

# Long-run purchasing power parity with short-run data: evidence with a null hypothesis of stationarity

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## Abstract

We investigate long-run Purchasing Power Parity with data from the current floating exchange rate period by using tests where stationarity and cointegration are the null, rather than the alternative, hypotheses. In most cases, we cannot reject either the null hypothesis of stationarity of the real exchange rate or the null of cointegration between the nominal exchange rate and the domestic and foreign price levels. This constitutes evidence of long-run Purchasing Power Parity because, using the same tests, we can reject the null of stationarity for the nominal exchange rate. Confirmation of the results is provided by a Monte Carlo study. © 1999 Elsevier Science Ltd. All rights reserved.

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## 1. Introduction

Purchasing Power Parity (PPP) is the intuitively appealing idea that exchange rates should tend to equalize national price levels and, as such, serves as the basis for many open economy macroeconomic models. While it is clear that PPP does not

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hold as a short-run proposition, empirical support for it even as a long-run equilibrium condition is mixed.

Testing for long run PPP has been facilitated by advances in testing for unit roots and cointegration. These tests compare the null hypothesis that the real exchange rate follows a random walk against the alternative hypothesis that PPP holds in the long run. Alternatively, the null is no cointegration between the nominal exchange rate and the domestic and foreign price levels. In that case, the cointegration alternative only provides strong evidence of long run PPP if the proportionality and symmetry restrictions are satisfied.<sup>1</sup> The most commonly used tests are Augmented-Dickey-Fuller (ADF) tests for unit roots and Engle-Granger (EG) tests for cointegration.<sup>2</sup>

There has been a plethora of work using these tests, which is described in the recent surveys by Froot and Rogoff (1995) and Rogoff (1996). The most striking finding is that, using data from the current flexible exchange rate period, the unit root null is only infrequently rejected for real exchange rates when the United States dollar is the numeraire currency. While the no cointegration null, a weaker hypothesis, is rejected somewhat more often, the proportionality restrictions required for long run PPP are typically violated.<sup>3</sup>

The most common explanation for the failure to reject the unit root and no cointegration nulls is the low power of these tests over short time spans of data. Frankel (1986), Froot and Rogoff (1995) and Lothian and Taylor (1996) show that, using standard Dickey-Fuller tests, the post-Bretton Woods period is far too short to reliably reject the unit root null against a stationarity alternative. In response to these problems, researchers have turned to longer data sets, panel testing procedures, more powerful tests, and nonlinear methods.

Using longer data sets, Frankel (1986) and Lothian and Taylor (1996) report strong rejections of unit roots in real exchange rates. These studies, however, which use data from both fixed and flexible exchange rate periods, cannot answer the question of whether the unit root null would be rejected with a century of flexible exchange rate data.

In order to isolate the current flexible exchange rate period, researchers have turned to panel data procedures that gain power by exploiting both cross-sectional and time series variation. While Abuaf and Jorion (1990), Frankel and Rose (1996), Jorion and Sweeney (1996), Papell (1997), Papell and Theodoridis (1998a,b) and O'Connell (1998) provide additional evidence of PPP beyond what can be found by univariate

<sup>1</sup> We denote “weak” evidence of long run PPP if the no cointegration null is rejected but the proportionality and symmetry conditions are not satisfied. Steigerwald (1996) develops a test for PPP which generalizes the dynamic structure of unit root tests while retaining the proportionality and symmetry restrictions.

<sup>2</sup> Engle and Granger (1987) proposed several tests for cointegration. What we call EG tests are ADF tests on the residuals of the cointegrating vector.

<sup>3</sup> Froot and Rogoff (1995) distinguish between *trivariate* and *bivariate* cointegration tests, where the proportionality and symmetry conditions are relaxed in the former case. Trivariate tests can be considered tests of an even weaker version of PPP since they require only that some linear combination of exchange rates and prices be stationary.

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