ISSN 1392-2785 ENGINEERING ECONOMICS. 2005. No 4 (44)
ECONOMICS OF ENGINEERING DECISIONS

Baltic States Business Cycle Symmetry: Shock Correlation Approach

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Paper intends to shed the light on the Baltic States (Lithuania, Latvia and Estonia) business cycle symmetry as compared to selected countries. Structural vector autoregressive model is employed in order to recover the underlying demand and supply shocks and further calculate correlation coefficients. Data for estimation covers ten years period starting with the end of 1993. Bivariate model includes real GDP as a proxy for output and consumer price index as a proxy for prices.

Our research is interesting in numerous aspects. First, all new EU countries compulsory must join European monetary union. The Baltic States expressed desire to be among the first entrants and join euro as soon as possible, preferably at the beginning of 2007. However, this might be a risky decision. If these countries will experience asymmetric shocks and subsequently diverging business cycles, grave consequences like output loss and rise in unemployment may arise. Since the Baltic countries are geographically and economically perceived as EU "periphery" we check the hypothesis that their shocks might be uncorrelated with "core" EMU member shocks. Low correlation would suggest that at least currently these countries are not suitable candidates for euro zone.

Our estimation indeed discloses troubling signs in this aspect. Symmetry among Baltic States and other EU countries business cycles is low. This findi7ng clearly signals about potential welfare losses arising from asymmetric shocks after euro accession. We find that demand shock correlations with euro area are negative in case of Estonia and Lithuania and very low in case of Latvia. Supply shock correlation with EU is positive for all three countries, but does not exceed 0.5. Estonia has the closest supply shock correlation with individual countries (what might be due to large amounts of foreign direct investment), while Lithuania has the highest correlation with EU "core" and whole euro zone.

Second, fixed exchange rate regimes, implemented in Lithuania and Estonia, create auspicious conditions to check the hypothesis about cycle importation from currency anchor country. However, correlation of demand shocks among fixed exchange rate pairs Lithuania-USA and Estonia-Germany is negative. Hence in case of Lithuania and Estonia theoretical prediction of policy importation fails.

Third, correlation of demand and supply shocks with major trading partners was calculated in search for business cycle similarities. Hypothesis that trading partners have similar business cycles in most cases is supported by data.

Finally, research reveals some specific features of Baltic business cycle. Demand and supply shocks among Lithuania, Latvia, Estonia and Poland in most cases are highly positively correlated. This suggests that some shocks might have been specific to economic reforms undertaken during transition and further development in the region. Demand shock correlation on average is lower than supply shock correlation. This finding goes in line with the results of similar research done on other Central and Eastern European countries. However, we think that increasing trade volumes with EU members and common EMU policies may alleviate the particular problem and force more converging business cycle fluctuations.

Keywords: *Baltic countries, euro accession, demand and supply shock symmetry, shock correlation.*

Introduction

Enlargement of the European Union brings many changes and challenges for its old and new members. All the new member states must compulsory join the European Monetary union. Baltic States intend to enter euro zone as soon as possible, namely at the beginning of 2007. However, even "old" Europe is not considered to be a real optimum currency area, there is "core" and "periphery". Ten new EU members are believed to be even further from the "core" than the existent periphery. Hence situation indicates two problems. First, diverging business cycles caused by asymmetric shocks may threaten the viability of monetary union as a whole. Second, it may have grave consequences on individual members, experiencing asymmetric shock. The latter problem might be serious for the Baltic countries, since structure and processes they undergo differ significantly from euro members like Germany or France.

Therefore **major goal of our research** is the investigation of the Baltic States business cycle symmetry using shock correlation approach. We will not limit our comparison only to euro zone, but compare Baltic shocks to shocks in broad range of other countries, including majority of EU members, USA, and important trading partners not belonging to EU. This allows us to check few more interesting hypotheses: do Baltic States have similar business cycles to closest neighbours? Does fixing exchange rate leads to convergence of business cycles with the country to which currency domestic currency is fixed?

The research on shock symmetry in future EU candidates is not new. It started to grow at the end of 1990s, when accession perspective became real. However, most studies concentrate on more developed Central and Eastern European countries (CEECs), namely Check Republic, Hungary, Slovenia, Poland. Baltic countries were usually

ignored and omitted from sample due to the small size of their economies or lack of reliable data. Hence we will fill the existing gap and provide thorough estimation on shock symmetry using the latest data.

The paper is organized as follows. First part provides broad review of current empirical studies dealing with shock symmetry of Central and Eastern European countries with euro area or major EU countries. This reveals techniques currently used and gives benchmark for comparison.

Second part discusses data, methodology and few problems encountered in estimation.

Third part presents results and interpretation. Final part concludes.

Shock symmetry in European Union and Central and Eastern European countries

Probably the first empirical research on shock symmetry in Central and Eastern European countries (CEECs) was the study by Frenkel et al. (1999). The authors followed Bayoumi and Eichengreen technique for shock extraction. Germany and France was used as comparison benchmark. The results revealed great variety of shocks: some of them were symmetric (positive correlation), some not; the magnitude of calculated coefficients differed significantly. The authors also estimated the response functions of shocks and the results led them to the conclusion that even symmetric shocks may cause possible problems and in some cases require monetary adjustment.

Horwath (2002) used eight CEECs and four EU countries (Germany, France, UK and Italy) to assess the correlations of supply and demand shocks. Once again, the picture was mixed, e.g. Slovenia exhibited positive supply and demand shock correlation with France and UK, but almost no correlation with Germany. Correlation of supply shocks between Hungary and Germany was relatively high (0.28), but correlation of demand shocks for the same country pair was negative (-0.40). Surprisingly Poland, German neighbour, showed almost no correlation with German shocks. Overall level of correlation coefficients was very low. This led them to the conclusion that giving up monetary policy for some of CEECs may be problematic.

Some other studies addressed the degree of business cycle correlation directly. Boone and Maurel (1998) calculated the correlation coefficients between the cyclical components of industrial production and unemployment rates for seven CEECs with Germany (as a most important EU country) and EU as a whole. Interestingly, they found that correlations with Germany were quite high, but low for EU as a whole.

Boone and Maurel (1999) further estimated univariate time series model, taking unemployment rate in accession country, using its own lags and those of EU unemployment. First, they tried to discover what part of variation in unemployment rate could be explained by EU or German shock and then what is correlation of shock propagation. Once again they found high correlation with Germany and concluded that the best option for many accession countries would be monetary union with Germany.

Korhonen (2001) studied short-term business cycles in EMU and CEECs. He proved that most of previous "first wave" CEECs are better integrated than "second wave"

Finally, recent study of Firdmuc and Korhenen (2003) showed that business cycles of CEECs were "catching up" in the end of 1990s and beginning of 2000s when EU was experiencing the economic slowdown.

Shock symmetry estimation for the Baltic countries

Supply and demand shocks in selected countries were identified using Vector Autoregressive technique. Business cycle symmetry could further be evaluated from shock correlation coefficients.

Methodology. The methodology follows the Bayoumi-Eichengreen approach, expressed in their article "Shocking aspects of European Monetary unification" (1993), who adopted procedure proposed by Blanchard and Quah (1989). They assume that shocks hit the economy push it from equilibrium. There are two types of shocks: demand shocks and supply shocks. Shocks and the response to them (evolution of business cycle) are identified decomposing macroeconomic fluctuations.

In order to find the transformation matrix, which allows to regain shocks from two variable VAR, four restrictions are needed. Theoretical restriction comes from traditional AS-AD setup, where aggregate demand curve is downwards sloping both in the short and long run, but aggregate supply curve is upwards sloping only the short run and vertical in the long run. Such setup of economy implies that demand shocks will have permanent effect on prices, but only temporary effect on output. Supply shocks will have permanent effect on both. This restriction along with technical requirement for normalization[1] (two restrictions) and orthogonality[2] (last restriction) helps to structure vector autoregressive (VAR) model and regain underlying demand and supply shocks from estimated model's residuals.

For two variables in our model real GDP (taken in log-difference form) and changes in consumer price index (CPI in log-difference form) were chosen as best proxies for output and prices.

Data sources and sample selection. The data for econometric estimation was taken from IMF International Financial Statistics database. The quarterly data comprises real GDP and CPI for selected sample countries: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Netherlands, Norway, Russia, Spain, Sweden, United Kingdom and United States. Most of our sample countries are EU members. Russia, Poland and Norway were included due to high share of Baltic imports and exports. USA was added to the sample, since Lithuania had a fixed exchange rate regime against US dollar, therefore theoretically Lithuanian business cycles or at least its demand shocks should be similar to the ones of United States.

Two data frequencies were used: quarterly and annual. The sample period for quarterly data started with the last quarter of 1993 and ended with the fourth quarter of 2003. Thus sample contained 40 observations after differentiation. Data was deseasonalized using multiplicative moving

[1] $\text{var}(\varepsilon_t^p)=\text{var}(\varepsilon_t^y)=1$

[2] $\text{cov}(\varepsilon_t^p, \varepsilon_t^y) = 0$

average method (except data on Germany, France, Italy, Spain, United Kingdom and United States, which were already seasonally adjusted in IFS database). The GDP series for Russia were "GDP, based on production". The data for Poland was available only on annual basis.

All the GDP data for Western European countries was translated from their national currencies into euros[3] in order to avoid the structural break, associated with currency denomination change and also for aggregation purpose. Data for Estonia, Latvia, Lithuania, Russia and United States was left in national currencies. Data for European Union GDP was generated by aggregating the national quarterly GDP of following member states: Austria, Belgium, Denmark, Germany, Finland, France, Italy, Netherlands, Spain, Sweden and United Kingdom (for other EU member states some data was missing, therefore we had to excluded them from our sample). CPI was constructed using same countries' GDP weighted inflation.

Data for euro area was aggregated in a similar manner, only excluding the non-euro members.

Stationarity issue. Data in unprocessed form was non-stationary. For VAR estimation we took first differences of logarithms of real GDP and CPI. In differentiated form almost all the series appeared to be stationary, as suggested by ADF and KPSS tests.

Lag length determination. Model cannot be solved without lag length determination. Current Eviews version allows checking the best lag length with quite simple procedure. Two years lag for almost all sample countries was selected as best option, thus two years lag was uniformly imposed. However, we encountered problem determining lag length for quarterly data. Lag length for economies in transition and developed economies was significantly different. Optimal lag length for developed countries tended to be shorter, while for transitional economies in some cases it ran up to 12 lags. There was no uniformity among countries, nor among the lag length criteria for the same country. Usually Scwartz criterion (which penalizes for additional lags) selected shorter length, while Akaike preferred the longer lagged period. A possibility to use different lag length for each country exists. Unfortunately, the choice of either only one criterion or majority of criteria is arbitrary. Since literature on VARs estimation in general and on Baltic States in particular suggests lagged response of one-two years, we decided to choose uniform length of four and six lags on quarterly data.

Table 1

Correlation coefficients between shocks using 4 and 6 lags

	Estonia	Latvia	Lithuania
Demand shocks	0.87	0.76	0.79
Supply shocks	0.79	0.84	0.78

A table 1 shows that results, obtained by imposing four or six lags, do not differ significantly (as their high mutual correlation suggests).

Finally, economic rationale suggests that a certain shock may have full impact on different economies with small time delays, e.g. a negative shock that hits Finish economy in particular quarter may reach Estonian economy only few quarters later. In this case shock correlation based on quarterly data would be underestimated (coefficients biased downwards). In order to avoid this problem we constructed aggregated annual shock series by computing the average of quarterly demand shocks for each year of the sample, each country (and similarly constructed aggregated supply shock series). This last type of data is most efficient since it contains more information than annual data and accounts for transmission period, ignored in quarterly data.

Quality of shock extraction procedure. Demand and supply shock series retrieved by SVAR technique using aforementioned four types of data represented reality sufficiently well. Quarterly data, since it is much noisier, extracted more shocks than annual or quarterly aggregated data. The latter two types of data picked out only the biggest shocks. Clearly main shocks that hit Baltic countries are attributable to the consequences of financial crisis and Russian crisis. The two crises seem to have had strong impact on demand as well as supply side. In order to save space details on extracted demand and supply shocks will not be provided, but can be obtained upon request.

Shock correlation estimation. Correlation of demand and supply shocks was calculated between three Baltic States and selected single countries plus European Union and Euro area.

Correlations were calculated for shock series identified by SVAR technique using all four above-described data series. Our results revealed the following pattern:

1. Correlation coefficients based on aggregated as well as unprocessed annual data were much higher in magnitude with comparison to quarterly data;
2. Allowing for few quarters transmission of the shocks increases the number of positive correlation coefficients, especially on supply side.

Bearing in mind the disadvantages of quarterly data (does not allow for short time delays of one or few quarters, may contain too much noise) and of unprocessed annual data (only 10 observations after differentiation), the results and interpretation will be presented for aggregated annual data. However, we will refer to quarterly and annual data results for robustness confirmation. Precise results of quarterly and annual data can be obtained upon request.

Priori expectations. *A priori* correlation coefficients of the shocks were expected to be highly positive for the major trading partners: Baltic neighbours, Scandinavian countries, Russia and Germany. On the contrary, for the countries with no trade links we expect null or negative correlation.

We further expected high positive demand shock correlations with the countries, from which monetary policy was (at least theoretically) imported. Such country pairs were:

- Lithuania-USA for the period 1994-2002;
- Estonia-Germany at least for 1992-1999.

Finally, examining shock symmetry we hoped to find highly positive correlation coefficients with euro zone and "core" euro countries. This would prove that Lithuania, Latvia and Estonia are suitable candidates to EMU and will

[3] Year 1999 taken as base period

have no problems associated with output stabilization. Other findings (no correlation or negative correlation) would imply that joining European monetary union might provoke economic tensions and potential recessions (especially in the case of highly negative correlation coefficients, which stand for asymmetric shocks).

Results and interpretation

Our results clearly show close mutual integration of Baltic economies. Lithuania and Estonia experience very similar demand shocks, while Latvian shocks are somewhat different. However, the difference is not very pronounced, since Latvian demand shocks correlation with Estonian and Lithuanian demand shocks is positive and on average 0.4, a relatively high coefficient. The result holds for both types of shocks and is very robust (coefficients obtained according to all types of data, do not vary over time). The reason for this result must be trade link: Lithuania, Latvia and Estonia extensively trade with each other and have common import and export markets.

Supply shock correlation among Baltic countries is also positive. As correlation coefficients suggest, Lithuania and Latvia experience almost identical supply shocks (correlation exceeds 0.9). Estonian supply shocks are also positively related to Latvian and Lithuanian, but correlation, especially with Latvia, is not high. Such pattern can be partially justified by underlying similarities of economic restructuring processes and partially by different investment decisions. Estonia throughout the first decade of independence was among the top FDI receivers. Scandinavian countries, especially Finland, invested heavily because of close cultural ties and bright Estonian prospects what in the future indeed became self-fulfilling prophecy. Capital flows to Latvia and Lithuania were much smaller and they lagged in the end among receivers before EU entrance.

Our speculation that countries underwent similar restructurisation processes which in turn caused high supply shock correlation and similar business cycle reasons is further confirmed by high supply shock correlation among all three Baltic countries and Poland, also an economy that underwent transition.

Having exposed main similarities we turn to detailed discussion of results. First we'll overview demand shock correlation and then proceed to supply side.

Demand shock correlation. Results presented in tables 2 and 3 clearly show that correlation of demand shocks is lower than correlation of supply shocks. This is not uncommon result – even in the original Bayoumi, Eichengreen (1992) article supply shocks were found to be more symmetric than demand shocks across Europe. Works on Central and Eastern European countries, like Fidrmuc and Korhonen (2001, 2003), Cortinhas (2002), Horwath (2003), Kucerova (2003) identify similar phenomenon.

Demand shocks are mainly policy induced, e.g. they can arise due to fiscal or monetary policy changes. They can be of foreign origin, such as output contraction in trade partner country or general recession. Evidently accession to European Union and especially to euro zone will change the demand shock induced business cycle divergence. Common Central Bank putting limits on monetary expansion together with Stability and Growth Pact restricting fiscal policies will lessen domestic demand shocks. Further integration into EU market with common outside customs will increase inter-European trade linkage and diminish the scope of external demand shocks. Recent study by Fidrmuc and Korhonen (2003) already revealed closer synchronization of new and old EU members' business cycles throughout 2000-2002. However, our calculations that cover shock correlation throughout ten-year period produced low demand shock coefficients with European Union. For Latvia this coefficient is positive, for Estonia and Lithuania they are negative. Same holds for euro zone. In case of Estonia negative demand shock correlation with euro zone is even greater, almost -0.3. This might seem troubling, but possibly can be explained by Estonian trade direction, especially EU "periphery" Finland. However, demand shock correlation with other Scandinavian neighbours is negative or insignificant.

Table 2

Demand shock correlation coefficients

	Estonia	Latvia	Lithuania
Estonia	1	0.43	0.70
Latvia	0.43	1	0.36
Lithuania	0.70	0.36	1
EU	-0.22	0.12	-0.27
EURO	-0.28	0.15	-0.16
Austria	0.01	0.66	0.41
Belgium	-0.01	0.11	-0.30
Denmark	-0.12	0.53	-0.25
Finland	0.52	0.63	-0.21
France	-0.26	-0.04	0.39
Germany	-0.03	0.60	0.00
Italy	-0.14	-0.01	-0.48
Netherlands	-0.24	0.45	0.33
Spain	-0.07	-0.77	-0.30
Sweden	0.15	0.48	0.13
UK	-0.09	0.25	-0.40
Norway	-0.25	-0.13	-0.13
Russia	0.14	0.29	-0.06
Poland*	0.56	0.20	0.68
US	-0.70	-0.11	-0.38

**Calculations in case of Poland are based on annual data*

Lithuania has high demand shock correlations with few "core" countries, like France, Austria, Netherlands.

Latvia, according to estimation has links with Germany, Austria, Sweden, Denmark, and the Netherlands.

None of Baltic countries have similar demand shocks as Southern European countries Italy, Spain, and United States of America as indicated by all negative coefficients. This supports theoretical belief that trade strongly influences demand spillovers.

Data forms overall impression that Latvia has highest demand shock correlations with European countries, while for Estonia and Lithuania any clear pattern that could be supported by trade data cannot be identified. Both for Estonia and Lithuania demand correlation coefficients with majority of European countries tend to have negative sign or be insignificant.

Supply shock correlation. As already mentioned, correlation of Baltic-European supply shocks is higher, at least for Estonia and Lithuania.

Supply shocks of all the three countries are strongly negatively correlated with Russian supply shocks (-0.7 for Latvia and Lithuania, -0.6 for Estonia), especially if few quarters for transmission are allowed. Quarterly data indicated strong negative correlation only for Latvia, while for Lithuania and Estonia there was almost no correlation.

Table 3

Supply shock correlation coefficients

	Estonia	Latvia	Lithuania
Estonia	1.00	0.34	0.19
Latvia	0.34	1.00	0.91
Lithuania	0.19	0.91	1
EU	0.44	0.16	0.39
EURO	0.20	0.28	0.42
Austria	0.54	0.12	0.24
Belgium	0.00	0.35	0.52
Denmark	-0.02	0.07	0.32
Finland	0.26	0.05	-0.09
France	0.52	0.10	0.11
Germany	0.36	0.43	0.63
Italy	0.71	0.05	-0.05
Netherlands	0.08	-0.22	-0.36
Spain	0.64	0.08	-0.09
Sweden	0.59	0.05	0.01
UK	0.39	-0.19	-0.27
Norway	0.77	0.12	-0.11
Russia	-0.60	-0.71	-0.70
Poland*	0.73	0.58	0.66
US	0.22	0.00	-0.10

**Calculations in case of Poland are based on annual data*

All three countries exhibit positive correlation coefficients with European Union. For Estonia this coefficient is the biggest, showing that almost half of supply shocks experienced by Estonian economy coincide with EU supply shocks. Slightly worse situation is for Lithuania (coefficient 0.39). Unfortunately for Latvia this coefficient is relatively low, though positive.

For Euro Area correlations of Lithuanian supply shock (coefficient 0.42) by far exceed the one of Estonia (0.20), since Lithuania seems to have closer links with the "core" of EU, while Estonia has closer links with "periphery", especially its Scandinavian neighbours. Supply shock correlation for Latvia with Euro zone is 0.28, showing closer ties with the "core" than the "periphery".

Though Estonian supply shock correlation with Euro zone is the smallest, on average they are more correlated with individual European countries than the ones of Latvia and Lithuania. This can be partially explained by close ties between Estonia and Scandinavia; also by fastest economic growth in this country and perceived "credibility", which let to the biggest portion of FDI received.

Lithuanian and Latvian supply shocks seem to move very closely with EU "core" countries, e.g. both countries have high correlation coefficients with Germany and Belgium, Lithuania on average exceeding Latvia.

In general all three Baltic countries have positive supply shock correlation with majority European countries in our sample. Bearing in mind that supply shocks signify changes in productivity or technology high correlation among such country pairs as Estonia-Spain, which at first sign seems to be spurious, might be justifiable. Finally, strong correlation among Baltic countries and Poland emphasizes importance of transition period.

Conclusions and final remarks

In this paper, we assessed the correlation of supply and demand shocks of Lithuania, Latvia and Estonia as compared to selected countries between 1993-2003. Supply and demand shocks were recovered from structural vector autoregressive model.

Our estimation shows low correlation among Baltic States and other European countries shocks. This is important finding in the context of EMU accession since it clearly signals about potential welfare losses arising from asymmetric business cycles.

Lithuania, Latvia and Estonia exhibit either negative or almost null demand shock correlations with euro area. Correlation of supply shocks with EU is positive for all three countries, but does not exceed 0.5. Estonia has closest supply shock correlation with individual countries (what might be due to large amounts of foreign direct investment), while Lithuania has highest correlation with EU "core" and euro zone.

Demand shock correlation on average is lower than supply shock correlation. This finding goes in line with results of similar research done on other Central and Eastern European countries.

Correlation of demand shocks among fixed exchange rate pairs Lithuania-USA and Estonia-Germany is negative. Therefore we conclude that theoretical prediction of policy importation fails.

Hypothesis that trading partners have similar business cycles in most cases was supported by data.

All three countries have high mutual correlation of their business cycles. Correlation is also high with Polish business cycles. This suggests that some shocks might have been specific to economic reforms undertaken during transition and further development in the region.

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Baltijos šalių verslo ciklų simetriškumas žvelgiant iš šokų koreliacijos perspektyvos

Santrauka

Europos Sąjungos plėtra sąlygos daug pasikeitimų tiek senosiose jos narėse, tiek ir naujosiose. Baltijos šalys – Lietuva, Latvija, Estija – ketina įstoti į Europos monetarinę sąjungą kuo anksčiau, būtent 2007-ųjų pradžioje. Tokio žingsnio pagrįstumas kelia abejonių, ypač turint omenyje, jog net senosios narės nėra optimali bendros valiutos zona. Vienas pagrindinių kriterijų, pagal kurį sprendžiama apie šalių tinkamumą formuojant monetarinę sąjungą, yra jų verslo ciklų simetriškumas. Skirtingi verslo ciklai reikalauja skirtingo ekonominės politikos atsako. Atskira šalis ar šalys, priklausančios monetarinei sąjungai, tačiau patiriančios asimetriškus svyravimus, negali naudoti individualios politikos ir todėl rizikuoja pereiti skausmingą BVP nuosmukio ir nedarbo kilimo laikotarpį. Baltijos šalys, geografiškai ir ekonomiškai priskirtinos prie ES periferijos, gali patekti į šią didesnės rizikos grupę.

Mūsų darbo tikslas yra Baltijos ciklų simetriškumo tyrimas. Simetriškumą mes nustatome pasitelkę šokų koreliacijos metodiką. Baltijos šalių ciklus lyginame su daugeliu kitų šalių (eurozonos, pavienių senosios ES narių ir pagrindinių prekybos partnerių nepriklausančių ES) ciklais. Į sąrašą įtraukėme ir JAV, nes Lietuva ilgą laiką buvo susiejusi savo valiutą su JAV, o Estija – su Vokietija, todėl galėjome patikrinti hipotezę, jog monetarinė politika yra "importuojama" iš pagrindinės valiutos šalies (o dėl to verslo ciklai tarp susietos valiutos šalių tampa simetriški).

Savo darbe pirmiausia apžvelgiame kitų autorių darbus, skirdami dėmesį empirinėms studijoms, susijusioms su simetriškumo vertinimu Centrinės ir Rytų Europos (CRE) šalyse. Tai padeda atskleisti tam tikrus dėsningumus bei parodo, jog Baltijos šalys dėl savo ekonomikos dydžio ar dėl statistinių duomenų trūkumo dažniausiai būdavo ignoruojamos ir netiriamos. Tikimės, kad šis darbas užpildys egzistuojančią spragą.

Šalių kandidačių tinkamumu Europos monetarinei sąjungai (EMS) pradėta domėtis devintojo dešimtmečio pabaigoje, kai stojimo į ES tikimybė tapo reali. Pirmasis išsamus darbas (Frenkel ir kt., 1999) atskleidė didelę šokų įvairovę: kai kurie šalių kandidačių šokai buvo simetriški, kai kurie – ne. Autoriai apskaičiavo ir atsako į šokus funkciją; rezultatai rodė, jog bent daliai CRE šalių stoti į EMS yra netikslinga. Panašią išvadą priėjo ir Horwath (2002), kuris matavo simetriškumą tarp aštuonių CRE šalių ir keturių ES senbuvių. Autoriams, kurie rėmėsi alternatyviomis metodikomis, pvz., koreliacija tarp ciklinių komponentų, trumpalaikių ciklinių svyravimų ar nedarbo lygio (Boone ir Maurel,1998; Korhonen, 2001), pavyko išsiaiškinti, jog CRE šalių ciklai yra gana simetriški Vokietijos ciklų atžvilgiu, tačiau asimetriški visos euro zonos ciklams. Optimistiškiau nuteikia tik Firdmuc ir Korhenen (2003) rezultatai, nes jie parodo simetriškumo didėjimą tarp senųjų ir naujųjų ES šalių laikui bėgant. Šis procesas ypač paspartėjo pastaraisiais metais, kai senųjų narių ekonominė plėtra yra sulėtėjusi.

Darbe išsmiai aptariame duomenis ir metodologiją, kuriais remiantis identifikuojame ekonominius šokus ir apskaičiuojame koreliacijos koeficientus. Duomenis ėmėme iš Tarptautinio Valiutos fondo duomenų bazės. Rezultatų patikimumui patikrinti naudojome ketvirtinius ir metinius duomenis bei agreguotus metinius duomenis. Gauti rezultatai ryškiai nesiskyrė, todėl trumpumo pateikėme agreguotų duomenų apskaičiavimus, kurie leidžia šokų transmisijai atsilikti kelias ketvirčiais.

Mums pavyko gauti dešimties metų duomenis, kurie prasideda paskutiniu 1993 metų ketvirčiu. Simetriškumui nustatyti buvo pasirinktos šios šalys: Austrija, Belgija, Danija, Didžioji Britanija, Estija, Italija, Ispanija, Jungtinės Amerikos Valstijos, Latvija, Lietuva, Lenkija, Norvegija, Olandija, Prancūzija, Rusija, Suomija, Švedija ir Vokietija. Prieš pradedant ekonometrinius skaičiavimus, iš duomenų pašalintas sezoniškumas naudojant multiplikacinį slenkamojo vidurkio metodą (išskyrus Vokietijos, Prancūzijos, Italijos, Ispanijos, Didžiosios Britanijos ir JAV duomenis, kurie duomenų bazėje buvo pateikti jau įvertinus sezoniškumą). Rusijos duomenys buvo "BVP, nustatytas remiantis gamybos apimtimis". Lenkijos duomenys buvo tik metiniai.

Europos Sąjungos duomenys apskaičiuoti sumuojant įtrauktų šalių BVP. Vartotojo kainų indeksas sukonstruotas svorį suteikiant pagal BVP dydį. Euro zonos duomenys apskaičiuoti analogiškai neįtraukiant euro zonai nepriklausančių šalių.

Savo darbe pasirinkome struktūrizuotą vektorinį autoregresinį modelį. Modelyje naudojome du kintamuosius: realųjį BVP ir vartotojo kainų indeksą. Abu kintamieji imti logaritmine pirmojo skirtumo forma, o tai užtikrina duomenų stacionarumą (patvirtinta ADF ir KPSS testais). Metodologija buvo parinkta sekant Bayoumi ir Eichengreen, kurie pritaikė Blanchard and Quah (1989) procedūrą šokams identifikuoti. Jie teigė, kad šokai išveda ekonomiką iš pusiausvyros ir sąlygoja ciklinius svyravimus. Daroma prielaida, jog šokai yra tik dviejų tipų: pasiūlos ir paklausos. Visuminės paklausos kreivė modelyje yra žemyn besileidžianti tiek trumpu, tiek ilgu laikotarpiu, o visuminės pasiūlos kreivė yra kylanti trumpu laikotarpiu, tačiau vertikali ilgu. Dėl šios priežasties paklausos šokai daro ilgalaikį poveikį kainoms, tačiau trumpalaikį poveikį BVP. Pasiūlos šokai daro ilgalaikį poveikį ir kainoms, ir BVP.

Šis teorinis apribojimas kartu su techniniais reikalavimais (normalizacija ir ortogonalumas) leidžia struktūrizuoti vektorinį autoregresinį modelį ir išgauti iš apskaičiuotų modelio liekamųjų pasiūlos ir paklausos šokus. Apskaičiavę Lietuvos, Latvijos ir Estijos šalių šokus, diagnozavome, jog modelis veikia gana patikimai. Pagrindiniai šokai buvo susiję su bankų sektoriaus krize ir Rusijos krize, palietusia visas tris Baltijos šalis. Ketvirtiniai duomenys identifikavo daugiau šokų, metiniai mažiau.

Remiantis šokų seka apskaičiuoti koreliacijos koeficientai, atspindintys verslo ciklų simetriškumą tarp Baltijos šalių ir kitų pasirinktų šalių. Kadangi rezultatai buvo panašūs, o tinkamiausi analizei yra agreguoti ketvirtiniai duomenys (kuriuose daroma prielaida, kad išorinis šokas gali pasiekti šalį tik po vieno ar net dviejų ketvirčių), straipsnyje interpretacija pateikta būtent pagal šios duomenų grupės apskaičiavimus.

Gauti rezultatai atspindi glaudžią Baltijos šalių tarpusavio integraciją. Lietuva ir Estija patiria labai panašius paklausos šokus. Latvijos šokai šiek tiek skiriasi, tačiau nedaug. Visi koeficientai teigiami. Manome, jog tokia situacija susiklostė dėl panašios ekonomikos raidos ir intensyvios tarpusavio prekybos. Pasiūlos šokų koreliacija tarp Baltijos šalių taip pat aukšta. Lietuvos ir Latvijos pasiūlos šokai beveik identiški (koreliacijos keficientas viršija 0.9), Estijos šokų koreliacija taip pat teigiama, tačiau koeficientų išraiška, ypač su Latvijos šokais, nėra didelė. Manome, jog teigiamą koreliaciją nulėmė panašūs ekonomikos restruktūrizavimo procesai, o Estijos išskirtinumą paaiškina dideli investicijų srautai iš Vakarų Europos. Dar pastebima labai aukšta koreliacija su Lenkijos ciklais, o tai leidžia daryti išvadą, jog daugelio šokų kilmė šiose šalyse buvo ekonomikos reformos ir restruktūrizacija, būdinga pereinamajam laikotarpiui.

Baltijos šalių paklausos šokų koreliacija vidutiniškai yra mažesnė nei pasiūlos. Šis reiškinys pastebimas daugelio autorių, nagrinėjančių Europos verslo ciklų sinchroniškumą. Kadangi paklausos šokai dažniausiai kyla dėl skirtingos fiskalinės ar monetarinės politikos, ši problema gali būti lengviau išspręsta nei pasiūlos šokų, kurie atspindi realius ekonomikos pokyčius. Manome, jog tarptautinės prekybos intensyvėjimas tarp Europos šalių dėl bendros vidaus ir išorinių muitų politikos taip pat sąlygos paklausos šokų vienodėjimą. Deja, nors perspektyvoje ši problema gali švelnėti, apskaičiuoti koeficientai rodo blogą situaciją. Paklausos šokų koreliacija analizuojamu 10 metų laikotarpiu buvo neigiama Estijos ir Lietuvos atveju. Latvijos atveju ji buvo teigiama, tačiau žema. Koreliacija su euro zonos šokais taip pat neigiama arba žema ("Lietuva – euro zona" koeficientas –0.16, "Latvija – euro zona" koeficientas 0.15, "Estija – euro zona" koeficientas –0.28).

Kalbant apie simetriškumą su visos ES ciklu, bendrosios pasiūlos padėtis geresnė nei paklausos. Visi koeficientai teigiami, pirmauja Estija, kurios pusė pasiūlos šokų yra identiški su ES šokais. Lietuvos atveju koeficientas yra 0.39. Padėtis kiek skiriasi simetriškumo su euro zona atžvilgiu. Čia pirmauja Lietuva, kurios susietumo koeficientas 0.42. Estijos koeficientas tesiekia 0.2 ir tai tikriausiai paaiškinama glaudesniais Estijos ryšiais su Skandinavijos šalimis, kurios priklauso euro "periferijai". Latvijos koeficientas 0.28.

Taigi susumavus rezultatus galima teigti, jog Baltijos šalių verslo ciklų simetriškumas su euro zona yra žemas. Tai signalizuoja apie potencialius gerovės nuostolius įstojus į euro zoną ir leidžia daryti išvadą, kad bent jau šiandien Lietuva, Latvija ir Estija nėra tinkamos kandidatės euro zonai.

Analizuojant koreliaciją su pavienėmis šalimis, galime diagnozuoti, kad Estijos paklausos šokai labiausiai susiję su Suomijos (koreliacijos koeficientas 0.52). Latvijos paklausos šokai teigiamai koreliuoja su daugelio ES narių šokais, tuo tarpu Estijos ir Lietuvos šokų koreliacija dažniausiai yra menka arba neigiama. Asimetriškiausi yra Baltijos ir Pietinės Europos šalių paklausos šokai. Neigiama koreliacija su JAV šokais. Taigi hipotezė, jog prekybos partnerių ciklai sinchrozinuojasi, pasitvirtinta. Tai leidžia tikėtis, jog ateityje Baltijos šalių verslo ciklai panašės su Europos senbuvių ciklais.

Tikrinant ekonominės politikos "importavimo" per valiutos susiejimą hipotezę, apskaičiuotas toks susietumas: Lietuvos šokų koreliacija su JAV abiem atvejais neigiama (paklausos šokų koeficientas -0,38, pasiūlos šokų koeficientas -0,10). Estijos su Vokietija koreliacija neigiama paklausos šokų atveju (-0,03), tačiau teigiama pasiūlos šokų atveju (0,36). Kadangi turėtume pastebėti aukštą paklausos šokų susietumą, šią hipotezę tenka atmesti.

Raktažodžiai: *Baltijos šalys, prisijungimas prie euro zonos, verslo ciklų simetriškumas, šokų koreliacija.*

The article has been reviewed.

Received in March, 2005; accepted in October, 2005.