

# MONETARY UNION ACCESSION AND THE SEVERITY OF POTENTIAL ASYMMETRIC SHOCKS – THE CASE OF LITHUANIA AND POLAND

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*Monetary union accession generates benefits and costs for the entering countries. According to the seminal paper by Mundell (1961), the possible costs are usually associated with the asymmetric shocks that might take place. Under the currency union regime, these asymmetric shocks can be no longer neutralized by the country-specific monetary policy tools, hence the flexibility of the economy is desirable.*

*In this article, we employ the measure of business cycles correlation proposed by Artis and Zhang (1995) as well as labor market statistics to examine how easy the economies of Lithuania and Poland can adjust to asymmetric shocks in comparison to some other EU countries. Discussing the empirical results, we propose recommendations for economic policy that might help to fulfil the conditions of the Optimum Currency Area.*

**Keywords:** monetary union, asymmetric shocks, currency area

## Introduction

The decision on joining a monetary union is rather fundamental in terms of economic policy. In the case of Lithuania and Poland, it can be only compared with the decision of economic system transformation from the beginning of the nineties. By accessing the European Union, both of the countries have committed themselves to join also the euro monetary union, but the question about the

specific date of replacing the local currencies by the euro still remains open. Lithuania has already started the preparatory phase entering the ERM2, however, a lot of doubts have emerged about the accurate timing for this decision since the moment the whole process has started four years ago. Polish economists are also not unanimous in their opinions about the calendar of joining the euro area, while some of them even undermine the sense of forgoing the Polish Zloty itself (Łon, 2007).

During the discussion about the potential economic costs of common currency, the question of asymmetric shocks is perhaps the most popular one. We define an asymmetric shock as a disturbance that causes different in size negative<sup>1</sup> output deviations from the potential level among the member countries of a monetary union. Under the common currency regime there is no longer possibility to neutralize these shocks using country-specific tools of monetary policy, hence a special attention is paid to this problem. According to the seminal paper by Mundell (1961), there are two main conditions that predestinate a candidate country to join the monetary union, establishing a situation where the severity of potential asymmetric shocks will be minimized. These conditions are high labour mobility and the flexibility of wages, especially in downward direction. If the labour market is flexible enough, the economy easier restores an equilibrium with the initial level of prices and income *per capita*.

We cannot treat the above suggestions as a finite list of conditions which, being fulfilled, will guarantee the success of the accession process. There are, of course, many other detailed factors, e.g. the degree of openness of an economy (McKinnon, 1963) or the degree of product diversification among the member countries (Kenen, 1969); however, the Mundell's conclusions can be viewed as some general prerequisites to the accession process. Therefore, the first goal aim of this paper is to verify, using the available labour market statistics, whether the Lithuanian and Polish job markets are flexible enough to easily neutralize the potential economic disturbance.

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<sup>1</sup> The Common Currency Area theory pays attention to negative deviations from the potential level of output.

The latter target focuses on estimating the chance of emerging a special type of an asymmetric shock.

Disturbances that cause asymmetric reaction can be classified in a number of ways. European Parliament (1998) divides shocks into real and financial as well as into exogenous and policy-induced shocks. Borowski (2001) distinguishes two main types of asymmetric shocks: "classical", i. e. country-specific shocks that do not affect the other countries of monetary union, and another group of shocks that influence all the common currency area, however, to a different degree.

Balancing the benefits and costs of joining the monetary union and discussing the optimal timing of accession, we need a more pragmatic way of describing the asymmetric shocks. We suggest, therefore, to categorize shocks from the point of view of our ability to predict these disturbances. Having established this classification, we may then better identify the potential threats of monetary union accession.

Perhaps there are no totally unpredictable as well as definitely certain shocks. The natural disasters are those that are always hard or even impossible to predict. The productivity shocks are also generally unpredictable, but very often they are also difficult to identify. Using the portfolio theory language, these types of shocks may be treated as "non-diversifiable risks", hence we should pay attention mainly to these sources of shocks that can be "diversified" by the appropriate timing of the monetary union accession. We would like, therefore to focus on the common monetary policy that may be a source of the asymmetric shock itself.

Under the common central banking regime, the monetary authorities' target is the

average inflation rate for the whole union area, so it is not difficult to imagine a situation where the distribution of the inflation rates among the member countries is dispersed and at the same time the Central Bank reaches its target. In such a case, the common monetary policy can destabilize some of the local economies leading them to an unnecessary recession or overheating the economy. Looking at the country-inflation rates of the euro area and keeping in mind the 2% target inflation rate, we may observe this kind of dispersion.

There is a group of countries (Ireland, Greece, Spain, Luxembourg, Portugal) which have country inflation rates permanently above the target, and we may distinguish countries with a permanently lower inflation (Germany and in the recent years the

Netherlands and Finland). Comparing the EU-13 inflation rates with the inflation rates of the candidate countries, we see that in the latter case the rates are definitely more volatile; thus, an independent monetary policy may be needed. Economists, however, are aware of this macroeconomic risk, therefore the Maastricht criteria have been established. To fulfil the convergence requirements, any candidate country has to keep a set of macroeconomic indicators at the predefined level which maximizes the chance that the local economy has converged to the situation of the euro area economy and the common monetary policy will be appropriate.

The idea of establishing transparent rules of euro accession is definitely adequate from the legal point of view because it does not leave much place for discretion. From the

*Table 1. Annual inflation rates in euro area countries*

Country/ Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Euro area</b>	<b>1.1</b>	<b>2.1</b>	<b>2.3</b>	<b>2.2</b>	<b>2.1</b>	<b>2.1</b>	<b>2.2</b>	<b>2.2</b>	<b>2.1</b>
Belgium	1.1	2.7	2.4	1.6	1.5	1.9	2.5	2.3	1.8
Germany	0.6	1.4	1.9	1.4	1.0	1.8	1.9	1.8	2.3
Ireland	2.5	5.3	4.0	4.7	4.0	2.3	2.2	2.7	2.9
Greece	2.1	2.9	3.7	3.9	3.4	3.0	3.5	3.3	3.0
Spain	2.2	3.5	2.8	3.6	3.1	3.1	3.4	3.6	2.8
France	0.6	1.8	1.8	1.9	2.2	2.3	1.9	1.9	1.6
Italy	1.7	2.6	2.3	2.6	2.8	2.3	2.2	2.2	2.0
Luxem- bourg	1.0	3.8	2.4	2.1	2.5	3.2	3.8	3.0	2.7
Nether- lands	2.0	2.3	5.1	3.9	2.2	1.4	1.5	1.7	1.6
Austria	0.5	2.0	2.3	1.7	1.3	2.0	2.1	1.7	2.2
Portugal	2.2	2.8	4.4	3.7	3.3	2.5	2.1	3.0	2.4
Slovenia*	6.1	8.9	8.6	7.5	5.7	3.7	2.5	2.5	3.8
Finland	1.3	2.9	2.7	2.0	1.3	0.1	0.8	1.3	1.6
Lithuania	1.5	1.1	1.6	0.3	-1.1	1.2	2.7	3.8	5.8
Poland	7.2	10.1	5.3	1.9	0.7	3.6	2.2	1.3	2.6

\* Slovenia joined the euro area in 2007.

Source: Eurostat data, HICP inflation.

economic perspective, however, there are some doubts whether fulfilling the Maastricht criteria really guarantees economic convergence; therefore, we will run a separate analysis of business cycles synchronization that might provide some valuable conclusions. Finally, our second research target is to elucidate whether for Lithuania and Poland the common monetary policy may be a source of an asymmetric shock.

### **Data and methodology**

The two broad definitions of the business cycle are recognized in the literature (Reichlin, 2005): the so-called classical cycle and the growth or deviation cycle. The classical business cycle is a sequence of expansions and contractions in the absolute level of economic activity. The growth cycle is defined in terms of the deviation from trend or potential output, and thus within an additive or multiplicative trend-cycle decomposition. The rationale for investigating the deviation cycle is that absolute prolonged declines in the level of economic activity tend to be rare events, so, in practice, many economies have not exhibited recessions in classical terms. The notion of the cycle as a deviation of current output from its potential has become increasingly relevant for the conduct of monetary policy, and it is this concept of the cycle that is the focus of attention here.

In this paper, deviation cycles are identified for Poland, Lithuania and for the EU-13 as an aggregate. The four key economic indicators are reviewed in terms of their cyclical movements across countries, and both activity and price developments are covered. The indicators considered are: real GDP, unemployment rate, industrial production index and the harmonised index of consumer

prices (HICP). These play an important role in an assessment of the economic situation. Our sample covers the period between 1995–2007 for quarterly data on GDP and the period between 1998–2007 for the other monthly data. As a data source, the official Eurostat webpage was used. Most of the series are given by the Eurostat in an already seasonally and working-day-adjusted form.

Although it can prove difficult to distinguish empirically between trend and cycle, such a distinction is helpful, as these two phenomena frequently tend to be discussed in connection with different economic issues. For example, the extent to which trend developments in output growth diverge or narrow across the countries is discussed in the context of countries “catching up” with one another, while the degree of similarity of cyclical movements across the countries is discussed in connection with the issue of “synchronization”. Ideally, what is required is an estimate of the asymmetry in shocks that a country will experience in future versus those that will impact its prospective partner. One would like to have estimates of the “no policy” shocks, since it is one of the tasks of policy precisely to offset them. In practice, economists have had recourse to two alternative approaches to get an estimate of the asymmetry of shocks. One, following Bayoumi and Eichengreen (1993), isolates the shocks as the error terms in an estimate of a two-variable (output and prices) structural vector autoregression model (SVAR) on which some identification restrictions have been imposed. Once supply and demand shocks are identified separately for individual countries, synchronization is assessed by the correlation between the shocks. However, the use of SVARs is debated even for countries having long sample periods (Darvas, Szapary, 2004). Imposing

long-run identifying restriction for data available for Lithuania and Poland would not make much sense in the framework of the SVAR model (see Faust, Leeper, 1997; Cooley, Dwyer, 1998). Moreover, some of the inflation data series are not stationary and seem to be even an I(2) process which raises a problem that is quite difficult to handle.

Due to these theoretical and practical deficiencies of the SVAR technique, in this paper we employ the alternative and more "atheoretical" approach based on identifying asymmetries in the business cycle phase as a signal of asymmetric shocks in the relevant sense. The adopted approach consists of using detrended time series as cyclical measures and calculating various synchronization measures based on them. The same method was used by Artis and Zhang (1995), Borowski (2001), Darvas and Szapary (2004). In the following, we describe the methodological issues related to detrending and the measurement of synchronization.

The first issue is the decomposition of the observed series into a trend movement and cyclical component. There are a number of different ways of extracting the trend from the data. However, while different detrending methods give rise to somewhat different results, it appears that the principal results and the validity of broad conclusions are not sensitive to the method chosen (ECB, 1999). For the purposes of this paper, the trend series are derived on the basis of purely statistical considerations rather than from a specific economic theory. Due to its widespread use in empirical economics, the Hodrick–Prescott (HP) filter has been applied here in order to mechanically decompose the individual indicators into a trend movement and a

cyclical component. The HP filter can be specified as

$$\min_{g_t} \left\{ \sum_{t=1}^n (y_t - g_t)^2 + \lambda \sum_{t=2}^{n-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2 \right\}, \quad (1)$$

where  $y_t$  denotes the raw series,  $g_t$  the growth component and  $(y_t - g_t)$  the cyclical component. The first part measures the fitness and the second is a measure of smoothness. The parameter  $\lambda$  is the signal-to-noise ratio and weights the relative importance of the two conflicting goals in the loss function: when  $\lambda = 0$  the filter gives the original series; as  $\lambda$  goes to infinity, the HP filter collapses to a linear trend. Hodrick and Prescott (1997) suggest a value of  $\lambda = 14400$  for monthly data and  $\lambda = 1600$  for quarterly data, and these values have been adopted in the estimates here. The HP filter is easy to implement, but suffers from the end-point bias owing to the fact that both lagged and lead values of the series are taken into consideration when calculating the trend, thus making it less precise at the beginning and at the end of the sample. Nevertheless, we decided to use the HP filter, because all alternative detrending methods also suffer from specific shortcomings.

The techniques used to investigate the question of synchronization exploit correlation analysis between the cyclical series. A high coefficient of correlation will indicate that countries tend to be in similar states of cyclical movement. We used three measures. Firstly, we calculated simple contemporaneous unconditional correlations between the cycle of the euro area and those of individual countries for each indicator, which provide the information about overall linkage

between cyclical movements. Next, we examined developments in synchronization over time on the basis of the contemporaneous correlation coefficients for rolling 3-year periods, which allows for a fairly comprehensive analysis. While evidence of increasing or decreasing synchronization may emerge, there is uncertainty as to whether this is due to generally higher or lower linkages in cyclical developments or simply to a phase shift of the cycles. With this end in view, we provided an explicit measure of phase shift by finding the lead or lag at which the maximum correlation is obtained. Thus, for a given pair of cycles,  $X_t$  and  $Y_t$ ,  $\rho_{xi}(X_t, Y_{t \pm i})$  denotes the correlation between  $X_t$  and  $Y_t$  at displacement  $\pm i$ . In this paper, in order not to decrease the degrees of freedom too much, the maximum value of

$|\rho_{xi}|$  is chosen for  $i \leq 12$  for monthly data and for  $i \leq 4$  for quarterly data. From the perspective of the optimum currency area, zero or small lead/lag would be optimal.

## Empirical results

### *Labour market flexibility*

Flexible labour market conditions stimulate people's professional activity, hence the employment rate may be treated as the most straightforward indicator of labour market flexibility. Table 2 displays the data.

The assessment of labour market flexibility of the two candidate countries differs significantly. The Lithuanian employment rate is nearly equal to the euro area average, while

Table 2. Annual employment rates in euro area countries

Country/ Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Euro area</b>	<b>60.5</b>	<b>61.5</b>	<b>62.2</b>	<b>62.4</b>	<b>62.7</b>	<b>63.2</b>	<b>63.8</b>	<b>64.8</b>	<b>65.7</b>
Belgium	59.3	60.5	59.9	59.9	59.6	60.3	61.1	61.0	62.0
Germany	65.2	65.6	65.8	65.4	65.0	65.0	66.0	67.5	69.4
Ireland	63.3	65.2	65.8	65.5	65.5	66.3	67.6	68.6	69.1
Greece	55.9	56.5	56.3	57.5	58.7	59.4	60.1	61.0	61.4
Spain	53.8	56.3	57.8	58.5	59.8	61.1	63.3	64.8	65.6
France	60.9	62.1	62.8	63.0	64.0	63.7	63.9	63.8	64.6
Italy	52.7	53.7	54.8	55.5	56.1	57.6	57.6	58.4	58.7
Luxem- bourg	61.7	62.7	63.1	63.4	62.2	62.5	63.6	63.6	63.6
Nether- lands	71.7	72.9	74.1	74.4	73.6	73.1	73.2	74.3	76.0
Austria	68.6	68.5	68.5	68.7	68.9	67.8	68.6	70.2	71.4
Portugal	67.4	68.4	69.0	68.8	68.1	67.8	67.5	67.9	67.8
Slovenia*	62.2	62.8	63.8	63.4	62.6	65.3	66.0	66.6	67.8
Finland	66.4	67.2	68.1	68.1	67.7	67.6	68.4	69.3	70.3
<i>Lithuania</i>	<i>61.7</i>	<i>59.1</i>	<i>57.5</i>	<i>59.9</i>	<i>61.1</i>	<i>61.2</i>	<i>62.6</i>	<i>63.6</i>	<i>64.9</i>
<i>Poland</i>	<i>57.6</i>	<i>55.0</i>	<i>53.4</i>	<i>51.5</i>	<i>51.2</i>	<i>51.7</i>	<i>52.8</i>	<i>54.5</i>	<i>57.0</i>

\* Slovenia joined the euro area in 2007.

Source: Eurostat data.

Table 3. Correlation of cyclical components in key indicators with the euro area

Indicator Country	GDP	HICP	Unemployment rate	Industrial production
Lithuania	-0.41	0.51	-0.59	-0.05
Poland	0.46	0.52	0.24	0.58

Source: our own calculations.

Polish employment is the lowest in the whole sample. According to the conclusions of the Optimum Currency Area theory, Lithuania is more predestined to join the euro area. Comparing, however, the euro area employment rate with the data from Japan and USA where the employment rate is about 70%, there is still a need to reform the labour market in euro area to enhance its flexibility and competitiveness. The reasons for the low market flexibility and at the same moment the targets of desired labour market reforms have been repeated several times by the economists (Balcerowicz, 2008): too high a tax rate on labour, too strong a position of the trade unions. In these circumstances, the crucial

point seems to be the lack of political will rather than the lack of good ideas.

### Synchronization of business cycles

Table 3 shows the overall degree of synchronization between EU-13 as an aggregate and the individual countries' cycles for the whole sample period.

Figure 1 shows three-year rolling sample correlations for quarterly data on GDP between EU-13 and Lithuania, Poland and Germany, the latter being graphed here for comparison purposes only.

The coefficients in Figure 1 refer to the end of the respective period, i.e. the latest available data for 1998Q1 reflect the average

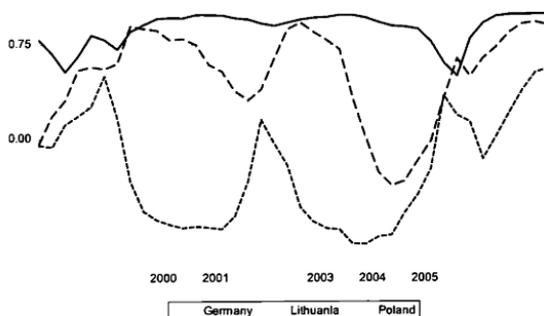


Figure 1. Correlation of cyclical components in real GDP with the euro area

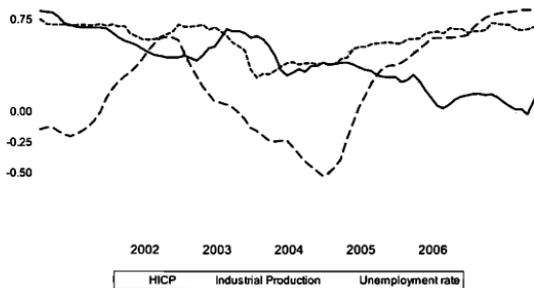
Source: our own calculations.

correlation of national developments and the euro area wide developments over the period from 1995 to 1998. This implies that references to particular periods have to be viewed from a broader perspective, with individual results possibly reflecting a number of events and major occurrences which continue to have an impact on the data. The visual impression indicates a strong co-movement with the euro area for Germany, whilst Poland and Lithuania exhibit significant synchronization

only in the most recent period. In case of both countries, this phenomenon may be explained by the moment of entering the European Union which took place in May 2004.

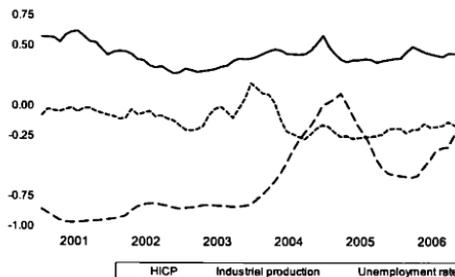
Figures 2 and 3 show the evolution over time of rolling 3-year correlations of monthly indicators for Poland and Lithuania respectively. In both figures, the cycle of the euro area aggregate appears as the reference value.

With regard to the synchronization of cyclical movements in Poland, the evidence



**Figure 2. Correlation of cyclical components between euro area and Poland**

Source: our own calculations.



**Figure 3. Correlation of cyclical components between euro area and Lithuania**

Source: our own calculations.

points to an increasing rather than decreasing synchronization since 2006, especially in industrial production and unemployment rate. Synchronization of the cyclical element of price increase with that of the euro area as a whole was characterized by relatively low correlation coefficients ranging from 0 to 0.25 during the last two years. However, in periods of relatively low inflation rates, more temporary country-specific factors may dominate, and it becomes increasingly difficult to disentangle cyclical movements from a purely statistical noise caused by all kinds of relatively small shocks to the price level (e.g. differing seasonal patterns, liberalization measures, administrative price changes and asymmetric effects caused by differences in the composition of the basket of consumer goods and services).

Synchronization patterns for Lithuania are different. While the correlation of the cyclical element of price developments remained relatively stable at around 0.5 for the examined period (see also Table 3), there is a noticeably lower degree of synchronization in the unemployment rate and industrial production compared with Poland. This surprising observation, especially in case of unemployment rate, has its origins in the high labour force migration from Lithuania to the countries

(mainly UK and Ireland) that decided to open their labour markets for the citizens of the new member states from the very beginning, i. e. from May 2004. The low correlation coefficient, therefore, is a statistical fact rather than a real economic phenomenon: in case of Poland, the unemployment rate has been diminishing more slowly, which has been more in line with the average rate for the euro area countries, while the Lithuanian unemployment rate has been decreasing faster, hence the correlation is lower. Labour force migration in case of both countries has been a kind of macroeconomic shock; therefore, more credible results of cyclical components synchronization will be possible to obtain for a few years.

Additionally, we have estimated the values of the leads/lags in the cycle components, which are denoted by  $i$ , and the corresponding highest correlation value  $|\rho_{\pm i}|$  between the euro area and the individual countries examined. Table 4 displays these results.

The interpretation of the results for this measure is the following: the zero value indicates that the contemporaneous correlation is the highest, negative values indicate that the euro area leads the country studied, while a positive number indicates the reverse. The price indexes for both countries perform the

Table 4. Leads or lags of the maximum correlation with euro area aggregate

Country \ Indicator	GDP		HICP		Unemployment rate		Industrial production	
	$i$	$ \rho_{\pm i} $	$i$	$ \rho_{\pm i} $	$i$	$ \rho_{\pm i} $	$i$	$ \rho_{\pm i} $
<b>Lithuania</b>	-2	0.46	0	0.51	0	0.59	-4	0.23
<b>Poland</b>	-1	0.53	0	0.52	-3	0.27	0	0.58

Source: our own calculations.

best in this respect, having a zero phase shift. The other variables show a diverse picture of lead-lag structure; for instance, the unemployment rate in the EU leads the Polish unemployment by 3 months, in contrast to a zero lag in the case of Lithuania.

## Conclusions

Our analysis has led to two main conclusions: labour markets in both countries are not highly flexible (especially the Polish labour market) and the business cycles are not strongly correlated with the euro area average, indicating that at the present moment common monetary policy could be a source of an asymmetric shock, so for Lithuania and Poland the current macroeconomic situation does not seem to be the optimal moment for entering the euro area.

For practical reasons, however, we think that the best strategy of joining the monetary union is the ASAP strategy. Recommending early terms for entering the euro area may work like a self-fulfilling forecast. It may stimulate the government to conduct the sound economic reforms which helps to fulfil the Maastricht criteria. Emphasizing the potential benefits of the common currency may help also to find the public support of this idea. In our opinion, discussing the scenarios of abandoning the process of entering the euro area may be perceived only in economic-fic-

tion terms because it would inevitably be followed by the costs of losing the country's investment credibility, which are even hard to assess. Poland and Lithuania are still emerging market economies, their currencies are not the major world currencies, so there is no chance for successfully repeating the UK case.

It is also necessary to note the questions that this paper does not investigate. It does not examine the sources of shocks, i. e. whether the business fluctuations are caused by supply or demand shocks. Many authors (for instance, Blanchard and Quah, 1989) have found that both demand and supply shocks contribute to fluctuations, the former dominating in the shorter frequencies and the latter becoming important in the longer run. Identifying the sources of shocks is important because monetary policy cannot deal with all types of shocks similarly. Another question our paper does not investigate is the channels of transmission of business cycles from one country to another. The empirical evidence discussed in the literature shows that openness, trade integration and a similarity of economic structures have a strong effect on international co-movements. Investigating the sources of shocks and the transmission mechanism of business cycles, however, exceeds the scope of this paper, but, in our opinion, both of these challenging issues should become the dominant areas of future research on monetary integration.

## REFERENCES

1. Artis, M., Zhang, W. (1995). International Business Cycles and The ERM: Is There a European Business Cycle?, *CEPR Discussion Paper No. 1191*.
2. Balcerowicz, L. (2008), *Ekonomia i etyka państwa socjalnego*, [http://www.wiedzainfo.pl/wyklady/104/ekonomia\\_i\\_etyka\\_panstwa\\_socjalnego.html](http://www.wiedzainfo.pl/wyklady/104/ekonomia_i_etyka_panstwa_socjalnego.html)

3. Bayoumi, T., Eichengreen, B. (1993). Shocking aspects of European integration. Torres F., Giavazzi F. (eds). *Adjustment and Growth in the Monetary Union* – Cambridge and New York, Cambridge University Press.

4. Blanchard, O., Quah, D. (1989). The Dynamic Effects of Aggregate Demand and Supply Disturbances. *The American Economic Review*, p. 655–673.
5. Borowski, J. (2001). Podatność Polski na szoki asymetryczne a proces akcesji do Unii Gospodarczej i Walutowej. *Bank i Kredyt*. Vol. Nov-Dec, p. 191–208.
6. Cooley, T., Dwyer, M. (1998). Business cycle analysis without much theory: A look at structural VARs. *Journal of Econometrics*, Vol. 83, p. 57–88.
7. Darvas, Z., Szapary, G. (2004). *Business cycle synchronization in the enlarged EU: comovements in the new and old members*, Centre For European Policy Studies Working Document No. 200.
8. European Parliament (1998), *Adjustment to Asymmetric Shocks*, Econ 104, [http://www.europarl.europa.eu/workingpapers/econ/104/chap1\\_en.htm](http://www.europarl.europa.eu/workingpapers/econ/104/chap1_en.htm)
9. ECB Monthly Bulletin (1999). *Longer-Term Developments and Cyclical Variations in Key Economic Indicators Across Euro Area Countries*.
10. Faust, J., Leeper, E. (1997). When do long-run identifying restrictions give reliable results?, *Journal of Business and Economic Statistics*, Vol. 15, No 3, p. 345–353.
11. Hodrick, R., Prescott, E. (1997), Post-war Business Cycles: An Empirical Investigation, *Journal of Money, Credit and Banking*, Vol. 29, p. 1–16.
12. Kenen, P. (1969). *The Theory of Optimum Currency Areas: An Eclectic View*, Monetary Problems of the International Economy (eds. R. Mundell, A. Swoboda) – Chicago: University of Chicago Press.
13. Łon, E. (2007). Dlaczego Polska nie powinna wchodzić do strefy euro? *Dyskusje i opinie na temat wprowadzenia euro*, [www.nbp.pl](http://www.nbp.pl).
14. McKinnon, R. (1963). Optimum Currency Areas. *American Economic Review*, Vol. 53 (September), p. 717–725.
15. Mundell, R. (1961). Optimum currency areas. *American Economic Review*, Vol. 51, No. 4.
16. Reichlin, L. (ed.) (2005). *The Euro Area Business Cycle: Stylized Facts and Measurement Issues*, CEPR.