

A TALE OF TWO CYCLES IN DEVELOPING AND ADVANCED ECONOMIES: A COUNTRY CASE STUDY COMPARISON

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Abstract: *This research aims at performing an econometric analysis on the credit cycle and business cycle from a comparative perspective, with a focus on ten developing and advanced economies from the area of Central, Eastern and South-Eastern Europe, in order to better understand their behaviour and the impact of the interactions between them. To achieve this aim, the study focuses on two strategic objectives: a) on the one hand, it analyzes the short-term dynamics (from one quarter to the other) of the relationships between credit expansion and economic growth in order to better grasp which variable influences the other; and b) on the other hand, the research investigates the cyclical components of the data sets (after extracting them from the real GDP and the total volume of credits given by the banking system to the non-governmental sector), i.e. it performs statistical analysis on the medium-term relationships between the business cycle and the credit cycle for each of the ten European economies. The findings revealed in the first phase of the investigation that we cannot speak of a relation of unidirectional causality between credit expansion and economic growth across countries (not even across geographical regions). In Bulgaria, Latvia, Lithuania and Slovenia, economic growth had an important influence over the crediting activity, thus “guiding” it, whereas in the case of Poland, Romania and Slovakia, Granger-type causality relations were registered from the crediting expansion process towards economic growth. The second part of the investigation revealed that sometimes the credit cycle seems to be independent from the business cycle, manifesting an amplitude, a synchronicity and a volatility that is different from and superior to that of business cycle in all the analyzed countries (“having a mind of its own”). Moreover, there is evidence of important spill-over effects of the credit activity across banking systems at national and regional level thus confirming the international feature of the credit cycle.*

Key words: credit cycle, business cycle, unidirectional causality, amplitude, synchronicity

JEL classification: C01, C19, C29, E30, E32, E51

1. Introduction

The occurrence of the most critical international financial crisis of the 21st century questioned the validity of the mainstream economic theories and, more specifically, brought back to the centre of academic circles many variables such as monetary aggregates or credit fluctuations and their macroeconomic importance in the amplification, propagation and even generation of severe financial shocks during calm periods, as well as during times of financial turmoil. Hence, the analysis and understanding of the credit cycle (also known as the leverage cycle) and its connections with the business cycles (or economic cycle) is more than interesting, especially during these times of distress, for academic circles, as well as for decision makers who are still striving to find a pertinent answer to the current financial turbulences.

In this context, the study aims at performing an econometric analysis on the credit cycle and business cycle (offering not only an individual approach but also a comparative perspective), with a focus on ten economies from the area of Central, Eastern and South-Eastern Europe, with the purpose of understanding their behaviour and the impact of the interactions between them. In order to achieve this bold aim, this study is structured into two main parts, thus delineating the two strategic objectives: a) on the one hand, we plan to analyze the short-term (from one trimester to the other) causality relations between the credit cycle and the business cycle in order to understand which cycle influences the other; b) on the other hand, we intend to investigate the nature of the interferences which appear between the frequency at the level of the business and credit cycles within a bigger time span.

The structure of the study is as follows: chapter 2 captures a brief overview of the economic literature on the main findings on the business and credit cycle, chapter 3 presents the data and methodology used, chapter 4 and 5 presents the results of the empirical study and chapter 6 resumes the main findings.

2. A brief Literature Review

When speaking about a cyclic phenomenon, we usually refer to a sequence of events that repeat in time. As far as *business cycles* are concerned, they refer to sequences of economic booms and recessions that are specific to the market economy. The first written mention of a business cycle appears in the Bible, the Old Testament, Genesis 41, 2-7, where Joseph refers to those 7 years business cycles.

The last two decades can be described as a period of rapid development in the *theoretical literature* on the macroeconomic implications of financial variables. When investigating the financial frictions, the researchers found that these market imperfections arise from several sources: the *informational asymmetry between creditors and borrowers* (Bernanke and Gertler, 1995; Bernanke, Gertler, and Gilchrist, 1999; and Gilchrist, 2004), the *lending collateral constraints faced by borrowers* (Kiyotaki and Moore, 1997; Gertler and Kiyotaki, 2010) and the *raise of loanable funds by the banks* (Chen, 2001; Meh and Moran, 2004). Yet again, financial factors play an important role in the modern business cycle. As mentioned in the papers of Fisher (1933) and Minsky (1986), works which have recently re-entered into the spotlight of many researchers (e.g., Jorda, Schularick and Taylor, 2012; Bhattacharya *et al.*, 2011), the potential explanations for this „financial phenomenon” should be considered the financial accelerator effects, more acute debt-overhang pressures after credit-intensive booms and effects of the risen credit intensity in a more extreme fashion.

Several researchers go even further by applying *models of financial frictions to an open economy* in order to investigate the role of financial variables in the international transmission mechanism and thus in the modelling and propagation of business cycles. Gilchrist (2004), focusing on the asymmetries between lending conditions across different economies, demonstrated that *highly leverage countries are more vulnerable to external shocks*. Devereux and Yetman (2010), using a model based on two countries, concluded that, in condition of binding leverage constraints, a fall in asset values in one country forces the *balance sheet to contract* for both domestic and foreign investor.

Regarding to the *empirical literature* on the subjects of interest, many researchers have studied the linkages between financial components and economic development. Levine and Zervos (1998), using cross-country studies, found a positive and significant *correlation between the initial level of banking development and future rates of economic and productivity growth* over a period of eighteen years. Focusing on the same type of instrumental variables, Levine, Loayza and Beck (2000) emphasized a *strong connection between the exogenous component of financial intermediary development and long-run economic growth*. Jorda, Schularick and Taylor (2012), studying fourteen developed economies during the period 1870-2008, concluded that *financial factors play an important cyclical role*.

The present study builds upon the research of Apostoiaie and Percic (2012), where they analyzed the short-term relation of causality between the credit cycle and the business cycle in ten European states over the period 2002-2012, and concluded that in the economies of five states the real GDP was the variable which “guided” the credit cycle, whereas in the case of four states relations were registered from the crediting activity towards the economic activity. Nevertheless, as they also highlighted in their analysis, the results were distorted by the very reduced time frame of the data set used for some countries. Moreover, the current research intends to complement the study developed by the European Banking Federation (2011) on 11 European states plus the United States in which, it was highlighted that the credit cycles are generally independent from the business cycles, at least in terms of synchronicity and amplitude.

3. Data used and methodological approach

In the present analysis we used sets of data with a quarterly frequency of the real GDP and of the total volume of credits given to the non-banking private sector by the credit institutions from the ten countries from Central Europe (Poland, the Czech Republic, Hungary, Slovakia and Slovenia), Eastern Europe (Estonia, Latvia, Lithuania) and South-Eastern Europe (Bulgaria and Romania). The reference period is 2000 (first quarter) – 2012 (final quarter) or 2000:Q1-2012:Q4. The data set consists of:

- 1) the data for the real GDP and the GDP price deflator, for each country, are from the Eurostat data base (series keys *namq_gdp_c* and *namq_gdp_p*);
- 2) the data series for bank loans come mainly from the ECB, Statistical Data Warehouse as follows: Poland (2004Q1-2012Q4), Czech Republic (2002Q1-2012Q4), Hungary (2003Q1-2012Q4), Slovakia (2006Q1-2012Q4), Slovenia (2004Q1-2012Q4), Estonia (2008Q1-2012Q4), Latvia (2003Q1-2012Q4), Lithuania (2004Q1-2012Q4), Bulgaria (2004Q1-2012Q4) and Romania (2004Q1-2012Q4);

3) the remaining data for bank loans are proxies generated either from data coming from the Eurostat data base (Poland, Hungary, Slovakia, Slovenia, Latvia, Lithuania, Bulgaria) or from the Central Banks data reports (Czech Republic, Estonia, Romania). Regarding the total volume of credits in each state, the data series was updated in order to take into consideration the level of inflation by using the GDP deflator. After examined the seasonal nature of the real GDP, the graphical representation showed that seasonality occurs in all states that are the object of this study. When analyzing the evolution of the GDP for each quarter and the average of the observations, also for each quarter, significant differences between the quarterly averages were noticed especially in Bulgaria, Hungary, Latvia, Poland, Romania and Slovenia. In these states, the time set corresponding to the real GDP presents an accentuated seasonality. In the other states (the Czech Republic, Estonia, Lithuania and Slovakia), the quarterly averages corresponding to the real GDP are in the immediate proximity. Given the fact that the data set corresponding to the real GDP presented a strong seasonal nature, the authors have seasonally adjusted, in EViews, the time sets by using a methodology also employed by Eurostat (Statistical Office of the European Commission) in its analyses (the *Tramo/Seats* methodology).

4. Results of the analysis on the short-term dynamics of the relationships between credit expansion and economic growth

In this part of our analysis we will verify whether there is any kind of relationships between the two variables (credit and real GDP) in the ten states (either contemporaneous correlation or Granger type causality). In other words, the research paper examines: firstly, if there is any kind of correlation between the two variables and secondly, whether the short-term turbulences that may occur in the credit expansion process and economic growth are related, without taking into consideration the medium-term trend of the two variables (which will be analyzed later).

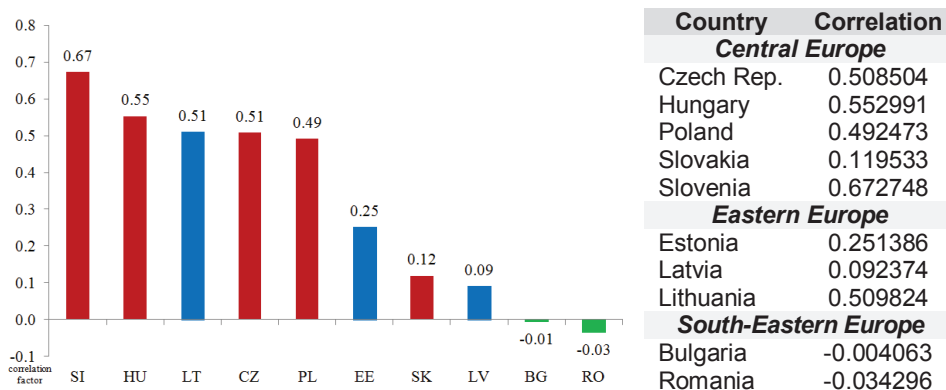


Figure 1: Short-term correlation between the real GDP growth and credit volatility (in logarithmic values) over the 2000-2012 time span
Source: author's elaboration

When analyzing the co-movement between the *credit volatility* (upwards or downwards changes of the logarithmic values of the total volume of credit adjusted with the GDP deflator) and *real GDP growth* (dynamics of the logarithmic values of the real GDP)

using simple correlation analysis (see Figure 1), one can see that it is particularly strong, in many cases the values exceeding the threshold of 0.50 (in Slovenia, Hungary, Lithuania, Czech Republic and close to Poland). Therefore, in these particular cases, we can speak of a dynamics that is almost coordinated (the degree of interdependence between the two variables is high). The results are uniform at region level for South-Eastern Europe (where, both in the case of Bulgaria and Romania, the correlation is weak, with factors ranging from -0.004 to -0.034) and Central Europe (where, with the exception of Slovakia, all the countries have high correlation values). In Eastern Europe we encounter heterogeneous results: in Lithuania there is a strong correlation between the two variables, in Estonia there is a medium-strength correlation and in Latvia a very weak correlation. The cross-correlation analysis with the two variables for each of the ten economies revealed thus big and positive values of the coefficients for *lag/lead* 0 (first row) for all the countries in the panel data set. Therefore, this is evidence of a *pro-cyclic* movement between the two analyzed variables in these economies.

Although there is strong evidence of co-movement between the *credit expansion* and *real GDP growth*, this does not imply that one variable influences the other (the Cross Correlogram also does not confirm the causality but rather determines the time lag between two variables). In such a scenario, further analysis should be employed to establish the causality between the two variables.

An important analysis that can show if the causality relations between two variables are unidirectional or bidirectional is the *Granger* analysis of causality. At the same time, we will be able to test whether a certain variable (either economic growth or credit volume) can be treated as endogenous or exogenous. A very important aspect with regard to the *Granger* test of causality consists in the fact that, if it is applied on non-stationary data sets, the results can be inconclusive (a stochastic process is *stationary* if its average and covariance are constant in time, which means that they oscillate around a certain value). For these reasons, we determined the level of stationarity by using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests for the variables used (and that were previously adjusted to take into consideration seasonally fluctuations). The results (which for reason of space constraints were not attached at this paper but can be delivered upon request) showed that, at a level of relevance of five per cent, the order of integration is at least 1 or the set is $I(1)$ (therefore, are non-stationary). Given the fact that we are dealing with non-stationary data sets in determining the Granger-type causality, the Toda and Yamamoto approach (see Apostoae and Percic, 2012).

According to the results in Table 2, the credit expansion process can be a "leader", as well as a "follower" in its relation with economic growth, outlining thus the complexity of the mechanics of economic development. According to the results of the Granger tests (using the Toda-Yamamoto approach), we may notice that these are not uniform, i.e. there is no relation of *unidirectional causality* (of the Granger type) from the crediting activity towards the economic activity or the other way around in the analyzed economies. Nevertheless, at regional level, there is a common ground, e.g. in the case of Eastern Europe, there is a unidirectional relationship from the real GDP to the crediting activity. In another study (EBF, 2011) it was noticed a complete lack of any relation of the type lag-lead between the economic activity and the crediting activity in states such as Italy, Portugal or the Netherlands (for the period 1980-2010).

One can notice that in the economies of four states (Bulgaria, Latvia, Lithuania and Slovenia), the real GDP was the variable which influenced in a decisive manner the crediting activity of the banking system, in the sense that a growth of economic activity was followed (in an interval period from two to four quarters) by an increase in the volume of credits granted (credit expansion). In some countries, like the cases of the Czech Republic, Hungary or Estonia, there is no apparent causal relationship (a lead-lag type one) between the GDP growth and the credit expansion. Therefore, upwards or downwards alternations in the crediting activity do not appear to be caused by modifications in the real economy (through the real GDP) or vice versa. The case of Hungary is an exception, because if we were to determine the causality using the simple Granger causality test (without using the T-Y procedure given the presence of stationarity within the data series), we would find out that there is a unidirectional influence from the credit to the real GDP (i.e., credit expansion causes GDP growth with a delay of 2 and a half years (10 quarters)).

Table 1: Test of the Granger-type causality between the economic and crediting activity

	Country	Type of causal relationship	VAR order	Additional lags	Chi-sq
Central Europe	Czech Rep.	NO	2	1	-
	Hungary	NO	3	0	-
	Poland	Credit \Rightarrow PIB PIB \Rightarrow Credit	2	1	12.387*** 5.359*
	Slovakia	Credit \Rightarrow PIB PIB \Rightarrow Credit	3	1	7.253* 17.459***
	Slovenia	PIB \Rightarrow Credit	2	2	8.428**
Eastern Europe	Estonia	NO	5	2	-
	Latvia	PIB \Rightarrow Credit	4	2	11.021**
	Lithuania	PIB \Rightarrow Credit	4	2	7.639*
S-E Europe	Bulgaria	PIB \Rightarrow Credit	2	1	6.281**
	Romania	PIB \Rightarrow Credit Credit \Rightarrow PIB	4	1	10.477** 13.297***

Note: *, ** and *** denote the significance at the levels 10%, 5% or 1%; Credit \Rightarrow GDP supposes that the historical values (or lags) of the crediting activity contribute to the estimate of the future values of economic activity; The VAR order has been selected by using the informational criteria Akaike, Schwarz and Hannan-Quinn, the Schwarz criterion having priority; The additional lags represent the number of additional lags taken into consideration for testing the Granger-type causality.

Source: author's elaboration

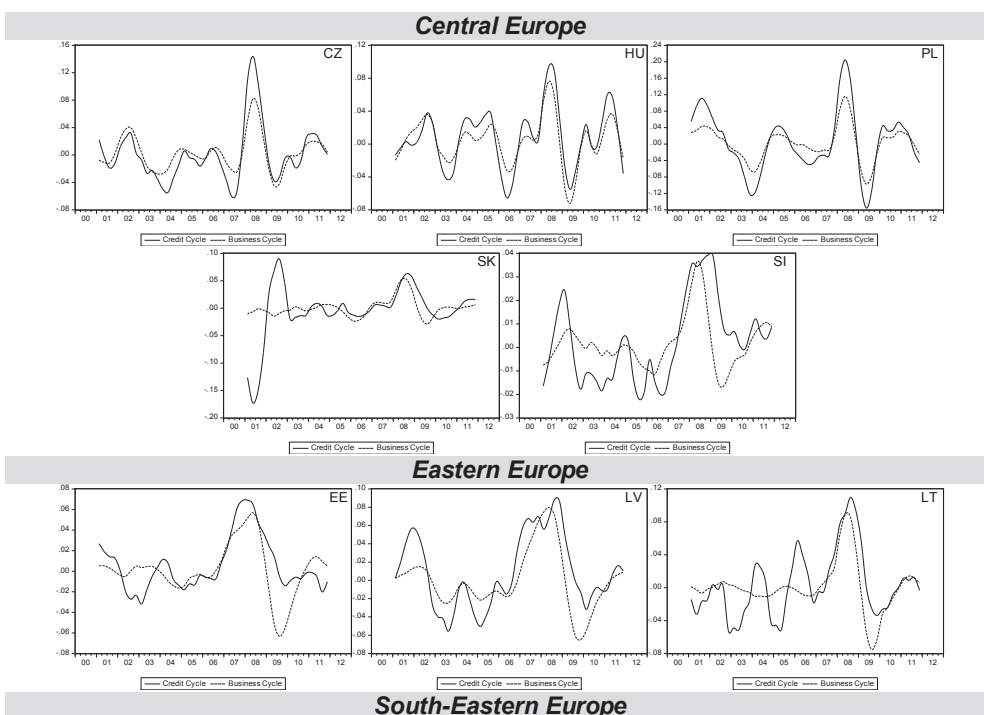
Relations of causality of Granger-type from the crediting activity towards the economic activity were registered in the economies of three states (Poland, Romania and Slovakia). Unlike the first relation, where the effect of an increase in the real GDP was felt in the volume of credits during the following two to four quarters, this time credit expansion transfers to the real GDP, with lags ranging from two to three quarters (the effect is more rapidly). In these states, the higher level of indebtedness of the banking system boosted the economic activity. Furthermore, in the above mentioned countries, there seems to be even a feedback from the real economy for the crediting process. Therefore, for these countries, the credit expansion registered at a certain point leads in the next quarter to a growth of the real GDP which, in its turn, determines a bigger expansion of the crediting activity in the near future. Unlike the cases of Bulgaria,

Latvia, Lithuania and Slovenia (where there was a unidirectional causality from the real GDP to the credit area), in Poland, Romania and Slovakia the relation of causality is bidirectional.

5. Results of the analysis of the medium-term relations between the business cycle and the credit cycle

This part of the research aims at performing statistical analysis on the cyclical components of the data sets (after extracting them from the real GDP and the total volume of credits given by the banking system to the non-governmental sector), i.e. it analyzes the medium-term relationship between the business cycle and the credit cycle for each of the ten economies from Central, Eastern and South-Eastern Europe. The cyclical component of a data set captures oscillations for periods longer than one year at a macroeconomic level.

The most frequently used filters for obtaining the cyclic component from a data set are the Baxter-King filter and the Hodrick-Prescott filter. In our case, we will use, during a first phase, the Baxter-King filter (Baxter and King, 1999) with the frequency set at 1 year. The accuracy of the data was subsequently verified by using the Hodrick-Prescott filter (Hodrick and Prescott, 1997).



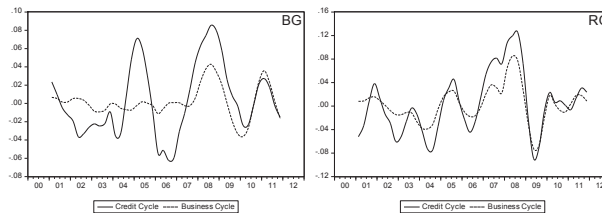


Figure 2: Dynamics of the business cycle and of the credit cycle in the panel of ten economies, using the B-K filter with a frequency of 4 quarters
Source: author's elaboration

The business cycle from each country is actually the deviation of the real GDP from its long-term trend. The *credit gap* is quantified in per cents from the total volume of credits given by the banking system. After the extraction of the cyclic component from the economic and crediting activity for each of the ten states by using the Baxter-King (BK) filter with a frequency of 4 quarters, the data were centralized and their graphical representation is presented in Figure 2. One can notice the dynamics of the cyclical components from the two analyzed variables. Consequently, we may identify the two cycles: *the business cycle* and *the credit cycle*.

The positioning of the business cycle above the line representing the null value (which means that the *output gap* takes positive values) suggests that the economic activity had a period of sustained growth and exceeded the long-term trend a while ago. Consequently, the economic activity is in a stage of expansion. On the other hand, the positive values of the *credit gap* suggest that the crediting activity went through an expansion stage which exceeded its long-term trend; this means that there was an increased availability of credits in the economy. Unlike the business cycle, the credit cycle has a higher volatility in time in most analyzed cases.

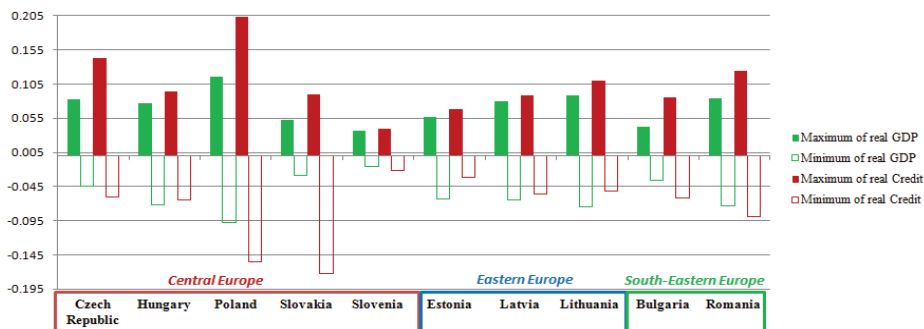


Figure 3: Extreme values in the amplitude of the business cycle and of the credit cycle in the ten analyzed states from Central, Eastern and South-Eastern Europe
Source: author's elaboration

According to Figure 3, the credit cycle has a bigger amplitude rate in comparison with the business cycle in all the analyzed countries. Moreover, in Central Europe there seems to be the biggest amplitude of the analyzed cycles.

Table 2: Spill-over effects of credit expansion in the panel of ten economies

in Central Europe		in Eastern Europe		in South-Eastern Europe	
from country	to country	from country	to country	from country	to country
HU, LT, LV, SI, SK	Czech Rep. (CZ)	HU, LT, PL, RO, SI, SK	Estonia (EE)	EE, RO, SI, SK	Bulgaria (BG)
CZ, LT, LV	Hungary (HU)	EE, PL, RO, SK	Latvia (LV)	EE	Romania (RO)
EE, LV	Poland (PL)	EE, LV, RO, SK	Lithuania (LT)		
BG, LV, RO, SI	Slovakia (SK)				
BG, LV	Slovenia (SI)				

Source: author's elaboration

A more interesting analysis is the one of the spill-over effects regarding the international disturbances in bank credit across the analyzed panel of countries. This study was conducted using the VAR (p) analysis (where the number of lags considered was $p=2$) including in the equation the quarterly changes occurred in the logarithmic values of the real credit for each economy. Within each VAR, we then looked at the statistical significance of each estimated parameter (corresponding to the influence of a lagged credit change ($t-1$ or $t-2$) of country α passed into the volatility in credit growth of country β) and considered only those for which the value exceeded the threshold of 10%. An important aspect to be considered is that the credit shocks from countries α_1 to α_2 towards country β are not exhaustive, i.e. there are of course other important factors that affect the credit cycle of a country but are not considered in this study (in the panel of economies analyzed).

According to the results (see Table 2), there seems to exist significant spill-over effects regarding the credit expansion, moreover in Estonia (where credit spill-over effects come from 6 countries) and in Czech Republic, Slovakia, Latvia, Lithuania and Bulgaria (with credit spill-over effects from 4 to 5 countries) confirming thus the statement made in EBF (2001) according to which "the credit cycle is an increasingly international phenomenon". Less influenced appears to be the case of Romania, whose credit cycle seems to be disturbed only by crediting activities in Estonia (but provides, along with the Estonian and Slovakian cases, important credit disturbances for all the banking systems in Eastern and South-Eastern Europe). Within the banking systems in Central Europe, Latvian banks play a dominant role in the transmission process of credit disturbances.

6. Conclusions

The first part of the analysis focused on the short-term relation of correlation and causality between the crediting activity of the banking system and economic growth in ten economies from Central Europe, Eastern Europe and South-Eastern Europe over a twelve years period span (2000-2012). The findings revealed that we cannot speak of a relation of *unidirectional* causality between the two variables across countries (not even across geographical regions). In four economies (of Bulgaria, Latvia, Lithuania and Slovenia), economic growth had an important influence over the crediting activity, thus "guiding" it, whereas in the case of three other economies (Poland, Romania and Slovakia), Granger-type causality relations were registered from the crediting expansion process towards economic growth. Moreover, in the above three mentioned countries, there seems to be even a feedback from the real economy towards the crediting activity. In some countries, like the cases of the Czech Republic, Hungary or Estonia, there is no apparent causal relationship (a lead-lag type one) between the GDP growth and the credit

expansion. The results so far are in line with the findings mentioned in the study conducted by EBF (2011) on 11 European states plus the United States. This report showed that, in the case of the economies of Germany, Spain, France, USA, Finland and Ireland, the real GDP is the one which “guides” the credit expansion. The findings are also confirmed by the analysis conducted by Levine and Zervos (1998), although they used a cross-sectional approach with regard to the relation between bank crediting and the real GDP on a panel of states (the economies with a bigger Credit/GDP ratio tend to be characterized by faster economic growth rhythms in the long run). Obviously, there are also other factors which affect the credit cycle or the business cycle, but studying them is not the key focus of this scientific work.

The second part of the research investigated the relations which appear between the cyclical components of the data sets (after extracting them from the real GDP and the total volume of credits given by the banking system to the non-governmental sector) for each of the ten economies from Central, Eastern and South-Eastern Europe. The results revealed that sometimes the credit cycle seems to be independent from the business cycle, manifesting an amplitude, a synchronicity and a volatility that is different from and superior to that of business cycle in all the analyzed countries (“having a mind of its own”). In cases such as the Czech Republic, Hungary Poland or Romania, one can notice a movement in the same rhythm of the two cycles, which may involve an alignment of credit expansion to the needs of the real economy (statement confirmed by the high values of the correlation coefficients from the above mentioned countries). Moreover, there seems to be important spill-over effects of the credit activity across banking systems at national and regional level thus confirming the international feature of the credit cycle.

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