

# **Financial and real cycle synchronisation in Central, Eastern and Southeastern European (CESEE) countries**

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This paper analyses the interactions between the real and financial cycles in the CESEE region and also between the financial and real cycles of these countries with the respective cycles of the Eurozone. Our findings indicate that real and financial cycles are significantly synchronised only in the minority of CESEE countries (Macedonia, Bulgaria, Croatia, Estonia, Lithuania and Turkey). We have also found that there are a few CESEE countries which have a synchronous real business cycle with the Eurozone as opposed to the financial cycles which were found to be significantly concordant with the Eurozone in far larger number of the analysed countries.

## **[1] Introduction**

The role of the financial markets in driving real business cycles is a long debated topic in the literature. The interest in the subject is supported by anecdotal evidence that recognises the interrelations between the financial and real cycles. The cases of Japan and its “Lost Decade” and the Asian crisis, form some prominent examples from the 1990s where economic downturns were preceded by financial busts that came after a prolonged booming phase at some particular segment of the financial market. More recent example is the global economic crisis from 2008-2009, that was to a large extent shaped by the overturn in the financial cycle. These developments have brought the debate about the linkages between the real economy and the financial sector to the fore and renewed the interest of researchers in studying the finance-growth nexus. In our paper, we study this question by analysing the interactions between the real and financial cycles in the CESEE region and also between the financial and real cycles of these countries with the respective cycles of the Eurozone.

## **[2] Data and methodology**

Our sample consists of sixteen countries of the CESEE region: Czech Republic, Slovakia, Hungary, Poland and Slovenia from Central and Eastern Europe (CEE), Macedonia, Serbia, Bulgaria, Albania, Bosnia & Herzegovina, Croatia and Romania from Southeastern Europe (SEE),

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<sup>1</sup> The opinions and views expressed in this paper are only those of the authors and do not necessarily reflect the position and views of the National Bank of the Republic of Macedonia. Any errors or omissions are the responsibility of the authors.

Estonia, Latvia and Lithuania from the Baltic region and Turkey. The Eurozone is also included to serve as benchmark for comparison of the results.

Following Harding and Pagan (2002) we focus on cycles in the levels of the variables, which are generally referred to as classical cycles. Hence, to study the real business cycle we use the real GDP<sup>2</sup>, since this is the best available measure of the aggregate economic activity typically used in the literature. As a measure of the financial cycle, real credit to the private sector<sup>3</sup> is used, as it represents the most important link between savings and investment. Data is quarterly for the period from 1995-2015 and is also seasonally adjusted. It is acquired from Eurostat, ECB, national statistical offices and national central banks. In order to identify the cyclical turning points we use a variation of the Bry-Boschan procedure developed by Harding and Pagan (2002) which is applicable to quarterly data and thus is referred to as BBQ algorithm. The degree of synchronisation between real business and financial cycles is analysed by calculating the concordance index established also by Harding and Pagan (2002). The concordance index is a descriptive statistic which specifies the average amount of time in which two variables, in our case GDP and credit, are found to be in the same phase of their cycles. It can take any number between 0 and 1, with 1 representing perfect overlap of the two cycles and 0 indicating no synchronisation. The index has the advantage in that it does not require the two variables to be stationary. In order to compute the index the following formula is applied:

$$\hat{I} = \frac{1}{T} \left\{ \sum_{t=1}^T S_{xt} S_{yt} + \sum_{t=1}^T (1 - S_{xt})(1 - S_{yt}) \right\}$$

Given the two series  $x_t$  and  $y_t$ ,  $S_{xt}$  and  $S_{yt}$  are the binary variables obtained from the BBQ algorithm which are defined as:

$S_{xt} = \{1 \text{ if } x \text{ is in expansionary phase at time } t, 0 \text{ otherwise}\}$

$S_{yt} = \{1 \text{ if } y \text{ is in expansionary phase at time } t, 0 \text{ otherwise}\}$

$T$  is the number of time periods in the sample.

Once the concordance index is calculated, we then test whether the degree of synchronisation of the two cycles is statistically significant or not. To this end, Harding and Pagan (2006) suggest estimating the following linear relationship:

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<sup>2</sup> Gross domestic product at market prices, chain linked volumes in national currency, seasonally adjusted.

<sup>3</sup> Outstanding amounts at the end of the period (stocks) of loans of MFIs excluding central bank (total maturity, all currencies combined) to non-MFIs excluding general government sector, denominated in national currency, seasonally adjusted.

$$\frac{S_{yt}}{\hat{\sigma}_{Sx}\hat{\sigma}_{Sy}} = \alpha_1 + \rho \frac{S_{xt}}{\hat{\sigma}_{Sx}\hat{\sigma}_{Sy}} + u_t$$

where  $\hat{\sigma}_{Sx}$  and  $\hat{\sigma}_{Sy}$  are the estimated standard deviations of  $S_{xt}$  and  $S_{yt}$ , respectively,  $\alpha_1$  is a constant,  $\rho$  is the correlation coefficient and  $u_t$  is an i.i.d. error term. Then, the t-statistic on  $\rho$  is used to test the null hypothesis of no synchronisation. However, since the  $S_{yt}$  series exhibits extensive serial correlation, one must take account of this and use autocorrelation (and heteroscedasticity) consistent method to obtain the correct t-ratios and draw inference about the statistical significance of the concordance indicator. To this end, following Harding and Pagan (2006) we use the Generalised Method of Moments (GMM) estimator.

### [3] Main results

The results in Table 1 suggest that output and credit tend to be pro-cyclical in all of the analysed countries, with concordance above 0.5 for all cycle pairs. However, they are statistically significant only for six of the CESEE countries: Macedonia, Bulgaria, Croatia, Estonia, Lithuania and Turkey. In all of these countries output and credit cycles appear to be highly synchronised, with the highest concordance registered in Macedonia (0.89). This means that in the case of Macedonia both output and credit are concurrently in the same phase of the cycle about 90% of the time. This result suggests that fluctuations in credit are very important for the Macedonian real economy, i.e. expansion in real credit goes together with expansion in real GDP and vice versa. Taking into account the underdeveloped financial market in the country and the practical non-existence of other forms of financing of the investment projects of firms<sup>4</sup>, this appears to be a reasonable finding. In addition, the concordance that Macedonia displays is found to be higher than the statistic for the Eurozone (0.78). Turkey displays second highest concordance index of 0.86, followed by Bulgaria (0.77), Croatia (0.76), Estonia (0.72) and Lithuania (0.56). It is interesting that very high concordance indices are also observed in two other countries (Slovakia and Poland), but they are not found to be statistically significant. This is in contrast with the lower but statistically significant concordance statistic for Lithuania. Harding and Pagan (2006, p.11) offer an explanation according to which “what might appear to be a high degree of association between cycles can be misleading, as it is simply an artifact of expansions lasting for long periods of time relative to the sample”<sup>5</sup>. Hence, the high

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<sup>4</sup> In spite of the underdeveloped domestic capital market, it should be noted that intercompany lending is an alternative source of firms' financing in Macedonia.

<sup>5</sup> The authors show that in the case of independent random walk processes,  $\rho_s=0$  so that the concordance index equals 0.5 when the empirical average of the states of the two series also equal 0.5. However, if the two random variables are with drifts so that the

concordance in Slovakia and Poland is most likely to be a result of the high mean value of the states of the cycles, rather than of a strong correlation between phases. In fact, as it can be seen from Table 1, the estimated correlation between the output and credit cycles is actually negative in these countries.

Table 1: Concordance and correlation statistics of output and credit cycles, by country

Country	$\hat{\rho}$	CI
<b>Eurozone</b>	0.61	0.78***
<b>Macedonia</b>	0.59	0.89***
<b>Bulgaria</b>	0.93	0.77***
<b>Croatia</b>	0.62	0.76***
<b>Serbia</b>	0.25	0.64
<b>Albania</b>	-0.06	0.56
<b>BIH</b>	-0.02	0.61
<b>Romania</b>	0.30	0.61
<b>Slovenia</b>	0.29	0.64
<b>Czech Republic</b>	-0.21	0.59
<b>Slovakia</b>	-0.18	0.81
<b>Hungary</b>	0.08	0.68
<b>Poland</b>	-0.19	0.80
<b>Estonia</b>	0.54	0.72**
<b>Latvia</b>	0.31	0.57
<b>Lithuania</b>	0.54	0.56**
<b>Turkey</b>	0.85	0.86***

Source: Authors' calculation.

$\hat{\rho}$  is the estimated correlation coefficient, whereas CI is the concordance index.

\*\* and \*\*\* indicate significance at the 5% and 1% level, respectively.

Table 2 contains the results about the synchronisation between the real business cycles of the CESEE countries and the Eurozone. Ex ante, one might expect that the CESEE business cycles would be synchronised with the Eurozone business cycle, given that the Eurozone is their most important trading partner. But surprisingly, concordance is found to be statistically significant only in the minority of the CESEE countries, suggesting a high risk of asymmetric shock transmission. The strongest link with the Eurozone business cycle is found in Slovenia, with the two outputs coinciding in the same phase of the cycle about 95% of the time. The other

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empirical average of the states of the two series equal 0.9, in that case the concordance index equals 0.82. However, since the variables have been sampled independently, there should be no relation between them. Thus, a high value of the concordance index relative to 0.5 should not imply a high degree of synchronisation. That is why Harding and Pagan argue that it is necessary for the concordance statistic to be mean corrected, which is what happens if one estimates the correlation coefficients and uses them for inference.

member-countries of the Eurozone display non-concordance, even though in the literature it is argued that joining a currency union should increase business cycle synchronisation<sup>6</sup>. However, Slovenia has been the longest of all other countries in our sample a member of the Economic and Monetary Union, so this might lend support to the significant coincidence of their cycles. Of the other non-Eurozone CEE countries, a strong degree of business cycle synchronisation is observed also in the Czech Republic (0.87) and Poland (0.78), which suggests that they appear ready to join the Eurozone judging solely by this criterion<sup>7</sup>. Turning to the SEE region, it is evidenced that output cycles with the Eurozone have overlapped to a significant extent in Bosnia and Herzegovina (0.84), Croatia (0.83), Bulgaria (0.81) and Serbia (0.73). The concordance index for Macedonia is relatively high (0.75), but it is not statistically significant given the low correlation coefficient. Furthermore, the Baltic countries and Turkey are also found not to be significantly concordant with the Eurozone business cycle.

Table 2: Concordance and correlation statistics of real business cycles, by country

Country	Eurozone	
	$\hat{\rho}$	CI
<b>Macedonia</b>	0.12	0.75
<b>Bulgaria</b>	0.76	0.81***
<b>Croatia</b>	0.57	0.83**
<b>Serbia</b>	0.34	0.73*
<b>Albania</b>	-0.31	0.52
<b>BIH</b>	0.99	0.84***
<b>Romania</b>	-0.12	0.69
<b>Slovenia</b>	0.90	0.95***
<b>Czech Republic</b>	0.56	0.87**
<b>Slovakia</b>	0.04	0.75
<b>Hungary</b>	0.29	0.78
<b>Poland</b>	0.70	0.78**
<b>Estonia</b>	0.40	0.82
<b>Latvia</b>	0.14	0.75
<b>Lithuania</b>	0.19	0.82
<b>Turkey</b>	0.25	0.72

Source: Authors' calculation.

$\hat{\rho}$  is the estimated correlation coefficient, whereas CI is the concordance index.

\*, \*\* and \*\*\* indicate significance at the 10%, 5% and 1% level, respectively.

<sup>6</sup> Engel and Rose (2002) for example, show empirically that there is a positive effect of currency unions on the correlation of business cycles.

<sup>7</sup> Business cycle similarity is among the criteria defined within the theory of optimum currency areas.

The results of the co-movement of the financial cycles between the CESEE countries and the Eurozone are shown in Table 3. In this regard, one should expect concordance between the two financial cycles, given that most of the CESEE countries are either part of the Eurozone, or their monetary policies are very closely linked to that of the Eurozone<sup>8</sup>. As expected, we find concordance in 75% of the CESEE countries, which is much higher than in the case of business cycle synchronisation. Interestingly, the highest significant concordance is observed in Hungary, a country with independent monetary policy, where the two cycles overlap for 88% of the time. It should be however noted that for the most of the period under observation, Hungary has been operating under some form of a peg regime. Significant concordance is evidenced in all of the Baltic countries and in all CEE countries with the exception of Poland. However, one peculiar finding when it comes to the CEE countries is the low and statistically significant concordance index obtained for the Czech Republic, which indicates that the relationship between this country's credit cycle and the Eurozone credit cycle is significantly countercyclical. Specifically, the concordance value for the Czech Republic is 0.48, which implies that 52% of the time the Czech financial cycle is in different phase compared to the Eurozone. The negative correlation between the two cycles further supports this countercyclical behaviour. When it comes to the SEE region, a strong positive co-movement of the financial cycles is evidenced in all countries, with the exception of Macedonia and Bosnia and Herzegovina. Not surprisingly, we do not detect a significant synchronisation between the financial cycles of Turkey and the Eurozone.

Table 3: Concordance and correlation statistics of financial cycles, by country

Country	Eurozone	
	$\hat{\rho}$	CI
<b>Macedonia</b>	0.11	0.77
<b>Bulgaria</b>	0.39	0.72*
<b>Croatia</b>	0.63	0.83***
<b>Serbia</b>	0.92	0.85***
<b>Albania</b>	0.93	0.85***
<b>BIH</b>	0.36	0.60
<b>Romania</b>	0.69	0.68***
<b>Slovenia</b>	0.77	0.77***
<b>Czech Republic</b>	-0.32	0.48**
<b>Slovakia</b>	0.98	0.74***
<b>Hungary</b>	0.75	0.88***

<sup>8</sup> Slovenia, Slovakia and the Baltic countries are part of the Eurozone; Macedonia has a euro peg whereas Bulgaria and Bosnia & Herzegovina have euro-based currency boards. Croatia, Serbia and Albania operate under flexible exchange rate regimes but are subject to practical constraints in the monetary policy conduct given the high euroisation in the countries.

<b>Poland</b>	0.44	0.79
<b>Estonia</b>	0.43	0.75**
<b>Latvia</b>	0.75	0.81***
<b>Lithuania</b>	0.62	0.74***
<b>Turkey</b>	-0.08	0.58

Source: Authors' calculation.

$\hat{\rho}$  is the estimated correlation coefficient, whereas CI is the concordance index.

\*, \*\* and \*\*\* indicate significance at the 10%, 5% and 1% level, respectively.

## [4] Conclusion

The main goal of this paper was to quantitatively evaluate whether there is a co-movement between financial and real cycles in the CESEE region, and also between the financial and real cycles of these countries with the respective cycles of the Eurozone. The key empirical findings indicate that real and financial cycles are significantly synchronised only in the minority of CESEE countries (Macedonia, Bulgaria, Croatia, Estonia, Lithuania and Turkey). We have also found that there are a few CESEE countries which have synchronous real business cycles with the Eurozone. Bulgaria, Croatia, Serbia and BIH of the SEE region, and Slovenia, Czech Republic and Poland of the CEE region are significantly concordant with the Eurozone business cycle, which for the countries that are already EU members might signify their preparedness for joining the monetary union, judging solely by this criterion. On the other hand, there appears to be no clear pattern of clustering of peaks and troughs in the Baltic countries and Turkey. Contrary, financial cycles are found to be significantly concordant with the Eurozone in far larger number of the CESEE countries. Only in Macedonia, BIH, Poland and Turkey there is no clear relationship between the timing of their financial cycles with the one of the Eurozone. In addition, it should be also noted that when looking at the comparison of the cycle synchronisation with the Eurozone, our study shows that in many of the analysed countries there is no discrepancy between the synchronisation of their real and their financial cycles with the respective cycles of the Eurozone. All in all, the obtained results provide useful stylised facts of the CESEE countries cycle behaviour which should prove valuable to policy makers in these countries. However, it should be noted that concordance here was examined only in terms of the classical cycle definition, so a natural way of expanding the analysis is by studying the properties of the growth and/or deviation cycle. Additionally, it would be also interesting to investigate the potential determinants underlying the synchronisation of business and financial cycles.

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