Journal of Macroeconomics 46 (2015) 1–22

Contents lists available at ScienceDirect

Journal of Macroeconomics

journal homepage: www.elsevier.com/locate/jmacro

Revisiting the relationship between exchange rates and fundamentals

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ARTICLE INFO

Article history:
Received 21 May 2015
Accepted 15 July 2015
Available online 14 August 2015

JEL classification:
C22
F31
F47

Keywords:
Monetary fundamentals
Exchange rates
Permanent–transitory decomposition

ABSTRACT

In this paper, we apply the permanent–transitory decomposition method to analyze the role of permanent and transitory shocks in explaining the apparent weak link between nominal exchange rates and economic fundamentals. The results suggest that for most of the countries we investigate, including Finland, Italy, Portugal, France and Switzerland, transitory shocks dominate exchange rate fluctuations, while permanent shocks dominate the variations in economic fundamentals. The findings therefore provide an alternative interpretation of the "exchange rate disconnect puzzle". Moreover, the results also suggest that comprehensive modeling of transitory components in empirical models should not be neglected in studies of the dynamics of exchange rates.

1. Introduction

According to the seminal work by Meese and Rogoff (1983), the underlying economic fundamentals often fail to explain short-term volatility in exchange rates. In particular, it is a puzzle that economic models have difficulty outperforming a simple random walk model in terms of out-of-sample forecasts. This apparent weak linkage between the nominal exchange rate and economic fundamentals has been found in the subsequent literature, and is now well known as the "exchange rate disconnect puzzle." Although some recent studies have found that fundamental-based exchange rate models perform well in predicting the exchange rate (see e.g., Mark and Sul, 2001; Rapach and Wohar, 2002; Cerra and Saxena, 2010; Moosa and Burns, 2014), this evidence is not robust enough (see Cheung et al., 2005) to conclude that fundamental-based forecasts are a success.

In this paper, we extend research on the source of this puzzle by gauging the relative contributions of permanent and transitory shocks in nominal exchange rates and fundamentals. Using a long span of data from 1880 to 2011, we reveal the origins of these fluctuations in exchange rates and fundamentals using the permanent–transitory decomposition method developed by Gonzalo and Ng (2001), which shows how we can empirically identify innovations, as distinguished by their degree of persistence, in cointegrated systems. Given that exchange rates and fundamentals are cointegrated, decomposition analysis allows inferences regarding the possible sources (permanent versus transitory shocks) of exchange rate and fundamentals movements over time.

In a recent study by Chou (2014), the permanent–transitory decomposition method has been employed to revisit the performance of the Taylor rule exchange rate models proposed by Engel and West (2005). Here we employ a simple monetary model

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http://dx.doi.org/10.1016/j.jmacro.2015.07.004
0164-0704/

of exchange rates to investigate the relationship between exchange rates and economic fundamentals. The reason we use the monetary model is that the monetary approach to exchange rate determination emerged as the dominant exchange rate model after the introduction of floating rate systems in the early 1970s, and it remains an important exchange rate paradigm (see Cerra and Saxena, 2010). Moreover, because the Gonzalo and Ng (2001) decomposition method depends crucially on whether exchange rates are cointegrated with fundamentals, the availability of long-span data for money supply, real output, and price level allows us to accurately identify the cointegrating relationship between exchange rates and monetary fundamentals.[1] Finally, the recent popular Taylor rule exchange rate models aim to analyze monetary policy in modern economies, and are not applicable when examining a century of data as in the current paper.

We use annual data from 1880 to 2011 for Finland, France, Italy, Portugal, Spain, and Switzerland, with the US serving as the numeraire. We select this sample of countries based on past empirical findings that the long-run relationships between exchange rates and fundamentals are likely to be robust in these countries, as shown in a number of previous studies (Rapach and Wohar, 2002; Sarno et al., 2004).

The empirical findings show that for Finland, Italy, and Portugal, transitory shocks are able to explain most exchange rate movements, while the permanent shocks appear to dominate in explaining the fundamental variability. Moreover, unlike the fundamentals, the exchange rates are not weakly exogenous in the cointegrated system, suggesting that it is the exchange rate, not the fundamentals, which adjusts to restore long-run equilibrium in these countries. For France and Switzerland, permanent and transitory shocks jointly determine the movements in exchange rates and fundamentals because both adjust to restore the long-run equilibrium. Finally, the exchange rate in Spain is dominated by permanent shocks, while the transitory shocks explain a large proportion of the variations in the fundamentals.

Overall, in five of the six countries we consider in this paper, transitory shocks affect exchange rates substantially, while the permanent shocks appear to dominate the variations in the fundamentals. It is worth noting that our data include both the fixed and float exchange regimes, which could be a drawback because the variability of the nominal exchange rate during the fixed regime could be limited. However, these results are robust with respect to the subsample of the modern floating (post-Bretton Woods system) exchange rate regimes. Moreover, our conclusion remains when considering alternative macro fundamentals such as relative prices suggested by purchasing power parity (PPP).

We can intuitively understand these findings by observing that because exchange rates and fundamentals are cointegrated, their movements must be tied together in the very long run, and therefore so must any variations. However, exchange rate variations are far more volatile than fundamentals over short horizons. Hence, we can only reconcile the short- and long-run properties of these variables if over time either (1) the variations in fundamentals increase or (2) the variations in the exchange rate decrease. Our results are consistent with the latter explanation, which suggests that the exchange rate adjusts over longer horizons to match the fundamentals. Hence, we are able to explain the empirical evidence that exchange rate movements are forecastable over long horizons, which implies the existence of transitory variations in exchange rates of the form we reveal here.

Our findings suggest that we should not approximate exchange rate behavior with a pure random-walk model, and that empirical models based solely on macroeconomic variables may fail to provide much more information beyond the permanent components in these macroeconomic variables themselves, making any predictability indistinguishable from that provided based on a pure random walk. This finding is similar to the argument in Moosa and Burns (2014) that root-mean-square-error tests of the monetary model are essentially tests of the random walk hypothesis. Moreover, our results also show that the transitory shocks are highly persistent, and that they induce sizable movements in exchange rates. It is therefore of no surprise to obtain evidence that the fundamentals, such as the money supply minus real output differentials across countries, fail to account for the large transitory impacts on exchange rates, because the fluctuations in the fundamentals are primarily attributable to permanent shocks.

Finally, our findings further suggest that the transitory shocks in monetary models, such as deviation from PPP, money demand disturbances, and foreign exchange risk premium, can be essential in explaining exchange rate dynamics. Comprehensive modeling of the transitory components is required to enhance the explanatory power of empirical exchange rate models. We also find that the risk premium dominates other components in driving the exchange rate fluctuations of France, Italy and Switzerland.

The remainder of the paper is organized as follows. Section 2 presents the theoretical background for the monetary model of exchange rate determination. Section 3 outlines the econometric framework. Section 4 describes the data and the preliminary test results. Section 5 provides the main empirical results and Section 6 checks for robustness of the baseline results. Section 7 gauges the relative contributions of the unobserved fundamentals to exchange rates. Finally, Section 8 concludes.

2. Monetary model

In a simple monetary model of exchange rates, the liquidity–money demand functions for the home country and the foreign country are given by:

$$m_t - p_t = \phi y_t - \lambda i_t + v_t^d, \tag{1}$$

$$m_t^* - p_t^* = \phi y_t^* - \lambda i_t^* + v_t^{d*}, \tag{2}$$

[1] It has been shown in Hakkio and Rush (1991); Otero and Smith (2000); Rapach and Wohar (2002) that the power of cointegration tests depends on the data's span, rather than its frequency.