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Panel unit root tests of purchasing power parity for price indices

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Abstract

This paper adopts four panel unit root tests to evaluate PPP over the floating period for six different price indices. Results generally support PPP, albeit the speeds of adjustment differ considerably between price indices and test procedures. The degree of contemporaneous and serial correlation as well as heterogeneity of the series in the panel affect stationarity and the speed of mean reversion. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Introduction

Purchasing Power Parity (PPP) remains the benchmark model for long run nominal exchange rate determination since Cassel's (1916) pioneering work despite mixed empirical results. This paper examines some explanations for the conflicting results, which include lack of power of unit root tests, appropriate price indices, the degree of cross correlation and heterogeneity of the series in the panel. We adopt the four panel unit root tests developed by Abauf and Jorian (1990), Levin and Lin (1993), Im et al. (1997) and Maddala and Wu (1997) to evaluate real exchange rate stationarity over the floating period, because univariate unit root tests often lack sufficient power in relatively small samples. These tests differ in their assumptions, asymptotic and finite sample properties as well as their implications for PPP. Since price indices differ in their traded and nontraded components, which affect the arbitrage mechanism of PPP, we construct OECD real exchange rates using six different price

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measures. Thus, we focus on the robustness of real exchange rate stationary and half-lifes to alternative test procedures and examine the impact of cross correlation in the errors and heterogeneity on real exchange rate adjustment.

The panel tests possess important differences concerning the speeds of adjustment and testing for real exchange rate stationarity. The LL test (Levin and Lin, 1993) and the SUR procedure of Abauf and Jorian (1990) impose an identical first order autoregressive coefficient on all series in the panel and rejection of the null hypothesis implies that real exchange rates in all economies adjust at the same rate. The IPS (Im et al., 1997) and Fisher P_{λ} test (Maddala and Wu, 1997) allow for heterogeneous first order coefficients so that real exchange rates may adjust at different rates. In addition, contemporaneous and serial correlation can severely bias the panel tests toward under rejecting the null hypothesis (Maddala and Wu, 1997; Papell, 1997; O'Connell, 1998). This paper corrects for contemporaneous and serial correlation using common time effects as well as parametric and nonparametric bootstrap techniques. Further, we analyze the robustness of the results to heterogeneity in the panel as a subset of real exchange rates may adjust at considerably different rates. Following the procedure of Fleissig and Strauss (1997), we remove series that appear to possess different autoregressive processes from the rest of the panel, and find support for PPP with quicker mean reversion for most economies. The paper also examines whether domestic and foreign prices, denominated in a common currency, meet both the criteria of stochastic convergence (I (0) with drift) and absolute convergence (I(0) without drift).

Results from the panel unit root tests support PPP for most real exchange rate measures, although the speeds of adjustment differ substantially. Real exchange rates deflated by the price index for goods adjust most rapidly, possessing a half-life of 1–2 yr; whereas, real exchange rates deflated by rent, CPI, and services (when stationary) have half-lifes considerably longer. Additionally, correcting for both contemporaneous and serial correlation affects the stationarity results and the half-lifes. Similarly, we find that heterogeneity in the panel also changes the speed of adjustment.

2. Review of the literature

Much of the literature has found a random walk in real exchange rates and failed to support PPP for the floating exchange rate period (Frankel, 1981; Cumby and Obstfeld, 1984; Enders, 1988). See Breurer (1994) for a survey on the literature of PPP. A prominent explanation for the failure of PPP maintained by Balassa (1964) and Samuelson (1964) emphasizes that productivity differentials between traded and nontraded sectors lead to movements in the relative prices of nontradeables and real exchange rates. Hsieh (1982) and Asea and Mendoza (1994) using a neoclassical general equilibrium model empirically supported these propositions. However, Engel (1996) and Rogers and Jenkins (1995) find that the relative price of nontradeables has virtually no effect on US real exchange rate movements.

There are however a number of prominent works that support PPP. These papers