



Purchasing power parity for fifteen Latin American countries: Stationary test with a Fourier function

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ARTICLE INFO

Article history:

Received 2 July 2010

Received in revised form 3 February 2011

Accepted 7 March 2011

Available online 13 March 2011

JEL classification:

C23

F31

Keywords:

Purchasing power parity

Stationary test

Fourier function

Latin American countries

ABSTRACT

This study applies a stationary test with a Fourier function, proposed by Becker et al. (2006), to test the validity of long-run purchasing power parity (PPP) in fifteen Latin American countries over the period of December 1994 to February 2010. The empirical results from the univariate unit root tests indicate that PPP does not hold for these fifteen countries under study. However, a stationary test with a Fourier function indicates that PPP is valid for four of these 15 Latin American countries and they are Brazil, Chile, Ecuador and Uruguay. These results have important policy implications for these fifteen Latin American countries under study.

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1. Introduction

During much of the past few decades, a plethora of studies has centered on the investigation of the stationarity of the real exchange rate (O'Connell, 1998; Taylor and Sarno, 2001). The results from such studies are not only valuable for empirical researchers and policy makers, but they have also unveiled extremely important implications in international finance. To be more to the point, a non-stationary real exchange rate indicates that any long-run relationship between the nominal exchange rate and domestic and foreign prices is virtually non-existent, therefore invalidating the theory of purchasing power parity (hereafter, PPP). In this event, PPP cannot be used to determine the equilibrium exchange rate; what's more, the invalidation of PPP disqualifies any monetary approach to determining the exchange rate since that would necessitate that PPP holds true.

Empirical evidence of PPP on the stationarity of the real exchange rate is abundant, but unfortunately, thus far, the consensus has not yet reached. For details about previous studies, see the work of Taylor (1995), Taylor and Sarno (1998), Sarno and Taylor (2002), Lothian and Taylor (2000, 2008) and Wu, Cheng, and Hou (2011) who have provided in-depth information on the theoretical and empirical aspects of PPP and the real exchange rate.

While some empirical evidence of long-run PPP for both developed countries and less developed countries seems convincing, unfortunately thus far none has been proven to be conclusive. As for methodology, recent studies of long-run PPP have mostly

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utilized conventional unit root tests such as the augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) – fail to reject the unit root hypothesis of the real exchange rate. For previous studies, one possible explanation for the inconsistencies in the existing empirical evidence on the PPP hypothesis is that the prior studies implicitly assume that exchange rate behavior is inherently linear in nature. However, Sarno (2000) and Baharumshah, Lau, and Nziramasanga (2010); Baharumshah, Liew, and Chowdhury (2010) demonstrate that the adoption of linear stationarity tests is inappropriate for the detection of mean reversion if the true process of the data generation of the exchange rate is in fact a stationary non-linear process. Taylor (2001) indicates that the power of the conventional ADF test is poor if the series follow a non-linear threshold process. To do that, the non-linear unit root test based on an exponential smooth transition autoregressive (ESTAR) proposed by Kapetanios, Shin and Snell (2003) and it shows that the power of their test is higher than that of the ADF test. The omission of some structural breaks is a possible cause of the traditional unit root tests failing to reject the unit root null for real exchange rate. Perron (1989) argued that if there is a structural break, the power to reject a unit root decreases when the stationary alternative is true and the structural break is ignored. Meanwhile, structural changes present in the data generating process, but have been neglected, sway the analysis toward accepting the null hypothesis of a unit root. As we know that exchange rates might be affected by internal and external shocks generated by structural changes may be subject to considerable short-run variation. It is important to know whether or not the real exchange rate has any tendency to settle down to a long-run equilibrium level, because PPP hypothesis requires that real exchange rate evolves around a constant or a time trend. If real exchange rate is found stationary by using unit root test with structural break (s), the effects of shocks such as real and monetary shocks that cause deviations around a mean value or deterministic trend are only temporary. Then, PPP is valid in the long run. Marcela, Gadea, and Serrano (2003), Narayan (2005), and Narayan (2006) provide evidence that, when structural breaks are included for individual countries, real exchange rate is stationary, implying support for purchasing power parity.

As discussed, traditional unit root tests lose power if structural breaks are ignored in unit root testing. The general method to account for breaks is to approximate those using dummy variables. This poses a serious problem for practitioners since important macroeconomic variables can display a wide variety of structural breaks of unknown number, duration and form. A researcher who is unsure about whether a series is stationary is unlikely to know the proper way to model the potential breaks. Busetti and Harvey (2001), Kurozumi (2002), Presno and Lopez (2003), Harvey and Mills (2003), and Busetti and Taylor (2003) modify the standard Kwiatkowski, Phillips, Schmidt and Shin (KPSS, 1992) test by including dummy variables to capture changes in the level and trend. Note that all these papers require that the break(s) be sharp and time dummies might not capture the nature of the breaks. Otherwise, this approach has several undesirable consequences. First, one has to know the exact number and location of the breaks. These are not usually known and therefore need to be estimated. This in turn introduces an undesirable pre-selection bias (see Maddala and Kim, 1998). Second, current available tests account only for one to two breaks. Third, the use of dummies suggests sharp and sudden changes in the trend or level. However, for low frequency data it is more likely that structural changes take the form of large swings which cannot be captured well using only dummies. Breaks should therefore be approximated as smooth and gradual processes (see Leybourne et al., 1998). These arguments motivate the use of a recently developed set of unit root and stationarity tests that avoid this problem. Becker, Enders, and Lee (2006), Enders and Lee (2009), and Christopoulos and Leon-Ledesma (2010) develop tests which model any structural break of an unknown form as a smooth process via means of Flexible Fourier transforms (i.e., an expansion of a periodic function in terms of an infinite sum of sines and cosines). Several authors, including Becker, Enders, and Lee (2004), Christopoulos and Leon-Ledesma (2010), Enders and Lee (2009), and Gallant (1981), show that a Fourier approximation can often capture the behavior of an unknown function even if the function itself is not periodic. The authors argue that their testing framework requires only the specification of the proper frequency in the estimating equations. By reducing the number of estimated parameters, they ensure the tests have good size and power irrespective of the time or shape of the break.

The present empirical study contributes significantly to this field of research by using the stationary test with a Fourier function, proposed by Becker et al. (2006), to determine whether long-run PPP exists in a sample of Latin American countries.¹ As we know that these countries share some characteristics as high inflation, nominal shocks, and trade openness which might have led to quicker adjustment in relative prices and contributed for PPP to hold. To the best of our knowledge, this study is the first of its kind to utilize the stationary test with a Fourier function to test the long-run PPP in these 15 Latin American countries. The empirical results indicate that PPP does not hold true for most of Latin American countries studied, with the exception of Brazil, Chile, Ecuador and Uruguay. Our results have important policy implications for these 15 Latin American countries under study.

The plan of this paper is organized as follows. Section 2 presents the data used in our study. Section 3 first outlines the methodology we employ and then discusses the empirical findings. Finally, Section 4 reviews the conclusions we draw.

2. Data

The monthly end-of-period nominal exchange rate and CPIs in this empirical analysis are obtained from the Datastream International. Among a sample of these 15 Latin American countries includes Argentina, Bolivia, Brazil, Chile, Columbia, Costa Rica, Domanic, Ecuador, Haiti, Honduras, Mexico, Paraguay, Peru, Uruguay, and Venezuela. The sample period is from 1994:M12 to 2010:M2. It is the reason that the majority of studies that favor long-run PPP find empirical estimates of the persistence of PPP

¹ Here, we use a KPSS-type stationarity test since tests with the null of a unit root have low power with stationary, but persistent data. The problem of low power is exacerbated when a theory, such as purchasing power parity or the convergence of growth rates across nations, can be more naturally tested under the null of stationarity. Stationarity tests are also useful since they can be used to confirm results from unit-root tests with a stationary alternative.

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