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## Current account benchmarks for central and eastern Europe: a desperate search?

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**CURRENT ACCOUNT  
BENCHMARKS FOR  
CENTRAL AND  
EASTERN EUROPE**

**A DESPERATE  
SEARCH?**

by Michele Ca' Zorzi,  
Alexander Chudik  
and Alistair Dieppe



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# CURRENT ACCOUNT BENCHMARKS FOR CENTRAL AND EASTERN EUROPE

## A DESPERATE SEARCH?<sup>1</sup>

by Michele Ca' Zorzi,  
Alexander Chudik and Alistair Dieppe<sup>2</sup>



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## Abstract

This paper examines two competing approaches for calculating current account benchmarks, i.e. the external sustainability approach á la Lane and Milesi-Ferretti (*LM*) versus the structural current accounts literature (*SCA*) based on panel econometric techniques. The aim is to gauge the medium term adjustment in current account positions that may be required in some central and eastern European countries. As regards the *LM* approach, we show how the outcome is especially sensitive to (i) the normative choice for external indebtedness and (ii) the decision to exclude the foreign direct investment subcomponent from the NFA aggregate. Turning our search to the *SCA* approach, we assess its sensitivity to model and parameter uncertainty by setting different selection criteria to choose amongst the over 8000 possible combinations of fundamentals. Furthermore, to test the robustness of our findings we combine all models, attaching to each a probability (Bayesian Averaging of Classical Estimates). We show both the *LM* and *SCA* methodologies are not immune from severe drawbacks and conceptual difficulties. Nevertheless pulling together the results of both approaches point to the countries that may need a current account adjustment over a medium term horizon.

**Keywords:** Current account, capital flows, financial integration, central and eastern Europe, panel data, model uncertainty, model combination.

**JEL Classification:** C11, C33, F15, F32, F34, F41, O52



## Non-technical summary

Several central and eastern European countries have over recent years recorded a period of robust economic growth, accompanied in some cases by sizeable current account deficits and strong capital inflows. While this can be viewed as a natural phenomenon and a sign of economic success, policy makers need to balance opportunities and risks appropriately. The current account provides a signal to assess if a medium term adjustment is required. The aim of this paper is to review critically two competing methods for calculating benchmarks for the current account and discuss their applicability to the case of central and eastern Europe.

The two approaches are very different. The approach á la Lane and Milesi-Ferretti (*LM*) is an accounting framework, in which benchmarks are calculated to ensure a stable external indebtedness position. Two factors turn out to be decisive: (*i*) at what level policy makers wish to stabilise external indebtedness - in some countries the 2007 level is by international standards high; (*ii*) whether to include foreign direct investment in the aggregate measure of indebtedness - the composition of net foreign assets positions may matter.

The alternative approach for deriving benchmarks is to estimate structural current accounts (*SCA*) based on panel econometric techniques. The search seems "desperate", as there are over 8000 alternative models. We proceed to run all models and show how for a number of variables the sign and magnitude of the coefficients are robust across all specifications. We then develop a transparent selection procedure to narrow down the choice to five models. Finally we combine the information of all models, giving to each a different weight on the basis of their statistical properties. This is achieved by taking Bayesian Averages of the Classical Estimates (BACE), following a methodology proposed recently by Sala-i-Martin *et al.* (2004). Our five preferred specifications and the combination of all models show current account benchmarks located within a relatively narrow range. One could claim success, however, for the policy maker two important caveats remain, (*i*) not all coefficients are consistent with our ex-ante expectations in terms of sign or magnitude (*ii*) some countries appear to be for a prolonged period of time in disequilibrium, suggesting that important country factors may be at play that a world model cannot adequately capture.

Our conclusion is that both the *LM* and *SCA* methodologies suffer from drawbacks and conceptual difficulties. Nevertheless pulling together the results of both approaches point to the countries that may need a current account adjustment over a medium term horizon. For the Visegrad countries the current account deficits in 2007 are consistent with stable external indebtedness (albeit in some cases at high levels) and no evidence of disequilibria emerge from the models selected and the models combined. For all other central and eastern European countries in our sample, the current account balances in 2007 are consistent with a deteriorating external indebtedness position. The selected models as well as the model combination also point to the need for a current account adjustment over a medium term horizon

# 1 Introduction

Several central and eastern European countries have over recent years recorded large current account deficits and a sizeable accumulation of stock liabilities. Different views have been expressed on whether this represents a concern or simply reflects the low initial level of financial integration and the ongoing catching up process. The question that then arises is if this substantial increase in stock liabilities, gross and net, may be justified in terms of economic fundamentals or is unwarranted.

This is not a new debate in economics as it is closely related to the "transfer problem" that was already addressed by Keynes and Ohlin in the 1920s whilst discussing the economic consequences of war repayments by Germany. In a similar vein it could be argued today that an exchange rate adjustment may be required to stabilise net foreign assets positions or reverse negative income flows, to swing these countries from experiencing current account deficits to surpluses (see Lane and Milesi-Ferretti, 2004, Krugman, 1999).

That said there is also something *special* about these economies. A *positive* element are the large size of foreign direct investment (FDI) inflows that in some cases have fully covered the current account deficits while helping to develop a viable and profitable export sector. This begs the non-trivial question whether strong FDI liabilities should be viewed as a supportive factor or worrisome (Aristovnik, 2006a). A *negative* element is the balance sheets exposure in some countries, a point which Krugman (1999) emphasised while analysing the origins of the Asian crisis.

Explanations for large deficits are often bundled with the notion of catching up. The literature by Lane and Milesi-Ferretti (2006) employs an accounting framework (*LM*) to derive current account (*ca*) benchmarks that would stabilise net foreign assets positions. From that perspective the open questions remain, especially for catching up countries, how much time is available for this stabilisation process to unfold and how to define the normative level of external indebtedness. The literature on structural current accounts (*SCA*) instead applies panel econometric techniques to establish if there is long-term relationship between the current account and standard macroeconomic fundamentals, such as relative GDP per capita, the demographic structure or fiscal policy. Key examples are the studies by Debelle and Faruquee (1996), Chinn and Prasad (2003), Bussière *et al.* (2004). The economic underpinning theory for this empirical analyses stems from the intertemporal approaches to the current account, which originated from the seminal papers by Buiter (1981) and Sachs (1981), later extended by Obstfeld and Rogoff (1994).

Emerging markets are traditionally expected to be net recipients of capital flows as the rate of return on investment is in normal circumstances higher. Although counter-examples are frequent,<sup>1</sup> central and eastern Europe behaves by the textbook: the financial and regional integration process is deepening, FDI is supporting the development of a competitive export sector and the catching up process has gathered momentum, particularly after EU entry in 2004.

Sizeable capital inflows may however constitute a risk to balanced economic growth and be subject to sudden reversals. Policy makers therefore face the challenge of balancing opportunities and risks appropri-

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<sup>1</sup>In his classic article Lucas (1990) described the reasons why capital may not always flow to emerging markets. Reinhard and Rogoff (2004) recently even pointed to the paradox whereby capital is flowing in the opposite directions to the "rich" countries. However, as suggested by a recent article by Abiad *et al.* (2007), Europe is different or rather closer to "textbook" theory.



ately.<sup>2</sup> Current account benchmarks may therefore constitute an additional tool among other indicators of financial stability for assessing the ongoing catching up process and whether a medium term adjustment is required. In this paper, we revisit the two competing methodologies just described, i.e. the accounting versus the panel econometric approaches. Our aim is to gauge if the implicit ranges that one derives from both these analyses provide ultimately meaningful guidance. As regards the *LM* approach, our contribution is to distinguish the role of different class of assets, in particular by separating the role of FDI. Given the nature of this paper we assess the sensitivity of the analysis to alternative plausible scenarios, including an exchange rate depreciation. We show how the outcome is especially sensitive (i) to the normative choice for external indebtedness and (ii) the decision whether to exclude the FDI subcomponent from the NFA aggregate.

As for the *SCA* approach, we address potential sources of model misspecification or inefficiency by developing a fully fledged model selection procedure for a large set of countries and a wide combination of determinants. This is in contrast with the existing analyses, which are not explicit on how the preferred model is selected (e.g. Chinn and Prasad, 2003 and Rahman, 2008). The different selection criteria here employed allow us to assess model and parameter uncertainty. As a final endeavour, we employ the Bayesian techniques recently developed by Sala-i-Martin *et al.* (2004) to weight and combine all models. As it turns out, the identified *ca* benchmarks that we find for central and eastern Europe are quantitatively similar irrespective of the selection criterion adopted, while the solution provided by combining all models lie typically within this range. Some elasticities are bounded in a tight range irrespective of model selected. For the Baltic countries, Romania and Bulgaria we find that *all models* signal a large current account disequilibrium that would require a correction over the medium term. This appears to be a very convincing result. The important caveat remains that some of the coefficients are not consistent with our ex-ante expectations either in terms of sign or magnitude, questioning the theoretical basis of this approach.

The remainder of this paper is organised as follows:

In Section 2 we introduce the key notation and the accounting framework developed by Lane and Milesi-Ferretti (2004 and 2006). In Section 3 we establish a number of key stylised facts for central eastern Europe for the period 2000-2007, examining in particular the important role played by FDI. In Section 4 we generalise the analysis by Lane and Milesi-Ferretti (2006), in particular by considering more explicitly the role of FDI and gauging the sensitivity of the results to alternative plausible assumptions. In Section 5 we calculate structural current accounts by panel data estimation techniques, by carrying out a wide-ranging search strategy for a large set of countries and fundamentals to assess model uncertainty. Additionally we explore model combination techniques to gauge the robustness of the analysis. Section 6 contains our main policy conclusions by pulling together the results of both approaches.

## 2 Notation and Accounting Framework

Let us assume that there are  $N$  currencies corresponding to  $N$  countries indexed by  $j \in \{1, \dots, N\}$ . We distinguish in this paper three types of assets/liabilities indexed by  $\ell \in \mathcal{S} \equiv \{eq, debt, fdi\}$ , standing respectively

---

<sup>2</sup>For a policy making perspective on the opportunities and risks associated to present developments in central and eastern Europe see the speeches by Bini Smaghi (2007) and Stark (2007).

for equity, debt and foreign direct investment.<sup>3</sup> The analysis that follows, however, is general as there are different possible ways of decomposing assets and liabilities.<sup>4</sup>

Define  $Q_{Aljt}$  the quantity of asset of type  $\ell \in \{eq, debt, fdi\}$  denominated in currency  $j$  and held by the home economy between period  $t$  and  $t + 1$ . The price of one unit of asset  $\ell$  denominated in currency  $j$  is similarly denoted as  $P_{Aljt}$ . Therefore  $A_{\ell jt} = P_{Aljt}Q_{Aljt}$  is the nominal value of the asset  $\ell$  denominated in currency  $j$  at the end of period  $t$ . Considering furthermore that  $E_{jt}$  is the nominal exchange rate of currency  $j$  (i.e. the amount of domestic currency for one unit of currency of country  $j$ ), the following expression  $1 + s_{jt} \equiv \frac{E_{jt}}{E_{j,t-1}}$  defines an exchange rate depreciation relative to country  $j$ . Finally  $A_{\ell t} = \sum_{j=1}^N A_{\ell jt}E_{jt}$  is the nominal value of assets of type  $\ell$  while  $A_t = \sum_{\ell \in \mathcal{S}} A_{\ell t}$  is the nominal value of all foreign assets held in the home economy, both expressed in domestic currency terms. Similarly, we use letter  $L$  to denote liabilities.

Given this initial notation, we denote the effective average return on all foreign assets held by the home economy as

$$r_{At} = \sum_{\ell \in \mathcal{S}} r_{A\ell t} w_{A\ell t},$$

where  $r_{A\ell t}$  is return on the assets of type  $\ell$ , the weights assigned to each asset are given by

$$w_{A\ell t} = \frac{A_{\ell,t-1}}{A_{t-1}},$$

and  $r_{A\ell t}$  is defined as follows<sup>5</sup>

$$r_{A\ell t} = \sum_{j=1}^N r_{Aljt} \frac{A_{\ell j,t-1} E_{jt}}{A_{\ell,t-1}}.$$

Similarly we define the rate of returns for liabilities. These definitions allow one to derive cross border financial flows as shown in Table 1 here below:

**Table 1: Cross Border Financial Flows (assets/liabilities).**

	Returns (in home currency)	Flows due to trade (in home currency)
<i>in</i>	$r_{At}A_{t-1}$	$H_{Lt} \equiv \sum_{s \in \mathcal{S}} \sum_{j=1}^N \Delta Q_{L\ell jt} P_{L\ell jt} E_{jt}$
<i>out</i>	$r_{Lt}L_{t-1}$	$H_{At} \equiv \sum_{s \in \mathcal{S}} \sum_{j=1}^N \Delta Q_{A\ell jt} P_{A\ell jt} E_{jt}$

<sup>3</sup>The international investment position was splitted among its equity and FDI components. Debt here is defined as the residual, incorporating therefore portfolio debt, other investment, financial derivatives and, in the case of assets, also reserves.

<sup>4</sup>One alternative would be dividing the international investment position between net external debt and non-debt components. This would entail subdividing FDI between debt (intercompany lending) and non debt components. One may also attempt to decompose FDI sectorally to distinguish between FDI that has flown in more or less productive or export oriented sectors. There is a degree of arbitrariness in the decision of how to split the international investment position. The example here chosen in this paper is meant to stress the importance of composition issues. Net FDI flows is used by central and eastern European national central banks as a proxy for productivity (e.g. in the Nigem block). Net FDI flows are also employed in export equations in a number of central and eastern European countries.

<sup>5</sup> $r_{A\ell jt}$  denotes return of asset  $\ell$  denominated in currency  $j$ .

## 2.1 Reconciling stocks, financial flows and capital gains

Recall that the following balance of payments identity must hold,

$$\underbrace{CA_t}_{\text{Current account}} + \underbrace{K_t}_{\text{Capital account}} + \underbrace{H_{Lt} - H_{AT}}_{\text{Trade in assets (financial account)}} + \underbrace{Z_t}_{\text{Net errors and omissions}} = 0, \quad (1)$$

as the sum of the current, capital, and financial account (including reserves) plus errors and omissions is equal to zero by construction. To reconcile cross-border financial flows with the evolution of stock assets and liabilities let us first consider the single asset  $A_{\ell jt}$ . The following identity holds:

$$\begin{aligned} \Delta Q_{A_{\ell jt}} P_{A_{\ell jt}} E_{jt} &= A_{\ell jt} E_{jt} - Q_{A_{\ell j, t-1}} P_{A_{\ell jt}} E_{jt} \\ &= A_{\ell jt} E_{jt} - Q_{A_{\ell j, t-1}} [P_{A_{\ell j, t-1}} E_{j, t-1} - \Delta (P_{A_{\ell jt}} E_{jt})] \\ &= A_{\ell jt} E_{jt} - A_{\ell j, t-1} E_{j, t-1} - KG_{A_{\ell jt}}, \end{aligned} \quad (2)$$

where capital gains (inclusive exchange rate valuation effects) for the type of asset  $\ell$  are equal to:  $KG_{A_{\ell jt}} \equiv Q_{A_{\ell j, t-1}} \Delta (P_{A_{\ell jt}} E_{jt})$ . Aggregating across the different class of assets we then define:

$$KG_{At} = \sum_{\ell \in \mathcal{S}} KG_{A_{\ell t}}, \text{ and } KG_{A_{\ell t}} = \sum_{j=1}^N KG_{A_{\ell jt}}.$$

By aggregating identity (2) across the different type of assets considered here yields the following

$$H_{AT} = A_t - A_{t-1} - KG_{At}. \quad (3)$$

After repeating the same for liabilities, net capital gain is defined as

$$KG_t = KG_{At} - KG_{Lt}.$$

Defining also  $B_t = A_t - L_t$  as net foreign assets at the end of period  $t$  evaluated in the domestic currency, then

$$B_t - B_{t-1} = H_{AT} - H_{LT} + KG_t,$$

which says that the improvement in net foreign assets position is equal to the sum of net cross-border financial flows plus the net total capital gain. Finally substituting identity (3) yields

$$CA_t + K_t + KG_t + Z_t = B_t - B_{t-1}. \quad (4)$$

To complete our notation, and similarly to Lane and Milesi-Ferretti (2006), financial integration is defined as  $F_t = A_t + L_t$ . Lower case letters are used to denote variables expressed as a shares of GDP, e.g.:  $b_t = \frac{B_t}{GDP_t}$ .

### 3 Stylised Facts and Patterns

Having completed these definitions, we review briefly where central and eastern Europe stands in terms of current account positions, financial integration and net foreign assets, both level and composition. One may recall that monetary policy differs considerably across countries, from completely fixed exchange rate arrangements to pure floaters. At the beginning of the transition process, most of these countries relied on pegging the exchange rate to a highly stable currency, such as the US dollar or the Deutsche Mark, as a way to import credibility from abroad and reduce inflation from high levels. In the course of the 1990s, a number of countries gradually softened their pegs and moved towards greater monetary policy autonomy and in some cases adopting inflation targeting as their monetary policy framework. Countries can be broadly distinguished between those with hard peg regimes (i.e. Bulgaria (BG), Estonia (EE), Latvia (LV) and Lithuania (LT)) and those with inflation targeting regimes with various degrees of exchange rate flexibility (i.e. the Czech Republic (CZ), Hungary (HU), Poland (PL), Romania (RO) and Slovakia (SK)). For the Visegrad countries current account positions in 2007 are not too dissimilar from the levels prevailing in 2000, while for the other five countries in this sample, those with hard peg regimes and Romania, there has been a substantial worsening in their CA positions since 2000 (see Figure 1).<sup>6</sup>

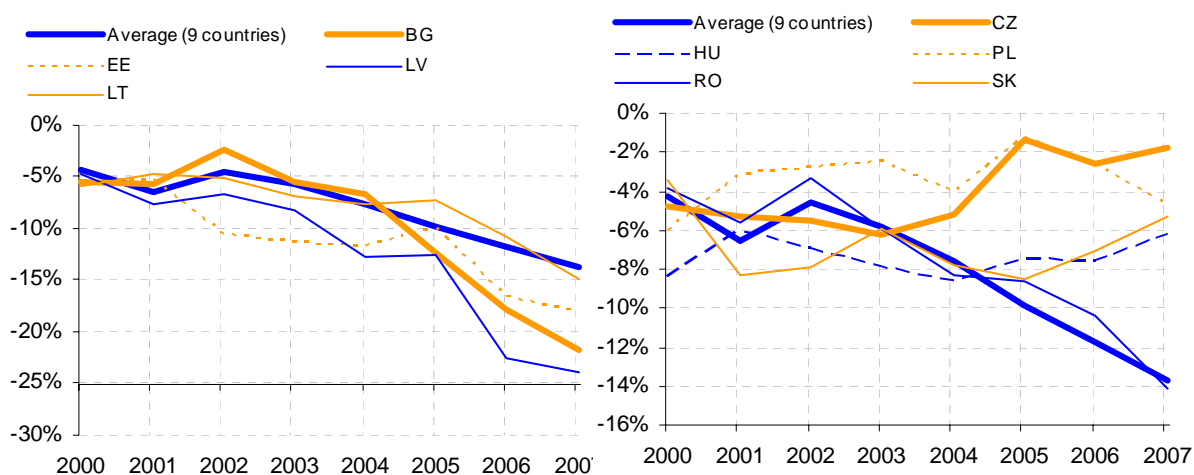


Figure 1: Current Account Developments (% of GDP); source ECB.

Consistently with the persistence of these deficits, the net foreign asset position in percent of GDP has deteriorated in all countries, reaching negative values close to 100% in the case of Hungary, and 80% in Estonia, Latvia and Bulgaria while remaining more contained elsewhere (see Table 2).

This process was accompanied by a general rise in the degree of financial integration, which reached levels greater than 100% of GDP for all countries (see Table 2) and above 200% for Estonia, Latvia, Hungary and

<sup>6</sup>Recent developments suggest that the current account positions might improve in the Baltics for 2008, against the backdrop of a substantially lower or even negative pace of economic growth.

**Table 2: Net Foreign Assets and Financial Integration in 2000 and 2007.**

	Net foreign assets		Financial integration	
	2000	2007	2000	2007
<b>Baltic States</b>				
Estonia	-48.6	-74.0	141.3	272.6
Latvia	-30.0	-79.2	129.1	246.5
Lithuania	-35.2	-56.1	84.6	149.9
<b>Visegrad group</b>				
Czech Republic	-8.8	-35.9	141.1	156.9
Hungary	-62.9	-97.1	148.3	320.1
Poland	-30.7	-47.9	80.6	113.3
Slovakia	-23.8	-53.2	125.6	145.9
Bulgaria	-34.5	-80.0	174.4	222.9
Romania	-27.1	-46.6	74.6	112.5

Source: ECB; in percent of GDP

Bulgaria. An important novel aspect of the catching up process compared to past experiences has been the large FDI coverage of the current and capital account deficits (see Figure 2), which was on average higher than 100% for the Czech Republic, Poland, Slovakia and Bulgaria between 2000 and 2007. The large current and capital account deficits have also been covered for a sizeable part by FDI in the Baltics, Romania and Bulgaria, although the coverage has fallen recently for all these countries except Bulgaria below 50%.

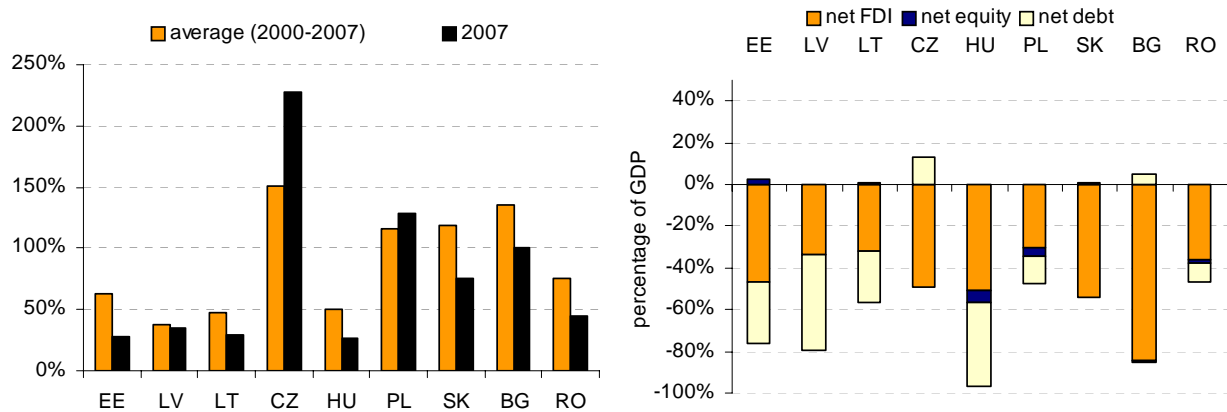


Figure 2: FDI Coverage of the Current and Capital Account on Average (2000-2007) and in 2007 (left chart) and Composition of the International Investment Position in 2007 (right chart).

This is reflected also in the composition of the net foreign assets, whose negative balances is mainly due to sizeable net FDI liabilities, albeit the debt component plays also an important role in the Baltic countries and Hungary. Excluding the FDI component, Bulgaria and the Czech Republic would even stand as net

creditors (see Figure 2). Finally, a key stylised fact is the high degree of foreign exchange rate exposure in several countries (see Lane and Shanbaugh, 2007). This applies particularly for the Baltic economies while it plays generally a lesser role for the Visegrad countries except for Hungary (see Table 3).

**Table 3: Central and Eastern European Countries: Foreign Currency Loans to the Private Sector.**

	2004	2005	2006	2007
<b>Baltic States</b>				
Estonia	80.0	79.3	77.6	78.6
Latvia	60.6	69.8	76.8	86.3
Lithuania	57.2	65.0	52.2	54.9
<b>Visegrad group</b>				
Czech Republic	11.2	10.0	10.4	9.1
Hungary	39.0	45.9	49.6	57.2
Poland	25.3	25.9	27.0	24.2
Slovakia	21.5	22.5	20.0	21.3
Bulgaria	46.1	48.4	45.7	NA
Romania	58.2	54.7	47.4	54.3

Source ECB, BSI; share in total loans

## 4 NFA Stabilizing *ca* Benchmarks

In what follows we first review the theoretical framework á la Lane and Milesi-Ferretti (2004 and 2006) to derive *ca* benchmarks, suggesting some extensions and caveats. We then apply this framework to the case of central and eastern European economies.

### 4.1 Framework á la Lane and Milesi-Ferretti

The balance of payments identity (4) at time  $t$  can be rewritten deflating each variable by nominal GDP. This yields:

$$b_t - b_{t-1} = ca_t + k_t + kg_t + z_t - \frac{n_t}{1 + n_t} b_{t-1} \quad (5)$$

where nominal GDP growth is denoted as  $n_t \equiv \frac{GDP_t}{GDP_{t-1}} - 1$ . Assume for simplicity that there are no errors and omissions,  $z_t = 0$  and let us denote as  $ca^s$  the current account position compatible with a stable NFA position as a share of GDP,

$$b_t = b_{t-1} = b^s. \quad (6)$$

Substituting  $b^s$  into the BOP identity (5) yields

$$ca_t^s = \frac{n_t}{1 + n_t} b^s - k_t^s - kg_t^s. \quad (7)$$



Let us then subtract the investment income component from the current account

$$CA_t \equiv \underbrace{BGST_t}_{\text{CA less inv. inc.}} + \underbrace{r_{At}A_{t-1} - r_{Lt}L_{t-1}}_{\text{investment income}}. \quad (8)$$

As is shown in Figure 3, investment income represents the dominant component in all the four Visegrad countries (Czech Republic, Hungary, Poland and Slovakia). For the remaining countries, the current account deficits are mainly due to negative balances in the trade account for goods and services.

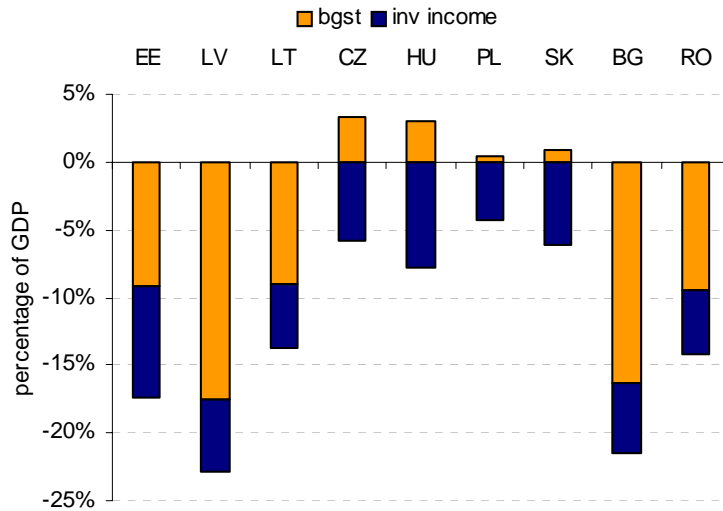


Figure 3: Investment Income in 2007

Given the above definitions, equation (5) can be written as

$$b_t - b_{t-1} = bgst_t + k_t + \frac{i_{At}}{1+n_t}a_{t-1} - \frac{i_{Lt}}{1+n_t}l_{t-1} - \frac{n_t}{1+n_t}b_{t-1}, \quad (9)$$

where  $i_{At}$  (and similarly  $i_{Lt}$  for liabilities) defines the effective return inclusive of capital gains on total external assets

$$i_{At} = \sum_{j=1}^N \theta_{Aj,t-1} i_{Ajt},$$

as a weighted average of the effective return of the different components  $i_{Ajt}$  with weights defined as  $\theta_{Aj,t-1} = \frac{A_{j,t-1}}{A_{t-1}}$ . The effective return on each asset  $\ell$  is similarly calculated as the weighted average of the return of the same asset for each currency  $j$ <sup>7</sup>

$$i_{A\ell t} = \sum_{j=1}^N \theta_{A\ell j,t-1} i_{A\ell jt},$$

<sup>7</sup>Similarly, we define  $\theta_{A\ell j,t-1} = \frac{A_{\ell j,t-1}}{A_{\ell,t-1}}$ .

which can be further decomposed to explicitly account for valuation effects,

$$i_{Alt} = \sum_{j=1}^N \theta_{Alj,t-1} (r_{Aljt} (1 + s_{jt}) + \varkappa_{Aljt}),$$

where  $\varkappa_{Aljt} \equiv \frac{KG_{Aljt}}{A_{j,t-1} E_{j,t-1}}$  is defined as the ratio of capital gains in the total value of asset  $\ell$  denominated in currency  $j$ .

To calculate benchmarks for  $bgst$  it is not sufficient to assume a steady state level for external indebtedness as expressed in (6). One needs to define also a steady state level for total liabilities,

$$l_t = l_{t-1}^s = l^s, \quad (10)$$

which contemporaneously determines the steady state for total assets and financial integration,

$$a_t = a_{t-1}^s = a^s = l^s + b^s, \quad f_t = f_{t-1}^s = f^s = 2l^s + b^s. \quad (11)$$

Substituting equations (6) and (11) into equation (9) yields the following benchmark for  $bgst$

$$bgst_t^s = \frac{1}{2(1+n_t)} [(i_{Lt} - i_{At}) l_s + 2n_t b_s] - k^s. \quad (12)$$

As shown in (12),  $bgst_t^s$  is an increasing function of the interest rate spread  $i_{Lt} - i_{At}$  given that  $l^s > 0$ . Expression (12) can also be generalised in terms of breakdown of aggregates into the corresponding equity, debt and foreign direct investment subcomponents. Defining the steady state for each subcomponent,

$$b_{\ell t}^s = b_{\ell}^s \text{ and } l_{\ell t}^s = l_{\ell}^s \text{ for } \forall \ell \in \{eq, debt, fdi\}, \quad (13)$$

the following analogous expression is found

$$bgst_t^s = \frac{1}{2(1+n_t)} \sum_{\ell \in S} [(i_{Lt} - i_{At}) l_{\ell}^s + 2n_t b_{\ell}^s] - k^s. \quad (14)$$

which allows one to decompose the contributions to  $bgst_t^s$  across the three different components of capital. Finally, to compute  $ca$  benchmarks  $kg_t^s$  is derived as follows,

$$kg_t^s = \sum_{\ell \in S} (kg_{Alt}^s - kg_{L\ell t}^s) = \sum_{\ell \in S} \left( \frac{\varkappa_{Alt}}{1+n_t} a_{\ell}^s - \frac{\varkappa_{L\ell t}}{1+n_t} l_{\ell}^s \right),$$

where  $\varkappa_{Alt} = \sum_{j=1}^N \frac{a_{\ell j,t-1}^s}{a_{\ell}^s} \varkappa_{Aljt}$  and  $\varkappa_{L\ell t} = \sum_{j=1}^N \frac{l_{\ell j,t-1}^s}{l_{\ell}^s} \varkappa_{\ell jt}$ .

## 4.2 The role of foreign currency exposure

The large foreign exchange rate exposure documented in Section 3 begs the question of what is the direct impact of an unexpected exchange rate change on the net foreign asset position in the home economy. Let

therefore  $\vartheta_{A\ell t}$  denote the share of foreign currency denominated assets of the type  $\ell \in \{eq, debt, fdi\}$ ,

$$\vartheta_{A\ell t} = \frac{\sum_{j=2}^N A_{\ell jt} E_{jt}}{A_{\ell t}},$$

where, without loss of generality, the country  $j = 1$  is assumed to be the home economy, that is  $E_{1t} = 1$ . Foreign assets  $a_{\ell t}$ ,  $\ell \in \{eq, debt, fdi\}$ , are function of nominal exchange rates collected in the vector  $\mathbf{E}_t = (1, E_{2t}, \dots, E_{Nt})'$ . A sudden and unexpected (hypothetical) depreciation of home currency,  $E_{it}^* = (1 + s) E_{it}$  for  $i = 2, \dots, N$ , implies

$$\begin{aligned} a_{\ell t}(\mathbf{E}_t^*) - a_{\ell t}(\mathbf{E}_t) &= a_{\ell 1t} + \sum_{j=2}^N \frac{A_{\ell jt} E_{jt}}{A_{\ell t}} (1 + s) \frac{A_{\ell t}}{GDP_t} - a_{\ell 1t} - \sum_{j=2}^N \frac{A_{\ell jt} E_{jt}}{A_{\ell t}} \frac{A_{\ell t}}{GDP_t}, \\ &= \vartheta_{A\ell t} a_{\ell t} s. \end{aligned} \quad (15)$$

Let the share of foreign currency denominated foreign assets be denoted as

$$\vartheta_{At} = \sum_{\ell \in \mathcal{S}} \vartheta_{A\ell t} \frac{A_{\ell t}}{A_t}.$$

It follows from (15) that

$$a_t(\mathbf{E}_t^*) - a_t(\mathbf{E}_t) = \vartheta_{At} a_t s,$$

and

$$b_t(\mathbf{E}_t^*) - b_t(\mathbf{E}_t) = (\vartheta_{At} a_t - \vartheta_{Lt} l_t) s. \quad (16)$$

This shows that a (sudden and unexpected) depreciation in the home currency by  $s$  percent improves the net foreign asset position by  $(\vartheta_{At} a_t - \vartheta_{Lt} l_t) s$  percent of GDP, ceteris paribus. This, in turn, affects the benchmark for  $bgst$

$$bgst_t^s(\mathbf{E}_t^*) = \frac{1}{2(1+n_t)} \sum_{\ell \in \mathcal{S}} [(f_\ell^s(\mathbf{E}_t^*) - b_\ell^s(\mathbf{E}_t^*)) (i_{Lt} - i_{At}) + 2nb_\ell^s(\mathbf{E}_t^*)] - k_t^s.$$

where

$$\begin{aligned} f_\ell^s(\mathbf{E}_t^*) &= a_\ell^s(\mathbf{E}_t^*) + l_\ell^s(\mathbf{E}_t^*) \\ a_\ell^s(\mathbf{E}_t^*) &= a_\ell^s + \vartheta_{A\ell} a_\ell^s s \\ l_\ell^s(\mathbf{E}_t^*) &= l_\ell^s + \vartheta_{L\ell} l_\ell^s s \end{aligned}$$

### 4.3 Benchmarks and sensitivity analysis for central and eastern Europe

Given the number of assumptions required, the best way to proceed is to define a plausible baseline and conduct a sensitivity analysis. For the growth assumption we take the average projection provided by

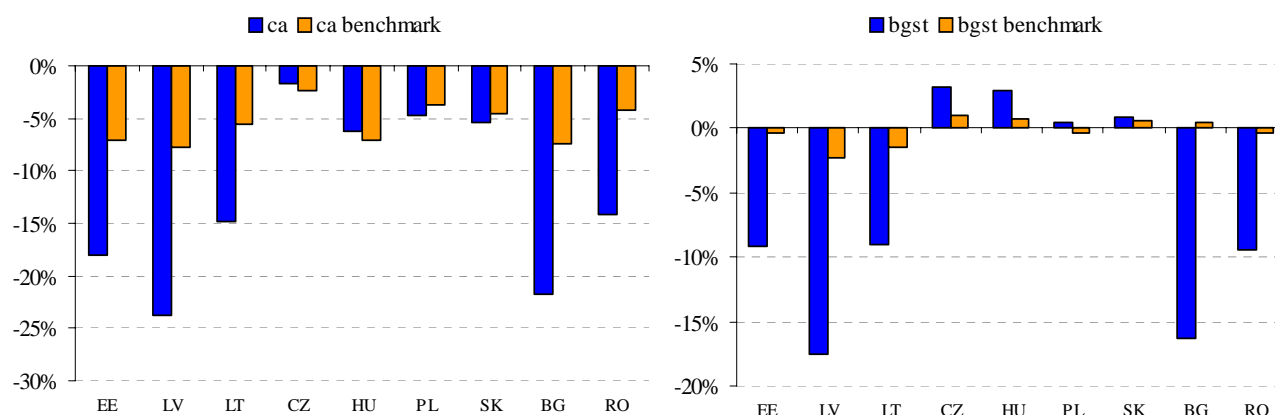


Figure 4: Current Account Benchmarks and 2007 Position (left chart); BGST Benchmarks and 2007 Positions (right chart).

Consensus Forecast for the period 2013-2017 (September 2007) as a proxy for potential output.<sup>8</sup> We also introduce the simplifying assumption that over the medium run the external environment is characterised by foreign inflation of 2% and potential growth of 2.25%, implicitly accounting for the dominant role of the euro area for these countries. The GDP deflator is instead assumed to be determined by the Balassa Samuelson effect. More specifically, we assume that, given a constant exchange rate, the inflation differential is determined by an elasticity of 0.5 multiplied by the growth differential vis-a-vis the foreign country. This elasticity is taken from a recent study on equilibrium exchange rate determination based on a large panel dataset by Osbat (2008). Other simplifying assumptions include that (i) the average nominal total return on debt assets is equal to euro area inflation plus a spread of 2.25; (ii) the average nominal total return on equity assets has a spread of 1 percentage points relative to debt assets and finally that (iii) the average nominal total return on FDI assets has a spread of 1.5 percentage points relative to debt.

Turning to the liabilities side, our benchmark is based on the initial assumption that (i) the average return on debt liabilities is characterised by a spread of 0.5 percentage points relative to debt assets; (ii) the average nominal return on equity is 0.5 percentage points higher than nominal GDP in the home country (iii) and the average nominal return on FDI is slightly higher, i.e. 1 percentage point higher than nominal GDP.

Given the size of the EU capital transfers, an important role is played by the capital account. There we assume that it will continue to record values equal to those prevailing on average between 2004 and 2007. Finally, we make the simplifying assumption that on average there are no capital gains on debt and FDI, whereas 90% of total returns on equity take place via capital gains. As it turns out, in 2007 current account and BGST deficits were larger than the corresponding benchmarks for the Baltics, Bulgaria and Romania (see Figure 4).

<sup>8</sup>This implies the following assumptions for real growth in central and eastern Europe, Estonia 5.1%, Latvia 5.2%, Lithuania 4.6%, Czech Republic 3.9%, Hungary and Poland 4.4%, Slovakia and Bulgaria 5.2%, Romania 5.1%.

Two digit current account deficits are in all cases consistent with a deteriorating net foreign asset position while stricter benchmarks (lower than 5% of GDP) typically apply for countries characterised by lower levels of external indebtedness. There also appears to be a simple rule of thumb for maintaining stable net foreign assets, that is *bgst* should remain close to balance (Figure 4).

While providing interesting insights, applying this accounting approach to the case of central and eastern Europe is not immune from critique for at least three set of reasons, namely: (a) the results may be sensitive to the initial assumptions, (b) it is difficult to define a normative level of external indebtedness and (c) the standard analysis ignores the important peculiarities of the region, i.e. the important share of net FDI stock in net foreign assets and the large foreign currency denomination of the debt component. We need to address all these three critical aspects to assess to what extent they may drive the results.

We start by conducting a sensitivity analysis to verify how the benchmarks would change if (i) the pace of catching-up moderates, i.e. growth halves relative to the baseline scenario, (ii) if the spread on debt payments increases by 200 basis points and (iii) the pace of the Balassa Samuelson doubles. We also examine what would change if scenarios (i) and (ii) take place simultaneously (see Table 4).

As it turns out, a moderate growth scenario has a positive impact (i.e. requires smaller deficits) on the *ca* benchmarks between 0.8 and 2.8% of GDP depending on the country. As already evident in equations (12) and (7) the increase in the debt spread has a positive impact on *bgst* (particularly in the Baltic countries and Hungary) but none on the *ca* benchmarks. The size of the Balassa Samuelson effect is also shown to matter, affecting *ca* benchmarks negatively. The combined scenario of low growth and high interest rate spreads would not change the general result for countries displaying deficits in the two-digit region that a substantial adjustment is needed. For lower deficit countries, these alternative assumptions change the overall assessment leaning toward the conclusion of a moderate disequilibrium.

**Table 4: Sensitivity Analysis.**

	Low growth Scenario (1)		High spreads Scenario (2)		High BS eff. Scenario (3)		(1)+(2) Scenario (4)	
	BGST	CA	BGST	CA	BGST	CA	BGST	CA
<b>Baltic states</b>								
Estonia	-0.31	2.21	1.66	0.00	0.11	-0.80	1.41	2.21
Latvia	1.56	2.75	2.30	0.00	-0.57	-1.01	3.95	2.75
Lithuania	0.63	1.71	1.21	0.00	-0.21	-0.57	1.88	1.71
<b>Visegrad group</b>								
Czech Republic	-0.68	0.78	0.67	0.00	0.19	-0.21	0.01	0.78
Hungary	-0.93	2.65	1.51	0.00	0.29	-0.84	0.63	2.65
Poland	0.21	1.26	0.72	0.00	-0.07	-0.40	0.95	1.26
Slovakia	-0.11	1.85	0.79	0.00	0.04	-0.68	0.71	1.85
Bulgaria	-0.22	1.85	0.79	0.00	0.04	-0.68	0.71	1.85
Romania	0.32	1.57	0.76	0.00	-0.11	-0.57	1.1	1.57

Notes: Impact in percent of GDP

A second and perhaps more poignant critique to this framework is that it is not clear how one should define a normative level for external indebtedness. There are indeed no particular reasons why a country should

stabilise NFA and its components at current values, which in some cases are very high. Thus constructing different benchmarks on this basis may bias the comparability of the results across countries.<sup>9</sup> To illustrate this point, we compute *ca* and *bgst* benchmarks as a function of different levels of external indebtedness and composition structure (see Table 5). Current account benchmarks turn out to be very sensitive not only to external indebtedness (scenario 1 vs. 2 and 4) but also to its composition (scenario 1 vs. 3).<sup>10</sup>

**Table 5: Sensitivity to alternative levels and composition structure of NFA.**

Scenarios	1	2	3	4		1	2	3	4				
Debt assets	50	100	50	60		BGST	CA	BGST	CA	BGST	CA	BGST	CA
Equity assets	5	10	30	60		<b>Baltic states</b>							
					Estonia	-0.5	-6.0	-0.5	-10.6	0.3	-3.6	3.3	0.6
FDI assets	10	20	20	60	Latvia	-0.5	-6.1	-0.5	-10.8	0.2	-3.7	3.4	0.6
					Lithuania	-0.5	-5.6	-0.5	-9.9	0.4	-3.6	2.4	0.2
Debt liabilities	60	120	70	60		<b>Visegrad group</b>							
					Czech Republic	0.7	-3.9	0.7	-7.6	1.0	-2.2	2.5	0.9
Equity liabilities	5	10	50	60	Hungary	0.1	-4.8	0.1	-8.9	0.6	-2.9	2.8	0.7
					Poland	0.2	-4.7	0.2	-8.9	0.7	-2.8	2.8	0.8
FDI liabilities	60	120	40	60	Slovakia	0.7	-4.9	0.7	-9.6	1.4	-2.5	4.6	1.8
					Bulgaria	-0.1	-5.7	-0.1	-10.4	0.7	-3.3	3.8	1.1
NFA	-60	-120	-60	0	Romania	0.3	-5.2	0.3	-9.8	1.0	-2.9	4.1	1.4

Notes: All numbers in percentage of GDP

A third critique in applying this framework to central and eastern Europe is that it does not consider important features of these economies, namely the share of FDI financing and the large foreign currency exposure of debt liabilities. One way of addressing the role of FDI is the following. Having disaggregated net foreign assets, we know the contributions of each component  $\ell \in \mathcal{S} \equiv \{eq, debt, fdi\}$ . By excluding the contribution associated to the FDI component, we derive a benchmark for that part of the current account deficit that is not financed by FDI inflows.<sup>11</sup>

A FDI financing gap equal to the benchmark effectively means that the accumulation of non-FDI net liabilities is stable as a percentage of GDP. As shown in Figure 5 most countries fair relatively well compared to this benchmark, except for the Baltic countries and Romania, which have shown recently a reduced ability of financing their deficit with FDI. This alternative benchmark takes therefore a more benign view of the role of FDI inflows.

Finally we address the issue of currency composition. Given our initial assumptions, we find that the impact of an exchange rate depreciation is shown to be broadly neutral (see Table 6). The reason is that

<sup>9</sup>Equation (7) shows that "any" deficit can be consistent with a stable net foreign asset position. This simple accounting framework, however, ignores that the interest rates spread may be a negative function of net foreign assets.

<sup>10</sup>The difference between scenario 1 and 3 is given by the size of  $k_g$ . As shown in equation (7),  $ca + kg$  instead does not depend on the composition of net foreign assets.

<sup>11</sup>In the Baltic states, a large share of FDI has flown into the banking and retail trade sectors. As these sectors are likely to facilitate imports as much as exports, a further extension would be to exclude only a subset of FDI from liabilities. However, it isn't clear cut how to do the breakdown and the larger the sectoral breakdown, the more it becomes necessary to add arbitrary assumptions on the rates of returns of each subcategory and thus limiting any additional insight.



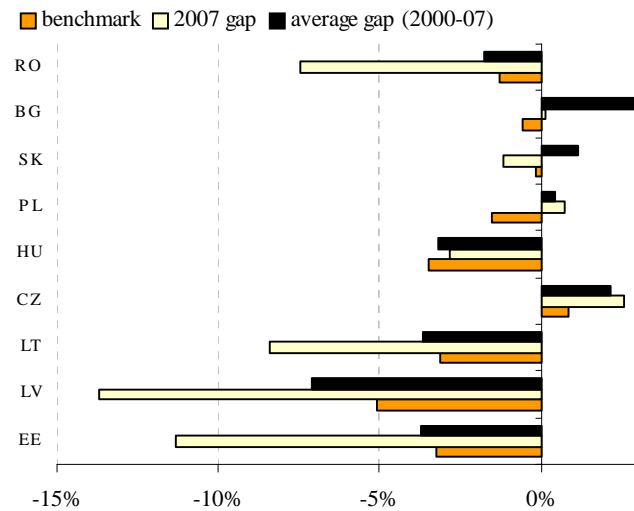


Figure 5: FDI financing gap vs. corresponding benchmark in percent of GDP

liabilities expressed in foreign currency, although substantial, are never larger than the total amount of assets which are expressed in foreign currency terms.<sup>12</sup> While it is true that the debt component is for a large share denominated in foreign currency terms, for most countries the bulk of total liabilities is constituted by FDI which are domestically denominated. This an important point generally neglected, showing how FDI plays here an offsetting role in terms of foreign currency exposure risk. For developed countries one would normally expect a positive impact of an exchange rate depreciation on net foreign assets, while the result is ambiguous for emerging markets depending on the their level of foreign exchange rate exposure. Given the importance of FDI in central and eastern Europe, however, it is not surprising that the impact of an exchange rate depreciation on net foreign assets is slightly positive for almost all countries. The only exception is the case of Latvia, where the impact is slightly negative because of the larger size of its debt liabilities (see Table 6). The impact of an exchange rate depreciation therefore affects only marginally the *bst* and *ca* benchmarks.<sup>13</sup>

To conclude, the accounting approach based on stable external indebtedness is subject to a number of drawbacks, which may affect the normative assessment. The bottom line remains that all countries with two-digits current account deficits will continue experiencing a deterioration in their net foreign assets position, whose impact is in some cases mitigated by the share of FDI financing.

<sup>12</sup>It appears realistic to assume that all assets are denominated in foreign currency terms. FDI and equity liabilities are instead assumed to be domestically denominated. We also take the simplifying assumption that the share of debt liabilities denominated in foreign currency terms corresponds to the figures presented in Table 3 for loans.

<sup>13</sup>This is based on the simple assumptions of this accounting framework. This approach does not consider the possible repercussions of an exchange rate depreciation on households and firms that may be more exposed than the economy as a whole.

**Table 6: Impact of a 10 percent Exchange Rate Shock.**

	NFA	BGST	CA
<b>Baltic States</b>			
Estonia	2.8	0.1	0.2
Latvia	-2.4	-0.1	-0.2
Lithuania	1.1	0.0	0.1
<b>Visegrad group</b>			
Czech Republic	5.7	0.1	0.3
Hungary	2.8	0.1	0.2
Poland	2.3	0.1	0.2
Slovakia	3.7	0.2	0.3
Bulgaria	1.1	0.2	0.1
Romania	1.1	0.1	0.1

Notes: In percentage of GDP

## 5 Benchmarks based on Structural Current Accounts

There is a second competitive approach to the determination of the *ca* benchmarks that takes a different route, i.e. it applies panel econometric techniques to establish if there is a long-term relationship between the current account and economic fundamentals. This methodology provides an indication of the level of current account that can be considered ‘normal/structural’ for a country based on a range of variables including, level of investment, fiscal balance, stage of development, demographic profile. Our objective is to identify the key medium-term determinants of current account balances with the aim of deriving a medium-term benchmark for current account balances for central and eastern European countries. We start by reviewing the potential determinants of the current account before outlining our approach and presenting estimates.

There is a large literature, both theoretical and empirical, that addresses this issue. One strand of the literature uses a consumption-smoothing role of the current account, where the current account deficit reflects expected increases in future net output (Adedeji 2001, Nason and Rogers 2006). The model’s implication is that the current account balance should incorporate all available information for predicting future changes in net output. A second and major strand of the literature is based on the intertemporal approach to the current account from the open economy macroeconomics literature. This work originated from Sachs (1981), and was later extended by Obstfeld and Rogoff (1994). The standard version of the model considers the current account from the saving-investment perspective and features an infinitely lived representative agent who smooth consumption over time by lending or borrowing abroad.

Empirical studies on the intertemporal approach to the current account have been carried out amongst others by Sheffrin and Woo (1990), Otto (1992), Milbourne and Otto (1992), Glick and Rogoff (1995), Otto and Voss (1995), Bergin and Sheffrin (2000), Bergin (2006). Typically though, the simple intertemporal current account models have a poor empirical fit. Partly to address this issue, the basic intertemporal model has been extended in many directions in the theoretical literature. Several papers have tried to identify the medium-term determinants of the current account drawing from an extended class of intertemporal models with overlapping generation models, e.g. Debelle and Faruquee (1996) and Chinn and Prasad (2003).

One key assumption in the basic model is that consumers can perfectly smooth their consumption over time and that this can only be done via the current account. Several papers show the importance of introducing additional factors that could affect consumption. Bussière *et al.* (2004) extend the intertemporal model to allow for fiscal balance (as well as lagged impact of current account). Galí *et al.* (2007) introduce ‘liquidity constraints’ in order to investigate the effect of government spending on private consumption. Endogenous investment has also been addressed, Glick and Rogoff (1995). Another direction of research has been to allow for variable interest rates and exchange rates, Bergin and Sheffrin (2000).

While these extensions typically improve the empirical fit, models such as these are sensitive to the choice of variables and there is a high degree of uncertainty associated with estimating the relevant coefficients. In some cases, particularly in transition economies, problematic data availability makes it even more difficult to define these approaches empirically. Clearly, there are a number of alternative theoretical models that have different predictions about the factors underlying current account dynamics and about the signs and magnitudes of the relationships between current account fluctuations and these determinants. However, as pointed out by Calderon *et al.* (2002) and Chinn and Prasad (2003), no single theoretical model captures the entire range of empirical relationships affecting the consumption-savings-investment balance of a country, and hence the current account balance.

Therefore, an encompassing approach to testing the medium-term empirical drivers of current positions, either directly or indirectly, is clearly of considerable interest. Particularly an approach that doesn’t suffer from the restrictiveness of the theoretical framework, and that allows for all potential possibilities whilst allowing for model uncertainty.

## 5.1 Potential determinants of current account

Before we go on to explain our estimation approach, we will first identify the main medium-term determinants of current account deficits and the potential implications of the variables for countries in central and eastern Europe. Our objective is to provide an empirical, although not entirely atheoretical, characterisation of current account determinants. Indeed, we use a variety of theoretical models to drive our estimation strategy and to provide guidance on the expected sign of the coefficients. In particular we build upon the work of Debelle and Faruquee (1996), Calderon *et al.* (2002), Chinn and Prasad (2003), Doisy and Hervé (2003), Bussière *et al.* (2004), Zanghieri (2004), Gruber and Kamin (2005), Hermann and Jochem (2005), Aristovnik (2006b), Campa and Gavilan (2006), IMF (2006), De Santis and Lührmann (2008), Rahman (2008) and others, by extending the analysis to a wider range of specifications but use an encompassing strategy whereby the key determinants are selected econometrically. Below we outline the main determinants of medium-term current account variation as identified by the above literature.

The following variables are not constructed relative to the foreign trading partners, because it is implicit in their definition.

- **‘Initial’ NFA**, as a share of GDP. The level of net foreign assets can affect the current account in two opposite directions. On the one hand, economies with relatively high NFA can afford to run trade deficits on an extended basis and still remain solvent, potentially leading to a negative association between NFA and the current account. On the other hand, economies with high NFA benefit from

higher net foreign income flows, which tend to create a positive association between NFA and current account balances. Standard open economy macroeconomic models predict that this second effect should be stronger. The NFA position used in the empirical model is measured before the period of reference for the current account balance, so as to avoid capturing a reverse link from the current account balance to NFA.

- **Oil balance.** Higher oil prices increase the current account balance of oil exporting countries and decrease the balance of oil-importing countries. The variable used allows the effect of oil prices to differ in sign and magnitude across countries, but it is questionable whether it can fully capture differentiated impact of change in oil prices across countries. Positive sign is expected.

The following determinants are instead constructed as deviations from the weighted averages of foreign trading partners:

- **Investment** as a share of GDP. Current accounts are in part driven by expectations about future wealth (Glick and Rogoff 1995), and to that extent future productivity gains from current investment would be correlated with a current account deficit. Furthermore, an increase in demand variable, such as investment, is associated with the increase of domestic demand and thus worsening of the foreign trade balance. Kraay and Ventura (2000) give an example of the importance of investment for OECD current account balances. A negative sign is expected.
- **Real GDP growth.** The interaction of CA with real GDP growth is well established. The effects GDP growth rates on low-frequency saving behavior depend on the implications, as perceived by households, for their permanent income. With a growing economy, workers could expect future income increases and therefore increase consumption. Among countries at a similar initial stage of development, the stronger is economic growth relative to trading partners, the lower is likely to be the current account. Therefore, a negative sign is expected.
- **Fiscal balance.** A variety of models predict a positive relationship between government budget balances and current accounts over the medium term. Overlapping generations models suggest that government budget deficits tend to induce current account deficits by redistributing income from future to present generations (see Obstfeld and Rogoff, 1994 and Chinn, 2005). Only in the particular case of full Ricardian equivalence, where private saving fully offsets changes in public saving, would there be no link between government budget balances and current account balances. Bussière *et al.* (2004) found there was a connection between the government fiscal deficits and the current account (in the line of the idea of the “twin deficits”). Therefore a positive coefficient is expected.
- **Relative income.** Countries with low income are expected to have larger current account deficits arising from building the infrastructure, expanding domestic markets and to facilitate economic convergence. As countries develop, its per capita income rises and the current account deficit tends to decline. Hence a positive coefficient is expected. Our measure is real GDP per capita in PPP terms.

- **Demographic variables.** Demographics should be important insofar as they differ across countries and, thereby, influence cross-country differences in saving. A country with a higher share of economically inactive dependent population is expected to be characterised by a lower level of national savings and hence a lower current account balance (IMF, 2006 and Higgins, 1998). As this depends on the fraction of the dependent population that are young and old dependents, we proxy for the impact of demographic development by the following three variables:
  - An **old age dependency ratio** constructed as the share of people older than 65 years on the population between 14-65.
  - An **young age dependency ratio** constructed as the share of young people (14-) on the population between 14-65.
  - **Population growth.**

For all these variables negative signs are expected.

- **Civil liberties.** Legal rights, sound institutions, functioning markets should all attract investment and ease access to international capital markets (De Santis and Lührmann 2008). This is measured with an index ranging between 1 (maximum degree of liberty) and 7 (minimum degree of liberty). Positive sign is expected.
- **Trade integration** measured by the openness as a share of GDP. Openness is commonly used in the literature also as a proxy for barriers to trade (or the trade costs in a wider sense). It could also be correlated with other attributes that make a country attractive to foreign capital. The net effects of these influences on current account balances can only be resolved empirically. Sign of the coefficient is therefore ambiguous.
- **Financial integration** defined in Section 2 as the sum of foreign assets and liabilities as a share of GDP. This gives us a measure of the depth and sophistication of the financial system. The argument being that a well developed financial system should induce more savings. On the other hand, it could also signal borrowing constraints and therefore fewer savings. The effects on domestic investment are also not clear from a theoretical perspective. Therefore, we take the sign of the coefficient to be ambiguous.
- **Relative income squared** allows for a non-linearity between relative per-capita income and current account positions (Chinn and Prasad 2003). This is consistent with low income countries having little access to international capital markets in contrast to countries at a middle stage of development. However, we do not impose any structure to the non-linearity. Sign of the coefficient is therefore ambiguous.

## 5.2 Data

We have constructed data on these 13 potential determinants of current account. It is well possible that only a subset of the fundamentals is relevant and we let data to decide on the most important determinants for

the countries in the panel.<sup>14</sup> Our main source of data is the IMF World Economic Outlook (WEO) database (April 2008 version), which is available to us from 1980 onwards. Thus the time dimension starts from 1980 with 181 countries featuring in the WEO database. The World Development Indicators (WDI) database is used for demographic variables except population growth, which is taken from WEO. The data on bilateral trade are taken from IMF DOTS database. Average foreign trade flows during 1996-2000 period are used to compute country-specific weighted averages of foreign variables. Out of 181 countries, 172 have data on current account balance (as % of GDP) for the full sample period. Thus the maximum possible dimension for the balanced regression is  $N = 172$  and  $T = 25$ . In the estimation, the time and group dimension is selected purely based on data availability. Table 10 in Appendix describes construction of variables in detail.

### 5.3 Estimation techniques and model selection

Let current account as a share of GDP in country  $i$  and period  $t$ , denoted by  $ca_{it}$ , be generated as

$$ca_{it} = \alpha_i + \sum_{\ell=1}^{p_i} b_{i\ell} ca_{i,t-\ell} + \sum_{\ell=0}^{q_i} \mathbf{x}'_{i,t-\ell} \boldsymbol{\delta}_{i\ell} + \epsilon_{it}, \quad (17)$$

where  $i \in \{1, \dots, N\}$ ,  $t \in \{1, \dots, T\}$ ,  $\mathbf{x}_{it}$  is  $k \times 1$  dimensional vector of fundamentals for country  $i$  in period  $t$  and  $\epsilon_{it}$  is error term, which is serially uncorrelated as well as uncorrelated with regressors,  $E(\epsilon_{it} \mathbf{x}_{it}) = \mathbf{0}$ . Model (17) is a general dynamic model of current account that allows for considerable heterogeneities across countries: individual fixed effects  $\alpha_i$ , and, more importantly, country-specific dynamics through heterogeneous coefficients  $\{b_{i\ell}\}$  and  $\{\boldsymbol{\delta}_{i\ell}\}$ . The level relationship between current account and the set of fundamentals is on the other hand assumed to be homogenous, in particular  $k \times 1$  dimensional vector of level elasticities, denoted by  $\boldsymbol{\phi}_i$ , is the same across countries

$$\boldsymbol{\phi}_i = \boldsymbol{\phi} = \frac{\sum_{\ell=0}^{q_i} \boldsymbol{\delta}_{i\ell}}{1 - \sum_{\ell=1}^{p_i} b_{i\ell}} \text{ for any } i \in \{1, \dots, N\}. \quad (18)$$

The level elasticities  $\boldsymbol{\phi}$  are the objective of our estimations.

Various approaches have been used in the literature to estimate  $\boldsymbol{\phi}$ . Depending on the way short-run dynamics are dealt with, econometric techniques can be divided into two groups: (i) static models (where  $b_{i\ell} = 0$  and  $\boldsymbol{\delta}_{i\ell} = \mathbf{0}$  for  $\ell > 0$ ) and (ii) dynamic models. We briefly review strengths and weaknesses of the two approaches below.

One of the major constraints in the estimating the level relationship between current account and a set of fundamentals is a relatively limited number of (annual) time observations (sometimes as small as  $T = 10$ ), while the number of countries is relatively large, often close to hundred. Data constraints are naturally reflected in the choice of techniques used to estimate the level relationship. The simple pooled least squares estimator suffers from short sample Nickel bias of order  $O(T^{-1})$  in the presence of fixed effects and it is therefore typically not used in a dynamic set up. Commonly employed estimators of dynamic current account equation are instrumental variable estimation in first differences (Andersen and Hsiao, 1982), and GMM

<sup>14</sup>We have also experimented with alternative measure for financial integration - e.g. ratio of broad money to GDP. However, we have decided to use the sum of external assets and liabilities as a share of GDP instead, due to data issues.



estimations. The former (IV) is valid estimator of (assumed) homogenous parameters under asymptotics  $N, T \rightarrow \infty$  (i.e. large  $N$  and  $T$ ), while the later (GMM) is valid for fixed  $T$  and  $N \rightarrow \infty$ . Due to relatively short time span of available data, GMM techniques are commonly preferred.<sup>15</sup> Examples of this approach include Bussière *et al.* (2004) who estimate *ca* benchmarks for panel of 33 countries, including ten central and eastern European countries.

Major drawback of fixed  $T$  and large  $N$  estimations is that they assume homogeneity for not only the level elasticities  $\phi$ , but *all* individual coefficients  $b_{i\ell} = b_\ell$  and  $\delta_{i\ell} = \delta_\ell$  for  $i = 1, \dots, N$ . This assumption is very unlikely to hold in practice. As shown by Pesaran and Smith (1995), in the dynamic case where the coefficients differ across groups, pooling give inconsistent and potentially highly misleading estimates of the homogenous level elasticities  $\phi$ . This is also true for pooled static models, which ignore dynamics altogether.

A compromise between ‘pure’ static models, and dynamic models is to filter high-frequency movements by means of  $m$ -year non-overlapping moving averages (typically  $m = 4$  or  $5$  years) and then a static relationship between the filtered variables is estimated. Filtering the short-run dynamics by constructing non-overlapping moving averages mitigates the bias stemming from ignoring the individual country dynamics, as shown by Pesaran and Smith (1995). The bias for the inference on level elasticities  $\phi$  is of order  $O(1/m)$ , and in the case when  $m, N \rightarrow \infty$ , we have consistent estimates. Pesaran and Smith (1995) explicitly considers the case where  $m = T$  and  $T, N \rightarrow \infty$ , that is cross-section regression on the data averaged across time.

Alternative estimation technique used is the pooled mean group estimator (PMG) using the unfiltered data. PMG belongs to the class of large  $N$  large  $T$  estimators of dynamic heterogenous panel data models, and it involves both pooling and averaging. Unlike in the IV estimations, the short run dynamics is allowed to be heterogenous across countries, only the level restriction given by equation (18) is imposed on the panel. This strategy yields consistent estimates, unlike the IV or GMM techniques described above, or simple static models. Although being consistent, the drawback of PMG estimations is that the asymptotic guidance is likely to be less reliable in the case with  $T = 25$  and relatively large number of regressors. In this case, the number of lags need to be heavily restricted and as a result it is questionable how well is the dynamic behaviour captured.

Considering above mentioned drawbacks and advantages, as well as the possibility of significant measurement errors in low frequency data and since our focus is on the medium-term developments in current accounts, we decided to filter the data first (by constructing non-overlapping time averages) and then apply simple pooled OLS. In line with the previous discussion, our preferred choice is larger numbers for  $m$  than commonly considered in the literature. In particular, our preferred estimation is for  $m = 12$ . As we have 25 annual observations, we compress the period into 2 observations per variable. By using this approach of non-overlapping averages we are concentrating on the medium-term fluctuations in current accounts and abstracting from factors that are purely cyclical or temporary. Indeed, too much focus on the dynamics could bias the results, given the measurement error in a lot of the data and relatively short time span.

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<sup>15</sup>It is useful to distinguish between the “standard” GMM estimators proposed by Holtz-Eakin *et al.* (1988) and Arellano and Bond (1991) and their subsequent extensions by, for example, Ahn and Schmidt (1995), Arellano and Bover (1995), and Blundell and Bond (1998). The “standard” GMM estimators are based on orthogonality conditions that interact the lagged values of the endogenous variables with first differences of the model’s disturbances, whereas the “extended” GMM estimators augment these orthogonality conditions with additional moment conditions implied by homoskedasticity and initialization restrictions. More recently, Binder *et al.* (2005) developed GMM and QML estimators for panel VARs (fixed  $T$  and  $N \rightarrow \infty$ ) where it is not known whether series are stationary, or  $I(1)$  and possibly cointegrated.

We also check the sensitivity of estimations by using different choices of  $m$ . This enables us check if they provide a consistent picture. We also assumed that conditional on fundamentals (output convergence etc.), the steady-state level of current account is 0 (i.e. no fixed effects).<sup>16</sup>

From the inspection of the data it is evident that the panel data estimation would be affected by the presence of outliers. We therefore decided to drop all countries with current account deficits larger than 50% at any point in time, as this reflects extreme conditions of macroeconomic instability that would not provide valuable information about the long-term determinants of the current account. For similar reasons we exclude countries that observed changes in the current account larger than 30% of GDP from one year to the next. As it is standard in this literature, we also introduce time dummies for the Asian countries between 1997 and 2004 reflecting the impact of the financial turmoil on the current account (see IMF, 2006, and Rahman, 2008).<sup>17</sup>

Having decided on the choice of estimation techniques, outliers and dummies, the next major issue that needs to be addressed is the selection of regressors. Clearly, the choice of fundamentals could be crucial for the results. The strategy of using all potential explanatory variables is not necessarily correct due to the limited size of the dataset. There is a trade-off between using potentially redundant regressors (which result in the less reliable estimates) and the possibility of the omitted variable problem (which could bias estimates if the omitted variable is correlated with remaining regressors). We have compiled the data on 13 potential determinants of the structural current account positions - but only a subset of them could be relevant for modelling medium-term current account movements. Considering all possibilities implies over 8000 different models to choose from, therefore we select the models according to four different criteria.

**Criterion 1** First, all models with correctly signed regressors (where the strong theoretical prediction for the sign is available) are selected. Out of these models, we exclude ones where regressors that have ambiguous signs are statistically insignificant. Finally we select the model(s) with the largest number of variables.

**Criterion 2** All models with regressors correctly signed (where available) as well as statistically significant are selected. Then model(s) with the largest number of fundamentals is (are) selected.

**Criterion 3** All models are ranked according to the Akaike Information Criterion (AIC). This index considers the statistical goodness of fit and imposes a penalty for the number of regressors. The best model is selected.

**Criterion 4** All models are ranked according to the Schwarz Information Criterion (SIC). This index penalises the addition of regressors more strongly than it does the AIC.

The first criterion minimises the possibility of omitted variable problem, but it is likely that the resulting model(s) is(are) not parsimonious, whereas the second criterion is likely to lead to a more parsimonious specification. For these two we use the maximum available sample size. The third and fourth criteria are purely statistical. In both cases we keep the number of countries fixed at 63, which is the common sample

<sup>16</sup>See also Chinn and Prasad (2003) on why it is preferable to avoid fixed effects.

<sup>17</sup>For years before 1997 we impose the dummy equal to zero and then take 12 years averages. This de facto reduced the coefficient associated to the dummy.

across all variables. For all four criteria we also conduct a sensitivity analysis, repeating the same exercise using 4-year non-overlapping moving averages instead of 12.

Whilst the above criteria enable us to select a small subset of preferred models, none of them might be true. An alternative approach is to attach probabilities to the different models and then average them based on these probabilities. This is known as Bayesian Model averaging and this framework allows us to deal with both model and parameter uncertainty in a straightforward and formal way. Furthermore, the literature has shown that averaging over all the models provides better average predictive ability, as measured, by a logarithmic scoring rule, than using any single model. In this paper we will use the Bayesian Averaging of Classical Estimates (BACE) approach as outlined by Sala-i-Martin *et al.* (2004). This approach, which comes from the assumption of diffuse priors, combines the averaging of estimates across models estimated by classical ordinary least squares (OLS).

Following Sala-i-Martin *et al.* exposition (2004), the posterior probability of a model  $M_j$  given data  $y$  and number of potential regressors  $K$ , can be expressed as

$$P(M_j/y) = \frac{l_y(M_j)P(M_j)}{\sum_{i=1}^{2^K} l_y(M_i)P(M_i)}, \quad (19)$$

where  $P(M_j)$  is the prior probability that  $M_j$  is the true model and  $l_y(M_j)$  is the likelihood of model  $M_j$ . The likelihood approach is based on the Schwarz model selection criterion and includes a degrees-of-freedom correction to take account of the fact that models with more variables have lower sum of squared errors:

$$l_y(M_j) = T^{-k_j/2} SSE_j^{-T/2}, \quad (20)$$

where  $SSE_i$  is the OLS sum of squared errors under model  $i$ .

This posterior can be used to simply select the “best” model (usually the one with highest posterior probability). However, the strategy of using only the best model has been shown to predict worse than model averaging. Therefore using the posterior model probabilities as weights, Bayes’ rule says that the posterior density of a parameter is the average of the posterior densities conditional on the models with weights given by the posterior model probabilities.

$$P(\beta/y) = \sum_{j=1}^{2^K} P(M_j/y)P(\beta/y, M_j), \quad (21)$$

where  $K$  is here equal to 13.

A posterior mean is defined to be the expectation of a posterior distribution. Therefore, taking expectations with respect to (21) the posterior mean and variance are then defined as follows:

$$E(\beta/y) = \sum_{j=1}^{2^K} P(M_j/y)E(\beta/y, M_j), \quad (22)$$

where  $E(\beta/y, M_j)$  is the OLS estimate for  $\beta$  with the set of regressors used in model  $j$ , i.e. this gives us the posterior mean conditional on model  $j$ , and the posterior variance of  $\beta$  is given by:

$$\text{Var}(\beta/y) = \sum_{j=1}^{2^K} P(M_j/y) \text{Var}(\beta/y, M_j) + E(\beta/y, M_j)^2 - E(\beta/y)^2. \quad (23)$$

One issue not addressed is the determination of the prior probabilities of the models,  $P(M_j)$ . We specify our model prior probabilities by choosing a prior mean model size,  $k$ , with each variable having a prior probability  $k/K$  of being included, independent of the inclusion of any other variables. In contrast to a standard Bayesian approach that requires the specification of a prior distribution for all parameters, the BACE approach requires the specification of only one prior hyper-parameter: the expected model size  $k$ . As a general principle, the effect of the prior should be minimal, as at the very least we should be able to trace the effect of these assumptions. In the case of model averaging it is acknowledged that the choice of this distribution can have a substantial impact on posterior model probabilities, and it can be contentious in some areas, in particular in cases where it might be counterintuitive to treat the inclusions of regressors as independent a priori. Furthermore, Fernandez *et al.* (2008) have shown that differences can arise from having a fixed hyper-parameter, as opposed to a random hyper-parameter. Nonetheless, this hyper-parameter is the standard prior used in the model averaging literature as it is an uninformative prior that is easy to interpret, easy to specify, and easy to check for robustness. Indeed, as the maximum model size is small relative to other examples of model averaging we are able to examine the robustness of our conclusions with respect to this hyperparameter by considering all possible model size, i.e. from 1 to 13 variables, thus directly addressing the criticism of Fernandez *et al.* (2008).

## 5.4 Empirical findings

In all we estimated over 8000 regressions. Figure 9 in the Appendix shows the distribution of the estimated coefficients for each variable (under the variable sample estimation). Clearly in a large number of these regressions the estimated coefficients will not be significant, nevertheless, these histograms give an idea of the uncertainty surrounding the contribution of each variable to explaining structural current accounts, i.e. a measure of parameter uncertainty. Looking across the variables we see that some coefficients are bounded in a tight range (e.g. NFA from 2.4% to 4.3%), whereas some have a larger range with both positive and negative coefficients (e.g. old age dependency ratio from -48.3% to + 24.1%). For most variables, there is a clear tendency to either positive or negative values with a uni-modal distribution, i.e. the sign of the coefficient appears robust across almost all alternatives. Financial integration, and relative income squared are the main exceptions where a significant portion of estimated coefficients are positive and a significant portion are negative. For both variables this matches our prior where theory is ambiguous on the expected sign. The only variable where the distribution is significantly against our prior is for relative GDP growth, where only a few models have the expected negative sign, and the vast majority have a positive sign, more on this below.

Following our selection procedure, we narrowed down the analysis to five models. These, along with the model average results (BACE) are presented in Table 7.

**Table 7: Fundamentals and estimated elasticities for the selected models ( $m = 12$ ).**

Variables/Prior <b>Variable</b>	Criter. 1 10 vars		Criter. 2 8 vars	Criter. 3 10 vars	Criter. 4 3 vars	BACE 5 vars	BACE-EM 5 vars
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Initial NFA	<b>0.025</b> (4.1)	<b>0.028</b> (5.1)	<b>0.026</b> (5.2)	<b>0.027</b> (5.9)	<b>0.032</b> (5.7)	<b>0.031</b> (5.6)	<b>0.032</b> (8.6)
Oil balance	<b>0.100</b> (2.2)	0.072 (1.1)	<b>0.099</b> (3.4)	0.087 (1.0)		0.157 (1.5)	0.093 (1.1)
Investment	-0.011 (-0.1)	-0.106 (-1.4)		-0.115 (-1.1)		-0.104 (-0.7)	-0.154 (-1.2)
Ec. growth				0.313 (1.3)		0.415 (1.1)	0.603 (1.9)
Fiscal balance		0.153 (1.4)				0.178 (1.0)	0.108 (0.8)
Rel. Income	0.017 (1.8)	<b>0.028</b> (2.7)	<b>0.019</b> (2.7)	<b>0.032</b> (3.7)	<b>0.022</b> (4.8)	0.028 (1.7)	0.015 (1.4)
Pop. growth	<b>-1.234</b> (-2.2)	<b>-1.305</b> (-2.2)	<b>-1.392</b> (2.7)	<b>-1.355</b> (-3.4)		-1.056 (-1.3)	-1.328 (-1.5)
Civil liberties		<b>0.011</b> (4.0)		<b>0.010</b> (4.0)	<b>0.010</b> (4.2)	<b>0.011</b> (2.0)	<b>0.009</b> (2.2)
Openness	<b>0.019</b> (2.3)		<b>0.019</b> (2.7)	0.011 (1.6)		0.017 (1.3)	-0.000 (-0.0)
Fin. Int.	<b>-0.002</b> (-2.2)		<b>-0.002</b> (2.7)			0.002 (0.6)	-0.001 (-0.1)
Dep. rat. old	<b>-0.224</b> (-2.4)	<b>-0.213</b> (-2.2)	<b>-0.213</b> (2.7)	-0.150 (-1.5)		-0.137 (-0.7)	-0.309 (-1.7)
Dep. rat. young	-0.020 (-0.6)	-0.042 (-1.2)				-0.061 (-1.1)	-0.019 (-0.4)
Rel. Income. sq.	<b>0.006</b> (2.2)	<b>0.006</b> (2.1)	<b>0.006</b> (2.7)	<b>0.008</b> (2.9)		0.007 (1.4)	0.000 (0.1)
Num. countries:	87	86	88	63	63	63	44
No. of obs:	2088	1824	2112	1512	1512	1512	1056
Data shrinkage	174	152	176	126	126	126	88
Adjusted $R^2$	45.3	44.4	36.6	61.5	53.4		

Notes: Pooled OLS estimation on the non-overlapping 12-year moving averages. Robust t-ratios are reported in parentheses. BACE results are for a prior of inclusions of 5 variables and the elasticities reported are conditional on the variable being included.

In each case the estimation was done for 12-year non-overlapping moving averages. The first observation from the table is that each selection criterion produces different models. Under the first selection criterion, 2 models are observed with (i) all variables for which we had a prior showing the correct sign (ii) the other variables being significant and (iii) matching the requirement of having the largest number of variables (in this case 10). Under the second selection criteria, which also foresees that all variables should be significant, the maximum number of variables in a regression meeting these requirements is 8, of which there is only one possible model combination. For these two first criteria, the number of countries modeled ranged from 86 to 88 reflecting the time series of the selected series, which constrained data availability in slightly different ways. For the next two criteria and the BACE method, the span of the time series was kept constant at the common sample of 63 countries to enable model comparability. Under the third selection method, the AIC based criterion, a model with 10 variables is chosen, whereas under the fourth, the Schwarz criterion, only 3 variables are selected. This is in line with the theory, whereby the AIC criterion assigns a smaller penalty to the number of regressors compared to the Schwarz criterion. Nonetheless, the AIC based model is notable in that the regression selected has 10 variables all with the correct signs.

Looking across the variables selected by the 4 different criteria, one sees that NFA is selected in all reported specifications, with a tightly bounded coefficient ranging from 0.025 to 0.032 and in all cases is strongly

significant. The other variable to feature in all regressions is the oil balance where the coefficient ranges from 0.072 to 0.10. Of particular relevance is that economic growth does not feature in any of the regressions other than the one chosen with the AIC based criterion. The reason becomes clear when considering the histogram, which shows that for nearly all the regressions, economic growth comes up with a positive sign. Therefore the prior that strong growth is associated with current account deficits finds here no empirical support. While relative GDP growth is often included in structural current account regressions, it is mostly insignificant (e.g. Chinn and Ito, 2005, Rahman, 2008), suggesting that its inclusion in their regressions could be biasing the results. By contrast openness, whose sign was said to be ambiguous, has a positive coefficient in all three models where it appears. Fiscal balance, relative income, civil liberties and the demographic variables are always selected with the correct sign, featuring to a larger or lesser degree in the 5 selected models. The coefficient estimate for relative income deserves particular attention, ranging between 0.019 and 0.032 whenever significant. As the textbook suggests "poorer" countries should be greater recipients of capital, other things being equal. The *SCA* literature, based on large datasets which include emerging markets, not always finds the expected sign. Even when it does, the coefficient turns out to be small as in our case (see Rahman, 2008, IMF 2006, Chinn and Prasad, 2003). The appealing notion that current account deficits are there to finance a process of economic catching up finds very limited empirical support in the data, raising the question whether the intertemporal approach to the current account is theoretically misleading, empirically irrelevant or other factors/frictions should be included both theoretically and empirically in the analysis.<sup>18</sup>

Turning to the remaining variables, both financial integration and investment have limited explanatory power, the first appearing in only two of the selected regressors with a small coefficient while the second is never significant. For relative income squared we did not have a clear-cut expectation about the sign ex-ante. Whilst the distribution was centred around zero, in selected models where it appears the sign is positive. The dummy for Asia turns out to be significant in the majority of models and the coefficient is always positive.<sup>19</sup>

It is also noteworthy that none of the coefficients in these models are at the extreme of the distributions in Figure 9 in the Appendix,<sup>20</sup> and the estimates are in line with other estimates in the literature.<sup>21</sup> As a robustness check, we estimated the same models with annual data and with 4-year non-overlapping averages (see Table 11 in the Appendix). While estimating the same model with 12 and 4 year non-overlapping averages produce for most variables similar results, all four selection criteria here chosen would lead to different models, suggesting that it may not be satisfactory to pick only one model. The main difference appears to be that with 4-year non-overlapping averages, investment and fiscal balance have greater explanatory power while relative income less.

The analysis carried out so far suggests there are a number of models could be used to provide benchmarks of structural current accounts, and our results provide some measure of uncertainty surrounding the estimates. It is though possible that none of them may be "true". Therefore, as mentioned above we also carried out a model combination exercise (BACE). These results are reported in the last two columns of

<sup>18</sup>This corresponds to the paradox that capital is not flowing from the "rich" to the "poor", see footnote 1.

<sup>19</sup>The exception are the models selected with the common sample of 63 countries, which exclude in particular China.

<sup>20</sup>Similar conclusions would be reached if histograms were presented in terms of common sample.

<sup>21</sup>For a survey of the results of other main studies see Table 2 in Rahman (2008).



Table 7. The second to last column is the BACE reported for all countries, whereas the last column is the BACE results out of a more restricted sample of low income countries. The results reported in this tables are for the case of a hyper-prior of 5 variables. The coefficients and t-statistics are the posterior mean and standard deviations conditional on variable being included in the regression, therefore, these coefficients can be considered comparable with the coefficients coming from the single regressions (Models 1 to 5). The coefficients for the BACE, are similar to the range of coefficients in Model 1 to 5, with the largest differences for oil balance. Civil liberties and NFA are the only coefficients with t-statistics greater than or equal 2. These findings are robust across alternative hyper-parameters (model size priors). An alternative way of presenting the results is Table 8, which reports the posterior and prior probabilities or inclusion for prior inclusion of 1 to 12 variables. This table shows that NFA and civil liberties have a very high probability of inclusion in all cases, followed by relative income. Oil balance and relative income squared also have a significant probability of being included.

As an additional robustness check we restrict the sample to a subset of countries, i.e. all countries with GDP per capita below 25000 PPP US dollars, 44 countries in all, and then apply the BACE model averaging procedure. These coefficients are reported in the last column of Table 7. The coefficients are generally close to the whole sample. With this restricted sample of countries, openness and financial integration change sign to become slightly negative. The coefficient for relative income is found to be even lower than before

## 5.5 Application to central and eastern European countries

Taking the main implications of our results out of sample to the central and eastern European countries allow us to provide estimates for the structural current account levels – i.e. estimates of what current account positions these countries will converge to in the medium-run. As a first endeavour we plot the 2007 benchmarks for *all* models. This reveals that for all countries with two digit deficits, i.e. the Baltic countries, Romania and Bulgaria *all models* indicated that a significant medium term adjustment is required (see Figure. 6).

Narrowing down from all models to the selected models, further interesting results become apparent. As there is uncertainty associated with a particular estimated model of current account (parameter, variable bias etc.), we have computed min-max bounds for the 3 models selected with the first two criteria. Along with these mix-max bounds, we also plot the results based on the AIC, Schwarz and unconditional BACE.<sup>22</sup> All results are based on 5 year centralised moving averages of the fundamentals (to filter out business cycles) and compared to actual current account developments (see Figure 7).

These estimates give us an idea of the degree that developments in the current account can be considered consistent with the estimated fundamentals. One observation is that the implied *ca* benchmarks of the 3 selected models are located within a relatively narrow range, and that the BACE is generally within this range. Looking first at the Baltic states, we see that in all three countries the estimated models give a range below -5% for the current account. All three countries have seen a sizeable worsening in the current account deficit, suggesting a strong movement away from that suggested by our models (i.e. not

<sup>22</sup>The unconditional coefficients of the BACE model are derived by rescaling the conditional coefficients using the probabilities in Table 8.

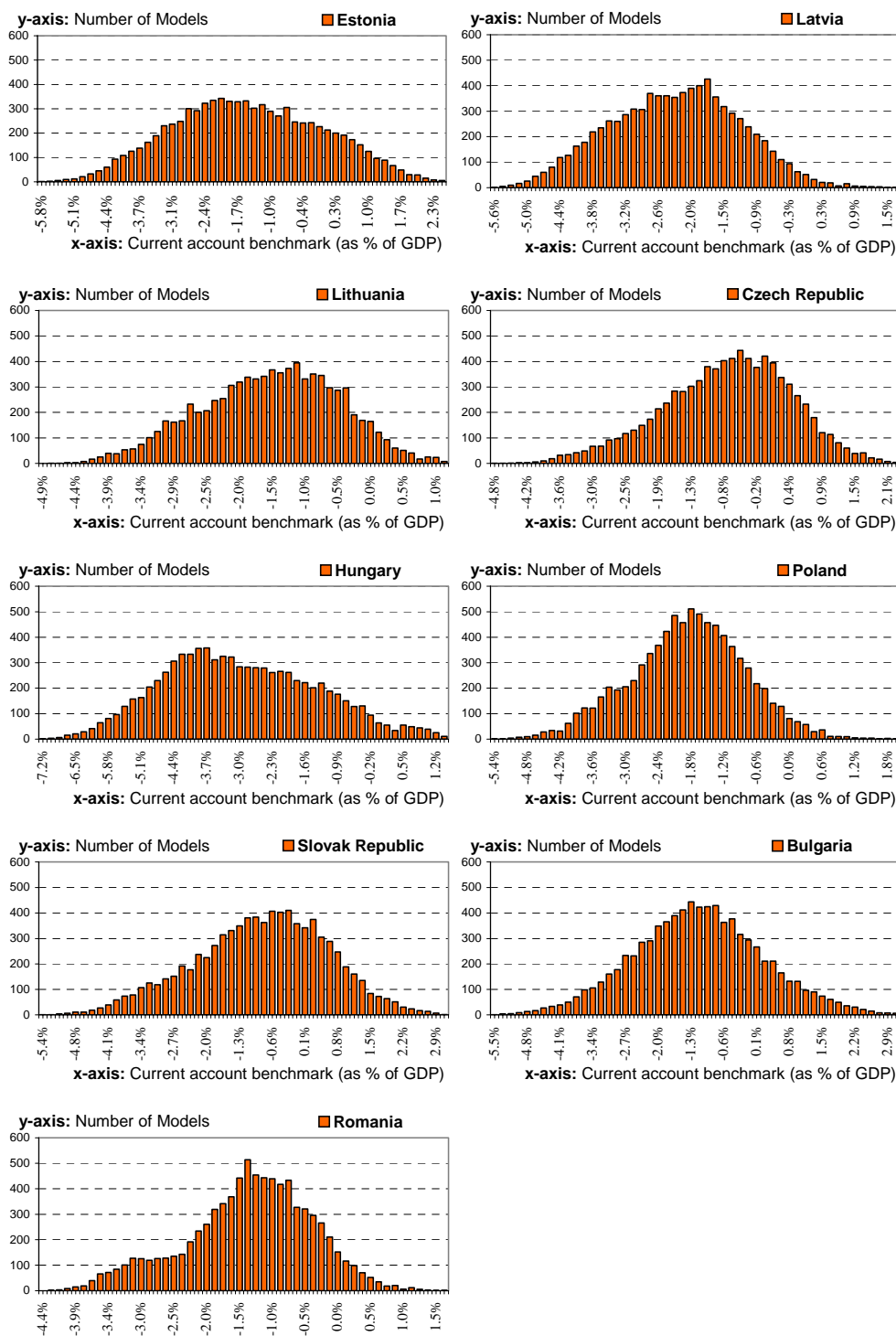


Figure 6: Current Account Benchmarks in 2007 (all models)

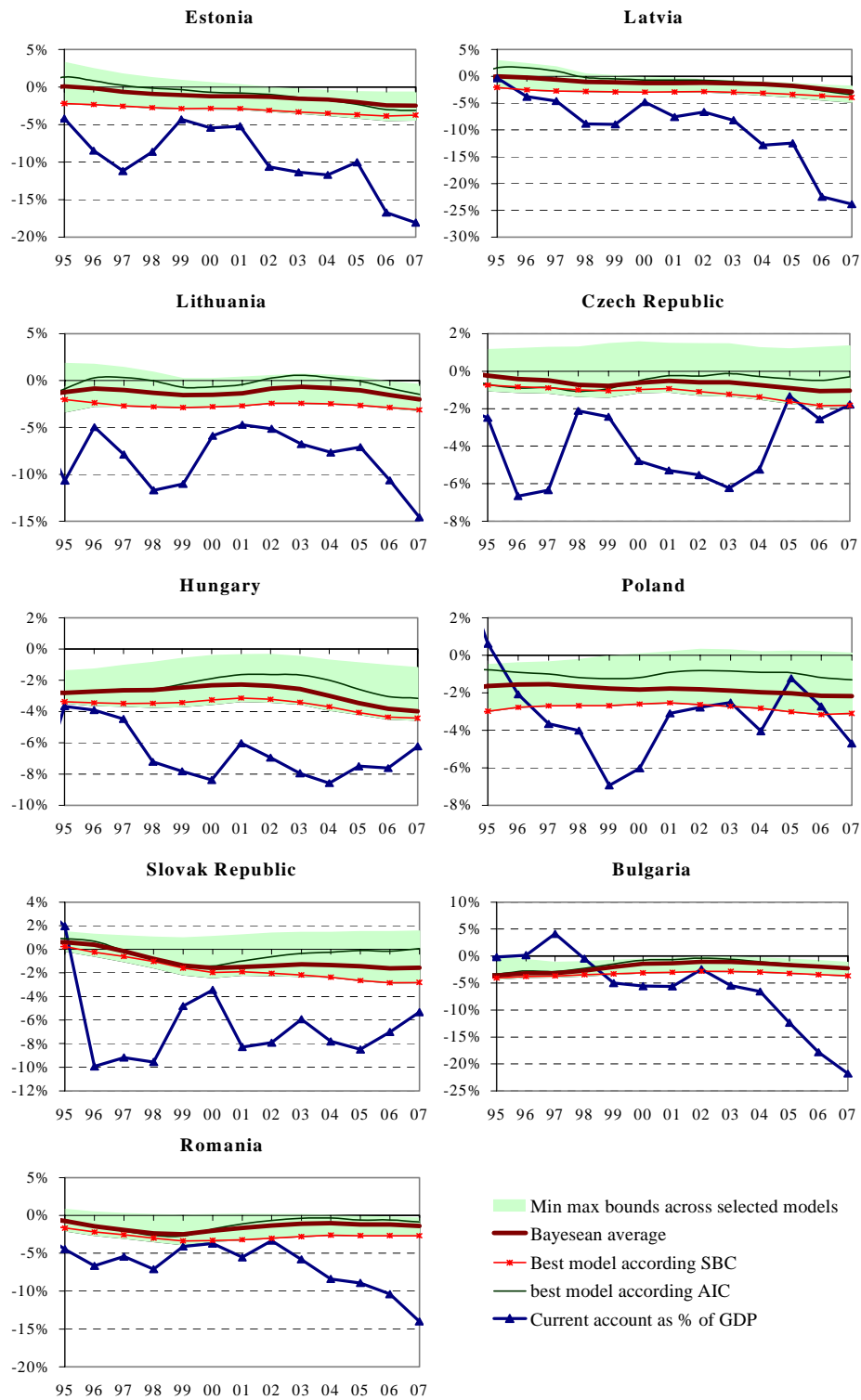


Figure 7: Current Account Benchmarks (1995 to 2007)

**Table 8: Posterior and prior inclusion probabilities.**

Variables:	k=1		k=2		k=3		k=4		k=5		k=6	
	post.	prior	post.	prior	post.	prior	post.	prior	post.	prior	post.	prior
Initial NFA	<b>1.000</b>	0.077	<b>1.000</b>	0.154	<b>1.000</b>	0.231	<b>1.000</b>	0.308	<b>1.000</b>	0.385	<b>1.000</b>	0.462
Oil balance	<b>0.683</b>	0.077	<b>0.666</b>	0.154	<b>0.637</b>	0.231	<b>0.608</b>	0.308	<b>0.583</b>	0.385	<b>0.566</b>	0.462
Investment	0.019	0.077	0.042	0.154	0.069	0.231	0.099	0.308	0.131	0.385	0.165	0.462
Ec. growth	<b>0.112</b>	0.077	<b>0.182</b>	0.154	<b>0.246</b>	0.231	0.303	0.308	0.351	0.385	0.391	0.462
Fiscal balance	<b>0.078</b>	0.077	0.119	0.154	0.147	0.231	0.169	0.308	0.187	0.385	0.202	0.462
Rel. income	<b>0.422</b>	0.077	<b>0.447</b>	0.154	<b>0.491</b>	0.231	<b>0.544</b>	0.308	<b>0.600</b>	0.385	<b>0.654</b>	0.462
Pop. growth	<b>0.213</b>	0.077	<b>0.289</b>	0.154	<b>0.333</b>	0.231	<b>0.366</b>	0.308	<b>0.399</b>	0.385	0.435	0.462
Civil liberties	<b>0.348</b>	0.077	<b>0.420</b>	0.154	<b>0.496</b>	0.231	<b>0.569</b>	0.308	<b>0.638</b>	0.385	<b>0.700</b>	0.462
Openness	<b>0.271</b>	0.077	<b>0.338</b>	0.154	<b>0.354</b>	0.231	<b>0.351</b>	0.308	0.342	0.385	0.333	0.462
Fin. int.	0.022	0.077	0.035	0.154	0.047	0.231	0.058	0.308	0.070	0.385	0.083	0.462
Dep. rat. old	0.022	0.077	0.039	0.154	0.059	0.231	0.085	0.308	0.115	0.385	0.149	0.462
Dep. rat. young	<b>0.262</b>	0.077	<b>0.264</b>	0.154	<b>0.262</b>	0.231	0.259	0.308	0.256	0.385	0.255	0.462
Rel. income. sq.	<b>0.104</b>	0.077	<b>0.203</b>	0.154	<b>0.296</b>	0.231	<b>0.384</b>	0.308	<b>0.466</b>	0.385	<b>0.542</b>	0.462

Variables:	k=7		k=8		k=9		k=10		k=11		k=12	
	post.	prior	post.	prior	post.	prior	post.	prior	post.	prior	post.	prior
Initial NFA	<b>1.000</b>	0.538	<b>1.000</b>	0.615	<b>1.000</b>	0.692	<b>1.000</b>	0.769	<b>1.000</b>	0.846	<b>1.000</b>	0.923
Oil balance	<b>0.557</b>	0.538	0.558	0.615	0.569	0.692	0.588	0.769	0.617	0.846	0.654	0.923
Investment	0.200	0.538	0.237	0.615	0.277	0.692	0.320	0.769	0.369	0.846	0.429	0.923
Ec. growth	0.424	0.538	0.451	0.615	0.474	0.692	0.496	0.769	0.519	0.846	0.549	0.923
Fiscal balance	0.215	0.538	0.228	0.615	0.242	0.692	0.259	0.769	0.281	0.846	0.312	0.923
Rel. income	<b>0.707</b>	0.538	<b>0.755</b>	0.615	<b>0.799</b>	0.692	<b>0.839</b>	0.769	<b>0.875</b>	0.846	0.906	0.923
Pop. growth	0.474	0.538	0.518	0.615	0.566	0.692	0.618	0.769	0.674	0.846	0.733	0.923
Civil liberties	<b>0.756</b>	0.538	<b>0.804</b>	0.615	<b>0.846</b>	0.692	<b>0.881</b>	0.769	<b>0.911</b>	0.846	<b>0.937</b>	0.923
Openness	0.329	0.538	0.331	0.615	0.340	0.692	0.358	0.769	0.385	0.846	0.424	0.923
Fin. int.	0.098	0.538	0.115	0.615	0.136	0.692	0.161	0.769	0.193	0.846	0.236	0.923
Dep. rat. old	0.187	0.538	0.229	0.615	0.274	0.692	0.323	0.769	0.378	0.846	0.442	0.923
Dep. rat. young	0.254	0.538	0.255	0.615	0.258	0.692	0.264	0.769	0.276	0.846	0.296	0.923
Rel. income. sq.	<b>0.611</b>	0.538	<b>0.674</b>	0.615	<b>0.730</b>	0.692	<b>0.781</b>	0.769	0.827	0.846	0.868	0.923

driven by fundamentals). This feature is also shared by Bulgaria and Romania, whereas for the Visegrad countries developments over the past few years suggest a movement of the current account back in line with fundamentals.

Finally, Table 9 decomposes the preferred model (BACE) into the contributions from the fundamentals. For the Baltic countries, NFA on average contributed -1.9% over the period 2004 to 2006 while low relative income contributed -1% (i.e. rather moderately). This cumulative negative number is offset by economic growth which on average contributed by 0.9% despite our initial prior of a negative sign. The role of other variables is limited, which means that altogether we derive fairly low benchmarks.<sup>23</sup>

Similar results are found for all other countries.<sup>24</sup> The model cannot easily account out of sample (and

<sup>23</sup>In the case of Investment or Fiscal deficit, for example, the low probability of inclusion (13% and 19%) reduces their contribution even further.

<sup>24</sup>In terms of contributions of the various variables, results differ depending on the choice of the hyperparameter  $k$ , although

thus meaningfully decompose among the 13 fundamentals) even moderate current account deficits. This implies that several countries require a large adjustment over a medium term horizon. It could be counter-argued, however, that (i) some elasticities of the model do not match very closely our theoretical priors in terms of sign and magnitude and that (ii) the analysis may not fully capture the specificities of central and eastern Europe.

**Table 9: Contributions to CA benchmark (in percentage points) according to the BACE model.**

Period	Fundamentals (Contribution to CA benchmark)													Sum Benc
	NFA	Oil	Inv	Ec.	Fis.	R. In.	Pop.	Civ.	Op.	Fin.	D.ol.	D. y.	R. In s.	
<b>Baltic states</b>														
<b>Estonia</b>														
97-06	-1.79	-0.19	-0.15	0.73	0.02	-1.15	0.40	0.16	0.43	-0.03	-0.01	0.03	0.17	-1.37
04-06	-2.49	-0.13	-0.21	0.85	0.06	-0.84	0.29	-0.19	0.42	-0.02	-0.01	0.06	0.09	-2.13
<b>Latvia</b>														
97-06	-1.18	-0.27	-0.11	0.82	-0.02	-1.58	0.46	0.23	0.06	-0.03	-0.01	0.02	0.33	-1.28
04-06	-1.84	-0.37	-0.21	1.13	0.00	-1.22	0.38	0.11	0.04	-0.03	-0.01	0.06	0.19	-1.78
<b>Lithuania</b>														
97-06	-1.04	-0.24	-0.04	0.65	-0.06	-1.34	0.42	0.14	0.14	-0.04	0.01	-0.02	0.23	-1.18
04-06	-1.30	-0.22	-0.06	0.76	-0.02	-1.04	0.42	0.05	0.16	-0.04	0.00	0.02	0.14	-1.14
<b>Visegrad group</b>														
<b>Czech Republic</b>														
97-06	-0.49	-0.27	-0.10	0.11	-0.08	-0.53	0.17	0.02	0.32	-0.03	0.05	0.05	0.04	-0.76
04-06	-0.91	-0.32	-0.08	0.43	-0.03	-0.43	0.02	-0.20	0.38	-0.04	0.07	0.06	0.02	-1.02
<b>Hungary</b>														
97-06	-2.25	-0.45	-0.07	0.34	-0.13	-0.84	0.27	-0.05	0.34	-0.02	0.01	0.03	0.09	-2.73
04-06	-2.81	-0.55	-0.04	0.27	-0.19	-0.69	0.25	-0.28	0.34	-0.03	0.03	0.03	0.06	-3.61
<b>Poland</b>														
97-06	-1.04	-0.19	-0.01	0.33	-0.09	-1.29	0.22	0.03	-0.08	-0.04	0.09	-0.01	0.21	-1.87
04-06	-1.31	-0.25	0.00	0.39	-0.10	-1.17	0.18	-0.19	-0.03	-0.05	0.10	0.03	0.17	-2.22
<b>Slovakia</b>														
97-06	-0.91	-0.43	-0.11	0.30	-0.08	-1.02	0.09	0.22	0.40	-0.03	0.10	-0.03	0.13	-1.35
04-06	-1.51	-0.49	-0.10	0.60	-0.03	-0.87	0.10	-0.12	0.45	-0.03	0.13	0.01	0.10	-1.78
<b>Bulgaria</b>														
97-06	-1.20	-0.67	0.01	0.30	0.12	-1.64	0.54	0.20	0.27	-0.02	-0.05	0.10	0.35	-1.69
04-06	-1.37	-0.66	-0.08	0.55	0.16	-1.45	0.53	0.19	0.29	-0.02	-0.03	0.12	0.27	-1.51
<b>Romania</b>														
97-06	-0.71	-0.24	0.01	0.09	-0.01	-1.63	0.41	-0.05	-0.01	-0.03	0.02	0.04	0.34	-1.77
04-06	-0.94	-0.24	-0.03	0.61	0.05	-1.45	0.39	0.24	-0.02	-0.04	0.03	0.07	0.27	-1.06
<b>Average across the Baltic states</b>														
97-06	-1.34	-0.23	-0.10	0.73	-0.02	-1.36	0.43	0.17	0.21	-0.03	0.00	0.01	0.24	-1.28
04-06	-1.87	-0.24	-0.16	0.91	0.01	-1.03	0.36	-0.01	0.20	-0.03	-0.01	0.05	0.14	-1.68
<b>Average across the Visegrad group</b>														
97-06	-1.17	-0.33	-0.07	0.27	-0.09	-0.92	0.18	0.05	0.24	-0.03	0.06	0.01	0.12	-1.68
04-06	-1.63	-0.40	-0.06	0.42	-0.09	-0.79	0.14	-0.20	0.28	-0.03	0.08	0.03	0.09	-2.16
<b>Average across the 9 central and eastern European countries</b>														
97-06	-1.18	-0.33	-0.06	0.41	-0.04	-1.23	0.33	0.10	0.21	-0.03	0.03	0.03	0.21	-1.56
04-06	-1.61	-0.36	-0.09	0.62	-0.01	-1.02	0.29	-0.04	0.22	-0.03	0.03	0.05	0.15	-1.80

Notes: Contribution to the *ca* benchmarks is calculated according to the corresponding elasticity from the BACE model in Table 7.

the thrust of the analysis remains similar in terms of overall size of the benchmarks.

## 6 Concluding Remarks

Over the past ten years Central and Eastern Europe has enjoyed a period of robust economic growth, accompanied in several cases by large current account deficits and strong capital inflows. While this can be viewed as a natural phenomenon and a sign of economic success, policy makers need to balance opportunities and risks appropriately. The current account provides a signal that an adjustment process may be needed over the medium term. The aim of this paper has been to review critically two competing methods for calculating benchmarks for the current account, i.e. the external sustainability approach à la Lane and Milesi-Ferretti (*LM*) versus the structural current account (*SCA*) literature. Throughout the text we have emphasised how both approaches offer valuable insights but are not immune from drawbacks and conceptual difficulties. We have shown that the *LM* approach is not only affected by alternative plausible assumptions, such as the pace of growth and interest rate spreads, but is particularly sensitive to the normative choice for external indebtedness. It turns out to be decisive also if FDI is excluded from the aggregate measure of external indebtedness. This normative decision depends on whether FDI inflows are viewed more as "blessing" for the benefits they bring or "liabilities" that must be stabilised.

Turning to the *SCA* literature we noted that it has ignored up to now the issue of model selection. The choice out of thousands of possible specifications matters for the estimates of elasticities. While for a number of variables the sign and the magnitude of the coefficients are robust across all specifications, for other coefficients, model uncertainty is high. Following our selection procedure, we narrowed down the analysis to five models. We also explored an alternative and increasingly popular route, i.e. we combined all models after having attached to each a probability, following Sala-i-Martin *et al.* (BACE). Altogether our five preferred models and the BACE specification show *ca* benchmarks located within a relatively narrow range. Two important caveats remain, nonetheless: (*i*) not all coefficients are consistent with our ex-ante expectations in terms of sign or magnitude; (*ii*) some countries appear to be for a prolonged period of time in disequilibrium, suggesting that important country factors may be at play that a world model cannot adequately capture.

All things considered, policy makers cannot abstain from evaluating current account developments. To this aim we pull the results of this paper together by showing the results of both methodologies in terms of disequilibria (see Figure 8).

For the *LM* methodology the current account disequilibria are shown both including and excluding FDI. For the *SCA* methodology we show a specification for the whole panel (BACE) and one for the subset of low-income countries (BACE-EM). The broad picture that emerges summarises well our exposition:

For the Visegrad countries the current account deficits in 2007 were consistent with stable external indebtedness (albeit in some cases at very high levels) and none of the BACE specifications signal evidence of large disequilibria. For all other countries, the current account deficits in 2007 mean a deteriorating external indebtedness position (except for Bulgaria when FDI is excluded). The BACE specifications also point to the need for a current account adjustment over a medium term horizon.<sup>25</sup> The literature on *ca* benchmarking has established itself as an essential tool in central banking and academia for identifying current account

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<sup>25</sup> Since the finalisation of the paper, this adjustment process has started to unfold, albeit partially, even prior to the present global turmoil.

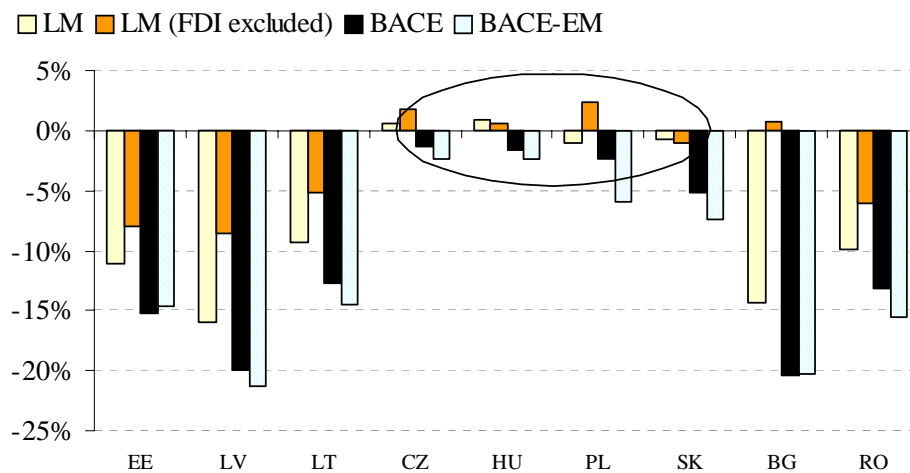


Figure 8: Current Account Disequilibria Measures in 2007

disequilibria. Given the difficulties of this endeavour, of which we think we provided convincing arguments, the interpretation of these numbers require knowledge of the underlying assumptions and a good degree of caution.

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# Appendix

**Table 10: Data description.**

Variable	Deviation from trading		Database	Description
	partners			
Initial NFA	no		L-MF	Net foreign assets as a share of GDP at the end of the previous year.
Oil balance	no		WEO	Oil trade balance as a share of GDP.
Investments	yes		WEO	Gross fixed investments as a share of GDP.
Economic growth	yes		WEO	Real GDP growth.
Fiscal balance	yes		WEO	Fiscal deficit as a share of GDP.
Relative income	yes		WEO	Real GDP per capita in PPP terms, US \$.
Population growth	yes		WEO	Annual growth of total population.
Civil liberties	yes		FWS	Index between 1 (free) and 7 (not free).
Openness	yes		WEO	Sum of exports and imports as a share of GDP.
Financial integration	yes		L-MF	Sum of external assets and liabilities as a share of GDP.
Dep. ratio: old	yes		WDI	Ratio of old age people (>64 years) to middle age (15-64) cohort..
Dep. ratio: young	yes		WDI	Ratio of young age people (<15 years) to middle age (15-64) cohort.
Current account	no		WEO	Current account as a share of GDP.
country-specific trade weights			DOTS	Average bilateral trade flows during the period 1996-2000 for all countries in the database are used to construct the trade weights matrix.

Notes: L-MF is Lane and Milesi-Ferretti (2006) database, WEO is September 2008 version of IMF World Economic Outlook database, WDI is 2007 version of WB World Development Indicators database, FWS stands refers to annual Freedom in the World survey and DOTS is IMF Direction of Trade Statistics database.

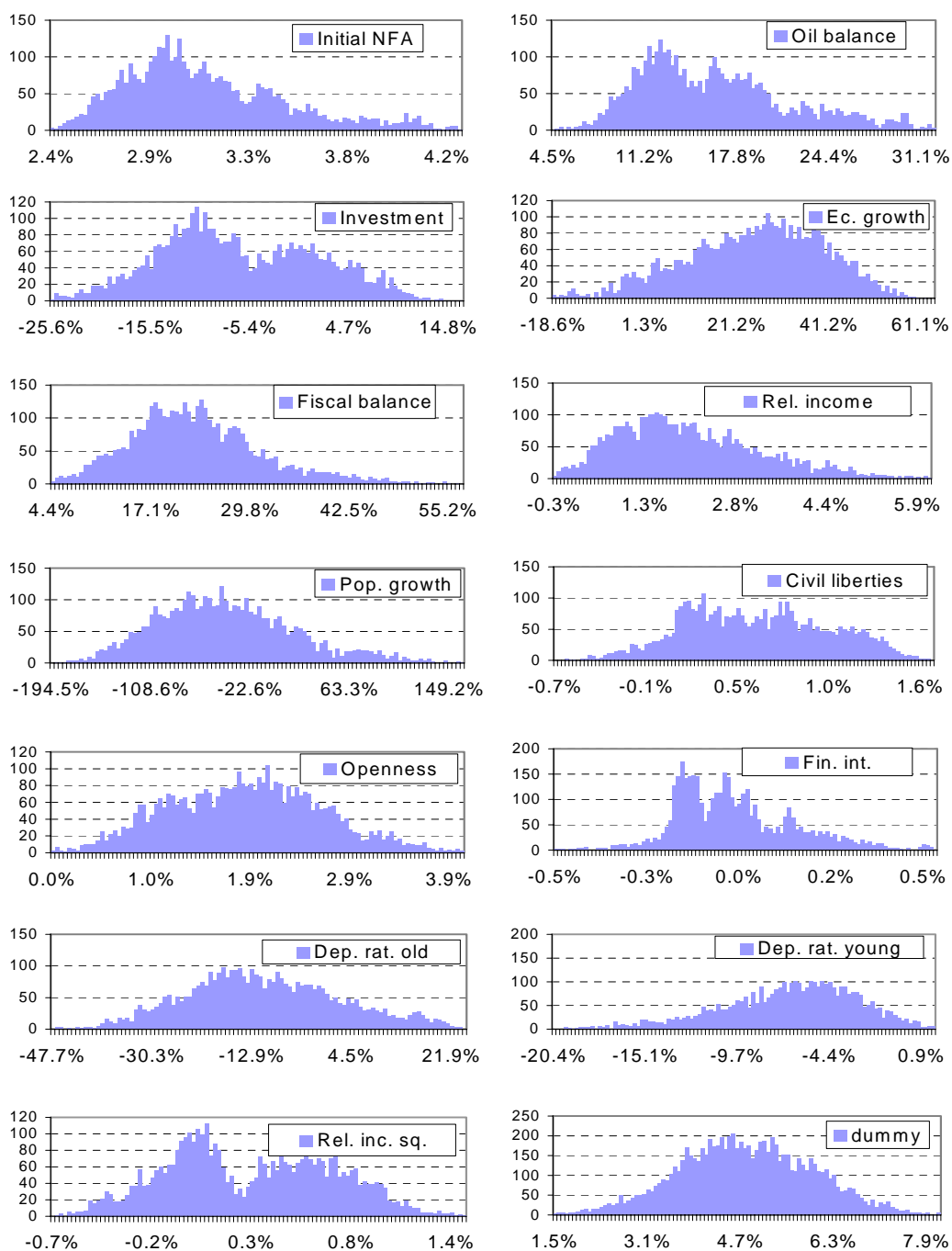


Figure 9: Histograms of coefficients' estimates.

**Table 11: Fundamentals and estimated elasticities for the selected models ( $m = 4$ ).**

Variables/Prior <b>Variable</b>	Crit. 1 10 vars				Crit. 2 8 vars	Crit. 3 8 vars	Crit. 4 5 vars	BACE 5 vars	BACE-EM 5 vars
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Initial NFA	<b>0.033</b> (5.2)	<b>0.027</b> (3.7)	<b>0.027</b> (4.1)			<b>0.033</b> (5.3)	<b>0.040</b> (7.8)	<b>0.034</b> (5.5)	<b>0.038</b> (9.3)
Oil balance	<b>0.114</b> (2.4)	<b>0.107</b> (2.6)		<b>0.121</b> (2.6)	<b>0.159</b> (2.4)	<b>0.118</b> (2.1)	<b>0.117</b> (2.9)	<b>0.113</b> (2.1)	0.105 (1.6)
Investment	<b>-0.152</b> (-3.4)		-0.081 (-1.5)	-0.103 (-1.3)	<b>-0.198</b> (-2.1)	<b>-0.162</b> (-3.0)		<b>-0.148</b> (-2.6)	<b>-0.139</b> (-2.5)
Ec. growth								0.055 (0.3)	0.209 (0.9)
Fiscal balance	<b>0.265</b> (3.6)				<b>0.267</b> (3.7)	<b>0.275</b> (3.7)	<b>0.288</b> (4.4)	<b>0.290</b> (3.7)	<b>0.237</b> (2.4)
Rel. income	0.002 (0.3)	0.010 (1.1)	<b>0.020</b> (2.3)	<b>0.025</b> (2.6)	<b>0.018</b> (2.0)			0.004 (0.5)	0.011 (1.0)
Pop. growth	-0.674 (-1.3)	<b>-0.788</b> (-2.2)	-0.731 (-1.9)	-0.786 (-1.8)		<b>-0.582</b> (-1.2)		-0.729 (-1.1)	<b>-1.208</b> (-3.0)
Civil liberties	<b>0.006</b> (2.6)	0.000 (0.1)	0.003 (1.0)	0.001 (0.4)	<b>0.007</b> (2.2)	<b>0.006</b> (2.8)		<b>0.007</b> (2.0)	0.006 (1.2)
Openness	<b>0.013</b> (2.4)	<b>0.027</b> (3.2)	<b>0.027</b> (2.8)	<b>0.029</b> (2.7)	<b>0.020</b> (2.3)	<b>0.014</b> (2.6)		0.014 (1.6)	0.017 (0.9)
Fin. int.		<b>-0.002</b> (-2.7)	<b>-0.002</b> (-3.1)	<b>-0.002</b> (-2.1)				0.001 (0.6)	0.004 (0.9)
Dep. rat. old	-0.054 (-0.7)	-0.132 (-1.6)	<b>-0.232</b> (-3.0)	<b>-0.272</b> (-2.9)				-0.049 (-0.5)	<b>-0.261</b> (-2.3)
Dep. rat. young	<b>-0.058</b> (-2.1)	-0.036 (-1.3)	-0.039 (-1.4)	-0.062 (-1.8)	<b>-0.092</b> (-2.7)	<b>-0.057</b> (-2.1)		<b>-0.074</b> (-2.6)	-0.055 (-0.9)
Rel. inc. sq.		<b>0.005</b> (2.1)	<b>0.006</b> (2.4)	<b>0.008</b> (2.7)	<b>0.005</b> (2.1)			0.001 (0.6)	-0.001 (-0.5)
No. of countries:	65	86	86	87	65	63	63	63	44
No. of obs:	1560	2064	2064	2088	1560	1512	1512	1512	1056
Data shrinkage	130	172	172	174	130	126	126	126	88
Adjusted $R^2$	50.9	35.5	33.5	28.8	58.1	50.2	46.5		

Notes: Pooled OLS estimation on the non-overlapping 4-year moving averages. Robust t-ratios are reported in parentheses. BACE results are for a prior of inclusions of 5 variables and the elasticities reported are conditional on the variable being included.

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