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Nominal exchange rate volatility, relative price volatility, and the real exchange rate

Srideep Ganguly, Janice Boucher Breuer*

Department of Economics, University of South Carolina, Columbia, SC 29208, USA

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A B S T R A C T

We model real exchange rate, nominal exchange rate, and relative price volatility using real and nominal factors. We analyze these volatility measures across developing and industrialized countries. We find that the inclusion of nominal factors achieves a sizable reduction in the real exchange rate volatility spread between developing and industrialized countries. In addition, we find that nominal factors matter to real exchange rate volatility in the short run and the long run, and that for developing countries, a higher share of real exchange rate volatility stems from relative price volatility.

1. Introduction

It has been thirteen years since Rogoff (1996) raised two important pieces of a puzzle for research in purchasing power parity: (1) slow convergence of deviations from purchasing power parity; and (2) short run deviations from purchasing power parity that are large and volatile. The pieces of the puzzle pose a contradiction – slow convergence implies that real factors like tastes and technology are responsible for the deviations and the slow pace of convergence, yet real factors, because they are slow to change, cannot explain short-run volatility which would be better explained by nominal (monetary) shocks.

While much work has been directed at the first piece of the puzzle, the second piece of the puzzle is arguably more important to understand than the first because of its implications for trade, investment, and economic growth. Yet, real exchange rate volatility has received sporadic

* Corresponding author. Tel.: +1 803 777 7419; fax: +1 803 777 6876.
E-mail address: boucher@moore.sc.edu (J.B. Breuer).

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attention, at best.[1] This is our focus. We build on the work of Hausmann et al. (2006) who find the volatility of real exchange rates of developing countries is 2.5 times higher than for industrialized countries, even when controlling for real shocks. Like their model, our model includes real factors but, we also include domestic and external monetary and financial factors and government and trade balances.

Using our model, we also explore nominal exchange rate and relative price volatility. Theoretical models of sticky-prices and asset markets dating back to Dornbusch (1976) explicitly address nominal exchange rate and relative price behavior. These models impute behavior to the real exchange rate in the short run and the long run owing to differences in the speed of adjustment between nominal exchange rates and relative prices. So, it seems useful to decompose real exchange rate volatility into its separate components. The Mundell–Fleming model with sticky prices also provides a link between nominal exchange rates and real exchange rates. By investigating the components of real exchange rate volatility separately, we distinguish our work from many others. Engel and Morley (2001), Mark and Sul (2001), Ng (2003), and Cheung et al. (2004) – who study the components of the real exchange rate – are exceptions.

We also conduct a simple variance decomposition of the real exchange, after controlling for real and nominal factors. The decomposition of the residual variance allows us to calculate the contributions of unexplained nominal exchange rate volatility, unexplained relative price volatility, and their covariance to the residual portion of real exchange rate volatility.

Our analysis produces several noteworthy results. Three main findings emerge. With the inclusion of nominal factors, our model substantially reduces the real exchange rate volatility spread between developing and developed countries and helps explain Hausmann et al.'s (2006) finding. We also find evidence that nominal factors matter in both the short and long run. Nominal factors can have long-lived (at 5 years) effects on the volatility of the real exchange rate. This finding is consistent with the range of half-life estimates reported for real exchange rate mean reversion. We also find that for developing countries, a much larger share of real exchange rate volatility stems from relative price volatility than for industrialized countries. The finding persists in both the short run and the long run. We conjecture that institutional differences, particularly with respect to central banks and national treasuries may be responsible.

2. Data and unconditional volatilities

The real exchange rate by definition consists of two components, namely the nominal exchange rate and the relative price differential as expressed in Eq. (1):

$$r = s + p \tag{1}$$

where r is the log real exchange rate expressed as units of domestic goods per unit of foreign goods, s is the log nominal exchange rate expressed as domestic currency per unit foreign currency, and p is the log of the price of a foreign basket of goods divided by the price of a domestic basket of goods. In what follows, we exploit Eq. (1) to explore the influence of nominal exchange rate volatility and relative price volatility on real exchange rate volatility.

2.1. Data

We collect data on real effective exchange rates for fifty countries for the period 1980–2000. This is the same sample period studied by Hausmann et al. (2006) to which we compare several of our results. There are 22 industrialized countries in the data set and 28 developing countries.[2] We

[1] Contributions include Edwards (1987), Côté (1994), Hausmann and Gavin (1996), McKenzie (1999), Hau (2000, 2002), Clark, Tamirisa, and Wei (2004), and Hausmann et al. (2006).

[2] Since some of the nominal effective exchange rates are calculated using unit labor costs, we are constrained to selecting a set of countries for which unit labor cost data is available.