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Purchasing power parity in transition countries: Sequential panel selection method

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ABSTRACT

This study applies the Sequential Panel Selection Method (SPSM), proposed by Chortareas and Kapetanios (2009) to test the validity of long-run purchasing power parity (PPP) for a sample of 14 transition countries, using real effective exchange rates, from 1994 to 2012 (for both monthly and quarterly data). SPSM classifies the whole panel into a group of stationary series and a group of non-stationary series. In doing so, we can clearly identify how many and which series in the panel are stationary processes. Empirical results from the SPSM using the Panel KSS unit root test (Ucar and Omay, 2009) with a Fourier function indicate that PPP holds true for most of these transition countries studied. Our results have important policy implications for these transition countries under study.

1. Introduction

During much of the past several decades, a huge number of studies have centered on the investigation of the stationarity of the real exchange rate (see, for example, Taylor, 2004; Taylor and Peel, 2000; Taylor et al., 2001).[1] Not only are the results from studies in this regard critical for both empirical researchers and policymakers alike but also have extremely important implications in international finance. To be more specific 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 determine the exchange rate since that would necessitate that PPP holds true.

Granted that numerous studies have found support a unit root in real exchange rates, but critics have staunchly contended that the drawing such a conclusion may be attributed to the lower power of the conventional unit root tests employed when compared with near-unit-root but stationary alternatives. More than that, conventional unit root tests have reportedly failed to consider information across regions, thereby yielding less efficient estimations. It should therefore not be unexpected that these shortcomings have seriously called into questions many of the earlier findings which are based on a unit root in real exchange rates. In this regards, the first generation panel-based unit root tests—Levin–Lin–Chu (Levin et al., 2002), the Im–Pesaran–Shin (Im et al., 2003), and the MW (Maddala and Wu, 1999) tests are developed. A serious drawback of the first generation panel-based unit root tests is that they do not take (possible) cross-sectional dependencies into account in the panel-based unit root test procedure. Hence, the second generation panel-based unit root tests of Bai and Ng (2004), Choi (2002), Moon and Perron (2004), and Pesaran (2007) are proposed in the literature. However, they are not informative in terms of the number of series that are stationary processes when the null hypothesis is rejected.

To classify a whole panel into a group of stationary series and a group of non-stationary series, this paper adopts the Sequential Panel Selection Method (hereafter, SPSM), proposed by Chortareas and Kapetanios (2009). This method uses a sequence of panel unit root tests to distinguish between stationary and non-stationary series. For a panel such as the data in this study, remarked by Chortareas and Kapetanios (2009), if more than one series are actually non-stationary

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[1] 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 Taylor (2004), Taylor (2004), Lothian and Taylor (2008), and Juvenal and Taylor (2008) who have provided in-depth information on the theoretical and empirical aspects of PPP and the real exchange rate.

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then the use of panel methods to investigate the unit root properties of the set of series may indeed be more efficient and powerful compared to univariate methods. This method first implements a panel unit root test to all time series in the panel and if the null is not rejected we accept the non-stationarity hypothesis and the procedure stops. If the null is rejected then we remove the one with the minimum individual DF t-test (or KSS statistic in our study) from the set of series and redo the panel unit root test on the remaining set of series. The procedure is continued until either the test does not reject the null hypothesis or all the series are removed from the set. The end result is a separation of the set of variables into a set of stationary variables and a set of non-stationary variables.

In each trial of SPSM, we develop tests for unit roots that account jointly for structural breaks and non-linear adjustment. Structural breaks are modeled by means of a Fourier function that allows for infrequent smooth temporary mean changes. 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. 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), show that a Fourier approximation can often capture the behavior of an unknown function even if the function itself is not periodic. Nonlinear adjustment is modeled by means of an ESTAR model for the 'band of inaction' where time series data may revert to their mean only when they are sufficiently far away from it but behave as non-stationary processes when they are close to their mean.[2] Ucar and Omay (2009) proposed a nonlinear panel unit root test by combining the nonlinear framework in Kapetanios et al. (2003, KSS) with the panel unit root testing procedure of Im et al. (2003), which has been proven to be useful in testing the mean reversion of time series.

Hence, this empirical study applies Panel KSS unit root test with a Fourier function, based on the Sequential Panel Selection Method (SPSM) procedure, to test the validity of long-run PPP for a sample of 14 transition countries. These 14 transition countries started their liberalization programs in the late 1980s and early 1990s. In some of these countries this period was characterized by dramatic improvements in budget deficits, debts and inflation. As these countries became increasingly open to trade (and inflation and growth rates converged to those of developed countries), we would expect to find more favorable evidence of the parity condition using data for recent years. A survey by the Organization for Economic Cooperation and Development (OECD, 1994) has pointed out that even early in the transition processes, international firms were impressed by how well these countries had adjusted after the transition and by their commitment to the newly adopted market system. In fact, many of these countries adopted trade policies that mimic those of the European Union (EU), with a view to alignment in readiness for membership. As the reform process (price liberalization and trade opening) intensified, we could expect a reduction in persistent shocks to international parity.

The plan of this paper is organized as follows. Section 2 presents the data used in our study. Section 3 first briefly describes the SPSM test proposed by Chortareas and Kapetanios (2009) and then presents our empirical results. Section 4 concludes the paper.

2. Data

Our empirical analysis covers the 14 transition countries: Austria, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovenia, and Slovak Republic. Both monthly and quarterly real effective exchange rate data sets are employed in our empirical study, and the time span is from 1994 to 2012. While previous studies use bilateral real exchange rate against the U.S. dollar, in our study we use real effective exchange rate, which is a more comprehensive stage to test PPP because they indicate movement in the overall value of a country's currency rather than a movement against the currency of only one trading partner embodied in the bilateral real exchange rate. Testing whether the real effective exchange rate follows nonstationary mean-reverting behavior is also a test of the multi-country version of PPP, rather than that of PPP based on a bilateral trading partner (see, Bahmani-Oskooee et al., 2008).

3. Methodology and empirical results

3.1. Sequential Panel Selection Method (SPSM) using Panel KSS unit root test with a Fourier function

As we stated earlier, 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 mean reversion of exchange rate. A number of studies have provided empirical evidence on the nonlinear adjustment of exchange rate. However, the finding of nonlinear adjustment does not necessarily imply nonlinear mean reversion (stationarity). As such, stationarity tests based on a nonlinear framework must be applied. Ucar and Omay (2009) proposed a nonlinear panel unit root test by combining the nonlinear framework in Kapetanios et al. (2003, KSS) with the panel unit root testing procedure of Im et al. (2003), which has been proven to be useful in testing the mean reversion of 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.[3] Therefore, the Sequential Panel Selection Method (SPSM) proposed by Chortareas and Kapetanios (2009), mixed with the Panel KSS unit root tests with a Fourier function, were used to test for long-run PPP for a sample of 14 transition countries in our study.

In line with Kapetanios et al. (2003), the KSS unit root test is based on detecting the presence of non-stationarity against a nonlinear but globally stationary exponential smooth transition autoregressive

[2] The presence of nonlinear mean-reverting adjustment for real exchange rates has been advanced by recent theoretical developments that emphasize the role of transaction costs. Taylor et al. (2001), Taylor and Peel (2000), Juvenal and Taylor (2008) and Lothian and Taylor (2008) have argued that different speeds of adjustment at the disaggregated goods level average up to nonlinearity at the aggregate level. An alternative view is that nonlinearity at the aggregate level is caused by other influences, such as the effects of official foreign exchange intervention (Menkhof and Taylor, 2007; Reitz and Taylor, 2008; Taylor, 2004) or heterogeneous agents (Kilian and Taylor, 2003). 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 majority of the models adopted in the prior empirical studies addressing the issue of equilibrium have generally failed to take into account the non-linear properties of the adjustment process; however, as noted by Laxton et al. (1993), both bias and mistakes are increasingly likely when a linear and symmetrical methodology is adopted to test economic variables that are non-linear and asymmetric.

[3] As we know, exchange rates might be affected by internal and external shocks generated by structural changes which 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. querylf 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 are to be only temporary. Therefore, PPP will be valid in the long run. Marcela et al. (2003) 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.