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Current Account Sustainability: A Non-Linear Comparative Empirical Overview

Summary: This study aims to examine the sustainability of current account deficits for Hungary, Poland, Czech Republic and Turkey over the period 1998Q1:2014Q2, with a special attention to the Turkish case, by applying the theoretical model of Steven Husted (1992). The main motive for the choice of time span is that the period comprises the outcomes of two important crises Turkish economy experienced in 2001 and 2008. The empirical testing procedure of the sustainability is twofold so as to be linear and non-linear. Both linear and non-linear test results provide evidence that the current account deficit is unsustainable for Turkey, Poland and Czech Republic. On the other hand, linear and non-linear test results lead to a conflicting evidence for Hungary. We conclude that there is a need to reduce the current account deficit for the countries examined. Otherwise, a sharp adjustment may be inevitable.

Key words: Current account, Sustainability, Cointegration, Non-linearity.

JEL: C32, F32.

The issue of the sustainability of current account deficits which mostly come into prominence at 1990's as a consequence of the balance of payment crises in certain economies, has led to a wide and expanding literature. As one of those economies, the underlying factors for rising Turkish current account deficits could be evaluated as similar to Euro area external imbalances, such as mistakes in economic policy implementations, lack of efficiency and competitiveness which are emphasized by Jorge Uxó, Jesús Paúl, and Eladio Febrero (2011). As stated in Gian M. Milesi-Ferrett and Assaf Razin (1996), the probability of crises, in other words unsustainability of current account deficits is associated with the current account deficits exceeding %5 of GDP in an economy which finances deficits by short-term debt or foreign exchange reserves. In this context, the deterioration in the external balance of Turkish economy after 2001 crises and the financing of deficits have created some concerns about the sustainability.

The main focus of this study is the examination of Turkish current account deficit. However, as a comparative analysis, the sustainability of current account deficits for three CEE economies, namely Hungary, Poland, and Czech Republic is also tested. The novelty of our study is twofold. First and foremost, we contribute to the regarding literature by employing non-linear methods. Second, our approach also differs from the other studies focusing on Turkey by adopting a comparative approach and including three CEE economies.

To analyze the long-run relationship, the cointegration methodology developed by Allan W. Gregory and Bruce E. Hansen (1996) is applied following the unit root test of Eric Zivot and Donald W. K. Andrews (1992). Both methodologies perform analysis in the presence of structural breaks in the series which carries a major importance due to the potential regime shifts as a consequence of 2001 and 2008 crisis. However, those linear testing procedures could improperly lead to the evidence of sustainability if non-linearity of the series in question is detected. Herewith, considering the potential non-linearity of the series, we employ Myunghwan Seo (2006) cointegration test since employing linear methods to analyze non-linear processes could inevitably lead to misleading findings and policy implementations. The cointegration analysis of Gregory and Hansen (1996) provides no evidence supporting the long-run relationship, in other words the sustainability of current account deficits in the considered period for Turkey, Poland and Czech Republic. On the other hand, the test results suggest that there is cointegration for Hungarian case implying the current account deficit is sustainable. The result of unsustainability from Seo (2006) test confirms the finding of linear analysis for Turkey, Poland, and Czech Republic but not for Hungary. Therefore, unlike other countries, we have a conflicting result in the case of Hungary which indicate prominence of performing non-linear tests besides the linear ones to obtain reliable results.

The study is structured as follows. Section 1 mentions the theoretical framework of the intertemporal budget constraint and the regarding literature. Section 2 discusses the data and the overview of the current account balance of Turkish economy over the considered period. Section 3 addresses the methodology and presents the empirical results for Turkey. Section 4 performs a comparative analyse. Finally, Section 5 conludes.

1. Theoretical Model and the Review of Literature

To analyze the sustainability of Turkish current account deficits, the theoretical framework of Husted (1992) is utilized. The model defines the current period budget constraint of an individual as:

$$C_0 = Y_0 + B_0 - I_0 - (1 + r_0)B_{-1}, \tag{1}$$

where $C_0, Y_0, B_0, I_0, r_0, (1 + r_0)B_{-1}$ denote current consumption, output, international borrowing, investment, one period world interest rate and external borrowing, respectively. Iterating (1) forward, the budget constraint is:

$$B_0 = \sum_{t=1}^{\infty} \mu_t \, TB_t + lim_{n\to\infty}\mu_n B_n, \tag{2}$$

where $TB_t = X_t - M_t (= Y_t - C_t - I_t)$ indicates the trade balance, in other words the difference between the exports (X_t) and imports (M_t), in the period *t*. $\mu_t = \prod_{s=1}^{t} \lambda_s$ where $\lambda_s = 1/(1 + r_s)$ and μ_t is the discount factor. Equation (2) implies that the foreign debt of a country equals to the present value of the future trade surpluses when the last term is assumed to be zero. In this case, if B_0 is positive, then the country is "bubble-financing" and if B_0 is negative then the country is making Pareto-inferior decisions (Husted 1992).

After rearranging equations above through several assumptions, Husted (1992) finally obtains the following regression model:

$$X_t = \alpha_1 + \alpha_2 MM_t + e_t, \quad (3)$$

where MM_t represents imports of goods and services plus net interest payments and net transfer payments. To satisfy the intertemporal budget constraint, it is expected that $\alpha_2 = 1$ and e_t would be stationary. Thus, if X_t and MM_t are non-stationary, they should be cointegrated not to violate the current account sustainability.

In the regarding literature, several studies examine the sustainability of current account deficits by applying unit root and cointegration analysis such as Jyh-Lin Wu, Stilianos Fountas, and Show-Lin Chen (1996), Fountas and Wu (1999), Nicholas Apergis, Konstantinos P. Katrakilidis, and Nicholas M. Tabakis (2000), Paul R. Bergin and Steven M. Sheffrin (2000), Lori L. Leachman and Bill B. Francis (2000), Wu, Chen, and Hsiu-Yun Lee (2001), Ahmad Z. Baharumshah, Evan Lau, and Fountas (2003), Yoichi Matsubayashi (2005), Hamizun Bin Ismail and Baharumshah (2008) and Matteo Lanzafame (2014). In a recent study, Fikret Dülger (2016) highligths the importance of structural breaks in examining the sustainability of current account deficit in a large group of developed and developing countries. On the other hand, a body of literature considering Turkish economy through different periods and methodologies finds evidence of sustainability (Huseyin Kalyoncu 2005) or *vice versa* (Ayla Oğuş Binatli and Niloufer Sohrabji 2008, 2012; Serdar Ongan 2008). Moreover, Gulcan Onel and Utku Utkulu (2006) conclude that Turkish external debt is weakly sustainable with or without considering any structural break over the period 1970-2002; while for the period 1970-2005, Subidey Togan and Hakan Berument (2007) reveal that sustainability could be achieved by only substantial depreciation of the real exchange rate. Furthermore, considering the effect of exchange rate on the current account sustainability, Blaise Gnimassoun and Issiaka Coulibaly (2014) find that employing fixed exchange rate regime or belonging to a monetary union lower the sustainability for Sub-Saharan Africa.

As a more recent strand of the literature, a number of studies analyzes the sustainability of the current account deficits in a non-linear framework. As Richard H. Clarida, Manuela Goretti, and Mark P. Taylor (2005) emphasize, empirically, the dynamic process which embodies the adjustment of current account balance to the long-run equilibrium is crucially based on the linearity condition. Particularly, if the process is linear, adjustment is symmetric above and below the long-run equilibrium without a threshold, and the speed of adjustment is independent from the magnitude of the shift from long-run equilibrium. For a linear process, the focus is solely on the adjustment of current account deficits by excluding the data on adjustment to surpluses or large deficits as all regimes provide the same information. By contrast, if the process that governs the current account adjustment to its long-run equilibrium is non-linear, then both the sign and size of the current account imbalance affect the adjustment process. Dimitris Christopoulos and Miguel A. Leon-Ledesma (2010) find evidence supporting the sustainability of US current account deficits by employing non-linear sup-*t* unit root tests for estimated exponential smooth autoregressive (ESTAR) models. Likewise, applying George Kapetanios, Yongcheol Shin, and Andy Snell (2003) non-linear

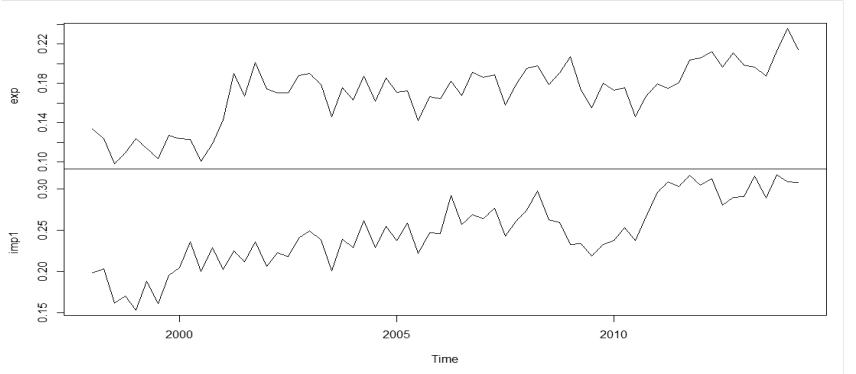
threshold unit root tests, Georgios E. Chortareas, Kapetanios, and Merih Uctum (2004) conclude that external debts of several Latin American countries are sustainable which reverses the results of linear analysis. Similarly, for most of the Latin American countries with the exception of Argentina, Brazil, Chile and Paraguay, current account deficit is found to be sustainable by Vicente Donoso and Victor Martin (2014). As another study examining sustainability *via* stationarity analysis, Bong-Han Kim et al. (2009) provide evidence of sustainability for Indonesia, Korea, Malaysia, Philippines and Thailand with regard to the results of non-linear unit root test of Joon Y. Park and Mototsugu Shintani (2005). Unlike the studies supporting the sustainability, Shyh-Wei Chen (2011) finds current account unsustainability over the period in question for several OECD countries such as Australia, the Czech Republic, Finland, Hungary, New Zealand, Portugal and Spain by employing unit root processes with regime switching. Similar to this study, Marzia Raybaudi, Martin Sola, and Fabio Spagnolo (2004) investigate the notion of sustainability by utilizing regime switching models. Finally, for Turkish economy, Aydin Cecen and Linlan Xiao (2014) find that intertemporal budget constraint would not hold in the long-run, in other words evidence of unsustainability by employing threshold unit-root test of Mehmet Caner and Hansen (2001).

2. Overview of Turkish Economy

Prior to the empirical analysis, the Turkish economy over the analysis period, which bears the traces of 2001 and 2008 crisis together with the resultant economic stability programs, is discussed with regard to Figure 1. Turkish economy has become more vulnerable to external shocks after the liberalization of international capital flows in the end of 1980s. The exchange rate policy together with growth-oriented policies, which lean on the import of intermediate and capital goods, have increased current account deficits. The external balance has deteriorated after the time span of financial liberalization excluding crisis periods, 1994 and 2001, when the import demand has decreased as a result of the collapse in GDP and employment. Considering high fiscal deficits and low rates of saving in the Turkish economy, the current account deficits had to be financed through foreign capital that has been including a high share of short-term credits relative to FDI or long-term credits. In parallel with Baharumshah, Lau, and Fountas (2003) who suggest that deficits provide a signal of macroeconomic imbalance calling for a devaluation and tighter macroeconomic policies, in 2001 the sudden reversal of short-term capital accompanied by the collapse of local currency has required a new economic program. It could be specified as unsustainabilty with regard to Milesi-Ferrett and Razin (1996) that define unsustainability as the change in current economic policies or the crisis situation which is triggered by a capital outflow as a consequence of a domestic or external shock.

The aim of the new program, in other words "The Transition to the Strong Economy Program", was determined to restructure economy and achieve stability through the targets as fighting inflation under the floating exchange rate system, strengthening financial sector and fiscal balance. The implementation of the program has yielded high growth rates, control on inflation and fiscal discipline in remuneration for growing current account deficits. The main source of the deterioration in the external balance has been the rise in import demand which was triggered by depreciated exchange

rate and relatively high interest rates leading to the short-term capital inflows. The macroeconomic stability as a consequence of the ample global liquidity has reversed due to the recession of 2008-2009 which has induced the sudden outflows and current account imbalances. Though the fall in GDP has accompanied an improvement in external balance as a consequence of the global crisis, deficits resurged to rise as in 2010. This episode clearly proves that the current account deficit is a structural phenomenon for Turkish economy and associated with the significant imbalances in economic fundamentals.



Source: Authors' calculation based on data from the Central Bank of Republic of Turkey Electronic Data Distribution System (2013)[1].

Figure 1 Export and Import of Turkish Economy

Since the current account deficit is the difference between the domestic saving and investment, we can look at the issue from the evolutions of saving and investment over time. As an emerging market economy, Turkey aims to catch up rich countries and get out of middle income trap, which requires a high investment level. However, Turkey's gross fixed capital investment, as a share of nominal GDP, is not extremely high for an emerging economy. On the other hand, the domestic saving rate is relatively low, despite a significant improvement in the government budget balance or borrowing requirement after 2002. This obviously means that in order to maintain the current level of investment, Turkey needs the foreign capital unless the domestic saving rate jumps. Since it is almost impossible to raise the domestic saving rate significantly in the very short-term, it seems that the only available option for Turkey is to use the foreign savings in order to have a high growth rate. On the other hand, a high and permanent current account deficit would make an economy more fragile and vulnerable to the external shocks even possibly trigger economic crises or downturn. This is especially true if current account deficits are financed with short-term debts and portfolio investments rather than the foreign direct investments. Moreover, after the 2001 crisis the private sector's foreign debt, as a share of GDP, has significantly increased, while public foreign debt has declined. This implies that a depreciation in

[1] **Central Bank of Republic of Turkey.** 2013. Electronic Data Distribution System. https://evds2.tcmb.gov.tr/ (accessed May 03, 2013).

Turkish currency or sudden stop in capital inflows would lead to a sharp adjustment due to a possible risk of default or worsening balance sheet of financial firms, affecting overall economic activity through the credit channel as well. If a new economic program aiming at restructuring economy and current account dynamics is implemented, Turkey would need less foreign capital inflows in the future, if decided so. In this context, more saving friendly policies, such as tax incentives, tight monetary policy and the restriction of credit expansion would be helpful to address this structural problem in an effective way. For example, we consider the recent introduction of a more comprehensive additional private pension system to increase the domestic saving rate a step taken toward the right direction. Nevertheless, the sustainability of the current account deficit and drawing foreign capital flows are currently crucial for Turkish economy. Furthermore, another consideration is whether the foreign capital flows are directed or used to boost the productive capacity of the Turkish economy or mostly non-productive spending. This will ultimately determine whether the repayment will be easy or not in the future.

3. Methodology and Empirical Results for Turkey

To analyze the sustainability of Turkish current account deficits over the period 1998Q1-2014Q2, the export and import series as the percentages of GDP are used. As Husted (1992) states, the export series include the export of the goods and the services while the import series consists of the import of goods and services plus net interest and net transfer payments obtained from the Central Bank of Republic of Turkey Electronic Data Distribution System (2013). The time series of expenditure-based GDP at current prices is provided from Turkish Statistical Institute (2013)[2]. All series are seasonally adjusted by means of Census X12 technique.

3.1 Linear Analysis

We first investigate the stationarity properties of the series. Considering the importance of structural breaks, some studies have asserted that conventional unit root tests such as ADF, Philips-Perron and KPSS yield biased results, which lead to the nonrejection of the null of unit root. As one of those studies in the regarding literature, Zivot and Andrews (1992) have developed a testing procedure which endogenously determines the time of one-time structural breaks. The Zivot-Andrews (henceforth ZA) procedure tests the null of unit root against the alternative hypothesis of a trend stationarity with a one-time break at unknown point in time *via* the models below:

Model A:

$$y_t = \alpha_0^A + \alpha_1^A y_{t-1} + \beta^A t + \theta^A DU_t(\lambda) + \sum_{j=1}^{k} d_j^A \, \Delta y_{t-j} + \epsilon_t, \tag{4}$$

Model B:

$$y_t = \alpha_0^B + \alpha_1^B y_{t-1} + \beta^B t + \theta^B DT_t(\lambda) + \sum_{j=1}^{k} d_j^B \, \Delta y_{t-j} + \epsilon_t, \tag{5}$$

[2] **Turkish Statistical Institute.** 2013. Databases. http://www.turkstat.gov.tr/ (accessed May 03, 2013).

Model C:

$$y_t = \alpha_0^C + \alpha_1^C y_{t-1} + \beta^C t + \theta^C DU_t(\lambda) + \gamma^C DT_t(\lambda) + \sum_{j=1}^{k} d_j^C \Delta y_{t-j} + \epsilon_t, \quad (6)$$

where $DU_t(\lambda) = 1$ and $DT_t(\lambda) = t - TB$ if $t > TB$ and zero otherwise. The dummy variables $DU_t(\lambda) = 1$ and $DT_t(\lambda)$ refer to the shifts in intercept and trend, respectively at the break point *TB*. In this case, Model A permits for a change in the intercept while Model B captures a change in trend. On the other hand, Model C allows both a change in intercept and trend. The null of unit root is rejected if the coefficient of y_{t-1} is statistically significant. The break time *TB* is determined that corresponds to the minimum value of ADF *t*-statistic. The results of ZA stationarity analysis are reported in Table 1.

Table 1 ZA Test Results (Turkey)

Variables	Model A		Model B		Model C	
	t-stat (level)	*t*-stat (1st difference)	*t*-stat (level)	*TB* (1st difference)	*t*-stat (level)	*TB* (1st difference)
X (export)	-4.853	-8.764*	-3.969	-8.357*	-4.794	-9.387*
TB:	(2001Q1)	(2001Q3)	(2001Q3)	(2000Q4)	(2001Q1)	(2001Q3)
MM (import)	-4.745	-6.801*	-4.033	-6.559*	-5.101**	-
TB:	(2008Q3)	(2009Q1)	(2001Q1)	(2010Q1)	(2008Q1)	

Notes: *, ** denote significance at %1 and %5 levels, respectively using the critical values from Table 4A in Zivot and Andrews (1992).

Source: Authors' calculations.

Based on the results in Table 1, export series is found to be integrated of order one according to all three models. Likewise, ZA tests show that import series is also I(1) with regard to Model A and B. However, allowing for a one-time break in intercept and trend, it is concluded that the import series is I(0) at %5 significance level. Excluding this finding, since ZA tests provide evidence of first difference stationarity for both series, the cointegration relationship between the series is required to be investigated in the succeeding step of the methodology.

For the sake of robustness of the findings to structural breaks, the Gregory-Hansen (henceforth GH) methodology is utilized to analyze the long-run relationship between the I(1) processes. This approach to cointegration proposes three models:

Model C (level shift):

$$y_t = \alpha_1 + \alpha_2 D_t^\tau + \beta x_t + \epsilon_t, \quad t = 1, \dots, n; \quad (7)$$

Model C/T (level shift with trend):

$$y_t = \alpha_1 + \alpha_2 D_t^\tau + \mu_t + \beta x_t + \epsilon_t, \quad t = 1, \dots, n; \quad (8)$$

Model C/S (regime shift):

$$y_t = \alpha_1 + \alpha_2 D_t^\tau + \mu_t + \beta_1 x_t + \beta_2 x_t D_t^\tau + \epsilon_t, \quad t = 1, \dots, n; \quad (9)$$

where t shows the time trend. Furthermore, α_1 denotes the intercept before the shift while α_2 represents the change in the intercept at the time of the shift. On the other hand, β_1 indicates the cointegrating slope coefficient before the break, β_2 presents the change in the slope coefficient after the shift. The dummy variable, D_t^τ, which captures the structural change is defined as follows:

$$D_t^\tau = \begin{cases} 0, & t \leq TB \\ 1, & t > TB \end{cases}, \tag{10}$$

where *TB* represents the break point which is determined as similar to ZA approach. GH procedure proposes a group of tests which are the ADF test and the extensions of Z_t and Z_α test statistics of Peter C. B. Phillips (1987). The results of GH tests are presented in Table 2.

Table 2 GH Test Results (Turkey)

	ADF		Z_t		Z_α	
	Test statistic	Break point	Test statistic	Break point	Test statistic	Break point
Model C	-4.09	2000Q4	-3.09	2000Q1	-4.28	2000Q2
Model C/T	-4.13	2000Q4	-4.38	2000Q2	-4.41	2000Q2
Model C/S	-28.47	2000Q4	-30.56	2000Q2	-30.83	2000Q2

Source: Authors' calculations.

According to Table 2, GH tests (ADF, Z_t and Z_α) do not support the existence of a cointegrating relationship between export and import series; in other words, the sustainability of current account deficits since the null of no cointegration is accepted at all significance levels. Our results are in line with that of the studies finding Turkish current account deficit unsustainable. Moreover, with regard to both ZA and GH testing procedures, the structural breaks are found to occur mostly close by 2001 financial crises and 2008 crisis which have affected the external balance of Turkish economy as a consequence of the global recession.

3.2 Non-Linear Analysis

Seo (2006) develops a methodology superior to Nathan S. Balke and Thomas B. Fomby (1997), Chien M. Lo and Zivot (2001) or Hansen and Byeongseon Seo (2002) as it enables to test no cointegration against threshold cointegration based on the three-regime threshold vector error correction models (TVECM).

The two-regime Band-TVECM for vector $Y_t = (X_t, MM_t)'$ proposed by Seo (2006) for relatively small sample sizes is presented below:

$$\Phi(L)\Delta y_t = \alpha_1 z_{t-1} I(z_{t-1} \leq \gamma) + \alpha_2 z_{t-1} I(z_{t-1} > \gamma) + \mu + \varepsilon_t, \tag{11}$$

where $\Phi(L)$ is a q^{th} order polynomial in the lag operator of $\Phi(L) = I - \Phi_1 L^1 - \cdots - \Phi_q L^q$, α_1 and α_2 are the parameters implying speed of adjustment, γ is the threshold parameter, z_t and ε_t are the (2×1) vectors of error correction terms and i.i.d. error terms, respectively. The test statistic sup$W$, in other words the supremum of the Wald

statistic tests the null of no linear cointegration ($\alpha_1 = \alpha_2 = 0$) when there is only one cointegrating relation known under the alternative. In this regard, the estimated TVECMs and cointegration test results are given by Table 3 and Equation (12).

Table 3 Seo (2006) Test Results - 1000 Bootstrap (Turkey)

Variables	sup*W*	*p*-value	Threshold parameter (*L*)	Threshold parameter (*H*)
X-MM	26.379	0.987	0.063	0.095

Source: Authors' calculations.

The estimated TVECMs which lead to Seo (2006) cointegration test are represented below:

$$X_t = \begin{cases} 0.0003 - 0.4022^{**}EC_{t-1} + 0.4789^{**}X_{t-1} + 0.0312X_{t-2} \\ \quad -0.8081^{***}MM_{t-1} - 0.1065MM_{t-2}, & EC_{t-1} \leq 0.012 \\ 0.0361 - 1.3849^{*}EC_{t-1} - 0.9412^{**}X_{t-1} + 0.0677X_{t-2} \\ \quad +0.3049MM_{t-1} - 0.5197MM_{t-2}, & EC_{t-1} > 0.012 \end{cases} \quad (12)$$

In both regimes, the error correction terms are found to be negative and statistically significant implying the convergence to the long-run equilibrium. However, it can be suggested that the adjustment to long-run equilibrium is slower in the first regime depending upon the lower value of error correction term (-0.4022) in comparison to the second regime (-1.3849). Finally, the null hypothesis of no cointegration *versus* threshold cointegration is tested by means of Seo (2006) testing procedure *via* TVECMs (Table 3). In parallel to the findings of linear analysis, the international budget constraint is not satisfied, in other words the Turkish current account deficits are found to be unsustainable since null of no cointegration is accepted with regard to the test statistic of (26.3795).

Our finding is consistent with that of Cecen and Xiao (2014) while it contradicts with Kalyoncu (2005), Togan and Berument (2007) to some extent with regard to different economic specifications, methodologies or time spans. Kalyoncu (2005) finds evidence of sustainability by employing conventional cointegration method of Søren Johansen (1991) for 1987-2002 period of Turkish economy. On the other hand; Togan and Berument (2007) find evidence supporting the sustainability of Turkish economy under some macroeconomic assumptions (large foreign direct investment and transfers from European Union, higher productivity growth and lower energy prices) embodied in the modeling procedure.

4. A Comparative Analysis: Selected CEE Countries

In this part of the study, we examine the issue of current account sustainability for Hungary, Poland and Czech Republic which are comparable to Turkish economy in that they have experienced large and persistent current account imbalances with sudden capital movements in 1990s with regard to the transition to the market economy from a centralized economic structure. The low domestic saving rates have yielded the dependency on foreign funds for financing the vital investments in the transition process. Rising amount of capital inflows has led to current account deficits which reached

to an average annual level around %5 in Hungary, Poland and Czech Republic in the period of recent 15 years. The 2008 global crisis has also contributed to the deterioration of the current account balance which posed the problem of sustainability to be analyzed. Our data taken from the International Financial Statistics of IMF (International Monetary Fund 2013)[3] to examine the current account sustainability covers the period 1998Q1-2014Q2. Series are seasonally adjusted by Census X12 method.

In this section, we apply the same empirical approach as Turkish case in the previous section. We will present and discuss ZA results, then perform GH cointegration tests and finally non-linear analysis following Seo (2006). ZA test results are summarized in Table 4.

Table 4 ZA Test Results (Hungary, Poland, Czech Republic)

Variables	Model A		Model B		Model C	
	t-stat (level)	*t*-stat (1st difference)	*t*-stat (level)	*TB* (1st difference)	*t*-stat (level)	*TB* (1st difference)
Hungary						
X (export)	-3.359	-7.281*	-3.136	-6.538*	-3.779	-7.219*
TB:	(2006Q1)	(2008Q3)	(2008Q1)	(2004Q4)	(2006Q3)	(2008Q3)
MM (import)	-3.517	-6.905*	-3.439	-6.033*	-3.877	-6.876*
TB:	(2008Q3)	(2008Q2)	(2007Q3)	(2004Q2)	(2005Q4)	(2008Q2)
Poland						
X (export)	-4.082	-7.984*	-4.434	-6.279*	-5.016	-8.015*
TB:	(2008Q4)	(2008Q3)	(2008Q1)	(2003Q4)	(2008Q4)	(2008Q3)
MM (import)	-4.373	-8.316*	-4.381	-5.871*	-4.748	-7.208*
TB:	(2008Q4)	(2008Q4)	(2008Q2)	(2003Q4)	(2006Q3)	(2008Q3)
Czech Republic						
X (export)	-3.557	-7.273*	-2.924	-6.736*	-4.420	-7.20*
TB:	(2008Q2)	(2009Q2)	(2010Q1)	(2008Q3)	(2008Q3)	(2009Q2)
MM (import)	-4.732	-7.049*	-4.123	-6.435*	-5.066	-7.046*
TB:	(2008Q2)	(2009Q3)	(2010Q1)	(2008Q3)	(2008Q2)	(2009Q3)

Notes: *, ** denote significance at %1 and %5 levels, respectively using the critical values from Table 4A in Zivot and Andrews (1992).

Source: Authors' calculations.

Test results reported in Table 4 indicate that export and import series are I(1) for Hungary, Poland and Czech Republic. In general, time of breaks confirms the impact of global crisis on the export and import series in the countries examined. We apply the GH cointegration tests to examine the relationship between the I(1) variables. GH test results for Hungary, Poland and Czech Republic are presented in Table 5.

We fail to reject the null of no cointegration hypothesis in the case of Poland and Czech Republic implying that the current account deficit is not sustainable. However, we have a relatively strong evidence for a cointegrating relationship for Hungary. Especially in Model C, which allows a one-time change in level, the null hypothesis is rejected even at 0.01 significance level by all three tests. Therefore, we conclude that

[3] **International Monetary Fund.** 2013. International Financial Statistics. https://www.imf.org/en/Data (accessed May 06, 2013).

the current account is sustainable only for Hungary. We also perform non-linear cointegration tests based on estimated TVECM models. Estimation results are reported in Table 6 and 7.

Table 5 GH Test Results (Hungary, Poland, Czech Republic)

	ADF		Z_t		Z_α	
	Test statistic	Break point	Test statistic	Break point	Test statistic	Break point
Hungary						
Model C	-6.40*	2008Q4	-6.41*	2008Q4	-51.58*	2008Q4
Model C/T	-3.80	2008Q2	-6.10*	2008Q3	-48.62**	2008Q3
Model C/S	-5.87**	2008Q3	-5.82**	2008Q3	-45.37	2008Q3
Poland						
Model C	-3.09	2001Q3	-3.15	2001Q4	-14.83	2001Q4
Model C/T	-3.20	2010Q3	-3.46	2009Q4	-14.51	2009Q4
Model C/S	-5.12	2006Q4	-5.16	2006Q4	-39.72	2006Q4
Czech Republic						
Model C	-3.85	2007Q3	-3.18	2005Q1	-16.20	2005Q1
Model C/T	-2.87	2007Q2	-3.61	2004Q2	-22.60	2004Q2
Model C/S	-5.18	2004Q2	-5.22	2004Q2	-39.81	2004Q2

Notes: *, ** denote significance at %1 and %5 levels, respectively.

Source: Authors' calculations.

Table 6 Seo (2006) Test Results - 1000 Bootstrap (Hungary, Poland, Czech Republic)

Variables	sup*W*	*p*-value	Threshold parameter (*L*)	Threshold parameter (*H*)
Hungary				
X-MM	60.99658	0.261	0.0022	0.0026
Poland				
X-MM	18.905	0.817		
Czech Republic				
X-MM	10.13438	0.749	0.325	0.422

Source: Authors' calculations.

Table 7 TVECMs for Hungary, Poland and Czech Republic (Dependent Variable: X_t)

	Constant	X_{t-1}	X_{t-2}	X_{t-3}	MM_{t-1}	MM_{t-2}	MM_{t-3}	EC_{t-1}	Threshold value
Hungary (*m* = 1)	-4.4e-05 0.002***	1.249 1.598**	-	-	-1.191 -1.755*	-	-	-0.460 -4.696***	0.0002
Poland (*m* = 2)	-0.002 0.002	-0.455 0.291	0.3499 0.082	-	1.5314 0.063	-2.065** -0.139	-	-0.078 -0.068	-0.0167
Czech Republic (*m* = 1)	-0.0063 0.0105	0.1606 0.1526	-	-	-0.0930 0.0866	-	-	-0.4893* -0.0376	0.037

Notes: Lag selection (*m*) is based on pooled AIC. First (second) rows of coloumns indicate the coefficients of low (upper) regimes. *, **, *** denote significance at %1, %5 and %10 levels, respectively.

Source: Authors' calculations.

As presented in Table 6, the null of no cointegration hypothesis is rejected for all countries now. This means that the current account deficits are unsustainable. Non-linear test results confirm the results obtained from the linear tests for Poland and Czech Republic. On the other hand, non-linear cointegration test results in the case of

Hungary greatly differ from the linear ones reported in Table 5. Thus, the current account is sustainable in one approach but not in the other for Hungarian case, which points out the importance of considering the non-linearity of the series.

TVECM results suggest that the coefficients on the lagged values of export and import series are insignificant for Czech Republic. The coefficents are significant in only upper regime for Hungary with a positive coefficient on the lagged value of export and negative on the import. In the case of Poland, all coefficients, except for the one on the two lags of import, are statistically insignificant. As for error correction terms, our results indicate that these coefficients are insignificant in both regimes for Poland. On the other hand, error correction terms are significant only lower regime for Hungary and upper regime for Czech Republic. More briefly, besides the absence of long-run relationship, we find no evidence of short-run adjustments to the long-run equilibrium with regard to the insignificant coefficients on error correction terms for Poland and in lower (upper) regime of Hungary (Czech Republic).

The finding for sample CEE economies, especially for Czech Republic and Poland, in support of unsustainability could be attributed to the fall in total savings rate due to high government deficits at the end of 1990s and during 2000s. In addition, during the catch-up process, the transformation of the industrial sector accelerated the import of capital goods and rise in investments, particularly in Poland (Paolo Zanghieri 2004). Considering the current account deficit as the difference between savings and investment, the deterioration in net savings led to the issue of unsustainability. On the other hand, for Hungary, unlike other economies, where a strong recovery in savings reduced the gap more than a half in 1994 and 2002, while the investment ratio remained constant could led to the contradiction between the results of linear and non-linear models. This temporary improvement in savings rate probably captured by the linear model which supports the evidence of sustainability in Hungary. However, taking into account the non-lineartity of the series by means of proper methods, we reveal that the current account is actually unsustainable in Hungary as for other sample economies.

5. Conclusion

The sustainability of the current account deficits for Turkey is examined by analyzing the long-run relationship between the exports and the imports plus net interest and transfer payments with regard to the theoretical model of Husted (1992). The GH cointegration test is utilized to test the long-run relationship under structural breaks. The empirical findings provide evidence supporting the absence of cointegration relationship between the I(1) series. Likewise, the non-linear analysis provides evidence of unsustainability which requires to question the source and the finance of external deficits. As a comparative analysis, we also examine the sustainability of current account deficits for Hungary, Poland and Czech Republic. GH results provide evidence for the existence of a cointegrating relationship in the case of Hungary while no cointegration for Poland and Czech Republic is found implying the deficit is sustainable for only Hungary. However, non-linear analysis indicate that there is no cointegrating relationship between the variables has lead to the conclusion that the current account deficits are unsustaniable for all three countries.

As for policy proposal, since the short-term capital inflows trigger current account imbalances with regard to the Turkish experience, share of FDI rather than the portfolio investments should be risen in financing of current account deficits. On the other hand, the saving-investment balance of Turkish economy should be maintained by mainly increasing the relatively low domestic saving rate and the production structure dependent on the import of capital and intermediate goods should be altered to recover from the current account deficits and maintain the sustainability. We should also note that a reduction in the crude oil prices takes place recently, together with a declining growth rate, would contribute to a remarkable decline in the current account deficit in Turkey that is highly dependent on the external sources of energy. However, this likely reduction should not prevent Turkey from taking some policy measures to deal with the high current account deficit. Finally, despite the mixed results obtained regarding the sustainability of current account deficit for Hungary, it seems that a change is needed to reduce the current account deficit in all countries examined. Otherwise it is possible that the apparent fragility of these economies stemming from high current account deficits may cause a sharp economic adjustment or contraction in the future.

This paper reveals the issue of unsustainability for sample countries in the framework of a conventional theoretical model. We principally contribute to the literature by underlining the importance of non-linearity issue which is not mostly considered in the relevant studies and probably lead to misleading results as in Hungarian case. In this context, as the future work, the current account dynamics can be examined from different angles by means of broader theoretical models examining the current account dynamics together with the issues that whether the deficits stem from catching up process or rather rising debts to fund the purchase of non productive commodities. Considering the country-specific macroeconomic effects and fiscal conditions, even institutional framework in the analysis of current account sustainability would be worthwhile and fruitful area for future research.

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