Journal of Applied Sciences

ISSN 1812-5654

Journal of Applied Sciences 9 (19): 3606-3608, 2009
ISSN 1812-5654

Random Walk or Mean Reversion of Balance of Payments in OECD Countries: Evidence from Panel Data

[1]F. Kula, [1]A. Aslan and [2]O. Gozbasi
[1]Department of Economics, Erciyes University, 39039 Kayseri, Turkey
[2]Department of Business Administration, Erciyes University, 38039 Kayseri, Turkey

Abstract: Mean Reversion of Balance of Payments (BOP) is analyzed by panel data methodology using the first generation (Im, Pesaran and Shin's and Levin, Lin and Chu t-test) and the second generation (cross-sectional augmented ADF statistics) unit root tests on 24 OECD countries over the years ranging from 1982 to 2007. Both of the cross-sectional independence and cross-sectional dependence test results we obtained illustrate that BOP is mean reverting. It follows that the BOP will return to its trend path over time and the assumption of Mundell-Fleming model will be validated. These findings provide strong evidence for the assumption of Mundell-Fleming model.

Key words: Balance of payments, CIPS test, Mundell-Fleming model

INTRODUCTION

The Mundell-Fleming (M-F) model has been significant in much of the professional work on open macroeconomics since Mundell (1962, 1963) and Fleming (1962). In 1999, Nobel Prize in economics was awarded to the M-F model. The M-F model is an extension of the IS-LM model in that it includes a demonstration of how the exchange rate and the flows of net exports are determined. M-F model tries to clarify the responses of a small open economy and the limits in which it runs in a world of free capital movements.

One of the key assumptions of M-F model is that the Balance Of Payments (BOP) is zero in equilibrium; that is, the trade balance equals the net capital outflow. However, so far enough attention is hardly paid on the characteristic of BOP time series. If BOP is mean reverting, it follows that the BOP will return to its trend path over time and the assumption of M-F model is reasonable. On the other hand, if BOP follows a random walk process, any shock or innovation has a sustained effect. Thus, the future BOP cannot be predicted based on its historical movements and requires a modification in the analytical approach of M-F model (Lin and Wang, 2008).

To the best of our knowledge, the work of Lin and Wang (2008) is the first attempt to introduce whether BOP series are mean reverting or not. Using the quarterly observations for G7 countries from 1981:1 to 2006:3 period and performing the standard ADF unit root tests, they show that the BOP may follow a random walk process in some series. However, for most of the G7 countries, the BOP is trend stationary when the unit root tests are allowing for one structural break in the trend function. This implies that the assumption of M-F model about the equilibrium of BOP is appropriate.

The purpose of this study is to investigate whether BOP is mean reverting or not in OECD countries via panel unit root methodology. Considering the aforementioned M-F model, this study is designed to contribute to the validity of M-F model's key assumption by testing whether the balance of payments (BOP) is zero in equilibrium for OECD countries. What distinguishes this study from the previous ones is that Panel unit root tests are employed for the first time.

MATERIALS AND METHODS

The data set, comprises annual observations for 24 OECD countries among 30 OECD countries, is obtained from the International Monetary Fund's International Financial Statistics (IFS).

The sample period ranges from 1982 to 2007. In order to measure the equilibrium of BOP, two indexes, BOP1 and BOP2 are employed. BOP1 is obtained by summing up the net balance in current account, capital account and financial account. Allowing for the statistical discrepancy, the other index, BOP2 is defined as overall balance which adds the net errors and omissions to the previous BOP1.

Corresponding Author: Onur Gozbasi, Department of Business Administration, Faculty of Economics and Administrative Sciences, Erciyes University, 38039, Kayseri, Turkey Tel: +90-352-4374937/30111 Fax: +90-352-4375239

All the accounts in BOP series are measured in billions of US dollars. BOP1 and BOP2 series are deflated by the consumer price index of each country.

It is well known that traditional unit root tests possess low power against near unit root alternatives (Diebold and Nerlove, 1990). A popular test for verifying unit roots is the Augmented Dickey-Fuller (ADF) test in which the null hypothesis is non-stationarity. However, these statistics are applied to time series data sets. Therefore, the most effectual choice is the application of panel unit root test. The pioneer of the panel unit root is Abuaf and Jorion (1990). In an influential study of Abuaf and Jorion (1990) developed a multivariate unit root test based on systems estimation of autoregressive processes for a set of real exchange rate series and use this to reject the joint null hypothesis of non-stationarity of a number of real exchange rates.

First generation unit root tests (cross-sectional independence)

Im, Pesaran and Shin's panel unit root test: The Im *et al*. (2003) IPS hereafter is based on the traditional augmented Dickey Fuller specification:

$$\Delta y_{it} = \mu_i + \delta_i t + \rho_i y_{it-1} + \sum_{k=1}^{p_i} \gamma_{ik} \Delta y_{it-k} + v_{it} \qquad (1)$$

IPS allows for a heterogeneous coefficient of y_{it-1} and proposes a testing procedure based on averaging individual unit root test statistics.

The null hypothesis is given by the existence of a unit root in all the units of the panel against the alternative of at least one stationary cross-section.

To test the hypothesis, IPS proposes a standardized t-bar statistic given by:

$$Z_{tbar} = \frac{\sqrt{N}\left\{tbar_{NT} - \frac{1}{N}\sum_{i=1}^{N} E\left[t_{iT}(p_i, 0) \mid \beta_i = 0\right]\right\}}{\sqrt{\frac{1}{N}\sum_{i=1}^{N} Var\left[t_{iT}(p_i, 0) \mid \beta_i = 0\right]}} \overset{T,N}{\Rightarrow} N(0,1) \qquad (2)$$

Levin, Lin and Chu t-test: The LLC test is carried out by estimating the following equation:

$$\Delta y_{i,t} = \alpha_{i,k} + \beta_i y_{i,t-1} + \sum_{l=1}^{L_i} \partial_l \Delta y_{i,t-1} + \varepsilon_{i,t} \qquad (3)$$

The panel OLS of the normalized residuals is run to obtain the β estimates. And LLC show that under the null hypothesis H_0: $\beta = 0$, the regression t-statistic (t_β) has a standard normal limiting distribution.

Second generation unit root tests (cross-sectional dependence): After the study of Abuaf and Jorion (1990), Levin and Lin (1992), O'Connell (1998) and Sarno and Taylor (1998) the panel unit root tests was improved by considering cross-sectional correlation. O'Connell (1998) was the first author to note that cross-sectional correlation in panel data will have negative effects on the Levin-Lin panel unit root test, making the test have substantial size distortion and low power.

Kristian (2005) studied the performance of the Levin-Lin test under cross-sectional correlation. In his DGP (Data Generation Processes), he controlled the magnitude of the correlation and found results similar to the results of O'Connell (1998).

Pesaran (2005) proposed the simple averages of the individual cross-sectional augmented ADF statistics (CIPS), based on a single common factor specification for the cross-correlation structure. Simulation results under the assumption of a single common factor and known autocorrelation order of the residuals demonstrate that the CIPS test performs very well. The Pesaran tests augment the standard ADF regressions with the cross section averages of lagged levels and first differences of the individual series (CADF).

The CADF tests which assume serial correlated errors are based on the t-statistics of the OLS estimate of β_1 in the following regression:

$$\Delta y_{it} = \mu_i + \delta_i t + \rho_i y_{it-1} + c_i \bar{y}_t + d_i \Delta \bar{y}_t + \sum_{k=1}^{p_i} \gamma_{ik} \Delta y_{it-k} + e_{it} \qquad (4)$$

$$CIPS(N,T) = N^{-1} \sum_{i=1}^{N} t_i(N,T) \qquad (5)$$

where, $t_i(N,T)$ the t-statistic of the coefficient of $y_{i,t-1}$ in the CADF regression for the ith countries.

RESULTS AND DISCUSSION

Both IPS and LLC unit root test results illustrate that BOP is mean reverting, it follows that the BOP will return to its trend path overtime and the assumption of Mundell-Fleming model is reasonable (Table 1).

The first generation of tests includes Levin *et al*. (2002) and Im *et al*. (2003), which are all constructed under the assumption that the individual time series in the panel are cross-sectionally independently distributed. On the

Table 1: First generation unit root tests

	IPS test result		LLC test result	
Test type	BOP1	BOP2	BOP1	BOP2
Individual intercept	-7.693*	-5.676*	-8.852*	-6.532*
Individual intercept and trend	-7.776*	-6.598*	-8.893*	-7.897*
None			-10.491*	-11.917*

*99% confidence level. To decide the number of lags, Modified Schwarz Information Criterion (MSIC) is used

Table 2: Second generation unit root test

CIPS test results			
BOP1		BOP2	
With intercept	With intercept and trend	With intercept	With intercept and trend
-2.271	-2.66	-2.846	-3.213

The distribution of the CIPS test is non-standard and the critical values for 1, 5 and 10% have been tabulated by Pesaran (2005) for different combinations of N and T. The critical values for the intercept case for 10, 5 and 1% significance levels are -2,070, 2.150 and 2.300, respectively. The critical values for the intercept and trend case for 10, 5 and 1% significance levels are -2.580, 2.660 and 2.810, respectively. And to decide the number of lags, Modified Schwarz Information Criterion (MSIC) is used

contrary a large amount of literature provides evidence of the co-movements between economic variables. To overcome this difficulty, a second generation of tests rejecting the cross-sectional independence hypothesis has been suggested.

In addition to the first generation unit root tests results with cross-sectional independence, if this survey considers the cross-sectional correlation by CIPS test, Table 2 displays similar results with IPS and LLC tests. Therefore, it is concluded that BOP is mean reverting, it follows that the BOP will return to its trend path overtime and the assumption of Mundell-Fleming model is reasonable. Results confirm the study of Lin and Wang (2008). They also concluded that the BOP is trend stationary when the unit root tests are allowing for one structural break in the trend function. This implies that the assumption of Mundell-Fleming model about the equilibrium of BOP is appropriate for G7 countries.

CONCLUSION

The Mundell-Fleming model has been significant in much of the professional work on open macro economics. One of the key assumptions of Mundell-Fleming model is that the balance of payments (BOP) is zero in equilibrium; that is, the trade balance equals the net capital outflow. This study is devoted to explore to see whether BOP is mean reverting in OECD countries or not. The results obtained in this research which are based on first and second generation panel unit root techniques indicate that BOP follows a stationary process for 24 OECD countries. These findings suggest that the assumption of Mundell-Fleming model is reasonable.

REFERENCES

Abuaf, N. and P. Jorion, 1990. Purchasing power parity in the long run. J. Finance, 45: 157-174.

Diebold, F.X. and M. Nerlove, 1990. Unit Roots in Economic Time Series a Selected Survey. In: Advances in Econometrics Co-integration Spurious Regressions and Unit Roots, Fomby, T. and G.F. Rhodes (Eds.). JAI Press, Greenwich, ISBN: 1-55938-038-1.

Fleming, M.J., 1962. Domestic financial policies under fixed and under floating exchange rates. Int. Monet. Fund Staff Pap., 9: 369-379.

Im, K.S., M.H. Pesaran and Y. Shin, 2003. Testing for unit roots in heterogeneous panels. J. Econometrics, 115: 53-74.

Kristian, J., 2005. Cross-sectional dependency and size distortion in a small-sample homogeneous panel data unit root test. Oxford Bull. Econ. Statist., 67: 369-392.

Levin, A. and C.F. Lin, 1992. Unit Root Tests in Panel Data Asymptotic and Finite Sample Properties. University of California, San Diego, pp: 93-23.

Levin, A., C.F. Lin and C.S.J. Chu, 2002. Unit root tests in panel data asymptotic and finite-sample properties. J. Econometrics, 108: 1-24.

Lin, M.Y. and J.S. Wang, 2008. Mean reversion of balance of payments g7 evidence from sequential trend break unit root tests. Econ. Bull., 6: 1-10.

Mundell, R., 1962. The appropriate use of monetary and fiscal policy under fixed exchange rates. Int. Monet. Fund Staff Pap., 9: 70-79.

Mundell, R., 1963. Capital mobility and stabilization policy under fixed and flexible exchange rats. Can. J. Econ. Polit. Sci., 29: 475-485.

O'Connell, P., 1998. The overvaluation of purchasing power parity. J. Int. Econ., 44: 1-19.

Pesaran, M.H., 2005. A Simple Panel Unit Root Test in the Presence of Cross Section Dependence. Cambridge University DAE, Cambridge.

Sarno, L. and M. Taylor, 1998. Real exchange rates under the recent float unequivocal evidence of mean reversion. Econ. Lett., 60: 131-137.