

*Macroeconomics*

Victor SHEVCHUK

**INTERACTION BETWEEN INCOME – GDP  
AND INDUSTRIAL OUTPUT AND EXTERNAL  
BALANCE IN THE EASTERN EUROPEAN  
AND BALTIC COUNTRIES****Abstract**

This paper analyses interaction between income (GDP and industrial output) and external balance (current account and trade balance) with the use of OLS and VAR/VEC techniques. Inverse relationship between the two appears to be important, but not unquestionable evidence in favor of intertemporal optimization of private and public consumption as predominant factor of income and external balance interaction.

**Key words:**

GDP, industrial output, current account, trade balance, balance-of-payment models, OLS and VAR methods.

---

© Victor Shevchuk, 2004.

Shevchuk Victor, PhD in Economics, Assistant Professor, Lviv Commercial Academy, Ukraine

## Introduction

There is a discussion on relationship between income dynamics and external balance (trade balance)<sup>1</sup> in the Eastern European and Baltic countries. It is assumed that persistent worsening of the current account balance (henceforth CA) needs productivity growth and investment [10: 4]. However, sustainability of the CA deficit is questioned on the grounds of inverse relationship with income, as well as high budget deficit and credit growth, and decrease in the foreign direct investment (FDI) [11: 40]. This paper provides an empirical study of the interaction between income and the CA balance (trade balance), with the impact of internal and external factors. The aim was to study: 1) long-run linkages between income and CA balance using annual data; 2) estimate dynamics of both for certain countries. These two aspects are of interest to assess automatic adjustment of balance-of-payments (BOP) without any change in economic policy.

This paper presents consequence of tasks. At first, it is briefly discussed specific features of GDP growth, the CA and trade balance including review of the relevant references. Using well-known economic models (absorption model, monetary model, model of Mundell-Fleming, model of «dependent» economy, and model of intertemporal use), there are complete theoretical explanations on the interaction between income and external balance. Afterwards, there is empirical study of functional dependencies of GDP growth and CA balance, using a panel sample of annual data for 11 Eastern European and Baltic countries from the period 1990–2003. The panel sample of annual data for 11 countries is selected by the OLS method. Although OLS method is widely popular and informative [2; 10: 4–15], there is VAR technique, which gives more information on functional dependencies of certain countries. Our study results do not contradict with logic of intertemporal approach in private and government sectors, which is considered to be a dominant modern framework to deal with the income CA interaction. However, results demand important remarks concerning individual countries.

## Specifications of GDP dynamics and current account

If we look at former transition economies, there is a tendency of stable growth path associated with a decline of the CA and trade balance (Fig. 1). For the period 1990–2003, the CA deficit in the Eastern European averaged 3.3 percent and in the Baltic countries 6.2 percent of GDP respectively. Sustainable CA deficit is considered to be in the range of 4 percent of GDP for Hungary [7: 6]

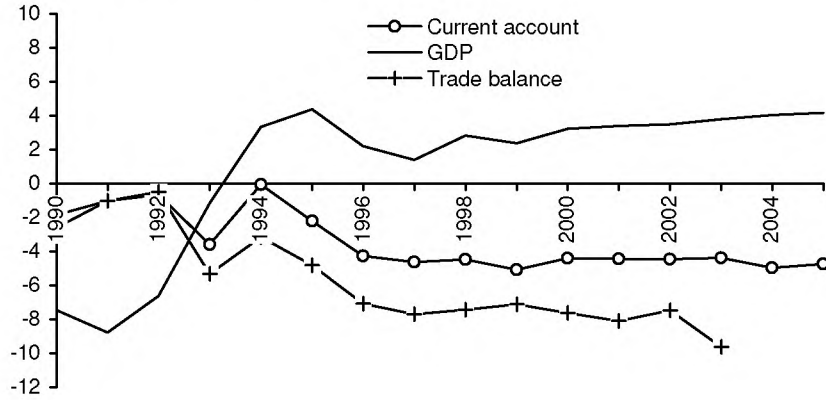
---

<sup>1</sup> The term «income» refers to GDP and industrial output, while external balance is defined as the current account balance, which records trade in goods and services, as well as investment income and transfer payments.

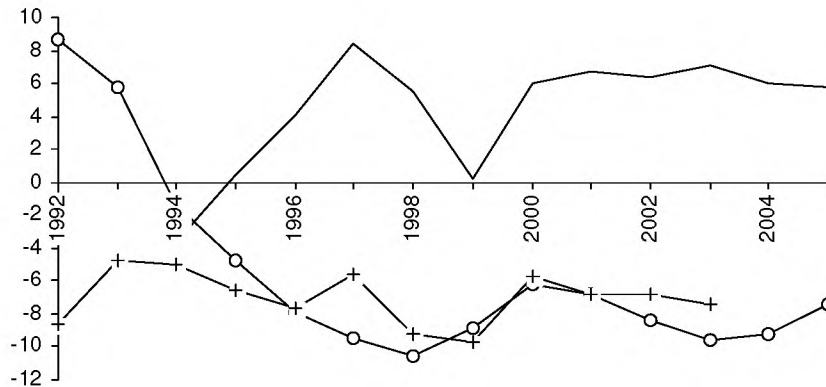
Figure 1.

**Selected macroeconomic indicators:  
GDP (%), CA and trade balances (% of GDP)**

a) The Eastern Europe countries



b) The Baltic countries

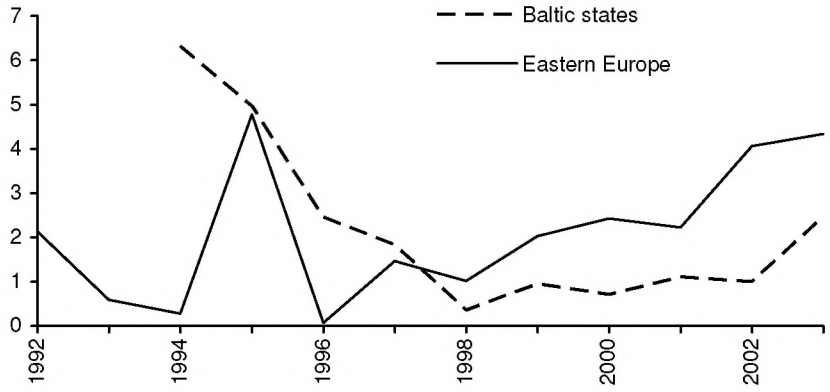


Source: International Financial Statistics; forecasts for 2004–2005 [11].

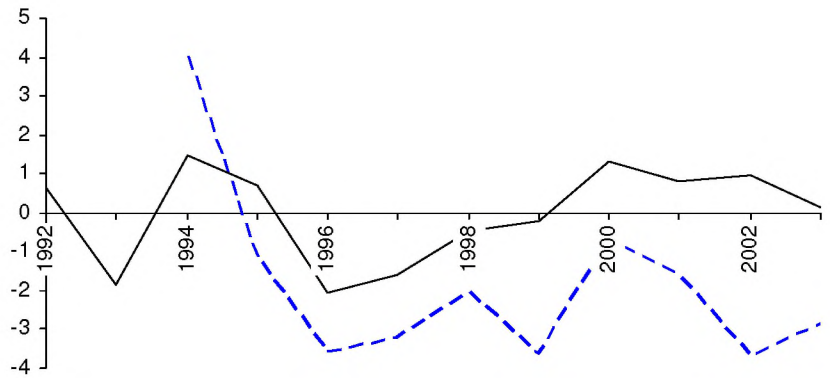
Figure 2.

**Financing of the CA deficit (% of GDP)**

a) Capital inflow



b) Foreign Direct Investment



Source: Constructed from raw data obtained from International Financial Statistics.



and to 3.5 percent of GDP for Croatia [4: 12, 56–58]. These indicators are below a standard *ad hoc* threshold of 5 percent of GDP [6: 509]. Such a level of the CA deficit sustainability is less favorable for the Baltic countries, where the «safe» CA deficit is estimated as 7.5 percent of GDP. However, this threshold level decreases to 5 percent of GDP, if the foreign debt «highest point» is at 70 percent of GDP imposed [10: 9, 13]. Although the net capital inflow still meets financing needs for the CA deficit, a high CA deficit increases vulnerability to possible instability of capital inflows (Fig. 2)

Reasonable concern about the CA deficit comes down, if economic growth leads to a subsequent improvement of the external balance. Empirical results are rather ambiguous for the Eastern European countries, as well as in a wider international context. D. Frenkel, A. Razin and Ch. B. Yuen, based on data from 58 countries for the period 1967–1990, found the existence of a negative correlation between trade balance and income [6: 231]. Similar result is obtained by S. Edwards for the relationship between the CA balance and GDP growth in 12 devaluation-experienced countries [5: 282]. M. Chinn and E. Prasad during a study of 89 countries found a direct dependence between increase of GDP per capita and the CA balance for industrial countries. However, empirical results are not the same for developing countries [3]. M. Bussière, M. Fratzcher, and G. Müller established for the OECD, Eastern European and Baltic countries that an increase of GDP above its level leads to improvement of the CA balance, while an opposite outcome is brought by the increase of investments [2]. In our study of 11 countries with transition economies inverse relationship between income growth and the CA balance has been found [1: 44]. On the other hand, a possible two-way causality between the CA balance and economic growth should be taken into consideration. This kind of relationship has not been detected for the sample of 1990–2000 period, but recent structural shifts for the years 2000–2003 related to EU enlargement could change the situation.

### Theoretical framework

Analysis of the relationship between income ( $Y$ ) and CA balance implies identification of its nature direct or inverse and its exact direction ( $CA \Rightarrow Y$ ,  $Y \Rightarrow CA$ ,  $CA \Leftrightarrow Y$ ). The most favorable is situation when GDP growth improves CA balance, which, in turn, provides with incentives to economic growth. Less attractive is an opposite case, when economic growth leads to a decline of the CA balance with an unfavorable feedback. Another two cases refer to asymmetric interaction between income and the CA balance. Both cases have rich theoretical explanations.

A direct relationship between income and the CA balance is defined by the absorption approach models, which imply that economic growth leads to a CA surplus, while an increase of absorption (expenditures of private and government sectors) has the opposite affect [6: 9–36]. Income growth is not ham-

pered by the BOP constraints. The fiscal-monetary tools are sufficient for the BOP adjustment. Considering money market equilibrium, a positive impact of income upon the CA balance is reinforced through the absorption-reducing increase of interest rate [1: 224–228]. Though in a standard absorption model the CA surplus is pro-growth, its extension for the «dependent» economy with supply and consumption of traded and non-traded goods does not rule out that exports «crowd out» demand for non-traded goods and thus decelerate income growth [1: 173]<sup>2</sup>. The CA balance is improved the higher is the share of traded goods in aggregate absorption. However, a demand-led income growth leads to worsening of the CA balance.

Income-induced demand for money is a main factor of the CA improvement in numerous monetary models of BOP, but this mechanism is of short-term duration, and it becomes ineffective in the long-run in line with monetization of foreign exchange reserves [9: 6–7]. However, a monetary model does not reject a sustainable combination of income growth and the CA surplus, if: 1) exports contribute to the increase in demand for money, and 2) there are conditions for sterilization policies via capital outflows. Thus a monetary model provides support to a two-way causality, when income growth contributes to the improvement of CA balance, and this outcome, in turn, strengthens dynamics of economic growth.

In the Mundell–Fleming model, as an open economy extension of the ISLM model, the CA balance is modeled as a function of domestic and foreign incomes plus relative price levels in the foreign trade. A general projection is that higher GDP growth leads to a CA deficit as part of the increased income spent on imports, thus requiring adequate foreign investment. This assumption is supported by data. For example, in 1990–1999 the CA deficit of 2.9 percent of GDP in the Eastern European countries and 5.3 percent of GDP in the Baltic countries was observed against the backdrop of capital inflows at the level of 2.9 and 9.8 percent of GDP, respectively. In 2000–2003, the average CA deficit in both groups of countries has increased to 4.4 and 7.7 percent of GDP. The trade deficit in the Eastern European countries has reached to 8.2 percent of GDP, comparing to 4.6 percent of GDP in 1990–1999. At the same time, the rate of GDP growth increased from 2.8 percent in 1994–1999 to 3.5 percent in 2000–2003. The International Monetary Fund (IMF) forecasts for 2004–2005 some improvement in the CA deficit in the Baltic countries, with no substantial changes in the Eastern Europe [11: 40]. Based on 2000–2003 data, capital inflow substantially exceeds financing needs of CA deficit in Croatia, Slovenia, the Czech Republic, Slovakia, and Romania. However, in Hungary, Poland, Estonia, and Latvia such opportunities are almost exhausted.

<sup>2</sup> The economy is «dependent» in the sense of the reliance of its growth upon the production of non-traded goods, which are not traded on the international markets. However, the CA balance is determined by the demand and supply of the traded goods only. This structural feature may cause obstacles for economic growth, as the CA deficit requires restrictive economic policies, contributing to a decline in the supply of non-traded goods and as a result it reduces GDP growth.

In the Mundell–Fleming model, inverse relationship between income and CA balance is combined with a pro-growth impact of the CA surplus. Substantial worsening of the CA balance requires devaluation of the currency note. Financing of the CA deficit by capital inflow is assumed to be stable, and non-limited phenomenon. This assumption is consistent with the experience of several countries, which financed their CA deficits for quite a long time [6: 531–555]. For instance, Australia ran a CA deficit for 40 post-war years; since the beginning of 1980s this indicator exceeded 5 percent of GDP. In 1965–1985, the CA deficit was a feature of the South Korean economy; only in the second half of 1980s there was a switch to the CA surplus. Similar evolution had been experienced by Ireland, where the CA deficit of 1970–1980s was followed by the CA surplus since the beginning of 1990s.

The portfolio model shares with the Mundell–Fleming theoretical framework the same specification of the CA balance (it is dependent upon income and relative prices in foreign trade). However, the possibility of indefinite external financing of the CA deficit is rejected on the grounds of financial assets equilibrium (in the long-run,  $CA = 0$ ). Capital inflow causes the CA balance to move into deficit through the income growth, caused by decrease in interest rate and increase in the money supply, or currency note appreciation. The CA balance does not exert any independent impact upon income, while being dependent upon capital flows.

In the neoliberal spirit, substantial capital inflows into Eastern European and Baltic countries and subsequent worsening of the CA balance are motivated by higher returns on investment. As incentives for capital inflow are gradually eliminated by accumulation of the capital stock to the level of EU countries, a necessary improvement in the CA balance is expected. Surely, this interaction assumes dependence of CA from capital inflow, not the opposite one. Corresponding developments are explained by macroeconomic balance models, which connect GDP growth to the increase in savings [8]. The higher is dependence of savings from income, the faster is improvement in the CA deficit; opposite result is brought by the inverse income–CA linkage. Preconditions for capital inflow are strengthened by a low foreign debt/GDP share, which ranges from 33.9 percent of GDP in Romania to 45 percent of GDP in Poland (as for 2003). But in a few countries, like Hungary (62.3 percent of GDP), Bulgaria (66.2 percent of GDP), Estonia (74.3 percent of GDP), Latvia (84.2 percent of GDP), and Croatia (83.3 percent of GDP), prospects for further foreign debt accumulation are rather pessimistic.

Worsening of the budget deficit in Poland, Hungary, Croatia and the Czech Republic is an extra argument against of large capital inflows. Accumulation of foreign liabilities in the government sector increases either risk of the BOP crisis, or the threshold of a «safe» (or equilibrium) CA deficit. Example of Hungary in 1993–1994 (see Fig. 3d), or several other international cases are quite convincing. Defaults on foreign debt in Mexico (1994) and Argentina (2000–2001) had occurred under relatively low foreign debt/GDP ratios of 50.0 and 51.6 percent of GDP, respectively. Even more convincing argument against

of large capital inflows that is provided by the example of Chile, where neither budget surplus, nor low foreign debt at 34.7 percent of GDP had secured against the 1982 crisis [6: 557].

Although capital inflows look sufficient for the CA deficit financing (usually problems are evident in the mid- and long-run), a decrease in FDI inflows raises more concerns. The Eastern European countries still are able to finance the CA deficit with FDI inflows (see Fig. 2b). However, this is not the case for the Baltic states, where in 2001–2003 FDI inflows were on average 2.2 percent of GDP less of the CA deficit financing requirements. The average in 1990–2003 levels of the CA deficit and FDI inflows, for the group of 8 Eastern European countries, is coinciding, 3.30 and 3.55 percent of GDP respectively. For same period in the Baltic countries corresponding figures is 6.2 and 5.4 percent of GDP. For the 2000–2003 period, FDI inflows exceeded the CA deficit financing only in Slovakia, Croatia, the Czech Republic, and Slovenia.

More complicated explanation of the interaction between income and the CA balance is offered by intertemporal approach [2; 6: 207–218]. A combination of economic growth and the CA deficit is justified on the grounds of investment needs, optimistic growth rate and higher capital costs comparing to the world standards. Regardless of motivation – *consumption-smoothing* between present and future periods, *consumption-tilting* (this might be resulting from low world interest rate), or *consumption-augmenting*, resulting from high contemporaneous investments, intertemporal approach argues in favor of a debt-financed CA deficit. Future economic growth should decrease foreign indebtedness and improve the CA balance.

Intertemporal approach does not reject a direct link between economic growth and the CA balance in the case of *temporary* increase in labor productivity [6: 217]. While a *permanent* increase in labor productivity worsens the CA balance through an increase in investment and private consumption in excess of production, a temporary increase in productivity is marked by a small increase of private consumption, with no changes in investment. As a result, productivity-led growth leads to improvement of the CA balance. Similar implication is raised by the permanent income hypothesis, which explains increase of savings solely by a stochastic increase of production above equilibrium level. Ultimately, a tendency for worsening of the CA balance in the way of EU accession can be explained by either a steep increase in investments caused by permanent productivity growth, or slower GDP growth. Both theoretical assumptions have empirical evidence [2].

## Empirical results

This paper analyses determinants of the CA and trades balances, measured as a ratio relative to GDP, GDP and industrial output growth rates (in percent). The sample covers period 1990 to 2003. All annual and quarterly data are obtained from the «*International Financial Statistics*». The set of independent variables encompasses domestic investment (annual data), exchange rate (quarterly data), and a few variables of external factors. Indicators of German's industrial output and consumer price inflation (CPI) used for the effects of foreign income and external trade relative prices. The London Inter-Bank Offer Rate (LIBOR) aimed to consider interdependence between external trade and income from capital flow. Dummy *CRISIS* used to detect consequences of crisis in 1997–1998.

The estimation of annual data performed by OLS method. The data set includes 11 countries like Bulgaria, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, Hungary, Croatia, and the Czech Republic. Country-by-country estimations for quarterly data are made with the VAR method. Such approach helps to verify the OLS estimates and provides with ability to trace dynamics between income and the CA (trade balance).

Table 1 presents the estimates for CA and trade balance determinants. Though the DW statistics reveal some autocorrelation of residuals for the trade balance, all other statistical properties are quite appropriate. Independent variables explain 52 percent of the CA balance and 84 percent of the trade balance. Our results in Table 1 are in line with other empirical studies on the Eastern European and Baltic countries. First, an inverse relationship between GDP growth and CA (trade balance) is confirmed. Annual GDP growth of 6 percent worsens the CA balance by 1 percent of GDP. The income effect upon trade balance is much weaker, which is puzzling, as economic growth should lead to higher demand for imported goods than for services. This result might be explained by a substantial debt component of economic growth, so that the foreign debt servicing leads to a deterioration of CA balance. Second, a growth of investment worsens the external balance. Once again higher investment sensitivity of the CA comparing to trade balance runs counter to conventional wisdom. Third, both CA and trade balances are dependent of their lagged values. According to the intertemporal consumption models, such a relationship may reflect consumers' habit formation [2].

Dependence of the external balance upon German's industrial output demonstrates high level of integration with the EU countries. Dynamics of the LIBOR affects neither CA, nor trade balances.



Table 1.

**Determinants of the CA and trade balances, 1990–2003  
(OLS estimates for annual data)**

Independent variables	Dependent variables	
	CA	Trade balance
Lagged value	0.320 (4.116 <sup>*</sup> )	0.443 (7.374 <sup>*</sup> )
GDP growth	-0.163 (-2.399 <sup>**</sup> )	-0.075 (-1.883 <sup>***</sup> )
Investment	-1.029 (-4.114 <sup>*</sup> )	-0.428 (-3.063 <sup>*</sup> )
Industrial output in Germany	0.126 (1.994 <sup>**</sup> )	0.120 (3.248 <sup>*</sup> )
Adj. $R^2$	0.52	0.84
F- test	10.14 <sup>*</sup>	44.23 <sup>*</sup>
DW	1.92	1.78

Note: † – statistics are reported in parenthesis;  
\* – coefficient is significant at the 1% level (\*\* – 5%, \*\*\* – 10%)

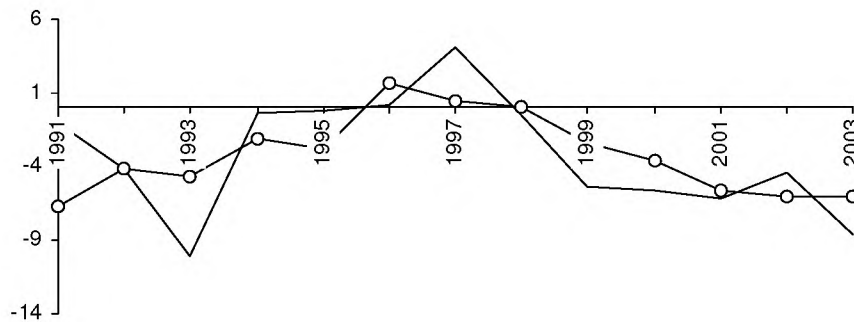
The OLS estimates confirm the existence of CA preconditions for the financial crisis in Hungary in 1993–1994, when the CA deficit exceeded its equilibrium value (Fig. 3d). It is more difficult to explain in the same BOP problems in the Czech Republic in 1996–1997 (Fig. 3b), which caused a devaluation of the *krona* in May 1997. However, since 2000 the actual CA balance is set at 2 to 2.5 percent of GDP below the equilibrium level. Similar to Hungary and the Czech Republic, Poland's equilibrium CA balance looks stable since mid-1990s (Fig. 3e). Excessive worsening of the CA happened in 1999, but the situation has been improved since then. Despite high deficits, there is no difference between Estonia's actual and equilibrium CA balances (Fig. 3c). A worsening of the Bulgaria's CA balance also coincides with a downward equilibrium trend (Fig. 3a). It is difficult to distinguish between actual and fitted CA balances in Romania (Fig. 3f).

Based on analysis of corresponding dummies, no country-specific conditions for the CA improvement are detected (not reported here). However, domestic conditions worsen the CA balance in Lithuania and Poland (corresponding coefficient is significant at the 1%), Bulgaria, Croatia, Latvia, and Romania (5%), and Estonia (10%). Only in Hungary, the Czech Republic, Slovakia and Slovenia domestic conditions have no impact upon the CA balance. Importance of the country-specific effects somewhat weakens the analytical congruence of panel estimates. A two-way causality between the CA (trade balance) and GDP growth looks quite convincing (Table 2). Intuitively comprehensive is a positive dependence of GDP growth from German's industrial output (due to higher demand for exports) and of a decrease in the lagged LIBOR (it stimulates capital inflow).

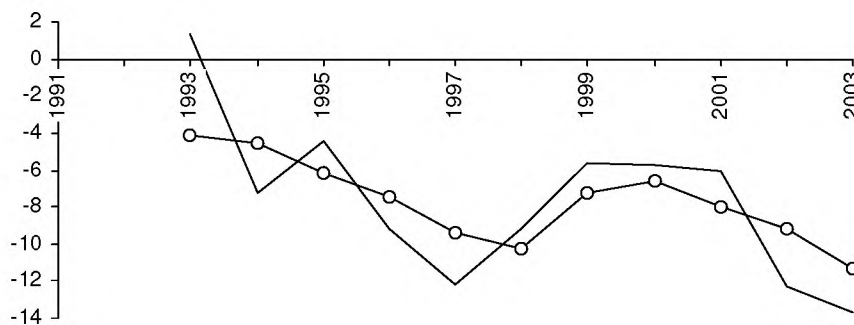
Figure 3.

**Actual and fitted (equilibrium) values of the CA balance  
for individual countries**

a) Bulgaria



b) Estonia



c) Poland

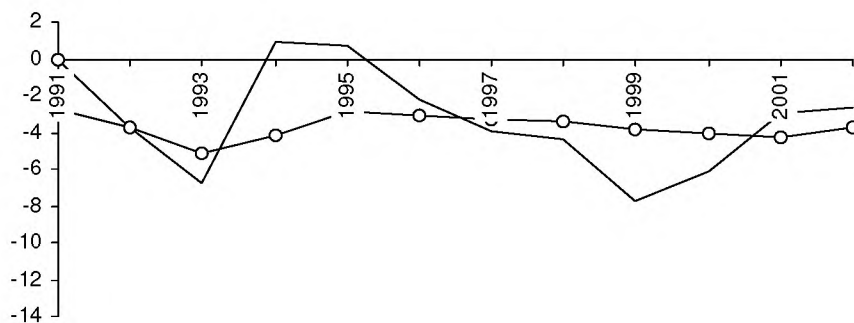
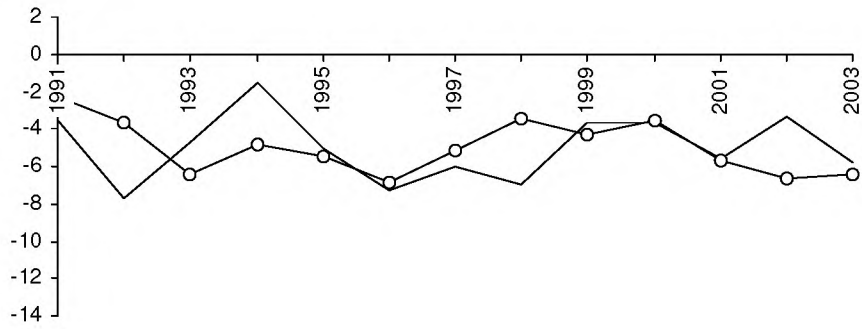
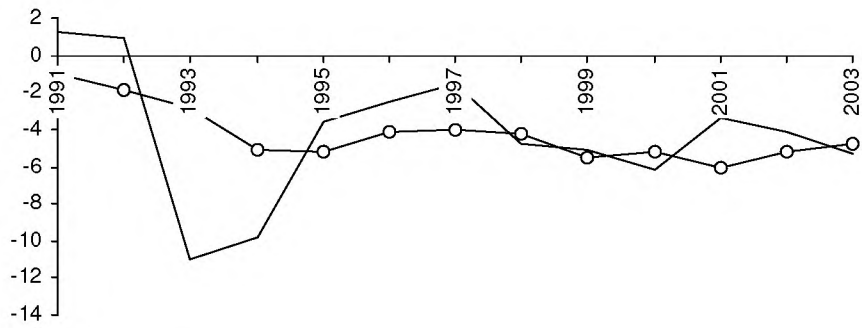


Figure 3.

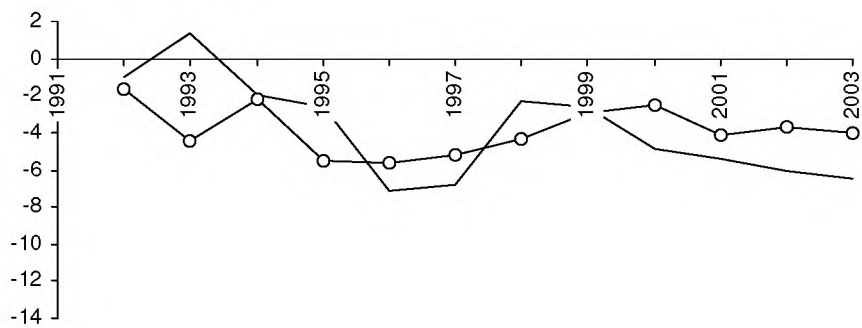
d) Romania



e) Hungary



f) The Czech Republic



Note: Actual values are shown with a solid line.



Statistical properties of GDP growth regression models (Table 2) are somewhat worse comparing to those of CA and trade balances (Table 1). Expansionary effects of the CA or trade balance deficits (Table 2) do not contradict the assumption of their «investment» quality (Table 1), providing support to intertemporal approach at the stage of a «catching-up» economic growth. In such a context, increase of investment, resulting from permanent productivity growth, causes a worsening of the CA balance, which in turn is favorable for the economic growth. It is not ruled out that a deterioration of the CA balance is caused by the increase of private and government expenditures induced by consumption-smoothing and consumption-tilting motives. The «dependent» economy model supports inverse relationship between the CA balance and GDP growth, but if growth is centered on the traded goods sector it leads to CA balance improvement. In the Mundell–Fleming model, the CA balance would have an expansionary impact, while in the portfolio model it does not affect the income growth to any extent.

Table 2.

**Determinants of GDP growth, 1990–2003**  
(OLS estimates for annual data)

Independent variables	Dependent variable – GDP growth	
	I	II
Lagged GDP growth	0.163 (1.764 <sup>***</sup> )	0.188 (2.017 <sup>**</sup> )
CA balance	-0.270 (-2.631 <sup>*</sup> )	—
Trade balance	—	-0.452 (-2.126 <sup>**</sup> )
Lagged trade balance	—	0.338 (2.004 <sup>**</sup> )
Lagged LIBOR	-0.184 (-2.279 <sup>**</sup> )	-0.174 (-1.979 <sup>**</sup> )
Industrial output in Germany	0.131 (1.610)	0.147 (1.669 <sup>***</sup> )
Adj. $R^2$	0.18 <sup>*</sup>	0.12 <sup>*</sup>
F- test	2.89 <sup>*</sup>	2.04 <sup>*</sup>
DW	2.24	2.37

Deeper insights in respect to the direction of causality, dynamics and magnitude of a few interrelated endogenous factors are provided by the VAR estimates. Country-specific variants of the following VAR model with **vector-error correction** term (VEC) are estimated:

$$\Delta y_{i,t} = \Gamma_1 \Delta y_{i,t-1} + \dots + \Gamma_k \Delta y_{i,t-k+1} + \Pi \tilde{y}_{i,t-1} + \Psi X_t + \varepsilon_t,$$

Where,

$\Delta y_t$  – the first differences of endogenous variables,

$\tilde{y}_t$  – the long-term values (in levels),

$X_t$  – the set of independent variables,

$\varepsilon_t$  – a stationary error term.

The VEC models account for the long-run restrictions imposed upon the short-run dynamics, being applied to the co-integrated series only. The Johansen's co-integration analysis is used to test a presence of long-term relations between income and external balance. For Slovakia, the error-correction is not used in one specification, as the long-term co-integrative relationship between the trade balance and industrial output has not been identified.

For all the countries long-run relationships of the VEC models confirm an inverse relationship between GDP growth and trade balance<sup>3</sup>, being fully relevant to the OLS estimates. The inverse relationship between GDP growth and the CA balance holds for Latvia, Croatia and Hungary, but in Lithuania, Slovenia and the Czech Republic the direct relationship between two indicators is observed. There is no long-run relationship between GDP growth and the CA balance in Estonia (lack of appropriate quarterly data did not allow the analysis for Poland, Romania, and Slovakia). The inverse relationship between industrial output and trade balance is found for Poland, Romania, Slovakia, and Croatia, while the direct relationship appears to be in case of Hungary and Slovenia. There are no any linkages between two indicators in the Czech Republic (estimations for the Baltic countries were not conducted). It is possible to conclude that the VEC model does not reject assumptions of the intertemporal models, but it attracts attention to the individual components of the CA balance (services and investment income), as well as to country-specific features.

The short-run effects are analyzed using the impulse response functions (Fig. 4–6). The inverse relationship between GDP growth and the CA balance is observed for the Czech Republic, Estonia and Lithuania, while the direct relationship is being a distinct feature of Hungary and Latvia (Fig. 4b). It is evident that the VEC estimates witness asymmetric short-run and long-run CA balance and GDP relationships. The impulse functions « $Y \Rightarrow CA$ » for Slovenia and Croatia differ on impact, but then both converge steadily to a neutral position. In all cases the impact of GDP growth upon CA balance is substantially weakened in about four quarters. Variance decomposition shows that GDP growth significantly affect the CA balance only in Hungary and Lithuania, where it determines up to 20% of the CA dynamics. The share of the CA balance in GDP growth for Croatia is 10%, even though the impulse function shows income neutrality in respect to the CA balance. Decomposition analysis supports assumption of lack of

<sup>3</sup> These results are not presented in the paper, but will be provided on request.

any GDP influence upon the CA balance in the Czech Republic, Slovenia, Latvia and Estonia. Around a year economic growth contributes to the CA improvement only in Hungary, but this effect becomes weaker over period of time. In case of Lithuania and Croatia, it is possible to argue about the worsening of the CA balance, which disappears over the year.

The impact of GDP growth upon the CA balance is much stronger in the group of countries with the pro-growth CA surplus, i.e. in Lithuania, the Czech Republic and Hungary (Fig. 4a), where the CA improvement triggers a sustainable income growth. The weight of the CA balance in GDP growth ranges from 35% in Hungary to 60% in the Czech Republic and Lithuania. Corresponding weight is much lower – 10 to 20% in the countries with inverse relationship between both indicators, like Estonia, Latvia, Croatia, and to less extent Slovenia. It worth to note that only in Estonia and Croatia, VEC estimates do not differ from the OLS estimates (Tables 1 and 2). It is just the opposite in Hungary, where GDP growth produces improvement in the CA balance, with a positive feedback to growth. In the Czech Republic and Lithuania, GDP growth causes deterioration of the CA balance, while improvement in the external balance contributes to the growth dynamics. In Slovenia and Latvia, GDP growth leads to the CA improvement, but with a negative feedback to GDP dynamics.

The growth automatic BOP adjustment seems to be present in Hungary. The situation looks somewhat worse in Latvia and Slovenia, because income-induced improvement in the CA balance has a negative feedback. The least optimistic are predictions for Estonia and Croatia, where a worsening of the CA balance strengthens an inverse relationship with income growth. Although the intertemporal approach assumes a reverse of the functional relationship between income and CA balance with time, estimated impulse functions do not predict this kind of development. Thus it is highly necessary that the fiscal-monetary mix and exchange rate policy are a must for the BOP adjustment.

It is no surprising that the impact of trade balance upon GDP growth (Fig. 5a) coincides with the impact of CA balance (Fig. 4a). The exception of the Czech Republic and Hungary, where an improvement in the trade balance has an adverse effect on GDP growth, while in the latter the trade balance becomes neutral in respect to GDP growth. Contrary to the CA estimates, expansionary impact of the trade deficit is stronger, especially in the Czech Republic and Slovakia, where foreign trade determines around 50% of GDP growth. This share is 30% for Hungary and Latvia, 20% for Slovenia, and 10% for Estonia and Croatia. Expansionary impact of the trade surplus is most visible in Poland, with its share in decomposition of GDP residuals exceeding 20%. The expansionary impact of trade surplus in Lithuania is short-lived. Taking into account mostly negative impact of the trade surplus, favorable effects of the CA surplus upon GDP growth in Hungary and the Czech Republic, may be attributed to lower costs of the foreign debt servicing.

Figure 4.

Interaction between GDP growth and the CA balance (VEC)

a) The effects of CA balance upon the GDP growth

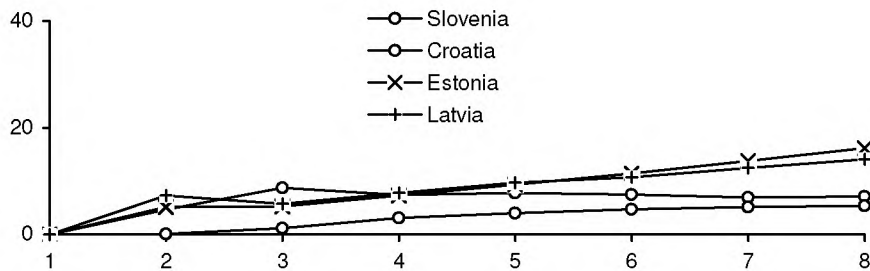
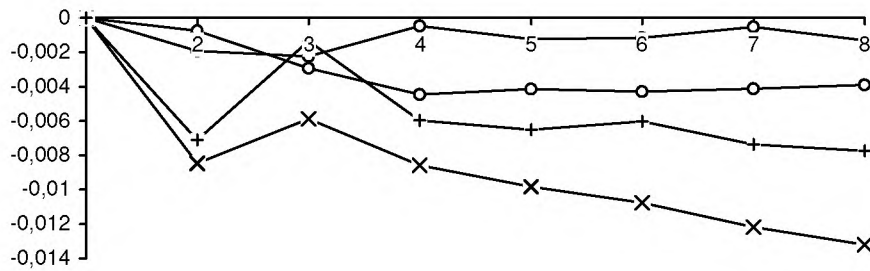
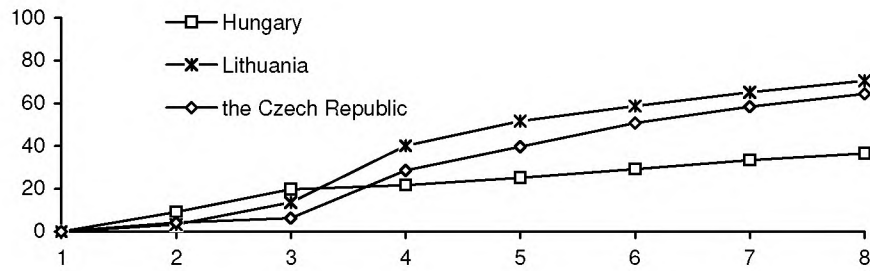
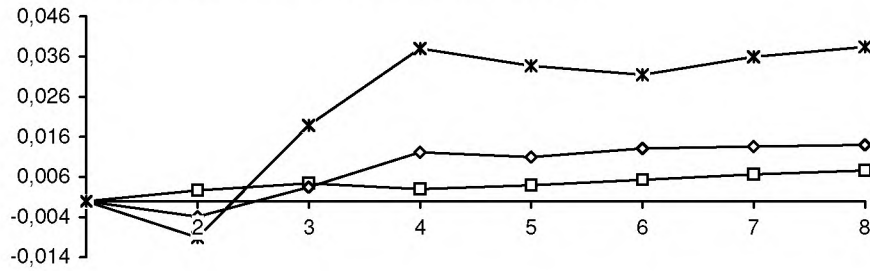


Figure 4.

b) The effects of GDP growth upon the CA balance

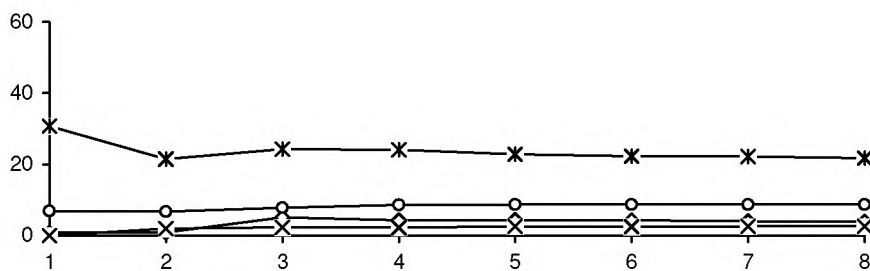
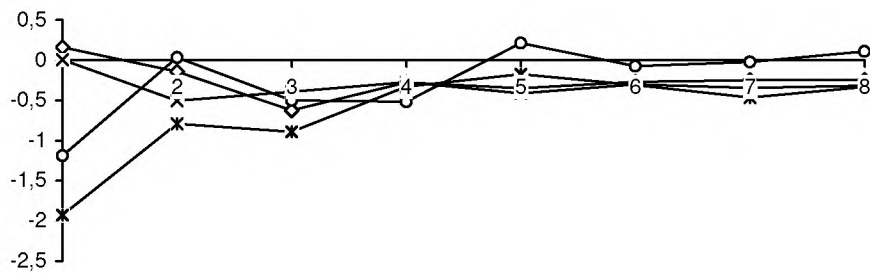
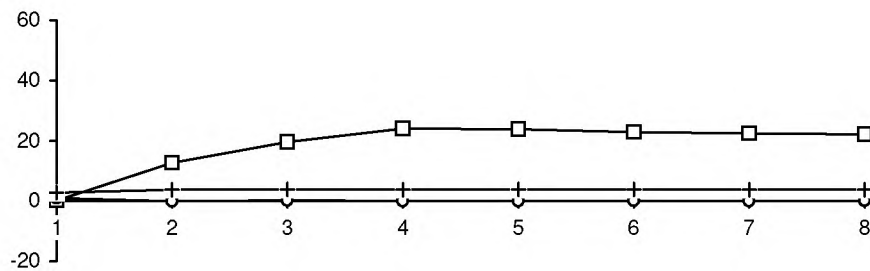
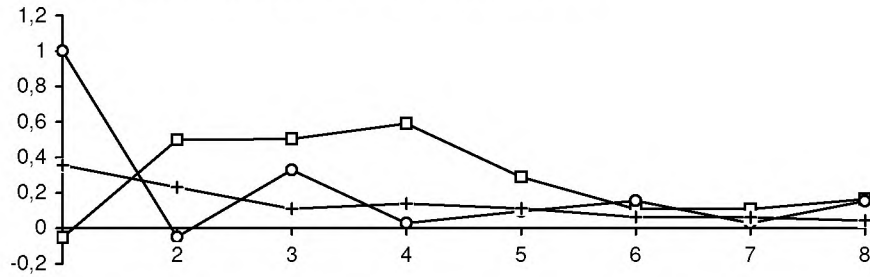


Figure 5.

Interaction between GDP growth and the trade balance (VEC)

a) The effects of trade balance upon GDP growth

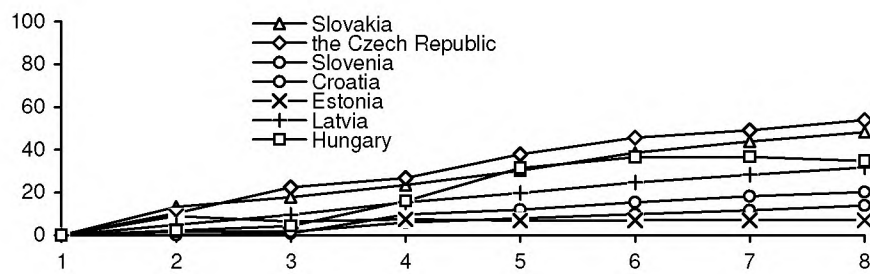
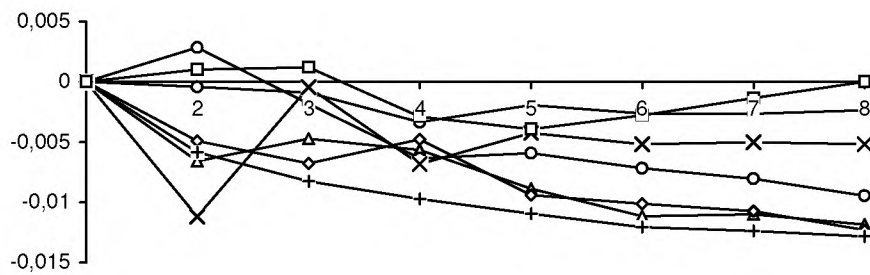
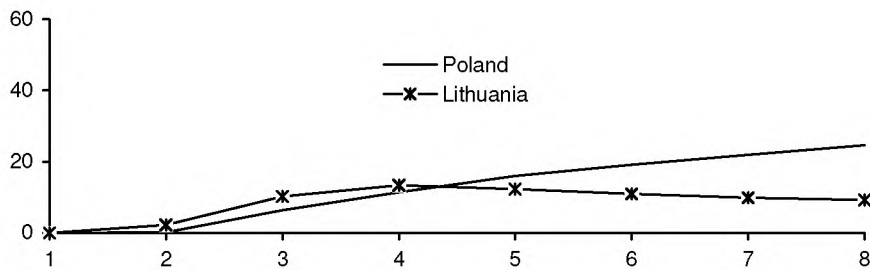
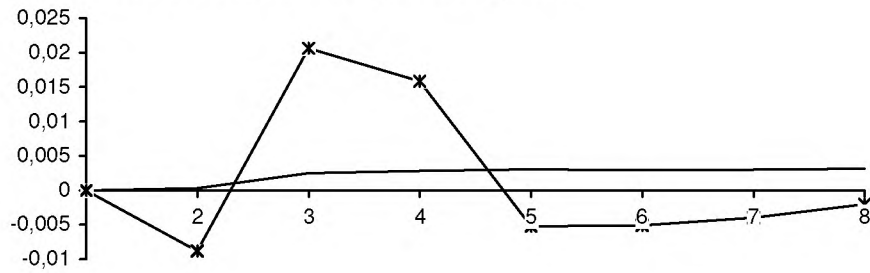


Figure 5.

b) The effects of GDP growth upon the trade balance

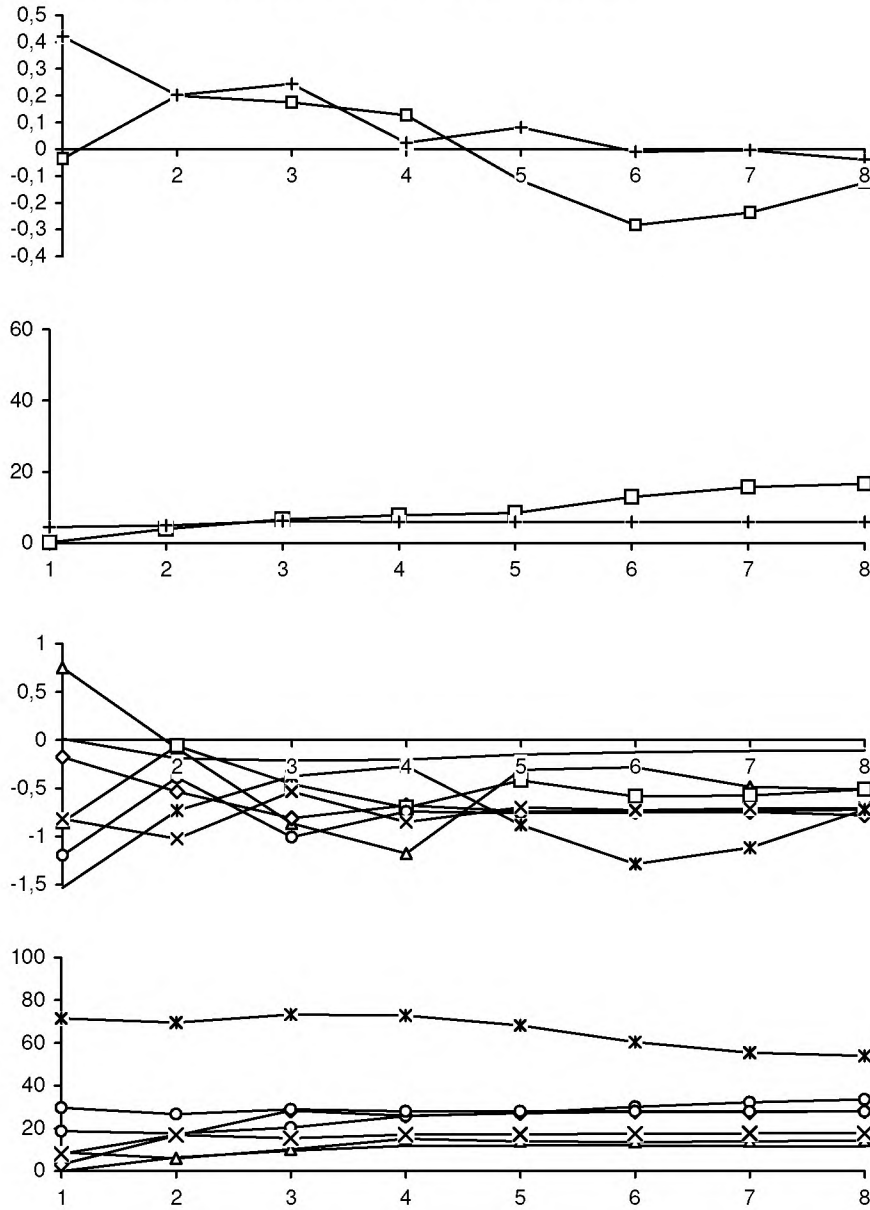


Figure 6.

Interaction between industrial output growth and the trade balance (VEC)

a) The effect of trade balance upon industrial output growth

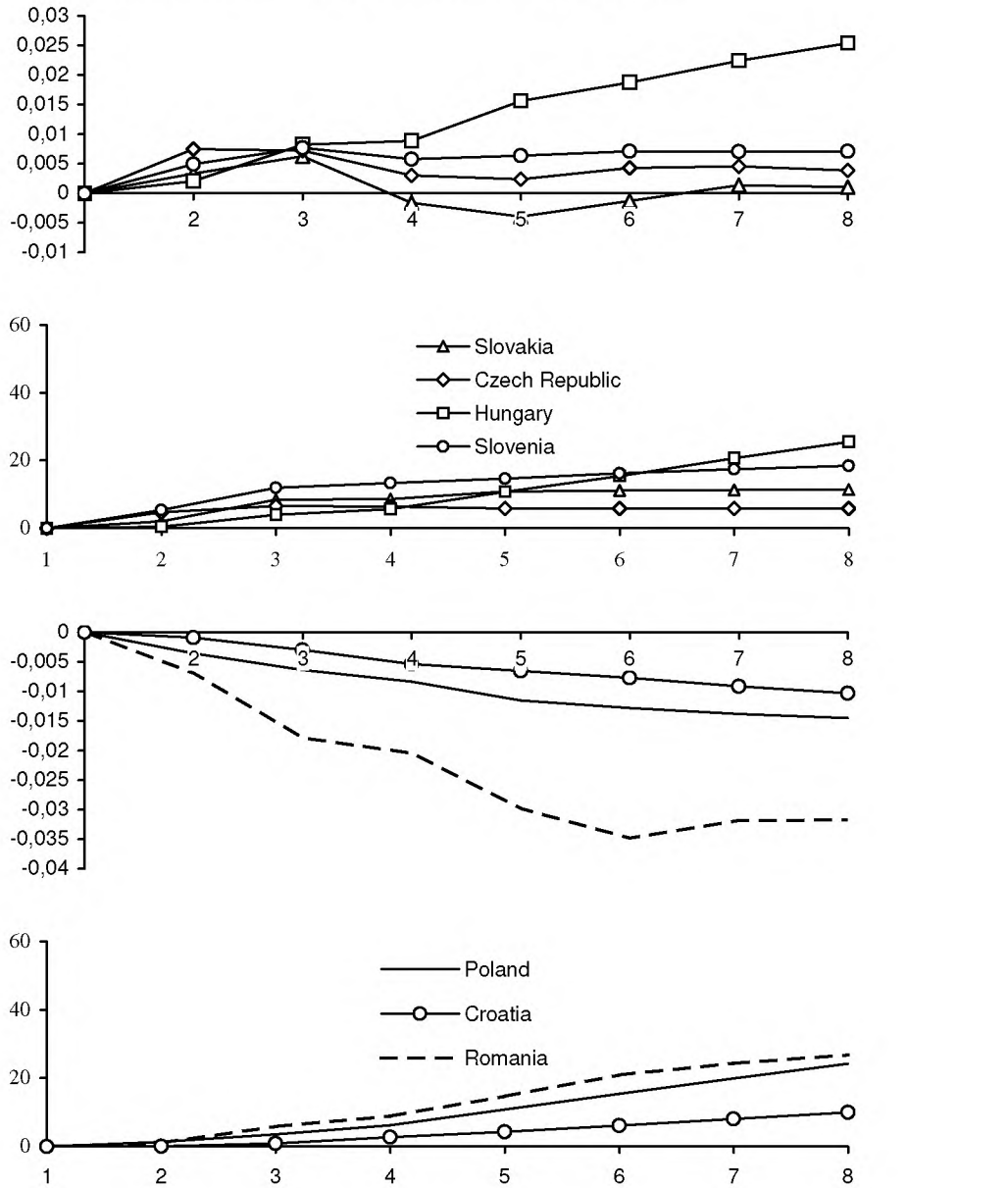
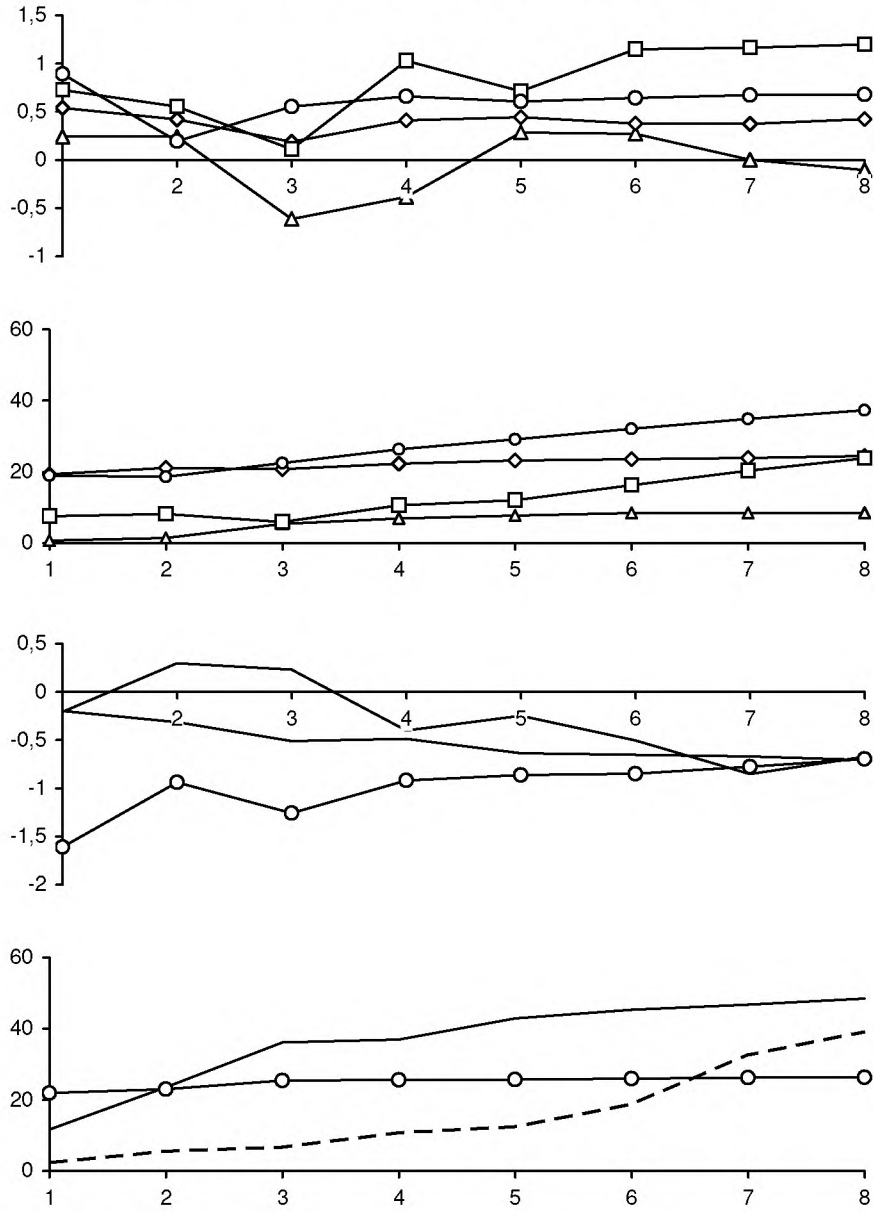




Figure 6.

b) The effects of industrial output growth upon the trade balance



It is clear that in debt-ridden economy conditions for intertemporal optimization of private and public consumption are lacking. The pattern of GDP–CA (trade balance) interaction in Hungary reflects the logic of the monetary model, which proposes symmetric short-run links between both macroeconomic indicators (economic growth improves the CA balance, thus creating a positive feedback), with a long-run neutrality. Although the effect of GDP growth upon CA and trade balances is not uniform, a switch from the short-run improvement of the external balance to the long-run neutrality is not ruled out. Similarly the trade surplus initially is marked by a slight acceleration of GDP growth, but then this impact is reversed, with a slow convergence towards neutrality. On the first glance, the expansionary impact of the CA surplus contradicts assumptions of a monetary model, but this outcome may result from the foreign debt servicing, preventing from accumulation of money assets. The trade surplus promotes GDP growth in Poland, but the opposite positive link is absent, which is in the spirit of the Mundell–Fleming model. Slovenia, Slovakia, the Czech Republic, Croatia and Estonia demonstrate such GDP–trade balance linkages, which are consistent with the logic of intertemporal approach.

If improvement in the trade balance has more chances to deteriorate GDP growth (Fig. 5a), its effects upon industrial output growth are opposite (Fig. 6a). Also a positive effect of industrial output growth upon the trade balance is more pronounced (Fig. 6b). In countries like Hungary, Slovenia and the Czech Republic with a positive income–trade balance relationship the weight of industrial output in the decomposition of residuals does not exceed 20%. Much stronger impact of industrial output is attributed to the countries with the corresponding worsening of the trade balance, as Poland, Romania, and Croatia, where the interaction between industrial output and trade balance looks unfavorable, as improvement in the latter sets obstacles to the former. More promising interaction of two determinants is observed in Hungary, Slovenia and the Czech Republic, where the expansionary trade surplus is supplemented with a positive output  $\Rightarrow$  trade balance causality. Regarding GDP growth and the CA balance, such a favorable interaction belongs only to Hungary (Fig. 3).

The impact of industrial output growth upon the trade balance looks stronger compare to the reverse dependence of trade balance from industrial output. On the other hand, it is likely that the trade balance exerts a stronger impact upon GDP than on industrial output. The impact of trade balance upon income is weaker for industrial output (Fig. 6b), compare to GDP (Fig. 5b). It may be explained by higher sensitivity of industrial output in respect to foreign demand, or by a relatively low propensity for imports in the domestic market-oriented branches. A stronger direct link between an increase in industrial output and improvement in the trade balance may result from certain import substitution. Also, output in export-oriented branches may be import-intense.

The impact of independent variables is very robust across all VAR models for German's CPI, suggesting that in all countries its upward changes are favorable for either GDP, or industrial output growth. There is not a single country with a positive impact of German's CPI upon the trade balance. With respect to

the CA balance, an improvement of this indicator is observed in Lithuania, with an opposite outcome attributed to Croatia and Latvia. Higher German's growth improves the trade balance in Poland and the Czech Republic, while affecting negatively foreign trade balances in Hungary and Slovakia; a resulting improvement in the CA balance is observed only in Latvia. German's industrial output promotes economic growth in the Czech Republic, Poland, and Slovenia, but in Slovakia and Lithuania its output effects are negative.

The currency devaluation does not affect GDP growth, industrial output and the external balance in Poland, Slovenia, and the Czech Republic. An unfavorable contemporaneous impact upon GDP growth in Croatia is neutralized in a quarter. Devaluation improves the trade balance in Romania, but at the cost of industrial output slowdown. Hungary is the only country, where the devaluation is favorable in both respects, promoting GDP growth and improving the CA balance.

The impact of LIBOR is quite heterogeneous. An inverse relationship between LIBOR and the external balance is found only in the Czech Republic (CA and trade balances) and Poland (the trade balance). Higher values of LIBOR improve the trade balance in Latvia and Slovakia, being neutral in respect to the CA balance in other countries. An increase in LIBOR promotes income growth in Hungary and Poland, but in the Czech Republic it causes a decrease in GDP and industrial output growth rates. An upward trend in LIBOR affects industrial output in Slovakia, but improves the country's GDP growth rate.

Dummy *CRISIS* suggests that the 1997–1998 crisis caused a worsening of CA and trade balances in Estonia, while only the former was affected in Hungary and Latvia and the latter suffered in Croatia and the Czech Republic. A crisis-connected decline in industrial output growth had happened in Romania and the Czech Republic, while in Slovakia only GDP growth left affected. Quite surprisingly the 1997–1998 crisis period contributed to GDP growth in Hungary and the Czech Republic. Contradicting results may be explained by the choice of exchange rate policies, as well as by structural features, such as the shares of traded and non-traded goods in the aggregate GDP, or the way the CA balance is determined by demand or supply of traded goods.

The BOP automatic adjustment looks a viable option for Hungary, where GDP growth at least does not worsen the CA balance, with an improvement of the latter being expansionary. By the same token, GDP growth does not affect the external balance in Latvia, but in this country improvements in either CA, or trade balances are not pro-growth. Similar are conditions for Slovenia, except of the inverse relationship between GDP growth and trade balance.

In other countries mostly inverse relationship between GDP or industrial output growth rates and the CA or trade balance looks «problematic» according to the majority of the BOP models, as a desirable improvement in the CA balance requires a slower income growth and implementation of the restrictive policy mix. An important exception is provided by intertemporal approach, which proposes a distinct two-period pattern of the income–external balance relation-

ship dependent on investment decisions. If intertemporal considerations are not effective, equilibrating improvement of CA deficit in Estonia and Croatia will require restrictive fiscal and monetary policies.

## Conclusions

This paper does not reject the assumption of significant long-run and short-run relationship between GDP and the current account or trade balances along the lines of intertemporal models. Relevant linkages are identified for either panel data estimates (OLS), or individual VAR/VEC estimates. Theoretically consistent interaction between GDP and the CA balance are traced in Estonia and Croatia, between GDP and the trade balance – in Estonia, Croatia, Slovakia, Slovenia, and the Czech Republic. However, theoretical predictions of intertemporal approach look much weaker in the case of industrial output (Poland, Romania, and Croatia). Regardless of indicators chosen, country-specific interaction between income and external balance is quite heterogeneous. The possibility of diverse effects by industrial output and GDP growth upon the trade balance is found in the Czech Republic, while different effects of the trade balance upon both indicators of income are present in Poland, Slovenia, and the Czech Republic. In Slovenia, GDP growth has asymmetric effects upon the CA and trade balances. Only in Croatia, Hungary, and the Baltic countries GDP–external balance relationships are different in respect to the indicators chosen. Hungary is closest among all countries to the pattern of direct linkage between income and external balance, when increase of GDP or industrial output improves the CA and trade balances.

A few other results are worth to mention:

- a) an improvement in the CA balance promotes GDP growth in Lithuania, Hungary, and the Czech Republic,
- b) expansionary trade deficits have stronger income effects comparing with CA deficits,
- c) the income elasticity of trade balance is higher comparing with the effects of trade balance upon income growth.

In most of the countries income growth depends positively upon German's CPI, while the contribution of German's industrial output appears to be much weaker. The trade balance of the Eastern European and Baltic countries follows changes in German's output, with the CA balance being more sensitive to German's CPI. The effects of LIBOR upon GDP growth and industrial output, as well as on the trade balance, do not reveal any regularity. The inverse relationship between LIBOR and the current account balance is established only in the Czech Republic. Preconditions for the balance-of-payment automatic adjustment have been found in Hungary, Latvia and Slovenia. If intertemporal considera-

tions are not strong enough, the improvement of CA deficit in Estonia and Croatia will require a restrictive fiscal-monetary mix..

### Bibliography

1. Шевчук В., Платіжний баланс і макроекономічна рівновага в трансформаційних економіках: досвід України. – Львів: Каменяр, 2001. – 495 с.
2. Bussière M., M. Fratzcher, and G. Müller., Current Account Dynamics in OECD and EU Acceding Countries – An Intertemporal Approach. *Working Paper* No. 311. – Frankfurt: ECB, 2004. – 32 p.
3. Chinn M., and E. Prasad., Medium-Term Determinants of Current Accounts in Industrial and Developing Countries: An Empirical Exploration. *Working Paper* No. 46. – Washington: IMF, 2000. – 39 p.
4. Croatia: Second Review Under the Stand-By Arrangement. *Country Report* No. 358. – Washington: IMF, 2003. – 58 p.
5. Edwards S., Real Exchange Rates, Devaluation, and Adjustment: Exchange Rate Policy in Developing Countries. – Cambridge, Mass.; London: The MIT Press., 1989. – 371 p.
6. Frenkel J., A. Razin, and C.-W. Yuen., Fiscal Policies and Growth in the World Economy. – Cambridge, Mass.; London: The MIT Press, 1996. – 641 p.
7. Hungary: 2004 Article IV Consultation. *Country Report* No. 145. – Washington: IMF, 2004. – 44 p.
8. Knight M., and F. Scacciavilliani., Current Accounts: What Is Their Relevance for Economic Policymaking? *Working Paper* No. 71. – Washington: IMF, 1998. – 41 p.
9. Polak J., The IMF Monetary Model at Forty. *Working Paper* No. 49. – Washington: IMF, 1997. – 20 p.
10. Stavrev E., Current Account Sustainability in the Baltic States // Estonia: Selected Issues. *Country Report* No. 331. – Washington: IMF, 2003. – P. 4–15.
11. World Economic Outlook. Advancing Structural Reforms. April 2004. – Washington: IMF, 2004. – 263 p.

The article was received on September 9, 2004.