Validity of purchasing power parity for selected Latin American countries: Linear and non-linear unit root tests[☆]

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Abstract

The aim of this study is to examine empirically the validity of PPP in the context of unit root tests based on linear and non-linear models of the real effective exchange rate of Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. For this purpose, we apply the Harvey et al. (2008) linearity test and the non-linear unit root test (Kruse, 2011). The results show that the series with linear characteristics are Argentina, Brazil, Chile, Colombia and Peru and those with non-linear characteristics are Mexico and Venezuela. The linear unit root tests indicate that the real effective exchange rate is stationary for Chile and Peru, and the non-linear unit root tests evidence that Mexico is stationary. In the period analyzed, the results show support for the validity of PPP in only three of the seven countries.

Resumo

O objetivo deste estudo foi examinar empiricamente a validade da PPC em um contexto de teste de raiz unitária linear e não linear para a taxa de câmbio real efetiva dos países Argentina, Brasil, Chile, Colômbia, México, Peru e Venezuela. Para tanto, o procedimento adotado foi o teste de linearidade das séries através da abordagem de Harvey et al. (2008) e, após a identificação da linearidade das séries, para as não lineares procedeu-se o teste de raiz unitária não linear de Kruse (2011) e para as séries lineares adotou-se os testes padrão de raiz unitária, Ng–Perron (2001) e de quebra estrutural. Os resultados evidenciaram que as séries com características lineares são Argentina, Brasil, Chile, Colômbia e Peru e não lineares México e Venezuela. Os testes de raiz unitária

lineares indicaram a taxa de câmbio real efetiva é estacionária para Chile e Peru e o teste não linear para o México. Portanto, para o período de tempo analisado os resultados evidenciaram a validade da PPC apenas para três países dos sete analisados.

1. Introduction

The hypothesis that changes in the long-term nominal exchange rate follow a difference in the relative prices of two countries, i.e. the hypothesis of purchasing power parity (PPP), is a cornerstone of a series of macroeconomic models and has been a controversial topic in empirical terms in international economics (Sarno, 2005). Another issue regarding the importance of the study of PPP would be the use of PPP as a reference for the real exchange rate of long-term equilibrium, which would allow the assessment of the degree of misalignment of the real exchange rate. Moreover, the validity of the PPP hypothesis is required for the comparison of real income between countries.

Empirical studies of the validity of the PPP hypothesis developed *pari passu* with the advancement of econometric techniques. In the 1980s, the unit root test of the real exchange rate and the real effective exchange rate using the approach of Dickey and Fuller was the standard approach. However, this unit root test suffered from low power (Enders and Granger, 1998; Lothian and Taylor, 1996). To solve the problem of the low power of the traditional unit root tests, a strategy involving the use of long-span data was considered (Taylor, 2002). However, the use of data over a time span as long as a century suffers from the existence of changes in exchange rate regimes; among other problems are real shocks that can cause structural breaks or changes in the exchange rate equilibrium.

Recent developments in econometrics panel data have been employed in the empirical tests of the PPP hypothesis. A potential problem with the panel unit root test is that the null hypothesis of this test is usually that all the series are generated by unit root process (Taylor et al., 2001). To overcome this potential problem of the panel unit root test, the use of the seemingly unrelated regressions augmented Dickey–Fuller panel (SURADF), which investigates the null hypothesis of a unit root for the panel and separately for each individual panel, has grown. The SURADF panel identifies how many and which series in the panel are a stationary process (He et al., 2014).

In recent years, the effect of non-linearity in the generation data process has become popular in studies of the validity of PPP. With respect to the unit root test for the real exchange rate and the real effective exchange rate in a non-linear context, see the work of Bahmani-Oskooee and Gelan (2006), Bahmani-Oskooee et al. (2008), Cuestas and Regis (2013), Divino et al. (2009), He et al. (2014), Kapetanios et al. (2003), Kruse (2011), Su et al. (2011), Su et al. (2014) and Taylor (2009), among others, who have provided in-depth information on the theoretical and empirical aspects. Another approach is the analysis of cointegration between the nominal exchange rate and the domestic and foreign prices (Bahamani-Oskooee and Hegerty, 2009; Chang et al., 2011; Drine and Rault, 2008; Liew et al., 2010; Taylor and Taylor, 2004; among others).

In this direction, Enders and Dibooglu (2001), Enders and Granger (1998) and Sollis (2009) highlight non-linearity and asymmetry as price rigidity for reductions and emphasize the fact that they do not occur for price increases in the adjustment process of the PPP. Thus, non-linear models treat the problem of the low power of the linear unit root and linear cointegration tests. Other grounds for the real exchange rate exhibiting non-linear behavior in the process of adjusting the PPP would be central bank intervention in the foreign exchange market, resulting in an asymmetric adjustment of the nominal exchange rate (Krugman, 1991; Taylor, 2004) and transaction costs that inhibit the international process of goods arbitrage (Michael et al., 1997; Sercu et al., 1995). Therefore, as stated by Kim and Moh (2010), the results of weak empirical evidence of the validity of the PPP hypothesis can be attributed to misspecification of the unit root and cointegration tests when they fail to consider the issue of non-linearity in the exchange rate.

Considering the increase interest in testing the PPP hypothesis in developing countries (Bahmani-Oskooee et al., 2008; Drine and Rault, 2008; Su et al., 2014) and that Latin American countries present some characteristics as trade openness, nominal shock and high inflation which might have led to contributed for PPP to hold (He et al., 2014; Su et al., 2011) the aim of this empirical study is to analyze the validation of PPP in its absolute version, considering the real effective exchange rate for principal Latin American countries from January 1994 to April 2014. The seven selected