Journal of International Money and Finance 40 (2014) 128–148

Contents lists available at ScienceDirect

Journal of International Money and Finance

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

Time-varying international diversification and the forward premium

Benjamin Jonen*, Simon Scheuring

Department of Banking and Finance, University of Zurich, Plattenstr. 32, 8032 Zurich, Switzerland

Keywords:
Forward premium
Habits
International diversification

A B S T R A C T

This paper reproduces the slope of the uncovered interest rate parity (UIP) regression for ten country pairs within one standard deviation under rational expectations. We propose an infinite horizon dynamic stochastic general equilibrium model with incomplete markets. Heterogeneous investors experience varying risk aversion as a result of habit formation.

The underlying mechanism of the model relies on varying international diversification in the investors' portfolio choice decision. In response to their changing habit levels, investors' hedging desire varies over time. This leads to adjustments in interest rates. The habit-induced investment decisions are negatively correlated with movements in the exchange rate. This results in a negative correlation between interest rates and expected exchange rates, as implied by a negative UIP slope.

Depending on the magnitude of habits, the model is capable of reproducing positive as well as negative UIP slopes, as seen empirically in the data.

1. Introduction

A large body of empirical literature finds that high interest currencies tend to appreciate.[1] This is surprising, since it implies that investors in high yield currencies benefit twice, once from the interest rate spread and once from the expected appreciation. Standard economic models predict exactly the

* Corresponding author. Tel.: +41 44 634 41 26.
E-mail addresses: benjamin.jonen@bf.uzh.ch, bjonen@gmail.com (B. Jonen), simon.scheuring@bf.uzh.ch (S. Scheuring).

[1] The discovery is attributed to Hansen and Hodrick (1980) and Fama (1984). For surveys see Hodrick (1987) and Engel (1996).

0261-5606/$ – see front matter
http://dx.doi.org/10.1016/j.jimonfin.2013.09.004

opposite, namely that the uncovered interest rate parity (UIP) holds: high interest currencies should depreciate. The empirical phenomenon, usually referred to as the forward premium anomaly, is one of the most prevalent puzzles in international finance and has also given rise to the great popularity of carry trades.[2]

Given the complexity and resilience of the puzzle, financial economists have been searching for a potential explanation ever since its discovery.[3] Approaches toward a theoretical explanation emerge from three major directions: irrational expectations, market frictions or rational risk premia. This paper develops a two-country model under rational expectations without market frictions, attributing the forward premium to time-varying risk premia.

We assume that consumers form habits according to their consumption history. This changes the price of risk over time. When consumption drops close to the habit level, marginal utility increases and implied risk aversion rises. Contrarily, a large wedge between consumption and habit implies small risk aversion. Without habit, expected exchange rate (FX) appreciations always translate into a falling interest differential (confirm UIP). The introduction of habit induces shifts in investors' international diversification: Investors purchase foreign assets to hedge their consumption risk. The desire to hedge varies with different levels of income. Therefore, interest rate differentials carry time-varying risk premia for consumption growth. These risk premia are negatively correlated with FX returns. Thus, for sufficiently high habit levels, expected exchange rate appreciations can lead to increasing interest rate differentials (contradict UIP), as seen in the data.

The model's exchange rate is the ratio between tradable good prices in the two countries. We therefore assume Purchasing Power Parity holds for the tradable part of agents' income. This allows the model to generate realistic levels of inflation and FX returns simultaneously.

Markets are assumed to be incomplete on the international level. There is no asset that directly enables the representative investors to insure their income risk. This assumption is necessary to prevent countries from completely aggregating their individual risk, i.e. consume a constant percentage of the global income in tradable goods. The emerging country-specific consumption uncertainty impacts risk premia: they become larger and more varying, across time as well as across countries.

With habit levels common in the literature, we are able to reproduce the forward premium anomaly for ten different country pairs, composed of the five countries Australia, Germany, Japan, United Kingdom and United States.[4] For eight out of those ten countries, the match is almost perfect, and for the remaining two the model remains within one standard deviation of the empirical observation. Additionally, our cross-country analysis allows us to deduce implied habit levels for the countries under investigation.

This paper is related to the work of Verdelhan (2010). Verdelhan provides an explanation to the forward premium in the Campbell and Cochrane (1999) habit framework. He combines pro-cyclical interest rates with habit driven counter-cyclical risk aversion to replicate the anomaly for real exchange rates. In our opinion, his model has two major shortfalls, one on the financial side and one on the real side. First, on the financial side, Verdelhan considers real exchange rates, although the empirical anomaly has been observed for nominal exchange rates. Introducing money allows us to make statements on the interplay between nominal exchange and interest rates. Second, on the real side, a major restriction of Verdelhan's approach is that consumption has to be exogenous. In an international model, this implies the absence of trade, which he achieves by assuming sufficiently large transportation costs. In the appendix of his paper, Verdelhan takes a first step toward a more diversified model, by reducing transportation cost and solving the planner's problem for the two countries. This paper takes the next necessary step: we abandon the planner and solve for a competitive equilibrium.

Thus, similarly to Verdelhan, we attribute the forward premium to rational risk premia, which vary over time due to habit formation. In our model, however, consumption is endogenous. We therefore

[2] Carry trade refers to the strategy of borrowing in low interest currencies while investing in high interest currencies.

[3] For a survey see Engel (1996). Important theoretical contributions include: Alvarez et al. (2009); Bacchetta and van Wincoop (2010); Bansal and Shaliastovich (2009); Bekaert (1996); Colacito (2006); Farhi and Gabaix (2008); Verdelhan (2010) and most recently Heyerdahl-Larsen (2012).

[4] Similar habit levels are used in Campbell and Cochrane (1999) and Verdelhan (2010).