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Nonlinear adjustment to purchasing power parity in the post-Bretton Woods era

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Abstract

This paper models the dynamics of adjustment to long-run purchasing power parity (PPP) over the post-Bretton Woods period in a nonlinear framework consistent with the presence of frictions in international trade. We estimate exponential smooth transition autoregressive (ESTAR) models of deviations from PPP, which are obtained using the Johansen cointegration method, for both consumer price index (CPI) and wholesale price index (WPI) based measures and a broad set of US trading partners. In several cases, we find clear evidence of a mean-reverting dynamic process for sizable deviations from PPP, with the equilibrium tendency varying nonlinearly with the magnitude of disequilibrium. Analysis of impulse response functions also supports a nonlinear dynamic structure, but convergence to long-run PPP in the post-Bretton Woods era is very slow.

JEL classification: F32; C22

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1. Introduction

The doctrine of purchasing power parity (PPP) in its absolute form states that a common basket of goods, when quoted in the same currency, costs the same in

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all countries.[1] The parity condition rests on the assumption of perfect inter-country commodity arbitrage and is a central building block of many theoretical and empirical models of exchange rate determination.[2] Due to factors like transaction costs, taxation, subsidies, actual or threatened trade restrictions, the existence of nontraded goods, imperfect competition, foreign exchange market interventions, and the differential composition of market baskets and price indices across countries, one may expect PPP to be valid only in the long run.

Empirical studies over long periods have supported long-run PPP (Diebold et al., 1991; Taylor, 1996; Michael et al., 1997). However, results are mixed when the recent floating-rate period is examined. Using standard unit-root tests, Corbae and Ouliaris (1988), Meese and Rogoff (1988), Edison and Fisher (1991) and Grilli and Kaminsky (1991) cannot reject the unit-root null hypothesis for real exchange rates in the managed-float regime. In contrast, Pedroni (1995), Frankel and Rose (1996), Lothian (1997), Oh (1996), Wu (1996) and Papell and Theodoridis (1998) find strong evidence of mean reversion in real exchange rates by implementing panel data variants of standard unit-root tests.[3] However, O'Connell (1998a) strongly disputes these mean-reversion findings in real exchange rates as they fail to control for cross-sectional dependence in the data.[4] Additional evidence against reversion to PPP based on a panel of real exchange rates is reported in Engel et al. (1997). Papell (1997) and Liu and Maddala (1996) also find that evidence of mean reversion in panels of real exchange rates is very sensitive to the groups of countries considered.[5]

Recently, an alternative explanation bases the persistence of managed-float deviations from parity on the presence of market frictions that impede commodity trade. Dumas (1992), Uppal (1993), Sercu et al. (1995) and Coleman (1995) develop equilibrium models of real exchange rate determination which take into account transaction costs and show that adjustment of real exchange rates toward PPP is necessarily a nonlinear process.[6] Market frictions in international trade introduce a neutral range, or band of inaction, within which deviations from PPP are left uncorrected, as they are not large enough to cover transaction costs. Only deviations outside the neutral range are arbitraged away by market forces. In this dynamic equilibrium framework, deviations from PPP follow a nonlinear stochastic process that is mean-reverting.

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[1] Relative PPP, which is implied by absolute PPP, states that the growth rate in the nominal exchange rate equals the differential between the growth rates in home and foreign price indices.

[2] See Rogoff (1996) and Froot and Rogoff (1995) for a review of the literature on PPP.

[3] Employing an alternative multivariate unit-root test where the null hypothesis is nonstationarity of at least one of the series under consideration, Taylor and Sarno (1998) find strong support for mean reversion in a panel of CPI-based US dollar exchange rates of the G5 countries. However, their evidence is not supportive of mean reversion for GNP deflator- and PPI-based real exchange rates for the same panel of countries. Taylor and Sarno also point to a number of pitfalls when using panel unit-root tests.

[4] See Higgins and Zakrajsek (1999) for evidence contrary to that of O'Connell's.

[5] A summary of stylized facts regarding real exchange rate behavior in the post-Bretton Woods era is presented in Lothian (1998).

[6] Instead of assuming instantaneous trade, Coleman considers the case in which time elapses when goods are shipped between markets.