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# Purchasing Power Parity in Developing Countries: Multi-Period Evidence Under the Current Float

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**Summary.** — Using panel unit root tests, we examine purchasing power parity (PPP) for US dollar real exchange rates of developing countries during the current floating rate period. Since evidence of PPP may vary from period to period, we examine the data for moving 10-year periods from 1976–85 up to 1990–99. We organize panels based on country characteristics influencing the validity of PPP. Those characteristics include openness, inflation, and the level and growth rate of per capita GDP. Although we find stronger evidence of PPP after 1980, our examination of panel data over 15 10-year periods yields only limited support for PPP.


*Key words* — purchasing power parity, panel unit root tests, developing countries

## 1. INTRODUCTION

Purchasing power parity (PPP) is an important and recurrent concept in international finance that underlies much of the existing literature on balance of payments and exchange rate determination. The PPP doctrine implies that we should be able to buy the same bundle of goods in any country for the same amount of a common currency. The underlying intuition is the law of one price, according to which international arbitrage equalizes prices across countries. While economists generally doubt the validity of PPP in the short run, they may be more willing to believe PPP's validity in the long run. Given PPP's far-reaching theoretical influence, it is not surprising that a large and growing empirical literature has emerged to examine the issue of whether PPP holds. This literature has given rise to two stylized facts. [1] First, in the short run, deviations from PPP are large and volatile. Second, although real exchange rates move toward PPP in the long-run, they do so only at extremely slow speeds. The second stylized fact casts some doubt as to whether PPP is valid even as a long-run proposition despite its seeming theoretical plausibility. The most we can say for the empirical validity of PPP in the long run is that it is far from settled and remains very controversial.

Another way of interpreting the PPP doctrine is that real exchange rates should be mean-reverting. That is, in response to any shock or disturbance, the real exchange rate must eventually return to its PPP-defined level. This is a useful interpretation because it is empirically testable. The baseline test involves testing for unit roots in real exchange rates using the augmented Dickey Fuller test. Rejection of the unit root hypothesis indicates mean reversion in real exchange rates. The numerous empirical studies along these lines rarely rejected the unit roots in real exchange rates. While it is possible to view such evidence as disfavoring PPP, Campbell and Perron (1991) point out that univariate unit root tests have relatively low power to reject the null hypothesis of unit roots when it is in fact false, especially for time-series data.

Increasing the span of the data by using either longer time horizons or panel data

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increases the power of the tests. But, using longer time horizon data entails additional problems such as encompassing both fixed and flexible exchange rate regimes. As a result, the focus of research has turned to implementing unit root tests in the context of panel data sets, an approach pioneered by Levin and Lin. [2] While using panel data significantly increases the power and size of unit root tests, empirical studies of this type still fail to provide convincing support for PPP. [3]

There could be systematic divergence from PPP, especially in developing countries. The well-known Balassa-Samuelson hypothesis offers an explanation for why PPP may not hold in high-growth and high-income countries. [4] In contrast, countries that are open and have high inflation could show stronger evidence of PPP. [5] The overall evidence of PPP, even though limited at best, seems to be stronger in some periods than others. [6] In this paper, we investigate the existence of unit roots in the US dollar real exchange rates of developing countries under the current float. More specifically, we do so in the context of panels based on country characteristics for moving 10-year periods during 1976–99. Our central objective is to test for the empirical validity of PPP in developing countries in different periods under the current float taking into account country characteristics.

Our data from developing countries yield only weak empirical support for PPP. We cannot reject the unit root hypothesis for the vast majority of panels in our study. This is in line with most existing studies, which tend to focus on data from developed countries. Our results also show stronger evidence of PPP after 1980 and are mostly consistent with theoretical predictions about the impact of country characteristics.

The remainder of our paper is organized as follows: in Section 2 we discuss our preliminary analysis of the data; in Section 3 we present the results of panel unit root tests of real exchange rates; and in Section 4 we conclude.

## 2. PRELIMINARY DATA ANALYSIS

In this study, we use the consumer price indexes (CPI) of 65 developing and 15 developed countries as domestic price indexes, with the US dollar as the numeraire currency. We follow Sachs and Warner's (1995) classification of developing and developed countries, which is based on a threshold of PPP-adjusted per capita real GDP of $5,000 in 1970. But, we reclassify Israel and Venezuela as developing rather than developed because they have many structural characteristics of developing countries. Both have experienced macroeconomic instability and opened up trade considerably later than developed economies.

Monthly CPI data and end-of-period nominal exchange rate data of most countries are from the International Financial Statistics (IFS-CD, May 2001). CPI data for Hong Kong, Taiwan, Ireland, and Iceland as well as nominal exchange rate data for Taiwan are from DataStream International. [7] For European Union (EU) member countries, we assume that nominal exchange rates for individual countries between January 1999 and December 1999 would have changed by the same percentage as the change in the euro during the same period. The time series of all variables are from January 1976 to December 1999. [8]

A common test of long run PPP is to examine if the real exchange rate has a unit root. The real exchange rate is calculated by

$$q = e + p^{*} - p, \tag{1}$$

where $q$ is the logarithm of the real exchange rate, $e$ is the logarithm of nominal exchange rate, $p$ is the logarithm of the domestic price index, and $p^{*}$ is the logarithm of the price index of the country chosen as the numeraire currency, in this case the United States.

As a preliminary step, we use the univariate ADF tests to examine the unit root null in the real exchange rates of developing and developed countries by running regressions on the following equation:

$$\Delta q_t = \mu + \alpha q_{t-1} + \sum_{i=1}^{k} c_i \Delta q_{t-i} + \varepsilon_t, \tag{2}$$

where $\Delta q_t$ is the first-difference of the logarithm of the real exchange rate and $k$ is the number of lagged first differences. [9] $k$ is determined according to the recursive $t$-statistic procedure proposed by Hall (1994). [10] We set the maximum of $k$ at 24, with significance determined at the 10% level of the asymptotic normal distribution. The null hypothesis is unit root and the alternative hypothesis is level stationarity. If the coefficient of the lag of the real exchange rate ($\alpha$) is significantly different from zero, then the null hypothesis is rejected.

Table 1 shows the results of the univariate ADF tests for the CPI-based real exchange