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INTERNATIONAL INTERTEMPORAL SOLVENCY IN OECD COUNTRIES: EVIDENCE FROM PANEL UNIT ROOT

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Abstract:
The purpose of this study is to investigate the sustainability of current account of 22 OECD countries by employing Liu and Tanner (1996) testing procedure. The procedure used here is to examine stationarity of current account. By using ADF unit root test on single time series, it has been found that current account of most OECD countries have unit root. This outcome, however, might be due to the generally low power of this test. The aim of this paper is to reconsider this issue by exploiting the extra information provided by the combination of the time-series and cross-sectional data and the subsequent power advantages of panel data unit root tests. We apply the test advocated by Im, Pesaran and Shin (1997). According to estimation, current account deficits in OECD countries are sustainable.

Keywords: panel data unit-root test, current account, solvency

JEL Classification: F30, C23, F32

1. Introduction

Large current account deficits witnessed in many developed economies have caused concern for policy makers. The current account is an important barometer to both policymakers and investors as it is an indicator of a country's economic performance. Temporary current account deficits are not bad as they reflect reallocation of capital to the country where capital is more productive (see Hakkio, 1995). However, persistent deficits can have serious effects. First, they might increase domestic interest rates to attract foreign capital. Second, the accumulation of external debt owing to persistent deficits will imply increasing interest payments, which imposes an excess burden on future generations.

While policy makers are concerned about the aggravation of current accounts, economists are more concerned with the country's intertemporal solvency constraint. This constraint focuses on the long-run path of the current account. Unit root and cointegration tests have provided useful tools in gaining insight into the long-run implications of a nation or government's intertemporal solvency. The tests determine whether a government or country is likely to be able to sustain its budget or ex-

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ternal deficits without defaulting on its debt. Such tests are first found in the literature regarding a government's solvency, beginning with the contribution by Hamilton and Flavin (1986), and developed by Wilcox (1989), Trehan and Walsh (1991), Hakkio and Rush (1991), Tanner and Liu (1994). Besides, some works such as Trehan and Walsh (1991), Hakkio and Rush (1991), Husted (1992), Sawada (1994), Ahmet and Rogers (1995), Liu and Tanner (1996), Wu, Fountas and Chen (1996), Fountas and Wu (1999), Wu (2000), Apergis, et al (2000) analyze the sustainability of external deficits. A stationary current account is consistent with a finite external debt to GNP ratio, and hence with sustainability of external debts.

Trehan and Walsh (1991) tested the sustainability of the current account of U.S. economy using annual data for the foreign debt during the period 1946-1987. They found that the current account balance was sustainable for the U.S. economy during that period. Liu and Tanner (1996) tested the external solvency of France, Germany, Italy, Japan, Canada, the United Kingdom, and the United States. The quarterly data used in the study corresponded to the period beginning in the early 1970s and finishing in the early 1990s. The authors used a Dickey-Fuller test with a break in the intercept to account for shifts in the behaviour of the series in the 1980s. They found that the intertemporal solvency condition was satisfied for the U.S., Germany, and Japan.

The aim of this study is to test for the sustainability of current account in 22 OECD countries. These countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States.

This paper is organized as follows. In section 2, we formally define the analytical framework and econometric methodology. Section 3 describes data and presents empirical result. Section 4 concludes.

2. Analytical Framework and Econometric Methodology

One of the most common approaches is taken by Liu and Tanner (1996). This approach starts from the per-period budget constraint faced by the country expressed in real terms:

$$X_t - M_t + r_t B_{t-1} = B_t - B_{t-1} \tag{1}$$

where X_t and M_t are real exports and imports of goods and non-factor services in period t, B_t is the stock of one-period foreign debt issued in period t and r_t is the one-period world interest rate. Assuming that the interest rate is stationary with mean r ($r_t = r + v_t$, with v_t a zero-mean random error), forward iteration of (1) gives

$$(1+r)B_{t-1} = \sum_{k=0}^{\infty} \frac{M_{t+k} - X_{t+k}}{(1+r)^k} + \lim_{k\to\infty} \frac{B_{t+k}}{(1+r)^k} + \sum_{k=0}^{\infty} \frac{v_{t+k}}{(1+r)^k} \tag{2}$$

Now, assuming that the exports and imports series are $I(1)$[1)] and taking expected values, (2) may be written as

$$CA_t = \theta + \lim_{k\to\infty} E\left[\frac{rB_{t+k}}{(1+r)^k}\right] + \omega_t \tag{3}$$

1) $M_t = \mu_1 + M_{t-1} + \varepsilon_{1,t}$, $X_t = \mu_2 + X_{t-1} + \varepsilon_{2,t}$.

where ω_t is a stationary error term[2] and θ is a constant.[3] If the solvency condition holds, the second term on the right-hand side of equation (3) equals zero. Thus if the current account is sustainable, then the current account series has to be a stationary process.

The stationarity of countries current account variables is tested using the ADF unit root test procedure. After that, panel unit root tests are applied. In recent years some tests for unit root within panels are developed in the literature. Levin and Lin (1992, 1993), Im, Pesaran and Shin (1997), Maddala and Wu (1999), Kao (1999) and Quah (1994) have developed panel unit root tests. In this study Im, Pesaran and Shin (hereafter IPS) are used. We briefly describe the IPS model:

Suppose that there is a group of N current accounts, CA_{it}, which have the following time-series representation:

$$\tilde{CA}_{it} = \alpha_i + \beta_i \tilde{CA}_{it-1} + \eta_{it}, \quad i = 1,...,N \tag{4}$$

where $\tilde{CA}_{it} = CA_{it} - (1/N)\sum_{i=1}^{N} CA_{it}$. The IPS test examines the null hypothesis:

$$H_0 : \beta_1 = \beta_2 = ... = \beta_N = 1$$

against

$$H_a : \beta_i < 1, \text{ for all } i$$

Since η_{it} is assumed to be stationary, we correct the possible serial correlation in η_{it} with the ADF method. Hence, the model to be estimated is given as follows:

$$\Delta\tilde{CA}_{it} = \alpha_i + \beta_i \tilde{CA}_{it-1} + \sum_{j=1}^{w_i} \gamma_{ij} \Delta\tilde{CA}_{it-j} + \zeta_{it} \tag{5}$$

where ζ_{it} is assumed to be uncorrelated over time, and mutually uncorrelated across individuals. Let us define the *t*-statistics of $\beta_i = 0$ as $t_{iT}(w_i)$. The *t*-bar statistics is defined as follows:

$$\bar{z}_{INT} = \sqrt{N}\left[\bar{t}_{NT} - a_{NT}\right] / \sqrt{b_{NT}} \tag{6}$$

where

$$\bar{t}_{NT} = (1/N)\sum_{i=1}^{N} t_{iT}(w_i)$$

$$a_{NT} = (1/N)\sum_{i=1}^{N} E\left[t_{iT}(w_i)\right]$$

and

$$b_{NT} = (1/N)\sum_{i=1}^{N} V\left[t_{iT}(w_i)\right]$$

$E[t_{iT}(w_i)]$ and $V[t_{iT}(w_i)]$ are the mean and variance of $t_{iT}(w_i)$.

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2) Error term is a function of v_t, $\varepsilon_{1,t}$, and $\varepsilon_{2,t}$.

3) $\theta = \dfrac{(\mu_1 - \mu_1)(1+r)}{r}$

3. Data and Empirical Results

3. 1 *Data*

All data are annual and gathered from the International Monetary Fund's International Financial Statistics (IMF-IFS) database. The data spans from 1960 to 2002. We estimate the current account to GDP ratio. Twenty-two countries included in the study are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States.

3. 2 *Empirical Results*

We have conducted the classical unit root tests, namely, the Augmented Dickey-Fuller (ADF) test (see Dickey and Fuller, 1979, 1981). ADF test is based on the null hypothesis that a unit root exists in the time series. This unit-root test is performed on level of the variable.

ADF test result is presented in Table 1. The null hypothesis of a non-stationary current account is rejected for Austria, Greece, Iceland, Italy, Korea, New Zealand,

Table 1
Results of the ADF Test for Current Account Balance to GDP Ratio

Country	*k*	τ_τ	τ_μ	τ
Australia	1	-2.82731	-2.73169	-0.74992
Austria	1	-2.35559	-2.41103	-2.38244*
Belgium	1	-1.61593	-0.91377	-0.22489
Canada	1	-2.17961	-2.08760	-1.93000
Denmark	1	-2.18415	-0.62709	-0.70716
Finland	1	-2.06305	-1.20500	-1.32152
France	1	-1.79542	-1.67115	-1.60687
Germany	2	-2.62605	-2.67184	-1.00885
Greece	1	-3.07449	-3.11670*	
Iceland	2	-3.22079	-3.30471*	
Ireland	1	-1.88545	-1.63951	-0.99625
Italy	1	-2.95058	-2.68495	-2.63743*
Japan	5	-1.81739	-1.60116	-0.17964
Korea	1	-4.24556*		
Luxembourg	1	-1.56987	-1.88534	-0.88347
Netherlands	1	-2.71484	-1.89730	-1.27211
New Zealand	1	-3.66894*		
Norway	1	-2.35081	-2.19980	-2.19374*
Spain	2	-3.99459*		
Sweden	1	-2.42540	-1.99675	-1.77438
United Kingdom	1	-3.15810	-2.91985*	
United States	2	-3.02271	-0.74835	-0.60602

Notes: 1- k denotes lag order and the lag order was determined using the Schwarz criterion (BIC).
2- τ_τ, τ_μ, τ denotes with trend and constant, with constant and no trend no constant.
3- 95% critical values for ADF statistics in order with trend, without trend and no trend no constant is: -3.41, -2.86 and -1.95; * null hypothesis of a unit root is rejected.

Norway, Spain and the United Kingdom. For these countries, test statistics exceed the 95% critical values. This means that these countries fulfil the international solvency condition.

In the cases of Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Japan, Luxembourg, the Netherlands, Sweden and the United States, it was not possible to reject the null hypothesis of non-stationary. These results suggest that these countries do not satisfy the intertemporal solvency condition.

After the stationary of current account is investigated by applying ADF unit root test, IPS panel unit roots test is performed. Taylor and Sarno (1998) point out that panel unit-root tests may lead to a very high probability of rejection of the joint null hypothesis of non-stationary when there is a single stationary process in a system of otherwise unit-root processes. In addition, the attractiveness of panel data unit-root tests is their higher power relative to the conventional ADF test. Therefore, applying the panel data unit-root test is meaningful only when the ADF test fails to reject the unit-root null. Therefore, we exclude Austria, Greece, Iceland, Italy, Korea, New Zealand, Norway, Spain and United Kingdom from our panel.

Table 2
Results of the Panel Unit Root Test

	$\bar{Z}_{INT}$ *	P**
Individual trend and intercept	-3.87615	0.0001
Individual intercept	-3.32649	0.0004

* $\bar{Z}_{INT}$ is the test statistic of Im et al. (1997)
** Probabilities are computed assuming asymptotic normality.

The IPS panel unit root test result is reported in Table 2. In contrast to ADF test, IPS test result rejects the unit root null, which indicates that current account balances are stationary. An important policy implication is that current account deficits in these countries are sustainable.

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This paper examines sustainability of current account for 22 OECD countries during the period 1960 – 2002. Using the usual intertemporal borrowing constraint, we have tested the stationarity of current account series. Using ADF unit root test on single time series, it has been found that current account of most OECD countries have unit root. This outcome, however, might be due to the generally low power of this test. The aim of this paper is to reconsider this issue by exploiting the extra information provided by the combination of the time-series and cross-sectional data and the subsequent power advantages of panel data unit root tests. We apply the test advocated by Im, Pesaran and Shin (1997). The joint unit-root null hypothesis can not be rejected for the panel. Empirical finding implies that the current account deficits among OECD countries are sustainable.

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