Purchasing power parity: Modeling and testing mean reversion

Lawrence G. Goldberg [a,*], Thomas F. Gosnell [b],
John Okunev [c]

[a] *Department of Finance, University of Miami, Miami, FL 33124, USA*
[b] *Department of Finance, Oklahoma State University, Stillwater, OK 74078, USA*
[c] *Lend Lease Investment Management, Sydney, Australia*

Abstract

A model of mean reversion of exchange rates to purchasing power parity is developed and tested where exchange rates are assumed to follow a mean reverting elastic random walk toward a stochastic PPP rate. The model recognizes the possibility that mean reversion towards PPP may be nonlinear which allows greater flexibility in the adjustment process. Regression equations consistent with the theoretical model are derived. The model is tested using long- and short-term data for six countries. While the results are generally consistent with the findings of previous studies, evidence is presented which demonstrates that the mean reversion process is not linear for some countries.

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* Corresponding author. E-mail: lgoldberg@sba02.msmail.miami.edu, Tel.: +1 305 284-1869. Fax: +1 305 284-4800.

1. Introduction

The theory of Purchasing Power Parity (PPP) provides a rationale for the behavior of exchange rates, the understanding of which is important for a number of reasons. The questions of whether exchange rates do adjust to equalize purchasing power across countries, and if so how fast they adjust, have major policy implications. PPP has been used by newly independent countries to set initial exchange rates. It has also been used to forecast real exchange rates for the medium and long term in various countries. [1] Understanding the adjustment process may lead to improved predictions that can benefit both policymakers and market participants. For example, the degree of adjustment to a purchasing power parity rate can guide government officials in deciding the appropriate monetary, fiscal, and exchange rate policies to be followed in adjusting macroeconomic variables such as the trade balance. Understanding the nature of the adjustment process for the exchange rate can also be useful in evaluating the relative merit of alternative exchange rate systems.

Previous studies of exchange rate adjustment have generally employed ad hoc frameworks of analysis with mixed empirical results. The earlier studies have generally supported a tendency for PPP to hold, while more recent studies have raised questions as to the validity of PPP as a guide to exchange rate behavior. These questions have been raised by the analysis of exchange rates in the short run – the period of floating exchange rates. The short-run analyses have generally failed to find support for PPP as a guide to behavior. Consequently, real exchange rates might be better characterized by a random walk than by a stationary autoregressive real exchange rate model.

In contrast with previous studies, this paper presents a model of the spot rate adjusting to a nonlinear functional form of the stochastic PPP rate which provides greater flexibility to the adjustment process. We explicitly allow the spot rate to move towards a moving target, the PPP rate. The model recognizes that the PPP rate is not fixed but is affected by numerous factors. A regression equation is derived from the model in order to test whether PPP holds. We test the model both in the short run (1973–1992) and in the long run (1914–1992 and 1900–1992). Similar to other studies we find evidence of mean reversion in the long term. However, we also provide evidence that this mean reversion process is nonlinear for some countries.

Section 2 of the paper presents a model of mean reversion towards PPP and briefly reviews some of the previous studies. The model derived explicitly provides a regression equation for empirical testing of the model. The equation tested contains variables similar to those used in previous studies, but it also contains additional variables due to the allowance for the adjustment process

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[1] Rogoff (1996, p. 649).