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Comment

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1. Introduction

International finance is not a sui generis field just because there is an exchange rate floating around (forgive the pun). International finance is open economy macroeconomics and should be studied with the tools of macroeconomics. That open economy macroeconomics *is* macroeconomics was a motivating argument of the new open economy macroeconomics (NOEM) literature and this paper takes that point seriously.

The paper displays an impressive technical mastery and makes a nice contribution to the new open economy macroeconomics literature. It is also a quite complicated paper, using a lot of heavy machinery. In my discussion I will try to provide an intuitive overview of the paper while pointing out that the machinery sometimes obscures some labeling issues.

2. Definitions

We can distinguish between three conceptually different definitions of real exchange rates. First, there is the internal real exchange rate, the price of non-tradables relative to tradables. Defining this exchange rate does not require an open economy; it is a simple relative price. In the paper's notation this is given as

$$P_t^R = \frac{P_t^N}{P_t^T},$$

where P_t^R is the internal real exchange rate, P_t^N is the price of non-tradables and P_t^T is the price of tradables.

A second real exchange rate is the one newspapers usually refer to—relative prices of the consumption basket in the foreign country and the home country. This external real exchange rate is CPI based and uses the consumption basket which involves the prices of non-tradables as well the prices of tradables. This definition of the external real exchange rate is

$$q_t = \frac{e_t P_t^{F^*}}{P_t},$$

where q_t is the CPI-based real exchange rate, P_t is the domestic price level, $P_t^{F^*}$ is the foreign price level and e_t is the nominal exchange rate.

Lastly, to abstract from the price differences of non-tradables in different countries, an alternative external real exchange rate can be defined as the relative price of the tradable good in the home and foreign countries

$$q_t^T = \frac{e_t P_t^{FT^*}}{P_{i_t}^T},$$

where q_t^T is the external real exchange rate and $P_t^{F^*}$ is the price of the tradable good in the foreign country.

3. The Question

All three measures of the real exchange rate show significant time variation. The main question of the paper is, can we make sense of this using microfounded models?

The internal real exchange rate appreciates considerably in developing economies, i.e., non-tradables become relatively more expensive. (Note that this *dual inflation* need not be an open economy issue.) However, in open economies q_t and q_t^T also move around a lot, importantly with q_t^T being very highly correlated with e_t. That is, fluctuations in nominal exchange rates translate into fluctuations in the real external exchange rates. Is there a unifying framework that explains both of these?

4. The Answer

Two different strands of the literature provide answers to different parts of this question. First, the time variance in P_t^R and q_t are related to each other via the Balassa-Samuelson effect. To the extent that productivity

in the tradables sector grows faster than that of non-tradables in developing economies, which seems to be the case, there will be dual inflation. Assuming that purchasing power parity (PPP) holds, the price (or the growth rate of the price) of the tradables in the two countries must be the same, thus relative deflation in the tradables sector in the home country will cause an appreciation of the nominal exchange rate which will cause an appreciation of the CPI-based real exchange rate (as non-tradables productivity is not improving at the rate of tradables').

On the other hand, the new open economy macroeconomics literature tackles the question of the correlation of the nominal exchange rate, e_t, and the real exchange rate, q_t^T. In a frictionless, flexible price world q_t^T should be unity. To allow it to deviate from this value and show time variation we need to introduce some frictions. The standard NOEM literature assumes price stickiness (following the New Keynesian macroeconomic models) to introduce this friction. In the limiting case of fixed prices P_t^T and P_t^{FT*} are constant and thus all movements of e_t are directly reflected in movements of q_t^T.

The problem with the above explanation is that these two answers are not mutually consistent. If PPP does not hold and productivity growth in tradables leads to dual inflation (relative deflation in tradables), the CPI based exchange rate will depreciate, not appreciate. Thus, to motivate the appreciation of the CPI based real exchange rate with dual inflation via the Balassa-Samuelson mechanism PPP is needed while PPP has to fail by definition to explain the variance of the external real exchange rate.

Purchasing power parity, of course, can fail at various degrees. In particular, the less substitutable the home and foreign tradables, the more scope there is for deviations from PPP and the more substitutable the two tradables, the more scope for the Balassa-Samuelson effect. It is important to note that imperfect substitutability of home and foreign tradables can simultaneously generate the Balassa-Samuelson effect and the positive covariance of nominal and real external exchange rates. Although this is qualitatively possible, Vilagi argues that the magnitudes observed in data cannot be matched by any degree of substitutability.

Vilagi's preferred solution is to introduce pricing to market (PTM) into the model. When PTM is possible, producers are able to price the same tradable good differently in different counties. To allow for this, the model is expanded into three sectors, non-tradables, domestic tradables, and export tradables. PPP holds for export tradables while PTM

takes place in the domestic tradable goods market. This device helps explain both types of stylized facts as the nominal exchange rate still appreciates when productivity in the tradables sector improves (as PPP holds for some tradables), helping generate the Balassa-Samuelson effect and the nominal and real (external) exchange rates, q_t^T, are correlated as PPP fails for the domestic tradables.

While introducing PTM helps simultaneously replicate the two stylized facts, it seems that some of this is due to labeling changes. Introducing PTM comes with the introduction of a domestic tradable good, which, unlike the export tradable, is not internationally traded—hence PTM is possible. It is not all that clear to me how non-traded tradables differ from non-tradables.

In particular, the reason we care about the external real exchange rate (and not only the CPI based real exchange rate) is that we do not expect PPP to hold for non-tradables. In this model, the domestic tradables that are subject to PTM are included in the tradable definition and therefore enter the calculation of the external real exchange rate. It is the inclusion of these that generates the failure of PPP for the tradables, broadly defined.

An alternative argument would be to assert that we only expect PPP to hold for goods that are actually traded and to define the external real exchange rate only for the export goods. In this model, the traded goods still satisfy PPP (depending on substitutability) and the real exchange rate defined over these goods would not be correlated with the nominal exchange rate to the extent such correlation is present in the data. It therefore seems that part of the success of the model comes from labeling some non-traded (but not non-tradable) goods as tradable.

This paper over all is a fine contribution to the NOEM literature in that it makes an important observation about the internal and external real exchange rates and their relationship with nominal exchange rates and then provides an explanation of the stylized facts using a micro-founded model. The paper provides a valuable service by coherently presenting the stylized facts and pointing out an important question, which will likely lead to more interest in the topic.