



# The long-run volatility puzzle of the real exchange rate

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## Abstract

This paper documents large cross-country differences in the long-run volatility of the real exchange rate. It shows that the real exchange rate of developing countries is approximately three times more volatile than the real exchange rate in industrial countries. The paper shows that this difference in volatility cannot be explained by the fact that developing countries face larger shocks (both real and nominal), recurrent currency crises or by different elasticities to these shocks. ARCH estimations find a much higher persistence of deviations of the variance of the RER from its long-run value when the economy suffers shocks of various kinds.

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*JEL classification:* F31; F41

*Keywords:* Real exchange rate; Volatility

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## 1. Introduction

In this paper we show that the real exchange rate tends to be much more volatile in developing countries than in industrial countries, even at long horizons, and that the bulk of this

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difference in volatility cannot be attributed to standard explanations based on the fact that developing countries face larger shocks (either real or nominal), or that they are more sensitive to these shocks. The paper finds that part of the explanation lies in the fact that volatility swings are more persistent in developing countries.

While there is a large literature that shows that in developing countries output, consumption, and interest rates are more volatile than in industrial countries (see, for instance, Hausmann and Gavin, 1996; Easterly et al., 2001; Prasad et al., 2004) and that high volatility is correlated with GDP growth (Ramey and Ramey, 1995; Aghion et al., 2005), we are not aware of any paper that documents difference in the long-run volatility of the real exchange rate. This is an important topic for at least two reasons. First of all, the literature on original sin and currency mismatches (Eichengreen et al., 2003) argues that, in the presence of foreign currency debt, swings in the real exchange rate may have important wealth effects and be an important determinant of macroeconomic volatility. The size of the wealth effect will depend on how persistent the shocks are perceived to be. Hence, the importance of determining whether the volatilities are also large at longer term horizons. Second, there is now evidence that the level of the real exchange rate is a strong predictor of growth accelerations (Hausmann et al., *in press*) possibly because it favors self-discovery process (Hausmann and Rodrik, 2003).

Since the seminal contribution by Cassel (1922), purchasing power parity (PPP) has been one of the most studied topics in international economics. In its simplest form, PPP implies that the price level of consumption baskets across countries is the same. This is the absolute version of PPP which, by expressing all variables in logs, can be written as:

$$p_t = p_t^* + s_t, \quad (1)$$

where  $p_t$  is the price of the domestic consumption basket,  $p_t^*$  is the price of the foreign basket, and  $s_t$  represents the exchange rate. The idea is that if goods are traded freely then deviations from PPP would imply flow of goods to arbitrage the differences. Absolute PPP is only satisfied under very strong assumptions and the presence of non-tradable goods, transportation costs, and monopolistic competition is among the main reasons used in the literature to account for deviations from absolute PPP. Relative PPP entails weaker assumptions and, rather than requiring price equalization across consumption baskets, it only assumes that changes in the price of those consumption baskets are arbitrated away. Formally, relative PPP requires that

$$\Delta p_t = \Delta p_t^* + \Delta s_t. \quad (2)$$

Both absolute and relative PPP have implications for the behavior of the real exchange rate. Absolute PPP implies that the real exchange rate is always equal to one, while relative PPP implies that deviations of the real exchange rate from its steady state are zero

$$\Delta q_t = \Delta s_t + \Delta p_t^* - \Delta p_t. \quad (3)$$

PPP is an appealing theory. So much so, that it is one of the most important building blocks of the models in international economics. PPP, however, was never meant to characterize the short-term dynamics of countries. Prices do not adjust to monthly fluctuations of the exchange rate, and in most countries, not even to yearly movements. Dornbusch's (1986) seminal paper explained exchange rate overshooting in the short run as the consequence of differential arbitrage speeds between the fast financial markets and the slower goods markets. In all these

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