

## BUSINESS CYCLE SYNCHRONIZATION BETWEEN THE BULGARIAN ECONOMY AND THE EUROPEAN UNION

ATANAS DAMYANOV

GALIN STEFANOV\*

“D. Tsenov” Academy of Economics

### Abstract

This paper analyzes the level of economic convergence within the EU and in particular within the EMU. The main purpose is to assess the level of business cycle synchronization between Bulgaria and the Eurozone. The research is conducted with data for the period 1995-2009 divided into two subsamples: 1995-2001 and 2002-2009. Business cycles are identified through detrending of GDP time series with Baxter-King and Hodrick-Prescott filters. The empirical results of this paper reveal that in the period 1995-2002 Bulgaria did not form an Optimum Currency Area with any of the EMU members and possibly suffered severe negative effects from the introduction of the Currency Board in 1997. The findings for the second sub-period 2002-2009 suggest that the introduction of the Euro in Bulgaria will be highly beneficial because of the high level of synchronization of its business cycle fluctuations with the Eurozone.

**JEL Classification:** E32, E42, E50.

**Key words:** business cycle synchronization, EU integration, currency unions, optimum currency area, economic development, economic convergence.

---

\* *Corresponding Author:* “D. Tsenov” Academy of Economics, Department of International Economic Relations, Em.Chakarov Str.2, 5250 Svishtov, Bulgaria, e-mail: g\_stefanov@uni-svishtov.bg

An earlier version of this paper was presented during the 6<sup>th</sup> International Conference of ASECU, held in Podgorica, May 20-22, 2010.

## I. Introduction

The process of Bulgaria's accession to the European Union started in 1990 with the signing of the Convention on Trade, Business and Economic Relations and a resolution of the parliament expressing the desire of the Republic of Bulgaria to become a full member of the European Community. In 1999 the European Council decided to start accession negotiations with Bulgaria, and in January 1, 2007 Bulgaria acquired officially the status of full member of the EU. Another dimension of the Bulgarian integration into the EU was the introduction of a currency board in July 1, 1997. After several failed stabilization attempts and a period of hyperinflation, the Bulgarian currency was pegged to the Deutschmark at a fixed rate and in 2002 when Germany adopted the Euro, it became the anchor currency for the Bulgarian Lev.

Now, 20 years after the start of this process and more than 3 years since the gaining of full member status, the Bulgarian integration into the EU economy is far from complete. Free trade and factor movement within the Union failed to provide economic convergence for Bulgaria. Despite the relatively high economic growth in the last decade Bulgaria remains one of the poorest members of the EU with the lowest income per capita, the lowest labor productivity, high unemployment, inflation and interest rates. In order to speed up the convergence The Bulgarian government declared its ambition to apply for membership of the Eurozone by the end of 2010. At the same time some policymakers (including one of the prime minister's advisors) advocated the abolishment of the currency board, arguing that Bulgaria needs independent monetary policy in accordance with its own economic conditions. The intention of this paper is to determine which of the two alternatives is better for Bulgaria – joining the Eurozone or maintaining monetary independence.

## II. Theory of Currency Unions

The Maastricht treaty defines the so called **Euro convergence criteria** which are the nominal requirements for European Union member-states to enter the third stage of European Economic and Monetary Union (EMU) and adopt the Euro as a national currency. The five main criteria listed in the treaty are:

1. Inflation rate: Applicant countries should have an inflation rate no more than 1.5 percentage points higher than the average of the three EU member states with the lowest inflation.
2. Long-term interest rate: The nominal long-term interest rate in the applicant countries must not be more than 2 percentage points higher than in the three lowest inflation member states.
3. Annual government deficit: The ratio of the annual government deficit to GDP must not exceed 3% at the end of the preceding fiscal year.

4. Government debt: The ratio of gross government debt to GDP must not exceed 60% at the end of the preceding fiscal year.
5. Exchange rate: Applicant countries should have joined the exchange-rate mechanism (ERM II) under the European monetary system (EMS) for two consecutive years and should not have devalued their currency during the period.

According to the Maastricht criteria Bulgaria is eligible for applying to the ERM II (see Table 1) and the Bulgarian Central Bank has been maintaining a fixed exchange rate with the Euro since 2002. Therefore the adoption of the Euro by Bulgaria is a real possibility in 2013.

**Table 1.** Fulfillment of Maastricht convergence criteria by Bulgaria

Criteria	Bulgaria	Reference value
Inflation rate	2.4 %	3.2 %
Annual government deficit to GDP	-3.2 %	3 %
Gross government debt to GDP	14.1 %	60 %
Long-term interest rate	5.82 %	6.5 %

Source: European Central Bank data for 2008<sup>1</sup>

Nevertheless due to its normative nature, the Maastricht Treaty does not provide measures to assess whether the adoption of the Euro will be beneficial for an applicant country. The benefits and costs for a country joining a currency union can be assessed within the framework of the theory of Optimum Currency Areas (OCA) developed by Robert Mundell<sup>2</sup> in the 1960's. According to Mundell a Currency Area is a domain within which all entities use a common currency or maintain fixed exchange rates. Usually currency areas coincide with national borders but they also can be bigger or smaller than the national territory.

Mundell analyses two extreme examples: where every person has their own currency, and where there is only one currency in the whole world. The first case is similar to a barter economy and is generally viewed as not beneficial for any economy. The more currencies that exist, the more money will have to be exchanged in order to trade with others, thus increasing transaction costs. Also, the smaller the currency areas are, the more vulnerable each area becomes to speculation with its currency. If

1. <http://sdw.ecb.europa.eu/>

2. Mundell, R., A Theory of Optimum Currency Areas, *The American Economic Review*, Vol. 51, No. 4 (Sep., 1961), pp. 657-665.

only transaction costs and speculation issues were to be considered, the whole world should have only one currency.

In the second case –only one currency for the whole world will not be beneficial either because it suggests uniform monetary policy for all entities. Monetary policy is used by governments as an anticyclical instrument– expansionary policy is used to combat unemployment and contractionary policy is employed to control inflation. Since the world is not homogeneous in terms of unemployment and inflation therefore a worldwide common currency would entail an inability to react to shocks by adjusting exchange rates. If economic stability or adjustment to shocks is the only goal considered, as many areas as possible should trade with flexible exchange rates. The best decision in respect of both minimizing transaction costs and ability to adjust to cyclical shocks is to establish monetary unions within regions regardless of national borders. In order to be optimal, currency areas must meet the following requirements (i.e. OCA properties):

1. Labor mobility across the region – mobility of workforce equalizes the level of unemployment within the area, which allows common policy.
2. Capital mobility across the region – foreign investments reduce the inflationary pressure and equalize prices within the region.
3. Entities within the region must have synchronized business cycle dynamics – allows uniform adjustment policy.

Some authors have suggested additional requirements for the optimality of currency unions. Ronald McKinnon<sup>3</sup> suggests price flexibility for goods and factors of production. Another contributor to the OCA theory is Peter Kenen,<sup>4</sup> who states that the participants in a currency union must have highly diversified economies (particularly external trade) because it would reduce the significance of random external shocks on exports.

Fulfillment of all these requirements suggests that the participation of a country in the monetary union will be beneficial owing to reduced transactional costs and increase of mutual trade among the union members. When the OCA criteria are not satisfied, idiosyncratic shocks cannot be adjusted with the instruments of monetary policy or the monetary policy itself may cause economic disturbances (inflation and unemployment).

---

3. McKinnon, Ronald I., *Optimum Currency Areas*, *The American Economic Review*, Vol. 53, No. 4 (Sep., 1963), pp. 717-725.

4. Kenen, P.B., 1969, *The Theory of Optimum Currency Areas: An Eclectic View*, in Mundell and Swoboda (eds.), *Monetary Problems in the International Economy*, University of Chicago Press.

As stated above the purpose of this paper is to assess if Bulgaria's joining of the European Monetary Union will be beneficial or not. In order to achieve the goal of this paper, it is necessary to examine whether the Bulgarian economy possesses the OCA properties.

A significant part of the fundamental European Union legislation is dedicated to the provision of factor mobility and price flexibility. Although the Rome Treaty and secondary legislation grant free movement of goods, capital and labor, in reality factor mobility within the Union is far from perfect. Capital is considered to be the more mobile factor among EU members, but its level is lower than the mobility within the US due to the different tax levels in EU countries.<sup>5</sup> The Rome treaty also postulates free movement of workforce but the mobility of labor is impeded by cultural and language barriers. All EU members are free market economies with negligible exclusions (in some of the members the price of electricity is regulated by the government and it is generally believed that there is no true wage flexibility).<sup>6</sup> Since most of the OCA properties are not country specific due to the common European legislation, this paper is focused on the main Mundell criterion – business cycle synchronization. In order to evaluate if the adoption of the Euro will be beneficial for Bulgaria it is necessary to assess the level of synchronization of the Bulgarian business cycle with the cycle of the Eurozone and the individual cycles of the EMU members.

### III. Data and Methodology

Measuring business cycle synchronization between the Euro zone and a specific country is not a simple task due to the composite nature of the European Monetary Union –it consists of 16 separate national economies, with their own cyclic fluctuations. In order to overcome this problem and to increase the robustness of the results we apply two parallel approaches– measuring the synchronization between Bulgaria and the aggregate EMU cycle and measuring the bilateral synchronization between Bulgaria and each EMU member state. The measurement of business cycle synchronization is carried out in two separate iterations: cycle identification and synchronization estimation.

We choose GDP as the most inclusive measure for economic activity and its dynamics may be considered as a sufficient approximation of overall business cycle. The source of the data is the European Central Bank statistical warehouse. We use

---

5. Wildasin, David E., Markusen, James R. and Winters, L. Alan, Factor Mobility and Fiscal Policy in the EU: Policy Issues and Analytical Approaches, *Economic Policy*, Vol. 15, No. 31 (Oct., 2000), pp. 339-378.

6. Sanz-de-Galdeano, A., Turunen, J., The Euro Area Wage Curve, *Economic letters* Volume 92, Issue 1, July 2006, Pages 93-98, 2006 Elsevier B.V.

quarterly data for the GDP of the 16 EMU countries and Bulgaria. The series are seasonally adjusted, because the non-adjusted data have cyclical properties and may distort the results. The timespan of the data is from the first quarter of 1995 to the last quarter of 2009. This period provides the longest possible sample from this particular database, and includes data for most of the selected countries (Ireland is reporting data from the beginning of 1997, Greece, Malta and Cyprus are reporting from the start of 2000).

### *1. Business Cycle Identification*

One of the most common methods of business cycle identification is detrending<sup>7</sup> of time series. We detrend the GDP data by filtering the time series with two different –from a theoretical point of view– statistical transformations: Band-Pass Filter and Hodrick-Prescott Filter.

The Band-Pass Filter isolates the cyclical component of the time series by removing both low (which reflect the long term growth component) and high (which might be due to measurement errors and noise) frequency fluctuations from the data at a predefined level. The filtered series are computed as:

$$z_t = \sum_{c=1}^{q+1} w(1, c) y_{t+1-c} + \sum_{c=2}^{q+1} w(1, c) y_{t+c-1} \quad t = q+1, \dots, n-q$$

Where:

$z_t$  – filtered series

$y_t$  – original series

$q$  – lag length order

$w(1, c)$  – the corresponding element of the weight matrix

We use the “Ideal” Band-Pass filter recommended by Baxter and King,<sup>8</sup> with low band set at 6 lags and upper band set at 32 lags; the maximum lead/lag length of the filter is 10 lags. The Baxter-King Band-Pass Filter belongs to the category of the fixed length symmetric filters which share a well known common deficiency<sup>9</sup> –they

7. Canova, F., Detrending and Business Cycle Facts, *Journal of Monetary Economics*, 41(3), 1998, 475-512.

8. Baxter, M., King, R., Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series, *The Review of Economics and Statistics*, Vol. 81, No. 4 (Nov., 1999), pp. 575-593.

9. Christiano, L., Fitzgerald, T., “The Band Pass Filter” *International Economic Review*, 2003, Department of Economics, University of Pennsylvania and Osaka University Institute of Social and Economic Research Association, vol. 44(2), pages 435-465.

significantly reduce the length of the filtered series. Therefore we apply an alternative detrending technique, namely – Hodrick-Prescott filter.

The Hodrick-Prescott Filter<sup>10</sup> is a smoothing method, which isolates the long-term trend component of time series. The cyclical fluctuations of the series are calculated as a difference between the trend component and the actual data. The Hodrick-Prescott filter is a two-sided linear filter that computes the smoothed series ( $s$ ) by minimizing the variance of actual series ( $y$ ), subject to a penalty  $\lambda$  that constrains the second difference of the smoothed series. That is, the HP filter chooses ( $s$ ) to minimize:

$$\sum_{t=1}^T (y_t - s_t)^2 + \lambda \sum_{t=2}^{T-1} ((s_{t+1} - s_t) - (s_t - s_{t-1}))^2 \rightarrow \min$$

We use smoothing parameter  $\lambda = 1600$  according to the frequency power rule of Ravn and Uhlig<sup>11</sup> (the number of periods per year divided by 4, raised to a power, and multiplied by 1600) which is generally accepted in the literature. Like the Band-Pass Filter the Hodrick-Prescott Filter also possesses some disadvantages, as pointed out by Baxter and King<sup>12</sup> it is highly dependent on the sample length (samples with different length provide different results).

The Band-Pass Filter is preferable from a theoretical perspective,<sup>13</sup> but its use on small sample series is questionable. Therefore we apply both filtering techniques independently and compare the two data sets in order to increase the robustness of the results.

## 2. Estimation of Business Cycle Synchronization

Business Cycle Synchronization between Bulgaria and the EMU is measured with unconditional contemporaneous correlations. We compute correlation coefficients between the filtered series for Bulgaria and the EMU aggregate (independently for Band-Pass and Hodrick-Prescott filters). As a benchmark we calculate correlation coefficients between the EMU aggregate and every EMU member-state. Additional reference is provided from the bilateral correlation coefficients between Bulgaria and individual EMU members.

---

10. Hodrick, R., Prescott, E., Post-war U.S. Business Cycles: An Empirical Investigation, *Journal of Money, Credit and Banking*, Vol. 29, No. 1 (Feb., 1997), pp. 1-16).

11. Ravn, M., Uhlig, H., On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations, *Review of Economics and Statistics*, 2002, 84, 371-375.

12. Baxter, M., King, R., op.cit.

13. Stock, H., Watson, W., 1999. Business Cycle Fluctuations in US Macroeconomic Time Series. In: *Taylor J.B., Woodford M. (Eds.) Handbook of Macroeconomics 1*. Elsevier Science B.V., 3-64.



In order to study the development of the business cycle synchronization over time, we divide the sample into two not-overlapping sub-periods: 1) from the first quarter of 1995 to the last quarter of 2001; and 2) from the first quarter of 2002 to the last quarter of 2009. Greece, Malta and Cyprus are omitted from the dataset in the first period for both filters, and Ireland is removed from the first period sample filtered with the Band-Pass Filter.<sup>14</sup> The dividing point has been chosen for two reasons: it provides two sub-periods of almost equal length; and also on January 01, 2002 the Euro was introduced in 11 EU members as an official currency.

We are interested in the intertemporal comparison of the synchronization because it shows the development of European economic convergence over time, but also it allows us to test the assertion of Frankel and Rose<sup>15</sup> for the endogeneity of the OCA criterion. Using regression techniques they found that the adoption of a common currency itself causes synchronization of the business cycle between the participating countries.

#### IV. Empirical Results

The results from the described procedure are presented separately for the two periods, followed by the intertemporal comparison within the same filtering technique.

##### *1. Business Cycle Synchronization within the EMU in the Period 1995-2001*

Not surprisingly the two filtering techniques provide quite different results. Nevertheless there are some common characteristics. In regard to the synchronization between the EMU aggregate and the individual states, the results indicate definite idiosyncratic properties of the business cycle for most of the countries in the selection (see table 2 below).

Under the Band-Pass Filter only four countries show strong correlation (coefficients higher than 0.7) with the EMU aggregate: Germany, Italy, Finland and Belgium. All other countries in the selection have moderate (between 0.3 and 0.7) or weak (below 0.3) correlation. Germany has the highest coefficient (0.979), indicating almost full synchronization with the EMU Aggregate, which is easily explained – as the biggest economy in the Eurozone, the properties of the German business cycle influence directly the aggregate measure.

---

14. Owing to lack of sufficient data. In the first period the series for Greece, Malta and Cyprus includes only 8 lags. The Ireland series includes 20 lags – insufficient for computing the Band-Pass filter, but enough to apply Hodrick-Prescott.

15. Frankel, J., Rose, A., The Endogeneity of the Optimum Currency Area Criteria, The Economic Journal, Vol. 108, No. 449 (Jul., 1998), pp. 1009-1025 Blackwell Publishing.



Within the observed period Bulgaria experienced severe economic problems with hyperinflation and negative economic growth, which led to the introduction of the currency board in July 1997.<sup>16</sup> The low value of the correlation coefficient (0.27) indicates the lack of synchronization between Bulgaria and EMU countries and probably an idiosyncratic nature of the cycle. In comparison with the EMU members Bulgaria's level of synchronization is similar to that of Slovenia and the Netherlands. Overall the level of synchronization with the EMU Aggregate across the selection may be defined as quite low or even absent.

**Table 2.** Synchronization Between EMU Aggregate and Individual Countries

Band-Pass Filter		Hodrick-Prescott Filter	
Portugal	-0,7862	Slovakia	-0,5949
Slovakia	-0,5916	Portugal	0,2091
Luxembourg	-0,5826	Slovenia	0,3298
Austria	-0,3584	Bulgaria	0,4773
Slovenia	0,2301	Luxembourg	0,6028
Bulgaria	0,2723	Austria	0,6211
Netherlands	0,3233	Ireland	0,7022
France	0,4604	Netherlands	0,7323
Spain	0,4871	Finland	0,7689
Belgium	0,7485	Italy	0,8237
Finland	0,8956	Spain	0,8258
Italy	0,9459	Belgium	0,8292
Germany	0,9790	France	0,9004
—	—	Germany	0,9253

Under the Hodrick-Prescott Filter the values of the correlation coefficients are radically different, but the order of synchronization level is not significantly different for most of the countries. Germany again has the highest correlation with the EMU Aggregate, followed by France, Belgium, Spain and Italy. Overall more countries have high synchronization of the business cycle with the EMU Aggregate (8 countries have coefficients higher than 0.7 against only 4 under the Band-Pass Filter). Bulgaria, Slovenia, Slovakia and Portugal have weak correlation with the EMU Aggregate under both filters, which indicates definite lack of synchronization of the business cycles of these countries and the Eurozone. In comparison with the Band-Pass more countries show high synchronization with the EMU under the Hodrick-Prescott Filter. Nevertheless the significant difference in the coefficients for Luxembourg and Austria indicate possible problems in the cycle identification process for these countries.

16. Gulde, A., The Role of the Currency Board in Bulgaria's Stabilization, in Finance and Development, September 1999 Volume 36, Number 2, Washington: IMF.

Our other reference measure is the bilateral synchronization of the business cycle between Bulgaria and the individual EMU member-states (see Table 3).

**Table 3.** Synchronization between Bulgaria and Individual EMU Countries

Band-Pass Filter		Hodrick-Prescott Filter	
Slovenia	-0,5958	Slovenia	-0,2118
Belgium	-0,1819	Slovakia	-0,2037
Slovakia	-0,0428	Ireland	0,0391
Luxembourg	-0,0318	Portugal	0,1031
Netherlands	0,0153	Finland	0,1346
Germany	0,0859	Belgium	0,1389
Italy	0,1270	Netherlands	0,2040
Finland	0,1826	Austria	0,3351
EMU_16	0,2723	Italy	0,3483
Portugal	0,2943	Luxembourg	0,4204
Spain	0,6298	Germany	0,4456
Austria	0,6475	EMU_16	0,4773
France	0,8984	France	0,5213
–	–	Spain	0,5807

Under the Band-Pass Filter the Bulgarian business cycle has a high level of synchronization only with France and a moderate level with Austria and Spain. As we said earlier, the correlation with the EMU Aggregate is weak. Business cycle identification with the Hodrick-Prescott Filter in general provides higher correlation coefficients except for France. As a result the category of moderate synchronization with Bulgaria contains 7 countries, but none of the entities in the sample is strongly correlated with the Bulgarian cyclic fluctuations.

The general conclusion for the observed period is that Bulgaria does not meet the fundamental requirement for joining a currency union with the selected countries. Nevertheless, Bulgaria de facto entered the EMU by introducing the currency board in 1997<sup>17</sup> and fixing its national currency to the German Mark. Therefore we may assume that Bulgaria suffered substantial negative effects from the establishment of the Currency Board in 1997 owing to the loss of independent currency policy. This conclusion is not surprising, but we also found that the EMU members themselves did not meet the essential OCA criterion in the observed period and probably the introduction of the Euro caused significant disturbances in the economies of the EMU member states.

---

17. According to Mundell, the fixed exchange rate and the common currency are the same, and the participating countries have to possess the same OCA properties Mundell, R., op. cit.

## 2. Business Cycle Synchronization within the EMU in the Period 2002-2009

The macroeconomic setting in the second sub-period in the sample is radically different –the EMU was founded in December 1998 when 11 EU members fixed their exchange rates. In 2002 the Euro was introduced as a national currency in 12 EU members and by 2009 that number rose to 16 member-states. This should facilitate trade and therefore synchronization between those countries through reduction of transactional costs and owing to the common monetary policy. We test this hypothesis following the same procedure as in the previous paragraph. Although the results are theoretically consistent, their uniformity is astonishing (see Table 4).

**Table 4.** Synchronization Between EMU Aggregate and Individual Countries

Band-Pass Filter		Hodrick-Prescott Filter	
Malta	0,8032	Bulgaria	0,8000
Cyprus	0,8244	Greece	0,8167
Greece	0,8675	Cyprus	0,8461
Bulgaria	0,8814	Slovakia	0,8785
Slovakia	0,9118	Malta	0,8813
Ireland	0,9433	Ireland	0,8935
Luxembourg	0,9509	Portugal	0,9099
Portugal	0,9675	Luxembourg	0,9178
Slovenia	0,9744	Netherlands	0,9648
Belgium	0,9797	Spain	0,9651
Finland	0,9808	Belgium	0,9709
Netherlands	0,9833	Slovenia	0,9737
Austria	0,9857	France	0,9745
Spain	0,9865	Austria	0,9765
Germany	0,9930	Finland	0,9774
France	0,9959	Germany	0,9775
Italy	0,9991	Italy	0,9816

Under the Band-Pass technique for identification of the business cycle all correlation coefficients are within the range between 0.8 (Malta) and 0.999 (Italy). This result indicates an extremely high level of synchronization of the business cycle across the whole Eurozone, including the newest members and even the non-member-state Bulgaria. Actually the correlation coefficient between Bulgaria and the EMU Aggregate is higher than those of Greece, Malta and Cyprus.

In this sub-period the correlation coefficients, computed under the Hodrick-Prescott Filter provide almost the same results – the range for the whole selection is between 0.8 (Bulgaria) and 0.982 (Italy) and the individual values are very similar to the Band-Pass Filter. This confirms the conclusion derived from the Band-Pass

series: that in the sub-period 2002-2009 there is very high level of synchronization of the business cycle across the selection.

The results for the synchronization of the Bulgarian business cycle with the EMU members are also very similar for both filters (see Table 5).

**Table 5.** Synchronization Between Bulgaria and Individual Countries

Band-Pass Filter		Hodrick-Prescott Filter	
Malta	0,5044	Luxembourg	0,6160
Ireland	0,7796	Ireland	0,6329
Netherlands	0,8273	Malta	0,7016
Spain	0,8428	Greece	0,7392
Luxembourg	0,8490	France	0,7428
Germany	0,8706	Italy	0,7439
Austria	0,8788	Portugal	0,7487
Cyprus	0,8803	Germany	0,7880
EMU_16	0,8814	Belgium	0,7913
Portugal	0,8819	Spain	0,7944
France	0,8861	EMU_16	0,8000
Italy	0,8865	Cyprus	0,8101
Greece	0,8911	Slovakia	0,8111
Slovakia	0,9031	Austria	0,8154
Belgium	0,9106	Netherlands	0,8207
Slovenia	0,9140	Finland	0,8519
Finland	0,9193	Slovenia	0,8636

Under the Band-Pass filter, Bulgaria has strong correlations with all countries in the selection except Malta (0.5) and under the Hodrick-Prescott filter –except Luxembourg and Ireland. All coefficients have very close values, therefore the order of the countries differs more than the coefficients themselves. The general conclusion is that the cyclic fluctuations of the Bulgarian economy are highly synchronized with the EMU Aggregate and with every individual member state. This statement is confirmed under both techniques for business cycle identification.

### *3. Intertemporal Comparison*

When we compare the results between the two sub-periods it is quite obvious that the level of economic convergence has risen dramatically across the Eurozone (Table 6).

**All countries in the selection have improved their level of synchronization with the EMU under both filtering techniques.** These results confirm the hypothesis of Frankel and Rose that the currency union causes business cycle synchronization between the participants, even if the individual cycles are idiosyncratic prior to the adoption of the common currency. In the first sub-period the two filters provide quite

**Table 6.** Synchronization Between EMU Aggregate and Individual Countries

Band-Pass Filter				Hodrick-Prescott Filter			
1995-2001		2002-2009		1995-2001		2002-2009	
Austria	-0,36	Austria	0,99	Austria	0,62	Austria	0,98
Belgium	0,75	Belgium	0,98	Belgium	0,83	Belgium	0,97
Bulgaria	0,27	Bulgaria	0,88	Bulgaria	0,48	Bulgaria	0,80
Finland	0,90	Finland	0,98	Finland	0,77	Finland	0,98
France	0,46	France	0,99	France	0,90	France	0,97
Germany	0,98	Germany	0,99	Germany	0,93	Germany	0,98
Italy	0,95	Italy	0,99	Ireland	0,70	Ireland	0,89
Luxembourg	-0,58	Luxembourg	0,95	Italy	0,82	Italy	0,98
Netherlands	0,32	Netherlands	0,98	Luxembourg	0,60	Luxembourg	0,92
Portugal	-0,79	Portugal	0,97	Netherlands	0,73	Netherlands	0,96
Slovakia	-0,59	Slovakia	0,91	Portugal	0,21	Portugal	0,91
Slovenia	0,23	Slovenia	0,97	Slovakia	-0,59	Slovakia	0,88
Spain	0,49	Spain	0,99	Slovenia	0,33	Slovenia	0,97
–	–	–	–	Spain	0,83	Spain	0,97

different results, but in the second sub-period the coefficients are quite consistent. This disperses any doubts that one might have towards the quality of the identification processes. The high level of economic convergence may also be a consequence of trade between the members, but the sudden and substantial increase of the synchronization level must be a result of a particular event occurring at the end of the first sub-period and may not be attributed to the free trade which was persistent within the EU for decades.

## V. Conclusions and Future Research

The main purpose of this paper is to assess whether Bulgaria should join the EMU or whether it is more beneficial to abolish the existing currency board and have independent monetary policy. Our empirical results show that the business cycle of Bulgaria is highly synchronized with the EMU Aggregate and with every one of the EMU member-states –and thus Bulgaria fulfils the fundamental OCA criterion. Therefore we suggest that it is better for Bulgaria to join the Eurozone than to maintain independent monetary policy. The Bulgarian economy is highly synchronized with the economies of the EMU members and the centralized monetary policy should not cause excess inflation or unemployment. The exchange rate of the Bulgarian currency is anchored to the Euro within a currency board and therefore Bulgarian monetary policy is heavily influenced by the European Central Bank but the transaction costs are still present. If those costs are removed by the introduction of the Euro, Bulgaria can only benefit.

Although it was not our original intention, this paper gives some insight into the costs and benefits of the EMU for the member-states. Recently the viability of the Euro has been questioned by numerous scholars as a consequence of the 2010 debt crisis and the difficulties with the government debt and budget deficit in several EMU members (Greece, Portugal and Spain). Our results suggest that when the EMU was created the economies of the member-states weren't synchronized and probably the introduction of the Euro caused severe economic disturbances at least for some of the members. Deprived of independent monetary policy they were forced to use only fiscal instruments to correct their problems, which probably led to the debt crisis. The high level of synchronization of economic fluctuations in the second sub-period implies that the negative effects of the EMU creation are already in the past and the benefits are yet to be experienced. Therefore we think that the common currency should be rescued at any cost.

We plan to extend this research by studying the synchronization within the EU for more macroeconomic indicators (unemployment, inflation and interest rates) and to include additional countries both from the EU and non-member-states.

## References

- Baxter, M., King, R., Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series, *The Review of Economics and Statistics*, Vol. 81, No. 4 (Nov., 1999), pp. 575-593
- Canova, F., Detrending and Business Cycle Facts, *Journal of Monetary Economics*, 41(3), 1998, 475-512.
- Christiano, L., Fitzgerald, T., "The Band Pass Filter" *International Economic Review*, 2003, Department of Economics, University of Pennsylvania and Osaka University Institute of Social and Economic Research Association, vol. 44(2), pages 435-465.
- Frankel, J., Rose, A., The Endogeneity of the Optimum Currency Area Criteria, *The Economic Journal*, Vol. 108, No. 449 (Jul., 1998), pp. 1009-1025 Blackwell Publishing
- Gulde, A., The Role of the Currency Board in Bulgaria's Stabilization, in *Finance and Development*, September 1999 Volume 36, Number 2, Washington: IMF
- Hodrick, R., Prescott, E., Post-war U.S. Business Cycles: An Empirical Investigation, *Journal of Money, Credit and Banking*, Vol. 29, No. 1 (Feb., 1997), pp. 1-16).
- Kenen, P.B., 1969, The Theory of Optimum Currency Areas: An Eclectic View, in Mundell and Swoboda (eds.), *Monetary Problems in the International Economy*, University of Chicago Press
- McKinnon, Ronald I., Optimum Currency Areas, *The American Economic Review*, Vol. 53, No. 4 (Sep., 1963), pp. 717-725
- Mundell, R., A Theory of Optimum Currency Areas, *The American Economic Review*, Vol. 51, No. 4 (Sep., 1961), pp. 657-665
- Ravn, M., Uhlig, H., On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations, *Review of Economics and Statistics*, 2002, 84, 371-375
- Sanz-de-Galdeano, A., Turunen, J., The Euro Area Wage Curve, *Economic letters* Volume 92, Issue 1, July 2006, Pages 93-98, 2006 Elsevier B.V.

- Stock, H., Watson, W., 1999. Business Cycle Fluctuations in US Macroeconomic Time Series. In: Talor J.B., Woodford M. (Eds.) Handbook of Macroeconomics 1. Elseiver Science B.V., 3-64.
- Wildasin, David E., Markusen, James R. and Winters, L. Alan, Factor Mobility and Fiscal Policy in the EU: Policy Issues and Analytical Approaches, *Economic Policy*, Vol. 15, No. 31 (Oct., 2000), pp. 339-378.