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Purchasing power parity in transition countries: Old wine with new bottle

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ABSTRACT

This study questions whether the long-run purchasing power parity (PPP) holds in the transition economies (Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romanian, and Russia) for the period from January 1995 to October 2011. We employ the Sequential Panel Selection Method (SPSM) procedure using the Panel KSS unit root test with a Fourier function, a novel approach to panel unit root testing. The SPSM approach classifies the whole panel into a group of stationary and non-stationary series and is able to account for structural breaks, nonlinearity, and cross-section dependence. The results indicate that the PPP holds true for more than half of these transition countries studied, with the exception of Hungarian, the Czech Republic and the Russia. The findings have important policy implications for the transition countries.

1. Introduction

Purchasing power parity (hereafter, PPP) remains a cornerstone of many theoretical models in international finance. PPP states that the exchange rates between two currencies are in equilibrium when the purchasing power is the same in both countries. This means that the exchange rate between any two countries should equal the ratio of two currencies' price level of a fixed basket of goods and services. The basic idea behind the PPP hypothesis is that because any international goods market arbitrage should be traded away over time, we should expect the real exchange rate to return to a constant equilibrium value in the long run. Studies on this issue are critical not only for empirical researchers but also for policymakers. In particular, a non-stationary real exchange rate indicates that there is no long-run relationship between nominal exchange rate, domestic prices and foreign prices, thereby invalidating the PPP. Hence, PPP cannot be used to determine the equilibrium exchange rate. Furthermore, an invalid PPP also disqualifies the monetary approach from exchange rate determination, which requires PPP to hold true.

Given the importance of the PPP hypothesis in open economy macroeconomic models and for constructing fundamental equilibrium exchange rates, the long-run PPP relationship has been empirically investigated during the last decade (Cerrato and Sarantis, 2007). Empirical evidence on the stationarity of real exchange rates is abundant, but inconclusive so far. For details on previous studies, please refer to the works of Taylor (1995), Rogoff (1996), MacDonald and Taylor (1992), Taylor and Sarno (1998), Sarno and Taylor (2002), Taylor and Taylor (2004), and Lothian and Taylor (2000, 2008), who have provided in-depth information on the theoretical and empirical aspects of PPP and the real exchange rate. The most common approach in testing the PPP hypothesis is to utilize the unit root test(s) on the real exchange series. Recent studies have been reported that conventional unit root tests not only fail to consider information across regions, thereby leading to less efficient estimations, but also have lower power when compared with near-unit-root but stationary alternatives (Taylor and Sarno, 1998; Maddala and Wu, 1999; Levin et al., 2002; Im et al., 2003). It is not surprising that these factors have induced considerable doubt upon earlier findings, which are based on a unit root test on the real exchange rate. In order to increase the power in

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testing for a unit root, many researchers have employed panel data. Levin et al. (2002) and Im et al. (2003), for instance, have developed the asymptotic theory and the finite-sample properties of ADF tests to be employed within the panel data. These two tests have significantly improved power even in relatively small panels. However, Taylor and Sarno (1998) and Breuer et al. (2001) have shown that the "all-or-nothing" nature of the tests has not been fully addressed by recent methodological refinements to the Levin et al. (2002) test.

Although Im et al. (2003), Maddala and Wu (1999) and Taylor and Sarno (1998) developed tests that permit the autoregressive parameters to differ across panel members under the stationary alternative, they are not informative in terms of the number of series that are stationary processes when the null hypothesis is rejected. The reason is simple: they are not joint tests of the null hypothesis. In this regards, Breuer et al. (2001) claim that, by analogy to a simple regression, when an F-statistic rejects the null that a vector of coefficients is equal to zero, it is not necessarily true that each coefficient is nonzero. Likewise, when the unit-root null hypothesis is rejected may not completely justify that all series in the panel can be assumed stationary.[1] In contrast to those panel-based unit root tests that are joint tests of a unit root for all members of a panel, which are incapable of determining the mix of I (0) and I (1) series in a panel setting, the Sequential Panel Selection Method (hereafter, SPSM), proposed by Chortareas and Kapetanios (2009), classifies a whole panel into a group of stationary series and a group of non-stationary series. In so doing, they clearly identify how many and which series in the panel are stationary processes.

When testing the PPP hypothesis, in addition to conducting more powerful methods such as panel unit root tests, one of the important issues to consider possible structural breaks. Perron (1989) argued that if there is a structural break, the power to reject a unit root decreases when the stationary alternative is true, as a result the structural break is ignored. Meanwhile, structural changes presented in the data generating process that 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 the PPP hypothesis requires that real exchange rate revolves around a constant or a time trend. If the real exchange rate is found stationary by using the unit root test with structural break(s), as a result the effects of shocks such as real and monetary shocks that cause deviations around a mean value or deterministic trend to be only temporary. Therefore, PPP will be valid in the long run. Marcela et al. (2003a,b) and Narayan (2005, 2006) provide evidence showing when structural breaks are included for individual countries, the real exchange rate is stationary, which supports the purchasing power parity.

As the aforementioned, 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. However, 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. Nunes et al. (1997), Lee and Strazicich (2003) and Kim and Perron (2009), among others, demonstrate that such tests suffer from serious power and size distortions due to the asymmetric treatment of breaks under the null and alternative hypotheses. 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 with smooth and gradual processes (see Leybourne et al., 1998). These arguments motivate the use of a recently developed set of unit root and stationary tests that avoid this problem. Both Becker et al. (2004, 2006) and Enders and Lee (2012) develop tests which model any structural break of an unknown form as a smooth process via means of Flexible Fourier transforms. Several authors, including Gallant (1981), Becker et al. (2004) and Enders and Lee (2012), Pascalau (2010), and Christopoulos and Leon-Ledesma (2010), 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.

Recently, there is a growing consensus that real exchange rate exhibits nonlinearities and, consequently, conventional unit root tests, such as the Augmented Dickey Fuller (ADF) test, have low power in detecting the mean reversion of exchange rate. A number of studies have provided empirical evidence on the nonlinear adjustment of exchange rate.[2] However, the finding of nonlinear adjustment does not necessarily imply nonlinear mean reversion (stationarity). Thus, stationarity tests based on a nonlinear framework must be applied. Ucar and Omay (2009) propose a nonlinear panel unit root test by combining the nonlinear framework in Kapetanios et al. (2003, hereafter, KSS) with the panel unit root testing procedure of Im et al. (2003), which has been proved to be useful in testing the mean reversion of real exchange rate.

Another issue to consider in examining the PPP hypothesis is to take into account for cross-sectional dependence among the exchange rates. O'connell (1998) showed that failing to control for cross-sectional dependence in the panel data studies has dramatic consequences. As argued by Bai and Kao (2006), the assumption of cross-sectional independence is difficult to satisfy that neglecting this information in panel data setting causes bias and inconsistency. In some recent studies Basher and Carrion-i-Silvestre (2008) and Basher et al. (2009) provide further evidence of which in addition to structural breaks, cross-sectional dependence is crucial in the investigation of the PPP hypothesis.

This study tests for the validity of PPP hypothesis for a sample of transition countries (i.e., Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and the Russia) during the period January 1995–October 2011 by utilizing the recently developed the Panel KSS unit root test with a Fourier function based on the Sequential Panel Selection Method (SPSM) procedure. The transition countries have recently moved from centrally planned economies toward market driven economies

[1] Both Taylor and Sarno (1998) and Karlsson and Lothgren (2000) argued that panel tests can have high power even when a small fraction of the series is stationary. In other words, when the null hypothesis is rejected, we should not conclude that all the series in the panel are stationary.

[2] Reasons for the nonlinear adjustment are the presence of transactions costs that inhibit international goods arbitrage and official intervention in the foreign exchange market may be such that nominal exchange rate movements are asymmetric (see Taylor, 2004; Taylor and Peel, 2000; Taylor et al., 2001; Juvenal and Taylor, 2008; Reitz and Taylor, 2008). Kilian and Taylor (2003) also suggest that nonlinearity may arise from the heterogeneity of opinion in the foreign exchange market concerning the equilibrium level of the nominal exchange rate: as the nominal rate takes on more extreme values, a great degree of consensus develops concerning the appropriate direction of exchange rate moves, and traders act as accordingly.