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A note on the current account sustainability of European transition economies

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Abstract

This paper analyses the sustainability of the current accounts of a group of Central and Eastern European countries. Given the link between national savings (public and private) and investment, current account may yield stabilities in the former fundamental macroeconomic variables. Hence, this analysis is of paramount importance given the 2008-2011 debt crises faced by many European economies, and the addition of new EU countries to the EMU. By means of unit root tests and fractional integration it shows that, in general, the ratio of current account to gross domestic product is a stationary and mean reverting process, although in some cases shocks tend to have long lasting effects, implying that there is no evidence of a potential debt default in this group of countries.

J.E.L. Classification: C32, E24
Key words: Unit roots, fractional integration, current account, EU.

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1. Introduction

The analysis of current account deficits and their sustainability has gathered momentum after the 2008-2010 economic crisis. Fears of countries defaulting on their external debt have increased during the last few years, after some European countries have shown high rates on both internal and external debt. According to a basic macroeconomic identity obtained from the aggregate demand function, it is known that net exports should equalise private saving net of investment and public saving. Hence, there is an important connection between external and internal debt.

In order to analyse the degree of current account deficit persistence or current account sustainability, the application of unit root and stationarity tests are a popular approach (Coakley et al., 1996, Milessi-Ferretti and Razon, 1996, and Taylor, 2002). If shocks have transitory effects, the current account needs to be a stationary process and the variable will be a mean reverting process. In this situation, according to Trehan and Walsh (1991) and Husted (1992), the country is solvent, which is a necessary condition for sustainability. Basically, if the current account balance is mean reverting and stationary, the variable will not grow forever after a shock.[1] However, if shocks have permanent effects, the variable is a unit root process, or may even be explosive, and will not revert to equilibrium after a shock. In this situation, deficits tend to increase in the long run, and the application of economic reforms will be necessary to avoid a situation of excessive debt accumulation. Also, these reforms may be necessary when the process is not stationary but mean reverting, in particular when the speed of mean reversion is slow. Such considerations are particularly important for European transition economies, in particular those Central and Eastern European Countries (CEECs) which are candidates to join the euro zone (see section 2 for more details).

[1] In a recent contribution, Bohn (2007) provides evidence about the fact that stationarity is not a necessary condition for the transversality condition, derived from the inter-temporal budget constraint, to hold. Still, the external deficit may satisfy the transversality condition for higher orders of integration than zero. Hence, stationarity of the current account balance over GDP can be seen as a strong form of sustainability.

There is a much smaller literature on the analysis of current account sustainability for transition than industrialised economies (Holmes, 2006). For CEE countries, Holmes (2004) finds evidence of current account sustainability for some, by means of applying (linear) unit root tests for panel data; in contrast to the general findings of studies looking at industrialised countries (Holmes, 2006, Stein, 2007, and Christopoulos and León-Ledesma, 2010, and Cunado, Gil-Alana and Pérez de Gracia, 2010).

In this paper, I follow the approach of Christopoulos and León-Ledesma (2010), applying nonlinear unit root tests to test for the current account sustainability (their application was to the US). I also apply a battery of panel unit root tests in order to gain power by taking into account cross-sectional information. Finally, in order to gain some flexibility when analysing the order of integration of variables (Gil-Alana and Robinson, 1997, amongst others), in this paper I apply the Robinson (1995) test for fractional integration.

The remainder of the paper is organised as follows. The second section discusses the issue opf current account sustainability for CEE countries. Section three explains the methods applied to analyse current account sustainability, with the third and fourth sections presenting the results and the concluding remarks.

2. Current account sustainability and central and eastern Europe

As pointed out by Roubini and Wachtel (1999), current account deficits are of particular importance for transition economies, given the general upward trend in the real value of their currencies. This may destabilise even more the current account, and it turns out to be of crucial importance for the new European Union (EU) economies from Central and Eastern Europe, which have recently joined the EU, the euro zone or are candidates to join the EU or the single European currency. With an appreciating real exchange rate and currency boards, like the ones maintained by most CEECs, and the willingness to control inflation, the problem becomes of paramount importance. The reason for analysing the current account sustainability is, then, twofold. First, the current account balance could be considered a proxy for the strength of the external position of the country, since it is a measure of the foreign resources that come into the country to finance insufficient national savings. Second, the degree of persistence of current account deficits provides us with insights into the willingness of countries to default. Temporary or transitory current account deficits may promote economic growth, as far as they are allocated in countries where capital is more productive. However, permanent deficits could be a sign of increasing interest repayments, which may impose restrictions on future generations, and/or, eventually, the impossibility of repaying the debt. In this situation, a short term solution is the application of a tight monetary policy in order to increase national interest rates to attract foreign capital. This, of course, will affect real exchange rates and the overall competitiveness of the country, reducing the current account. However, these measures increase the price of debt, which may make repayment even more difficult for the host country (see Christopoulos and León-Ledesma, 2010, amongst others). Also, this will increase the overall fiscal debt burden, increasing internal debt problems which many European countries are already facing. This situation will not be very promising especially for those EU countries which joined the Union without an *opt-out* clause, and will have to join the Economic and Monetary Union in the future. This implies satisfying the Maastricht criteria on public debt, interest rates exchange rates and inflation differentials with the best three EU inflation performers. In particular, the Maastricht Treaty establishes that the country should be in the Exchange Rate Mechanism II (ERM II) for two years, which means no possibility of devaluation whatsoever. If countries run large and permanent current account deficit, devaluation of the currency could be a feasible option to increase competitiveness. This downward pressure over the value of the country might provoke speculative attacks. To date, Estonia and Slovenia have become members of the EMU and have adopted the single currency as a unique legal currency. For these economies the possibility of devaluation is inexistent and hence the reduction of persistent current account deficits would have to rely on structural measures.

3. Econometric methods

The econometric approach is to apply a battery of unit root tests for panel data, individual series and fractional integration, in order to analyse the long run behaviour of current account ratio to GDP for a pool of CEE countries.

First, a group of panel unit root tests are applied. These tests take into account cross-sectional information, although is not possible to distinguish which series are I(0) when the null is rejected. Thus, I apply the Levin, Lin and Chu (2002) (LLC), Im, Pesaran and Shin (2003) (IPS), Maddala and Wu (1999) and Choi (2001) (MWC) tests. The first test imposes a common unit root under the null hypothesis, against the alternative of stationarity of all individuals, whereas the latter allow for individual stationarity under the alternative hypothesis. This supposes a less restrictive framework as, in the former case, the assumption of a common unit root under the null, or general stationarity under the alternative, may be too strong. In addition, IPS base their test on the assumption of different autoregressive parameters, for each individual.

An alternative approach is taken by MWC, who combine the different p-values of the individual auxiliary regressions, either for the ADF and Phillips-Perron tests, to obtain the following Fisher (1932)-type test,

$$-2\sum_{i=1}^{N}\ln p_i \rightarrow \chi^2_{2N} \tag{1}$$

where p_i is the asymptotic p-value of a unit root test for individual i. Additionally, Choi (2001) proposes the following test, based on the combination of individual p-values:

$$Z = \frac{1}{\sqrt{N}}\sum_{i=1}^{N}\Phi^{-1}(p_i) \rightarrow N(0,1) \tag{2}$$

where Φ is the standard normal cumulative distribution function.

Finally, it is also possible to apply the Kwiatkowski et al. (1992) (KPSS) test in a panel framework. Thus, Hadri's (2000) test is a panel version of the stationarity test KPSS. Therefore, for the Hadri (2000) test, the null hypothesis is stationarity of all the individuals (countries in this case) of the panel.

In order to analyse the order of integration of the ratio of current account to gross domestic product (GDP) for the individual countries, I also consider two groups of unit root tests: Ng and Perron (2001), which are based on linear models, and Kapetanios, Shin and Snell (2003) (KSS) and Sollis (2009), which are nonlinear. We use linear unit root tests as a starting point and benchmark for the subsequent analysis. However, economics, which is mainly driven by human decisions, is not always as a place for simplistic assumptions as constant parameters. In this paper I also take into consideration the possibility of change parameters. Unlike models with structural breaks, which normally depend on some historical incident which changes permanently the mean or the slope of the relations, in this paper it is incorporated the possibility of changing autoregressive parameters, depending upon the size of shocks. In general, we can believe that small shocks, which may only have mild effects on a given economic variable, might not trigger any alarm, and the responsible national authorities may decide not to act to correct for any deviations. Nevertheless, when shocks are significant in nature and they may have an important effect of the target variable, the responsible authority may put in place a series of mechanisms and policy aiming at cancelling out the effects of the shocks. In this situation, we may observe that the further the variable deviates from the equilibrium value, the faster will be the reversion towards it. This relaxation of the constancy of parameters implies that the autoregressive parameter in auxiliary regressions for unit root tests should depend on the values of the so-called transition variable, which in general is a lag of the variable of interest. As aforementioned, we should not confuse this type of state-dependent model, with models including structural breaks, that although they are a type of nonlinear models, the nonlinearity in the later is related to the deterministic component, and not to the speed of adjustment towards equilibrium. Neglecting this sources of parameter inconstancy when testing for unit roots has been reported to affect the power of the tests (see KSS amongst many others). If the underlying data generation is nonlinear, liner unit root tests may confuse a stationary process with unit root, when the nonlinearity is not accounted for. In the case of this paper, let us suppose an inner regime and an outer regime, where the ratio of current account to GDP may behave in a different manner.

Ng and Perron propose upgraded versions of previously existing linear unit root tests, in order to improve their performance. In order to do this, the authors combine a Modified Information Criterion for the lag length and a Generalised Least Squares method for detrending the data. In particular, they propose the following tests; MZa and MZt that are the modified versions of Phillips' (1987) and Phillips and Perron's (1988) Za and Zt tests; the MSB that is related to Bhargava's (1986) R1 test; and, finally, the MPT test that is a modified version of Elliot, Rothenberg and Stock's (1996) Point Optimal Test.

Within the nonlinear paradigm which as aforementioned may affect the veracity of the results and policy implications, in this paper I also apply the KSS test. Kapetatios et al. (2003) develop a test which has under the null a unit root process, but unlike the linear unit root tests, takes into consideration the possibility of a globally stationary exponential smooth transition autoregressive (ESTAR) process under the alternative hypothesis. This makes it possible to characterise the target variable as a two regime process, for which the change in regimes is smooth rather than sudden[2]. Therefore, the variable may behave as a stationary process in the outer regime, but as a unit root in the inner regime. The unit root hypothesis can be tested against the alternative of a globally stationary ESTAR process using the following auxiliary regression:

[2] Note that this type of smooth transition models nests other type of threshold autoregressive models.

$$y_t \;=\; \varphi y_{t-1} \;+\; \phi y_{t-1}\, F(\theta; y_{t-1}) \;\; + \;\; \varepsilon_t\,, \qquad (3)$$

where ε_t is $iid(0,\sigma^2)$ and $F(\theta; y_{t-1})$ is the transition function, whose transition function is one lag of the dependent variable. F is assumed to be exponential (ESTAR):

$$F(\theta; y_{t-1}) \;=\; 1 \;-\; exp\{-\theta\, y_{t-1}^2\}, \qquad (4)$$

with $\theta > 0$. Hence, F is bounded between zero and one. For large absolute values of the transition variable, F approaches unity, whereas small absolute values will make the transition to collapse to zero. Hence, for this particular type of transition function, the autoregressive parameter depends on the absolute size of the shock. Combining equations (3) and (4) and taking first differences on the left hand side we obtain,

$$\Delta y_t \;=\; \alpha\, y_{t-1} \;+\; \gamma\, y_{t-1}(1 - exp\{-\theta\, y_{t-1}^2\}) \;+\; \varepsilon_t, \qquad (5)$$

KSS impose the condition that the variable is a unit root process in the central regime, so that $\alpha = 0$, although the process is globally stationary. The null hypothesis $H_0 : \theta = 0$ that the process is a unit root in the outer regime is then tested against the alternative $H_1 : \theta > 0$ of stationarity. However, this test cannot be performed directly over θ, given it is not possible to identify this parameter under the null hypothesis of random walk. By means of a first order Taylor expansion of (5), KSS propose the form:

$$\Delta y_t = \beta y_{t-1}^3 + error \qquad (6)$$

Testing $H_0 : \beta = 0$ against $H_1 : \beta < 0$ is equivalent to testing for unit roots in the outer regime in equation (3). Equation (6) may incorporate lags of Δy_t. KSS consider three possibilities regarding the deterministic components in their test: applying the test to the raw data, to the demeaned data and to the demeaned and detrended data. Since we are analysing the ratio of current account to GDP against convergence to an equilibrium value, the KSS test is applied to the demeaned data.

The nonlinear function used by KSS in order to take into account nonlinearities, assumes that shocks have symmetric effects upon the variable, i.e. the sign of the shocks does not matter, only the size. However, for many economic variables this assumption may be too simplistic. The speed of mean reversion may actually depend not only on the absolute deviation from the equilibrium, but also upon the sign of the shock. It makes common sense to think that a negative shock on the current account balance may be more difficult to tackle than a positive shock. Hence, Sollis (2009) proposes a similar test to KSS, in the sense that both assume that the speed of mean reversion depends on deviations from equilibrium. However, Sollis (2009) distinguishes asymmetric or symmetric effects under the alternative hypothesis. This asymmetric ESTAR model (AESTAR) is defined as:

$$\Delta y_t = G_t(\gamma_1, y_{t-1})\{S_t(\gamma_2, y_{t-1})\rho_1 + (1 - S_t(\gamma_2, y_{t-1}))\rho_2\}y_{t-1} + \varepsilon_t \tag{8}$$

where $G_t(\gamma_1, y_{t-1}) = 1 - \exp(-\gamma_1(y_{t-1}^2))$, with $\gamma_1 \geq 0$, and $S_t(\gamma_2, y_{t-1}) = \{1 + \exp(-\gamma_2 y_{t-1})\}^{-1}$, with $\gamma_2 \geq 0$. Again, equation (8) may incorporate lags of the dependent variable to control for autocorrelation.

Hence, the null hypothesis of unit root can be specified as $H_0: \gamma_1 = 0$. However, under the null hypothesis, γ_2, ρ_1 and ρ_2 cannot be identified. In order to get around this problem Sollis (2009), by means of Taylor approximations, proposes to test for unit roots in this nonlinear framework using the following auxiliary equation,

$$\Delta y_t = \beta_1 y_{t-1}^3 + \beta_2 y_{t-1}^4 + error \quad (9)$$

Thus, testing for unit roots in model (9) implies testing $H_0 : \beta_1 = \beta_2 = 0$ by means of F-type-test, whose critical values are proposed by Sollis (2009, p. 121), since standard F distribution is not valid for unknown order of integration of the residuals in (9). If the null hypothesis is rejected, the possibility of symmetric vs. asymmetric shocks may be of relevance. Thus, this latter hypothesis can be tested by means of standard hypotheses testing, since the null of symmetry would imply that β_2 is not statistically significant. In this case (9) collapses to (7).

In order to take into account the possibility of a slow speed of mean reversion towards equilibrium, situation which may bias the previously mentioned unit root test, I also test for the possibility of fractional order of integrations. The aforementioned unit root tests only consider integer numbers for the order of integration, say *d*, which may be too restrictive, in particular when the variable need long period of time to revert to its mean. Following the contributions in the field of spectral analysis, long memory and fractional integration, I also apply the tests of Robinson (1995), which take into account the possibility of values of d in the interval (0, 1) or even above 1. Autoregressive, fractionally integrated, moving average *ARFIMA(p, d, q)* of the form:

$$\Phi_p(L)(1-L)^d x_t = \Theta_q(L)\varepsilon_t, \quad t = 1,...T, \quad (10)$$

where $\Phi_p(L)$ and $\Theta_q(L)$ are polynomials of orders *p* and *q* respectively, with all zeros of $\Phi_p(L)$ outside the unit circle, and all zeros of $\Theta_q(L)$ outside or on the unit circle, and ε_t a white noise process (Granger and Joyeux, 1980; Granger, 1980, 1981; Hosking, 1981). The closer is the parameter *d* to 1, the more persistent is the process, and the effect of shocks on the variable will last longer. If $d \in (0, 0.5)$ the series is covariance stationary and mean reverting. However, if $d \in [0.5,$

1) the series is no longer stationary, but still mean reverting. The case when $d \geq 1$ implies that the series is non-stationary and non-mean reverting.

Robinson (1995) proposes a multivariate semiparametric approach in order then to estimate the differencing parameter d in equation (10). This test may be applied to individual series or to a pool of variables; allowing in the latter, intercept and slope to be different for each individual of the pool.

4. Empirical evidence

The variable of interest for the current analysis is the ratio of current account to GDP. The data for this empirical analysis have been obtained from *Eurostat*. Quarterly data have been used, from 1999:Q1 to 2011:Q3. The data have been seasonally adjusted using the X-12 filter. Figure 1 displays the ratios for the target countries. It appears that the deficits have been quite close to zero for most of the sample for countries like Bulgaria, Lithuania, Slovakia and Slovenia; however, this changed at the end of 2006 with the beginning of the global economic crisis. Figure 1 also shows that the deficits have improved at the end of the sample. As pointed out by Aristovnik (2006), the current account deficits for most of these countries are a result of long term growth, structural, external and domestic policy factors. In particular, the growth in trade deficits of merchandise products, slowdown in services trade, profit repatriation, and appreciation of the exchange rate.

The results from the panel unit root tests are reported in Table 1. The results are a bit mixed. Whereas with the Levin, Lin and Chu, Im, Pesaran and Shin and both version of the ADF test, the null of a common unit root cannot be rejected, the Phillips-Perron and Hadri tests, point to the existence of stationarity in the data.

Hence, in order to distinguish which countries' ratios are stationary, I report in Table 2 the Ng-Perron, KSS and Sollis (2009) unit root tests results. These do not seem very promising. The null of unit root can only be rejected at the 5% significance level for the Czech Republic, Estonia and Lithuania. Some evidence of rejection of the null is found in the case of Latvia with the Ng and Perron tests, at the 10%. Additionally, I have performed the test to distinguish between ESTAR or AESTAR for the cases of the Czech Republic and Lithuania, finding that the null of asymmetric effects is rejected.

As mentioned, unit root tests may not be able to distinguish between unit root processes and fractional integrated processes. Thus, in Table 3, I display the Robinson (1995) pooled test, for fractional integration. This test is based on $(1-L)^d x_t = \varepsilon_t, \quad t = 1,...T$, without taking into consideration any AR or MA structure. Interestingly, the null hypothesis that *d=0,* cannot be rejected in any case at conventional significance levels, and the estimated *d* are below 1. Therefore, the ratio of current account to GDP turns out to be a mean reverting process. This means that after a shock, the ratio tends to correct the effect of the shock and returns to the long run equilibrium. From Table 3, we can point to the fact that the speed of mean reversion is different for the different countries, given that the estimated *d* differs from country to country. However, in order to take into account the possibility of a more general *ARFIMA (p,d,q)* model, like the one in equation (10), I estimate ARFIMA models for the target countries. This has been done using Fox and Taqqu (1986) approach. The results are presented in Table 4. For all countries, an *ARFIMA (4,d,0)* seems to be the most appropriate model, except for Poland, where the selected model is an *ARFIMA (1,d,0)*. The selection of the model has been made according to the Akaike Information Criterion. Again the results point to different degrees of persistence, and in most cases the variables seem to be mean reverting, except in the cases of Romania and Hungary. This is corroborated by the impulse-response functions, obtained by means of Gourieroux and Monfort's (1997, p. 438) theorem, which are displayed in Figure 2. We can say that in general the variables show high degree of persistence after a shock in most cases. We can distinguish different cases. First, Slovakia and Slovenia seem to be the countries which tend to suffer less after a shock, since the immediate effects are not very big, and the effects of the shock tend to vanish relatively fast. Bulgaria, Estonia and Latvia, seem to suffer a huge impact immediately after the initial shock, and although the speed of mean reversion seems to be quite fast, it takes a significant number of periods for the effects to disappear. The Czech Republic, Poland and Lithuania, only seem to suffer mild effects immediately after a shock, although the speed of mean reversion tends to be slow. Finally, Hungary and Romania do not seem to present mean reversion at all.

Interestingly, Slovakia and Slovenia are the countries who joined the eurozone first from these countries, namely in 2009 and 2007. Looking at the evolution of their current accounts as percentage of their GDP, in Figure 1, the results are not surprising since they are the countries with the most equilibrated current account of the area, probably linked to their examination for euro membership.

Some of the target countries have been in the Exchange Rate Mechanism II since in order to fulfill one of the Maastricht criteria. Given that eurozone's countries are their main trade partners, joining the single currency and losing the possibility of devaluations or revaluations will not help to correct current account deficits. This implies, therefore, that additional and, probably, more demanding policy decisions will need to be taken to reduce future current account deficits. And this problem is particularly important for those countries which tend to suffer more the effects of shocks on their current accounts.

In general it is found that, although the degree of persistence varies from country to country, there is no statistical evidence indicating a potential problem of current account sustainability in this group of CEE countries, with the exception of Hungary and Romania. This result contrast with previous studies on industrialised economies (Cunado et al., 2010, for instance) and complements those of Holmes (2004). The macroeconomic adjustments performed during the last decade by this group of countries, from communism to market economies in order to prepare for EU membership, have helped to control external debt.

5. Conclusions

This paper has provided evidence on the degree of sustainability of current account deficits for a pool of CEE economies. This has been achieved by testing for the order of integration of the ratio of current account to GDP, using a battery of unit root and fractional integration tests. Although the results of the unit root tests point to the fact that shocks seem to have permanent effects in the majority of the target countries, the fractional integration analysis provides more promising results, given that the variable appears to be stationary and mean reverting, in most cases. This result has important implications for policy modelling and for the future of an extended eurozone, as shocks tend to die out in the long run, in these countries.

References

Aristovnik, A. (2006): "Current account deficit sustainability in selected transition economies", *Zb. Rad. Ekon. Fak. Rij.,* vol. 24, pp. 81-102.

Bhargava, A. (1986): "On the theory of testing for unit roots in observed time series", *Review of Economics Studies*, vol. 53, pp. 369-384.

Bohn, H. (2007): "Are stationarity and cointegration restrictions really necessary for the intertemporal budget constraint?", *Journal of Monetary Economics,* vol. 54, pp. 1837-1847.

Christopoulos, D. and M. A. León-Ledesma (2010): "Current account sustainability in the US: What did we really know about it?", *Journal of International Money and Finance,* vol. 29, pp. 442-459.

Choi, I. (2001): "Unit root tests for panel data", *Journal of International Money and Finance*, vol. 20, pp. 249-272.

Coakley, J. F., F. Kulasi and R. Smith (1996): "Current account solvency and the Feldstein-Horioka puzzle", *Economic Journal,* vol. 106, pp. 620-627.

Cunado, J., L. A. Gil-Alana and F. Pérez de Gracia (2010): "European current account sustainabilty: New evidence based on unit roots and fractional integration", *Eastern Economic Journal,* vol. 36, pp. 177-187.

Elliot, G., T. J. Rothenberg and J. H. Stock (1996): "Efficient tests for an autoregressive unit root", *Econometrica*, vol. 64, pp. 813-836.

Fox, R. and M. S. Taqqu (1986) "Large-Sample Properties of Parameter Estimates from Strongly Dependent Stationary Gaussian Time Series" *The Annals of Statistics*, vol. 14, pp. 517-532.

Fisher, R. A. (1932). *Statistical Methods for Research Workers, 4th Edition*, Edinburgh: Oliver & Boyd.

Gil-Alana, L. A. and P. Robinson (1997): "Testing of unit root and other nonstationary hypotheses in macroeconomic time series", *Journal of Econometrics,* vol. 80, pp. 241-268.

Gourieroux, C. and A. Monfort (1997): *Time series and dynamic models*, Cambridge, Cambridge University Press.

Granger, C. W. J. (1980): "Long memory relationships and the aggregation of dynamic models", *Journal of Econometrics,* vol. 14, pp. 227-238.

Granger, C. W. J. (1981): "Some properties of time series data and their use in econometric model specification", *Journal of Econometrics,* vol. 16, pp. 121-130.

Granger, C. W. J. and R. Joyeux (1980): "An introduction to long memory time series and fractional differencing", *Journal of Time Series Analysis,* vol. 1, pp. 15-29.

Holmes, M. J. (2004): “Current account deficits in the transition economies”, *Prague Economic Papers,* vol. 4, pp. 347-358.

Holmes, M. J. (2006): “Do Latin American countries have an incentive to default on their external debts? A perspective based on long-run current account behaviour”, *Emerging Markets Finance and Trade,* vol. 42, pp. 33-49.

Hosking, J. R. M. (1981): “Modelling persistence in hydrological time series using fractional differencing”, *Water Resources Research,* vol. 20, pp. 1898-1908.

Hadri, K. (2000): “Testing for Stationarity in Heterogeneous Panel Data,” *Econometric Journal*, vol. 3, pp. 148–161.

Husted, S. (1992): “The emerging US current account deficit in the 1980s: A cointegration analysis”, *Review of Economics and Statistics,* vol. 74, pp. 159-166.

Im, K. S., M. H. Pesaran, and Y. Shin (2003): "Testing for unit roots in heterogeneous panels," *Journal of Econometrics*, vol. 115, pp. 53-74.

Kapetanios, G., Y. Shin and A. Snell (2003): “Testing for a unit root in the nonlinear STAR framework”, *Journal of Econometrics*, vol. 112, pp. 359-379.

Kwiatkowski, D., P. C. B. Phillips, P. Schmidt and Y. Shin (1992). “Testing the Null Hypothesis of Stationary against the Alternative of a Unit Root,” *Journal of Econometrics*, vol. 54, pp. 159-178.

Levin, A., C. F. Lin, and C. Chu (2002): "Unit root tests in panel data: asymptotic and finite-sample properties," *Journal of Econometrics*, vol. 108, pp. 1-24.

Maddala, G. S. and S. Wu (1999): "A comparative study of unit root tests with panel data and a new simple test," *Oxford Bulletin of Economics and Statistics*, vol. 61, pp. 631-52.

Ng, S. and P. Perron (2001): “Lag selection and the construction of unit root tests with good size and power”, *Econometrica*, vol. 69, pp. 1519-1554.

Phillips, P. C. B. (1987): "Time series regression with a unit root", *Econometrica*, vol. 55, pp. 311-340.

Phillips, P. C. B. and P. Perron (1988): "Testing for a unit root in time series regression", *Biometrica*, vol. 75, pp. 335-346.

Robinson, P.M. (1995): “Log-Periodogram Regression of Time Series with Long Range Dependence”, *Annals of Statistics,* vol. 23, pp. 1048-1072.

Roubini, N. and P. Wachtel (1999): “Current-Account Sustainability in Transition Economies” in *Balance of Payments, Exchange Rates, and Competitiveness in Transition Economies*, Kluwer Academic Publishers, pp. 19-93.

Sollis, R. (2009): "A simple unit root test against asymmetric STAR nonlinearity with an application to real exchange rate in Nordic countries", *Economic Modelling,* vol. 26, pp. 118-125.

Stein, J. L. (2007): "United States current account deficits: A stochastic optimal control analysis", *Journal of Banking and Finance,* vol. 31, pp. 1321-1350.

Taylor, A. M. (2002): "A century of current account dynamics", *Journal of International Money and Finance,* vol. 21, pp. 725-748.

Trehan, B. and C. Walsh (1991): "Testing intertemporal budget constraints: theory and applications to US federal budget deficits and current account deficits*", Journal of Money, Credit and Banking*, vol. 26, pp. 206-223.

Table 1: Panel tests for the order of integration

Test	P-values
Levin, Lin and Chu	0.9758
Im, Pesaran and Shin	0.7093
ADF-Fisher	0.6651
ADF-Choi	0.7613
PP-Fisher	0.0003
PP-Choi	0.0011
Hadri	0.0778

Table 2: Ng-Perron, KSS and Sollis (2009) unit root test results

	MZa	**MZt**	**MSB**	**MPT**	**KSS**	**Sollis**
Bulgaria	-2.033	-0.950	0.467	11.466	-0.995	0.529
Czech Rep.	-10.066**	-2.241**	0.222**	2.442**	-3.614**	7.088**(S)
Estonia	-8.453**	-1.931**	0.228**	3.363*	-0.828	0.783
Hungary	-2.369	-0.762	0.321	8.566	-0.345	2.709
Latvia	-6.270*	-1.737*	0.277	4.016*	-1.286	0.810
Lithuania	-5.725	-1.499	0.261	4.832	-3.326**	5.814**(S)
Poland	-2.518	-1.082	0.429	9.528	-1.709	3.304
Romania	-5.301	-1.617	0.305	4.651	-1.459	2.968
Slovakia	-0.335	-0.158	0.472	16.763	-0.375	1.694
Slovenia	-4.521	-1.485	0.328	5.453	-0.568	0.526

Note: The order of lag to compute the tests has been chosen using the modified AIC (MAIC) suggested by Ng and Perron (2001). The Ng-Perron tests include an intercept, whereas the KSS test has been applied to the de-meaned data. The symbols * and ** mean rejection of the null hypothesis at the 10% and 5% significance levels respectively. (S) stands for symmetric adjustment. The critical values for the Ng-Perron tests and F-test have been taken from Ng and Perron (2001) and Sollis (2009) respectively, whereas those for the KSS have been obtained by Monte Carlo simulations with 50,000 replications.

Critical Values

	MZa	**MZt**	**MSB**	**MPT**	**KSS**	**Sollis**
5%	-8.100	-1.980	0.233	3.170	-2.886	4.886
10%	-5.700	-1.620	0.275	4.450	-2.603	4.009

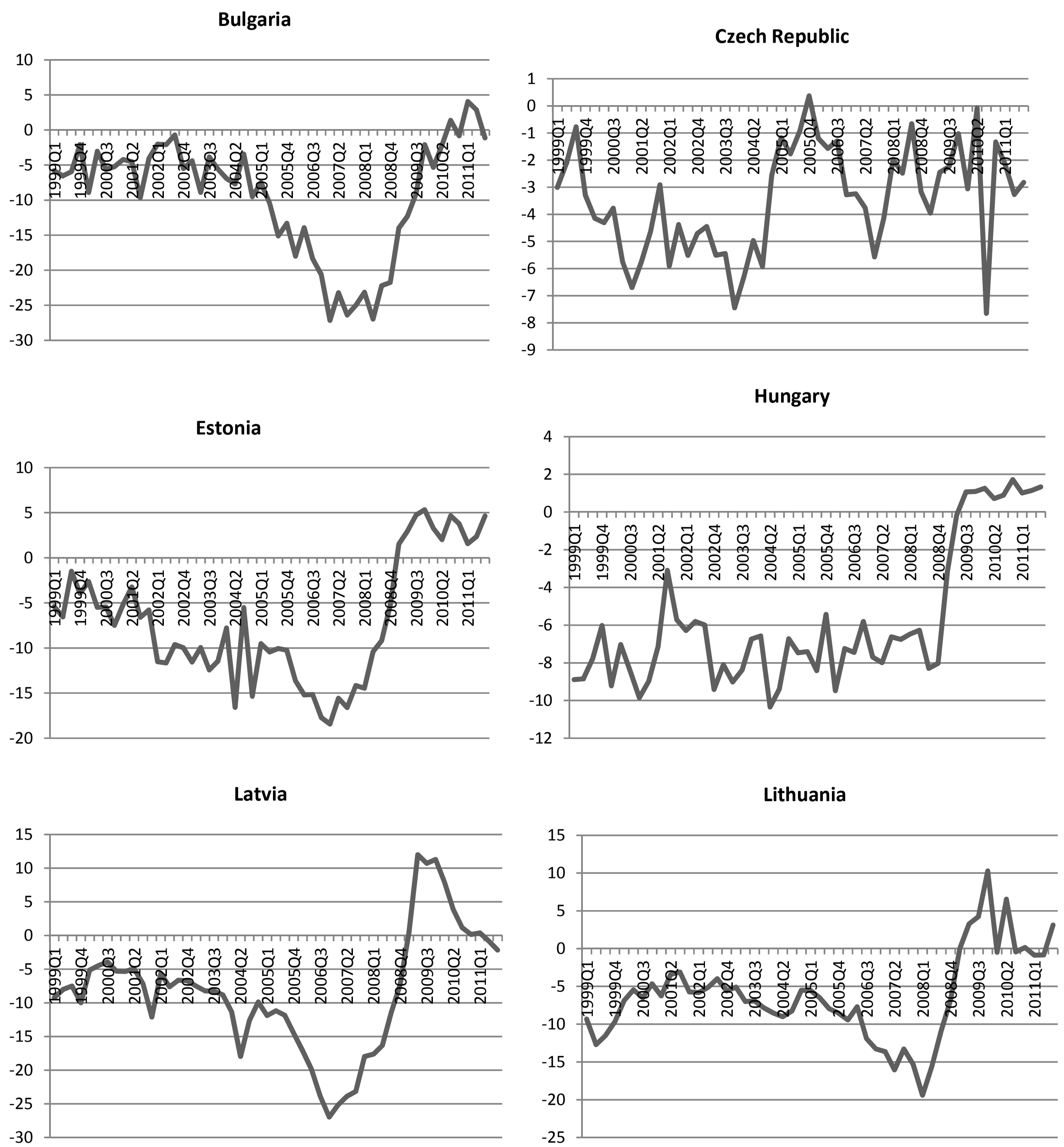
Table 3: Robinson's (1995) test. Pooled estimation

Country	Est. *d*	Std. Error	t-statistic	p-value
Bulgaria	0.570	0.128	4.446	0.000
Czech Rep.	0.317	0.128	2.472	0.018
Estonia	0.477	0.128	3.716	0.001
Hungary	0.644	0.128	5.017	0.000
Latvia	0.889	0.128	6.928	0.000
Lithuania	0.625	0.128	4.871	0.000
Poland	0.725	0.128	5.650	0.000
Romania	0.671	0.128	5.227	0.000
Slovakia	0.289	0.128	2.254	0.030
Slovenia	0.437	0.128	3.409	0.002

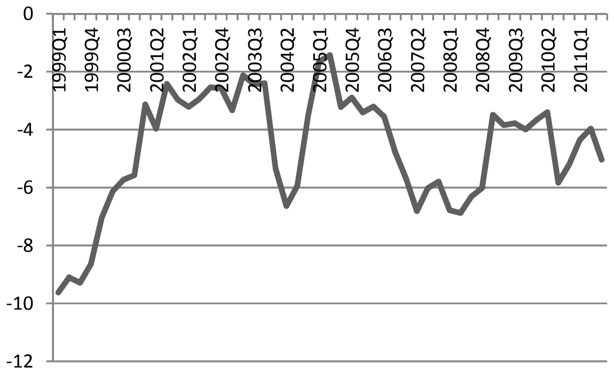
Table 4: ARFIMA estimation

Country	AR(1)	AR(2)	AR(3)	AR(4)	Estimated *d*
Bulgaria	-0.018	0.442	0.269	0.012	0.658
Czech Rep.	-0.285	0.071	0.134	0.104	0.742
Estonia	0.067	0.565	0.215	-0.105	0.493
Hungary	-0.108	-0.091	-0.118	0.167	0.981
Latvia	0.553	0.131	0.197	-0.253	0.606
Lithuania	0.115	0.425	0.008	-0.237	0.720
Poland	0.256	-	-	-	0.707
Romania	-0.212	-0.044	0.019	-0.267	1.140
Slovakia	-0.298	-0.185	-0.003	-0.192	0.850
Slovenia	0.267	0.049	0.372	-0.115	0.302

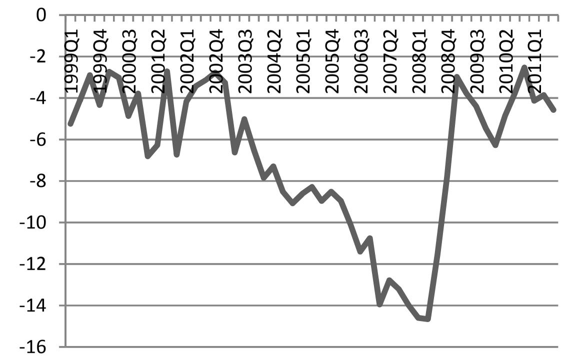
Figure 1: Current account ratio to GDP



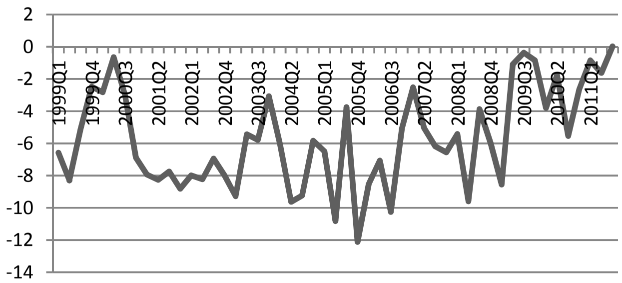
Poland



Romania



Slovakia



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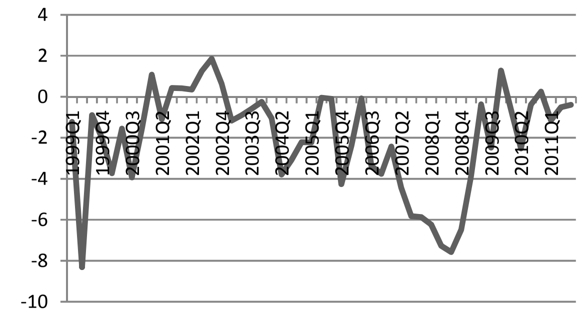

Figure 2: Impulse-response functions