



Monetary versus Capital-Based Macroprudential Transmission - Efficiency and Effectiveness: Evidence from Central and South-Eastern European Banking Sectors

Milan Eliskovski
National Bank of the Republic of North Macedonia
Monetary Policy and Research Department
EliskovskiM@nbrm.mk

Neda Popovska-Kamnar
Palladium Group
neda.popovskakamnar@thepalladiumgroup.com

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The views expressed herein are those of the authors and do not necessarily represent the views of the National Bank of the Republic of North Macedonia



Objectives

- The main research question of this paper is to answer the following: Which policy, between the monetary and capital-based macroprudential, more effectively contributes to smooth out the credit cycle by imposing minimum costs to credit borrowers through the interest rates i.e. more efficient.
- Efficiency of both policies defined as imposing less costs to loan borrowers (non-financial companies and households) in terms of reducing the loan interest rate or less than proportionate increase of the loan interest rate.
- Effectiveness of both policies defined as the degree to which each respective policy achieves the smoothening of the cycle of loans to non-financial corporations and households.



Countries and Data

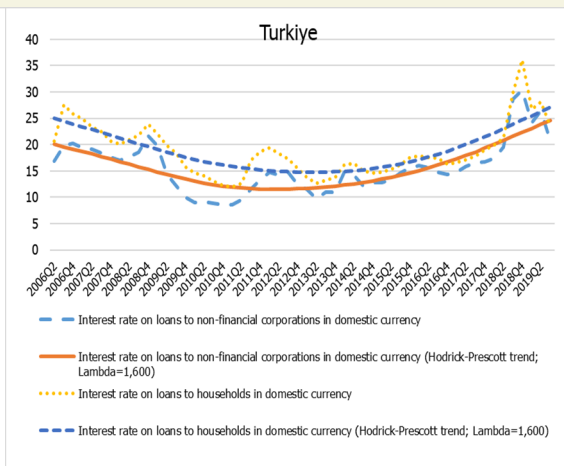
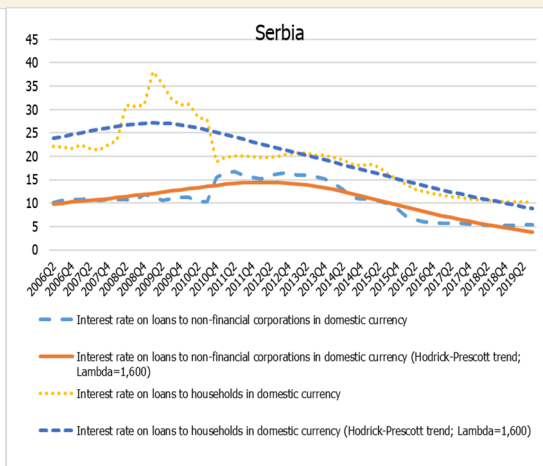
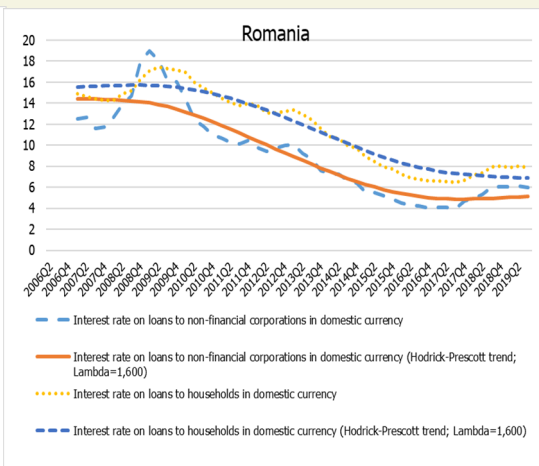
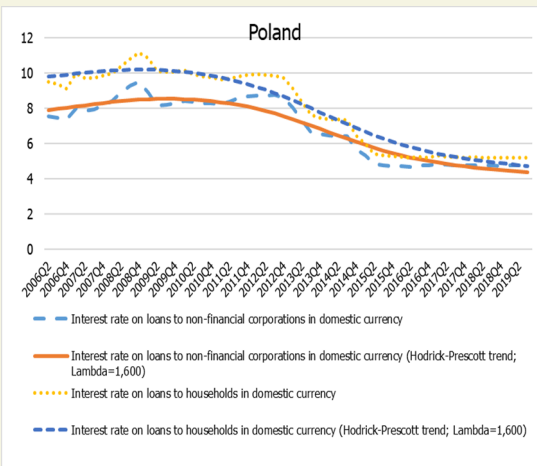
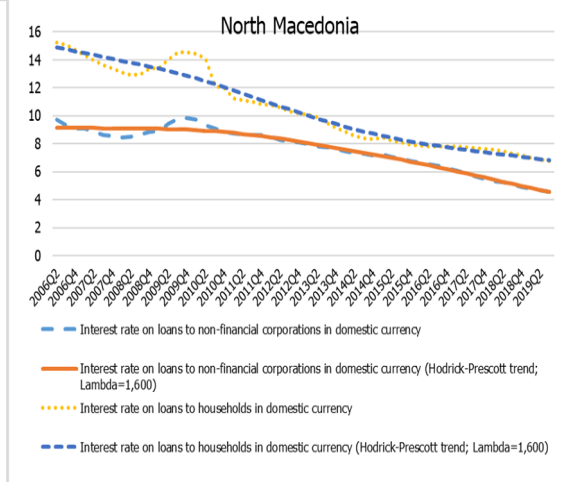
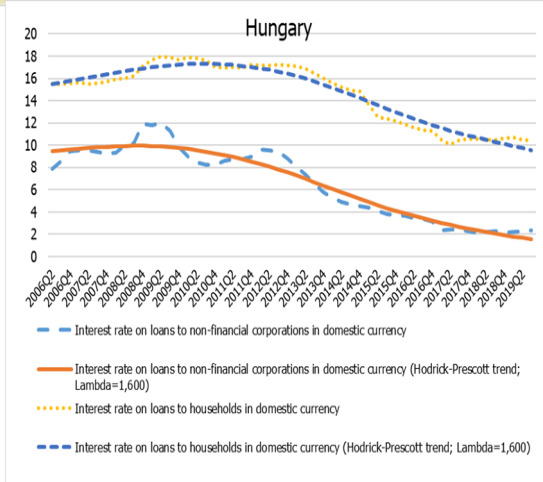
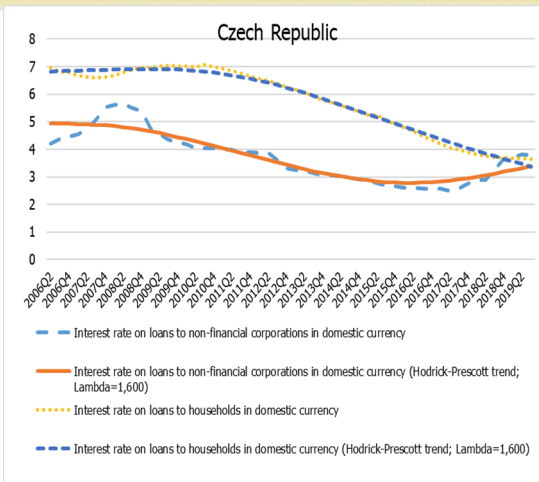
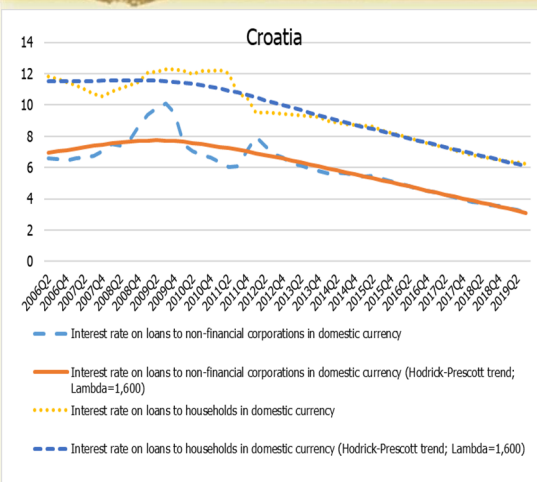
- The countries taken in the sample are 8 countries from Central and South-Eastern Europe: Croatia, Czech Republic, Hungary, North Macedonia, Poland, Romania, Serbia and Türkiye.
- The data are aggregate referring to the banking sectors and overall economies and are organized as unbalanced panel, covering for the period from 2006q2 to 2017q4/2019q3



Dependent Variables (1)

Loan interest rate cycle distinguishes between over-charging or sub-charging the clients.

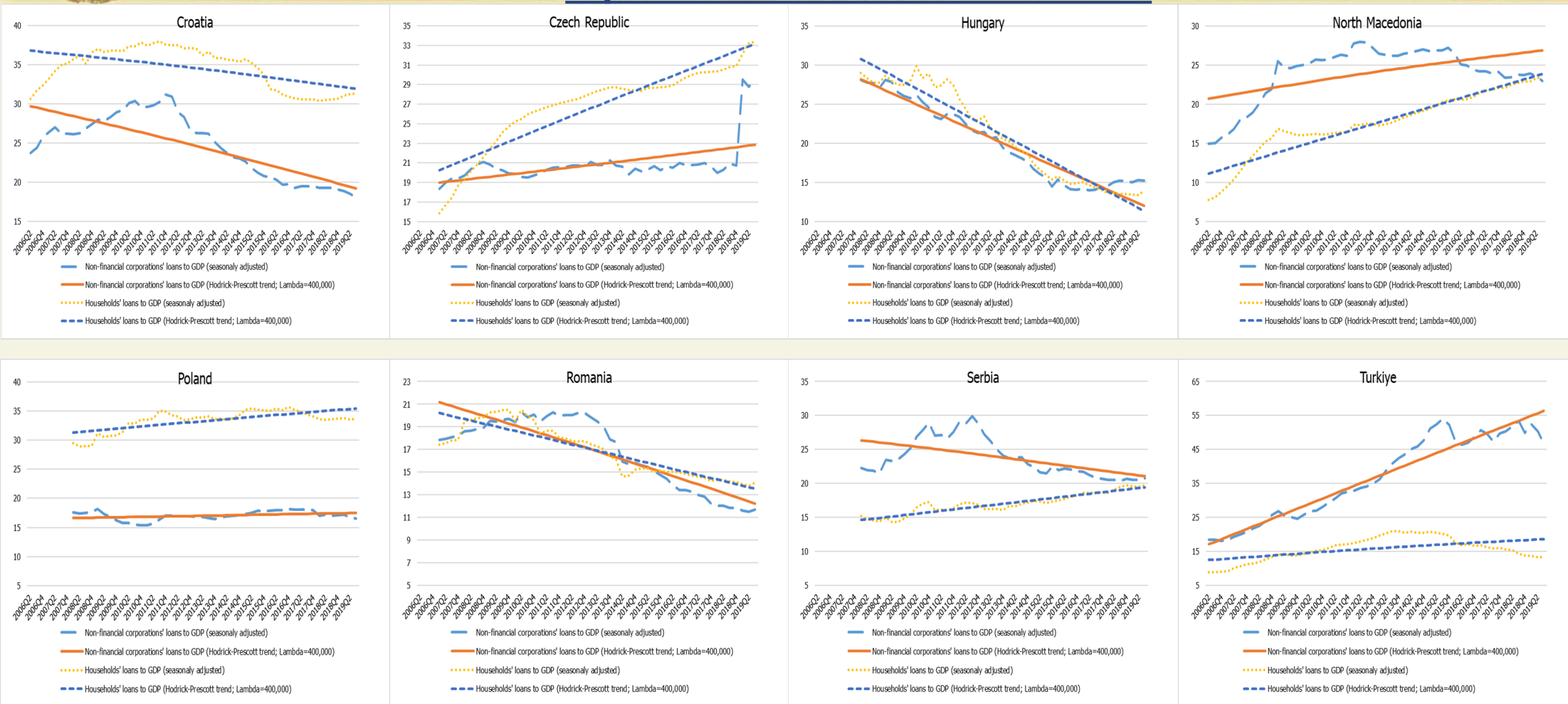
This is important from aspect of the efficiency





Dependent Variables (2)

Lending cycle has to be smothern out. Therefore, this variable is important from aspect of effectiveness assessment





Variables and expected effects for the monetary policy (1)

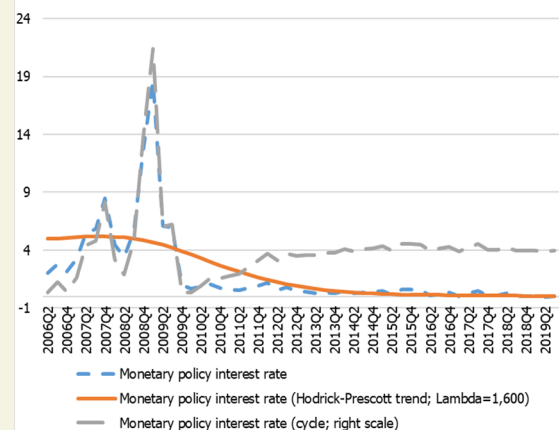
- The monetary policy is represented by the cycle of the referent (policy) interest rate managed by each central bank. The monetary policy interest rates taken in this analysis are nominal (not real policy interest rates), because the central banks provide the monetary signal by adjusting the nominal aggregates.



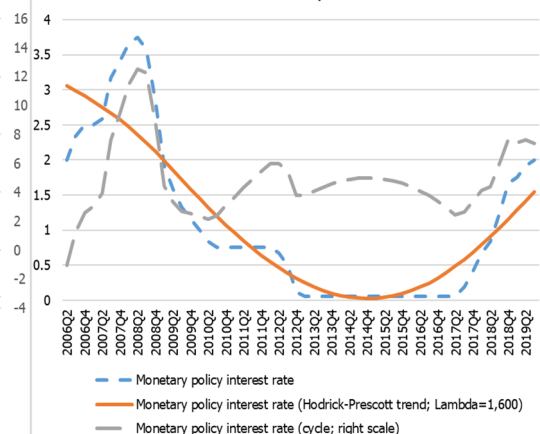
Independent Variables (1)

Monetary policy stance (expansionary or restrictionary)

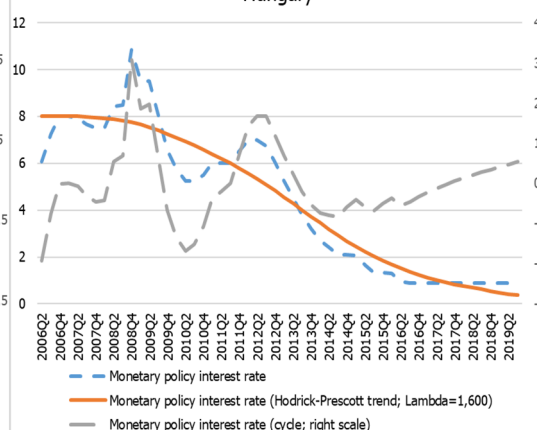
Croatia



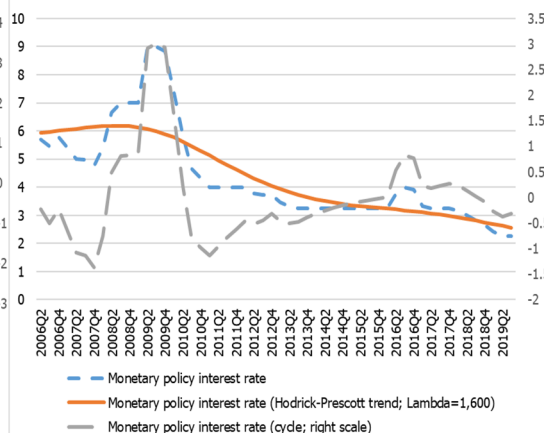
Czech Republic



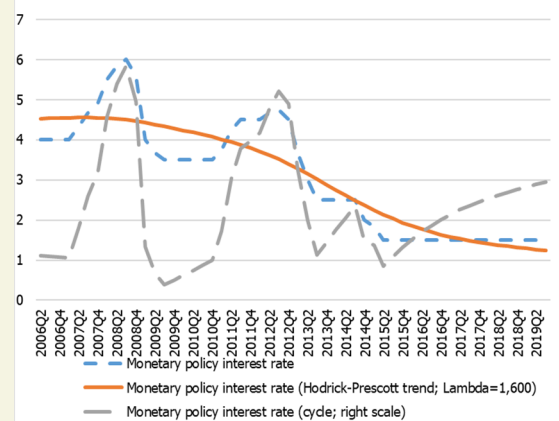
Hungary



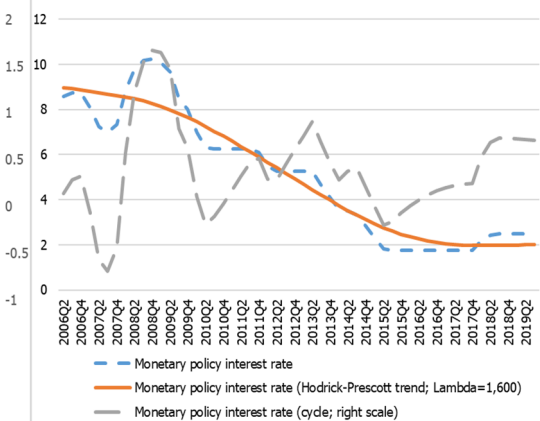
North Macedonia



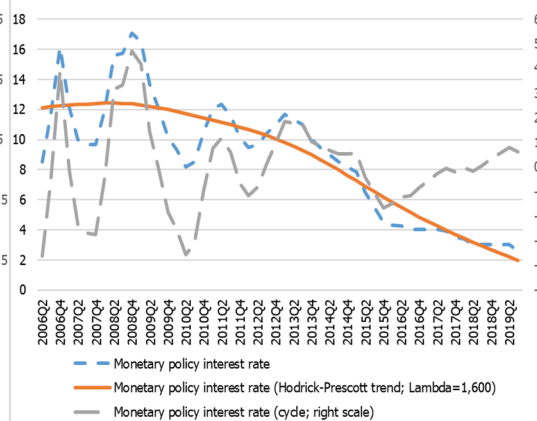
Poland



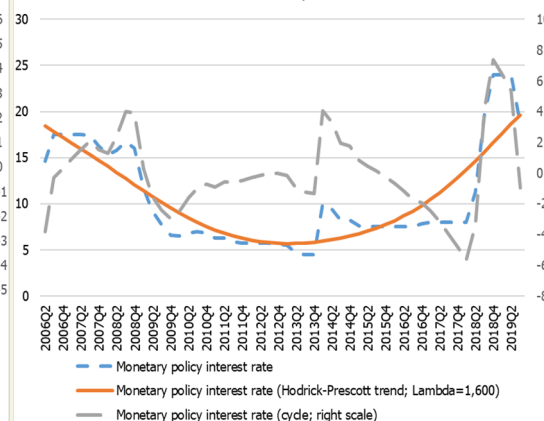
Romania



Serbia



Turkey





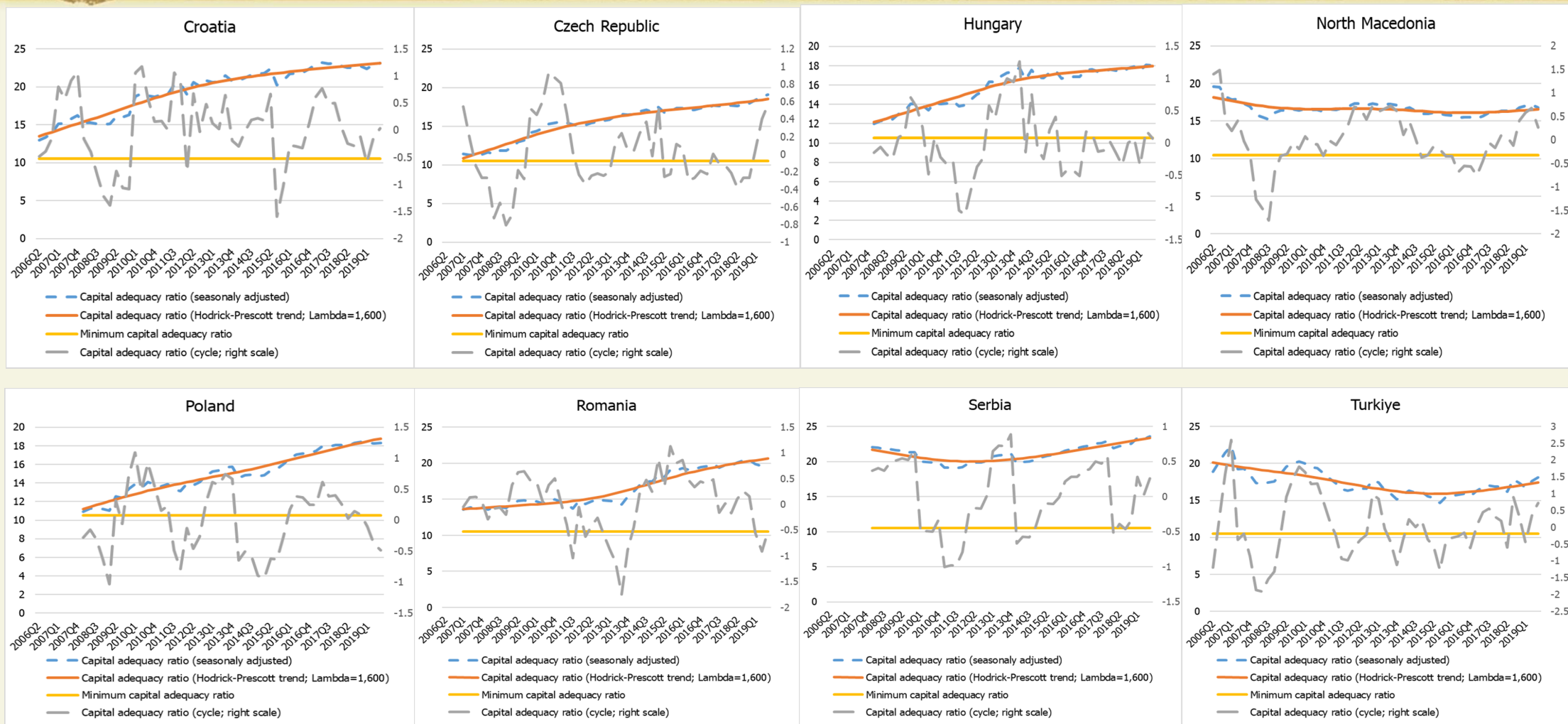
Variables and expected effects for the capital-based macroprudential policy (2)

- Representatives of the capital-based macroprudential policy are: Capital adequacy rate's cycle and the Sum of capital-based macroprudential dummy variables.
- First variable - capital adequacy rate's cycle
- The capital adequacy rate's cycle variable is proxy and it is not perfect variable in a sense of distinguishing the clear effect of the capital-based macroprudential policy imposed by the policy maker and the prudential managerial decisions.
- Second variable - sum of capital-based macroprudential dummy variables
- The data for the sum of capital-based macroprudential dummy variables are taken from the database created by Cerutti et al (2015).
- *(1) time-varying/dynamic loan-loss provisioning that requires banks to hold more loan-loss provisions during upturns, (2) general countercyclical capital buffer/requirement that requires banks to hold more capital during upturns, (3) leverage ratio that limits banks from exceeding a fixed minimum leverage ratio and (4) capital surcharges on systemically important financial institutions (SIFI) that requires the SIFI to hold a higher capital level than other financial institutions.*
- This aggregate dummy variable is also not perfect representative of the capital-based macroprudential policy, in a sense that it does not differentiate between restrictive or expansionary variations of the measures.



Independent Variables (2)

Proxy for capital-based macroprudential policy stance (expansionary or restrictionary)



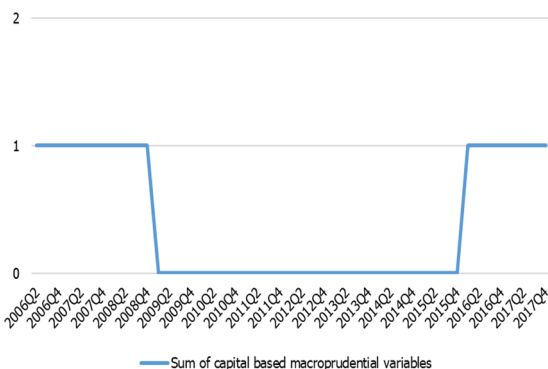


Independent Variables (3)

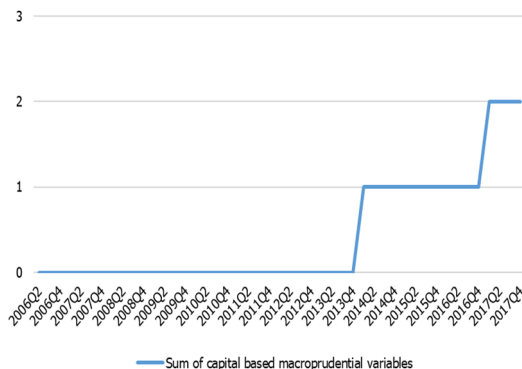
Indicating the number of capital-based macroprudential measures used at given point in time

Data taken from Cerutti et al (2015)

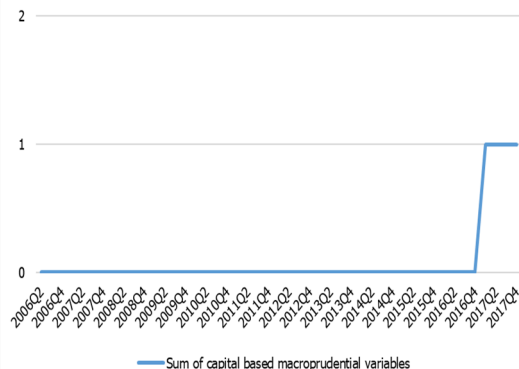
Croatia



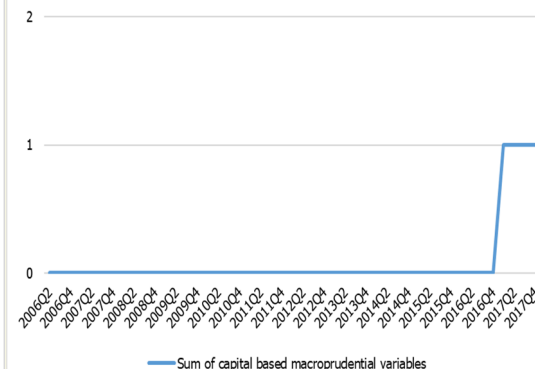
Czech Republic



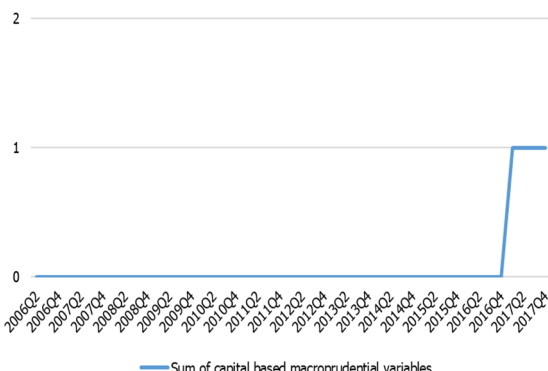
Hungary



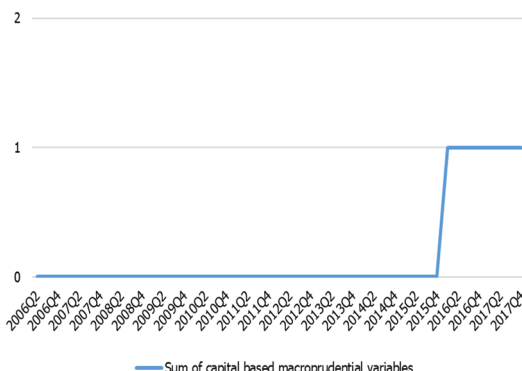
North Macedonia



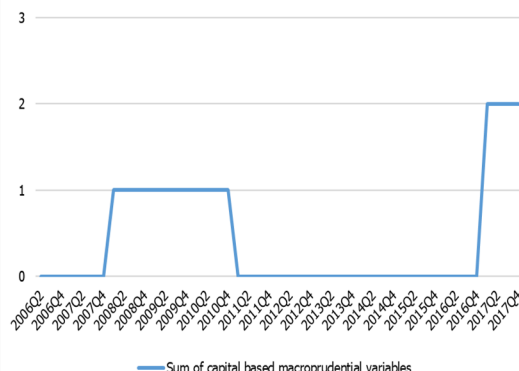
Poland



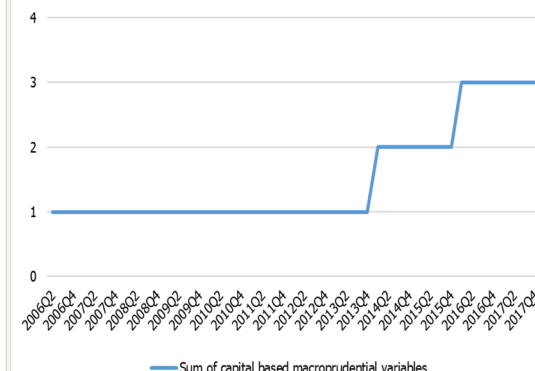
Romania



Serbia



Türkiye





Other Independent Variables

Independent variables	Description	Representative of
Interest rate on total deposits in domestic currency expressed as cycle in percentage points	= (interest rate on total deposits in domestic currency minus Hodrick-Prescott trend of interest rate on total deposits in domestic currency; $\lambda=1,600$)	Borrowing costs to the banks
Deposits to GDP cycle in percentage points	= (total deposits to GDP minus Hodrick-Prescott trend of total deposits to GDP; $\lambda=1,600$)	Funding structure of the banks
Non-performing loans ratio cycle in percentage points	= (total non-performing loans ratio minus Hodrick-Prescott trend of total non-performing loans ratio; $\lambda=1,600$)	Credit risk undertaken by the banks
Return on equity cycle in percentage points	= (return on equity minus Hodrick-Prescott trend of return on equity; $\lambda=1,600$)	Profitability of the banks
Real gross domestic product growth cycle	= (annual growth of real gross domestic product minus Hodrick-Prescott trend of annual growth of real gross domestic product; $\lambda=1,600$)	Income capacity of the economies
1 month EURIBOR cycle in percentage points	= (1 month EURIBOR minus Hodrick-Prescott trend of the 1 month EURIBOR; $\lambda=1,600$)	Foreign interest rate transmission
Dummy for the Global Financial crisis (2008q2 to 2009q4)	1 for the period from 2008q2 to 2009q4 and 0 for the rest	Global financial crisis effect



Variables and expected effects

- The restrictive monetary policy stance is expected to affect positively the cycles of the loan interest rates in domestic currency to non-financial corporations and households, and negatively the respective credit cycles.
- The restrictive capital-based macroprudential policy could ambiguously influence the loan interest rates.
- It depends on whether the banks try to safeguard the “skin” of the shareholders and consequently reduce the loan interest rates’ cycles, or increase the loan interest rates’ cycle as the captured volume of capital entails high opportunity costs in terms of keeping large and costly funding sources unavailable for lending.
- The tightened capital-based macroprudential policy unambiguously restricts the lending and dampens the positive lending cycle.



Econometric methodology

- Concerning the features of the sample in this paper, it consists of limited and small number of cross sections ($N=8$ countries) and relatively large time period (T spans from 2006q2 to 2017q4/2019q3).
- This paper utilizes two techniques: the first one is the Ordinary Least Squares (OLS) method and cross-section Seemingly Unrelated Relations (SUR) with Panel-Corrected Standard Errors (PCSE) and the second technique is the Pool Mean Group (PMG) cointegration method.
- Concerning the distinction between the short-run and long-run effect of the central monetary and capital-based macroprudential policies, the OLS-SUR-PCSE methodology is designed as partial-adjustment model (PAM).
- The regressions estimated by the PMG in this paper, include one lag chosen on arbitrary basis. Including one lag is reasonable as it is a period of one quarter that is long enough to encompass the transmission effects as well as not to over-parameterize the regressions with too many lags.



Results OLS-SUR-PCSE (estimation period 2006q2 to 2017q4)

Dependent variable	Interest rate on loans to non-financial corporations in domestic currency expressed as cycle											
	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b
Independent variables		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))
Interest rate on loans to non-financial corporations in domestic currency expressed as cycle (lagged variable (-1))	0.433*		0.728*		0.734*		0.728*		0.727*		0.728*	
Monetary policy interest rate cycle	0.050***	0.088***	0.204*	0.750*	0.191*	0.718*	0.203*	0.746*	0.193*	0.707*	0.205*	0.754*
Capital adequacy ratio cycle	-0.147**	-0.265**	-0.227*	-0.835*	-0.217*	-0.816*	-0.227*	-0.835*	-0.205*	-0.751*	-0.228*	-0.838*
Sum of capital-based macroprudential dummies	-0.054	-0.095	-0.087	-0.320	-0.129	-0.485	-0.084	-0.309	-0.091	-0.333	-0.088	-0.324

* p<0.01 ** p< 0.05 ***p<0.1

All specifications are estimated by employing ordinary least square (OLS), fixed effects, cross-section seemingly unrelated regressions (SUR) panel-corrected standard errors (PCSE)

Dependent variable	Non-financial corporations' loans to GDP cycle											
	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b
Independent variables												
Non-financial corporations' loans to GDP cycle (lagged variable (-1))	0.904*		0.877*		0.900*		0.895*		0.896*		0.898*	
Monetary policy interest rate cycle	0.018	0.188	0.017	0.138	-0.026	-0.260	-0.010	-0.095	-0.013	-0.125	-0.016	-0.157
Capital adequacy ratio cycle	-0.274*	-2.854*	-0.254*	-2.065*	-0.238*	-2.380*	-0.254*	-2.419*	-0.248*	-2.385*	-0.251*	-2.461*
Sum of capital-based macroprudential dummies	-0.144	-1.500	-0.136	-1.106	-0.175***	-1.750***	-0.116	-1.105	-0.117	-1.125	-0.112	-1.098

* p<0.01 ** p< 0.05 ***p<0.1

All specifications are estimated by employing ordinary least square (OLS), fixed effects, cross-section seemingly unrelated regressions (SUR) panel-corrected standard errors (PCSE)

Source: Authors' calculations



Results OLS-SUR-PCSE (estimation period 2006q2 to 2017q4)

Dependent variable	Interest rate on loans to households in domestic currency expressed as cycle											
	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b
Independent variables		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))		Long-run effect = (short-run coefficient/(1 -coefficient of the lag of the dependent variable))
Interest rate on loans to households in domestic currency expressed as cycle (lagged variable (-1))	0.747*		0.725*		0.723*		0.723*		0.725*		0.718*	
Monetary policy interest rate cycle	0.125*	0.494*	0.209*	0.760*	0.213*	0.769*	0.210*	0.758*	0.215*	0.782*	0.188*	0.667*
Capital adequacy ratio cycle	0.024	0.095	-0.011	-0.040	-0.013	-0.047	-0.007	-0.025	-0.020	-0.073	-0.0003	-0.001
Sum of capital-based macroprudential dummies	0.025	0.099	-0.038	-0.138	-0.026	-0.094	-0.019	-0.069	-0.037	-0.135	-0.029	-0.103

* p<0.01 ** p< 0.05 ***p<0.1

All specifications are estimated by employing ordinary least square (OLS), fixed effects, cross-section seemingly unrelated regressions (SUR) panel-corrected standard errors (PCSE)

Source: Authors' calculations

Dependent variable	Households' loans to GDP cycle											
	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b
Independent variables												
Households' loans to GDP cycle (lagged variable (-1))	0.885*		0.873*		0.884*		0.889*		0.884*		0.890*	
Monetary policy interest rate cycle	-0.019	-0.165	-0.006	-0.047	-0.036***	-0.310***	-0.019	-0.171	-0.017	-0.147	-0.027	-0.245
Capital adequacy ratio cycle	-0.080***	-0.696***	-0.080**	-0.630**	-0.066	-0.569	-0.082***	-0.739***	-0.086***	-0.741***	-0.076***	-0.691***
Sum of capital-based macroprudential dummies	-0.208*	-1.809*	-0.217*	-1.709*	-0.273*	-2.353*	-0.222*	-2.000*	-0.208*	-1.793*	-0.202*	-1.836*

* p<0.01 ** p< 0.05 ***p<0.1

All specifications are estimated by employing ordinary least square (OLS), fixed effects, cross-section seemingly unrelated regressions (SUR) panel-corrected standard errors (PCSE)

Source: Authors' calculations



Results PMG (estimation period 2006q2 to 2017q4)

Independent variables	Dependent variable	<u>Interest rate on loans to non-financial corporations in domestic currency expressed as cycle</u>				
		1	2	3	4	5
Long-run equation						
<u>Monetary policy interest rate cycle</u>		0.355*	0.798*	0.812*	0.782*	0.809*
<u>Capital adequacy ratio cycle</u>		-0.248*	-0.134*	-0.159*	-0.201*	-0.171*
<u>Sum of capital-based macroprudential dummies</u>		-0.246*	-0.307*	-0.358*	-0.293*	-0.295*
Short-run equation						
Error correction term		-0.284*	-0.278*	-0.262*	-0.263*	-0.297*
Difference of monetary policy interest rate cycle		0.232**	0.293*	0.306*	0.303*	0.287*
Difference of capital adequacy ratio cycle		0.076	0.005	-0.006	0.026	0.032
Difference of the sum of capital-based macroprudential dummies		0.122	0.019	-0.006	-0.009	-0.003

* p<0.01 ** p< 0.05 ***p<0.1
Source: Authors' calculations

Independent variables	Dependent variable	<u>Non-financial corporations' loans to GDP cycle</u>				
		1	2	3	4	5
Long-run equation						
<u>Monetary policy interest rate cycle</u>		-0.668	0.412	-5.976**	-1.152**	-0.797**
<u>Capital adequacy ratio cycle</u>		-3.041*	-3.059*	-2.373	-4.504*	-1.445*
<u>Sum of capital-based macroprudential dummies</u>		1.686**	1.390**	-4.846**	2.385***	1.144**
Short-run equation						
Error correction term		-0.049**	-0.060*	-0.024***	-0.032***	-0.068*
Difference of monetary policy interest rate cycle		-0.026	0.067	0.046	-0.002	-0.027
Difference of capital adequacy ratio cycle		-0.074	0.071	-0.190***	-0.128	-0.191
Difference of the sum of capital-based macroprudential dummies		-0.686	-0.392**	-0.522	-0.816**	-0.762

* p<0.01 ** p< 0.05 ***p<0.1
Source: Authors' calculations



Results PMG (estimation period 2006q2 to 2017q4)

Independent variables	Dependent variable	<u>Interest rate on loans to households in domestic currency expressed as cycle</u>				
		1	2	3	4	5
Long-Run equation						
<u>Monetary policy interest rate cycle</u>		<u>0.559*</u>	<u>1.050*</u>	<u>0.954*</u>	<u>0.982*</u>	<u>1.076*</u>
<u>Capital adequacy ratio cycle</u>		<u>0.455*</u>	<u>0.165</u>	<u>0.214**</u>	<u>0.061</u>	<u>0.260*</u>
<u>Sum of capital-based macroprudential dummies</u>		<u>0.031</u>	<u>0.024</u>	<u>0.071</u>	<u>0.056</u>	<u>0.013</u>
Short-run equation						
Error correction term		-0.221*	-0.209*	-0.233*	-0.212*	-0.233*
Difference of monetary policy interest rate cycle		0.0007	0.069	0.049	0.053	0.092
Difference of capital adequacy ratio cycle		-0.195	-0.146	-0.200	-0.165	-0.282
Difference of the sum of capital-based macroprudential dummies		-0.088	-0.317	-0.023	-0.024	-0.171

* p<0.01 ** p< 0.05 ***p<0.1
Source: Authors' calculations

Independent variables	Dependent variable	<u>Households' loans to GDP cycle</u>				
		1	2	3	4	5
Long-run equation						
<u>Monetary policy interest rate cycle</u>		<u>-1.418*</u>	<u>-1.244*</u>	<u>-1.228*</u>	<u>-1.115*</u>	<u>-1.283*</u>
<u>Capital adequacy ratio cycle</u>		<u>-0.929*</u>	<u>-0.796**</u>	<u>-0.463***</u>	<u>-0.077</u>	<u>-1.010*</u>
<u>Sum of capital-based macroprudential dummies</u>		<u>-1.858*</u>	<u>-1.709*</u>	<u>-1.892*</u>	<u>-1.887*</u>	<u>-1.601*</u>
Short-run equation						
Error correction term		-0.090*	-0.084*	-0.107*	-0.094*	-0.097*
Difference of monetary policy interest rate cycle		0.009	0.053	-0.022	-0.078	-0.026
Difference of capital adequacy ratio cycle		-0.177***	-0.124	-0.205**	-0.203**	-0.189**
Difference of the sum of capital-based macroprudential dummies		-0.220	-0.182	-0.229	-0.249	-0.293

* p<0.01 ** p< 0.05 ***p<0.1
Source: Authors' calculations



Conclusion (1)

- In conclusion, the efficiency and the effectiveness of both monetary and capital-based macroprudential transmission were tested on the dominant borrowing sectors: non-financial corporations and households.
- For the purpose of this paper, the efficiency is defined as imposing less costs to loan borrowers in terms of reducing the loan interest rate or less than proportionate increase of the loan interest rate.
- The effectiveness of both policies is defined as the degree to which each respective policy achieves the smoothening of the cycle of loans to non-financial corporations and households.
- The monetary policy increases the interest rates to non-financial corporations and households and according to the results of the paper may be considered as more costly.
- The capital-based macroprudential policy is less costly concerning the non-financial corporations as it decreases the interest costs, but the results from the PMG cointegration imply that ultimately the households bear higher loan interest rates.
- Thus, the efficiency from the macroprudential policy imposed to the corporations, is actually transferred and burden by the households.
- Regarding the effectiveness, both policies smoothen the credit cycles to both sectors, but, as the results imply, the capital-based macroprudential policy has higher effectiveness in dampening the credit cycle.



Conclusion (2)

- Thus, the findings of this paper suggest that the policy maker should give priority to the capital-based macroprudential policy in order to stabilize the lending on the equilibrium trend path.
- Nevertheless, this does not mean that the monetary policy is ineffective, because the monetary policy also smoothens the credit cycle, but at higher costs to both sectors.
- The advantage of the capital-macroprudential policy relative to the monetary policy is that the former could be specifically designed to affect the loan interest rates and credit cycle.



THANK YOU FOR THE ATTENTION!

Milan Eliskovski
National Bank of the Republic of North Macedonia
Monetary Policy and Research Department
EliskovskiM@nbrm.mk

Neda Popovska-Kamnar
Palladium Group
neda.popovskakamnar@thepalladiumgroup.com

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The views expressed herein are those of the authors and do not necessarily represent the views of the National Bank of the Republic of North Macedonia