This journal provides immediate open access to its content under the Creative Commons BY 4.0 license. Authors who publish with this journal retain all copyrights and agree to the terms of the above-mentioned CC BY 4.0 license.

DOI: 10.2478/seeur-2023-0016

THE IMPACT OF MONETARY POLICY ON BANK RISK IN THE WESTERN BALKAN COUNTRIES

Fatmir Gashi
Faculty of Business and Economics
South East European University, North Macedonia
fatmirgashinlb@gmail.com

Besnik Fetai
Faculty of Business and Economics
South East European University, North Macedonia
b.fetai@ seeu.edu.mk

ABSTRACT

The objective of this research paper is to examine the impact of monetary policy conditions on bank risk-taking in the Western Balkan countries. The paper tries to identify if monetary policy conditions, especially money interest rates, may induce a greater appetite for bank risk-taking in the Western Balkan countries. The impact of macroeconomic and banking indicators on bank risk-taking will be examined, too. For this purpose, we apply pooled OLS techniques, Fixed and Random effects panel, and Hausman-Taylor Instrumental IV model. The econometric results show a negative correlation between the monetary policy rate and bank risk-taking, rejecting the hypothesis that monetary policy rates indicate bank risk increase. However, expansive credit policies or loan portfolio growth have a positive impact on bank risk-taking in the Western Balkans. The study is original, and its findings will be of value to Central Banks and other policymakers in the Western Balkan countries.

JEL Classification: E51, E52, G01

Key words: Monetary policy, low-interest rate, credit policies, NPL, bank risk-taking

INTRODUCTION

The correlation between monetary policy and bank risk-taking is of particular importance, and for many years has been of great interest because of its role in the stability of the financial system. However, with the appearance of the global financial crisis, monetary policy has remained partially responsible for causing the global financial crisis (Boyd et al., 2006); (Dell' Ariccia et al., 2010). But, the global financial and banking crisis, which affected many banking industries, has attracted interest, especially in developed countries, to analyze the role and impact of monetary policy in banking risk. It is considered that the accommodative policies of the Central Banks spurred risk-taking among financial intermediaries. Low-interest rates can lead banks to take on more risk. This may increase the incentives of banks to make risky investments in the "search for yield" (Rajan, 2006).

Many researchers think that, before the financial crisis, interest rates were held very low (Taylor, 2009), and this encouraged financial institutions-intermediaries to increase leverage and take on excessive risk (Borio & Zhu, 2008); (Adrian & Shin, 2009). After the financial crisis, Borio and Zhu (2008), have analyzed the link between monetary policy and bank risk-taking, through low-interest rate, as part of the monetary transmission mechanism, referred to as the risk-taking channel, and it relates to how changes in monetary policy rates affect risk perceptions or risk tolerance (Borio & Zhu, 2008). Monetary policy conditions in developed countries have been characterized by the low-interest rate for a prolonged time.

While many studies analyze the impact of monetary policy on bank risk, especially in developed countries, however, there are very few empirical studies that have studied the impact of credit channel of the monetary policy transmission mechanism, especially in the Western Balkan countries (henceforth WB). So, we will analyze the impact of monetary policy conditions on banking risk in the Western Balkan countries (Albania, Kosovo, Macedonia, Serbia, Montenegro, Bosnia and Herzegovina), over the period of 2003 to 2017. The monetary system of countries in the Western Balkans is characterized by a high level of euroization. The process of euroization in the Western Balkan countries is connected with past macroeconomic, social and political instability. These countries suffered from hyperinflation, economic, political and social crisis during the transition process. (Boshkov et al., 2017). Kosovo and Montenegro have unilateral euroization, Bosnia and Hercegovina have currency board, while Albania, North Macedonia and Serbia have de jure flexible rate regimes (Slavov, 2017). Even monetary conditions in these countries are under influence of an easy monetary policy rate as in developed European countries, however, the interest rates in the WB countries are higher than in Central and Eastern Europe New Member States (henceforth NMS). The Western

Balkan countries mainly rely on the high-interest rate, compared to those in developed countries, which is an indicator of inefficiency and weak intermediation. Even though the evidence suggests that the increase of credit portfolio in the Western Balkan countries, in the run-up of the financial crisis in 2008 was high, however the credit cycle in these countries was smaller than in NMS. Some countries have shown a significant and sharp increase in credit portfolios, such as Montenegro, and to some extent Albania and Kosovo (IMF, 2015).

The market interest rates were not low, compared to European developed countries but expansive monetary or credit policies in the WB6 have indicated credit risk increase. The credit portfolio in the WB6 has developed rapidly but did not reach the levels of development or the depth as in the New Member States, like in the Baltic States: Estonia, Latvia, and Lithuania, with the exception of Montenegro. The period of recovery in WB countries, after the financial crisis in 2008, was not as hard as it was in many developed countries of Europe, because they relied mainly on expanding domestic deposit bases. (IMF, 2015).

Therefore, this paper aims to analyze the impact of monetary policy conditions on bank risk-taking in the WB countries, over the period of 2003 to 2017. In order to examine the implication of monetary policy conditions on bank risk in the WB, we address the research question: Does the monetary policy condition increase bank risk-taking in the Western Balkans? To address these research questions, we establish the following research hypothesis: H1: Monetary policy rate increases bank risk-taking in the Western Balkan countries. The contribution of this study is twofold: First, only a few studies have examined the causal direction between the monetary policy rate and the bank risk in the Western Balkan countries. This paper thus contributes to filling this gap. Second, the study explores the impact of other monetary, banking, and macroeconomic indicators on bank risk in the Western Balkan countries. The paper is organized as follows: Section 2 includes literature review; Section 3 discusses the research methodology; Section 4 includes descriptive statistics; Section 5 provides the empirical results, and Section 5 provides the conclusion.

LITERATURE REVIEW

There are a large number of authors that have studied the impact of monetary policy on bank risk. Bank risk-taking can be influenced in different ways through low-interest rates. According to Borio and Zhu (2008); Altunbas et al. (2010), the monetary policy rate has an impact on valuations, incomes, and measured risk. The monetary policy rate reduction increases asset and collateral values tend to reduce asset price volatility and thus the measured risk (Altunbas et al., 2010). Rajan (2006) has named the risk-taking channel operation as: “the

search for yield". Low-interest rates may have a negative impact on bank profits, thus may increase the incentives of asset managers for higher return targets, leading to higher risk tolerance (Borio & Zhu, 2008). Altunbas et.al. (2009) have analyzed the link between monetary policy and expected default frequencies (EDFs) in 600 US and European banks, over the period of 1999 to 2008, and found that prolonged periods of easy monetary policy condition indicate increasing of the bank risk over the last decade (Altunbas et al., 2009). Authors Gambacorta (2009), Dell'Arricia, et.al. (2010), observed that bank risk-taking has increased during a prolonged period of easy monetary policy conditions (Gambacorta, 2009). On the other hand, Maddaloni and Peydro (2010), observed that a low short-term monetary rate softens the credit standards. Moreover, holding low monetary policy rates for prolonged times indicates increasing risk of bank assets, leading to the financial crisis (Maddaloni & Peydro, 2010).

Apart from theoretical research, many empirical studies have examined the link between monetary policy and bank risk-taking. Jimenez et.al. (2008), firstly observed that in the short term, lower interest rates reduce total credit portfolio bank risk, because the total amount of outstanding loans is higher than the volume of newly disbursed loans; secondly, in the medium term, low-interest rates may increase the bank credit risk. Due to the search for yield or profit, banks tend to soften credit standards, financing also many borrowers including those with bad credit history (Jimenez et al, 2008). Ioannidou et.al, (2009), concludes that when interest rates are low, the bank will increase the number of risky loans, financing riskier borrowers with lower rates, too. Thus, relaxing monetary policy condition increases bank risk-appetite (Iannodou et al., 2009). Jimenez and Suarina (2006) observe a positive correlation between rapid credit growth and credit risk. During credit booms, the bank will finance riskier borrowers, and loan collateral requirements will soften (Jimenez et al., 2008). Authors Bonfim and Soares (2014) concluded that the risk-taking channel works through two main mechanisms. First, in periods of lower monetary policy rates, banks tend to grant loans to riskier borrowers. Second, the loans granted when monetary policy rates are low for a long period, have a chance to default when interest rates increase later on (Bonfim & Soares, 2014). Dell'Ariccia, et.al. (2010), observed that bank risk-taking will increase when there are prolonged periods of relaxing monetary policy conditions, and monetary easing leads to greater leverage and lower monitoring (Dell' Ariccia et al., 2010). Altunbas, et.al. (2010), empirically tested the correlation between monetary policy and risk-taking by banks. They concluded that an increase in banks' risk-taking is caused by low-interest rates over a prolonged period of time (Altunbas et al., 2010). Haselmann and Watchel (2008) did not observe a well-documented bank risk-taking channel in transition countries, and there is no indication of excessive risk-taking by banks.

Bank risk in transition countries is managed by banks as in other developed countries (Haselmann & Watchel, 2008). While several studies have examined the impact of monetary policy in developed and developing countries, in this research, we empirically analyze the impact of monetary policy on bank risk in the Western Balkan countries.

RESEARCH METHODOLOGY AND DATA

In this section, we developed an empirical econometric model to assess the correlation and the causal link between monetary policy conditions and bank risk in Western Balkan countries. For this purpose, we used different econometrics techniques: pooled OLS, Fixed, and Random effects. Furthermore, we also have used the Hausman-Taylor test to choose between Fixed, Random, and Hausman-Taylor Instrumental IV model.

The empirical model

Since, the Hausman-Taylor Instrumental IV model is considered to be more consistent and efficient than the Fixed and Random models we have used this model in order to empirically assess the impact of monetary policy conditions in bank risk in 6 Western Balkan countries, covering the period of 2003-2017 (Baltagi, 2013). Applying Hausman-Taylor Instrumental IV, we find a solution for the endogenous problem, which is very important from the econometrics point of view. The Specification of the Hausman-Taylor empirical model is as follows:

$$\begin{aligned} Y\,it \;=\; & \beta 1(\mathrm{Yit}-1)+\beta 2(\mathrm{MonPol}.it)+\beta 3(\mathrm{Gdp}\;it)+\beta 4\;(\mathrm{Loan\;Port.Growth}\;it) \\ & +\beta 5\left(\frac{\mathrm{BankCap}}{\mathrm{Tot.\,Assets}}it\right)+\beta 6\left(\frac{\mathrm{Liq.\,Assets}}{\mathrm{Tot.\,Assets}}\;it\right)+\;\beta 7\;(\frac{\mathrm{Reg.\,Cap}}{\mathrm{RWA}}it)\;+\beta 8(\mathrm{ROA}\;it) \\ & +\beta 9(\mathrm{ROE}\;it)+\;\mathrm{u}\;it \end{aligned}$$

where $Y\,it$ is a dependent variable which represents bank risk, expressed by Nonperforming Loans (NPL); for each county i and t represent years; c is a term of constant; explanatory or independent variables include, $\mathrm{Yit}-1$ which is the first lagged of the dependent variable; $\mathrm{MonPol}.it$ is a monetary policy rate; $\mathrm{Gdp}\;it$ expresses GDP annual growth rate; $\mathrm{Loan\;Port.Growth}\;it$ shows loan portfolio growth; $\frac{\mathrm{BankCap}}{\mathrm{Tot.Assets}}it$ is leverage indicator expressed by Bank Capital to Total Assets; $\frac{\mathrm{Liq.Assets}}{\mathrm{Tot.Assets}}\;it$ expresses the report of liquid assets to total assets; $\frac{\mathrm{Reg.Cap}}{\mathrm{RWA}}it$ is the solvency risk expressed by Regulatory Capital /Risk-Weighted Assets; $\mathrm{ROA}\;it$ measures profitability of the financial sector and is expressed by an

indicator Return on Average Assets; ROE it measures Return on Average Equity; u it is the exogenous disturbance.

Descriptive statistics

The study uses panel data for 6 Western Balkan countries, over the period of 2003 to 2017. The source of the data set was the World Bank and Central Banks of The Western Balkan countries (Albania, Kosovo, Macedonia, Serbia, Montenegro, and Bosnia and Herzegovina). (World Bank, 2019). An important issue is choosing appropriate indicators to measure the bank risk as well as monetary policy indicators. Since the bank risk is related to the probability of default or failure, the most well-known indicators in literature for measuring the bank risk are the Nonperforming Loan ratio – NPL ratio, Jimenez et al. (2007); Iannodou et al., (2009); the Expected Default Frequency, Altunbas et al.(2010); Gambacorta, L., (2009); or the Z-score indicator, Chen et al.,(2015). For the purpose of our research, we have used NPL as a dependent variable or a bank risk indicator, whereas several micro-level or banking indicators, including GDP as a macroeconomic indicator, have been used as independent variables in order to assess the impact on bank risk in the Western Balkan countries. A panel data methodology is used in the paper. In the model, we have used an annual time series. The main sources of data have been taken from World Bank Data Indicators and Central Banks of 6 Western Balkan countries.

The Nonperforming Loan ratio is used as a dependent variable, as in Berger and DeYong (1997); Agoraki et al. (2009); Delis and Kouretas (2010); Delis and Kouretas (2010); Jimenez et al. (2008); Iannodou, et al.,(2009); Jabra et al. (2017), which is defined as the ratio of the number of Nonperforming loans (NPL) to bank's loan portfolio (total amount of bank outstanding loans). NPL expresses bank asset deterioration and threatens financial stability. According to BIS, Nonperforming Loans are loans or the interest over 90 days in arrears Baudino, et al. 2018. While independent variables that are included in the model are the Money Market rate as in Altunbas et al. (2010); Gambacorta (2009); Jimenez et al.(2008); Iannodou et al.(2009); Total bank assets, Gambacorta, L., (2009); Bonfim and Soares (2014); Iannodou, et al.,(2009); the Loan growth Jimenez, et al.(2008); Bank Capital/Total assets (Leverage indicator) as studies of Gambacorta (2009); Bonfim and Soares (2014); The Liquid Assets/Total Assets as in Haselmann and Watchel (2008); Gambacorta (2009); Bonfim and Soares (2014); Regulatory Capital Risk-Weighted Assets (Solvency Risk); Chen et al.(2015); Profitability indicators such as Return on Assets (ROA) as in Altunbas et al. (2010); Gambacorta, (2009); Bonfim and Soares (2014); and Return on Equity (ROE). In the econometric model, we have included the macroeconomic indicator expressed by GDP growth rate as in studies of Jimenez, et al. (2008); Altunbas,et.al. (2010).

In the Western Balkan countries, there were no policies of zero or very low-interest rates, like in many developed countries. The interest rates in the Western Balkan countries were higher than in developed ones, but decreased gradually, and have been associated with rapid loan growth, due to relatively low loan portfolio base and expansive monetary policies, which lead to an increase of bank risk in the WB 6 countries. However, through the econometric model, we will test the impact of monetary policies as well as other banking and macroeconomic variables on bank risk in these countries.

EMPIRICAL RESULTS

In this section, we introduce the empirical results from pooled OLS, fixed effects, random effects, and the Hausman-Taylor IV. Because of the endogeneity problems, which may lead to biased coefficients in the regression, which are shown in data, the Hausman -Taylor instrumental IV is estimated. In applying the Hausman-Taylor instrumental IV estimator, the variables are considered to be exogenous variables: Money market rate; GDP growth; Loan growth; Bank Capital to Total Assets; Liquid Assets to Total Assets; Regulatory Capital to Risk-Weighted Assets. The endogenous variable is NPL. A positive value of explanatory variables means a positive impact or increase of NPL, while a negative value of the variables means a negative impact or decrease of bank risk (NPL).

Table 1: Regression results

Variables	Pooled OLS	Fixed Effects	Random Effects	Hausman Taylor IV
NPL –Depend.var				.5797299**
GDP growth	-	-.2939718 **	-.5131924**	-.2984315**
		(0.169)	(0.055)	(0.025)
Money market rate	-.2372791**	-.2366845**	-.2751452**	-.0280233**
	(0.21)	(0.148)	(0.122)	(0.782)
Total Bank Assets	-	2.1106**	1.2406**	-1.0407**
		(0.165)	(0.062)	(0.861)
Loan (portfolio) Growth	-.0553144*	.0050901**	-.0371926**	.0235353**
	(0.041)	(0.834)	(0.177)	(0.108)
Bank Cap./ Tot. Assets	.7598065*	1.377615*	.7498667*	.666871 *
	(0.008)	(0.000)	(0.006)	(0.000)
Liquid Assets/Tot. Assets	-.0503201**	-.2016645*	-.033239**	-.1435529*
	(0.619)	(0.010)	(0.730)	(0.003)
Reg. Capital/RWA	.2197024**	.1169696**	.3056964**	-.0346286**
	(0.517)	(0.696)	(0.352)	(0.839)
ROA	-3.6399562 *	-4.289211*	-3.341805*	-3.664833*
	(0.020)	(0.000)	(0.024)	(0.000)
ROE	.1748185**	.167395**	.2212919**	.1570406**
	(0.373)	(0.276)	(0.246)	(0.104)
Constant	3.170237	1.654247	1.58529	8.862212
Nr. of Observations	79	79	79	79
R-squared	0.4509	0.4125	0.495	

*Notes: *statistically significant at 5 % level; **statistically significant at 10%*
Source: Author calculations based on World Bank-Data indicators and Central Bank data of Western Balkan countries (Albania, Kosovo, Macedonia, Serbia, Montenegro, and Bosnia and Herzegovina) over the period from 2003 to 2017.

The first explanatory macroeconomic variable we set was the GDP growth rate, and it has a negative coefficient of -.2984315, p-value of coefficient is 0.025, statistically significant, which means that the GDP growth rate has a negative correlation with the bank risk (Non-Performing Loans). It means that the higher the GDP rate is, the lower the bank risk will be since the borrowers will have a higher capacity to pay back the loans. On the other hand, when the economic growth is very low, the level of NPL is supposed to increase because the borrowers will have difficulty repaying their debt (obligation), see (Jimenez et al, 2008). The Money market rate has a negative coefficient of -.0280233, p-value 0.782, which means that it has a negative impact on bank risk-taking. So, based on empirical results, we find that the money market policy rate has no impact on bank risk-taking in the Western Balkan countries. This result will reject the hypothesis that the monetary policy rate in the Western Balkans indicates bank risk-taking.

The results of table 1 show that the loan (portfolio) growth is positive for .0235353, p-value is 0.108, statistically significant, which means that the loan portfolio growth will indicate an increase of bank risk or Nonperforming Loans. The result is consistent with many previous studies such as Altunbas, et al. (2010); Dell' Ariccia et al. (2010); Jimenez et al. (2008), that the loan portfolio increase will be indicated in the bank risk-taking. The Bank Capital to Total Asset ratio has a positive coefficient of .666871, p-value 0.000, statistically significant, which means it has a positive impact on bank risk in the Western Balkan countries. There are contradictory results in the literature on bank capital's impact on bank risk. The result is consistent with studies of many authors or studies, Dell' Ariccia, et al. (2010), that banks with a higher capital take more risks, studies of Berger and DeYong, (1997), find that decrease in bank capital ratios or low capitalized banks lead in bank risk-taking or Nonperforming loans increase. Regulatory Capital to Risk-Weighted Assets has a negative coefficient -.0346286, p-value 0.839, the result is in line with studies of authors Maddaloni and Peydro (2010), which means that it has a negative correlation and will indicate a decrease of bank risk in the Western Balkan countries. Liquidity indicator: Liquid Assets/Total Assets, has a negative coefficient of -.1435529, p-value 0.003, with high statistical significance, which means it has a negative impact on bank risk. The result is consistent with the findings of Bonfim and Soares (2014), that liquid banks are less risky banks. Regulatory Capital to Risk-Weighted Assets Ratio (RC/RWA), which is the bank core capital, has a negative coefficient of -.346286, p-value

0.839, is negatively related to the bank risk, and will indicate a decrease of bank risk and thus is in line with studies of Bonfim and Soares (2014), that banks with closer to minimum regulatory ratios are exposed to more risk. The ROE indicator has a positive coefficient of .1570406, p-value is 0.104, statistically significant, and has a positive correlation with the bank risk in the Western Balkan countries. The ROA indicator has a negative coefficient of -3.664833, p-value 0.000, with high statistical significance. It has a negative correlation with bank risk. This means that the higher profitability of banks indicates a decrease in bank risk or Nonperforming Loans in the Western Balkan countries. The indicator shows that banks in Western Balkan countries are well-capitalized.

CONCLUSION

By applying different econometric techniques, we examine whether the monetary policy rate indicates the bank risk increase in the Western Balkan countries, over the period of 2003 to 2017. The paper also uses different banking, regulatory and macroeconomic indicators, in order to test bank risk-taking in the Western Balkan countries. The results show the negative impact of monetary policy rates on bank risk-taking in the Western Balkans. It means that monetary policies do not show any positive indication in bank risk-taking in the Western Balkans, while, the macroeconomic indicator of GDP rate has shown a negative impact on bank risk, indicating a lower bank risk. Moreover, financial indicators like Liquid Assets, Regulatory Capital to Risk-Weighted Assets, profitability indicators expressed through ROA, have a negative impact on bank risk in the Western Balkan countries. On the other hand, the loan portfolio growth indicator that is in line with studies of Altunbas et al. (2010); Gambacorta (2009); Borio and Zhu (2008) indicate an increase of bank risk in WB6. The ROE is another indicator having a positive impact on bank risk in the Western Balkan countries. Finally, according to econometric results, monetary policy conditions in the Western Balkans countries did not show a positive correlation with bank risk-taking. Based on these results, we can conclude that the monetary policy or low-interest rates have no impact on increasing bank risk in the Western Balkans. However, expansive credit policies driven by low-interest rates, in order to increase bank profits and capital, have been in a positive correlation or have a positive impact on banking risk in the Western Balkans.

The findings of this paper are useful for monetary policy authorities, central and commercial banks providing them with useful information about monetary-credit policy correlation and bank risk-taking. This will help them design sound monetary policies in order to maintain financial and macroeconomic stability in these countries. The paper has its

limitations, so future researchers would extend further studies focusing on short and long-term interest rates' impact on bank risk-taking, both in the private and the business sector. New innovative banking products and services and their impact on bank risk-taking should be of interest for further studies, too.

REFERENCES

1. Adrian,T.& Shin.S.H. (2009). Money, Liquidity and Monetary Policy.Federal Reserve Bank of New York Staff Reports, no.360. https://www.newyorkfed.org/medialibrary/ media/ research /staff_reports/sr360.pdf
2. Agoraki, M. E., Delis, M. D., & Pasiouras, F. (2009). Regulation competition and bank risk-taking in transtion countries. Journal of Financial Stability, 7 (2011),38-48. doi: 10.1016/j.jfs.2009.08. 002.
3. Altunbas,Y.,Gambacorta,L.,&Marques-Ibanez, D. (2009). An empirical assessment of the risk-taking channel. BIS/ECB Conference on "Monetary Policy and financial stability".
4. Altunbas, Y., Gambacorta,L., &Marques-Ibanez,D.(2010). Does Monetary Policy Affect Risk Bank Taking? European Central Bank.Working Paper Series, No.1166/March 2010. https://www.ecb.europa.eu/ pub/ pdf/ scpwps/ecbwp1166.pdf
5. Baltagi,H.B. (2013). Econometrics Analysis of Panel Data.Third Edition. John Wiley&Sons,Ltd.
6. Baudino,P.,Orlandi.,J.& Zamil,R. (2018). Financial Stability Institute.The identification and measurement of Nonperforming assets: Cross country comparison. Bank for International Settlements. Retrieved from https://www.bis.org/ fsi/publ /insights7.pdf
7. Berger,N.A.,& DeYong,R. (1997). Problem loans and cost efficiency in commercial banks. Journal of Banking and Finance.
8. Bonfim,D. & Soares,C. (2014). The risk-taking channel of monetary policy-exploring all avennues. Retrieved from http://dx.doi.org/10.2139/ssrn.2512244
9. Borio,C & Zhu,H. (2008). Capital Regulation.Risk Taking and Monetary Policy: A Missing Link in the Transmission Mechanism? Retrieved from http://www.bis.org/publ/work268.pdf
10. Boshkov, T., Temelkov,Z.,&Zezova,A. (2017). Euroisation in the Western Balkans: The Evidence for Macedonian Economy. Mediterranean Journal of Social Sciences.
11. Boyd,H.J., De Nicolo,G.D., & Jalal, A.M. (2006). Bank Risk-Taking and Competition Revisited: New Theory and New Evidence. IMF Working Paper WP/06/297. Retrieved from https://www.imf.org/external/pubs/ft/wp/2006/wp06297.pdf
12. Chen, M., Wu,J.,Jeon,B.N.,& Wang,R. (2015). Monetary Policy and Bank Risk Taking.Evidence from Emerging Economies. Retrieved from https://doi.org/10.1016/j.ememar.2017.04.001

13. Delis,D.M.,and Kouretas,G. (2010). Interest rates and bank risk-taking. Munich PersonalRePEcArchive.https://mpra.ub.unimuenchen.de/20132/2/MPRA_paper_20132.pdf

14. Dell' Ariccia, G., Laeven, L., & Marquez, R. (2010). Monetary Policy, Leverage and Bank Risk- Taking.IMF Working Paper WP/10/276. https://www.imf.org/en/Publications /WP/Issues /2016/12/31/Monetary-Policy-Leverage-and-Bank-Risk-Taking-24424

15. Gambacorta,L. (2009). Monetary policy and the risk-taking channel. BIS Quarterly Review. https://www.bis.org/publ/qtrpdf/r_qt0912f.pdf

16. Haselmann,R., & Watchel,P. (2008). Risk Taking by Banks in the Transition Countries. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=952949

17. Ioannidou, V., Ongena,S., &Peydro, J.L. (2009). Monetary Policy, Risk-Taking and Pricing: Evidence from a Quasi-Natural Experiment. https://www.researchgate.net/ publication/228121518

18. IMF. (2015). Regional Economic Issues. Special report.The Western Balkans,15 Years of Economic Transition. IMF.Retrieved from https://ssrn.com/abstract=1406423

19. Jabra,B.W.,Mighri,Z.,& Mansouri,F. (2017). Determinants of European Bank risk during financial crisis. doi.org/10.1080/23322039.2017.1298420

20. Jimenez,G.,Onega,S.,Peydro, J-L.&Saurina J. (2008). Hazardous Times for Monetary Policy: What do twenty three million bank loans say about the effects of moentary policy on credit risk-taking? doi:https://doi.org/10.3982/ECTA10104

21. Maddaloni, A.& Peydro,J.L.. (2010). Bank Risk-Taking, Securitization, Supervision and Low Interest Rates. Evidence from the Euro Area and the U.S. lending standards. European Central Bank. Working Paper Series, no.1248/October 2010. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1679689

22. Rajan,R. (2006). Has Financial Development Made the World Riskier? NBER Working Paper No.11728. https://www.nber.org/system/files/working_papers/w11728 /w11728.pdf

23. Slavov, S. (2017). Exchange Rate Regimes in Central, Eastern and Southeastern Europe: A Euro Block and a Dollar Bloc? IMF Working Paper WP 17/83.

24. Taylor,B.J. (2009). The Financial Crisis and the Policy Responses: An Empirical Analysis of what Went Wrong. ttps://www.researchgate.net/publication /23779400_The_Financial_Crisis_and_the_Policy_Responses_An_Empirical_Analysis_of_What_Went_Wrong

25. World Bank. (2019). Financial Indicators Data for Albania, Kosovo, Macedonia, Serbia, Montenegro, and Bosnia and Hercegovina. https://data.worldbank.org/

Annexes

OLS regression results

```
. regress NPL ROE ROA RAC_RWA leqasse_totasset bank_cap_tota_asset loan_growth loan_portfolio mony_market
```

Source	SS	df	MS		
Model	1357.67991	8	169.709989	Number of obs	= 79
Residual	1653.69782	70	23.6242546	F(8, 70)	= 7.18
				Prob > F	= 0.0000
Total	3011.37773	78	38.6074068	R-squared	= 0.4509
				Adj R-squared	= 0.3881
				Root MSE	= 4.8605

NPL	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ROE	.1748185	.1951662	0.90	0.373	-.2144281	.5640651
ROA	-3.639562	1.532531	-2.37	0.020	-6.6961	-.5830252
RAC_RWA	.2197024	.337183	0.65	0.517	-.4527878	.8921927
leqasse_totasset	-.0503201	.1006725	-0.50	0.619	-.2511051	.1504649
bank_cap_tota_asset	.7598065	.279695	2.72	0.008	.2019725	1.317641
loan_growth	-.0553144	.0266213	-2.08	0.041	-.1084088	-.0022199
loan_portfolio	7.83e-07	9.93e-07	0.79	0.433	-1.20e-06	2.76e-06
mony_market	-.2372791	.1873492	-1.27	0.210	-.6109354	.1363771
_cons	3.170237	4.696159	0.68	0.502	-6.195956	12.53643

.

Fixed effects model results

```
. xtreg NPL ROE  ROA RAC_RWA leqasse_totasset bank_cap_tota_asset loan_growth total_bank_asse mony_market
>  gdp , fe

Fixed-effects (within) regression               Number of obs      =        79
Group variable: code                            Number of groups   =         6

R-sq:  within  = 0.6274                         Obs per group: min =        12
       between = 0.3301                                        avg =      13.2
       overall = 0.4125                                        max =        14

                                                F(9,64)            =     11.97
corr(u_i, Xb)  = -0.6305                        Prob > F           =    0.0000
```

NPL	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ROE	.167395	.152449	1.10	0.276	-.1371568	.4719468
ROA	-4.289211	1.147232	-3.74	0.000	-6.58107	-1.997352
RAC_RWA	.1169696	.2977173	0.39	0.696	-.4777891	.7117283
leqasse_totasset	-.2016645	.0761801	-2.65	0.010	-.3538518	-.0494771
bank_cap_tota_asset	1.377615	.2916265	4.72	0.000	.7950242	1.960206
loan_growth	.0050901	.0241643	0.21	0.834	-.0431837	.0533639
total_bank_asse	2.11e-06	1.50e-06	1.41	0.165	-8.87e-07	5.10e-06
mony_market	-.2366845	.1616176	-1.46	0.148	-.5595528	.0861838
gdp	-.2939718	.2111898	-1.39	0.169	-.7158719	.1279283
_cons	1.654247	6.080043	0.27	0.786	-10.49204	13.80053
sigma_u	5.021675					
sigma_e	3.4947368					

```
--more--
```

Random effects model results

```
. xtreg NPL ROE  ROA RAC_RWA leqasse_totasset bank_cap_tota_asset loan_growth total_bank_asse mony_market
>  gdp , re

Random-effects GLS regression                   Number of obs      =        79
Group variable: code                            Number of groups   =         6

R-sq:  within  = 0.5284                         Obs per group: min =        12
       between = 0.4584                                        avg =      13.2
       overall = 0.4950                                        max =        14

                                                Wald chi2(9)       =     67.63
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

NPL	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ROE	.2212919	.1907834	1.16	0.246	-.1526366	.5952204
ROA	-3.341805	1.481726	-2.26	0.024	-6.245934	-.4376766
RAC_RWA	.3056964	.3282475	0.93	0.352	-.3376569	.9490497
leqasse_totasset	-.033239	.0963331	-0.35	0.730	-.2220485	.1555704
bank_cap_tota_asset	.7498667	.2743532	2.73	0.006	.2121443	1.287589
loan_growth	-.0371926	.0275296	-1.35	0.177	-.0911496	.0167644
total_bank_asse	1.24e-06	6.66e-07	1.87	0.062	-6.31e-08	2.55e-06
mony_market	-.2751452	.1781126	-1.54	0.122	-.6242395	.0739492
gdp	-.5131924	.2677186	-1.92	0.055	-1.037911	.0115264
_cons	1.58529	4.51315	0.35	0.725	-7.260322	10.4309
sigma_u	0					
sigma_e	3.4947368					

```
--more--
```

Hausman_Taylor model results

```
. xthtaylor NPL NPLlag ROE ROA RAC_RWA leqasse_totasset bank_cap_tota_asset loan_growth total_bank_asse m
> ony_market gdp cod, endog( NPLlag ROA ROE)

Hausman-Taylor estimation                       Number of obs      =        79
Group variable: code                            Number of groups   =         6

                                                Obs per group: min =        12
                                                               avg =      13.2
                                                               max =        14

Random effects u_i ~ i.i.d.                     Wald chi2(11)      =    373.82
                                                Prob > chi2        =    0.0000
```

NPL	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
TVexogenous						
RAC_RWA	-.0346286	.1703442	-0.20	0.839	-.368497	.2992398
leqasse_to~t	-.1435529	.0486023	-2.95	0.003	-.2388116	-.0482942
bank_cap_t~t	.666871	.1852065	3.60	0.000	.3038729	1.029869
loan_growth	.0235353	.0146561	1.61	0.108	-.0051901	.0522607
total_bank~e	-1.04e-07	5.93e-07	-0.18	0.861	-1.27e-06	1.06e-06
mony_market	-.0280233	.1014944	-0.28	0.782	-.2269486	.170902
gdp	-.2984315	.1329362	-2.24	0.025	-.5589816	-.0378815
TVendogenous						
NPLlag	.5797299	.0594719	9.75	0.000	.4631671	.6962927
ROA	-3.664833	.7207942	-5.08	0.000	-5.077564	-2.252102
ROE	.1570406	.0966315	1.63	0.104	-.0323536	.3464348
TIexogenous						
code	-1.29106	.4703493	-2.74	0.006	-2.212928	-.3691923
_cons	8.862212	3.333648	2.66	0.008	2.328382	15.39604
sigma_u	1.5312063					
sigma_e	2.1049696					
rho	.34604034	(fraction of variance due to u_i)				

```
Note:  TV refers to time varying; TI refers to time invariant.

.
```

```
. xtreg NPL NPLlag ROE  ROA RAC_RWA leqasse_totasset bank_cap_tota_asset loan_growth total_bank_asse mony
> _market gdp loan_portfolio , fe

Fixed-effects (within) regression               Number of obs      =        79
Group variable: code                            Number of groups   =         6

R-sq:  within  = 0.8525                         Obs per group: min =        12
       between = 0.5792                                        avg =      13.2
       overall = 0.6893                                        max =        14

                                                F(11,62)           =     32.57
corr(u_i, Xb)  = -0.5423                        Prob > F           =    0.0000
```

NPL	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
NPLlag	.591394	.0608058	9.73	0.000	.469845	.712943
ROE	.1850158	.0984355	1.88	0.065	-.0117539	.3817856
ROA	-3.925544	.7363247	-5.33	0.000	-5.397436	-2.453651
RAC_RWA	.1366025	.1958025	0.70	0.488	-.2548011	.5280062
leqasse_totasset	-.1539798	.0490368	-3.14	0.003	-.252003	-.0559566
bank_cap_tota_asset	.7217711	.1982533	3.64	0.001	.3254684	1.118074
loan_growth	.0268241	.0158065	1.70	0.095	-.0047725	.0584208
total_bank_asse	-2.69e-06	2.25e-06	-1.20	0.236	-7.19e-06	1.81e-06
mony_market	-.0256943	.1077132	-0.24	0.812	-.2410099	.1896214
gdp	-.338187	.1351819	-2.50	0.015	-.6084118	-.0679623
loan_portfolio	4.84e-06	2.89e-06	1.67	0.099	-9.40e-07	.0000106
_cons	.5052645	3.914029	0.13	0.898	-7.318769	8.329298
sigma_u	3.7048861					
sigma_e	2.234142					
rho	.7333313	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(5, 62) =     6.59                 Prob > F = 0.0001

.
```