

ANALYZING CREDIT RISK FACTORS: A WESTERN BALKANS CASE STUDY

The purpose of this research paper is to determine factors of credit risk expressed in terms of non-performing loans in six countries of the Western Balkans (Kosovo, Albania, North Macedonia, Bosnia, and Herzegovina, Montenegro, and Serbia). The research uses different econometric techniques for the presentation of econometric models, where 4 models are used: OLS, fixed-effects model, random-effects model, and Hausman Taylor IV estimators. The results from the empirical analysis presented show that unemployment and the real interest rate have a positive impact on the growth of non-performing loans where both coefficients are statistically significant at the 1% level, while other variables (financial stability, economic growth, and inflation) show a statistically significant negative impact. These findings are important for the decision-makers of the financial systems of these countries, especially countries that have limited use of monetary policy, making decisions to create greater financial stability to reduce credit risk

Keywords: Risk, Unemployment, Economic Growth, Western Balkans, Financial Stability

JEL: G32, J64, O40, P27, G01

1. Introduction

Credit risk is the possibility that a borrower will default on their debt obligations or fail to make timely payments. It is the risk that a lender takes when extending credit to a borrower, and it is a major concern for banks, financial institutions, and investors who lend money or invest in debt securities. Credit risk can be influenced by several factors, including the borrower's creditworthiness, financial stability, and ability to generate sufficient cash flows to meet their debt obligations. It can also be affected by external factors, such as changes in interest rates, economic conditions, or industry-specific risks. A significant number of studies (Ali, 2010; Wagner, 2006; Kiff, 2002; Herring, 1999; Goodhart, 2005) conclude that the financial stability of a country is closely related to the credit risk of borrowers, moreover, most of the authors, which have a statistical and empirical basis, show that during the various global financial crises, there is a positive relationship with the increase in credit risk. Other authors (Chaibi, 2015; Castro, 2013; Erb, 1995; Haris, 2023) show Inflation can have a significant impact on credit risk, especially through its effect on interest rates. As inflation rises, central banks often respond by raising interest rates to control it. This can increase borrowing costs for individuals and businesses, making it more difficult for them to repay their debts. Higher interest rates can also lead to a decline in economic activity, which can further increase the credit risk of borrowers. In addition, inflation can erode the purchasing power of the currency, making it harder for borrowers to repay their debts in real terms. As a result, inflation can lead to an increase in default rates and credit losses for lenders. Therefore, lenders must carefully monitor inflation trends and adjust their credit risk management strategies accordingly to mitigate the impact of inflation on credit risk.

Hence, the primary objective of this research is to identify the key elements that contribute to credit risk in six developing nations in Southeast Europe: Kosovo, Albania, North

Macedonia, Montenegro, Serbia, and Bosnia and Herzegovina, the latter being considered a developed country. These countries were selected due to their comparable political, social, and economic conditions, rendering them highly suitable for examination. So, the research question is which are the most important credit risk determinants? To answer the research question, inflation, interest rate, financial stability, unemployment, and economic growth were taken as variables for the study.

This paper's main contribution lies in identifying the factors that influence credit risk. While many previous studies have utilized econometric models like linear regression, fixed effects, and random effects, these methods have faced criticism for their limited reliability in producing robust results, mainly due to the neglect of endogeneity issues or exclusive reliance on pooled OLS. To overcome these limitations, we adopt a diverse range of techniques, including pooled OLS, fixed and random effects, and the Hausman-Taylor model with instrumental variables (IV), to effectively address endogeneity concerns. Another contribution of this paper is that we also take the social factor (unemployment) as a basis, where most of the research carried out on credit risk examines financial factors, while in this paper, in addition to financial factors, a social factor such as unemployment is also examined, which it is considered a very important variable for credit risk, especially in countries in transition.

In conclusion, the regression analysis reveals that unemployment and interest rate have a positive influence on non-performing loans, whereas financial stability, economic growth, and inflation rate exhibit negative effects on non-performing loans. The paper is structured into four sections: a literature review, methodology and data analysis, a discussion and interpretation of the findings, and finally, concluding remarks and suggestions for future research.

2. Literature review

This chapter provides an extensive analysis of existing literature, exploring the research conducted by various authors who have empirically studied the factors influencing credit risk across different countries and time periods.

In the study conducted by Koju (2020), the primary objective was to empirically evaluate the macroeconomic indicators associated with credit risks. Notably, the research concentrated its focus on developed countries, seeking to illuminate the intricate relationships between macroeconomic factors and the assessment of credit risks within these advanced economic settings. In this research, the author uses the GMM model, where the research is conducted for 49 developed countries in the time 2000-2015. The author's findings show that macroeconomic variables have an important role in the stability of credit risk. Based on the author's findings, it is recommended that developed countries increase productivity and develop employment promotion policies as a factor that affects the reduction of non-performing loans. These findings are also supported by Authors Gulati et al. (2019) who carry out research with data from 1998 to 2014, the author aims to evaluate the main determinants of risk in the banking industry of the state of India. The author uses panel data models (Fixed and Random Effect). The author's findings show that non-performing loans are very sensitive to macroeconomic factors.

Regarding the financial factors that affect credit risk, many works have been carried out, mainly in an empirical way. According to Barra (2021), whose research spans the period from 2001 to 2014, it is posited that financial crises exert a substantial influence on credit risk. The author underscores that during pivotal financial crises, particularly in 2008 and 2012, the escalation of interest rates and the concomitant threat to financial stability resulted in a notable upsurge in non-performing loans. This observation underscores the interconnected dynamics between financial crises, interest rate fluctuations, and the heightened vulnerability of credit portfolios, as discerned through an extensive analysis of data spanning the specified timeframe, similarity Khan (2020) emphasizes that non-performing loans and the financial stability of the banking sector are interconnected, this author conducts research in the period 2005-2017. The results show that the movement of interest rates has an impact on financial stability, which then tends to increase non-performing loans.

The author's study Ali (2010) points out that the global financial crisis of 2008 has highlighted the importance of understanding financial volatility, especially in the context of credit risk management with special emphasis on the banking sector. The methodology used by this author is quantitative with the OLS model. In the research, the author presents a comparative analysis between the United States of America and Australia, where the findings show that the United States of America is much more sensitive to macroeconomic shocks, endangering financial stability, which then has an impact on increasing the risk of non-payment of the loan.

Das (2007) conducted a research study in India utilizing advanced panel data techniques to investigate the factors influencing credit defaults. The study spans the period 1994-2005. The findings derived from the fixed and random effects econometric models indicate that macroeconomic factors such as GDP growth, as well as bank-level factors including real credit growth, operating expenses, and bank size, play significant roles in shaping non-performing loans.

Similarly, Mpodu (2018) conducted research on macroeconomic determinants of credit risk in the banking systems of 22 sub-Saharan African economies. The author employed dynamic panel data methods and analyzed data from 2000 to 2016. The findings from the econometric model specifications demonstrate that economic growth has a statistically significant decreasing effect on the occurrence of bad loans. Additionally, the findings also highlight that an increase in the inflation rate and the global crisis of 2008/09 have statistically significant positive impacts on credit defaults.

Garr (2013) investigates the impact of various factors on credit risk in commercial banks in Ghana. The study employs an unbalanced panel data set of 33 commercial banks spanning 21 years from 1990 to 2010. The analysis utilizes annual time series data during this period. The results indicate that credit risk in Ghana is influenced by several factors. Specifically, the study highlights the significance of per capita income as a measure of the standard of living, government borrowing, and financial sector development. The findings suggest that government borrowing and financial sector development are inversely related to credit risk, while there is a positive relationship between management inefficiency and credit risk.

Poudel (2013) conducted a research investigation into the macroeconomic determinants of credit risk in Nepal. The study reveals that inflation and fluctuations in foreign exchange rates have exerted an influence on the credit risk of banks. The implications of these findings are significant for policymakers, regulators, and managers, particularly considering the coverage of the recent crisis period. This study also contributes to filling the research gap by being the first comprehensive exploration of the determinants of credit risk, to the best of our knowledge

Tehulu (2014) conducted a study to examine the specific determinants of bank credit risk. The research focused on 10 banks during the period 2007-2011, and the empirical analysis utilized GLS regression with random effects. The empirical findings indicate that credit growth and bank size have a statistically significant negative impact on credit risk. Additionally, financial stability is found to have a statistically significant negative effect on credit risk.

Similarly, Bajraktarovic et al. (2022) conducted a similar study on the determining factors of credit risks in the Western Balkan region. The paper presents an analysis of how certain parameters influence the performance of the banking system, particularly in relation to the movement of non-performing loans (NPLs). The research spans a 10-year period from 2010 to 2019, and it also provides a forecast of bad credit trends for the period 2020-2025. The authors utilized correlation and linear regression analysis in their study. The findings highlight that the unemployment rate is the most influential factor affecting non-performing loans in the Western Balkans region. The authors Siddiqui et al. (2012) research the impact of the interest rate on non-performing loans. The research period covers the years 1996-2011 where data is collected quarterly. From the analysis of the Pooled OLS model, the findings show that the fluctuations (mainly the increase in the interest rate) have a positive impact on the growth of non-performing loans.

The issue of non-performing loans (NPLs) has garnered significant attention in recent years, particularly within the context of the Economic and Monetary Union (EMU) and the European Economic Community (EEC). This literature review aims to provide a comprehensive overview of existing research on the determinants of non-performing loans in the EEC region and their implications for financial stability and the real economy. One of the central themes in the literature is the examination of macroeconomic factors as determinants of non-performing loans. Scholars such as Tatarici, Kubinski, and Barnea (2020) emphasize the association between adverse macroeconomic developments and higher NPL ratios. The cyclical nature of NPLs is explored, with evidence suggesting that deteriorating macroeconomic conditions contribute to an increase in non-performing loans. Moreover, the literature suggests that the impact of NPLs on the real economy and credit is transitory. Tatarici et al. (2020) find that while NPLs have a short-term negative effect, the long-term implications on the real economy and credit are limited. This insight contributes to the understanding of the dynamics between macroeconomic factors and NPLs, emphasizing the need for targeted policy measures during economic downturns. Another crucial aspect explored in the literature is the role of banking sector variables in influencing non-performing loans. Tatarici et al. (2020) propose that a more profitable and better capitalized banking sector tends to have lower NPL ratios. This underscores the importance of robust financial

institutions in maintaining financial stability and reducing the prevalence of non-performing loans.

The literature also delves into the significance of government effectiveness in mitigating NPLs. Evidence suggests that an improvement in government effectiveness contributes to a reduction in NPLs, highlighting the interplay between governance indicators and financial stability. Furthermore, studies in the literature, including Tatarici et al. (2020), shed light on the impact of past credit growth rates on current NPL ratios. Countries experiencing higher credit growth rates in the past tend to witness elevated levels of NPLs in subsequent periods. This insight underscores the importance of considering historical credit dynamics in understanding and addressing non-performing loans. The literature supports the adoption of macroprudential measures as a means of enhancing the resilience of borrowers and tempering the credit cycle. Tatarici et al. (2020) advocate for the use of tools such as debt service-to-income (DSTI) and loan-to-value (LTV) caps to regulate the level of indebtedness, thereby contributing to financial stability.

The theoretical foundation of the research by Ozili (2019) is built upon the NPL model developed by Louzis et al. (2012), Ozili (2015), and Beck et al. (2015). These scholars lay the groundwork for exploring the multifaceted dynamics of NPLs by considering factors such as financial intermediation, foreign bank presence, bank efficiency, loan loss coverage ratio, competition, banking system stability, banking crises, and bank concentration. The empirical findings of Ozili (2019) suggest that financial development, as measured by foreign bank presence and financial intermediation, exhibits a positive association with NPLs. This underscores the nuanced impact of financial structures on the prevalence of non-performing loans, challenging conventional wisdom that perceives financial development as uniformly beneficial. The literature emphasizes several determinants that influence NPLs. Bank efficiency, loan loss coverage ratio, competition, and banking system stability emerge as factors inversely associated with NPLs. In contrast, NPLs show a positive association with banking crises and bank concentration. These findings contribute to a nuanced understanding of the intricate interplay between institutional and market factors shaping the NPL landscape. This research underscores the importance of comprehensive regulatory supervision in mitigating NPL risks. Regulators and supervisors are encouraged to not only consider the broader impact of financial development structures on aggregate NPLs but also to actively monitor lending practices and the financial intermediation process. This emphasizes the need for a holistic regulatory approach that addresses both macro-level financial development and micro-level banking practices.

There have been limited empirical studies examining the relationship between the unemployment rate and credit risk. However, the existing research conducted by Zheng (2019), Kjosevski (2019), and Lubis (2021) suggests a positive correlation between unemployment and economic growth. It is important to note that these studies do not explicitly consider the variables of the financial sector to establish a direct connection. Therefore, in this research, an attempt has been made to link the variables of the financial and social sectors to the impact on credit risk. The study includes both the financial sector variables (inflation, interest rate, financial stability) and the social variable (unemployment). Regarding the empirical methodology, in the literature, most of the authors have developed the research with panel data. To address the issue of significant variations in panel data across

different countries, this paper employs the Hausman-Taylor IV model. This modeling approach is utilized to mitigate the potential challenges associated with such variations in data.

3. Methodology

Many works deal with the impact of fiscal policy on the economic growth of different countries. Different authors deal with different aspects of fiscal policy management. To analyze the impact of fiscal policy on economic growth in the South East European Countries, panel data were used where 5 econometric models were applied; the first model executed is based on the method, Ordinary least squares (OLS), the second model Ordinary least squares robust (OLSR). While the models for the panel data are also used; fixed effect (FE), random effect (RE), and General method of moments (GMM).

In this section, we will discuss the development of econometric models to examine the influential factors impacting non-performing loans in the Western Balkan region. Various models will be presented, including pooled OLS, fixed effects, random effects, and the Hausman-Taylor instrumental IV model. The selection of the appropriate model is determined using the Hausman test, which compares fixed effects, random effects, and the Hausman-Taylor IV model. The results of the Hausman test demonstrate that the Hausman-Taylor instrumental IV model provides greater consistency and efficiency in analyzing the factors that determine non-performing loans. It is essential to address concerns related to endogeneity, as certain variables may be influenced by non-performing loans themselves, thus requiring careful consideration.

Empirical Model

Since the Hausman-Taylor model is considered the most suitable model for the analysis of our data compared to the other executed models (POLS model, Fixed Effect, and Random Effect) (Table A2), then we use this model to investigate the determining factors. of credit risk in the six countries of the Western Balkans in the period 2010-2021. For comparative purposes, the paper presents the summarized results of other models besides the Hausman-Taylor model. With the application of this model, we address the problem of endogeneity between variables, which is considered an important problem in empirical analyses. Considering the aforementioned concerns regarding endogeneity and the outcomes of the Hausman test, it can be concluded that the Hausman-Taylor IVs model is deemed more suitable when compared to the random and fixed effects models (as shown in Table A2).

The model, Hausman - Taylor, is defined as follows:

$$NPL_{it} = c + B1 (NPL_{it} - 1) + B2 (UNE_{it}) + B3 (FSTAB_{it}) + B4 (GDP_{it}) + B5(INF_{it} + B6 (IR_{it}) + \mu_{it} \quad (1)$$

Where NPL_{it} is the dependable variable, (annual % of total loans), $i = 1 \dots 6$ (countries), $t = 2010 \dots 2021$ (years); c is constant; the explanatory variables include: y_{it-1} , which is the first lagged of a dependent variable, UNE_{it} (Unemployment as a percentage); $FSTAB_{it}$ (Financial Stability as an index); GDP_{it} (Economic Growth as a percentage); INF_{it} (Inflation rate as a percentage); IR_{it} (Interest rate as a percentage) and μ_{it} is the exogenous disturbance.

Descriptive statistic

The empirical analysis conducted in this study covers the period from 2010 to 2021, encompassing panel data from six countries in the Western Balkans: Kosovo, Albania, North Macedonia, Montenegro, Bosnia and Herzegovina, and Serbia. The data used for this research were obtained from "The Global Economy" database and the World Bank database. Non-performing loans are represented as a percentage of total loans, while unemployment, inflation, interest rate, and economic growth are expressed in percentage units. Financial stability is measured using an index ranging from 0 to 100.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
NPL	72	9.062	5.423	1.933	22.244
UNE	72	20.968	6.735	9.08	35.3
FSTA	72	56.667	7.506	50	70
GDP	72	2.55	3.718	-15.307	12.434
INF	72	1.993	2.181	-1.584	11.137
IR	72	5.575	2.762	.088	11.54

Source: World Bank Data and the Global Economy Data, calculation by Author

4. Results

In this part, the results of the correlation analysis are first presented in order to identify the ratio of independent variables with non-performing loans. Based on the presented results of this coefficient, there is a positive ratio of non-performing loans with the unemployment rate ($r=0.55$), the inflation rate ($r=0.09$) and the interest rate ($r=0.17$). So, the growth of these three indicators has a potential impact on the growth of bad loans and vice versa. Meanwhile, non-performing loans have a negative relationship with the variables; financial stability index ($r=-0.88$) and economic growth ($r=-0.40$). So, economic growth and increased financial stability have an impact on the reduction of non-performing loans.

Table 2. Correlation analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) NPL	1.00					
(2) UNE	0.55	1.00				
(3) FSTA	-0.88	0.04	1.00			
(4) GDP	-0.40	0.02	0.09	1.00		
(5) INF	0.09	0.09	0.01	0.55	1.00	
(6) IR	0.17	0.17	-0.08	0.09	-0.33	1.00

The findings of the conducted econometric models are presented, encompassing four different models: pooled OLS, random effects, fixed effects, and the Hausman-Taylor model with IV instrumental variables. The results of the Hausman test can be found in Appendix 2, specifically Table A2, where a value of 9.42 ($P=0.0052$) rejects the null hypothesis,

indicating that the random effects model is less efficient compared to the fixed effects model. Due to the presence of endogeneity, the Hausman-Taylor model is employed. The outcomes of this model can be found in Table 2. The Hausman test was also used to compare the fixed effects model with the Hausman-Taylor model. With a test result of 5.13 ($P=0.6632$), there is insufficient empirical evidence to reject the null hypothesis, thus indicating that the Hausman-Taylor model is more suitable for the empirical analysis.

Drawing from the empirical results presented in Table 2, it can be observed that the unemployment variable has a positive and statistically significant impact on the growth of non-performing loans ($B=0.249$) at a 1% significance level. This means that, on average, a 1% increase in the unemployment rate corresponds to a 0.24% increase in non-performing loans. These results align with previous studies conducted by Barajaktarovic (2022), Klein (2013), and Messai (2013).

Furthermore, the financial stability variable exhibits a negative and statistically significant impact on non-performing loans ($B=-0.406$) at a 1% significance level. For every additional unit in the financial stability index, non-performing loans decrease by an average of 0.40%. These findings are consistent with the research discussed by Ali (2010), Garr (2013), and Tehulu (2014).

Table 3. Regression results

Variables	OLS NPL	Fixed-Effects NPL	Random-Effects NPL	Hausman-Taylor NPL
NPL_L1				0.431*** (0.04)
UNE	0.160* (2.00)	0.146 (1.27)	0.160* (2.00)	0.249*** (0.023)
FSTA	-0.290*** (-4.35)	0.213 (0.184)	-0.290*** (-4.35)	-0.406*** (-0.051)
GDP	0.184 (1.36)	0.244* (2.55)	0.184 (1.36)	-0.194** (0.312)
INF	-0.814** (-3.34)	-0.508** (-2.79)	-0.814*** (-3.34)	-0.943*** (-0.242)
IR	1.237*** (5.94)	1.049*** (5.5)	1.237*** (5.94)	1.452*** (0.209)
_cons	-9.752* (-2.16)	0.536 (0.29)	-9.752* (-2.16)	7.421** (3.42)
R	0.4909	0.5567	0.536	
N	72	72	72	72

Notes: ***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level

Table No. 3 shows that economic growth has a negative impact on non-performing loans ($B=-0.19$), which is statistically significant at the 5% significance level. So, for every 1%

economic growth, non-performing loans decreased by 0.19% on average. This result is compatible with the findings of the author Das (2007) and Garr (2013).

Regarding the inflation rate, there is a negative impact on non-performing loans ($B=-0.943$) which is statistically significant at the 1% significance level, so for every 1% increase in the inflation rate, non-performing loans decreased by 0.94% on average. Meanwhile, the real interest rate has a positive impact on non-performing loans ($B=1.452$), which is statistically significant at the 1% level, so for every 1% increase in the real interest rate, non-performing loans increased by 1.45% on average, and this result is compatible with the findings of the authors Siddiqui et al. (2012).

The empirical analysis presented in this study provides valuable insights into the dynamics of non-performing loans in the Western Balkans from 2010 to 2021. The dataset, comprising panel data from six countries, namely Kosovo, Albania, North Macedonia, Montenegro, Bosnia and Herzegovina, and Serbia, draws from reputable sources such as "The Global Economy" database and the World Bank database. The research focuses on the relationship between non-performing loans and key economic indicators, including unemployment, inflation, interest rate, economic growth, and financial stability measured by an index ranging from 0 to 100.

The correlation analysis reveals significant associations between non-performing loans and several independent variables. Notably, a positive correlation is identified between non-performing loans and the unemployment rate, inflation rate, and interest rate. Conversely, a negative correlation is observed with the financial stability index and economic growth. These results set the stage for a more in-depth exploration through econometric models, where the study employs pooled OLS, random effects, fixed effects, and the Hausman-Taylor model with IV instrumental variables.

The econometric models yield crucial findings. The positive and statistically significant impact of the unemployment variable on non-performing loans aligns with prior studies, indicating that a 1% increase in the unemployment rate corresponds to a 0.24% increase in non-performing loans. Moreover, the negative impact of the financial stability variable on non-performing loans supports existing research, suggesting that an increase in the financial stability index leads to a decrease in non-performing loans. Additionally, economic growth and inflation rate exhibit negative impacts on non-performing loans, while the real interest rate has a positive impact. These findings contribute to the understanding of the complex interplay between macroeconomic factors and the health of banking systems in the region.

Study not only establishes significant correlations between non-performing loans and key economic indicators but also employs robust econometric models to delve into the nuances of these relationships. The findings underscore the importance of addressing unemployment, enhancing financial stability, and fostering economic growth as strategies to mitigate non-performing loans in the Western Balkans. The study's academic rigor, data sources, and

comprehensive analysis enhance its contribution to the existing literature on financial stability and macroeconomic factors in emerging economies.

5. Conclusions

Using the empirical model of endogeneity (Hausman-Taylor) we have presented the determinants of credit risk in terms of non-performing loans in six countries of the Western Balkans for the period 2010-2021. The results from the empirical analysis presented show that unemployment and the real interest rate have a positive impact on the growth of non-performing loans where both coefficients are statistically significant at the 1% level, while other variables (Financial stability, economic growth, and interest rate of inflation) show a statistically significant negative impact.

The paper emphasizes the importance that the countries of the Western Balkans, as still developing countries, must maintain sustainable financial stability, where these countries can achieve this stability by implementing sound fiscal policies and reducing public debt. In addition, the development of the financial sector can help increase access to credit and improve financial intermediation. This can be achieved through measures such as strengthening banking supervision, improving financial regulation, and promoting financial education.

The findings of this study have important policy implications and recommendations for the countries of the Western Balkans. To maintain sustainable financial stability, policymakers should have to keep the high inflation rates under control and create financial stability. The development of the financial sector through measures such as strengthening banking supervision, improving financial regulation, and promoting financial education can help increase access to credit and improve financial intermediation. This would lead to lower non-performing loans and ultimately contribute to a healthier financial system. In addition, reducing unemployment should be a priority for policymakers in the region. Encouraging entrepreneurship and small business development can create new jobs and reduce unemployment. Stimulating economic growth through investment in infrastructure and improving the business environment can also create new job opportunities. Improving education and skills training is also essential to reduce unemployment. By focusing on these policy recommendations, the countries of the Western Balkans can create sustainable economic growth and reduce credit risk in the long term.

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APPENDIX

Table A1 – Description of variables

No.	Variables	Unit	Code
1	Non-Performing Loans	% of all Loans	NPL
2	Unemployment	%	UNE
3	Financial Stability	Index, 0-100	FSTA
4	GDP Growth	Annual %	GDP
5	Inflation	%	INF
6	Real Interest Rate	%	IR

Table A2 – Hausman Test

Test	Chi²	Prob > Chi²	Results
Fixed vs Random	9.42	0.0052	Reject Hypothesis zero
Fixed vs Hausman Taylor	5.13	0.6632	Does not Reject Hypothesis zero