



Purchasing power parity-symmetry and proportionality: Evidence from 116 countries [☆]



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ABSTRACT

This paper examines the cointegration property of exchange rates and prices using techniques that have received limited attention in several studies on the validity of the Purchasing Power Parity (PPP) hypothesis. It provides comprehensive evidence on the PPP hypothesis using recent monthly data for 1971 through 2011 (i.e., 492 observations). The paper also explores the symmetry and proportionality conditions in PPP. In addition, estimates of the short-run dynamics are obtained for each country, utilizing the error-correction technique. Results from long-run cointegration analysis, short-run dynamics and half-lives, all provide evidence for long-run PPP. The symmetry condition is largely supported, and when imposed on prices, the proportionality condition is supported in a majority of cases.

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1. Introduction

One of the most important subjects in international finance is the theory of purchasing power parity (PPP), which asserts that prices in different countries should be equal when expressed in terms of the same currency. The key idea underlying this long-run theory is that exchange rate movements are largely determined by differences between domestic and foreign prices; therefore, when purchasing power in the two countries remains the same, the exchange rates between currencies are in equilibrium. It follows that the possibility of deviations in the short term is allowed. Nevertheless, these deviations from PPP represent profitable commodity arbitrage opportunities which, if exploited by market participants, eventually force the exchange rate toward its latent PPP equilibrium (see Ghosh & Arize, 2003).

The PPP theory provides a basis for the behavior of exchange rates, and its validity is important to policymakers and the decisions of market participants. This is so because it is the foundation of many long-run exchange rate models which are often adopted as

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prediction tools for future exchange rate movements.¹ Also, PPP generally serves as a guide to financial authorities when they intervene in the foreign exchange rate market to ensure that the level of exchange rate is consistent with PPP. In this sense, it is used for the evaluation of whether the exchange rate is over-or-undervalued based on the equilibrium value as suggested by PPP itself. In addition, financial analysts use PPP when they compare real purchasing power between countries in policy analysis,² or when the focus is on the degree of trade integration and liberalization among nations (Arize, Malindretos, & Nippani, 2004, among others). Due to its relevance to international finance and policy analyses, a great deal of empirical testing has been devoted to whether PPP holds in the long run. However, the empirical evidence is far from being comprehensive and conclusive.

While there is a general agreement that PPP does not explain short-run exchange rate movements (Frenkel, 1981), whether or not such a relationship holds in the long run, however, has become controversial in the literature even as many techniques for studying time series data have been proposed. Long-run PPP has been rejected by numerous empirical studies by (inter alia) Chang, Tang, Liu, and Lee (2010), Doğanlar, Bal, and Özmen (2009), Wang (2000), Papell (1997), Ahking (1997), Serletis and Zimonopoulos (1997), Crowder (1996), Cooper (1994), Patel (1990), Corbae and Quailaris (1988), Enders (1988) and Taylor (1988).

On the other hand, in recent years, empirical studies (see, for example, Abuaf & Jorion, 1990; Achy, 2003; Alba & Park, 2003; Anoruo, Braha, & Ahmad, 2002; Arize, Malindretos, & Nam, 2010; Bahamani-Oskooee & Hegerty, 2010; Cheung & Lai, 1993; Cheung & Lai, 2000; Cheung, Lai, & Bergman, 2004; Edison, Gagnon, & Melick, 1997; Güney, Telatar, & Hasanov, 2012; Lothian & Taylor, 1996; Nagayasu, 1998; Narayan, 2005; Odedokun, 2000; Salehizadeh & Taylor, 1999; Yazgan, 2003; Zurbrugg & Allsopp, 2004) find support for PPP in terms of either cointegrating relationship between exchange rates and (relative) prices or mean-reverting real exchange rates in most of their samples.

Because of the above inconclusive empirical findings, the aim of this paper is to revisit the validity issue using alternative testing procedures that are supported in several recent Monte Carlo simulations. Our approach employs the fully modified least squares (FMLS) technique (Phillips & Hansen, 1990) to obtain estimates of the long-term relationship between exchange rates and prices.³ This methodology is preferred to other single-equation estimators because of its simplicity, and yet it produces estimated parameters that are not only consistent [as in ordinary least squares (OLS)], but are also asymptotically efficient and median unbiased. It tends to eliminate sample bias, as well as take into account simultaneity bias, non-normality and serial correlation problems that are often found in economic and financial data. These characteristics are technically vital because the presence of, say, simultaneity bias can result in biased standard errors and hence deceptive inferences.

After obtaining the coefficient estimates of the cointegrating relation, we test for possible cointegration between exchange rates and prices by using tests of the null hypothesis of cointegration against the alternative hypothesis of no cointegration advanced by Harris and Inder (1994) and Shin (1994). Following this, Stock's (1987) specification suggestions are employed to examine the short-run relations by constructing and estimating an error-correction model. For more on this approach, see, for instance, Wolters, Terasvirta, and Lutkepohl (1998: 402).

Therefore, this paper attempts to add to the literature in the following ways. First, it provides comprehensive evidence on the validity of PPP using FMLS, Harris-Inder, and Shin's techniques as far as the number of countries is concerned. The authors are not the first to employ FMLS and Harris-Inder estimators. Empirical works on PPP have been done using the above-named estimators employing data from some industrialized countries; see, for example, Dutt and Ghosh (1996) and Crownover, Pippenger, and Steigerwald (1996).⁴ The experiences of many other developed economies other than those included in the above studies as well as that of the developing economies have not been adequately investigated by using these techniques. To the best of our knowledge, there are no PPP studies for the countries examined here using Shin's test for cointegration. An important motivation of this paper is to examine the results of alternative tests. This paper aims to complement these existing studies by examining PPP in 116 countries with recent monthly data for the period 1971 through 2011 (i.e., 492 observations) in some cases. Our data include developed and less developed countries.

Second, this paper is the first study to employ the above techniques to provide evidence for the validity of PPP using the so-called transition economies of the former Soviet Union and of Central and Eastern Europe. In this study, we provide fresh evidence for these economies and, there have been relatively few studies of countries in transition. Available evidence is limited, and for the most part, it examines PPP in only a small number of individual countries. The relative absence of empirical studies is due in part to concerns over reliability and frequency of time series data. However, as pointed out by Iradian (2009), in recent years there has been significant progress in the improvement of data quality in these economies. Hence, the transition countries studied are: the Commonwealth of Independent States (CIS) (Georgia, Moldova and Russia) and the Baltic countries (Estonia, Latvia and Lithuania) and Central and East European (CEE) countries (Bulgaria, the Czech Republic, Hungary, Poland, Romania, the Slovak and Slovenia). Unlike the CEE countries, the Baltic and CIS economies started their transition at the end of 1991.

Finally, empirical investigation has often been limited to whether PPP holds or not [see, for example, Dutt and Ghosh (1996) and Crownover et al. (1996)]. With a few exceptions, the speed with which the exchange-rate adjusts to its equilibrium value has largely been ignored. In a policy sense, the short-run adjustment of exchange rates to changes in domestic and foreign price is also frequently important. How quickly exchange rates respond to changes in domestic and foreign prices is important both for understanding future effects that may occur as a result of changes in monetary or exchange rate policy and for interpreting recent events (Arize, Osang, &

¹ Examples of exchange rate models that assume PPP holds are the sticky-price models of Dornbusch (1976), the flexible-price monetary models of Johnson (1976) and the asset pricing models of Lucas (1982).

² As Dornbusch and Krugman (1976) have pointed out, "Under the skin of any international economist lies a deep-seated belief in some variant of the PPP theory of the exchange rate."

³ Following the specification suggestions in Funke (2001) and Monte Carlo simulations by Li and Maddala (1997), Cappuccio and Lubian (2001) Christou and Pittis (2002), Kurozumi and Hayakawa (2009) and Khalaf and Urga (2014) we base our coefficient analysis on FMLS estimator.

⁴ We are grateful to an anonymous referee for bringing this to our attention.

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