

Emerging Markets Queries in Finance and Business

Credit cycles and business cycles in twenty EU economies

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Abstract

Given that EU has been frequently described as having bank-dominated (or hybrid) financial systems, an understanding of the particularities of the flows of credit and their interferences with shifts in the business cycle (either boom or bust phases) is essential not only for policymakers but also for market participants. In this context, this research offers a fresh view by performing an econometric analysis on the credit cycle and business cycle in twenty advanced and developing EU economies, with the purpose of better understanding their behavior and the impact of the interactions between them. It analyses, on the one hand, the short-term dynamics of the relationships between credit expansion and economic growth; and, on the other hand, it investigates the cyclical components of the two variables by performing statistical analysis on the medium-term relationships between them (volatility, amplitude, persistence, correlation, spill-over effects).

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1. Introduction

This research aims at performing an econometric analysis on the credit cycle and business cycle with a focus on twenty advanced and developing European economies, with the purpose of better understanding their behavior and the impact of the interactions between them. In order to achieve this aim, the study is structured into two main parts, thus delineating the 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

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grasp which variable influences the other; b) on the other hand, the research investigates the cyclical components of the data sets in order to determine their volatility and amplitude, persistence, correlation and cyclical nature and determines the credit spill-over effects that appear between countries. The rest of the paper is structured as follows: part 2 briefly captures the current state of the literature in the field, part 3 presents the dataset and methodology used in the study, parts 4 and 5 present the results of the empirical analysis and part 6 resumes the main findings and future directions.

2. Literature Review

When speaking about *business cycles*, researchers usually refer to sequences of economic booms and recessions that are specific to the market economy. The first working definition was established by Burns and Mitchell (1946) according to which, the business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises.

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.

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), after studying fourteen developed economies during the period 1870-2008, concluded that financial factors play an important cyclical role. After an analysis that gathered more than 100 countries during a period span of 40 years, Braun and Larrain (2005) concluded that industries that are more dependent on external finance are hit harder during recessions.

The present study builds upon the findings of Apostoaie, Percic and Cocris (2013) where they analyzed the short-term relation of causality between the credit cycle and the business cycle in twelve Central, Northern and South-Eastern European economies and intends to complete the study developed by the European Banking Federation (2011) on 11 European states plus the US 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

3.1. Data

In the present research we included 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 for a total number of 20 European countries. The countries were divided into 3 groups/clusters: 5 high developed countries (France (FR),

Germany (DE), Italy (IT), Spain (ES), United Kingdom (UK)) including here the European developed countries that are among the ten largest advanced economies in the world (by either nominal GDP or GDP (PPP)) according to IMF (2012), 8 European developed countries (Cyprus (CY), Estonia (EE), Finland (FI), Greece (GR), Netherlands (NL), Portugal (PT), Slovakia (SK), Slovenia (SI)) and 7 European developing countries (Bulgaria (BG), Hungary (HU), Ireland (IE), Latvia (LV), Lithuania (LT), Poland (PL), Romania (RO)).

The sample period covers 2000 (first quarter) to 2012 (fourth quarter) or 00:01-12:04. The primary data sources are the Eurostat data base (for the real GDP and the GDP price deflator) and the ECB - Statistical Data Warehouse (for bank loans). In some cases where data was not fully available for bank loans through the ECB for the entire period, the remaining variables were searched either in the Eurostat data base (Hungary for 00:01-02:04; Poland for 00:01-03:04; Slovakia for 00:01-05:04; Slovenia for 00:01-03:04; Latvia for 00:01-02:04; Lithuania for 00:01-03:04; Bulgaria for 00:01-03:04, Cyprus for 00:01-05:03) or from the Central Banks' quarterly data reports (Estonia for 00:01-07:04 and Romania for 00:01-04:03).

3.2. Methodology and tests

The first step of the research was to update the total volume of credits for each country so that it takes into consideration the level of inflation and this was done by using the GDP deflator.

Secondly, the authors have deseasonalized the data referring to the real GDP (given the fact that the graphical representations showed that seasonality occurs in all countries that are the object of this study). This is done by using the *Tramo/Seats* methodology (also employed by Eurostat). The Bureau Census' X-12 seasonal adjustment program was also used as an alternative method and similar results were found.

Thirdly, after deseasonalizing the real GDP, the authors extracted the natural logarithms from the raw data sets. Afterwards, the data series were decomposed into cycle and trend terms. The authors have used in this paper the BK filter (with a frequency of 6 quarters), in order to offer an alternative perspective of such an analysis. The accuracy of the results was verified afterwards using the HP detrending technique with $\lambda=1600$.

The method proposed by Baxter and King (1995) relies on the use of the symmetric finite odd-order $M = 2K + 1$ moving average so that:

$$y_t^f = \sum_{h=-K}^K a_h y_{t-h} = a_0 y_t + \sum_{h=1}^K a_h (y_{t-h} + y_{t+h}) \quad (1)$$

When applying this formula (1) to our data sets (with quarterly frequency), the BK filter takes the form of a 24-quarter moving average (see Guay and St-Amant (2005) for details), as follows (equation (2)):

$$y_t^f = \sum_{h=-12}^{12} a_h y_{t-h} = a(L) y_t \quad (2)$$

Therefore, for the second part of the research, all references to the variables referred to the cyclic components of the data sets (capturing oscillations for periods longer than one year at a macroeconomic level).

The first part of the research paper examines: firstly, if there is any kind of short-term correlation between the two variables (the authors tested for contemporaneous correlation) 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 in the second part of the work). To establish if there is short-term – *unidirectional* or *bidirectional* – causality between the two variables the authors have used the *Granger* analysis of causality (see Apostoaie, Percic and Cocris (2013) for details).

The second part of the research aims at performing statistical analysis on the cyclical components of the data sets, i.e. it analyzes the relationship between the business cycle and the credit cycle for each of the twenty European economies. The research proceeds with the statistical analysis of the features that are commonly referred to when assessing the properties of a cyclical component extracted from time series: a) *volatility* (V) and *relative volatility* (Rv) which reflects the magnitude of fluctuations of the analyzed variables and is measured as percentage standard deviation for both cycles (Rv is computed for the credit cycle and is measured as the ratio between the volatility of the credit cycle and the volatility of the business cycle); b) *persistence* (P) is computed as the AR(1) coefficient of the cyclical components of the data series (its' significance is measured using the Ljung-Box portmanteau (Q) test for white noise); c) *cross-correlation* (C) reflects the degree of co-movement of the credit cycle with the business cycle and it is computed as the contemporaneous cross-correlations between the detrended values of real GDP and credit, $p(j)$ where $j \in \{0, \pm 1, \pm 2, \dots\}$. The credit cycle would be considered pro-cyclical if $p(j)$ is positive, acyclical if $p(j)$ is null and countercyclical if $p(j)$ takes negative values.

Finally, the authors have proposed three indexes that measure the spill-over effects (in-coming, out-going and net) regarding the international disturbances in bank credit across the analyzed panel of countries. This study was conducted using the VAR (p) analysis (for a detailed description of this method see Percic, Apostoae and Chirleşan, 2013). The proposed indexes are: a) the OUT-flow Spill-over Index (OSI) which takes into account the credit disturbances originated in a specific country, e.g. France, and transmitted, via different channels, to other national banking systems (i.e., the OSI_{France}); b) the IN-flow Spill-over Index (ISI) reflects the credit disturbances originating somewhere in the twenty European countries and transmitted to a specific banking systems, e.g. France (i.e., the ISI_{France}); c) the Net Spill-over Index (NSI) determines if a country is a net contributor or a net receiver of credit shocks. The proposed indexes are constructed as follows:

$OSI_i = A_i / (A_i + B_i)$ and $ISI_i = B_i / (A_i + B_i)$ and $NSI_i = OSI_i - ISI_i$, where:

$$A_i = \left[1,5 * \frac{y_{C1}}{t_{C1} - p_{C1}^i} + 1 * \frac{y_{C2}}{t_{C2} - p_{C2}^i} + 0,5 * \frac{y_{C3}}{t_{C3} - p_{C3}^i} \right] / 3 \text{ and } B_i = \left[1,5 * \frac{z_{C1}}{t_{C1} - p_{C1}^i} + 1 * \frac{z_{C2}}{t_{C2} - p_{C2}^i} + 0,5 * \frac{z_{C3}}{t_{C3} - p_{C3}^i} \right] / 3$$

where, i denotes a country from cluster 1, 2 or 3 (high developed, developed respectively developing countries), y_{Cj} and z_{Cj} , $j \in \{1, 2, 3\}$, denotes the number of countries from cluster 1, 2 and 3 to which credit shocks are directly transmitted by country i , and respectively, the number of countries from cluster 1, 2 and 3 from which credit shocks are directly transmitted by another country to country i ,

t_{Cj} , $j \in \{1, 2, 3\}$, denotes the total number of countries from each cluster (1, 2 and 3),

p_{Cj}^i , $j \in \{1, 2, 3\}$, takes the value 1 if the country i pertains to one of the cluster 1, 2 or 3, and the value 0 for not pertaining in the other two clusters,

1,5 and 1 and 0,5 are the weights assigned to high developed, developed respectively developing countries.

4. Analysis of the short-term co-movement between credit expansion and economic growth

The results of this part of the research refer to the short-term dynamics (from one quarter to the other) of the relationships between credit expansion and economic growth verifying wheatear there is any kind of relation (and if so, what is it's nature?) between the two variables in the European economies.

When analyzing the co-movement between *credit expansion* (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 seasonally adjusted) using simple correlation analysis (see Table 1 and Appendix A), one can notice that this is very strong in countries like Poland, Spain, Hungary, Romania, or Ireland, the values exceeding the threshold of 0.70 and very week in some countries like Germany

or Italy. Therefore, in the first cases mentioned above, one can speak of a dynamics that is almost coordinated (the degree of interdependence between the two variables is high). Although, as one can see, the results are not uniform in any of the analyzed clusters, there seems to be a higher interdependence between the two variables in the developing countries and a lower one in the developed 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. Therefore, further analysis should be employed to establish the causality. The results of the *Granger* analysis of causality are centralized in Table 1.

Table 1. Short-term correlations Granger-type causality between the real GDP growth and credit expansion in 2000-2012

High developed countries (HDED)					Developed countries (DED)					Developing countries (DING)				
Country Code	Corr. value	Type	VAR order	F-Stat.	Country Code	Corr. value	Type	VAR order	F-Stat.	Country Code	Corr. value	Type	VAR order	F-Stat.
FR	0.382	GDP \Rightarrow Cdt.	1	8.46***	CY	0.288	GDP \Rightarrow Cdt.	1	3.53*	BG	0.586	GDP \Rightarrow Cdt.	2	3.03*
DE	0.166	Cdt. \Rightarrow GDP	1	3.38*	EE	0.594	GDP \Rightarrow Cdt.	4	2.26*	HU	0.782	NO	2	-
IT	0.130	GDP \Rightarrow Cdt.	3	2.39*	FI	0.414	GDP \Rightarrow Cdt.	4	5.10***	IE	0.704	GDP \Rightarrow Cdt.	1	4.79**
ES	0.785	GDP \Rightarrow Cdt.	4	2.63**	GR	0.385	GDP \Rightarrow Cdt.	2	7.50***	LV	0.637	GDP \Rightarrow Cdt.	4	3.62**
UK	0.551	Cdt. \Rightarrow GDP	4	13.8***	NL	0.382	GDP \Rightarrow Cdt.	5	2.84**	LT	0.418	GDP \Rightarrow Cdt.	4	2.42*
		GDP \Rightarrow Cdt.	4	9.87***	PT	0.535	GDP \Rightarrow Cdt.	4	2.43*	PL	0.914	Cdt. \Rightarrow GDP	1	9.59***
					SK	0.478	GDP \Rightarrow Cdt.	1	3.92*	RO	0.709	Cdt. \Rightarrow GDP	1	4.38**
							Cdt. \Rightarrow GDP	1	2.87*					
					SI	0.527	GDP \Rightarrow Cdt.	4	2.68**					

Note: *, ** and *** denote the significance at the levels 10%, 5% or 1%; Cdt. \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 AIC (Akaike), SC (Schwarz) and HQ (Hannan-Quinn), the Schwarz criterion having priority.

Source: authors' calculations

As one can see, in almost all the countries there is evidence of a short-term *lead-lag* relationship between credit and real GDP. Nevertheless, this is not uniform, i.e. there is no relation of unidirectional Granger type causality from the crediting activity towards the economic activity or the other way around in the analyzed economies. In the majority of the countries analyzed the real GDP was the variable which influenced in a decisive manner the crediting activity, in the sense that a growth of economic activity was followed (with a delay of 1 to 4-5 quarters) by an increase in the volume of credits granted (credit expansion). Moreover, in UK and Slovakia there seems to be even a feedback from the crediting activity towards the real economy. In Hungary there is no apparent short-term causal relationship (a *lead-lag* type one) between the GDP growth and the credit expansion. Relations of unidirectional short-term Granger-type causality from the crediting activity towards the economic activity were registered only in Germany, Poland and Romania (with a delay of one quarter). Unlike the first relation, where the effect of an increase in the real GDP was felt in the volume of credits during the following one to four quarters, this time credit expansion transfers to the real GDP very fast. Here, the higher level of indebtedness of the banking system boosted the economic activity and the business cycle.

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

The results depicted in this second part of the research refer to the statistical analysis performed on the cyclical components of the data sets, thus taking into consideration the medium-term trends related to fluctuations in the credit and business cycles. The graphical representations of the two cycles (the business cycle and the credit cycle) are presented in Appendix B.

The *business cycle* of a 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. 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. The statistical features referring to the volatility (*V*) and relative volatility (*Rv*), persistence (*P*) and cross-correlation (*C*) of the two cycles are presented in Table 2.

Table 2. Basic statistical features of the credit and business cycle and spill-over effects of bank credit expansion

Country codes	Volatility			Persistence						Correlation		Spill-over effects		
	<i>V</i>		<i>Rv</i>	<i>P – GDP</i>			<i>P – Credit</i>			<i>C</i>		OSI	ISI	NSI
	GDP	Cr	Cr	Lag 1	Lag 2	Q	Lag 1	Lag 2	Q	level	1 dif			
FR	1.05	1.85	1.76	0.889	0.599	34.0***	0.897	0.641	34.7***	0.83***	0.86***	0.36	0.64	-0.28
DE	1.55	0.48	0.31	0.872	0.544	32.8***	0.841	0.495	30.4***	-0.18	-0.27*	0.60	0.40	0.20
IT	1.17	2.40	2.05	0.873	0.561	32.8***	0.864	0.531	32.2***	0.56***	0.64***	0.44	0.56	-0.12
ES	1.07	2.21	2.07	0.918	0.704	32.3***	0.964	0.870	40.7***	0.79***	0.74***	0.31	0.69	-0.38
UK	4.16	8.46	2.03	0.895	0.623	34.5***	0.860	0.523	31.9***	0.84***	0.94***	0.53	0.47	0.05
CY	1.50	3.04	2.03	0.855	0.525	31.5***	0.899	0.643	34.8***	0.47**	0.66**	0.55	0.45	0.09
EE	4.74	5.08	1.07	0.922	0.712	36.7***	0.947	0.814	38.6***	0.69***	0.67***	0.57	0.43	0.13
FI	2.28	1.81	0.79	0.890	0.609	34.1***	0.862	0.587	32.0***	0.51***	0.48***	0.35	0.65	-0.30
GR	1.24	5.57	4.49	0.867	0.558	32.4***	0.830	0.408	29.7***	-0.12	-0.22	0.54	0.46	0.09
NL	1.37	1.26	0.92	0.871	0.554	32.7***	0.846	0.495	30.8***	0.59***	0.47***	0.68	0.32	0.35
PT	1.10	1.59	1.45	0.871	0.543	32.7***	0.872	0.680	32.7***	0.46***	0.24	0.33	0.67	-0.33
SK	2.85	5.88	2.06	0.903	0.653	35.2***	0.651	0.220	18.3***	0.45***	0.18	0.67	0.33	0.33
SI	1.91	3.34	1.75	0.899	0.647	34.8***	0.954	0.830	39.2***	0.66***	0.64***	0.74	0.26	0.47
BG	2.67	7.11	2.66	0.862	0.518	32.0***	0.915	0.683	36.3***	0.61***	0.57***	0.73	0.27	0.46
HU	3.90	5.02	1.29	0.846	0.457	30.9***	0.851	0.482	31.2***	0.85***	0.91***	0.55	0.45	0.11
IE	2.17	3.65	1.68	0.952	0.825	39.0***	0.956	0.849	39.3***	0.67***	0.51***	0.64	0.36	0.27
LV	6.35	7.72	1.22	0.933	0.748	37.5***	0.949	0.817	38.8***	0.82***	0.75***	0.48	0.52	-0.05
LT	5.17	6.84	1.32	0.894	0.611	34.4***	0.907	0.677	35.5***	0.71***	0.67**	0.49	0.51	-0.02
PL	6.37	11.75	1.84	0.846	0.473	30.8***	0.845	0.492	30.8***	0.98***	0.99***	0.52	0.48	0.03
RO	5.00	8.72	1.74	0.892	0.619	34.3***	0.921	0.720	36.6***	0.94***	0.94***	0.33	0.67	-0.34
<i>HDED</i>	<i>1.80</i>	<i>3.08</i>	<i>1.64</i>	<i>0.889</i>	<i>0.606</i>	-	<i>0.885</i>	<i>0.612</i>	-	<i>0.755</i>	<i>0.795</i>	-	-	-
<i>DED</i>	<i>2.12</i>	<i>3.45</i>	<i>1.82</i>	<i>0.885</i>	<i>0.600</i>	-	<i>0.858</i>	<i>0.585</i>	-	<i>0.547</i>	<i>0.477</i>	-	-	-
<i>DING</i>	<i>4.52</i>	<i>7.26</i>	<i>1.68</i>	<i>0.889</i>	<i>0.607</i>	-	<i>0.906</i>	<i>0.674</i>	-	<i>0.797</i>	<i>0.763</i>	-	-	-

Note: *, ** and *** denote the significance at the levels 10%, 5% or 1%; level – raw data, 1 dif – data in the 1st difference

Source: authors' calculations

The main conclusions regarding the statistical analysis on the two cycles can be summarized as follows:

1. With regards to the volatility of the cycles, one can notice that the credit is, on average, twice more volatile in the analyzed countries than the output is. The results across countries reveal that in Latvia, Romania

and Poland there seems to be the highest volatility of both output and credit in comparison with France or Spain where there is a low volatility of the above mentioned cycles. The results across the three clusters reveal that output is particularly volatile amongst the developing countries. On average, output is 2.5 times more volatile in the developing countries than output in the high developed economies (with the exception of UK, it is more stable in the high developed group of countries). These results are in line with the findings of Male (2010) or Loayza *et al.* (2007) but in contradiction with the results of Rand and Tarp (2002), who state that output is no more than 0.2 times more volatile in developing countries. The credit is also very volatile but the results vary across countries and clusters. Nevertheless, one can see that it is more volatile (2 times, on average) in the developing countries than in the developed ones. Another important feature worth mentioning here is the *amplitude* of the cycles. Given the fact that the relative volatility of the credit cycle is greater than one in the majority of the cases (with the exception of Germany, Netherland and Finland), the credit variable has greater cyclical amplitude than the aggregate business cycle. The highest amplitude of the credit cycle is encountered in Greece (the credit cycle exceeded 4.4 times the business cycle).

2. The statistical analysis revealed also that the persistence of the cyclical components of real GDP and crediting activity is statistically significant at a level of 1 percent according to the Ljung-Box portmanteau (Q) test for white noise. There is a significant overall persistence across countries of the output as compared to the credit variable. In eight countries the average autocorrelation coefficient at lag one for the cyclical component of real GDP is greater than of the crediting activity (as compared to the other twelve countries where the persistence of the crediting activity is greater than of the real GDP). Across clusters, only in the developing countries (except Poland) one can say that crediting activity is more persistent than the real GDP. One average, across the 3 clusters, at lags one and two, the persistence of the real GDP is similar. Only in the developing economies the average autocorrelation coefficient (at lag one as well as at lag two) for the cyclical components of the crediting activity is greater than of the real GDP.

3. The values of the contemporaneous cross-correlation coefficients reveal that there is a particularly strong relationship between the cyclical components of the two variables. The positive values of the contemporaneous cross-correlation coefficients reveal also that the real GDP and the credit component are pro-cyclical in nature, i.e. the credit moves in the same direction as the output. This statement is also backed by the visual representation of the business and credit cycles in Appendix B. When analyzing the timing of the most significant cross-correlation coefficients in order to establish the dynamics of the relationship between the two cycles, i.e. which cycle *leads/lags* the other, the following conclusions were drawn: 1) in six countries (BG, ES, HU, LV, PL, RO) because the largest significant cross-correlation coefficients appear at Lag 0, the business and credit cycles in these countries are synchronous; 2) because the largest significant cross-correlation coefficients appear at a Lag greater than zero, in thirteen countries, the business cycle leads the credit cycle (in EE, FR, IE, IT, LT, NL, SI and SK it leads by 1 quarter, in CY, FI and PT it leads by two quarters while in DE and GR the business cycle leads the credit cycle by more than 3 quarters); 3) in UK the credit cycle leads the business cycle by 1 quarter.

The values of the three indexes that measure the credit spill-over effects (OSI, ISI, NSI), are captured in Table 2. As one can see, the results are not uniform across the three clusters. At country level, there seems to exist significant spill-over effects regarding the credit expansion. Important out-flows of credit disturbances in the European economies seems to originate in German, Slovenian, Slovakian, Netherlander, Bulgarian or Irish banks whereas significant in-flows of credit shocks were identified, in particular, in the banking systems of Spain, Italy, France, Portugal, Romania or Finland. An interesting study would consist in find out why some developing countries have such high OSI values. Nevertheless, according to the NSI index, the net recipients of credit disruptions are fewer than the net givers (eight compared to twelve) highlighting thus the contagion behavior of such anomalies and confirming at the same time the statement made in EBF (2001) according to which “the credit cycle is an increasingly international phenomenon”.

6. Conclusions

The findings of the first part of the research revealed that there is a strong dynamics of the relationships between credit expansion and economic growth in almost all the countries. This result points towards a co-movement between the two variables that is almost coordinated. Also, one can notice that there seems to be a higher interdependence between the two variables in the developing countries as compared to a lower one in the developed economies. As regards to the Granger type causality between the two variables, in almost all the countries there is evidence of a short-term *lead-lag* relationship. Nevertheless, the results are not uniform implying that there is no relation of unidirectional causality from the crediting activity towards the economic activity or the other way around in all the analyzed economies. In the majority of the countries analyzed the real GDP was the variable which influenced in a decisive manner the crediting activity (with two cases of feedback effects). The overall results of the second part of the research brought to the spotlight the “wild behavior” of the credit cycle (having sometimes “a mind of its own”) and its international/contagion feature and the “disciplined” movement of the business cycle. As the findings showed, output and credit are particularly volatile amongst the developing countries (between 2 and 2.5 times, on average, more volatile than in the other economies) with higher amplitudes in the credit cycle, there is a significant overall persistence across countries of the business cycle as compared to the credit cycle, there is a particularly strong relationship of a pro-cyclical nature between the cyclical components of the two variables given the high contemporaneous cross-correlation coefficients, and in the majority of the countries (13), the business cycle leads the credit cycle by one or two quarters. Overall, the results are in line with the findings of Male (2010), EBF (2011) and Alp *et al.* (2012).

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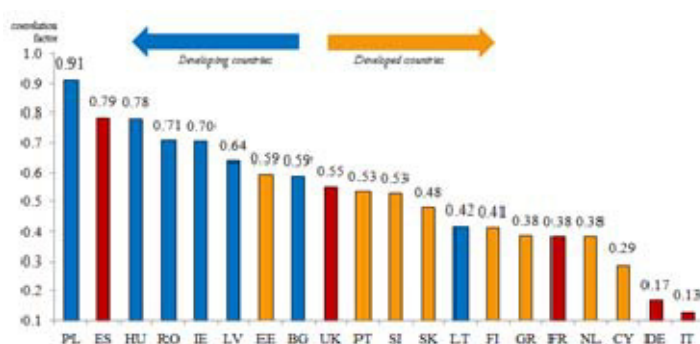
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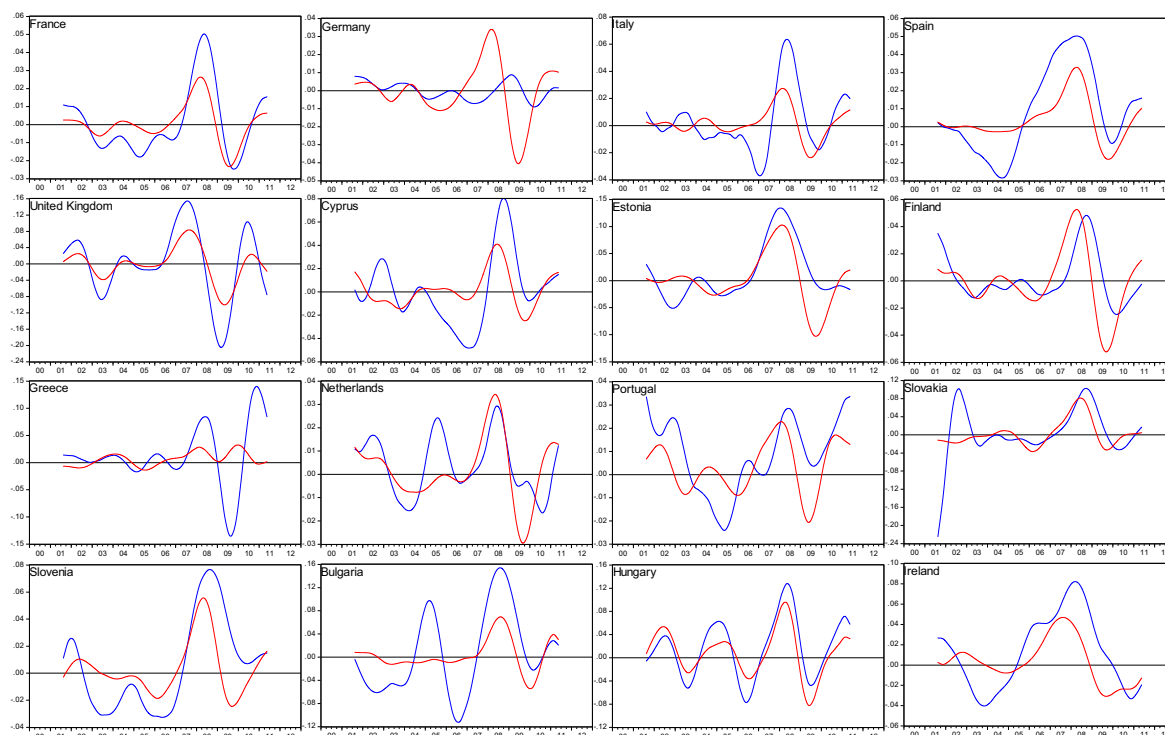
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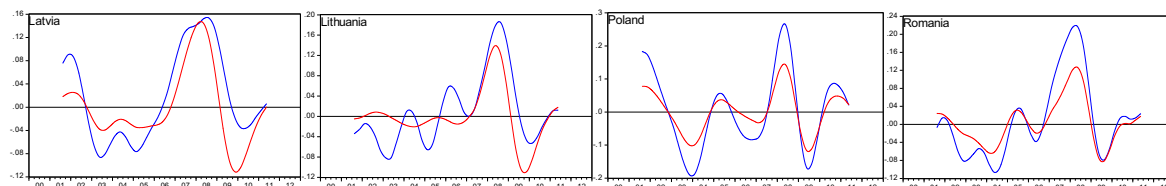
Appendix A. Short-term correlation between the real GDP growth and credit expansion in 2000-2012



Source: authors' calculations

Appendix B. Dynamics of the business cycle (red line) and of the credit cycle (blue line) in the twenty European economies





Source: authors' calculations