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Testing for current account sustainability under assumptions of smooth break and nonlinearity

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ABSTRACT

In this paper we reexamine the current account sustainability under assumptions of smooth break and nonlinearity for nine European countries. We test for the null hypothesis of a unit root of the current account–GDP ratio against the alternative hypothesis that encompasses smooth break, size nonlinearity and sign asymmetry at the same time. For this purpose, we propose a battery of new test statistics and provide their critical values via Monte Carlo simulations. Our results show that the breaks alone can account for rejection of the null hypothesis of a unit root, although the evidence in support of the current-account sustainability is not sufficiently strong (only for Australia, the Czech Republic and New Zealand). Moreover, the evidence in favor of the current-account sustainability has been increased (i.e., Australia, Belgium, the Czech Republic, Finland, New Zealand, Norway, Ireland and Portugal) after taking account of size nonlinearity and structural break at the same time. Finally, for Finland, New Zealand and Ireland, the speed of mean reversion of the current account–GDP ratios is dependent not only upon the absolute deviation from the equilibrium, but also upon the sign of the shock.

1. Introduction

Based on Trehan and Walsh (1991), a myriad of studies have devoted many efforts to current account sustainability. It refers to whether an economy is able to meet its intertemporal budget constraint in the long run without a drastic change in private-sector behavior or policy changes, such as a sharp currency depreciation or a reduction in government expenditures. One avenue to discuss this issue is to employ a linear unit root test, cointegration test, panel unit root and panel cointegration with a consideration being given to a structural break (e.g., Apergis, Katrakilidis, & Tabakis, 2000; Arize, 2002; Baharumshah, Lau, & Fountas, 2003; Bergin & Sheffrin, 2000; Holmes, 2006a,2006b; Holmes, Otero, & Panagiotidis, 2010; Ismail & Baharumshah, 2008; Lau & Baharumshah, 2005; Lau, Baharumshah, & Haw, 2006; Liu & Tanner, 2001; Nag & Mukherjee, 2012). Basically, distinct results based on previous research are due to differences in methodology, approaches and samples and are subject to diverse interpretations, thus making it difficult to reach a corroborative position on the stationarity property of the current account.

Another avenue to examine this issue is adopting the nonlinear model.[1] See, for example, Chortareas, Kapetanios, and Uctum, (2004), Raybaudi, Sola, and Spagnolo (2004), Holmes and Panagiotidis (2009), Kim, Min, and McDonald (2009), Christopoulos and León-Ledesma (2010), Takeuchi (2010), Chen (2011a,b), Cuestas (2013), Gnimassoun and Coulibaly (2014) and Cecen and Xiao (2014).

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[1] Readers are referred to Milesi-Ferretti and Razin (1998), Mann (2002) and Freund (2005) for explanations of nonlinearity which may be relevant for analyzing the time series properties of the current account.

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Basically, the empirical evidence from this line of research indicates that, by taking the nonlinear property into account, the US (e.g., Christopoulos & León-Ledesma, 2010) and Latin American countries (e.g., Chortareas et al., 2004) are no longer in violation of current account sustainability.[2]

There are several different types of nonlinearities in the literature. First, nonlinearity may affect a variable in the form of *structural changes in the deterministic components*. From an economic point of view, if the current account imbalance-to-GDP ratio is a stationary process around a nonlinear deterministic trend, then it implies a time-varying equilibrium current account–GDP ratio. For example, Holmes and Panagiotidis (2009) consider nonlinearity that stems from structural breaks by using the Breitung (2002) non-parametric cointegration test. Chen (2010) applies Bierens (1997) nonlinear unit root test to re-examine the mean-reverting property of the current account for the US, the UK, Canada and France.[3] From an econometric point of view, if the true data generating process is a linear process with structural breaks (e.g., Perron, 1989) or nonlinear (e.g., Bierens, 1997; Pippenger & Goering, 1993), then the traditional unit root or cointegration tests may suffer from size distortion and low power problems.

Second, if the mean-reverting process that governs the current account adjustment to the long run equilibrium is nonlinear, then the adjustment process may depend both upon the *size* (*asymmetric speed of adjustment toward equilibrium*) and *sign* (*asymmetric adjustment*) of the current account imbalance. Asymmetric speed of adjustment differs from the concept of asymmetric adjustment. The former implies that the further the variable deviates from its fundamental equilibrium, the faster will be the speed of mean reversion. The latter implies that the variable reacts in a different manner depending upon the sign of the shock. Clarida, Goretti, and Taylor (2006) point out that both government policies and market forces can induce faster current account corrections when deficits reach a certain "danger zone", leading to nonlinear adjustment dynamics in the current account. Christopoulos and León-Ledesma (2010) claim that changes in the agents' perceptions regarding risk, portfolio allocation decisions, future policy changes, and transaction costs in international financial flows, etc., can lead to changes in the dynamics of current account mean reversion and hence equilibrium values of the current account. Thus, for large changes in the current account imbalance away from equilibrium we might expect the speed of mean reversion to be faster as markets (or governments) would not be willing to finance deviations from equilibrium for long periods. Kim et al. (2009, p. 167) point out that "such nonlinearity implies an equilibrium level of the current account in the neighborhood of which the behavior of the current account is close to a random walk, becoming increasingly mean reverting with the absolute size of the deviation from equilibrium." Thus, the process of nonlinear adjustment depends on *the size of the disequilibrium*.

Third, sign nonlinearity could be motivated by asymmetric market friction or the action of policy-makers may also impart nonlinear adjustment dynamics. In particular, where, for example, central banks have an explicit current account imbalance–GDP ratio target (e.g., 6% of GDP), they may pay more attention to rising current account–GDP ratios than to falling ratios due to their different implications for default risk. Specifically, this implies that the current account imbalance exhibits asymmetric adjustment. It reacts in a different manner depending on *the sign of the disequilibrium* or shock.

Although recent studies have pointed out the importance of nonlinearity in testing for current account sustainability, thorough investigations on which type of nonlinearity is really vital to the determination of current account sustainability are rare in the literature. Recently, Chen (2014) tries to analyze three types of nonlinearities, i.e., *the nonlinearity that stems from structural breaks*, *size nonlinearity* and *sign nonlinearity*, for ten European countries and examines their importance in letting the current account imbalance be sustainable. His empirical evidences show that the current account–GDP ratios of the European countries do not exhibit the sign nonlinearity. However, a weakness of Chen's (2014) research is that he examines the three types of nonlinearities one by one but not at the same time. Cuestas (2013) also examines current account sustainability of the central and eastern European countries (CEECs) after taking account of size and sign nonlinearities with the Sollis (2009) test.

The purpose of this paper is to re-examine the current account sustainability under assumptions of smooth break and nonlinearity at the same time. In particular, we propose a test that could encompass all three types of nonlinearities under the alternative hypothesis. That is, we test for the null hypothesis of a unit root against the alternative hypothesis that encompasses smooth break, size nonlinearity and sign asymmetry at the same time. We adopt a two-step testing strategy: first estimating nonlinear trend and then applying various nonlinear unit root tests with no deterministic component. The idea of this procedure is in line with Leybourne, Newbold, and Vougas (1998), Sollis (2004) and Cook and Vougas (2009). In the first step, we employ logistic smooth transition models proposed by Leybourne et al. (1998) to model the nonlinearity that stems from structural breaks. These models permit the possibility of a smooth transition between two different trend paths over time.[4]

In order to take account of the possibility of smooth break and *asymmetric speed of adjustment toward equilibrium* (i.e., size nonlinearity) at the same time, we assume that the adjustment speed is nonlinear and follows an exponential smooth transition autoregressive (ESTAR) process. This nonlinear behavior implies that there is a central regime where the series behave as a unit root whereas for values outside the central regime, the variable tends to revert to the equilibrium. Therefore in the second step, we apply a variety of the ESTAR-type unit root tests, i.e., Kapetanios, Shin, and Snell (2003), Kilic (2011) and Park and Shintani (2012),

[2] The conventional linear unit root models are misspecified and the test results will be incorrect if the true data generating process is a nonlinear process. In other words, if the current account adjusts in a nonlinear way then conventional unit-root and cointegration tests suffer from a loss of power that may lead to the acceptance of non-stationarity when the current account is actually sustainable. For example, Chortareas et al. (2004) demonstrate that linear and nonlinear unit root tests give rise to different results for a number of Latin American countries.

[3] Bierens (1997) proposes a unit root test versus the alternative hypothesis of stationarity about a nonlinear deterministic trend. The nonlinear trends are approximated by means of Chebishev polynomials.

[4] Leybourne and Mizen (1999) point out that "when considering aggregate behavior, the time path of structural changes in economic series is likely to be better captured by a model whose deterministic component permits gradual rather than instantaneous adjustment."