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What are the Key Determinants of Nonperforming Loans in CESEE?

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Motivation

- Credit risk is one key risk for financial stability in Central, Eastern and Southeastern Europe (CESEE)
- CESEE - banks apply the traditional business model based on accepting deposits and granting loans
- Credit risk assessment is also crucial part of macro-stress tests
- In this study, we focus on some specifics of the CESEE region that could determine the key drivers of NPL development

Data sample

- In contrast to the study by Beck et al. (2013), we focus only on CESEE and have a richer data sample with quarterly frequency
- Focusing on some specific effects for emerging Europe that cannot be fully revealed with a global data sample at annual frequency
- Our study covers the following nine CESEE countries: Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Russia, Slovakia and Ukraine
- Time span 2004-2012

NPLs potential drivers

- Real GDP as well as at the two main components of final demand, namely real exports and real domestic demand
- The international environment - the Chicago Board Options Exchange (CBOE), Market Volatility Index (VIX), a popular measure of the implied volatility of Standard and Poor's (S&P) 500 index options, the emerging market bond index global (EMBIG) and the national stock indices
- Domestic bank credit to the private sector, including both households and nonfinancial corporations
- The exchange rate against the euro for most CESEE countries and the one against the U.S. dollar for Ukraine and Russia
- Return on assets (RoA) as a measure for banks' profitability

Econometric framework

- Linear model for panel data explaining changes in the NPL ratio, using logarithmic differences for independent variables
- We expect the NPL growth rate to exhibit some degree of persistence -> dynamic panel
- Generalized method of moments (GMM) with the corresponding GMM type of instrumental variables
- First, We used the “difference GMM” proposed by Arellano and Bond (1991) by using past lagged levels as instruments
- Then, we used the GMM-type instruments for both the first-difference equation and the level equation, thus applying the “system GMM” elaborated by Arellano and Bover (1995) and Blundell and Bond (1998) by using lagged first-differences as instruments for the level equation

Results – main model

	Type of model		
	Difference GMM	System GMM	System GMM with constant
Explanatory variables: coefficients			
NPL ratio (first lag)	0.21	0.22	0.21
t-statistic	*1.76*	*1.84*	*1.78*
p-value	*0.11*	*0.10*	*0.11*
Real GDP (first lag)	-1.65	-1.58	-1.64
t-statistic	*-3.92*	*-3.86*	*-3.86*
p-value	*0.00*	*0.00*	*0.00*
Private sector credit-to-GDP ratio (sixth lag)	0.47	0.48	0.46
t-statistic	*4.46*	*4.54*	*4.33*
p-value	*0.00*	*0.00*	*0.00*
National stock index (fifth lag)	-0.10	-0.10	-0.10
t-statistic	*-2.92*	*-2.87*	*-2.91*
p-value	*0.02*	*0.02*	*0.02*
Exchange rate,			
weighted by foreign currency share (first lag)[1]	0.36	0.37	0.37
t-statistic	*2.37*	*2.38*	*2.37*
p-value	*0.04*	*0.04*	*0.05*
Constant			0.02
t-statistic			*1.88*
p-value			*0.10*
Number of observations	285	294	294
F-test (p-value)	0.00	0.00	0.00
AR-1 test (p-value)	0.04	0.04	0.04
AR-2 test (p-value)	0.20	0.17	0.19
Sargan test (p-value)	0.12	0.12	0.13
Source: Authors' estimations.			
[1] *A positive sign denotes a depreciation of the national currency.*			
Note: All variables in logarithmic differences. Dependent variable: NPL ratio.			

Results – additional models

	Type of model		
	Difference GMM	System GMM	System GMM with constant
Explanatory variables: coefficients			
NPL ratio (first lag)	0.18	0.20	0.18
t-statistic	*1.65*	*1.72*	*1.66*
p-value	*0.13*	*0.12*	*0.14*
Real GDP (first lag)	-1.50	-1.42	-1.48
t-statistic	*-3.81*	*-3.65*	*-3.74*
p-value	*0.00*	*0.01*	*0.01*
Private sector credit-to-GDP ratio (first lag)	-0.42	-0.34	-0.39
t-statistic	*-2.17*	*-2.16*	*-2.18*
p-value	*0.06*	*0.06*	*0.06*
Private sector credit-to-GDP ratio (sixth lag)	0.53	0.53	0.52
t-statistic	*3.77*	*3.97*	*3.80*
p-value	*0.00*	*0.00*	*0.01*
National stock index (fifth lag)	-0.10	-0.10	-0.10
t-statistic	*-3.12*	*-3.06*	*-3.14*
p-value	*0.01*	*0.01*	*0.01*
Exchange rate,			
weighted by foreign currency share (first lag)[1]	0.39	0.40	0.39
t-statistic	*2.54*	*2.58*	*2.55*
p-value	*0.03*	*0.03*	*0.03*
Constant			0.02
t-statistic			*2.37*
p-value			*0.05*
Number of observations	285	294	294
F-test (p-value)	0.00	0.00	0.00
AR-1 test (p-value)	0.05	0.04	0.04
AR-2 test (p-value)	0.07	0.07	0.07
Sargan test (p-value)	0.17	0.15	0.17
Source: Authors' estimations.			
[1] *A positive sign denotes a depreciation of the national currency.*			
Note: All variables in logarithmic differences. Dependent variable: NPL ratio.			

	Type of model		
	Difference GMM	System GMM	System GMM with constant
Explanatory variables: coefficients			
NPL ratio (first lag)	0.26	0.27	0.26
t-statistic	*2.35*	*2.33*	*2.35*
p-value	*0.04*	*0.04*	*0.05*
Real exports (first lag)	-0.27	-0.26	-0.27
t-statistic	*-3.05*	*-3.26*	*-3.06*
p-value	*0.01*	*0.01*	*0.02*
Real domestic demand (first lag)	-0.62	-0.61	-0.62
t-statistic	*-2.24*	*-2.09*	*-2.26*
p-value	*0.05*	*0.07*	*0.05*
Private sector credit-to-GDP ratio (sixth lag)	0.40	0.43	0.40
t-statistic	*4.02*	*3.83*	*3.92*
p-value	*0.00*	*0.00*	*0.00*
National stock index (fifth lag)	-0.09	-0.09	-0.09
t-statistic	*-2.16*	*-2.18*	*-2.20*
p-value	*0.06*	*0.06*	*0.06*
Exchange rate,			
weighted by foreign currency share (first lag)[1]	0.51	0.51	0.50
t-statistic	*2.41*	*2.46*	*2.52*
p-value	*0.04*	*0.04*	*0.04*
Constant			0.01
t-statistic			*2.00*
p-value			*0.08*
Number of observations	285	294	294
F-test (p-value)	0.00	0.00	0.00
AR-1 test (p-value)	0.03	0.03	0.03
AR-2 test (p-value)	0.12	0.10	0.12
Sargan test (p-value)	0.66	0.67	0.68
Source: Authors' estimations.			
[1] *A positive sign denotes a depreciation of the national currency.*			
Note: All variables in logarithmic differences. Dependent variable: NPL ratio.			

Results
Static Panel Model with FE

	Type of model					
	FE model, main version		FE model, including additional lag		FE model, with demand components	
		with robust standard errors		*with robust standard errors*		*with robust standard errors*
Explanatory variables: coefficients						
Real GDP (first lag)	-1.87	-1.87	-1.59	-1.59		
t-statistic	*-6.32*	*-6.87*	*-5.30*	*-6.27*		
p-value	*0.00*	*0.00*	*0.00*	*0.00*		
Private sector credit-to-GDP ratio (sixth lag)	0.45	0.45	0.60	0.60	0.42	0.42
t-statistic	*3.22*	*3.44*	*4.15*	*3.32*	*2.99*	*3.56*
p-value	*0.00*	*0.01*	*0.00*	*0.01*	*0.00*	*0.01*
Private sector credit-to-GDP ratio (first lag)			-0.55	-0.55		
t-statistic			*-3.55*	*-3.08*		
p-value			*0.00*	*0.02*		
National stock index (fifth lag)	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12
t-statistic	*-4.48*	*-6.04*	*-4.23*	*-5.61*	*-4.30*	*-4.52*
p-value	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Exchange rate,						
weighted by foreign currency share (first lag)[1]	0.51	0.51	0.48	0.48	0.61	0.61
t-statistic	*2.07*	*2.71*	*1.99*	*2.62*	*2.55*	*2.42*
p-value	*0.04*	*0.03*	*0.05*	*0.03*	*0.01*	*0.04*
Real exports (first lag)					-0.29	-0.29
t-statistic					*-2.82*	*-2.36*
p-value					*0.01*	*0.05*
Real domestic demand (first lag)					-0.84	-0.84
t-statistic					*-5.11*	*-2.90*
p-value					*0.00*	*0.02*
Constant	0.02	0.02	0.03	0.03	0.02	0.02
t-statistic	*3.81*	*6.94*	*4.65*	*8.96*	*3.38*	*5.33*
p-value	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Number of observations	295	295	295	295	295	295
F-test (p-value)	27.69	30.27	25.58	38.93	21.67	40.46
F-test on fixed effects (p-value)	3.80		3.74		4.54	
Correlation between error term and explanatory	0.15	0.15	0.15	0.15	0.10	0.10
Sigma_u	0.03	0.03	0.03	0.03	0.03	0.03
Sigma_e	0.08	0.08	0.08	0.08	0.08	0.08
Rho	0.13	0.13	0.12	0.12	0.15	0.15
R^2_within	0.28	0.28	0.31	0.31	0.28	0.28
R^2_between	0.89	0.89	0.86	0.86	0.94	0.94
R^2_overall	0.30	0.30	0.33	0.33	0.28	0.28

Source: Authors' estimations.

[1] *A positive sign denotes a depreciation of the national currency.*

Note: All variables in logarithmic differences. Dependent variable: NPL ratio.

Policy Implication

- In boom times, the national economy is characterized by high, possibly overheating GDP growth amid a benign international environment in which financial investors have a positive perception of future financial and economic developments in the country concerned
- Excessively high credit growth in boom times can be seen as a proxy for loosening bank lending standards and underwriting criteria, often implemented in the quest for market shares
- Ongoing macroprudential efforts to curtail foreign currency lending with respect to unhedged borrowers may well contribute to make bank asset quality and credit risk less volatile
- Macroprudential tools should mitigate negative consequences of excessive credit expansion on bank asset quality (LTV, LTI)

Conclusion

- Domestic economic activity plays a key role for nonperforming loans
- Stock indices work as leading variables for financial and economic developments that directly influence the NPL ratio, and they might also capture other effects that are not included in our model
- Moreover, our results confirm the conclusion by Beck et al. (2013) that the depreciation of a local currency can have a sizeable negative impact on the quality of banks' assets
- Crucial role of the credit-to-GDP indicator on credit quality was revealed

Thank you for your attention!

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