FUTURE EURO AREA MEMBERSHIP OF BULGARIA IN TERMS OF THE BUSINESS CYCLE

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Abstract: In the present paper, vector autoregression (VAR) is used to assess the extent to which Bulgaria's economic cycle is synchronized with the one of the euro area (EA). The main fiscal and monetary factors affecting the coordination of the business cycles of Bulgaria and the EA are identified. Recommendations for macroeconomic policies are formulated to support the synchronization of Bulgaria's economic cycle with the one of the EA and to prepare our country for the adoption of the euro.

Keywords: Bulgaria, membership, euro area, business cycles, synchronization.

JEL: E32, E42, E50.

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Introduction

Thirteen new Member States (NMS) joined the European Union (EU) during the last three enlargements in 2004, 2007, and 2013 – Poland, the Czech Republic, Hungary, Slovakia, Slovenia, Lithuania, Latvia, Estonia, Malta, Cyprus, Bulgaria, Romania, and Croatia. Seven of the countries were already members of the euro area (EA) – Slovenia, Malta, Cyprus, Slovakia, Estonia, Latvia, and Lithuania. The other six countries – Poland, the Czech Republic, Hungary, Romania, Bulgaria, and Croatia, in compliance

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with the EU accession agreements signed by them, had to accept the single European currency after meeting certain requirements (the Maastricht convergence criteria). Therefore, the question is not whether, rather when these six countries will become members of the EA.

When assessing a country's readiness for EA membership, it is advisable to use not only the Maastricht convergence criteria but also the criteria of the optimum currency area theory. Simultaneous use of the two sets of criteria helps to combine their strengths, avoid their weaknesses and get the most complete and credible assessment of the candidate countries' preparedness for Economic and Monetary Union (EMU) membership.

One of the most important criteria for the optimum currency area is the similarity between the economic cycles of participating countries. If these cycles are not synchronized, it is possible for the monetary union to be affected by asymmetric shocks. The presence of asymmetric shocks makes the common monetary policy ineffective as it has a pro-cyclical effect in countries whose cycle is not converged with the overall currency area cycle. During an upswing, the common monetary policy creates inflationary 'bubbles' and the danger of economy 'overheating', while in a period of downturn further exacerbates recession in countries with divergent economic cycles. It is not advisable for countries whose individual business cycles are not sufficiently correlated with the overall currency area cycle to join a monetary union. One of the reasons for the debt crisis in the EA is the insufficient synchronization of the economic cycles of peripheral countries with the overall monetary union cycle.

The present study aims to assess Bulgaria's readiness for EA membership in terms of convergence of the Bulgarian business cycle with the aggregate EA cycle. To achieve this goal, the study will be structured as follows:

- Empirical assessment of the degree of convergence of Bulgaria's economic cycle with the overall EA cycle (section 1);
- Identifying fiscal and monetary factors affecting the convergence of the Bulgarian cycle with the one of the EA (section 2);
- Formulating recommendations for macroeconomic policies to support the synchronization of Bulgaria's economic cycle with the one of the EA and to prepare our country for the adoption of the euro. (conclusion).

In the present study, vector autoregression (VAR) methods and the Hodrick-Prescott filter are applied, and advisable macroeconomic policy options to stimulate the convergence of Bulgaria' business cycle with the one of the EA are formulated. Quarterly seasonally adjusted Eurostat data are used for the period from the first quarter of 2000 to the fourth quarter of 2017. All indicators are calculated as a percentage of real Gross Domestic Product (GDP) except for the disruption in manufacturing, which is calculated as a

percentage of potential GDP. Potential output is estimated by using the Hodrick-Prescott filter. Economic cycles of Bulgaria and the EA are dated and their phases (downturns and upswings) and positions (inflationary and deflationary shocks) are identified.

The empirical assessment of the degree of convergence of the economic cycles of Bulgaria and the EA is carried out by the following four indicators:

- Difference between disruption of GDP in Bulgaria and the disruption of the EA GDP;
- Correlation coefficient between disruption of GDP in Bulgaria and the disruption of the EA GDP;
- Percentage of convergent phases of Bulgaria's business cycle and the one of the EA;
- Percentage of convergent cyclical positions of Bulgaria and the EA.

All variables are tested for stationarity. When it is found out that they are integrated of order one, tests are made for the optimal number of lags and for Johansen co-integration. The optimal number of lags is used in the Johansen test and later when creating vector autoregression. If the Johannes test demonstrates a co-integration relationship between the variables, a restricted vector autoregression, also known as Vector Error Correction (VEC), is applied. Otherwise unrestricted vector autoregression is used.

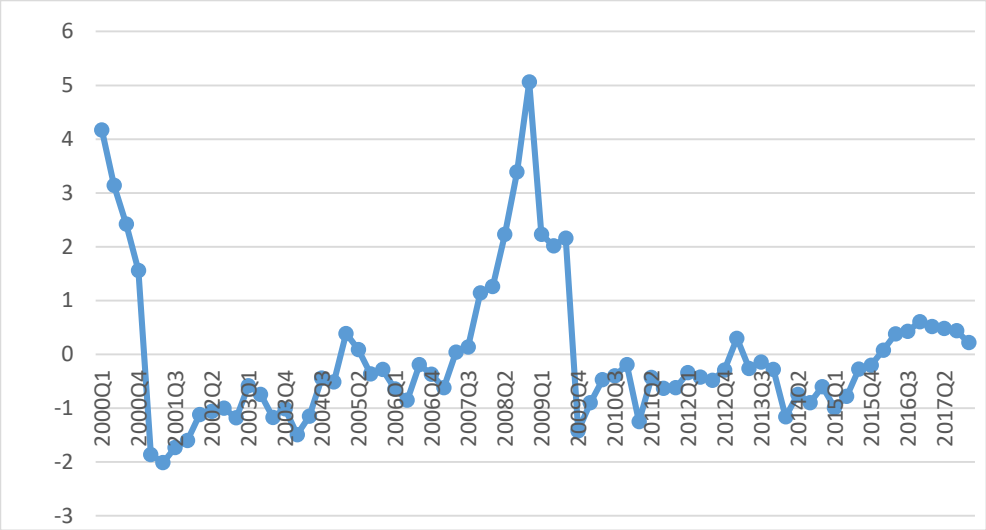
Short-term cause-and-effect relationships between variables are analyzed by Pairwise Granger Causality Tests, while long-term by Granger Causality/Block Exogeneity Wald Tests. Impulse Response graphs are drawn showing how the target variable (the difference between disruption in manufacturing in Bulgaria and the EA) responds to fiscal and monetary shocks.

Recommendations for macroeconomic policies are formulated to support the synchronization of Bulgaria's business cycles with the ones of the EA and to prepare our country for the adoption of the euro. When selecting explanatory fiscal and monetary variables involved in vector autoregression, macroeconomic policy specifics under conditions of a currency board and a monetary union are taken into account.

1. Empirical assessment of the degree of convergence of Bulgaria's economic cycle with the overall EA cycle

Figure 1 shows the dynamics of the difference between disruption in manufacturing in Bulgaria and the EA, calculated as a percentage of potential GDP. The Hodrick-Prescott filter is used to determine the potential GDP of Bulgaria and the EA. Disruption in manufacturing is calculated by the following formula:

(1) Disruption = (Real GDP – Potential GDP) *100 / Potential GDP



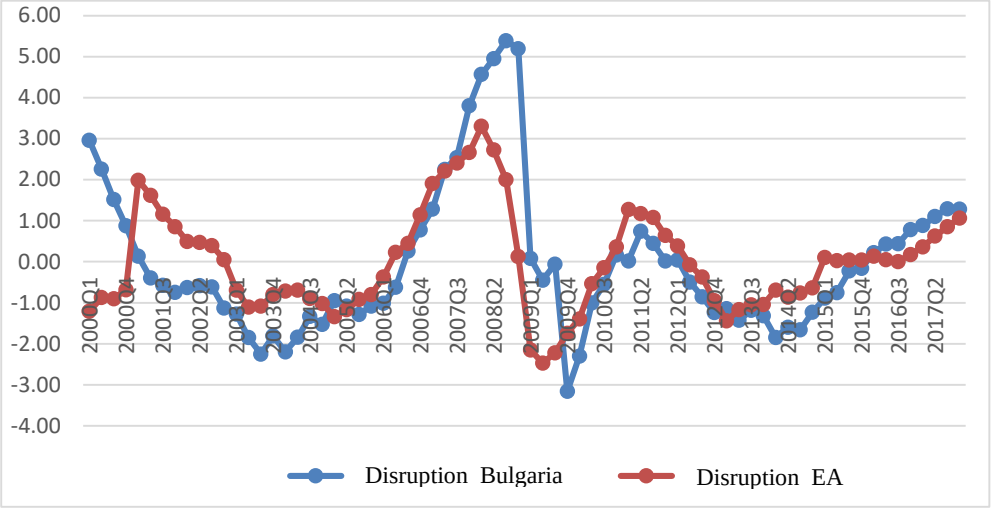
Source: Calculations by the authors based on Eurostat data

Figure 1. ***Dynamics of the difference between disruption in manufacturing in Bulgaria and the EA***

In the 2000-2009 period, there were serious differences between disruption in manufacturing in Bulgaria and the EA, exceeding 5% in the last quarter of 2008. In the 2010-2017 interval, these differences were reduced and rarely exceeded 1%, which implies a significant increase in the synchronization of Bulgaria's business cycle with the one of the EA.

The same conclusion can be drawn from the correlation coefficient between disruption in manufacturing in Bulgaria and in the EA. For the 2000-2009 period, the coefficient was 0.60, increasing to 0.86 for the 2010-2017 period.

Analysis of the dynamics of the disruption of GDP and the EA (see Figure 2) helps to determine the turning points (tops and bottoms), phases (upswings and downturns), and positions (inflationary and deflationary disruptions) in their economic cycles. When determining the turning points, a rule is observed that there must be at least three and at most eight years between two tops (two bottoms). Phases between a top and a bottom are called downturns, while between a bottom and a top are called upswings. Positive disruptions in manufacturing are inflationary, while negative – deflationary.



Source: Calculations by the authors based on Eurostat data

Figure 2. ***Dynamics of disruptions in manufacturing in Bulgaria and the EA***

The turning points in the economic cycles of Bulgaria and the EA are shown in Tables 1 and 2. In the 2000-2009 period, the share of converging phases and positions in Bulgarian and the EA cycles was 62.5% and 67.5% respectively. In the 2010-2017 period, the share increased to 84.38% and 87.5% respectively, a fact confirming the strong convergence of the Bulgarian cycle with the one of the EA.

Table 1

Turning points in Bulgaria's business cycle

Tops	2000 – quarter 1	2008 – quarter 3	2011 – quarter 2	2017 – quarter 4
Bottoms	2003 – quarter 3	2009 – quarter 4	2014 – quarter 1	

Source: Calculations by the authors based on Eurostat data www.eurostat.com

Table 2

Turning points in the EA business cycle

Tops	2001 – quarter 1	2008 – quarter 1	2011 – quarter 1	2017 – quarter 4
Bottoms	2000 – quarter 1	2005 – quarter 1	2009 – quarter 2	2013 – quarter 1

Source: Calculations by the authors based on Eurostat data www.eurostat.com

2. Fiscal and monetary factors affecting the convergence of the Bulgarian cycle with the one of the EA

Fiscal and monetary determinants of the convergence of Bulgaria's cycle with the one of the EA are identified by vector autoregression involving the following variables: **BCS –** difference between disruption in manufacturing in Bulgaria and the EA; **FISC_BAL_BG** – Bulgaria's budget balance; **FISC_BAL_EA** – budget balance of the EA; **FOREX_RES_BG** – Bulgaria's foreign exchange reserves (total assets of the Bulgarian National Bank Issue Department); **GOV_DEBT_BG** – Bulgaria's government debt; **GOV_DEBT_ EA** – government debt of the EA; **GOV_DEP_BG –** government deposit in the balance sheet of the Bulgarian National Bank Issue Department; **GOV_EXP_BG** – budget expenditure in Bulgaria; **GOV_EXP_EA** – budget expenditure in the EA; **GOV_REV_BG** – budget revenues in Bulgaria; **GOV_REV_EA** – budget revenues in the EA; **INT_RATE_EA** – interest rate on the main refinancing operations of the European Central Bank; **MRR_BG** – percentage of minimum required reserves in Bulgaria; **MRR_EA** – percentage of minimum required reserves in the EA. The target variable is **BCS.**

The unit root group tests (see Table 3) show that variables are stationary (integrated of order zero), which requires the application of unrestricted vector autoregression.

Table 3

Tests for stationarity of variables in vector autoregression

Method	Statistics	Probability	Cross-sections	Observations
Null hypothesis: There is a unit root (allows the presence of common unit root processes)				
Levin, Lynn and Shu t*	-2.80746	0.0025	14	960
Null hypothesis: There is a unit root (allows the presence of individual unit root processes)				
Im, Pesaran and Shin W-stat	-4.52295	0.0000	14	960
Extended Dickey-Fuller test - Fisher chi- square	97.5076	0.0000	14	960
Phillips-Peron test - Fisher chi-square	108.303	0.0000	14	970

Source: Made by the authors.

The test for the optimal number of lags in vector autoregression shows that according to all criteria, except for the Schwarz criterion, the number is three lags (see Table 4). Vector autoregression is estimated with three lags.

Table 4

Determining the number of lags in vector autoregression

Number of lags	Phillips-Peron criterion	Akaike Criterion	Schwarz criterion	Hannan Quinn Criterion
0	1.878237	40.36057	40.84503	40.55044
1	3.48e-08	22.41143	29.67837*	25.25941
2	1.11e-08	20.24843	34.29785	25.75453
3	1.12e-10*	11.99887*	32.83078	20.16309*

* Shows the optimal number of lags according to the given criterion.

Source: Made by the authors.

The equation for the target variable in the BCS VAR model after a stepwise removal of statistically insignificant variables is of the type:

(1) BCS = 3.41*FISC_BAL_EA(-2) + 0.03*GOV_DEP_BG(-1) - 0.08*GOV_EXP_BG(-2) + 3.19*GOV_EXP_EA(-2) + 0.13*GOV_REV_BG(-1) - 3.14*GOV_REV_EA(-2) - 0.61*GOV_REV_EA(-3) + 0.78*MRR_BG(-3) + 15.69

Budget balance in the EA, Bulgarian government debt, budget expenditure in Bulgaria and in the EA, budget revenues in Bulgaria and in the EA, and the minimum reserve requirements in Bulgaria have a statistically significant delayed impact on the convergence of Bulgaria's economic cycle with the one of the EA. Regression coefficients of the EA fiscal and monetary variables are much higher in absolute value than regression coefficients of Bulgarian fiscal and monetary variables.

This difference in ratios indicates that it is not advisable for Bulgarian macroeconomic strategists to undertake management and adjustment policies, and to influence BCS because changes in the euro area policy would immediately affect and neutralize the actions taken.

The value of determination coefficient (R-squared = 0.894009) shows that 89.4% of the variation in the difference between **BCS** disruption in manufacturing in Bulgaria and the EA can be explained by changes in the independent variables involved in Equation (1). Probability F-statistic = 0,000000 indicates that the alternative hypothesis of the adequacy of the model used is confirmed. However, it should be specified that this does not mean the model is the best possible, rather adequately reflects the relationship between dependent and independent variables.

CUSUM test results indicate that Equation (1) is dynamically stable (see Figure 3) since the actual values of CUSUM are within the confidence interval at a 5% level of significance. The probability of Jarque-Bera statistic is 0.036123 (see Figure 4), which gives grounds to accept the null hypothesis for a normal residual distribution in Equation (1) at a 1% critical level of significance.

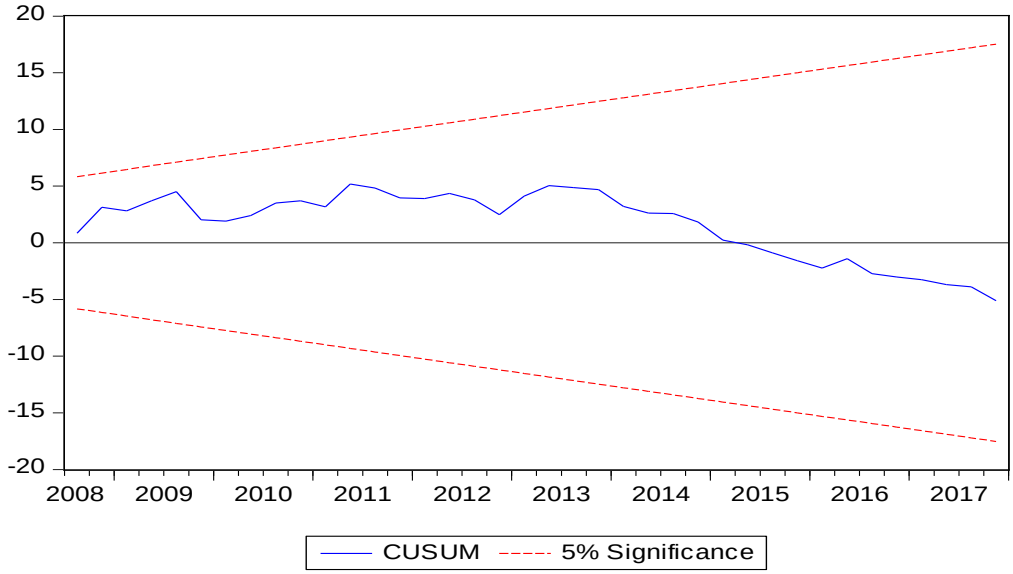


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Figure 3. ***A CUSUM test for dynamic stability of Equation (1)***

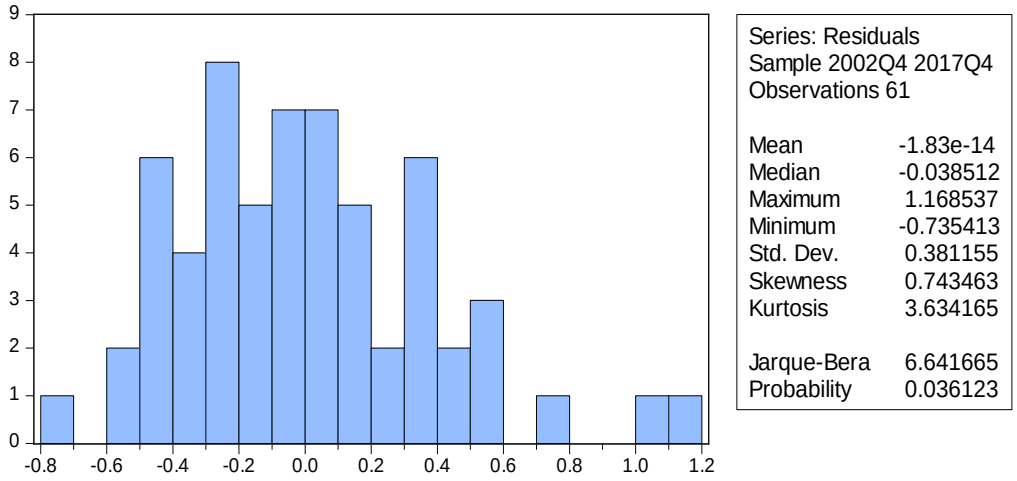

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Figure 4. **A test for the normal residual distribution in Equation *(1)***

Table 5

Serial correlation of residuals in Equation (1) test results

F-ratio	0.875544	Probability F(2,57)	0.4602
Observations R^2	3.103525	Probability Chi-square (2)	0.3759

Source: Made by the authors.

Table 6

Heteroscedasticity of residuals in Equation (1) test results

F-ratio	2.318507	Probability F(1,63)	0.0857
Observations R^2	6.618271	Probability Chi-square (1)	0.0851

Source: Made by the authors.

The null hypothesis about the absence of serial correlation of the disturbances in Equation (1) is valid (see Table 5). Test results of the heteroscedasticity of residuals in Equation (1) listed in Table 6 give grounds to accept the null hypothesis about the absence of heteroscedasticity at a 5% critical level of significance.

The Pairwise Granger Causality Tests results show that in the short run at a 10% critical level of significance, there are causal relationships between budget balances in Bulgaria and the EA, the Bulgarian government debt, the government deposit in the Issue Department of the Bulgarian National Bank, the budget expenditure in Bulgaria and the EA, and the minimum reserve requirements in Bulgaria to BCS (see Table 7). Granger Causality / Block Exogeneity Wald Tests results show that in the long run at a10% critical level of significance, there are causal relationships between the budget balance in the EA, the government deposit in the Issue Department of the BNB, the budget expenditure in the EA, budget revenues in the EA, and the minimum reserve requirements in Bulgaria to BCS (see Table 8).

Table 7

Pairwise Granger Causality Tests results

Independent variables	Probability
FISC_BAL_BG	0.0102
FISC_BAL_EA	0.0368
FOREX_RES_BG	0.1037
GOV_DEBT_BG	0.0708
GOV_DEBT_EA	0.9764
GOV_DEP_BG	0.0030
GOV_EXP_BG	0.0246
GOV_EXP_EA	0.0450
GOV_REV_BG	0.8578
GOV_REV_EA	0.9547
INT_RATE_EA	0.7065
MRR_BG	0.0198
MRR_EA	0.9915

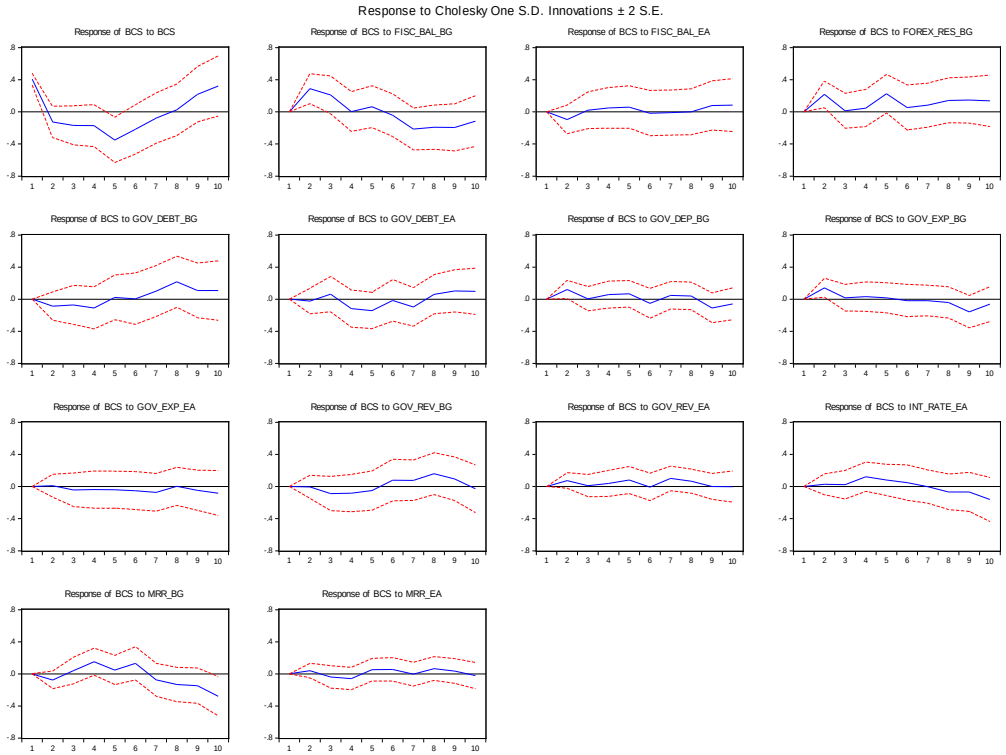
Source: Made by the authors.

Table 8

Granger Causality / Block Exogeneity Wald Tests results

Independent variables	Probability
FISC_BAL_BG	0.4099
FISC_BAL_EA	0.0691
FOREX_RES_BG	0.3455
GOV_DEBT_BG	0.4074
GOV_DEBT_EA	0.8090
GOV_DEP_BG	0.0492
GOV_EXP_BG	0.3765
GOV_EXP_EA	0.0716
GOV_REV_BG	0.3934
GOV_REV_EA	0.0648
INT_RATE_EA	0.9561
MRR_BG	0.0008
MRR_EA	0.7502

Source: Made by the authors.



Source: Made by the authors.

Figure 5. ***BCS response to fiscal and monetary shocks***

The **BCS** dependent variable responds more strongly to changes in Bulgaria's budget balance, foreign exchange reserves and the minimum reserve requirements, and less to changes in other fiscal and monetary variables (see Figure 5).

Conclusion

The study presents strong empirical evidence that Bulgaria's economic cycle is highly correlated with the one of the EA. In terms of the synchronization of business cycles, our country is ready to adopt the single European currency. The high degree of similarity between the economic cycles of Bulgaria and the EA minimizes the likelihood of asymmetric shocks and ensures that the monetary policy of the ECB will have an anticyclical rather than procyclical impact on the Bulgarian economy.

It is advisable for our country to apply as soon as possible for participation in the European Exchange Rate Mechanism 2 (the EA 'waiting room') and after staying there for two years and successfully meeting the Maastricht criteria to introduce the euro. Maintaining fiscal and monetary parameters close to the EA average would help to achieve this objective without violating the convergence criteria.

Similar conclusions were drawn and recommendations, such as in the present study, were made by Damyanov and Stefanov (2010), Todorov and Patonov (2012), Todorov (2013), and others.

It would be useful for Bulgaria to join the European Banking Union, in order for Bulgarian commercial banks to be supervised by the European Central Bank. This would contribute to the stability of the Bulgarian banks, because it would minimize the risk to the banking sector. On the other hand, when the control over and supervision of the banking sector are managed by an institution (ECB), the degree of synchronization between Bulgaria and the Euro area will be further increased.

It has been proved by empirical research that the higher degree of synchronization of our country with the Euro area and the reduction of the asymmetric shocks would contribute to:

- enhancing the integration of financial markets and banking;
- increasing trade in goods between Bulgaria and the other Member States;
- converging the structure of Bulgarian GDP, exports and imports with those of the euro area.

The degree of correlation between disturbances in business cycles of Bulgaria and the euro area is comparable to the degree of correlation between

business cycles of the core European countries, which is indicative that our country has reached the required level for full euro area membership.

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