables/regressors such as GDP growth rate, inflation rate, unemployment rate, loans interest rate, exchange rate, and gross loans to GDP ratio. The results show that, in a long run, all the regressors have a statistically insignificant impact on the target variable; only the exchange rate negatively affects the target variable, whilst all other regressors have a positive impact on it.

Keywords: non-performing loans, banks, time series analysis, ARDL model, North Macedonia

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1. Introduction

Commercial banks play a crucial role in the economic growth of the country by making available the funds for investors to borrow as well as financial deepening in the country. In most cases, this refers to the possibility for the best transformation of savings into productive investments, which in turn represents an engine for economic development. The banks, as financial mediators, accumulate resources from several sources and allocate them into a credit portfolio comprised of different securities. They canalize the resources of the entities that have a surplus of liquid assets, to those that lack them. With that, they make the capital flows and trade easier. Here, they face an "exchange" between the risk and the return. So, at a given risk level, they attempt to maximize the returns.

Loans are the major output provided by the bank and they are related to credit risk. Hence, the bank usually wants it to be a performing one since its nonpayment leads to the incidence of huge loss on banks in particular and the country in general. The quality of the credit portfolio determines the performance of the banks and it is a crucial factor affecting the profitability of individual banks and the entire banking sector. Accordingly, proper credit policy is considered to be a fundamental determinant of the financial stability of banks (Kil & Miklaszewska, 2017). Consequently, managing credit risk should be given special emphasis, as the quality of credit risk management influences the success or failure of financial institutions (McNaughton *et al.*, 1997). In the relevant literature, one of the most commonly used proxies of credit risk is non-performing loans (NPLs).

A bank loan is considered non-performing when more than 90 days pass without the borrower paying the agreed installments or interest (ECB, 2016). A performing loan will provide a bank with the interest income it needs to make a profit and extend new loans. When customers do not meet their agreed repayment arrangements for 90 days or more, the bank must set aside more capital on the assumption that the loan will not be paid back. This reduces its capacity to provide new loans. Furthermore, if a bank has too many bad loans on its balance sheet, its profitability will suffer because it will no longer earn enough money from its credit business. In addition, it will need to put money aside as a safety net in case it needs to write off the full amount of the loan at some point in time (ECB, 2016). So, to be successful in the long run, banks need to keep the level of bad loans at a minimum level so they can still earn a profit from extending new loans to customers.

International analysis indicates that the maintenance of non-performing loans in the banks' balance sheets and the long resolution process lead to debt overhang and the inability to reduce leverage. This additionally restricts private sector investment incentives, tends to decrease credit demand, and weakens debt repayment, all of which creates new pressure on banks' profitability, their ability to reduce non-performing loans, and ultimately loan supply.

According to Greenidge & Grosvenor (2010), NPLs are therefore a measure of the stability of the banking system, and thereby the financial stability of a country. Consequently, to ensure a healthy and stable banking system, it is crucial to encourage many activities in the function of decreasing the volume of

non-performing loans. Regarding all these above, it is crucial to understand the determinants of NPLs and to investigate the relationship between them. Many studies in their attempt to analyze the determinants of non-performing loans identify two groups of factors. The first group is focused on macroeconomic determinants, while the second one is related to the bank-specific determinants. So, the main objective of our study is to examine the macroeconomic determinants of non-performing loans to ensure the improvement of non-functional loan management.

The rest of the paper is organized as follows. Section 2 deals with some previous work on the effect of the selected macroeconomic determinants on non-performing loans. Section 3 reviews and analyzes the non-performing loans in the Macedonian banking system. Section 4 provides insights into the objectives of the study, the research hypothesis, data, and methodology. The results obtained from the time series analysis are presented in Section 5, whilst Section 6 deals with their interpretation. The last section concludes and recommends.

2. Related research

Many studies have attempted to explore the effects of macroeconomic determinants on non-performing loans which had derived several variables such as gross domestic product rate, inflation rate, interest rate, exchange rate, unemployment rate, etc. Notable among them is the study conducted by Bošnjak *et al*. (2021). They examine the impact of some macroeconomic determinants on non-performing loans in Croatia and revealed that the unemployment rate and construction work volume have an impact on the NPL levels. Namely, while the increase in unemployment rates results in an increased level of NPLs, an increase in construction works volume and a decrease in unemployment rates were not correlated with a decrease in NPL. Otašević (2013) explores the impact of macroeconomic and bank-specific determinants on non-performing loans, using a sample of 33 banks in the Republic of Serbia in the period from 2008:Q3 to 2012:Q2. The findings of this paper indicate that it is only the macroeconomic determinants that have an impact on non-performing loans, while the impact of the bank-specific determinants is statistically insignificant. This is to say that the decrease in the GDP growth and the depreciation of the dinar lead to the deterioration of the credit portfolios of the Serbian banks. Beck *et al.* (2013) from European Central Bank in their study analyze the macroeconomic determinants of non-performing loans in 75 countries for one decade and conclude that the growth of real GDP is the main driver for non-performing loans. In the study, Ciukaj & Kil (2020) attempt to identify the quality of credit exposure determinants of banks in European Union countries (Bulgaria, Croatia, Cyprus, Italy, Ireland, Greece, Portugal) that were characterized by a high level of impaired loans at the end of 2017. They analyzed the NPLs determinants by using the static panel-based approach for the period from 2011 to 2017. The results of the panel research carried out show that the value of the NPLs ratio of the analyzed banks is statistically significantly affected by macroeconomic factors, such as GDP and the unemployment rate, as well as bank-specific factors such as the size of the bank or the dynamics of lending. Similar results are confirmed in the study conducted by

Ćurak M. *et al.* (2013) who revealed that lower economic growth, higher inflation, and higher interest rate are associated with higher non-performing loans in Southeastern European banking systems. In her study, Skarica (2013) confirmed that the primary cause of high levels of NPLs is the economic slowdown, which is evident from statistically significant and economically large coefficients on GDP, unemployment, and the inflation rate in selected European emerging markets and e. Similar results are gained from the study of Bashir *et al.* (2017) who explored the NPLs determinants on the banking system of China and they revealed, that determinants like macroeconomic factors have a huge impact on NPLs, predominantly real GDP, inflation, and real interest rate.

Regarding the research related to the macroeconomic determinants of non-performing loans in North Macedonia, it can be concluded that the studies are limited. One of the recent studies is the research revealed by Nikolov & Popovska-Kamnar (2016). They examined macroeconomic and bank-specific determinants of NPLs in Macedonia using descriptive and econometric analysis and their findings indicate that in a period of economic growth and higher inflation, non-performing loans are low and stable. Also, they confirmed that as long as the economy is stable and banks are profitable and have adequate capital, nonperforming loans are on a level suitable for the banks. In a similar study, J. Kjosevski *et al.* (2019) found out that the profitability of banks, the growth of loans to enterprises and to households respectively, as well as the growth of GDP, all have a negative impact, while banks' solvency and unemployment have a positive impact on the rise of non-performing loans in both models. In addition, their results indicate that the exchange rate has a positive and statistically significant impact on the level of NPLs, while inflation has a negative and statistically significant impact on the increase in non-performing loans to households. Similarly, Ilievska *et al*. (2012) reported a negative relationship between GDP growth and non-performing loans ratio, as well as a positive relationship between NPLs and interest rates.

Based on the results of the conducted research it can be concluded that the macroeconomic determinants play an important role in explaining the dynamic movement of non-performing loans (NPLs) and their increase can affect banks' liquidity and solvency. Regarding this, defining the macroeconomic determinants that influence non-performing loans has crucial importance on the banks' performance and the stability of the financial system as a whole.

3. Non-performing loans of the Macedonian banking system

Proper credit policy is considered to be a fundamental determinant of the financial stability and profitability of banks. The increased number of banks with high-risk loans leads to an increase in the value of loans not repaid on time and an increase in provisions created on this account and consequently reduces the profitability of the entire banking sector.

In the literature, many indicators are used by both banks and supervisors to measure the quality of credit exposure. However, the most frequently used indicator is non-performing loans (NPLs), also called non-performing exposures (ECB, 2017).

A bank loan is considered non-performing when customers do not meet their agreed repayment arrangements for 90 days or more. Thus the bank must set aside more capital on the assumption that the loan will not be paid back which results in reduced banks' capacity to provide new loans. The non-performing loan growth involves the necessity of provisions for loans and advances losses, which reduces the overall profits and weakens the structure. A non-performing loan is a risky asset and it leads to the insolvency of banks and major effect on the economy as a whole. So, to maintain a sound banking system, but also to enable sustainable credit growth with all the consequent effects on the dynamics of total economic growth, it is crucial to urge activities and efforts to reduce the volume of non-performing loans.

Regarding this, non-performing loans (NPLs) and the banking system stability nexus continue to gain more research attention, especially after the 2008/2009 global financial crisis (GFC) that led to the credit crisis in most economies (Ciukaj & Kil, 2020). The management of banks has been aware of the significance of credit risk in banking operations for many years and since 2013 it considers them the greatest threat to the financial stability of banks in surveys (Kil & Miklaszewska, 2017).

The increased non-performing loans in banks' balance sheets is one of the important challenges faced by most European countries in the post-crisis period and especially after the emergence of debt problems in some countries of the EU area. This problem was more pronounced in the countries in Central, Eastern, and Southeast Europe where non-performing loans significantly increased during the post crises period. Since the onset of the crisis, NPLs in the region increased to an average of 11% (end-2011) from just above 3% in 2007 (Klein, 2013).

In the Macedonian banking system, between 2008 and 2014, the share of non-performing loans to total gross loans grew slower compared to other countries in Central Eastern or Southeastern Europe. An important factor was that the credit growth in the Republic of North Macedonia in the period before the global crisis was double-digit only in a relatively short period and substantially smaller compared to other countries. This, together with the relatively good coverage of non-performing loans with impairment, was the main reason why the global financial crisis and the resulting economic slowdown were not a concern for the Macedonian banks compared to some other countries.

The graph in Fig. 1 depicts the level of non-performing loans to the non-financial sector of the Macedonian banking system for the period from 2005 to 2021.

Based on the graph in Fig. 1, it can be concluded that the share of NPL in total loans of non-financial entities was at a very low level in 2008 and was followed by a steady increase until 2013. But, in 2016 non-performing loans recorded a significant decline, mainly due to the amendments to the regulation of the National Bank, requiring banks to transfer all claims that have been fully provisioned for more than two years to off-balance sheets (NBRM, 2017). This compulsory cleansing of credit portfolios of banks is the main driver for the improvement of the credit risk indicators and resulted in dropped NPLs ratio of 6.6%. Such positive movements in NPLs ratio continued in the following years and it decreased significantly in 2019, whereby their share in the total loans to the

non-financial sector reduced to 4.2%. In the portfolio comprised of non-financial companies, non-performing loans decreased as a result of the selling of non-performing claims from one non-financial company, conducting mandatory write-offs by banks, and to a lesser extent due to foreclosures.
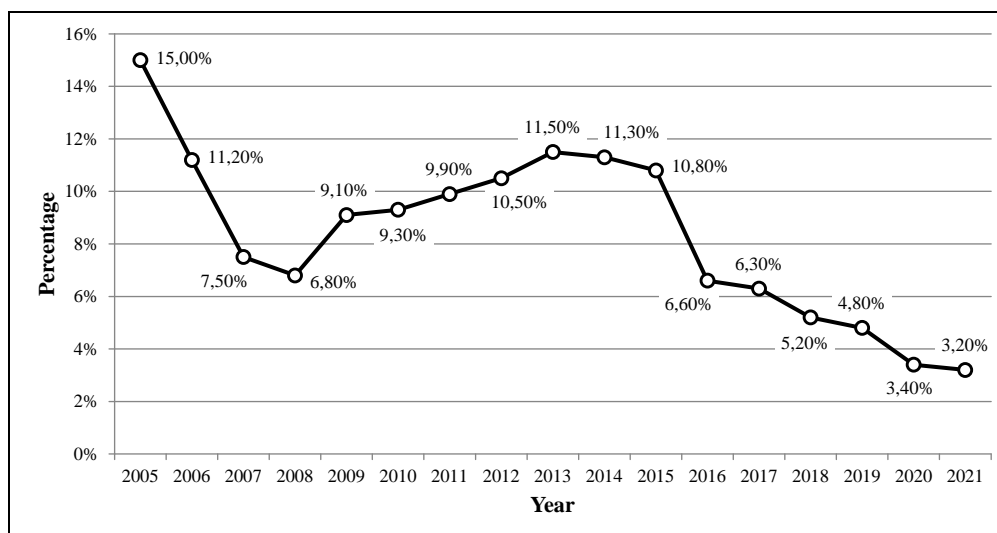

Figure 1. Non-performing loans ratio, 2005−2021 (Source: NBRNM, Banking System Indicators)

Although in 2020 the Macedonian banking sector faced many challenges, it succeeded to maintain its stability and contributed to mitigating the consequences of the COVID-19 crisis, registering solid growth of activities. This was a result of the public trust in the banking system, amid strong capital and liquidity positions with banks, but on the other hand, it arises from the National Bank's rapid reaction. Regarding the quality of the loans portfolio, as is shown in Fig. 1, non-performing loans decreased by 26.5%, reducing their share in total loans by 1.4 percentage points, to a very low level of 3.4%. The reduction of non-performing loans was influenced by the regulatory measure for the mandatory write-off of fully provisioned nonperforming loans and also influenced by regulatory measures undertaken by the National Bank in the area of credit risk management, primarily the introduction of the possibility for temporarily delayed repayment of loans due to corona crisis. This measure led to a temporary delay in the possible materialization of the credit risk in the banks' portfolios (NBRNM, 2020). Such positive movements continued in the following 2021 and the non-performing to total loan ratio remained at the historically lowest level of 3.2%. Even though during 2020 and 2021 the Macedonian banking sector was functioning in conditions of severe health and economic crisis, it could support the corporate sector and households and remained sound and stable (NBRNM, 2021).

4. Research Methodology

4.1 Objectives of the Study

The primary objective of the study is to examine the nature and the magnitude of the impact several macroeconomic determinants have on non-performing loans in North Macedonia.

4.2 Research Hypothesis

The null hypothesis this study attempts to confirm can be specified as:
H_0: Macroeconomic determinants have a significant impact on non-performing loans.

4.3 Data

The study examines the impact of several macroeconomic determinants on non-performing loans (NPLs) in North Macedonia. The dataset obtained for the study consists of officially published quarterly time-series data, covering the period from 2006:Q1 to 2021:Q4 (16 years × 4 quarters/year = 64 observations). The variables of interest are given as follows:

- *Dependent variable*
  - Non-Performing Loans to Total Loans ratio (*NPL2TL*), in percentages [%], as a measure of the quality of banks' loan portfolio;
- *Independent variables*
  - Gross Domestic Product Rate (*GDPR*), in percentages [%], as a measure of the economic activity in the country;
  - Inflation Rate (*IR*), in percentages [%], as a measure of macroeconomic stability;
  - Unemployment Rate (*UR*), in percentages [%];
  - Loans Interest Rate (*LIR*), in percentages [%];
  - Exchange Rate (*EXR*), in percentages [%];
  - Gross Loans to GDP ratio (*GL2GDP*), in percentages [%], as a measure of intermediary financial development;

All the data used in this research have been exploited from secondary online sources, i.e. the official websites of the National Bank of the Republic of North Macedonia (NBRNM, −) for *NPL2TL*, *LIR*, *EXR*, and *GL2GDP*, Ministry of Finance of the Republic of North Macedonia (MoF, −) for *IR* and *UR*, and State Statistical Office of the Republic of North Macedonia (MAKStat Database, −) for *GDPR*.

4.4 Methodology

The stationarity of the variables was tested by Augmented Dickey-Fuller (ADF) test and Phillips-Peron (PP) unit root tests, taking into account two information criteria: AIC (Akaike Information Criterion) and SIC (Schwarz Information Criterion).

The optimal lag length is estimated based on the evaluation of a corresponding unrestricted/standard VAR model.

The ARDL model is specified taking into account the variable *NPL2TL* as dependent one, and six dynamic regressors (*GDPR*, *IR*, *UR*, *LIR*, *EXR*, and *GL2GDP*), based on the AIC selection criterion, and automatic selection of a certain number of lags as maximum dependent lags.

Based on the obtained ARDL short-run coefficients, the short-run causality tests are performed using the series of Wald tests.

The long-run coefficients of the regressors and cointegration equation are estimated after performing the Bounds Cointegration Test.

The residual diagnostics include testing for the presence of autocorrelation and serial correlation using the Ljung-Box Q-statistics, testing for normality of residuals using the Jarque-Bera test, testing for the presence of serial correlation using the Breusch-Godfrey Serial Correlation LM Test, and testing for heteroskedasticity test using both Breusch-Pagan-Godfrey and ARCH tests.

The stability diagnostics of the selected ARDL model is carried out using the CUSUM and CUSUM of Squares Test.

All data analyses were carried out using the EViews v10 econometric package.

5. Results of the analysis

The results of both unit root tests (ADF and PP) and both information criteria (AIC and SIC) indicate that only the variable *GDPR* is stationary at level, i.e. its order of integration is I(0). All other variables (*NPL2TL*, *IR*, *UR*, *LIR*, *EXR*, and *GL2GDP*) are not stationary at level, but they become stationary after being first-differenced. Therefore, their order of integration is I(1). None of the variables has an order of integration I(2). Since all the variables of interest have an order of integration that is either I(0) or I(1), but not I(2), an ARDL (Auto-Regressive Distributed Lag) model can be built.

The optimal lag length was determined to be 4 according to the AIC selection criterion.

Based on the evaluation of numerous ARDL models vis-à-vis trend specification, and taking into account the values of important parameters like R^2, Adjusted R^2, F-statistics, and Durbin-Watson statistics, the ARDL(4, 2, 2, 2, 4, 4, 3) model was selected among 62,500 evaluated models, based on an unrestricted constant & unrestricted trend specification and minimal AIC value of 1.795308 (Table 1):

Table 1. ARDL(4, 2, 2, 2, 4, 4, 3) model summary statistics
(Source: Authors' calculations, EViews output)

R-squared	0.982547	Mean dependent var	8.132409
Adjusted R-squared	0.966783	S.D. dependent var	2.795224
S.E. of regression	0.509442	Akaike info criterion	1.795308
Sum squared resid	8.045470	Schwarz criterion	2.807575
Log likelihood	−24.85925	Hannan-Quinn criter.	2.191262
F-statistic	62.32911	Durbin-Watson stat	1.972548
Prob(F-statistic)	0.000000		

The specification of the ARDL(4, 2, 2, 2, 4, 4, 3) model is given in Table 2.
Table 2. Specification of the ARDL(4, 2, 2, 2, 4, 4, 3) model and short-run coefficients (Source: Authors' calculations, EViews output)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
NPL2TL(-1)	0.563571	0.152690	3.690960	0.0009
NPL2TL(-2)	0.161123	0.170551	0.944719	0.3521
NPL2TL(-3)	−0.025637	0.169535	−0.151219	0.8808
NPL2TL(-4)	0.197254	0.127881	1.542480	0.1331
GDPR	0.057704	0.026855	2.148695	0.0396
GDPR(−1)	0.067998	0.027330	2.488009	0.0184
GDPR(−2)	−0.070299	0.026848	−2.618452	0.0135
IR	0.067927	0.084963	0.799490	0.4301
IR(−1)	−0.244045	0.119347	−2.044828	0.0494
IR(−2)	0.314418	0.091625	3.431575	0.0017
UR	0.057316	0.207348	0.276424	0.7841
UR(−1)	0.220610	0.248610	0.887376	0.3817
UR(−2)	0.362307	0.216644	1.672365	0.1045
LIR	5.148388	1.701593	3.025628	0.0050
LIR(−1)	3.825919	1.873254	2.042392	0.0497
LIR(−2)	−6.982085	1.840258	−3.794079	0.0006
LIR(−3)	−0.627310	1.781253	−0.352174	0.7271
LIR(−4)	2.830798	1.250922	2.262970	0.0308
EXR	3.734549	1.998945	1.868260	0.0712
EXR(−1)	3.473223	1.929644	1.799930	0.0816
EXR(−2)	−7.636210	2.242558	−3.405134	0.0018
EXR(−3)	−1.591507	1.914990	−0.831078	0.4123
EXR(−4)	−3.804857	2.006711	−1.896066	0.0673
GL2GDP	0.411660	0.122056	3.372713	0.0020
GL2GDP(−1)	−0.314975	0.154079	−2.044236	0.0495
GL2GDP(−2)	−0.417506	0.144195	−2.895432	0.0069
GL2GDP(−3)	0.371976	0.130387	2.852855	0.0077
C	286.2993	232.2976	1.232468	0.2270
@TREND	0.668565	0.183687	3.639697	0.0010

The Bounds Cointegration Test showed that there is cointegration among the variables in the model, i.e. there is a long-run relationship, which allows one to estimate both a short-run ARDL model and long-run ECM/VECM model, as F-statistic = 5.496136 > I(1) at all levels of significance (1%, 2.5%, 5%, and 10%) (Table 3).

Table 3. The outcome of the Bounds Cointegration Test
(Source: Authors' calculations, EViews output)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0) Asymptotic: n=1000	I(1)
F-statistic	5.496136	10%	2.53	3.59
k	6	5%	2.87	4
		2.5%	3.19	4.38
		1%	3.6	4.9

The cointegration equation is specified in Table 4:

Table 3. The outcome of the Bounds Cointegration Test
(Source: Authors' calculations, EViews output)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	−0.103689	0.015302	−6.776380	0.0000

The estimated values of long-run coefficients are summarized in Table 5.

Table 5. Long-run coefficients of the ARDL(4, 2, 2, 2, 4, 4, 3) model and error correction (EC) term (Source: Authors' calculations, EViews output)

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPR	0.534316	0.587515	0.909451	0.3701
IR	1.333792	1.953676	0.682709	0.4999
UR	6.174546	6.388705	0.966479	0.3413
LIR	40.46433	46.01817	0.879312	0.3860
EXR	−56.17563	90.18301	−0.622907	0.5379
GL2GDP	0.493366	1.212143	0.407019	0.6868
EC = NPL2TL − (0.5343*GDPR + 1.3338*IR + 6.1745*UR + 40.4643*LIR −56.1756*EXR + 0.4934*GL2GDP)				

6. Interpretation of the obtained results

Based on the results of the analysis presented in Table 2, it can be concluded that in the short run:

- The first lag of *NPL2TL* is both positive and statistically significant (p-Value = 0.0009 < 1%). The third lag *NPL2TL*(−3) negatively affects the current value of *NPL2TL*, but it is statistically insignificant. The second and the fourth lag of *NPL2TL* positively affect the current value of *NPL2TL*, but they are statistically insignificant, too;
- At level, *GDPR* positively (+0.057704) affects the current value of *NPL2TL*; this impact is statistically significant (p-Value = 0.0396 < 5%);
- At level, *IR* has a positive (+0.067927), but statistically insignificant impact on the current value of *NPL2TL*;
- At level, *UR* has a positive (+0.057316), but statistically insignificant impact on the current value of *NPL2TL*;
- At level, *LIR* has a positive (+5.148388) impact on the current value of *NPL2TL*, which is also statistically significant (p-Value = 0.0050 < 1%).
- At level, *EXR* has a positive (+3.734549) and statistically significant impact on the current value of *NPL2TL* (p-Value = 0.0712 < 10%).
- At level, *GL2GDP* has a positive (+0.411660) and statistically significant impact on the current value of *NPL2TL* (p-Value = 0.0020 < 1%).

The series of Wald tests, which tests the null hypothesis that the specific regressor's lags cannot jointly influence the current value of the target variable, *NPL2TL*, have shown that this null hypothesis can be rejected at a 1% level of significance for all dependent variables included in the ARDL model. In other words, it can be concluded that all dependent variables along with their lags and their current value can jointly influence the current value of *NPL2TL* in the short run because there is a short-run causality running from them to the current value of *NPL2TL*.

The outcome of the Bounds Cointegration Test shown in Table 3 shows that since F-statistic = 5.496136 > I(1) at all levels of significance (1%, 2.5%, 5%, and 10%), the null hypothesis stating that there is no cointegration among the variables has to be rejected. This confirms that there is cointegration among the variables, i.e. there is a long-run relationship, meaning that time series are related to each other and therefore they can be combined linearly. This justifies the estimation of both the short-run ARDL model and the long-run ECM/VECM model.

Based on the results given in Table 4, the coefficient of the CointEq(−1) is negative, with a coefficient estimate of −0.103689, and statistically significant (p-Value = 0.0000 < 5%) at 5% level of significance. This implies that there is a long-run causality running from all the regressors to *NPL2TL*. The speed of the adjustment towards long-run equilibrium is 10.36%, i.e. the system corrects its

previous period of disequilibrium at a speed of 10.36% within one period of time
(a quarter).

The long-run values of the regressors' coefficients presented in Table 5
undoubtedly suggest that in a long run:

- All the regressors have a statistically insignificant impact on *NPL2TL*;
- One of the regressors (*EXR*) has a negative (−56.17563) impact on *NPL2TL*;
- All other regressors (*GDPR*, *IR*, *UR*, *LIR*, and *GL2GDP*) have a positive impact on *NPL2TL*;
- The increase of *GDPR* by 1 percentage point (pp) yields an increase of NPL2TL by 0.534316 percentage points (pp), having minded the *ceteris paribus* principle;
- The increase of *IR* by 1 pp yields an increase of *NPL2TL* by 1.333792 pp, having minded the *ceteris paribus* principle;
- The increase of *UR* by 1 pp is expected to increase *NPL2TL* by 6.174546 pp, having minded the *ceteris paribus* principle;
- The increase of *LIR* by 1 pp is expected to increase *NPL2TL* by 40.46433 pp, having minded the *ceteris paribus* principle;
- The increase of *EXR* by 1 pp is expected to decrease *NPL2TL* by 56.17563 pp, having minded the *ceteris paribus* principle;
- The increase of *GL2GDP* by 1 pp is expected to increase *NPL2TL* by 0.493366 pp, having minded the *ceteris paribus* principle.

According to Table 1, the extremely high value of the coefficient of determination R^2 suggests that the regressors explain 98.25% of the variation of the target variable, *NPL2TL*. The extremely high value of Adjusted R^2 (0.966783) points out the fact that the model includes regressors that highly contribute to the explanatory power of the model, which suggests that the observed ARDL(4, 2, 2, 2, 4, 4, 3) model is a good-fitting model. The model is also statistically significant since the value of 62.32911 of the F-statistics is statistically significant (p-Value = 0.000000 < 5%). Since the value of the Durbin-Watson statistics is slightly below the value of 2.00 (1.972548 ≈ 2.00), it can be concluded that the model is free from autocorrelation, i.e. free from first-order serial correlation.

The Ljung-Box Q-statistics for high-order serial correlation shows that there is no serial correlation in the residuals up to 28 lags. The Jarque-Bera test of normality of the residuals confirms the fact that the residuals are normally distributed. The residuals obtained from the ARDL model are free from serial correlation up to order 4. The Breusch-Pagan-Godfrey test proves that the residuals are free from heteroskedasticity. Finally, the plots of the CUSUM and CUSUM of Squares tests remain strictly between the 5% critical bounds, which proves the structural stability of the ARDL(4, 2, 2, 2, 4, 4, 3) model, as well as the stability of the variance of the regression error.

7. Conclusions

The banking system in each country has a crucial role in providing financial resources to the corporate sector and supports economic development, especially in developing countries and transition economies where the banks dominantly participate in the financial system as the capital market is still poor and undeveloped. The Macedonian financial system is characterized by the dominant role of the banks which are the most important source of funding in the Macedonian economy. The credit exposure of the Macedonian banks for the last five years increased about 40% from 484,201 million MKD in 2017 to 672,939 million MKD in 2021. Closely related to banks' credit exposure are credit risk and non-performing loans as the main indicator of the quality of banks' loan portfolios. The credit risk has to be managed carefully by the supervisory authorities to avoid bankruptcies and to keep the safety and stability of the banking and the financial system as a whole. So, the main objective of this study was to examine the impact of macroeconomic determinants on the ratio of non-performing loans to total gross loans in North Macedonia. To reach the goal of the research we apply Auto-Regressive Distributed Lag (ARDL) model and our findings show that, in a long run, GDP growth rate, inflation rate, unemployment rate, loans interest rate, and gross loans to GDP ratio have a positive, yet statistically insignificant effect on the non-performing loans ratio, while the exchange rate negatively affects the target variable. So, the results did not confirm the null hypothesis of the study since the impact of all macroeconomic determinants that are taken into account on the non-performing loans ratio is not statistically significant.

This study will contribute to the existing research in this field and can be a basis for further research on the relationship between NPLs and some variables that were not analyzed in this paper. A challenge for the next research will be the inclusion of the causality between the non-performing loans ratio and profitability indicators in North Macedonia.

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