

LONG-RUN RELATIONSHIP BETWEEN EXPORTS AND IMPORTS IN TRANSITION EUROPEAN COUNTRIES

Ahec Šonje, Amina; Podobnik, Boris; Vizek, Maruška

Source / Izvornik: **Ekonomski pregled**, 2010, 61, 3 - 18

Journal article, Published version

Rad u časopisu, Objavljena verzija rada (izdavačev PDF)

Permanent link / Trajna poveznica: <https://um.nsk.hr/um:nbn:hr:213:795158>

Rights / Prava: [In copyright](#)/[Zaštićeno autorskim pravom.](#)

Download date / Datum preuzimanja: **2024-11-18**



Repository / Repozitorij:

[The Institute of Economics, Zagreb](#)

Amina Ahec Šonje*
Boris Podobnik**
Maruška Vizek***

UDK 330.101.541:339.72.053.1
JEL Classification F17, F32, F41
Original scientific paper

LONG-RUN RELATIONSHIP BETWEEN EXPORTS AND IMPORTS IN TRANSITION EUROPEAN COUNTRIES

An important aspect of macroeconomic policy is to monitor the time path of the current account, which can be considered as a measure of national net indebtedness. If current account deficit is stationary, the external debt is sustainable. In this paper we test the long-run relationship between imports and exports in sixteen transition European countries, using quarterly data from different years in the 1990s to the end of 2006. In order to test the possible cointegration between exports and import in the sample countries, we apply the Johansen approach. We find existence of cointegration in 10 out of 16 analyzed countries. However, restrictions on long run coefficient suggest that current account deficit is sustainable only in 5 countries.

Key words: Johansen cointegration, exports, imports, current account sustainability

1 Introduction

An important aspect of macroeconomic policy is to monitor the time path of the current account, which is generally taken as the measure of change in the level

* A. Ahec Šonje, Ph.D., Department of Economics, Zagreb School of Economics and Management (e-mail: asonje@zsem.hr)

** B. Podobnik, Ph.D., Department of Physics, Faculty of Civil Engineering, University of Rijeka (e-mail: bp@phy.hr)

*** M. Vizek, Ph.D., Institute of Economics, Zagreb (e-mail: mvizek@eizg.hr)

The first version of the paper was received on May 20th 2009., the final one was received on Feb. 9th 2010.

of country indebtedness. External debt is believed to be sustainable if current account deficit is stationary. To measure the sustainability in current accounts one commonly estimates the cointegration between imports and exports. In order to be cointegrated, both exports and imports time series must be $I(1)$, while there must be a linear combination of both time series that is $I(0)$, with the cointegration vector equals to $(1, -1)$. In other words, exports and imports should be cointegrated with a long run coefficient of unity.

The main contribution of this study to the literature is that it applies Johansen cointegration method to 16 transition European countries in order to check the sustainability of their current accounts. Hence we start the empirical section of the paper with unit root test. We use augmented Dickey-Fuller test (Dickey and Fuller, 1979) on series with a drift and series with a drift and a trend. Then, we apply Johansen method (1995) in order to test the possible cointegration between exports and imports. Thereafter we impose restrictions on cointegrating space to check whether long run coefficients are equal to unity and to determine. We also test for weak exogeneity of exports and imports.

In order to address the issues described above, the paper is organized as follows. Section 2 reviews the literature, while section 3 discusses a theoretical background. Section 4 explains the data, methods and discusses the results. Conclusions are provided in the final section of the paper.

2 Literature review

In the last two decades, numerous studies have analyzed the long-run relationship between exports and imports. A part of the studies is based on data from the U.S. economy (see, Husted (1992), Fountas and Wu (1999)). However, there are studies employing data for other developed countries (see e.g., Bahmani-Oskooee (1994), Bahmani-Oskooee and Hyun-Rhee (1997), and Wu et al. (2001)). Holmes (2006) uses panel cointegration approach in order to test the current account sustainability in 11 OECD countries. His results suggest that sustainability is present in six countries. Moreover, sustainability is generally a characteristic of the non-Euro countries.

As far as developing countries are concerned, Arize (2002) found the presence of long-run relationship between exports and imports in 35 of the 50 countries, both developing and OECD economies making the sample reasonably representative on the world level. In most countries where the slope coefficient on the export variable is positive, the cointegrating coefficient is also unity. However, when compared to other regions, cointegration space does not appear to be stable

for countries in the Middle East, Latin America and Europe. Narayan and Narayan (2005) examined current account sustainability in 22 least developed African and Asian countries. Their findings suggest that exports and imports are cointegrated only for six out of the 22 countries, and the coefficient on exports is less than one. Holmes (2004) tests the current account sustainability in Russia and 9 Central and Eastern European countries using panel data approach. The results of the study indicate that over half of the sample (the Czech Republic, Estonia, Hungary, Poland, Romania and the Slovak Republic), are characterized by current account sustainability where the impact of a current account shock on external debt will not be permanent. Erbaykal and Karaca (2008) conclude that exports and imports in Turkey are cointegrated, but due to the fact that the slope coefficients obtained from the equations derived from exports and imports series is not equal to 1, current account deficit is not sustainable. Aristovnik (2006) employs two accounting approaches in order to assess the current account sustainability in 17 Central and Eastern European countries. The results show that if the observed level of foreign direct investment (FDI) flows is sustained at the same level in the medium run, almost all countries could even increase their current account deficits. The most notable exceptions are: the Baltic States, Hungary, Macedonia, Moldova and Romania. Roubini and Wachtel (1999) underscore the importance of assessing current account sustainability. Given the fact that exports and imports series at the time when this paper was written were not sufficiently long, the authors provide a descriptive analysis of possible indicators of current account sustainability of Central and Eastern European countries in early transition.

It is worth noting that these investigations have reported conflicting results about the relationship between imports and exports. For example, by using US quarterly data for the period 1967-1989, Husted (1992) found there is a long-run relationship between exports and imports yielding the conclusion that the US trade deficits are sustainable. This result implies that the US exports and imports may drift apart in the short run, but converge toward equilibrium in the long run. In contrast, Fountas and Wu (1999) using again US quarterly data but for somewhat longer period 1967-1994 have found that the hypothesis of no long-run relationship between exports and imports cannot be rejected. One may wonder whether these conflicting results are due to different time period used in analyses or due to different testing techniques employed.

3 Theoretical background

Husted (1992) offers a simple framework that implies a long-run relationship between exports and imports. The analysis assumes that a representative con-

sumer who resides in an open economy with no government control. It is assumed that the consumer uses one-period financial instruments to borrow and lend in international markets. The consumer's current-period budget constraint is

$$C_0 = Y_0 + B_0 - I_0 - (1+r)B_{-1} \quad (1)$$

where C_0 is the current consumption, Y_0 is the income, I_0 is the investment, B_0 is the international borrowing, and t is the one-period world interest rate. $(1+r)B_{-1}$ is the initial debt size. Husted makes several assumptions, among which is that imports and exports follow a random walk with drifts and that the world interest rate is stationary with mean r . Husted proposes a testable model:

$$EX_t = \alpha + \beta IM_t + \varepsilon_t \quad (2)$$

where EX is the exports of goods and services and IM is the imports of goods and services. For a sustainable current account deficit two conditions are needed: (i) β should be equal to one and (ii) ε_t should be a stationary process. In other words, current account deficit is sustainable if exports are cointegrated with imports and if the cointegration coefficient β is one. However, if exports are cointegrated with imports, while β is less than 1, the economy is not capable to satisfy its budget constraint.

4 Empirical analysis

In our empirical exercise we use a sample comprised of 16 transition European and CIS countries. The countries are chosen to obtain a sample that is representative of former communist economies: Belaruss, Bulgaria, Kazakhstan, Georgia, Armenia, Russia, Czech Republic, Slovakia, Estonia, Latvia, Hungary, Lithuania, Croatia, Slovenia, Poland, and Romania. We use two time series: total exports of goods and services and total imports of goods and services, both in national currencies. All series are seasonally adjusted and transformed to logarithms. The data is taken from the International Monetary Fund International Financial Statistics CD-ROM. All data are in quarterly frequency and in general they cover the period from various years in nineties to the end of 2006. The exact starting year for each series is available in Table 1.

We start the empirical analysis with unit root test. We use augmented Dickey-Fuller test (Dickey and Fuller, 1979) on series with a drift and on series with a drift and a trend. After we established the level of the integration of each series, we move to Johansen cointegration test. We use this method to check whether the behavior of foreign trade (i.e. exports and imports of goods and services) in ex-communist countries is sustainable in the long-run. If the export and import series of a country are found to be cointegrated and the elasticity of imports with respect to exports is equal to one, we may conclude that the current account deficit recorded in that country is sustainable. We also test for weak exogeneity of imports and exports. In order to apply the Johansen test all series must be I(1) or higher, i.e. series in levels must not exhibit mean reverting properties. Moreover, each pair of series tested for cointegration must be of the same level of integration.

The results of Augmented Dickey-Fuller (ADF) test in levels and first differences are displayed in Tables 1 and 2. The results suggest that most of the series are indeed I(1), with or without a stochastic trend. However, there are some exceptions: export series with included drift and a trend for Kazakhstan, Georgia, Latvia, Croatia and Slovenia as well as export and import series with included drift for Romania seem to be I(0). However, we continue with our analysis by assuming all series are I(1) for three reasons. Firstly, we are not sure of the true data generating process and secondly, the null hypothesis of the ADF test in levels was never rejected in both test specifications of any series, i.e. when a drift was included and when a trend and a drift were included. Finally, if one of the tested series was indeed stationary, the number of cointegration vectors found in VAR containing that particular series will be equal to 2, which will enable us to exclude that particular country from the analysis.

Table 1.

ADF TEST – IN LEVELS

| Name of the variable | Period | Trend components | Chosen time lag | t-value (ADF) | Beta | Sigma | t-value (lag) | AIC |
|----------------------|-------------------|------------------|-----------------|---------------|---------|--------|---------------|--------|
| BU_EX | 1994(1) - 2006(4) | constant | 4 | -2.601 | 0.92691 | 0.2308 | -1.573 | -2.811 |
| BU_EX | 1994(1) - 2006(4) | trend & constant | 3 | -2.568 | 0.88100 | 0.2308 | 1.763 | -2.830 |
| BU_IM | 1994(1) - 2006(4) | constant | 2 | -2.655 | 0.93474 | 0.2116 | -2.474 | -2.985 |
| BU_IM | 1994(1) - 2006(4) | trend & constant | 4 | -1.942 | 0.90979 | 0.2132 | -2.165 | -2.952 |
| KZ_EX | 1994(1) - 2006(4) | constant | 0 | -0.04643 | 0.99898 | 0.1170 | - | -4.248 |
| KZ_EX | 1994(1) - 2006(4) | trend & constant | 2 | -3.543* | 0.65871 | 0.1030 | 2.285 | -5.441 |

| Name of the variable | Period | Trend components | Chosen time lag | t-value (ADF) | Beta | Sigma | t-value (lag) | AIC |
|----------------------|-------------------|------------------|-----------------|---------------|----------|---------|---------------|--------|
| KZ_IM | 1994(1) - 2006(4) | constant | 2 | 0.1293 | 1.0017 | 0.05827 | -3.819 | -5.562 |
| KZ_IM | 1994(1) - 2006(4) | trend & constant | 4 | -1.969 | 0.78829 | 0.05616 | -2.517 | -5.617 |
| GE_EX | 1996(1) - 2006(4) | constant | 4 | -1.502 | 0.95926 | 0.09666 | -1.663 | -4.529 |
| GE_EX | 1996(1) - 2006(4) | trend & constant | 1 | -5.048** | -0.12671 | 0.08474 | 1.930 | -4.837 |
| GE_IM | 1996(1) - 2006(4) | constant | 2 | 1.231 | 1.0352 | 0.07375 | -2.592 | -5.115 |
| GE_IM | 1996(1) - 2006(4) | trend & constant | 2 | -1.599 | 0.81489 | 0.07085 | -1.716 | -5.172 |
| BEL_EX | 1995(1) - 2006(4) | constant | 2 | -2.369 | 0.97348 | 0.1421 | -1.336 | -3.811 |
| BEL_EX | 1995(1) - 2006(4) | trend & constant | 2 | -0.2093 | 0.99189 | 0.1436 | -1.413 | -3.770 |
| BEL_IM | 1995(1) - 2006(4) | constant | 1 | -2.456 | 0.97278 | 0.1393 | 2.125 | -3.874 |
| BEL_IM | 1996(3) - 2006(4) | trend & constant | 1 | -0.5866 | 0.97835 | 0.1411 | 1.902 | -3.827 |
| AR_EX | 1994(4) - 2006(4) | constant | 1 | -1.011 | 0.96526 | 0.1144 | -2.619 | -4.269 |
| AR_EX | 1994(4) - 2006(4) | trend & constant | 1 | -2.106 | 0.66034 | 0.1107 | -1.321 | -4.314 |
| AR_IM | 1994(4) - 2006(4) | constant | 1 | -1.524 | 0.93755 | 0.07790 | -2.890 | -5.037 |
| AR_IM | 1994(4) - 2006(4) | trend & constant | 4 | 2.737 | 0.58549 | 0.07250 | 1.896 | -5.119 |
| RU_EX | 1993(3) - 2006(4) | constant | 2 | -1.535 | 0.97979 | 0.09720 | -2.254 | -4.582 |
| RU_EX | 1993(3) - 2006(4) | trend & constant | 5 | -2.207 | 0.87367 | 0.09512 | 1.453 | -4.554 |
| RU_IM | 1993(3) - 2006(4) | constant | 2 | -1.176 | 0.98773 | 0.06347 | -1.618 | -5.435 |
| RU_IM | 1993(3) - 2006(4) | trend & constant | 4 | -2.444 | 0.86462 | 0.06055 | 1.357 | -5.474 |
| CZ_EX | 1991(1) - 2006(4) | constant | 1 | -0.9698 | 0.98960 | 0.03988 | 1.366 | -6.393 |
| CZ_EX | 1991(1) - 2006(4) | trend & constant | 1 | -2.811 | 0.81429 | 0.03780 | 2.072 | -6.484 |
| CZ_IM | 1991(1) - 2006(4) | constant | 2 | -2.517 | 0.95540 | 0.06314 | -1.293 | -5.458 |
| CZ_IM | 1991(1) - 2006(4) | trend & constant | 5 | -2.281 | 0.82931 | 0.05775 | 2.859 | -5.576 |
| SL_EX | 1993(1) - 2006(4) | constant | 5 | 0.1531 | 1.0015 | 0.03133 | -1.805 | -6.797 |
| SL_EX | 1993(1) - 2006(4) | trend & constant | 4 | -3.479 | 0.56335 | 0.02864 | -0.02168 | -6.977 |
| SL_IM | 1993(1) - 2006(4) | constant | 0 | -1.082 | 0.98541 | 0.04520 | - | -6.154 |
| SL_IM | 1993(1) - 2006(4) | trend & constant | 0 | -3.095 | 0.72236 | 0.04193 | - | -6.285 |
| EE_EX | 1993(1) - 2006(4) | constant | 0 | -1.404 | 0.98124 | 0.05189 | - | -5.878 |
| EE_EX | 1993(1) - 2006(4) | trend & constant | 5 | -2.107 | 0.87306 | 0.04990 | -1.086 | -5.850 |
| EE_IM | 1993(1) - 2006(4) | constant | 1 | -1.167 | 0.98607 | 0.04479 | 2.834 | -6.153 |
| EE_IM | 1993(1) - 2006(4) | trend & constant | 1 | 2.638 | 0.85974 | 0.04262 | 3.308 | -6.234 |
| LV_EX | 1992(1) - 2006(4) | constant | 4 | 0.9353 | 1.0122 | 0.04076 | -2.213 | -6.296 |
| LV_EX | 1992(1) - 2006(4) | trend & constant | 1 | -2.601 | 0.86648 | 0.04106 | 3.756 | -6.314 |
| LV_IM | 1992(1) - 2006(4) | constant | 5 | 0.2250 | 1.0032 | 0.05945 | -1.610 | -5.525 |
| LV_IM | 1992(1) - 2006(4) | trend & constant | 4 | -1.878 | 0.87163 | 0.05898 | 1.752 | -5.557 |
| HU_EX | 1995(1) - 2006(4) | constant | 1 | -1.802 | 0.98037 | 0.03036 | 3.825 | -6.920 |
| HU_EX | 1995(1) - 2006(4) | trend & constant | 1 | -2.407 | 0.91701 | 0.02935 | 3.983 | -6.966 |

| Name of the variable | Period | Trend components | Chosen time lag | t-value (ADF) | Beta | Sigma | t-value (lag) | AIC |
|----------------------|-------------------|------------------|-----------------|---------------|----------|---------|---------------|--------|
| HU_IM | 1995(1) - 2006(4) | constant | 1 | 2.634 | 0.96798 | 0.03351 | 2.383 | -6.723 |
| HU_IM | 1995(1) - 2006(4) | trend & constant | 1 | -2.501 | 0.91011 | 0.03272 | 2.465 | -6.749 |
| LT_EX | 1993(1) - 2006(4) | constant | 3 | -2.110 | 0.94695 | 0.07227 | 2.015 | -5.160 |
| LT_EX | 1993(1) - 2006(4) | trend & constant | 4 | -4.608** | 0.63433 | 0.06232 | 2.542 | -5.422 |
| LT_IM | 1993(1) - 2006(4) | constant | 0 | -1.427 | 0.96327 | 0.07473 | - | -5.149 |
| LT_IM | 1993(1) - 2006(4) | trend & constant | 0 | -2.236 | 0.85218 | 0.07300 | - | -5.176 |
| CRO_EX | 1994(1) - 2006(4) | constant | 5 | 0.5855 | 1.0233 | 0.05286 | -3.418 | -5.741 |
| CRO_EX | 1994(1) - 2006(4) | trend & constant | 4 | -6.676** | -0.37100 | 0.04312 | 2.606 | -6.167 |
| CRO_IM | 1994(1) - 2006(4) | constant | 5 | -1.145 | 0.96485 | 0.04480 | -1.685 | -6.072 |
| CRO_IM | 1994(1) - 2006(4) | trend & constant | 5 | -1.914 | 0.77252 | 0.04380 | -1.322 | -6.099 |
| SI_EX | 1995(1) - 2006(4) | constant | 1 | 0.1323 | 1.0015 | 0.02653 | - | -7.212 |
| SI_EX | 1995(1) - 2006(4) | trend & constant | 5 | -3.715* | 0.43930 | 0.02334 | 2.292 | -7.346 |
| SI_IM | 1995(1) - 2006(4) | constant | 4 | 0.06985 | 1.0011 | 0.03697 | -1.951 | -6.464 |
| SI_IM | 1995(1) - 2006(4) | trend & constant | 3 | -2.943 | 0.45600 | 0.03487 | 2.081 | -6.581 |
| PL_EX | 1990(1) - 2006(4) | constant | 4 | -3.433* | 0.97230 | 0.04763 | -1.534 | -5.997 |
| PL_EX | 1990(1) - 2006(4) | trend & constant | 4 | -1.723 | 0.94637 | 0.04774 | -1.386 | -5.978 |
| PL_IM | 1990(1) - 2006(4) | constant | 3 | -2.441 | 0.97332 | 0.06692 | 1.821 | -5.331 |
| PL_IM | 1990(1) - 2006(4) | trend & constant | 1 | -1.167 | 0.96152 | 0.06866 | -2.161 | -5.295 |
| RO_EX | 1997(1) - 2006(4) | constant | 1 | -3.929** | 0.93227 | 0.07846 | -2.637 | -5.006 |
| RO_EX | 1997(1) - 2006(4) | trend & constant | 1 | -0.7355 | 0.94998 | 0.07966 | -2.524 | -4.950 |
| RO_IM | 1997(1) - 2006(4) | constant | 0 | -3.631* | 0.96299 | 0.04829 | - | -5.946 |
| RO_IM | 1997(1) - 2006(4) | trend & constant | 0 | -0.9833 | 0.95137 | 0.04901 | - | -5.947 |

Note: ADF - Augmented Dickey-Fuller; optimal time lag chosen according to AIC; all series are seasonally adjusted and in logarithms; ** null hypothesis about existence of unit root rejected at 1 percent level of significance; * hypothesis about existence of unit root rejected at 5 percent level of significance.

Source: calculation of the authors.

Table 2.

ADF TEST – IN DIFFERENCES

| Name of the variable | Period | Trend components | Chosen time lag | t-value (ADF) | Beta | Sigma | t-value (lag) | AIC |
|----------------------|-------------------|------------------|-----------------|---------------|----------|---------|---------------|--------|
| BU_EX | 1994(1) - 2006(4) | constant | 3 | -3.121* | 0.35300 | 0.2494 | 1.491 | -2.673 |
| BU_EX | 1994(1) - 2006(4) | trend & constant | 0 | -5.044** | 0.24922 | 0.2502 | - | -2.707 |
| BU_IM | 1994(1) - 2006(4) | constant | 3 | -3.568* | 0.29371 | 0.2295 | 2.184 | -2.840 |
| BU_IM | 1994(1) - 2006(4) | trend & constant | 3 | -4.111* | 0.11945 | 0.2229 | 2.533 | -2.879 |
| KZ_EX | 1994(1) - 2006(4) | constant | 0 | -5.78** | 0.12894 | 0.1155 | - | -4.272 |
| KZ_EX | 1994(1) - 2006(4) | trend & constant | 0 | -5.783** | 0.12149 | 0.1162 | - | -4.239 |
| KZ_IM | 1994(1) - 2006(4) | constant | 4 | -5.16** | -0.1103 | 0.05797 | 3.906 | -5.589 |
| KZ_IM | 1994(1) - 2006(4) | trend & constant | 3 | -5.096** | -0.11018 | 0.05870 | 3.767 | -5.544 |
| GE_EX | 1996(1) - 2006(4) | constant | 3 | -5.64** | -1.9135 | 0.09627 | 1.662 | -4.556 |
| GE_EX | 1996(1) - 2006(4) | trend & constant | 3 | -5.738** | -2.0171 | 0.09618 | 1.807 | -4.536 |
| GE_IM | 1996(1) - 2006(4) | constant | 3 | -5.02** | -0.7939 | 0.07366 | 1.438 | -5.092 |
| GE_IM | 1996(1) - 2006(4) | trend & constant | 3 | -6.121** | -1.1655 | 0.06725 | 1.677 | -5.251 |
| BEL_EX | 1995(1) - 2006(4) | constant | 0 | 3.458* | 0.51339 | 0.1523 | - | -3.716 |
| BEL_EX | 1995(1) - 2006(4) | trend & constant | 1 | -4.656** | 0.19439 | 0.1407 | 1.816 | -3.829 |
| BEL_IM | 1995(1) - 2006(4) | constant | 0 | -3.87** | 0.43663 | 0.1496 | - | -3.752 |
| BEL_IM | 1996(3) - 2006(4) | trend & constant | 0 | -4.765** | 0.26152 | 0.1411 | - | -3.847 |
| AR_EX | 1994(4) - 2006(4) | constant | 0 | -9.51** | -0.3788 | 0.1154 | - | -4.271 |
| AR_EX | 1994(4) - 2006(4) | trend & constant | 0 | -9.424** | -0.38348 | 0.1166 | - | -4.229 |
| AR_IM | 1994(4) - 2006(4) | constant | 0 | -9.14** | -0.3558 | 0.07974 | - | -5.011 |
| AR_IM | 1994(4) - 2006(4) | trend & constant | 0 | -8.999** | -0.37586 | 0.08030 | - | -4.975 |
| RU_EX | 1993(3) - 2006(4) | constant | 1 | 5.633** | 0.30290 | 0.09017 | 2.697 | -4.750 |
| RU_EX | 1993(3) - 2006(4) | trend & constant | 1 | -5.580** | 0.28312 | 0.09079 | 2.743 | -4.717 |
| RU_IM | 1993(3) - 2006(4) | constant | 0 | -5.342** | 0.39398 | 0.06154 | - | -5.535 |
| RU_IM | 1993(3) - 2006(4) | trend & constant | 2 | -5.304** | 0.22333 | 0.06108 | 1.318 | -5.491 |
| CZ_EX | 1991(1) - 2006(4) | constant | 1 | -5.49** | 0.05499 | 0.04006 | 1.188 | -6.383 |
| CZ_EX | 1991(1) - 2006(4) | trend & constant | 0 | -6.108** | 0.17494 | 0.04044 | - | -6.364 |
| CZ_IM | 1991(1) - 2006(4) | constant | 5 | -3.221* | 0.02175 | 0.05702 | 2.664 | -5.614 |
| CZ_IM | 1991(1) - 2006(4) | trend & constant | 5 | -3.546* | -0.26511 | 0.05635 | 2.994 | -5.623 |
| SL_EX | 1993(1) - 2006(4) | constant | 4 | -4.99** | -0.3127 | 0.03056 | 2.197 | -6.862 |
| SL_EX | 1993(1) - 2006(4) | trend & constant | 4 | -4.928** | -0.30584 | 0.03076 | 2.104 | -6.832 |
| SL_IM | 1993(1) - 2006(4) | constant | 0 | -7.99** | -0.15691 | 0.04546 | - | -6.142 |
| SL_IM | 1993(1) - 2006(4) | trend & constant | 0 | -7.969** | -0.16314 | 0.04576 | - | -6.109 |

| Name of the variable | Period | Trend components | Chosen time lag | t-value (ADF) | Beta | Sigma | t-value (lag) | AIC |
|----------------------|-------------------|------------------|-----------------|---------------|-----------|---------|---------------|--------|
| EE_EX | 1993(1) - 2006(4) | constant | 1 | -3.415* | 0.39533 | 0.04956 | -1.559 | -5.950 |
| EE_EX | 1993(1) - 2006(4) | trend & constant | 0 | -5.873** | 0.19297 | 0.04981 | - | -5.940 |
| EE_IM | 1993(1) - 2006(4) | constant | 0 | -4.49** | 0.39632 | 0.04536 | - | -6.146 |
| EE_IM | 1993(1) - 2006(4) | trend & constant | 0 | -4.527** | 0.38417 | 0.04557 | - | -6.118 |
| LV_EX | 1992(1) - 2006(4) | constant | 3 | -4.73** | 0.16655 | 0.04068 | 1.923 | -6.314 |
| LV_EX | 1992(1) - 2006(4) | trend & constant | 3 | -4.749** | 0.10242 | 0.04073 | 2.011 | -6.295 |
| LV_IM | 1992(1) - 2006(4) | constant | 2 | -3.446* | 0.21569 | 0.05862 | -1.824 | -5.601 |
| LV_IM | 1992(1) - 2006(4) | trend & constant | 0 | -7.609** | -0.046 | 0.05985 | - | -5.577 |
| HU_EX | 1995(1) - 2006(4) | constant | 0 | -3.139* | 0.59368 | 0.03158 | - | -6.863 |
| HU_EX(!) | 1995(1) - 2006(4) | trend & constant | 0 | -3.376 | 0.54024 | 0.03140 | - | -6.852 |
| HU_IM | 1995(1) - 2006(4) | constant | 0 | -3.63** | 0.49300 | 0.03604 | - | -6.599 |
| HU_IM | 1995(1) - 2006(4) | trend & constant | 0 | -4.073* | 0.39128 | 0.03523 | - | -6.621 |
| LT_EX | 1993(1) - 2006(4) | constant | 4 | -3.124* | 0.18988 | 0.06301 | 2.622 | -5.415 |
| LT_EX | 1993(1) - 2006(4) | trend & constant | 0 | -9.421** | -0.26285 | 0.07264 | - | -5.185 |
| LT_IM | 1993(1) - 2006(4) | constant | 0 | -7.48** | -0.08632 | 0.07622 | - | -5.108 |
| LT_IM | 1993(1) - 2006(4) | trend & constant | 0 | -7.504** | -0.094712 | 0.07637 | - | -5.085 |
| CRO_EX | 1994(1) - 2006(4) | constant | 1 | -9.75** | -0.6703 | 0.04435 | 2.784 | -6.167 |
| CRO_EX | 1994(1) - 2006(4) | trend & constant | 5 | -5.352** | -1.7264 | 0.04402 | 1.393 | -6.086 |
| CRO_IM | 1994(1) - 2006(4) | constant | 4 | -4.21** | -0.3703 | 0.04554 | 1.426 | -6.055 |
| CRO_IM | 1994(1) - 2006(4) | trend & constant | 3 | -3.887* | -0.13901 | 0.04660 | 2.543 | -6.009 |
| SI_EX | 1995(1) - 2006(4) | constant | 0 | -5.18** | 0.17860 | 0.02632 | - | -7.227 |
| SI_EX | 1995(1) - 2006(4) | trend & constant | 0 | -5.121** | 0.17810 | 0.02665 | - | -7.179 |
| SI_IM | 1995(1) - 2006(4) | constant | 3 | 4.063** | -0.7339 | 0.03692 | 1.967 | -6.484 |
| SI_IM | 1995(1) - 2006(4) | trend & constant | 3 | -3.998* | -0.73136 | 0.03744 | 1.934 | -6.436 |
| PL_EX | 1990(1) - 2006(4) | constant | 2 | -4.56** | 0.23026 | 0.05193 | 2.343 | -5.853 |
| PL_EX | 1990(1) - 2006(4) | trend & constant | 3 | -5.369** | -0.20766 | 0.04901 | 1.400 | -5.938 |
| PL_IM | 1990(1) - 2006(4) | constant | 2 | -3.021* | 0.30079 | 0.07003 | -3.068 | -5.254 |
| PL_IM | 1990(1) - 2006(4) | trend & constant | 2 | -3.830* | -0.07256 | 0.06774 | -1.971 | -5.306 |
| RO_EX | 1997(1) - 2006(4) | constant | 1 | -3.322* | 0.07866 | 0.09343 | -1.520 | -4.655 |
| RO_EX | 1997(1) - 2006(4) | trend & constant | 0 | -10.73** | -0.56196 | 0.07203 | - | -5.175 |
| RO_IM | 1997(1) - 2006(4) | constant | 0 | -4.28** | 0.25260 | 0.05641 | - | -5.691 |
| RO_IM | 1997(1) - 2006(4) | trend & constant | 0 | -5.839** | -0.04471 | 0.04946 | - | -5.927 |

Note: ADF - Augmented Dickey-Fuller; optimal time lag chosen according to AIC; all series are seasonally adjusted and in logarithms; ** null hypothesis about existence of unit root rejected at 1 percent level of significance; * hypothesis about existence of unit root rejected at 5 percent level of significance, (!) – hypothesis about existence of unit root rejected at 10 percent level of significance.

Source: calculation of the authors.

The results of cointegration tests are presented in Table 3. Results show that one cointegration vector was detected in 10 out of 16 countries. This suggests that exports and imports in these countries behave according to a long-run equilibrium relationship. These countries are: Bulgaria, Armenia, Russia, Czech Republic, Slovak Republic, Lithuania, Croatia, Slovenia, Poland and Romania. In case of Kazakhstan, Belarus, Latvia and Hungary cointegration matrix had full rank, thus indicating that either their export or import series (or both) is stationary. No cointegration between exports and imports was found in case Estonia and Georgia, thus implying exports and imports in these countries are not determined by a long-run equilibrium relationship and hence do not share a common trend.

Table 3.

RESULTS OF JOHANSEN COINTEGRATION

| Country | Rank | Eigenvalue | Log-likelihood | trace test | p-value | lags included |
|----------------|------|------------|----------------|------------|----------|---------------|
| BULGARIA | 0 | - | 77.3 | 26.8 | 0.004*** | 5 |
| | 1 | 0.35 | 87.3 | 6.7 | 0.147 | |
| | 2 | 0.13 | 90.7 | - | - | |
| KAZAKHSTAN | 0 | - | 104.1 | 27.1 | 0.004*** | 5 |
| | 1 | 0.31 | 112.5 | 10.3 | 0.029** | |
| | 2 | 0.20 | 117.7 | - | - | |
| GEORGIA | 0 | - | 80.1 | 10.7 | 0.577 | 1 |
| | 1 | 0.16 | 84.0 | 3.0 | 0.585 | |
| | 2 | 0.07 | 85.5 | - | - | |
| BELARUS | 0 | - | 61.3 | 73.0 | 0.00*** | 1 |
| | 1 | 0.57 | 81.3 | 32.9 | 0.00*** | |
| | 2 | 0.50 | 97.8 | - | - | |
| ARMENIA | 0 | - | 77.0 | 30.7 | 0.001*** | 1 |
| | 1 | 0.41 | 89.5 | 5.6 | 0.23 | |
| | 2 | 0.11 | 92.3 | - | - | |
| RUSSIA | 0 | - | 120.8 | 18.5 | 0.086* | 2 |
| | 1 | 0.21 | 127.0 | 6.2 | 0.18 | |
| | 2 | 0.11 | 130.1 | - | - | |
| CZECH REPUBLIC | 0 | - | 225.8 | 25.7 | 0.007*** | 8 |
| | 1 | 0.28 | 234.9 | 7.5 | 0.11 | |
| | 2 | 0.12 | 238.6 | - | - | |

| Country | Rank | Eigenvalue | Log-likelihood | trace test | p-value | lags included |
|-----------|------|------------|----------------|------------|----------|---------------|
| SLOVAKIA | 0 | - | 173.9 | 33.3 | 0.000*** | 2 |
| | 1 | 0.40 | 187.9 | 5.3 | 0.26 | |
| | 2 | 0.09 | 190.5 | - | - | |
| ESTONIA | 0 | - | 202.7 | 16.6 | 0.148 | 2 |
| | 1 | 0.15 | 207.1 | 7.7 | 0.09 | |
| | 2 | 0.13 | 211.0 | - | - | |
| LATVIA | 0 | - | 145.4 | 34.7 | 0.000*** | 1 |
| | 1 | 0.35 | 157.9 | 9.6 | 0.04** | |
| | 2 | 0.15 | 162.7 | - | - | |
| HUNGARY | 0 | - | 165.3 | 34.7 | 0.000*** | 1 |
| | 1 | 0.73 | 196.1 | 9.6 | 0.003** | |
| | 2 | 0.27 | 203.6 | - | - | |
| LITHUANIA | 0 | - | 131.1 | 35.1 | 0.000*** | 2 |
| | 1 | 0.42 | 146.0 | 5.5 | 0.246 | |
| | 2 | 0.10 | 148.7 | - | - | |
| CROATIA | 0 | - | 152.2 | 32.9 | 0.000*** | 6 |
| | 1 | 0.43 | 165.0 | 7.2 | 0.118 | |
| | 2 | 0.15 | 168.6 | - | - | |
| SLOVENIA | 0 | - | 184.3 | 29.8 | 0.001*** | 8 |
| | 1 | 0.43 | 195.5 | 7.2 | 0.118 | |
| | 2 | 0.17 | 199.1 | - | - | |
| POLAND | 0 | - | 220.2 | 24.1 | 0.013** | 7 |
| | 1 | 0.30 | 231.1 | 2.2 | 0.731 | |
| | 2 | 0.04 | 232.2 | - | - | |
| ROMANIA | 0 | - | 98.6 | 22.6 | 0.021** | 2 |
| | 1 | 0.38 | 107.6 | 4.6 | 0.346 | |
| | 2 | 0.11 | 109.9 | - | - | |

Note: In order to determine the optimal lag length of VAR tested for cointegration, AIC and F-tests for the significance of each lag and for joint significance of lags were used.

Source: calculation of the authors.

After identifying countries whose exports and imports are cointegrated, we resume with testing various restriction on cointegration space for these countries. Hence in Table 4 we present long-run coefficients (β) and adjustment parameters (α) for each country's import and export before and after testing the restriction that β written in vector form equals -1. As can be seen from the table, the restriction of unit elasticity of imports with respect to exports was accepted in case of Bulgaria, Slovak Republic, Slovenia, Croatia and Romania. This suggests that for

these countries, imports in the long-run tightly follow the movement of exports and vice versa, the movement of exports closely follow imports. In other words, current account deficits generated in these economies are sustainable. For all other countries, such statement can not be made.

Besides testing for unit elasticity of imports with respect to exports, we also tested for weak exogeneity of exports and imports (each one in its own turn). These results are shown in the last column of Table 4. If, for example, imports are found to be weakly exogenous, this means that in case when the long-run comovement of imports and exports is disrupted, only exports adjust in order to restore the equilibrium path in the short-run. Weak exogeneity restriction for exports is accepted in case of Armenia, Russia and Romania, while weak exogeneity of imports is accepted in case of Croatia. One must also note that weak exogeneity of imports or exports was imposed to cointegration space jointly with unit import elasticity restriction in the cases where the latter restriction was accepted. Since in the case of Romania and Croatia both restrictions were accepted, we can conclude the following: while in Romania imports closely follow the export movements in the long-run, in the short-run only imports change to restore the equilibrium. The opposite applies to Croatia, where the equilibrium in the short-run is restored through the changes in exports, while imports remain unaffected.

Table 4.

PROPERTIES OF COINTEGRATION VECTOR

| Country | Variable in cointegrating vector | Before imposing restriction | | After imposing restriction | | Testing restriction | Testing weak exogeneity |
|----------|----------------------------------|-----------------------------|----------|----------------------------|----------|------------------------------------|------------------------------------|
| | | β | α | β | α | $\beta=-1$ Chi ² (1) | $\alpha=0$ Chi ² (1) |
| BULGARIA | Export | 1.00 | 0.78 | 1.00 | 0.69 | - | 10.2*** [0.006] |
| | Import | -0.98 | 0.90 | -1.00 | 0.75 | 0.607 [0.44] | 15.6*** [0.0004] |
| | Constant | 0.05 | - | 0.25 | - | - | - |
| ARMENIA | Export | 1.00 | -0.02 | 1.00 | -0.05 | - | 0.036 [0.85] |
| | Import | -1.77 | 0.27 | -1.00 | -0.04 | 19.07*** [0.00] | 13.3*** [0.0003] |
| | Constant | 9.83 | - | -0.02 | - | - | - |

| Country | Variable in cointegrating vector | Before imposing restriction | | After imposing restriction | | Testing restriction | Testing weak exogeneity |
|----------------|----------------------------------|-----------------------------|----------|----------------------------|----------|------------------------------------|------------------------------------|
| | | β | α | β | α | $\beta=-1$ Chi ² (1) | $\alpha=0$ Chi ² (1) |
| RUSSIA | Export | 1.00 | 0.10 | 1.00 | -0.14 | - | 1.71 [0.19] |
| | Import | -1.32 | 0.10 | -1.00 | -0.08 | 3.35* [0.067] | 5.74** [0.02] |
| | Constant | 1.91 | - | -0.68 | - | - | - |
| CZECH REPUBLIC | Export | 1.00 | 0.10 | 1.00 | -0.03 | - | 4.18** [0.04] |
| | Import | -1.31 | 0.17 | -1.00 | -0.04 | 5.58** [0.018] | 10.02*** [0.002] |
| | Constant | 2.04 | - | -1.18 | - | - | - |
| SLOVAKIA | Export | 1.00 | 0.01 | 1.00 | 0.02 | - | 21.18*** [0.00] |
| | Import | -1.41 | 0.01 | -1.00 | 0.02 | 0.41 [0.52] | 9.9*** [0.007] |
| | Constant | 7.86 | - | 2.04 | - | - | - |
| CROATIA | Export | 1.00 | -0.05 | 1.00 | -0.06 | - | 17.5*** [0.0002] |
| | Import | -1.02 | -0.01 | -1.00 | -0.01 | 0.0007 [0.98] | 1.89 [0.39] |
| | Constant | -0.53 | - | -0.66 | - | - | - |
| SLOVENIA | Export | 1.00 | 0.05 | 1.00 | 0.03 | - | 6.05* [0.05] |
| | Import | -1.04 | 0.12 | -1.00 | 0.06 | 0.138 [0.71] | 18.2*** [0.0001] |
| | Constant | 0.95 | - | 1.48 | - | - | - |
| POLAND | Export | 1.00 | 0.09 | 1.00 | 0.19 | - | 19.6*** [0.000] |
| | Import | -1.28 | 0.09 | -1.00 | 0.19 | 8.54*** [0.004] | 10.78*** [0.001] |
| | Constant | 3.75 | - | 0.34 | - | - | - |
| ROMANIA | Export | 1.00 | 0.12 | 1.00 | 0.10 | - | 2.90 [0.23] |
| | Import | -1.06 | 0.24 | -1.00 | 0.27 | 2.20 [0.14] | 13.1*** [0.001] |
| | Constant | 1.04 | - | 0.42 | - | - | - |

Source: Authors calculation.

5 Concluding remarks

In this paper, cointegration approach is applied to check whether the behavior of foreign trade (i.e. exports and imports of goods and services) in European transition economies (former communist regimes) is sustainable in the long run. If the export and import series of a country are cointegrated and the elasticity of imports with respect to exports is equal to one, one may conclude that the current account deficit recorded in that country is sustainable.

The results of the empirical exercise suggest that one cointegration vector was detected for 10 out of 16 transition European countries. This indicates that exports and imports in Bulgaria, Armenia, Russia, Czech Republic, Slovakia, Lithuania, Croatia, Slovenia, Poland and Romania share a common time trend and determine each other in the long run. The restriction of unit elasticity of imports with respect to exports (i.e restriction on β coefficient) was accepted only for 5 countries (Bulgaria, Slovakia, Slovenia, Croatia and Romania), thus suggesting that in these countries current account deficits are sustainable. Weak exogeneity restriction for exports is accepted in case of Armenia, Russia and Romania, while weak exogeneity of imports is a valid assumption in case of Croatia. This finding suggests that in the case when the long-run comovement of imports and exports is disrupted, in Armenia, Russia and Romania only imports adjust in order to restore the equilibrium path in the short-run. In Croatia, only exports adjust in order to restore the equilibrium.

REFERENCES

1. Aristovnik, A. (2006). "Current Account Sustainability in Selected Transition Countries", *William Davison Institute Working Paper*, No. 844.
2. Arize, A. C. (2002). "Imports and exports in 50 countries: Tests of cointegration and structural breaks", *International Review of Economics and Finance*, (74): 101-115.
3. Bahmani-Oskooee, M. (1994). "Are imports and exports of Australia cointegrated?", *Journal of Economic Integration*, (9), 4: 525-533.
4. Bahmani-Oskooee, M. and Hyun-Rhee, R. (1997). "Are imports and exports of Korea cointegrated?", *International Economic Journal* , (11), 1: 525-533.
5. Dickey, D. A. and Fuller, W. A. (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, (74): 427-431.

6. Erbaykal, E. and Karaca, O. (2008). "Is Turkey's Foreign Deficit Sustainable? Cointegration Relationship between Exports and Imports", *International Research Journal of Finance and Economics*, (14): 177-181.
7. Fountas, S. and Wu, J.L. (1999). "Are the U.S. current account deficits really sustainable?", *International Economic Journal*, (13): 51-58.
8. Holmes, M. J. (2004). "Current Account Deficits in the Transition Economies," *Prague Economic Papers*, vol. 2004(4).
9. Holmes, M. J. (2006). "How Sustainable Are OECD Current Account Balances in the Long Run?", *Manchester School Working Papers*, v. 74, iss. 5.
10. Husted, S. (1992). "The emerging U.S. current account deficit in the 1980s: a cointegration analysis", *Review of Economics and Statistics*, (74): 159-166.
11. Johansen, S. (1995). *Likelihood-based inference in cointegrating vector autoregressive models*, New York, Oxford University Press.
12. Narayan, P. K. and Narayan, S. (2005). "Are exports and imports cointegrated? Evidence from 22 least developed countries", *Applied Economics Letters*, (12): 375-78.
13. Roubini, N. and Wachtel, P. (1999). "Current Account Sustainability in Transition Economies" in *Balance of Payments, Exchange Rates, and Competitiveness in Transition Economies*, edited by M. Blejer and M. Skreb, Kluwer.
14. Wu, J. L., Chen, S. L. and Lee, H. Y. (2001). "Are current account deficits sustainable? Evidence from panel cointegration", *Economics Letters*, (72): 219-224.

DUGOROČNI ODNOS IZMEĐU UVOZA I IZVOZA EUROPSKIH TRANZICIJSKIH ZEMALJA

Sažetak

Nadgledanje vremenske putanje tekućeg računa bilance plaćanja, kojeg možemo smatrati mjerom neto zaduženosti privrede, važan je aspekt makroekonomske politike. Naime, ako je tekući račun stacionaran, vanjski dug je održiv. U ovom radu testiramo dugoročni odnos uvoza i izvoza roba i usluga za šesnaest europskih tranzicijskih zemalja koristeći tromjesečne podatke od devedesetih

godina prošlog stoljeća do kraja 2006. Koristi se Johansenova kointegracija da bi se detektiralo postojanje kointegracije između uvoza i izvoza u zemljama iz uzorka. Kod deset zemalja potvrđeno je postojanje kointegracijskog odnosa između uvoza i izvoza. Međutim, uvođenjem restrikcija na dugoročne parametre, zaključuje se da je deficit tekućeg računa bilance plaćanja održiv u svega pet zemalja.

Ključne riječi: Johansen kointegracija, izvoz, uvoz, održivost tekućeg računa bilance plaćanja