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Maastricht Criteria Targeting and Credit Growth: Empirical Evidence for the New European Union Member States

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ABSTRACT

The study aims to investigate the impact of credit growth on the Maastricht criteria targeting process in the new member states of the European Union. The methodological framework is based on a two-component transmission mechanism represented by the output gap and the nonperforming loans. The empirical analysis consists of a set of simplified econometric models, built by panel estimates using annual data from 2000 to 2011. Statistical results revealed the existence of a reaction of long term interest rates to the developments in sovereign risk premium, determined, in turn, by the impact of the mutual reinforcing between lending rate and output gap on the loan portfolio quality dynamics. Strengthening prudential conduct of monetary policy with a conservative macro-prudential policy is a critical need for increased resilience of nominal convergence to exogenous shocks, given that containing the volatility of economic activity depends in a decisive way, on succeeding to maintain credit growth levels close to economic growth potential.

Keywords: Maastricht criteria, Lending to private sector, Output gap, Nonperforming loans, Primary budget balance

JEL codes: G01, G17, G21, G32, G33

1. Introduction

In the assessment of meeting convergence criteria, sustainability of obtained results has to be regarded as an essential factor, because their temporary fulfillment affects not only the economic development of the country but the functionality of the euro currency also.

Traditional assessment of risks to the continuity of nominal convergence process is focused on the vulnerabilities associated with the disinflation trend, given that it is considered the benchmark of

general macroeconomic conditions. The major challenge for the new Member States analyzed by distinguished academics, as well as by experts from central banks target the possible conflict between catching-up pace and avoidance of accumulation of imbalances in nominal convergence area. The starting point of these evaluations was represented by the observation that the productivity gains in the tradeable sector were accompanied by wage increases in the nontradeable sector, a phenomenon described in the literature as the Balassa-Samuelson effect (Egert, 2007). However, aggregate demand was fueled not only by pro-cyclical nature of income policy, but also easier access to bank loans. Increased purchasing power beyond the productivity gains led to overheating of the economy that was followed by inflationary pressures and widening external imbalance. Thus, pressures on sovereign risk premium emerge, which then lead to increased long-term yields on government bonds and exchange rate depreciation. Furthermore, the balance-sheet effects disrupt the formation of gross value added in the economy and the balance the budget through tax revenue channel. Public debt increases, putting additional pressure on sovereign risk, and the value of bank portfolios decreased, risking entering a vicious spiral between public finances and banking system stability. Hence, although there are no financial stability indicators among the Maastricht criteria, at least some of the areas of action of macroprudential supervision may indicate risks to nominal convergence process (Dardac and Moinescu, 2012).

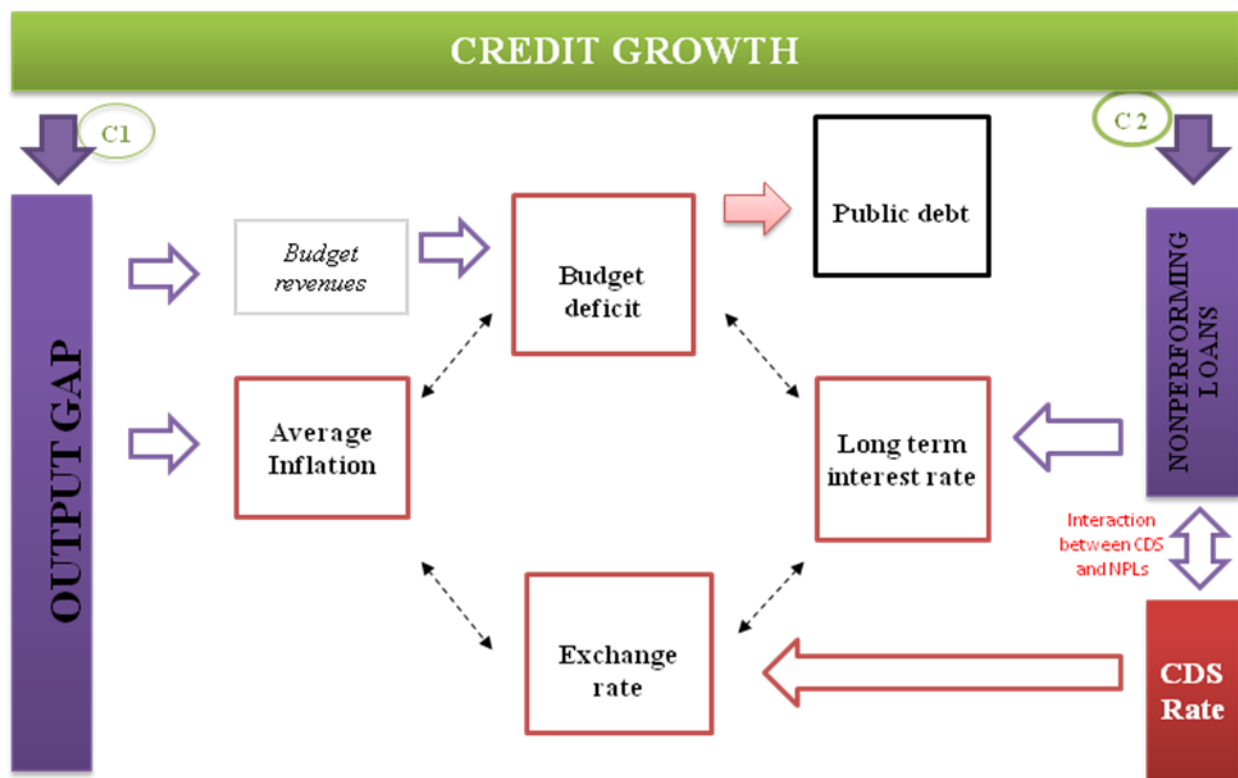
In this context, the aim of this study is to identify and assess the threats to the sustainability of the euro adoption process, associated with private sector lending in New Member States (NMS). Operational objective of the research is to investigate the interrelationships between lending rate and nominal convergence indicators, by developing a simplified financial satellite model with endogeneous cycles, based on credit accelerator theory.

The remaining the paper is structured as follows. The second section shows the methodology underlying analytical framework for assessing risks induced by credit growth on the success of euro adoption process by Central and Eastern European (CEE) countries, highlighting the main transmission channels considered. The third section presents the data sources used in the study. Section four provides an overview of key empirical issues in developing a financial satellite model, which favors estimating the credit dynamics impact on fulfillment of the Maastricht criteria. The last section consists of the main conclusions.

2. Methodological Framework

Analytical framework to investigate the impact of credit on the evolution of nominal convergence indicators for CEE countries is based on a transmission mechanism with two components, namely (1) the evolution of GDP deviation from its potential level and (2) nonperforming loans dynamic (Figure 1).

Figure 1 X-ray of risks and vulnerabilities induced by lending rate on nominal convergence



(1) Impact on GDP deviation from its potential level

Transmission channel on the output gap (GAP GDP) is based on the credit accelerator theory proposed by Bernanke, Gertler & Gilchrist (1999), showing that increasing the flow of credit (credit accelerator) feeds consumption and investment, creating space for multiplying the value added in the economy. Accelerating lending growth induces beyond potential GDP growth and the economy enters a process of overheating, which favors the generalized increase in prices in the economy. Conceptual model for the average rate of inflation is expressed by a modified Phillips curve, to capture the impact of exchange rate depreciation. Otherwise, when financing the economy enters a downward slope, there is lack of demand, which reduces inflationary pressures. However, the extent to which reduced revenues, due to a negative deviation of GDP is not accompanied by a similar adjustment in public spending and the primary deficit of the state budget is likely to increase, inflation rate can record important jumps, fueled by inevitable increase in indirect taxes such as VAT (Moinescu, 2012).

(2) Consequences on the dynamics of non-performing loans

Transmission channel on the dynamics of non-performing loans (NPL) is based on the model proposed by Moinescu and Codirlasu (2012), showing that bank portfolio quality deterioration is determined by square deviation of lending growth rate from the potential level of economic growth recorded two years earlier. The harmful effect on reimbursing capacity of reduced funding flow is similar to the case of inefficient allocation of bank resources (Jakubik and Moinescu, 2012), triggered by excessive lending amid loose credit standards during boom periods. Conceptual model for the dynamics of non-performing loans ratio implies the existence of an exponential relationship, in which the set of

determinants includes macroeconomic variables such as output gap, exchange rate and interbank interest rate changes. This approach is eligible in terms of economic reasoning, which states that the relationship between the rate of non-performing loans and economic environment presents a nonlinear form (Boss, 2002; Jakubik and Schmieder, 2008; Costea, 2012). Increasing non-performance of the loan portfolio generates the recapitalization needs of banks, sometimes covered only through public funding, as well as the deterioration of investor perceptions on sovereign risk, followed by significant upward movements CDS rate. Functional form of the explanatory equation for sovereign risk premium also includes the inversely proportional relation with output gap, as well as structural differences existent between economies of CEE countries, captured by the fixed effects of panel estimations. Dynamics of sovereign risk premiums is later reflected in the performance required for the issuance of bonds (Moinescu, 2012). Moreover, jumping sovereign risk premium leads to exchange rate depreciation. Explanatory equation of the exchange rate dynamics also includes the inversely proportional impact of the foreign direct investment flow, the positive effect of the evolution of the current account deficit, as well as the proportional effects of one year before change in the level of privat sector indebtedness.

Following the empirical literature and transmission mechanism already described, the dependant variables (average inflation, long term interest rate, exchange rate, primary deficit balance, output gap, NPLs ratio and sovereign risk) are regressed on their main determinants using the model specification presented by relation (1).

$$DV_{it} = \alpha_i + \beta \times X_{it} + \varepsilon_{it} \quad (1)$$

Where α_i is country i 's specific effect on dependant variable DV; X_{it} is a vector of variables that affect the dependant variable; and ε_{it} is a random error term. The indexes " i " and " t " indicate the individual contry and time period, respectively. The estimation method is OLS panel regression with fixed effects in order to capture the structural differences among the CEE economies. The β s can be interpreted as direct elasticity, except for the NPL equation where β s are cvasi-elasticities, considering the exponential form.

3. Dataset

Information underlying the impact assessment of credit growth on nominal convergence indicators in the CEE Member States with a floating exchange rate regime, namely the Czech Republic, Latvia, Poland, Romania and Hungary, covers annual data from 2000 to 2011.

The main source of information used is represented by Eurostat, from where data was extracted on credit flow to private sector, economic growth, number of employees, average income in the economy, foreign direct investment, long-term interest rate, exchange rate, average inflation rate and the primary deficit of the state budget. Nonperforming loans rate data were obtained from the International Monetary Fund reports on financial stability indicators, while the sovereign risk premium was calculated based on daily information extracted from Bloomberg plaforma. At the same time, data on potential

economic growth and output gap, both for CEE and for the euro area, were extracted from the database of the European Commission (AMECO).

Preliminary analysis on dependant variables shows a reasonable level of volatility in data that favors a fairly promising econometric output (Table 1).

Table 1 Statistics on dependent variables

	Average inflation	Long term yields	Change in exchange rate	Primary balance	Output GAP	GDP growth	NPL Ratio	CDS Rate	Credit flow
Average	4.5	6.4	1.7	-2.0	0.5	3.5	6.5	1.6	9.5
Median	4.0	6.2	0.1	-1.8	-0.3	4.2	4.6	0.9	8.0
Min	-1.2	3.5	-11.1	-8.3	-10.3	-17.7	0.5	0.1	-21.6
Max	15.3	12.4	30.5	8.5	14.2	11.2	21.2	7.3	43.0
Standard deviation	3.0	1.9	8.6	2.6	4.5	4.6	5.3	1.6	11.1
Skewness	1.0	0.9	1.2	0.5	0.4	-2.1	1.2	1.5	0.6
Kurtosis	1.9	1.0	1.9	3.2	1.2	7.4	0.6	2.7	1.6

Note: the values provided are expressed in percents

Preliminary empirical investigation on candidate determinant factors showed that credit acceleration in CEE countries was one of the main determinants of economic advance over potential in the region (Table 2).

Table 2 Univariate results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Eq 1: Change in Output GAP				
Credit accelerator	0.260094	0.046895	5.546265	0
Change in long term yield	-1.375464	0.347238	-3.961162	0.0003
Eq 2: Average inflation				
Output GAP	0.296457	0.0683	4.340482	0.0001
Average inflation (-1)	0.668956	0.048099	13.90793	0
Eq 3: Primary budget balance				
Change in Output GAP	0.306636	0.059763	5.130856	0.00
PRIMARY BALANCE (-1)	0.566772	0.089722	6.316984	0.00
Eq 4: Change in nonperforming loans ratio				
Squared deviation of credit growth (-2)	0.138131	0.019377	7.128665	0
Output GAP	-0.027146	0.016342	-1.661155	0.1059

Table 2 (continued)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Eq 5: CDS rate				
Change in NPL ratio	0.3986424	5.010321	7.956426	0
Output GAP	-0.2115299	3.080458	-6.866832	0
Eq 6: Long term yield				
CDS Rate	0.702264	0.154216	4.553769	0.0001
Money market interest rate (3M)	0.375051	0.068444	5.479663	0
Eq 7: Change in Exchange rate				
Interest rate differential	-2.213751	0.779935	-2.838379	0.0093
Change in current account balance	-2.034423	0.928593	-2.190866	0.0389

Moreover, the average rate of inflation dependence on economic developments indicates a significant causal linear form with elasticity levels amounting to approximately 30 percent.

Additional risks to the nominal convergence come from deterioration of the quality of credit portfolio, while the large fluctuations of bank financing are associated with medium-term growth of credit risk. Furthermore, results show that for each additional percentage share of nonperforming loans in total loans to the private sector, sovereign risk premium is increased by approximately 0.4 percent. Impact on sovereign risk is then translated on long-term interest rate at a ratio near 70 percent.

4. Estimation of Financial Satellite

The operational objective of the empirical multivariate assessment was to substantiate the mechanism by which the lending rate affects the fulfilment of nominal convergence criteria in Central and Eastern Europe countries, by taking into account macroeconomic factors short-listed in the previous section. The analytical component consists of a set of simplified econometric models, built by panel estimation using annual data (Table 3).

Table 3 Estimation output

Determinant factors\Dependant variables	OUTPUT GAP	AVERAGE INFLATION	PRIMARY DEFICIT	NPL (logarithm)	SOVEREIGN RISK	INTEREST RATE	EXCHANGE RATE
Credit Accelerator	0.079932 0.0226						
Credit Accelerator (-1)	0.097416 0.0027						
Squared deviation of credit growth				0.045094 0.0027			
Domestic Output Gap (NSM)		0.267833 0.0002	0.295585 0		-0.081747 0.0459		
Euro-zone Output Gap	1.22964 0						

Change in NPLs ratio					0.123244		
					<i>0.0588</i>		
Money-market interest rate						0.338728	
						<i>0</i>	
Sovereign rik premium (CDS)				0.096133		0.652448	
				<i>0.0381</i>		<i>0</i>	
Sovereign rik premium (-1)					0.198645		
					<i>0.0463</i>		
Average Inflation				0.032495			
				<i>0.0648</i>			
Average Inflation (-1)		0.63818					
		<i>0</i>					
Long term interest rate	-0.649914						
	<i>0.0022</i>						
Long term interest rate differential							-1.695966
							<i>0.0006</i>
Primary balance (-1)			0.532209				
			<i>0</i>				
Public debt to GDP							
Foreign Direct Investments					-3.454475		
					<i>0.0028</i>		
Change in average wages							-0.783282
							<i>0</i>
C	3.988188	1.391967	1.318863	-0.283908	1.721464	3.547635	0.10161
	<i>0.001</i>	<i>0.0005</i>	<i>0.1059</i>	<i>0.0268</i>	<i>0</i>	<i>0</i>	<i>0</i>
Fixed effects							
_BG--C	-0.738317	0.23836	1.250236	-0.186817	0.225428	-0.784339	
_CZ--C	-0.54565	-0.568756	-0.34718	0.149823	-0.969069	-0.590786	-0.067349
_LET--C	0.232814	0.525408	-0.473499	-0.015634	1.21513	0.739927	0.055842
_LIT--C	0.124229	-0.192736	-0.461794	0.318084	0.440513	0.76916	
_HUN--C	1.466851	0.335069	0.484316	0.000417	-0.421008	0.267361	0.006208
_POL--C	0.46618	-0.571728	-0.266809	-0.036556	-0.384362	0.204638	-0.03661
_RO--C	0.487047	0.234384	-0.18527	-0.236606	0.44361	-0.157999	0.078222
Adjusted R-squared	0.774028	0.770581	0.651091	0.687476	0.818777	0.72111	0.754338
Durbin-Watson stat	1.734459	2.130906	1.680039	2.416463	1.985235	1.751118	1.816863

Note: the values depicted in italics express nul hypothesis probabilities related to estimating the coefficients of respective equations

The first equation of the financial satellite models the dynamics of **output gap**. Empirical results confirm that dynamic of economic activity responds to bank financing impulse, about 18 percent of the credit accelerator turning into change of the output gap. Impact spreads over two years, in similar proportions, respectively 50 percent current year and 50 percent next year. Deviation of economic growth from its potential level in CEE countries depends, also, on the output gap in the euro area at a ratio slightly higher than one (1.22). At the same time, higher long-term interest rates by one percentage point determine a compression of about 0.65 percent on the deviation of GDP. These three key factors together easily explain over 75 percent of the variance of GDP deviation dynamics, by taking into account, through fixed effects, including structural differences existent at the level of economic dynamics.

The result of **average inflation rate** equation estimation shows that over potential supply growth through credit is instantly accompanied by generalized price increases in the economy, Phillips curve model being also relevant in CEE economies. About 25 percent of deviation of economic growth from its potential level materializes in the effective average rate of inflation. The estimated multifactorial functional form manages to capture about 75 percent of the average rate of inflation variance, considering through fixed effects the existing structural differences in terms of price stability.

The functional form of the equation for the **primary deficit** enforces the relevance of output gap deviation on nominal convergence, given that about 30 percent of deviation of economic growth from its potential level is reflected in the budget situation. The estimated equation highlights persistent deficits from one year to another, slightly more than 50 percent of last's year primary budget situation maintaining its result in current year. These two key factors together easily explain over 65 percent of change in primary budget balance.

At the same time, the evolution of the output gap has an immediate impact on the **dynamics of the non-performing loans rate**. Determinant relationship is negative, in accordance with economic theory. Moreover, the results obtained through panel data estimation confirms that large credit fluctuations lead to lower quality of bank portfolios two years later. The set of determinant factors is complemented by exchange rate and market interest rate variation. In both cases, the influence is positive and statistically significant at 95 percent confidence level, reflecting, on the one hand, the high share of foreign currency loans in the credit portfolio of banks in the CEE region, and on the other hand, the dominance of variable interest-bearing bank financing. Configuration of dynamics of the non-performing loans rate model allows explaining about 70 percent in the evolution examined.

The next step was the construction of a simplified model for predicting **the sovereign risk premium**, variable which is expressed by the level of 5Y CDS rate. One of its main determinants is represented by the quality of the loan portfolio, empirical estimates indicating that about one eighth of NPL rate change reflects positively on sovereign risk premium in the same year. The result reflects, however, the unfavorable investors' perception related to the propagation of emerging imminent major difficulty situations in NMS banking systems, to the need of financing the government sector, by actions of saving supposing any undercapitalized banks. Also, about eight percent of the output gap contributes to the attenuation of the CDS rate level.

Evolution of the sovereign risk premium is decisive for the dynamics of interest rates in the economy, about two-thirds of percent of the cost of insuring debt being reflected into the **yield on long-term government securities**.

Last equation of the financial satellite models the dynamics of the **exchange rate** using a modified form of covered interest rate parity. The econometric results show that for each additional percentage point of long-term interest differential (ie the difference between the yield on government securities and the related domestic euro area), the exchange rate appreciates by about two percent.

5. Conclusions

The main finding of the paper shows that although there are no financial stability indicators among the Maastricht criteria, credit growth plays a central role in nominal convergence process. The added value brought to the canon of knowledge is that not only real convergence is an important milestone for long lasting nominal convergence process, but also financial stability.

Bank financing pace has effects on both GDP deviations from its potential level and on the dynamics of non-performing loans. Quantitative analysis confirmed that credit accelerator drives economic activity beyond its potential during periods of excessive lending, pushing prices up and setting the grounds for high structural budget deficits amid procyclical fiscal policies. Econometric results also revealed the existence of a reaction of long term interest rate to the developments in sovereign risk premium. Furthermore, empirical findings show a strong reaction of sovereign risk premium to loan portfolio quality dynamics, determined, in turn, by the mutual reinforcing between lending pace and output gap. Thus, economic policies must be strengthened with a constant concern with regard to the sustainability of credit growth, avoiding over-indebtedness of non-bank clients and increase of their vulnerability to financial turmoil.

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