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Capital flows to transition economies: what is the role of external shocks?

Scott W Hegerty
Canisius College

Abstract

During the recent international financial crisis, capital flows into Central and Eastern European transition economies have faced a serious threat of a "sudden stop." But the specific dangers depend on these flows` macroeconomic determinants, which can be ambiguous because the underlying savings and investment decisions can vary depending upon the persistence of income shocks. This study applies VAR methodologies to examine the relative influences of foreign and domestic income growth on the capital accounts of six countries that have recently joined the European Union. Impulse response functions show that Bulgaria, the Czech Republic, and Lithuania are influenced more strongly by foreign shocks, while Latvia, Estonia, and Romania show more of a response to domestic shocks. As a result, these three countries—and Latvia in particular—show a vulnerability to a "sudden stop" if they experience localized recessions.

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1. Introduction

During the nearly 20 years since the fall of Communism, transition economies have experienced a tremendous increase in their capital inflows. This increase is driven partially by growth in domestic demand beyond what can be supplied internally, and partially because these countries present attractive opportunities for foreign investment as they continue to integrate with the rest of Europe. As a result, current account deficits have widened across the region. Foreign reserves have grown, especially for those countries that maintain fixed exchange rates. But capital flows may not be persistent if the economic factors that drive them, particularly real growth in either the host or the recipient country, slow. In the face of the 2008 financial crisis, the sources of vulnerabilities must be addressed in order to evaluate the specific effects on countries in the region. This study evaluates the roles of foreign and domestic economic shocks in the capital accounts of six new members of the European Union in Central and Eastern Europe. The effects of these shocks are shown to vary country by country. This implies that each country might face a different fate in the face of the current crisis, as some countries' flows are more affected by common, region-wide shocks, while others respond more asymmetricially due to idiosyncratic, domestic factors.

These six countries were chosen based both because of data availability and because they represent a broad range of European transition economies. The three Baltic nations, which along with the Czech Republic joined the European Union in May 2004, have since had to delay the prospect of Euro adoption until at least 2011. Bulgaria and Romania, Balkan countries that joined the EU in 2007, most likely will be able to adopt the Euro only after 2012. The Czech Republic has no set date to join the common currency.

Exchange rate policy also differs among the countries in the sample. Bulgaria, Estonia, and Lithuania have currency boards that are tied to the Euro, and Latvia pegs its currency to the Euro, and allows the currency to fluctuate much less than its fluctuation band allows. The Czech *koruna* currently maintains its managed float against the Euro, after its peg was abandoned in 1997; Romania follows a managed float as well. Since fixed exchange rates offer foreign investors a form of insurance against devaluation, it is possible that these countries might attract capital inflows more that those with floating rates. Transition economies with fixed exchange rates have recently experienced strong real appreciation and consequent inflation.

The growth of capital flows varies among economies. Figures 1 and 2 show the time paths of these countries' capital accounts from 1994 to 2008, as a share of GDP and in real (domestic currency) terms, respectively. The Czech Republic and Lithuania see little overall increase over this period. Latvia and Estonia show particularly large growth in their capital accounts, particularly during the latter part of the sample. The capital accounts of Bulgaria and Romania, which were liberalized later than those of the other countries studied here, still show increases during this period. This has been driven by key macroeconomic determinants, but it is unclear whether the source country or the recipient country has had more influence in each case.

The role of foreign shocks in driving capital flows is theoretically ambiguous. In a widely cited study, Glick and Rogoff (1995) show that since the savings and investment decisions that drive the current account depend on the persistence of shocks, the current account can be pro- or countercyclical. If growth at home is thought to be temporary, the extra income will be saved—leading to a current account surplus and a capital outflow. A permanent shock can increase investment, causing a current account deficit and a capital outflow. The same process can take place in the foreign country as well. World shocks, on the other hand, affect all countries equally and thus do not allow for excess saving or investment. It can be argued, however, that transition

economies are by nature not yet subject to these fluctuations to the degree that larger and more established emerging markets (such as Mexico or Korea) are. This is borne out both by these countries' incomplete convergence to EU norms and by the empirical results given below.

Because of their underlying theoretical ambiguity, the effects of foreign and domestic income shocks must be tested empirically. Quarterly datasets of sufficient length are now available to test each country individually in a time-series framework. This study does so using two different approaches. First, a Vector Autoregressive (VAR) methodology is applied to a model similar to that used by Ying and Kim (2001) in their study of the capital accounts of Mexico and Korea. Second, a cointegration test is used to find any long-run relationships.

Previous research on capital flows to Central and Eastern Europe has neither focused on individual countries nor emphasized foreign macroeconomic influences. Working papers by Árvai (2005), Ötker-Robe *et al.* (2007), and von Hagen and Siedschlag (2008) all provide excellent presentations of the stylized facts regarding these flows. They note both that periods of increased flows vary by country, as do policies (including exchange-rate, interest-rate and fiscal policy measures) that are used to accommodate them. Empirical studies are still rare, however.

Garibaldi *et al.* (2001) evaluate the determinants of capital flows to a panel of 26 transition economies from 1991-1999. They find that microeconomic and structural variables have effects on both Foreign Direct Investment (FDI) and portfolio investment. Gibson and Tsakalotos (2004) look at a panel of nine countries that acceded to the EU in 2004 and 2007 (including Malta), in context of currency policy and exchange-rate regimes. Private capital flows (excluding FDI) are modeled in an equation that includes domestic GDP growth and an interest differential, but does not include Foreign GDP. The authors do not evaluate countries individually, although they do include dummies for countries' choice of exchange-rate regime. Lane and Milesi-Ferretti (2007) examine the underlying sources and time path of capital flows into a number of Central and Eastern European countries, but also do not explicitly examine individual country experiences or the role of foreign shocks.

The effects of these shocks can be detrimental. Melecky (2005) shows that a reversal in these countries' capital inflows may result in diminished growth for at least three years. Thus, it is important that the macroeconomic determinants of overall capital flows in Central Europe be evaluated in a way that isolates the influences of domestic and foreign shocks. Doing so can help determine the overall exposure of these countries to external trends, and thus possible vulnerability to outside shocks. The structure of this paper is as follows: Section II provides the model, data sources, and choice of variables, and explains the time-series techniques that will be applied. Section III gives the empirical results, and Section IV concludes.

2. Methodology

Quarterly data from the International Financial Statistics of the IMF (over the period from 1994q1 to 2008q1) are used to evaluate shocks to the capital accounts of six Central European transition economies. The model of Ying and Kim (2001) is incorporated into a Vector Autoregression (VAR) and cointegration analysis of capital flows into the Czech Republic, Bulgaria, Romania, Estonia, Latvia, and Lithuania. While Ying and Kim (2001) use a structural VAR approach to eliminate contemporaneous effects among the variables, a generalized VAR methodology is applied in this study. The method is as follows:

First, shocks to the capital account are expected to be influenced by shocks to four main explanatory variables, and are modeled as an unrestricted VAR:

$$KA_t = f\left(M_t^{Home}, Y_t^{Home}, r_t^{For}, Y_t^{For}\right) \quad . \qquad (1)$$

Germany is used in this study as the foreign country. The five variables in the model are:

KA = Changes in reserves minus the current account, in local currency, in real terms (divided by the national Producer Price Index)

M = Domestic money supply (in local currency)

Y^{Home} = Real GDP in local currency, taken as nominal GDP divided by the national GDP deflator (due to data limitations, the PPI is used for Bulgaria and Romania[1])

r^{For} = the foreign interest rate (Euro Area interbank rate)

Y^{For} = foreign real GDP (here, German GDP volume, with 2000 = 100)

All variables are in logs except KA and r^{For}.

Stationarity tests show that nearly all variables are non-stationary. Each VAR is evaluated in first differences, although levels results are available upon request.[2] Using the data outlined above, the generalized VAR methodology of Pesaran and Shin (1998) is applied. Generalized impulse response functions have an advantage over orthogonalized functions in that they are invariant to the ordering of the variables of the VAR.

The generalized impulse response functions are generated to show the effects on the capital account of shocks to three variables: Foreign income, Home income, and the Foreign interest rate. Because interest rate convergence is an important step toward adoption of the Euro, it might be expected that German interest shocks might eventually have less effect on capital flows across countries. Differentials between interest rates have indeed been reduced over time, but they have not been eliminated.[3]

Income shocks are at the center of this study. Because their effects are theoretically ambiguous, their time paths can vary from country to county, and the relative strength of each country's influence must be assessed empirically. Forecast Error Variance Decompositions are obtained here to measure the relative size of the variance contributed by home income shocks to that provided by foreign shocks—to see whether "push" factors or "pull" factors are more important to the behavior of the capital account.

Finally, to address whether there is a long-run relationship among the variables, cointegration analysis is performed. While the traditional method of Johansen and Juselius (1990) was applied as a preliminary test (showing the presence of at least one cointegrating vector in a majority of cases), this method is not applicable in those cases where one or more variables may be stationary. As a result, an alternative test, the Autoregressive Distributed Lag (ARDL) technique of Pesaran *et al.* (2001) is used instead. The procedure has also been shown to have good small-sample properties.[4]

In this cointegration test, OLS is first performed on a short-run error-correction model (with lag lengths for each differenced variable chosen by minimizing the AIC). In place of the traditional error-correction term (which is a stationary linear combination of all variables, lagged one period), the lagged level variables are added separately to the short-run model and tested for joint significance. This is done with an F-test, with critical values given by Pesaran *et al.* (2001). Thus, cointegration can be shown if there is a sufficiently high F-statistic. In addition, if the test statistic is below a second critical value, the null of no cointegration is not rejected. The presence of a long-run relationship can attest to the permanence of the domestic and foreign shocks.

[1] In addition, excessive seasonality in the GDP data of Bulgaria and Romania is removed with the Hodrick-Prescott Filter, $\lambda = 1600$.

[2] While there is some debate about the use of levels in Vector Autoregressions, differencing is thought to remove useful information from the dataset, especially if the levels series are cointegrated. See, for example, Enders (2004), pages 358-359.

[3] Árvai (2005), for example, shows that interest rate convergence has not been achieved in the region.

[4] For a detailed description of this methodology, see Bahmani-Oskooee et al. (2008).

3. Results

Table 1 provides the results of the Augmented Dickey-Fuller test, with the lag length chosen by the minimum AIC (out of a maximum of 4 lags). Almost all are nonstationary, or I(1) in levels, except possibly the Lithuanian capital account.[5] Bulgaria's money supply is nonstationary when a structural break is added to control for the country's 1997 hyperinflation. Each VAR is then evaluated with a constant term but no trend, at an order that minimizes the Akaike Information Criterion. The AIC is minimized at a lag of 1 in all cases.

Figure 3 shows the generalized impulse responses of each country's capital account to shocks in the foreign interest rate. No country's capital account appears to respond to foreign interest rate shocks. Thus, the flow of capital into these Central and Eastern European countries can be more appropriately attributed to other shocks, both home and abroad.

The effects of Foreign and Home income shocks are provided in Figures 4 and 5, respectively. The capital accounts of Bulgaria and the Czech Republic are positively influenced by shocks to foreign income, but not to home income. Lithuania's capital account is as well, but at a significance level below 90 percent (the maximum t-ratio is 1.51 at 4 lags). This signifies that for this group of countries, economic growth abroad is channeled into domestic investment. For the Czech Republic, this result is particularly unsurprising, since it directly borders Germany and has long attracted direct investment. Bulgaria also attracts a high share of FDI relative to non-FDI investment; these results might indicate that this is driven by events in source countries.

The capital accounts of Estonia, Latvia, and Romania, on the other hand, appear to be driven more by domestic factors. For all three countries, the impact of a Home income shock is positive and significant at 99 percent. This suggests that a localized recession might put these countries at a particular risk of a capital outflow. Latvia's result is particularly long-lasting, so this Baltic nation might be particularly vulnerable. Thus, if "foreign" shocks indeed represent "world" shocks—against which risk-sharing is unavailable and smoothing is impossible—Romania, Latvia, and Estonia are particularly vulnerable to isolated, country-specific shocks.

How strong are domestic and foreign influences in relation to each other? The generalized Forecast Error Variance Decompositions, given in Table 2, can help answer this question. Unlike orthogonalized FEVDs, generalized FEVDs do not necessarily add up to 1.000. Nonetheless, the relevant impacts of the three main variables can still be addressed.

Table 2 shows that the foreign interest rate contributes a relatively small part of the variance in the capital account when compared to the amount which the capital account contributes to its own variance. The figures for income shocks are small as well. To show the relative influence of home and domestic income shocks, the ratio of the values is given as the statistic *H/For*. A particularly large value indicates that the impact of home income shocks far outweighs the impact of foreign shocks.

Bulgaria has the lowest *H/For* ratio (less than 0.5), suggesting that foreign income shocks play a relatively large role in the variance of the capital account. On the other hand, Latvia has the largest *H/For* ratio (more than 15), suggesting that home shocks are the most influential. (Lithuania's ratio was also high, but it is the only country in this study that did not register a significant response to either income shock). The other countries have a value in the middle (between 5 and 12). Two extremes, Bulgaria and Latvia, stand out from the impulse-response and variance decomposition results.

Bulgaria has the lowest *H/For* ratio, as well as strong response to foreign income shocks. Latvia, on the other hand, has the highest *H/For* and the strongest, longest-lasting response to

[5] Different lag length criteria show a different result; hence, the stationarity is ambiguous and the variable is treated in levels.

domestic income shocks. As a result, Bulgaria may be less vulnerable to capital flight or a "sudden stop" during a localized recession, while Latvia is the most vulnerable. Since Bulgaria has a high proportion of FDI inflows relative to short-term portfolio flows, while Latvia has a large share of "hot" money inflows from abroad, these results point toward a "sudden stop" for Latvia as Bulgaria's stable FDI remains in place. Those countries that have benefited the most from foreign capital might be hurt the most should these funds dry up.

Finally, Table 3 shows whether the variables in the VAR have a significant long-run relationship. The results of the F-test indicate that there exists a long-run relationship for all of the countries. Estonia, Latvia, Lithuania, and Romania have F-statistics above the 99 percent critical value of 5.122. Bulgaria's value is significant at 95 percent, and the statistic for the Czech Republic is significant at 90 percent.

4. Conclusion

Capital inflows in many Central and Eastern European transition economies have increased, in some cases dramatically, since 1994. These flows might be driven by domestic or foreign factors, and thus might be vulnerable to a "sudden stop" if those conditions change. Using quarterly data over the period from 1994 to 2008, the effects of foreign interest rate changes, as well as the relative influence of domestic and foreign income shocks, are studied for six countries. Generalized impulse-response and forecast error variance decomposition results show that these factors have varying effects for each country.

Foreign interest rates have minimal effects on all six countries. The effects of home and foreign income, and their relative influence, vary among the six countries studied here. Bulgaria and the Czech Republic appear to be most influenced by foreign shocks, while Estonia, Latvia, and Romania are affected by domestic shocks. Variance decomposition confirms that Bulgaria shows the strongest foreign impact, while Latvia's domestic response is strongest. While all countries show evidence of cointegrated relationships among the five variables in the VAR, Latvia shows the most risk of experiencing a "sudden stop" because of a localized recession. In general, the countries that are geographically most distant, and which have had the longest histories of having closed economies, show the weakest connection to their wealthy European neighbors. Of these countries, Estonia and Romania might be most likely to require a "Latvian"-style bailout.

These results have important implications during the current crisis. As new EU members seek to become more closely integrated with the Eurozone, they put their trust that a common monetary policy will benefit the entire currency area symmetrically. If some countries find the capital inflows on which they have grown to depend so heavily to be driven by common foreign shocks, this provides one measure of deepening economic integration. Others, like Latvia, might be more affected by country-specific factors. If this is indeed the case, they might find themselves less able to find refuge from the crisis in an economic bloc with which they are less strongly integrated, and more vulnerable to a localized crisis.

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Figure 1. Capital Accounts (Percent of GDP), 1994-2008.

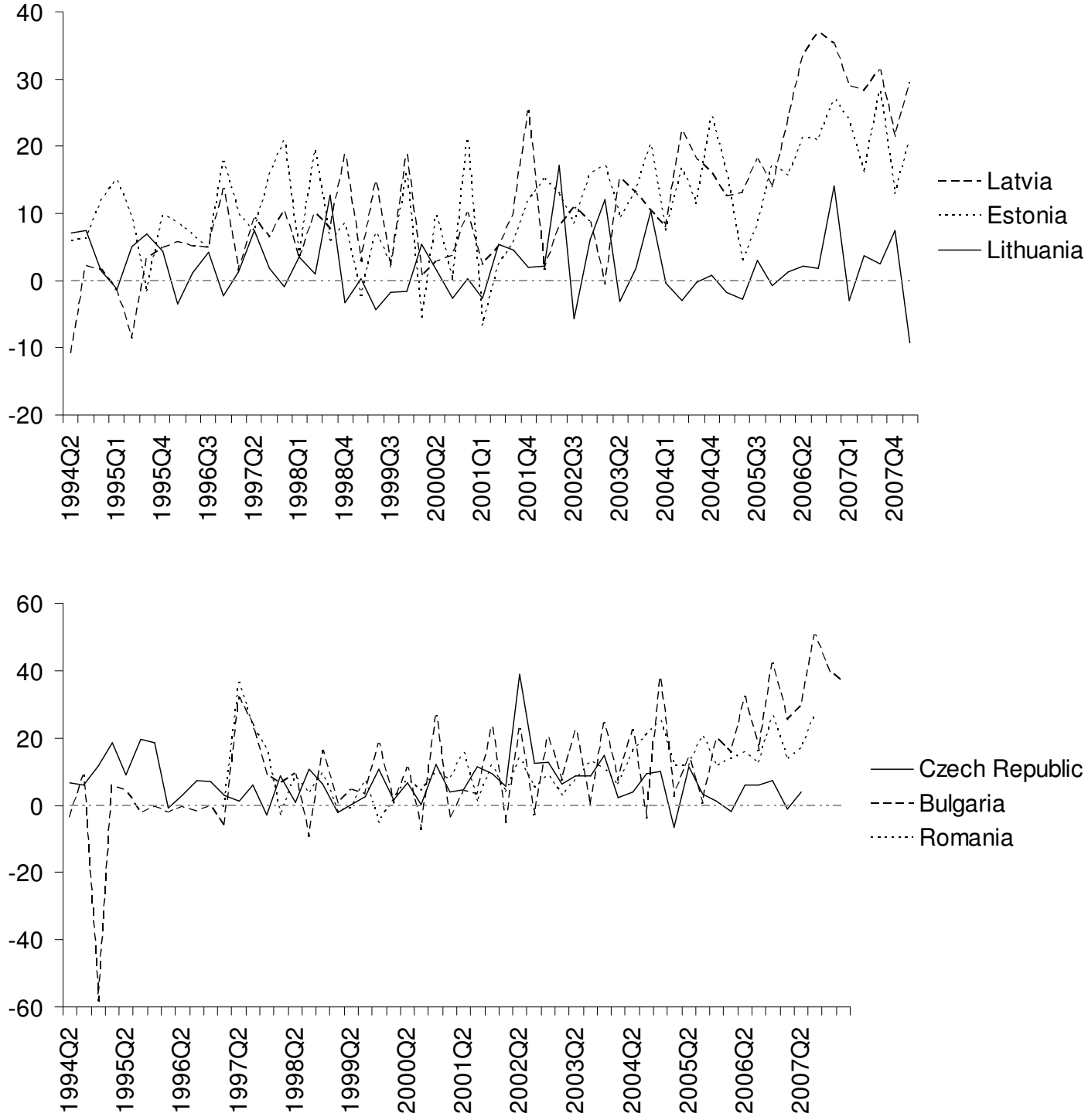
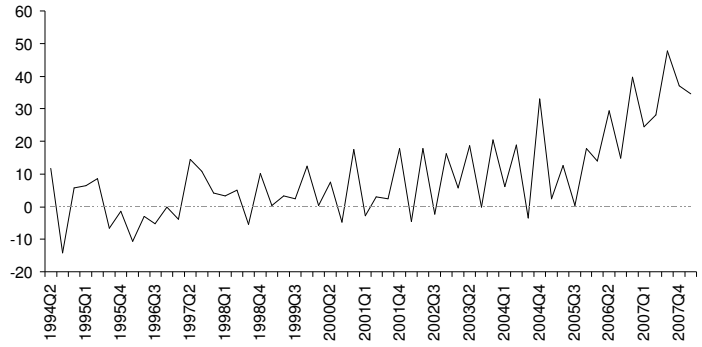
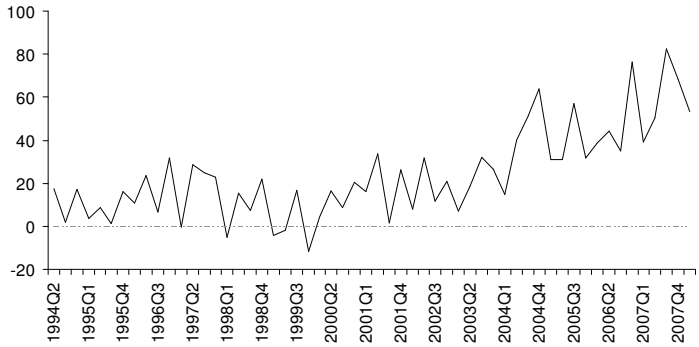


Figure 2. Capital Accounts (Real, in Millions of National Currency), 1994-2008.

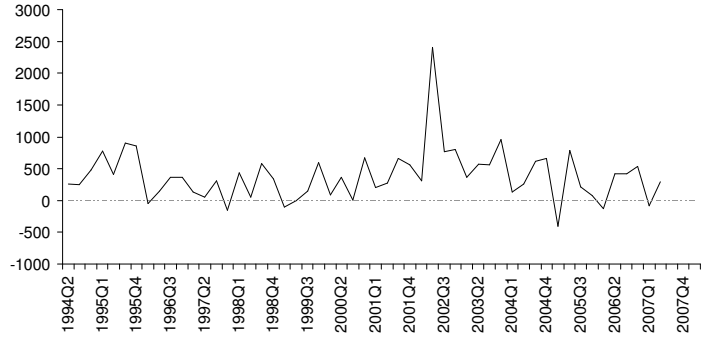
Bulgaria



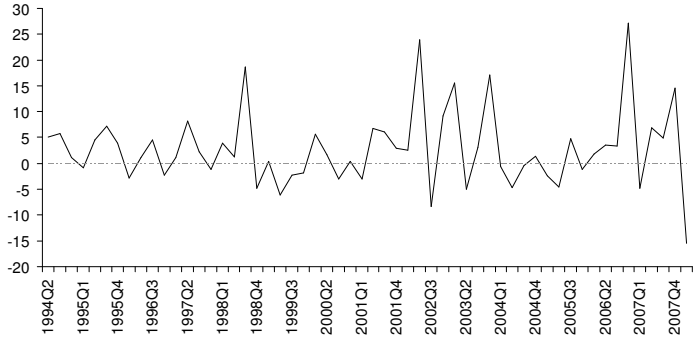
Romania



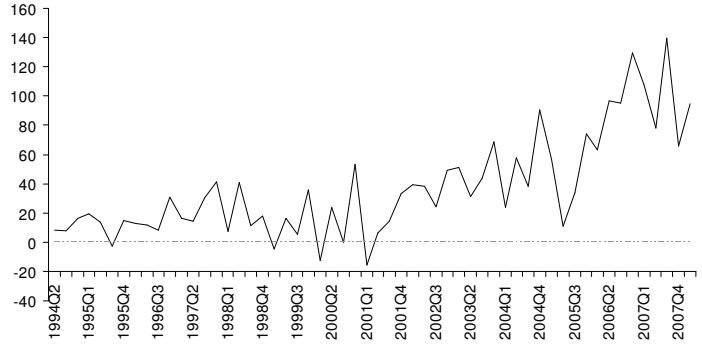
Czech Republic



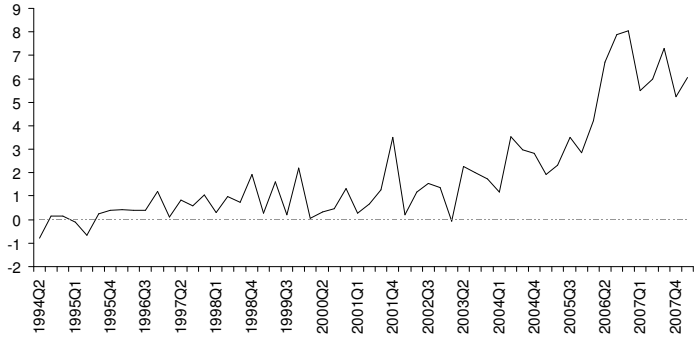
Lithuania



Estonia



Latvia



Calculated using data from the International Financial Statistics of the IMF.

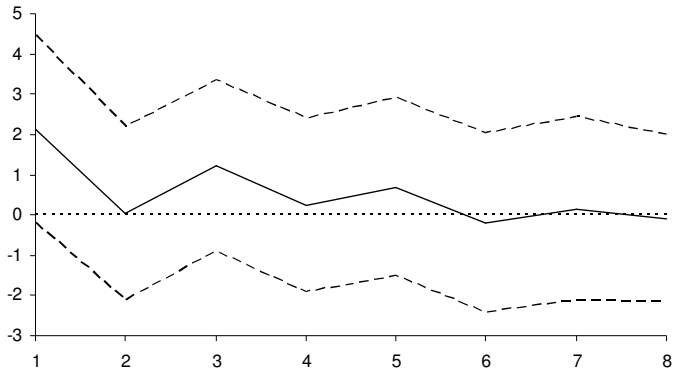
Table 1. ADF Stationarity Test Statistics.

		Levels		First Differences	
Country	**Variable**	**Order**	**Statistic**	**Order**	**Statistic**
Germany 1994Q1 to 2008Q1	r	3	-2.81	1	-3.10*
	Y	4	0.09	1	-3.86*
Bulgaria 1994Q3 to 2008Q1	KA	2	-0.27	1	-7.38*
	Y	0	7.83	1	-4.99*
	M	2	0.35	1	-7.13*
Romania 1997Q2 to 2007Q3	KA	1	-1.58	1	-8.76*
	Y	1	-0.05	2	-8.97*
	M	1	0.00	1	-7.47*
Czech Republic 1995Q1 to 2007Q2	KA	4	-2.26	1	-8.17*
	Y	2	-0.12	1	-7.12*
	M	3	0.72	1	-4.90*
Estonia 1994Q3 to 2008Q1	KA	4	-0.41	4	-3.67*
	Y	1	0.19	1	-4.75*
	M	1	-1.30	1	-3.74*
Latvia 1995Q1 to 2008Q1	KA	2	-0.70	1	-6.68*
	Y	2	0.98	1	-5.60*
	M	4	0.12	4	-3.00*
Lithuania 1994Q4 to 2008Q1	KA	4	-3.92*	1	-10.11*
	Y	1	-1.68	1	-28.08*
	M	3	-0.27	2	-4.45*

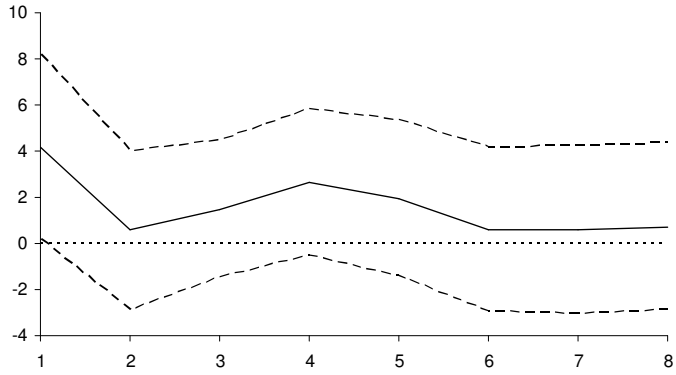
Order (lag length) chosen by the Akaike Information Criterion.
95% Critical Value: -2.90.
* = Significant at 95 percent.

Figure 3. Generalized Impulse Responses: Effects of 1 SD shock of Foreign Interest Rate on the Capital Account.

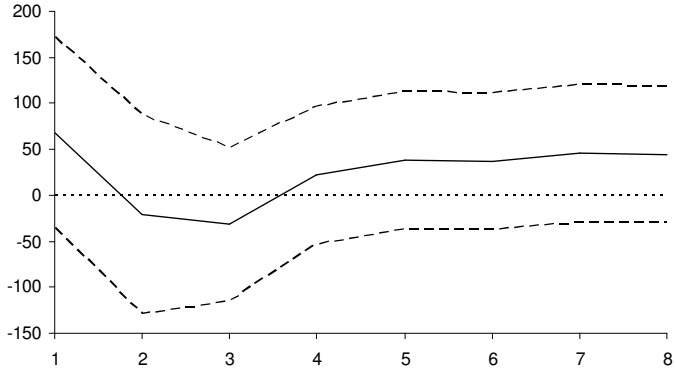
Bulgaria



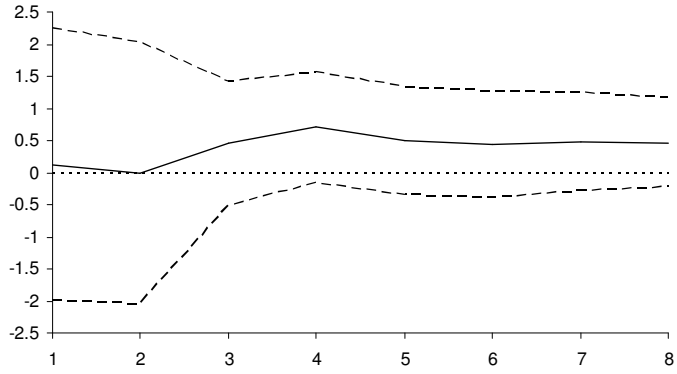
Romania



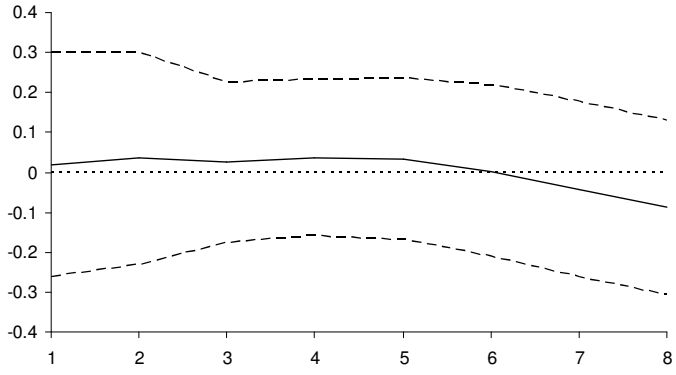
Czech Republic



Lithuania



Latvia



Estonia

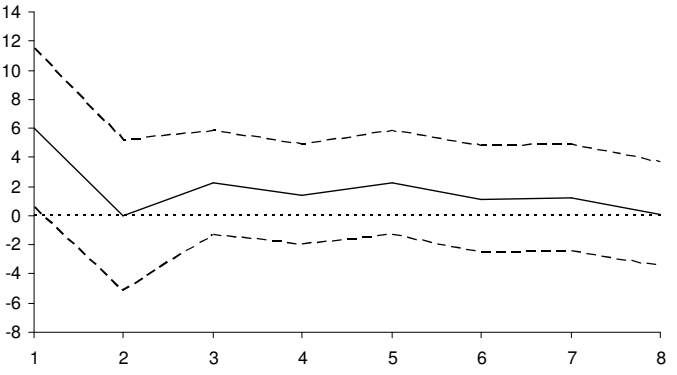
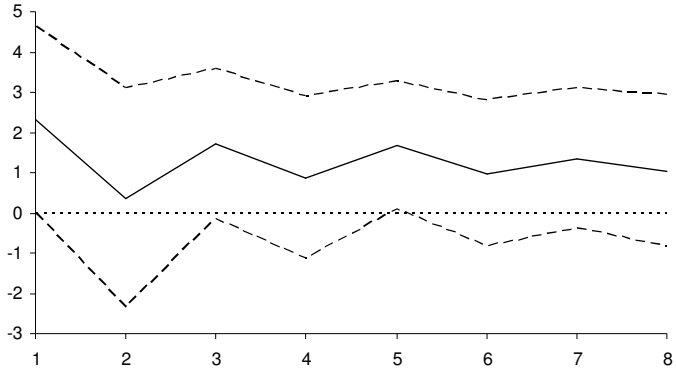
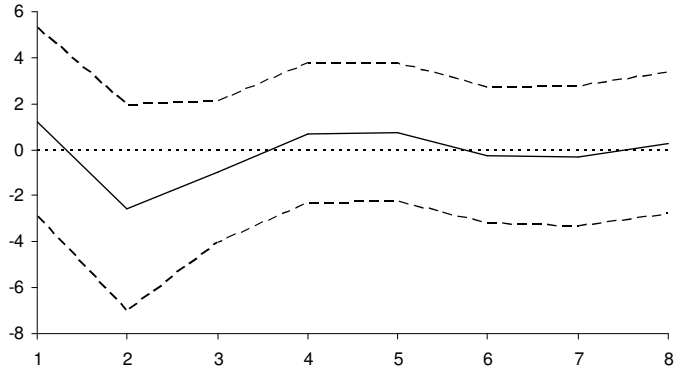


Figure 4. Generalized Impulse Responses: Effects of 1 SD shock of Foreign Income on the Capital Account.

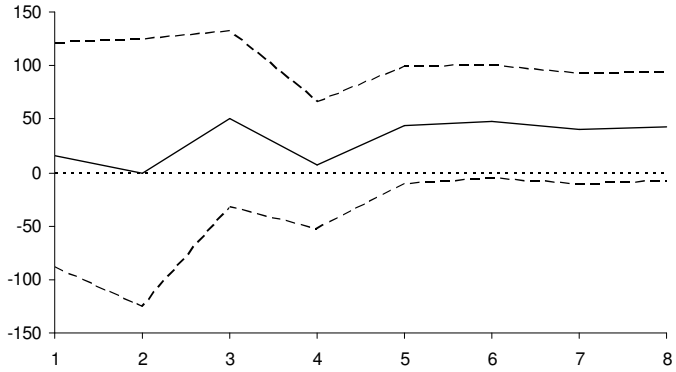
Bulgaria



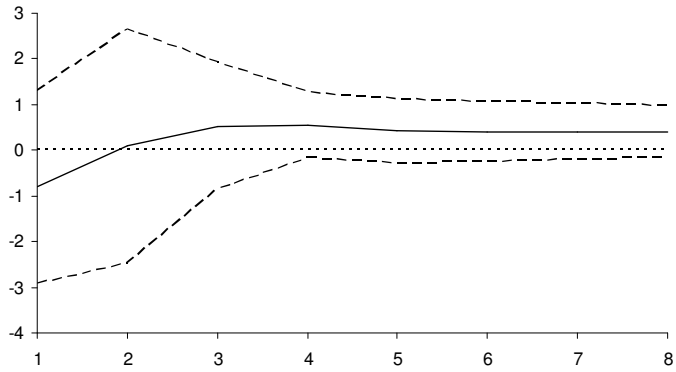
Romania



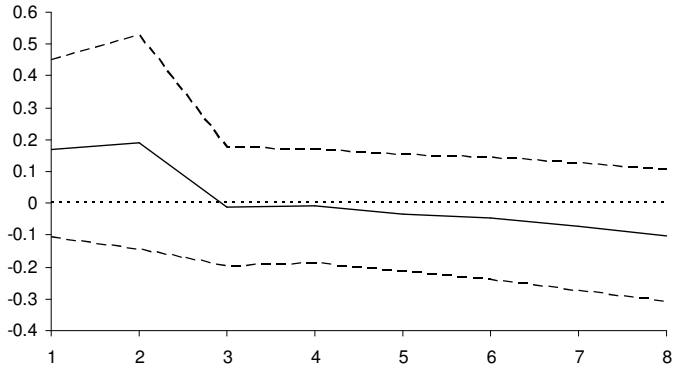
Czech Republic



Lithuania



Latvia



Estonia

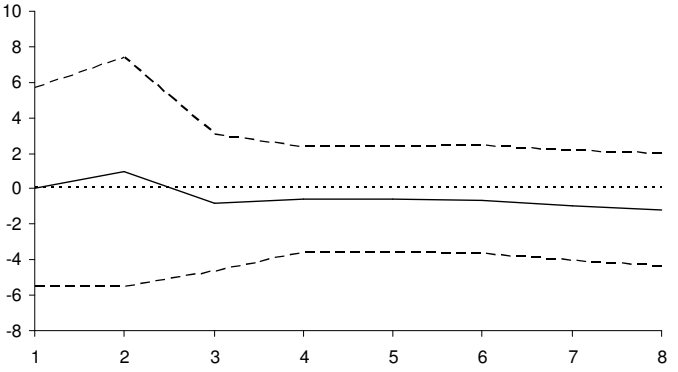
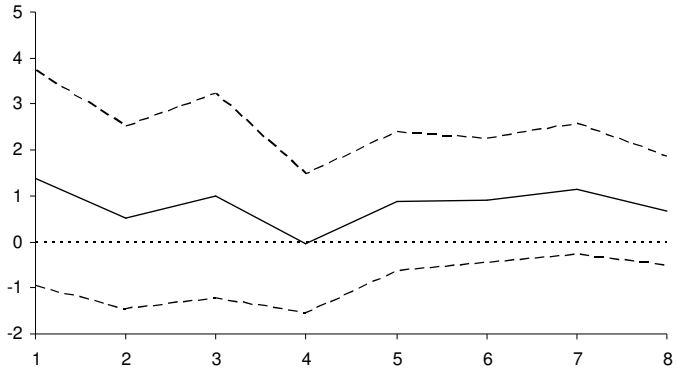
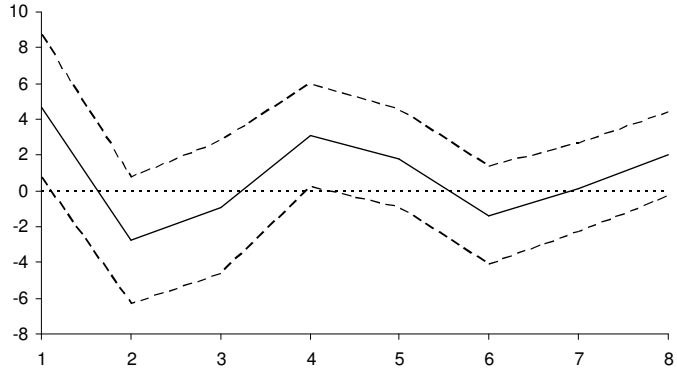


Figure 5. Generalized Impulse Responses: Effects of 1 SD shock of Home Income on the Capital Account.

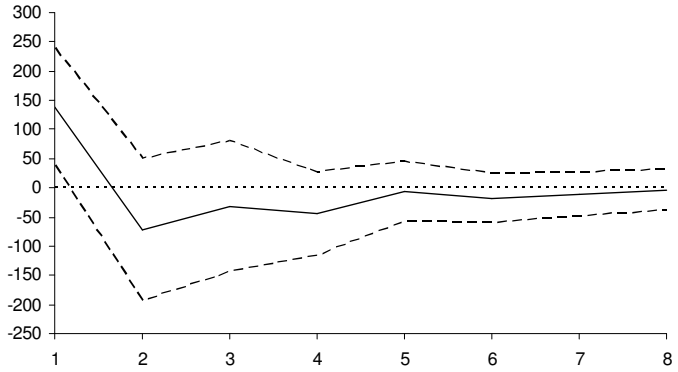
Bulgaria



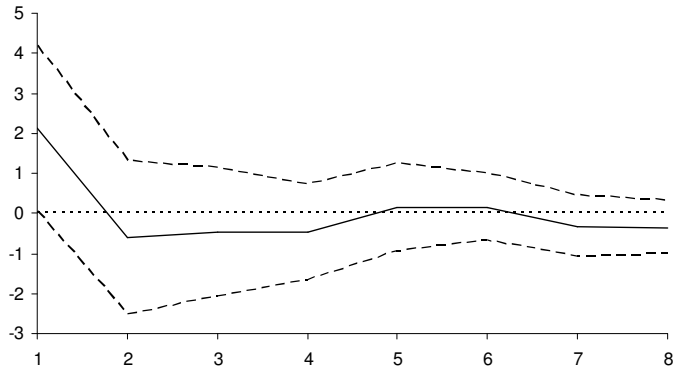
Romania



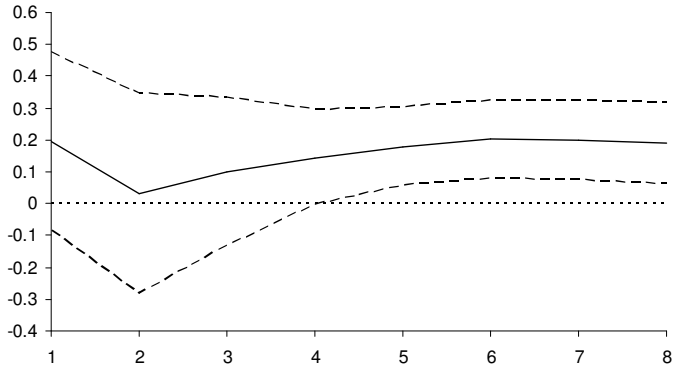
Czech Republic



Lithuania



Latvia



Estonia

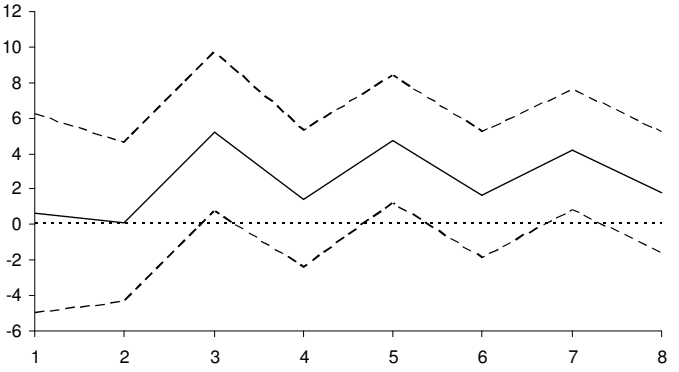


Table 2. Generalized Forecast Error Decompositions.

	Bulgaria						Romania					
Horizon	*KA*	*M*	Y^{Home}	r^{For}	Y^{For}	H/For	*KA*	*M*	Y^{Home}	r^{For}	Y^{For}	H/For
1	0.977	0.009	0.019	0.040	0.046	0.416	0.941	0.189	0.285	0.059	0.037	7.758
4	0.968	0.007	0.027	0.043	0.057	0.464	0.913	0.219	0.283	0.061	0.037	7.556
8	0.966	0.006	0.028	0.043	0.059	0.468	0.913	0.220	0.283	0.061	0.037	7.552

	Czech Republic						Lithuania					
	KA	*M*	Y^{Home}	r^{For}	Y^{For}	H/For	*KA*	*M*	Y^{Home}	r^{For}	Y^{For}	H/For
1	0.936	0.042	0.194	0.044	0.018	11.024	0.945	0.060	0.012	0.001	0.001	17.600
4	0.896	0.069	0.186	0.039	0.017	10.991	0.917	0.066	0.016	0.001	0.001	25.700
8	0.896	0.069	0.187	0.039	0.017	11.015	0.917	0.066	0.016	0.001	0.001	25.800

	Latvia						Estonia					
	KA	*M*	Y^{Home}	r^{For}	Y^{Home}	H/For	*KA*	Y^{Home}	*M*	r^{For}	Y^{For}	H/For
1	0.994	0.012	0.044	0.009	0.002	20.055	0.948	0.084	0.010	0.044	0.002	5.711
4	0.992	0.012	0.043	0.009	0.003	15.541	0.929	0.096	0.020	0.044	0.002	9.494
8	0.992	0.012	0.043	0.009	0.003	15.539	0.922	0.096	0.025	0.044	0.002	12.161

Table 3. ARDL Results: Cointegration Test Statistics.

	Bulgaria	**Romania**	**Czech Republic**	**Estonia**	**Latvia**	**Lithuania**
ARDL Order	(4,4,4,3,4)	(1,4,3,0,4)	(4,4,2,4,0)	(0,3,1,0,0)	(0,0,0,2,4)	(1,0,1,0,0)
F-Statistic	4.30**	10.19***	3.63*	10.60***	7.78***	15.78***

F-statistic "upper-bound" critical values (4 right-hand-side variables, with unrestricted intercept and no trend), are 5.12, 4.05, and 3.58 at 99, 95, and 90 percent, respectively. "Lower-bound" critical value (below which there is evidence of no cointegration) is 2.425 at 10 percent.
***,**,* = Significant at 99, 95, and 90 percent, respectively. ° = Not cointegrated.
The Bulgarian specification includes a dummy that equals 1 in 1997q1 to account for hyperinflation. Bulgarian and Romanian GDP is smoothed with the Hodrick-Prescott Filter (λ = 1600).