



The Impact of Macroeconomic Factors on Non-performing Loans in the Western Balkans

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Abstract

This paper analyzes the relationship of macroeconomic factors to the level of non-performing loans (NPLs) using the econometric models GMM, the Fixed Effect model, and the Random Effect model. This study aims to identify macroeconomic factors at the level of non-performing loans in the Western Balkans, measure their impact on non-performing loans, and thus fill the gap that exists between macroeconomic factors (consisting of economic growth) and those with more impact on NPLs. The methodology used to carry out this research was desk research. We used World Bank data from 2000–2019, processed with STATA software. Results show that macroeconomic factors have an impact on non-performing loans. It also proves that even when interacting with other variables, the level of bad debt has not been completely eliminated, despite economic growth in many countries. Third, throughout the study period, fixed effects estimates show that variables are not significant in a static context. According to the findings, the annual rates of GDP growth, final government consumption, the real interest rate, gross domestic savings, and the unemployment rate all have a favorable impact on NPLs. This research contributes to a deeper understanding of the relationship between macroeconomic factors and non-performing loans in the Western Balkans. Based on this, to help reduce loan risk and bad debt by the proper criteria, we propose a series of policy implications. These implications aim to improve the efficiency of banks in particular and the banking system as a whole.

Keywords:

Macroeconomic Factor;
Non-Performing Loans;
World Bank;
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1- Introduction

Indicators for measuring NPLs in macroeconomic terms are taken into account in the framework of this paper. According to the literature review of these variables' correlations, NPLs are affected by macroeconomic factors such as GDP growth, inflation, interest rates, and unemployment. Countries with economic growth tend to have low levels of NPLs, while countries that went through a recession (economic downturn) tend to have high rates of NPLs. Thus, an economic recession (decline in GDP growth) severely affects the major export sectors and their ability to increase variables to settle their bank liabilities. Positive inflation leads to higher interest rates, which affect the repayment capacity of variables as central banks adopt contractionary monetary policy. Rising unemployment means less demand from export operators, limiting their ability to repay their unemployment loan obligations and consequently increasing NPLs.

The ratio of non-performing loans (NPLs) to total loans began to fall. This pattern is consistent with the overall declining trend in NPLs reported since 2009. On the asset side of the banking balance sheet, however, credit risk remained the most significant risk. This study is motivated by this in that its primary goal is to investigate the macroeconomic causes of non-performing loans in Western Balkan countries.

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NPLs are the most controversial issue in developed and developing countries [1]. According to the Oesterreichische National Bank, loan quality had significantly improved in all Western Balkan economies during 2015 [2]. However, due to growing uncertainty and revenue losses, the annual growth of loans to the private sector has slowed in most countries mentioned above. Financial intermediation in the economies of the Western Balkans is relatively moderate, with private sector loan ratios to GDP [3].

From the literature review, most current research is positive in countries with economic development and negative in economically underdeveloped countries. There are two main aspects in which this research differs from other research. First, no research considers the impact of macroeconomic factors on the level of NPLs in the Western Balkans. Second, the methodology and information used in this research are different from other research. Every research has used one of the following: the GMM econometric method, the fixed-effect model, and the random effect model.

Given our understanding, this paper aims to analyze the relationship between macroeconomic factors that consist of economic growth and the level of NPLs for the period 2000–2019 in Western Balkan countries. This study aims to identify macroeconomic factors at the level of non-performing loans in the Western Balkans, measure their impact on non-performing loans, and thus fill the gap that exists between macroeconomic factors (consisting of economic growth) and those with more impact on NPLs.

This research contributes to a deeper understanding of the relationship between macroeconomic factors and non-performing loans in the Western Balkans. The research will show the impact of macroeconomic factors and non-performing loans in particular. This will clarify how bank managers should treat the performance of the real economy when lending given the reality that loan delays are likely to be higher during periods of economic downturn.

The study shows through a comparative approach how central banks should also expand their monitoring framework to include prudent macroeconomic indicators such as GDP and inflation rate when assessing the stability and health of the banking system as well as the governments of the countries they have. Research should always properly implement banking reforms in the right sequence, while initially maintaining macroeconomic stability. Based on this, to help reduce the risk of bad credit and debt with the right criteria, we propose a range of policy implications. These implications are intended to improve the efficiency of banks in particular and the banking system as a whole.

2- Literature Review

2-1- Empirical Findings on the Impact of Economic Growth on NPL

Morakinyo & Sibanda's paper (2016) studies the main determinants of NPLs in MINT economies (Mexico, Indonesia, Nigeria, and Turkey) from 2013, using the fixed and Random Effects model and Hausman -Taylor IV. The findings demonstrated that economic growth is directly and negatively impacted by the NPLs and bank loans to the economy ratio [4]. Dinçer et al. (2018) analyzed the annual panel data of 16 African countries between 2001 and 2015 the Dumitrescu Hurlin test. Their findings have concluded that the increase is the leading cause of the non-performing loan ratio, which shows a negative correlation; thus, when the economic growth of these countries is declining, customers begin to encounter some financial difficulties paying their debts to banks [5].

Impavid et al. (2012) analyzed data with annual frequency, covering the period between 2008 and 2010 using the GMM model. The findings indicate that real GDP growth has shown that the results are positive with significant effects on the NPL, in each decrease of 1 percent of GDP, reducing loan growth by about 0.85 percent [6]. Islam & Tareq (2016) analyzed the determinants of macroeconomic variables on NPLs of local Bangladeshi private commercial banks. The data ranges from 2004 -2013 and covers 18 scheduled banks. The findings showed that NPL is negative in terms of GDP growth, which means that with GDP growth, NPL will decrease [7].

Beaton et al. (2016) used bank-level panel data to evaluate NPL determinants in the ECCU (Eastern Caribbean Currency Union). Quarterly data are spread from the first quarter of 1996-2015 to the fourth quarter, using the fixed-effects models, Random Effects and GMM-IV evaluation. The findings found that a deterioration in asset quality has a negative effect on economic performance measured by real GDP growth. Thus, the baseline model suggests a one percent increase in real GDP growth, whereas keeping other factors constant leads to a decline in NPL growth of about 1.8 percent [8].

Georgiou, (2013) analyzed bank-level panel data to estimate NPL determinants in 21 countries for the periods 2000-2010 using the Generalized Least Squares (GLS) method. Results showed that the economic climate (growth or depression) and the recent economic depression resulted in increased NPLs, which drove the economic lie to affect the NPL negatively [9].

Ayhan & Kartal, (2021) investigated the macroeconomic drivers of NPLs in 23 selected countries. Annual data between 2006 and 2018 were analyzed using heterogeneous panel analysis and the regression model. Empirical findings indicate that gross domestic product (GDP) has a statistically significant negative effect on NPLs [10].

Balgora et al. (2016) used a global sample of 100 countries from 1997-2014 using regression analysis and VAR. The findings showed that NPLs positively affect GDP per capita growth, investment growth, labor force, market share, and unemployment rate. The findings state that reducing NPLs has an unclear positive medium-term impact on the economy [11]. Messai & Jouini (2013) attempted to discover the determinants of NPLs from 85 banks in three countries (Italy, Greece, and Spain) from 2004-2008, utilizing the matrix of the Pearson correlation. After applying the panel data method, they found that NPLs do not start negatively with the GDP growth rate [12].

2-2- Empirical Findings on the Impact of Macroeconomic Determinants on NPL

Sanyaolu et al. (2020) examined the specific determinants of bank and macroeconomic non-performing loans of listed money Banks (DMB). The regression analysis involving the fixed effect was adopted to analyze the panel data of 10 banks selected for deposit money in the period 2008-2017. However, no single macroeconomic variable exerts a significant effect on non-performing loans [13]. Kjosevski et al. (2021) in their study they examined selected macroeconomic and specific determinants of non-performing loan banks (NPLRs) for a panel of 21 commercial banks from the Baltic States (Estonia, Latvia and Lithuania), using annual data for the period 2005-2016. Empirical results provide evidence that the most important macroeconomic factors affecting NPLs are GDP growth, public debt, inflation and unemployment [14]. Nor et al. (2021) examined non-performing loan determinants (NPLs) in Asia using a panel data set in 9 countries covering the Middle East, Southeast Asia (SEA) and South Asia over the period 2000 to 2014, and test whether these determinants affect Southeast Asia differently. The results of the two-step GMM System show that GDP growth and liquid assets to total assets significantly affect NPLs in a negative way [15].

Anita et al. (2022) selected empirically selected macroeconomic determinants of non-performing loans (NPLs) for a panel of 8 South Asian Association for Regional Cooperation (Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan, and Sri Lanka) countries, using annual data for the period 2008–2019. To examine the association, this study primarily conducted the OLS model, fixed effects assessments, and random effects assessments, and, ultimately, applied robust fixed effects assessments to solve the heteroskedasticity problem. Empirical findings confirmed the previous findings, showing a significant positive correlation with the government budget balance and a significant inverse correlation with GDP, sovereign debt, inflation rate and money supply [16].

Syed (2022) have used the General Moment General (GMM) technique covering the period 1995-2019, in addition to the use of fixed and random tests for stability checks. The findings suggest that the common macroeconomic and specific factors of the bank that affect non-performing loans between developed and developing countries are growth rate, inflation, interest rate, capital adequacy ratio, deposit-to-deposit ratio and bank lending for the private sector [17]. Haniifah (2015) examined the economic determinants of NPLs in Ugandan commercial banks information was collected from all of 25 commercial banks in Uganda. Secondary data was obtained from BOU and WB databases from 2000-2013 and a regression model. The findings reveal a negative inflation rate, interest rate and growth of GDP, while the interest rate effect on NPLs is positive but insignificant [18].

Akinlo & Emmanuel (2014) investigated annual data for Nigeria from 1981-2011, using the OLS small squares model. The findings exhibit that real GDP growth tends to reduce NPLs in both short-term and long-term, as the lending rate has an increasing impact on NPLs, decreasing the unemployment rate will lead to a reduction in NPLs [19]. Klein (2013) researched NPLs in Central, Eastern, and South-eastern Europe (SEEU) from 1998-2011 by applying the VAR panel methodology. NPLs responded to macroeconomic conditions such as GDP growth, unemployment, and inflation. Furthermore, the analysis illustrates that there are strong reaction effects from the banking system to the real economy, suggesting that the high NPLs that many CEE countries currently face impact the pace of economic recovery negatively [20].

According to Ahmad et al. (2016) on economic indicators (i.e., GDP growth, interest rates, and inflation. NPLs from 1998-2010 come by annually, using the regression method. The findings concluded that there is a negative correlation between GDP and NPLs. However, interest rates and NPLs are positively correlated. Non-performing loans ultimately harm economic growth, for GDP and NPLs are negatively correlated [21]. Ghosh (2015) examines banking industry specific determinants at the state level, as well as economic determinants of the non-performing loan region for all commercial banks and savings institutions in 50 US states and the District of Columbia between 1984 and 2013. He used both the fixed effects methodology and the dynamic estimates of the GMM to demonstrate that the state's real GDP, actual growth rates of personal income, changes in the price index of state housing, reduce the NPLs. At the same time, inflation and U.S. government unemployment rates increase NPLs significantly [22].

Fofack & Fofack (2005) draw on both methodology and correlation to explore the leading causes of NPLs in Sub-Saharan Africa in the 1990s, through the causality and pseudo-panel models at the macroeconomic level. The simulated results show that macroeconomic stability and economic growth are accompanied by dwindling NPLs. In contrast, adverse macroeconomic shocks, coupled with higher capital costs, and lower interest margins are accompanied by an increase in the extent of NPLs. Analysis remarks that economic growth correlates negatively to NPLs [23].

Castro (2013) analyzed the relationship between macroeconomic developments and bank credit risk in Greece, Ireland, Portugal, Spain and Italy (GIPSI) which are recently affected by adverse economic and financial situations. Using dynamic panel data access for these five countries from 1997 to the third quarter of 2011, and the aggregated OLS methodology, Fixed Effects, and Random Effects. The researchers concluded that the macroeconomic environment greatly affects bank credit risk. When the GDP growth, housing stock, and price indices decrease, loan risk increases. The unemployment rate, interest rate, and the credit growth are also positively affected with regard to the real exchange rate [24].

The work of Angela & Irina (2015) empirically investigated the quality determinants of the bank loan portfolio for a panel of 29 commercial banks from two new EU member states, namely Bulgaria and Romania, from 2003-2019. Considering the econometric model's dynamic nature, they first turned to more traditional IV assessment techniques, namely the smallest two-phase squares (2SLS) and the two-step GMM. Their results showed that the dynamics of bank loan quality, expressed by the ratio of NPLs to total loans, are significantly influenced by macroeconomic factors (GDP growth rate, unemployment rate and inflation rate) [25].

Khemraj & Pasha (2009) analyzed the determinants of NPLs in the Guyanese banking sector using a panel data set and a Fixed Effect model. Their empirical results showed that GDP growth is inversely related to NPLs, suggesting that an improvement in the real economy reduces NPLs. They also discovered that banks with relatively higher interest rates and excessive lending tend to have higher levels of NPLs [26]. Louzis et al. (2012) used dynamic panel data methods from nine Greek commercial banks from the first quarter of 2003 to the third quarter of 2009 to examine determinants of NPLs in the Greek financial sector. They used the Fixed Effects method and GMM. The findings showed that macroeconomic variables, especially the real GDP growth rate, unemployment rate, and lending rates, substantially affect the level of NPLs [27].

Makri et al. (2014) Analyzed the factors influencing the (NPLs) of the Eurozone banking systems from 2000 to 2008, shortly before the onset of the recession, applying the GMM difference valuation methodology. Overall, the findings highlighted strong correlations between NPLs and various macroeconomic factors (i.e., unemployment, annual growth rate of GDP) [28]. Ghazo et al. (2021) examined NPL determinants in eight African countries using 2000-2016 data on NPLs and a dynamic panel methodology. Fixed Effects random model, and the GMM system showed that the relationship between NPL, Inflation, and GDP Growth Rate was significant but negative [29]. Wairimu & Gitundu (2017) researched the macroeconomic determinants of NPL in Kenya. Time series data from 1998-2015 were analyzed using a linear regression model. The findings showed that (when statistically compared) the inflation rate, interest rate, GDP growth rate, and exchange rate were not significant, while the unemployment rate stood out with a signifying rate at the 0.05 faith level [30].

Škarica (2014) analyzed the determinants of changes in emerging and selected European markets' NPLs ratios. The model was evaluated in a panel data set for seven Central and Eastern European countries between third quarter of 2007 and 2012, using the Fixed Effect estimator, difference GMM, and System GMM models. The countries subjected to analysis were Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Romania, and Slovakia. The findings suggested that the main cause of high NPL levels was the economic slowdown, which was evident from the statistically significant and economically large coefficients on GDP, unemployment, and the inflation rate [31].

Louzis et al. (2011) analyzed the panel data set that included the nine largest Greek banks from the first quarter of 2003 to the third quarter of 2009 using the GMM valuation model. The findings showed that NPLs in the Greek banking system could be mainly explained by macroeconomic variables (GDP, unemployment, interest rates, public debt) and the quality of management for all categories of loans. Differences in the quantitative impact of macroeconomic factors between loan categories were evident [32]. Bhattarai (2015) collected data for 26 commercial banks covering 2002-2012 era with 227 observations. The impact of the GDP growth rate turned out to be insignificant in this study, using the ordinary least squares model. The findings showed that the inflation rate had a significant positive impact on NPLs. Banks that charged relatively higher actual interest rates had higher NPLs and this data was consistent with the findings of previous studies [33].

Adusei (2018) researched the determinants of NPLs in Ghana, using annual historical time series data covering 1998-2013, based on the Common Least Squares model. The study found that macroeconomic variables were important determinants of NPLs with special emphasis on inflation, and the exchange rate was found to be an important determinant of NPLs [34]. Asafo (2018) analyzed annual series from 2008-2017, using the Bayesian Vector Autoregressive Approach (VAR) which interpolated frequencies into quarters to assess how macroeconomic shocks affect loan portfolio quality. The findings were that shocks to gross domestic product, and monetary policy rates led to an increase in the ratio of NPLs. This study concluded that the macroeconomic environment had a significant impact on the performance of the bank loan portfolio, which translated into loans with problems [35].

The analysis of Curak et al. (2013) was based on the sample of 69 banks in 10 countries from 2003 to 2010 using the estimator of the generalized moment method for dynamic panel models, and the GMM system estimator. The findings

showed that the lower economic growth, higher the inflation, and higher the interest rates associated with increased NPLs [36]. Abid et al. (2014) researched the dynamic panel methods. Data were assessed from 2003-2012 in about 16 Tunisian banks. The paper examined the determinants of NPLs of individuals using the GMM system estimator. The findings demonstrated that macroeconomic variables, (i.e., the real GDP growth rate, inflation rate, and real lending rate affected the degree of NPLs [37].

Isaevet al. (2017) explored the factors that pushed the non-performing financing of the Islamic bank in Malaysia from 2010 Q4 and 2016 Q3, using the model of Ordinary Least Squares (OLS). The results made it evident that macroeconomic variables, particularly the unemployment rate, had a powerful influence on the level of non-performing financing. However, when bank-specific variables were added to the base models, GDP growth and the real lending rate could not explain the change in financial problem [38]. Rajha (2017) researched the determinants NPLs in the Jordanian banking sector from 2007-2012 using panel data regression. The findings showed that economic growth and the inflation rate had a significant negative effect on NPLs [39].

Nkusu (2011) used two complementary approaches in a sample of 26 advanced countries covering 1998-2009 panel data, with the help of the VAR model. According to the study, the macroeconomic determinants of NPLs in the panel regressions confirmed that macroeconomic developments were associated with increased NPLs [40]. Beck et al. (2013) studied macroeconomic determinants of NPLs in 75 countries from 2005 -2010 over the past decade, using a new set of panels data the Fixed Effects, and Random Effects Models. They revealed that NPLs were affected significantly by the GDP growth, stock prices, the exchange rate, and the loan interest rate [41].

Singh et al. (2020) analyzed the 2015-2019 data through multiple regression analysis. This research showed how GDP and Inflation had a significant effect on NPL. They also stated that GDP affected NPL positively and significantly. Contrarily most studies showed a negative effect. The researchers pointed out that when GDP growth increased, Nepalese banks significantly, however, there were no significant changes in revenue increase [42].

Bolarinwa et al. (2021) examined the macroeconomic determinants of NPLs empirically in the Nigerian banking sector from 1980-201, in assistance with the Augmented Dickey-Fuller unit root test the co-integration test of Engel and Granger and the error correction mechanism. The findings showed that economic variables not affect the banks' NPLs in Nigeria adequately. This was due to the country's financial development, economic level, and the complex implementation of banking reformations that prevented them from achieving the desired goals [43]. SenGupta (2020) did a study using data from a panel of 103 countries with annual data from 2000-2017 and the Fixed Effects model. The study empirically confirmed the theory of the negative impacts of NPLs on the economy [44].

Jakubíka & Reiningerb (2014) provided NPLs' macroeconomic model for Central, Eastern, and Southeast European countries, based on GMM model panel data from Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Russia, Slovakia and Ukraine. Empirical findings showed that economic growth was the main driver that was negatively related to the development of NPLs [45]. In a study by Gjini (2021) using a simple and multi-linear regression method, it is clearly evident that there was in fact a strong correlation between economic indicators and the NPL rate in Albania from 2003-2016. Statistically, GDP growth and inflation had a direct and negative effect on NPLs. However, between unemployment and NPLs there seemed to be a negative correlation [46].

Turan & Koskija (2014) gathered data from 2003-2013 and using the multiple regression method, they presented of Johansen's NPLs results and five variables including the real GDP, unemployment, inflation, loan interest rates. Remittances are co-integrated with each other, but in the long run, this co-integration is weak [47]. From 2008-2020, the cointegration and the distributed autoregressive lag model were used by Foglia (2022) to investigate the macroeconomic determinants of NPLs impact on the Italian banking system. Empirical findings show that the GDP prompted a negative influence on NPLs; On the contrary, the unemployment rate affected impaired loans positively [48].

3- Research Methodology

The study employs panel data analysis and information from the years 2000-2019. We used the Fixed Effects estimation, Arellano-Bond GMM, System GM, and the random coefficient estimation to assure the robustness of our estimates. This paper aims to analyze the relationship between macroeconomic factors (i.e., economic growth) in the level of NPLs.

We consider only the Western Balkan countries (Albania, Kosovo, Bosnia and Herzegovina, Croatia, Northern Macedoni, Montenegro, and Serbia). Indicators for measuring NPLs in macroeconomic terms are taken from the World Bank for the manuscript's framework. We analyze the bank's NPLs to total gross loans, the annual percentage of GDP growth per capita, consumer inflation (%), real interest (%), and unemployment rates (% total workforce). Supplementary loans are affected by economic growth significantly. Countries that grew economically have lower levels of performing loans; however, those with low economic growth tend to increase performing loans. The risk lies in NPLs becoming an obstacle to economic growth as they aggravate loan growth, which remains stifled in most of the region in terms of NPLs and inflation.

Figure 1 presents the research methodology in a flowchart in five stages, where the first through the fifth stages identify the research problem, the review of relevant literature, the research methodology, the results and discussions, and the conclusions and recommendations of the study, respectively.

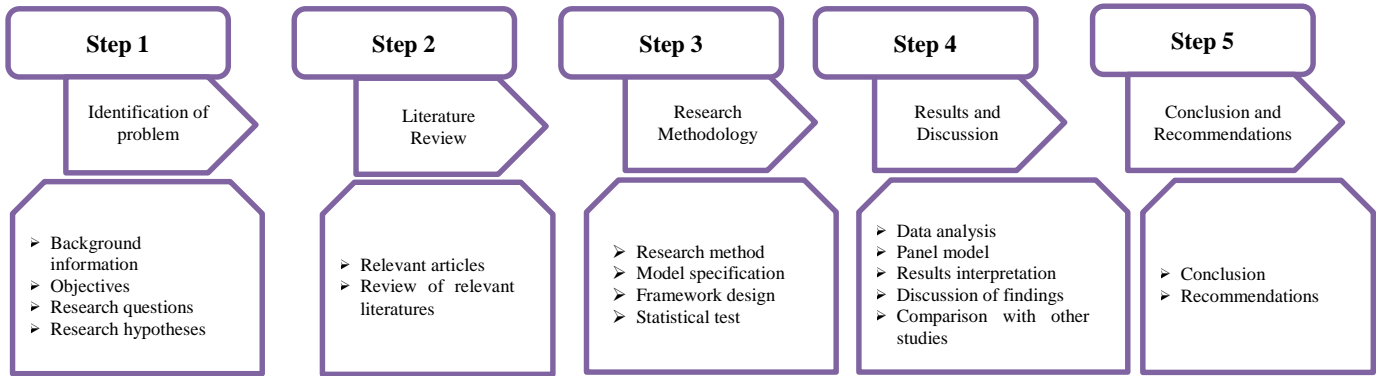


Figure 1. Flow chart of research

This paper answers the following questions:

- Does GDP affect the level of NPLs negatively?
- Does the inflation rate affect the level of NPLs negatively?
- Does the unemployment rate affect the level of NPLs negatively?
- Does the interest rate affect the level of NPLs negatively?

This research will confirm these hypotheses:

- H1-The economic growth affects the level of NPLs positively.
- H2-The rising inflation rate affects the level of NPLs negatively.
- H3-The unemployment rate affects the level of NPLs negatively.
- H4-The interest rate affects the level of NPLs negatively.

Figure 2 shows the relationships between the variables.

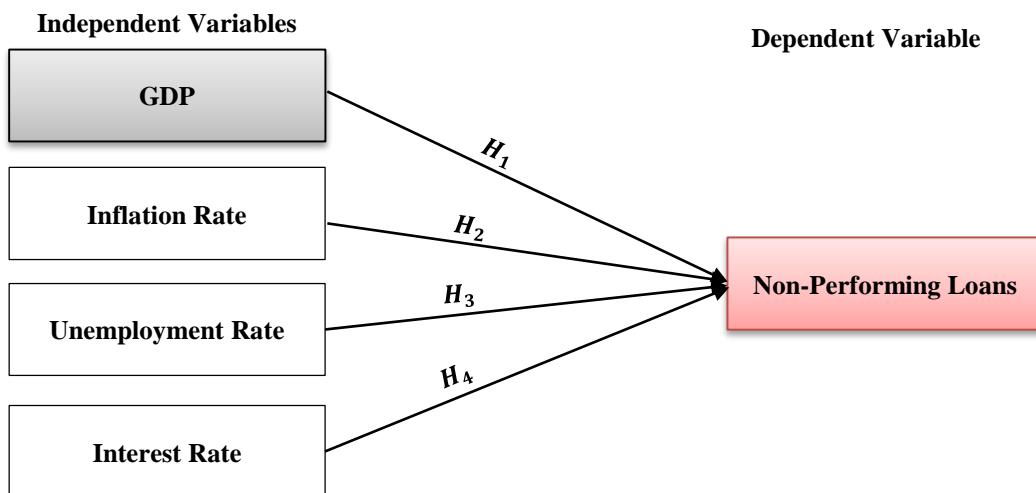


Figure 2. Framework of Research

In this framework, non-performing loans is the dependent variable while GDP, inflation rate, unemployment rate and interest rate are the independent variables that has an influence on dependent variable either positively or negatively. The map shows the countries that constitutes the Western Balkans (Figure 3).



Figure 3. Map of the Western Balkans

According to the World Bank, Albania's economy would rise by 8.0% in 2021 and 2022. Tourism revived substantially in the summer season, with foreign tourist numbers nearly matching pre-pandemic levels for the June-August period. In the second quarter of 2021, Bosnia and Herzegovina's economic performance exceeded expectations. Exports of goods and services increased by more than 50% in real terms year on year, owing to a strong rebound in the EU, the country's primary export market. Kosovo's economy is mostly recovered as a result of a supporting foreign sector. Services exports more than doubled in the first seven months of 2019, owing primarily to travel-related inflows. An increasing stream of remittances and credit expansion are supporting household consumption.

Montenegro's economy has begun to recover following one of the biggest contractions in EBRD regions in 2020. The government's revenue increased significantly during the summer months, helping to shore up the fiscal accounts. GDP is expected to expand by 12.3% in 2021 and 2022. North Macedonia's growth accelerated in the second quarter of 2017, fueled by both domestic and global demand. Exports of goods increased in both value and volume terms, paralleling imports, as the EU recovered. The GDP is expected to rise by 4% in 2021 and 2022. Following a modest recession in 2020, Serbia's GDP is expected to grow rapidly in 2021. Serbia's GDP is expected to expand by 6.5 percent in 2021 and 4.3 percent in 2022. In September 2021, inflation reached 5.7% year on year.

The Fixed Effects' framework enhances control on unobserved heterogeneity across countries. Although simple and intuitive, it may give rise to "dynamic panel bias" which results from the possible endogeneity of the lagged variable and the Fixed Effects in the error term. Arellano-Bond GMM system can be used to avoid these difficulties since it eliminates the Fixed Effect element by transforming the data to first differences and uses the lagged levels of the right-hand variables as instruments. Considering that in small samples and high steadiness, framework GMM might perform better, as the assessment from distinction GMM might have low accuracy, the last option is utilized additionally to approve our discoveries [49].

Mehmood et al. (2021) explored how random coefficient estimates might be superior to GMM and Fixed Effects, arguing that common fixed coefficients gave insufficient approximation to the genuine model. This was due to their presupposition of intercepts' homogeneity across nations and time periods [50]. It was critical that the nation specific variables and the other independent variables in the equation were mean independents of the error term in order to have consistent estimates of Fixed Effects under OLS. Furthermore, Random Effects estimation necessitated the use of GLS, and the error components were mean independents of the explanatory factors [51]. As a result, they believed that the GMM failed to offer consistent estimates since obtaining operable instrumental variables was a time-consuming process. On the other hand, the estimates allowed the intercepts and slopes to vary between countries over time and at a specific point in time (Time Varying Model), capture omitted variables without the need for dummy variables (as in a gravity model), and controls for endogeneity issues, measurement errors, and unknown functional forms.

Nonlinear models' RC estimations provide tests for parameter constancy, which aids to avoid incorrect inference or to determine whether the model is described correctly. Because of accounting approaches' differences, classification of NPLs might not be consistent across banks in our study. However, assuming that classification of NPLs has not changed significantly over time (within banks), this problem is somewhat mitigated by controlling for unobserved Fixed Effects in the econometric analysis. NPLs are concealed by a large number of restructured and "ever-greened" loans in some banks, which are not included in our research; therefore, reported NPL figures underestimate the underlying stress in the banking system (estimation bias).

Based on the theory of NPLs and Polodoo et al. (2015), the empirical research model, several independent variables reflecting the reality of the NPLs' situation in the Balkans has been adjusted. They proposed a model to test the impact of factors on NPLs in seven Balkan States from 2000-2019 [52].

The model affecting NPLs dependent variables and independent variables: GDP, INF, GFC, INT, GDS, UNEMP. A balanced panel data categorized into country and time was combined with secondary data from seven nations. As a result, the research has 140 observed variables (7 counties × 20 years = 140). The data was synthesized, processed, and planned using *Excel* and *Stata 14.0* software for estimation through the GMM, Fixed Effect Model, and Random Effect Model. The equation for the fixed effects model becomes:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \dots + \beta_k X_{k,it} + Y_2 E_2 + \dots + Y_n E_n + \sigma_2 T_2 + \dots + \sigma_t T_t + u_{it}$$

where β_0 is the unknown intercept, Y_{it} is the dependent variable (DV) where i = entity and t = time, $X_{k,it}$ represents one independent variables (IV), β_k is the coefficient for that IVs, u_{it} is the error term, E_n is the entity n. Since they are binary (dummies) you have n-1 entities included in the model, Y_2 is the coefficient for the binary regressors (entities), T_t is the time as binary variable (dummy), so we have t-1 time periods, and σ_t is the coefficient for the binary time regressors. The random effects model is:

$$Y_{it} = \beta X_{it} + \alpha + u_{it} + \varepsilon_{it}$$

where u_{it} is the between-entity error, and ε_{it} is the within-entity error.

In the choosing the appropriate model, the flow chart below is used (Figure 4).

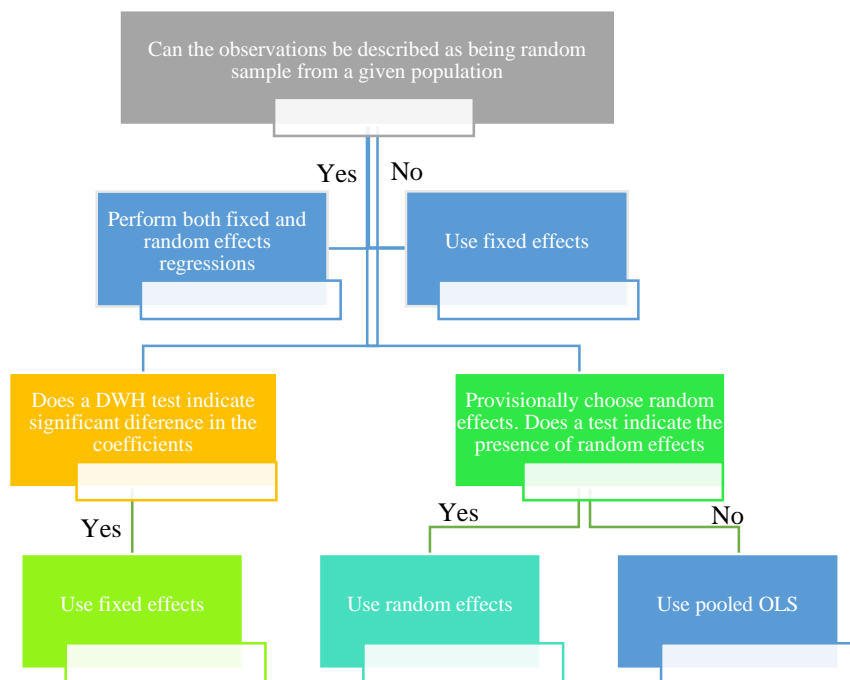


Figure 4. Flow chart for choosing the appropriate model

The first-difference GMM and the system GMM estimation are employed. Many previous empirical studies that have used panel data to examine the relationship between financial development and economic growth employ a Barro (1991) styled regression augmented with financial-development indicators [53].

$$y_{it} = \alpha + \beta X_{it} + \mu_{it};$$

$$\mu_{it} = \mu_i + v_{it}$$

$$v_{it} \sim N(0, \sigma_v^3) \tag{1}$$

Equation 1 presents a generic growth regression. In each cross-section, there are *i* provinces that operate over *t* sample time-period.

where; y_{it} is the dependent variable, and X_{it} is a vector of independent variables. Vectors of parameters are β , and the error term μ_{it} is composed of μ_i , the country-specific, time-invariant effect errors that are fixed over time, and the time-varying random error v_{it} , which is independent and identically distributed.

The GMM requires a set moment conditions based on the underlying assumption of the econometric model. Thus, Arellano and Bond (1991) suggest using a GMM approach building on the first-difference estimator and its conditions, producing:

$$\Delta y_{it} = \beta \Delta X_{it} + \gamma \Delta y_{i,t-1} + \Delta \mu_{it}, \tag{2}$$

The instruments here deal with the endogeneity of the vector X_{it} and the serial correlation caused by the new error terms, $\mu_{it} - \mu_{it-1} = \Delta \mu_{it}$. The first-difference GMM estimator uses the following moment conditions based on the assumption that μ_{it} is not serially correlation and that X_{it} is weakly exogenous [54].

4- Results and Discussion

4-1- Descriptive Analysis

The results in Table 1 reveal that the majority of the variables have a comparatively low dispersion. However, the GDP, INF, INT, and GDS variables produce the opposite result, with dispersion ranging from -7.323537 to 4295427, -2.410264 to 500, -25.67959 to 108.1846, and -16.13343 to 22.6053, respectively, and standard deviations of 1089260, 46.79103, 26.93594, and 9.477311, with average values of 302129.4, 10.90614, 13.83526 and 5.192628.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
BNPL	84	10.50865	5.568023	1.901134	23.49278
GDP	139	302129.4	1089260	-7.323537	4295427
INF	119	10.90614	46.79103	-2.410264	500
GFC	136	18.63287	4.791896	9.692358	39.28179
INT	80	13.83526	26.93594	-25.67959	108.1846
GDS	134	5.192628	9.477311	-16.13353	22.6053
UNEMP	128	21.21866	7.619452	6.935	37.25

4-2- Correlation Analysis

The results in Table 2 reveal that the correlation between the pairs of independent variables is relatively low, meaning that the variables in the model do not exhibit any collinear phenomena with one another.

Table 2. Correlation coefficients

	BNPL	GDP	INF	GFC	INT	GDS	UNEMP
BNPL	1.0000						
GDP	0.1222	1.0000					
INF	-0.2875	-0.2006	1.0000				
GFC	-0.3975	0.1674	0.0302	1.0000			
INT	0.4968	-0.1147	-0.3492	-0.6672	1.0000		
GDS	-0.0190	0.4697	-0.2188	-0.3952	0.2501	1.0000	
UNEMP	-0.1585	-0.2919	0.0729	0.1629	-0.0769	-0.5753	1.0000

4-3- Regression Analysis

Table 3 shows the findings of Fixed Effects for the NPL model. An examination of the data reveals that GDP annual sales, inflation rates, government final consumption, real interest rate, gross domestic saving, and unemployment rate are not important in explaining NPLs in the Balkans throughout the research period. Such findings contradict those of Messai & Jouini (2013) [12].

Table 3. Results of regression analysis

	FEM	REM	GMM	
			Arellano-Bond dynamic panel-data estimation	System dynamic panel-data estimation
BNPL1			.401818*	.7346722*
			(2.18)	(6.96)
GDP	5.41e-07	2.05e-06*	2.59e-07	7.02e-07
	(0.85)	(2.95)	(0.54)	(1.39)
INF	-0.4352288	-.226153	-.1002947	.1623291
	(1.81)	(-1.56)	(-0.53)	(0.98)
GFC	1.435228	-.8499545*	1.701404*	.4388755
	(1.18)	(-2.67)	(2.47)	(1.37)
INT	0.0317288	.0588511	.0807683*	.1045866*
	(1.30)	(1.59)	(3.57)	(4.41)
GDS	0.6360025	-.4707234*	.4782833	.0244118
	(2.50)	(-3.95)	(1.11)	(0.12)
UNEMP	0.8448395	-.2439807*	.5025222	-.0215045
	(2.58)	(-2.25)	(1.42)	(-0.12)
Cons	-37.14009	34.01432*	-39.78853*	-7.347328
	(-1.80)	(4.53)	(-2.12)	(-0.77)
R-Square	0.1005	0.5335		
Wald χ^2			70.64	111.39
Prob > chi2			0.0000	0.0000

Note: * denote the level of significance at 5%. Statistical value t in ()

Accounting for dynamism in our modeling, Arellano-Bond estimates for both differenced and system GMM (refer to Table 3) show that, when compared to Fixed Effects estimates, the interest rate is substantial under both differenced and system GMM. However, under system GMM and differenced GMM, GDP annual sales, inflation rate, gross domestic savings, and unemployment rates are negligible at 5%. Under both differenced and system GMM, interest rates are statistically significant at 5%. The Wald test's significance demonstrates the acceptable goodness of fit.

Table 3 also includes the estimates for the random coefficients. GDP annual sales, government final consumption, gross domestic saving, and the unemployment rate are all significant at 5% when compared to Fixed Effects and GMM estimations.

4-4- Discussion of Findings

Based on correlation and panel regression analysis, the results of this research show that interest rate and GDP annual sales have a positive correlation with non-performing loans, with inflation rate, gross domestic saving, and unemployment rate and government final consumption having negative relationship with non-performing loans. The findings of this study are supported by Impavid et al. (2012) who indicated that real GDP growth has shown that the results are positive with significant effects on the NPL [6]. Also, the work of Islam & Tareq (2016) [7], Ayhan & Kartal (2021) [10] showed that NPL is negative in terms of GDP growth, which means that with GDP growth, NPL will decrease. This contradicts the findings of this study.

Ahmad et al. (2016) concluded that there is a negative correlation between GDP and NPLs [21]. However, interest rates and NPLs are positively correlated. Non-performing loans ultimately harm economic growth, for GDP and NPLs are negatively correlated. Angela & Irina (2015) showed that the dynamics of bank loan quality, expressed by the ratio of NPLs to total loans, are significantly influenced by macroeconomic factors (GDP growth rate, unemployment rate and inflation rate) [25].

The findings of Louzis et al. (2012) showed that macroeconomic variables, especially the real GDP growth rate, unemployment rate, and lending rates, substantially affect the level of NPLs [55]. Bhattarai (2015) showed that the inflation rate had a significant positive impact on NPLs [33]. Adusei (2018) found that macroeconomic variables were important determinants of NPLs with special emphasis on inflation, and the exchange rate was found to be an important determinant of NPLs [34]. Rajha (2017) showed that economic growth and the inflation rate had a significant negative effect on NPLs [56]. Singh et al. (2020) showed how GDP and Inflation had a significant effect on NPL. They also stated that GDP affected NPL positively and significantly [42]. Beck et al. (2013) revealed that NPLs were affected significantly by the GDP growth, stock prices, the exchange rate, and the loan interest rate [41].

4-5- Limitations and Suggestions for Further Research

One limitation is that the study did not cover a long period of time because 139 observations is not the optimal number for a panel regression model. Furthermore, the study tends to oversimplify the situation by failing to adequately investigate the possibility that variables can vary between cross sections and time. Finally, the study was directed by six starting variables, which cannot definitely elaborate on the effects of macroeconomic factors on NPLs.

There are several possibilities for the future development of this research. To begin with, a study that covers more variables over a longer time range, particularly quarter data, than the ones employed in this study can provide a clearer picture of the effect of macroeconomics on NPLs. Another possibility is that additional research might be conducted to investigate the effect of variability across variables in order to have a better understanding of NPLs.

5- Conclusions

This article focused on theoretical foundations and actual studies on variables influencing bank NPLs. Findings have supplied critical information on the impact of several factors on NPLs. According to the findings, the GDP annual sales, government final consumption, real interest rate, gross domestic saving, and unemployment rate all have favorable influences on NPLs. Based on this, the study presents a number of policy implications to help choose a criterion that limits loan risks and lowers bad debt, contributing to the enhancement of banking operations efficiency in particular and the banking system in general. Throughout the study period, fixed effects estimates demonstrate that variables are not significant in a static context. In a dynamic scenario, on the other hand, GMM results show that INT is significant under both difference and system GM, while the GFC is minimal under Arellano-Bond GMM alone. Finally, all variables are significant under the RC estimate except for INT.

The study gives vital insights into the Balkan economy in the following: The analysis shows that the Balkan states benefit from falling sectors by constantly assessing loan concentration limitations in light of macroeconomic and structural developments in the economy. In exceptional circumstances, significant credit concentration in some areas of the economy and newer guidelines in the form of lending caps to specific industries may be recommended. Moreover, rather than imposing exposure limitations, a set of standards to limit a sector's exposure should be adopted.

Furthermore, a deepening of the economy through the use of derivatives is required. This can greatly lower the risk of default. Although derivatives can be costly for small businesses, expanding the derivatives market and encouraging additional firms to offer derivative services might help to cut hedging costs dramatically. Last but not least, principal banks should lead the resolution of BNPLs in a collective and cooperative manner. However, government policies (with regard to banks' ability to absorb losses), such as the reduction or removal of tax and regulatory impediments, may make it easier for banks to clean up their portfolios.

The countries of the Western Balkans went through the economic recession from the year we received them for analysis towards economic growth during the following years of research. The performance of these countries also affects the reduction of the level of non-performing loans. Therefore, these countries should pay more attention to macroeconomic stability given the impact of non-performing loans and financial crises. On the other hand, interest rate policy should be done to stimulate savings through high real deposit rates and reasonable lending rates in order to encourage fund seekers. Countries should also try to keep inflation in check in order to influence interest rate cuts and debt repayment. In terms of unemployment, they should use appropriate policies to reduce unemployment as it is a worrying problem in the Western Balkan countries and may have an impact on their ability to repay their loan obligations and increase NPLs.

The findings of our research and the research of other authors that address the same issue show that banks should also consider the performance of the real economy when lending, given the reality that credit arrears are likely to be higher during periods of economic downturn. Also, the governments of the countries we have researched should always implement the banking reforms properly in the right sequence, initially maintaining macroeconomic stability. Since the complete elimination of bad debts is inevitable and their impact can be positive or negative depending on whether countries have economic decline or growth, in our paper we have addressed only a few macroeconomic factors, future researchers dealing with macroeconomic factors and the impact of non-performing loans can also use other macroeconomic variables that are influential to obtain specific results that contribute better to the mitigation of bad debts.

6- Declarations

6-1- Author Contributions

Conceptualization, A.G., R.B. and S.T.; methodology, R.B.; software, S.T.; validation, A.D.; formal analysis, R.B. and A.D.; investigation, S.T.; resources, A.G.; writing-original draft preparation, A.G., R.B. and S.T.; writing-review and editing, A.G.; visualization, S.T.; project administration, A.G.; funding acquisition, A.G. All authors have read and agreed to the published version of the manuscript.

6-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6-3- Funding

Many thanks for AAB College for financing the publication and cover the costs of conducting research.

6-4- Institutional Review Board Statement

Not applicable.

6-5- Informed Consent Statement

Not applicable.

6-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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