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Consumption and real exchange rates with incomplete markets and non-traded goods

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A B S T R A C T

This paper addresses the consumption–real exchange rate anomaly. International real business cycle models based on complete financial markets predict a unitary correlation between the real exchange rate and the ratio of home to foreign consumption when subjected to supply-side shocks. In the data, this correlation is usually small and often negative. This paper shows that this anomaly can be successfully addressed by models that have an incomplete financial market structure and a non-traded as well as traded goods production sector.

1. Introduction

One of the well known puzzles in international finance is the so-called consumption–real exchange rate anomaly (see Backus and Smith, 1993 for an early paper and Chari et al., 2002 for a recent contribution). Most international business cycle models predict that, under the assumption of perfect financial markets along with supply disturbances, consumption across countries should be higher in the country where its price, converted into a common currency, is lower. This feature of the model is in sharp contrast with the empirical evidence which suggests that the consumption differential across countries does not move in any systematic pattern with its relative price (i.e. the real exchange rate). Chari et al. (2002) refer to this discrepancy as the consumption–real exchange rate anomaly.

The removal of the assumption of perfect financial markets is not sufficient in replicating the observed evidence: indeed, in their study, Chari et al. (2002) have shown that the same anomaly in

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the behavior of consumption and the real exchange rate does continue to hold. In this work we explore the extent to which the introduction of non-traded goods along with a limited international financial market structure might account for the aforementioned anomaly. Our results suggest that the combination of these two factors is a promising avenue for understanding the behavior of consumption across countries and the real exchange rate.

There are two key features that are important in accounting for our results. By assuming that international asset trade is limited to a risk-less bond we break the link between the real exchange rate and relative consumption that would arise under complete financial markets. While by introducing non-traded goods we allow for the possibility that, depending on the origin of the shock (i.e. traded versus non-traded), the real exchange rate and relative consumption across countries can move in opposite directions.

In particular, following a positive shock to the traded goods sector in the home economy, home consumption increases with respect to consumption abroad. On the other hand, the real exchange rate appreciates if the effect coming from the relative price of non-traded to traded goods (the so-called Balassa–Samuelson effect) outweighs the terms of trade effect that would imply a depreciation of the real exchange rate. This effect will be stronger the more dominant the shocks to the traded goods sector relative to non-traded goods sector.

More generally, the structure of the disturbance and the specification of preferences determine the overall cross-correlation between real exchange rate and relative consumption.

Finally we check the performance of our baseline model in replicating standard international business cycle statistics. Our model overcomes the problem of an unrealistically high cross-correlation between relative consumption and the real exchange rate. Where our model departs from the data, is the volatility of other key variables like the real exchange rate and the terms of trade.

Our model follows closely the ones proposed by Backus and Smith (1993), Chari et al. (2002) and Stockman and Tesar (1995): we construct a simple two-country stochastic dynamic open economy model in which we allow households to trade internationally in only one risk-less nominal bond, prices are flexible and households consume a final non-traded good produced with domestic as well as foreign-produced intermediate goods and a non-traded intermediate component. We allow for capital accumulation at the intermediate goods level and deviations from purchasing power parity are obtained by allowing for home-bias towards home-produced intermediate goods at the production level and because of the existence of non-traded intermediate inputs.

The remainder of the paper is structured as follows: in Section 2, we discuss the nature of the consumption–real exchange rate anomaly and survey related contributions in the literature. Section 3 presents the basic structure of the model. The model is calibrated in Section 4, and Section 5 outlines the basic mechanism behind our results. The results of the calibrated model are discussed in Sections 6 and 7, respectively. Section 8 concludes.

2. Data and related literature

In their influential paper, Backus and Smith (1993) document the failure of international macroeconomic models based on the complete market assumption in replicating the features of international macroeconomic data: indeed, they show the lack of correlation between growth rates of relative consumption and the growth rate of the real exchange rate. Chari et al. (2002) report the cross-correlations between consumption ratio and the real exchange rate for a subset of OECD economies from 1973 to 1994 at a quarterly frequency and find a median value of -0.07. In their work, they label the discrepancy between their model's prediction and the empirical evidence as the consumption–real exchange rate anomaly. Similarly, Corsetti et al. (2004) show that the cross-correlations obtained from Hodrick–Prescott filtered as well as first-difference filtered data for a selection of OECD countries appear to be small and often negative. Their median estimate is between -0.30 and -0.2. We also report our estimates for the cross-correlation between logged and Hodrick–Prescott filtered relative consumption and the real exchange rate, in levels as well as in first differences, where the reference country is the US. The data for consumption and real exchange rates are annual series from 1970 to 2000.