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European exchange rate regimes and purchasing power parity: An empirical study on eleven eurozone countries ☆

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ABSTRACT

It is widely believed that following the adoption of the euro, long run purchasing power parity (PPP) is more likely to hold within the euro countries. By applying the panel unit root test of Pesaran (2007) to real exchange rate data of eleven euro countries for the sample period of January 1957 to May 2013, we find that, contrary to the above intuition, the evidence for the mean-reverting in real exchange rates is much weaker in the post-1998 euro period than in the pre-euro period. In contrast, we find that for the four countries not using the euro: Norway, Sweden, Switzerland, and the UK, the evidence for the mean-reverting in real exchange rates is strong in both the pre- and post-euro (post-1998) periods. Moreover, through our panel estimation of the error correction model using the common correlated effects (CCE) estimators a la Pesaran (2006), we find that the flexibility of nominal exchange rates is crucial for the adjustment of real exchange rates to PPP.

1. Introduction

Has the introduction of the euro led to more integrated product markets in the eurozone and made the law of one price as implied by the purchasing power parity (PPP) easier to achieve? The conventional wisdom is that lower transaction costs via the adoption of a single currency should encourage greater cross-border trade (arbitrage) among the euro countries and hence induce faster price convergence, c.f., Rose (2000). Furthermore, as has been argued by Engel and Rogers (2004), in a flexible exchange rate regime, volatile movements in nominal exchange rates due to speculative short-term capital flows might lead to frequent currency misalignments that make the PPP equilibrium harder to achieve.[2] By alleviating the speculative attacks and the accompanying currency misalignments, the adoption of the euro might help for the attainment of the law of one price among the euro countries. In contrast, as the purchasing power parity can be achieved not only through arbitrage in the goods market that induces goods prices to adjust, but also through currency trade in the foreign exchange market that induces the nominal exchange rate to adjust, the added benefit of the

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[2] One possibility of the volatile movements of real exchange rate under the floating exchange rate regime is the well-known argument for the "overshooting" exchange rate a la Dornbusch (1976).

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adjustment channel provided by the flexibility of nominal exchange rate might be crucial for the attainment of the parity. Accordingly, the adoption of the euro might work against the attainment of one price among the euro countries since the adjustment of the nominal exchange rate is completely absent here.

In the past empirical literature on real exchange rate adjustment to PPP under different nominal exchange rate regimes, no consensus has been reached.[3] On the one hand, some studies found that the mean-reverting of real exchange rate under the fixed exchange rate regime is more pronounced than under the flexible exchange rate regime, e.g., Mussa (1986) and Parsley and Popper (2001). On the other hand, some recent studies found weaker evidence of mean-reverting of real exchange rate for many euro countries under the euro regime, which represents an extreme form of fixed exchange rate, than under the regimes with more flexible exchange rate, e.g., Rogers (2007), Christidou and Panagiotidis (2010), and Wu and Lin (2011). Furthermore, there are also studies showing no clear-cut difference in the mean-reverting behavior of real exchange rates across fixed and flexible nominal exchange rate regimes, e.g., Grilli and Kaminsky (1991), Lothian and Taylor (1996), and Bissoondeeal (2008), among many others.

In view of the aforementioned conflicting empirical results, in the current paper we examine how changes in nominal exchange rate regime, especially the launch of the euro, affects the adjustment of real exchange rates to PPP equilibrium in euro countries. We focus our study on eleven eurozone countries that are among the first to adopt the euro: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. One advantage of doing so is that these countries all experienced similar but drastic changes in the nominal exchange rate arrangement during the sample period.[4] In particular, the breakup of the Bretton Woods system in the early 1973, the introduction of the European exchange rate mechanism (ERM) in March 1979, and the launch of the euro in January 1999 all represent clear breaks in nominal exchange rate arrangements and provide ideal natural experiments for the study of PPP. Moreover, because the countries studied belong to a relatively integrated market where the barrier of trade and transportation costs have generally been low, our study should provide more clear-cut results than most previous studies by limiting the impact of the distorting factors on PPP adjustment.[5] Since the launch of the euro has been the focus of many previous studies on the effect of exchange rate regime on PPP convergence, we also utilize this event to examine whether and how real exchange rates behaved differently before and after the launch of the euro for two groups of advanced European countries: the "treatment group" of eleven countries adopting the euro in 1999 and the "control group" of four countries: Norway, Sweden, Switzerland, and the UK, that continued using the flexible exchange rate regimes after the euro launch. This group comparison turns out to shed important light on the possible cause of the slow adjustment of real exchange rates for the euro countries after the launch of the euro.

It is worth noticing that an alternative empirical approach adopted in the past literature is to explore the speed of real exchange rate convergence for countries with different exchange rate arrangements within the same sample period, e.g., Parsley and Popper (2001) and Bissoondeeal (2008). One disadvantage of the approach is that heterogeneity in social, political and economic conditions in the countries studied usually has important implications not only on the exchange rate arrangement adopted but also on the speed of PPP convergence,[6] and failure to take complete account of these conditions will result in a spurious relationship between the exchange rate arrangement and the speed of real exchange rate convergence. In contrast, by focusing on a relatively more homogenous group of countries with common changes in exchange rate regimes, our approach avoids the aforementioned complications.

In the current study, we employ panel unit root tests to examine the mean reverting property of real exchange rate under different exchange rate regimes. As the slow adjustment speed of real exchange rates has been the subject of considerable debate in the literature; cf. Rogoff (1996), we also compute the "half-lives" of real exchange rate adjustments to PPP under different regimes using panel estimation of auto-regression models of real exchange rates. In addition, to explore the roles of nominal exchange rates and relative prices played in the adjustments of real exchange rates in different regimes, we employ panel estimation of error correction models consisting of regressions of nominal exchange rate and relative prices on the lagged real exchange rate and the first difference of lagged dependent variables.

We find from our panel unit root tests and the estimated "half-life" that the mean-reverting property of real exchange rate for the eleven euro countries is weakest in the post-1998 euro regime period while strongest in the floating exchange rate period. In contrast, we find that for the four advanced European countries not using the euro: Norway, Sweden, Switzerland, and the UK, the evidence for the mean-reverting in real exchange rates is strong in both the pre-euro period and the post-euro (post-1998) period. From our panel estimation of the error correction model, we find that the flexibility of nominal exchange rate is crucial for the adjustment of real exchange rate to PPP.

The remainder of this article is organized as follows. Section 2 provides data description and conducts panel unit root tests to examine the mean-reverting property of real exchange rate under different exchange rate regimes. Section 3 uses panel error correction model estimation to explore the roles of relative prices and nominal exchange rates played in the convergence of real exchange rates to PPP under different nominal exchange rate regimes. Section 4 compares the mean-reverting behavior of real exchange rates between a "control group" and a "treatment group" of advanced European countries for the pre- and post-euro periods to check for robustness of our major empirical results. Section 5 provides the concluding remarks.

[3] For a review of the vast literature on PPP, see Taylor and Taylor (2004) and Taylor (2006).

[4] To our surprise, in the past empirical literature on PPP, only a very limited number of works studied PPP hypothesis for the pure eurozone countries. See, for example, Koedijk, Tims, and van Dijk (2004), Christidou and Panagiotidis (2010), and Wu and Lin (2011).

[5] Rogoff (1996) shows that trade barriers and transportation costs can explain why PPP might not hold in a large international framework. Funke and Koske (2008) suggest that focusing the analysis on an integrated market with restricted geographical expansion allows limiting the impact of these distorting factors. In addition, due to the proximity of the eurozone countries, transportation costs play a less important role on a eurozone level than on an intercontinental level.

[6] One example is that low-income countries tend to impose higher tariffs to protect their domestic industries and while at the same time prone to more fixed exchange rate regimes. For a detailed study on the factors affecting the exchange rate regime choice in emerging market economies, see, for example, Ghosh (2014).