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Uncovered interest parity: The long and the short of it

James R. Lothian *

Gabelli School of Business, Fordham University, 113 West 60th Street, New York, NY 10023, USA

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ABSTRACT

Uncovered interest rate parity (UIP) is a theoretical relation linking changes in exchange rates and corresponding interest rate differentials. Despite its considerable intellectual appeal, uncovered interest rate parity has very often been found wanting empirically. I reinvestigate this relation using a 17-country panel of historical time series data at its longest—for the US–UK country pair—spanning 217 years. I find results that are largely consistent with theory: over the long term, in most countries, bond yields expressed in common currency bear a positive relationship to one another as UIP predicts. This is in contrast to the very nearly opposite findings reported in much of the literature and now taken as a stylized fact.

1. Introduction

According to the uncovered interest rate parity (UIP) relation, countries with high interest rates should have depreciating currencies relative to currencies of countries with low interest rates. Most studies, however, have found the opposite. High interest rate countries over quite lengthy periods have often experienced currency *appreciation* rather than depreciation. This in turn has come to be known in the literature as the "forward premium puzzle". The proof of the pudding has also been found in the eating. Among practitioners, the phenomenon of "carry trades"—an implicit bet against UIP in which traders borrow low interest rate currencies (the "funding currencies") and invest in high interest rate currencies (the "target" or "investment currencies")—has become common.[1]

In this study, I re-examine the performance of UIP using an even richer body of long-term historical data. These data span 16 foreign countries and the United States and periods ranging from 90 to 217 years. I find results that are largely consistent with theory: in most countries bond yields expressed in common currency bear a positive relationship to one another as UIP predicts. This is in contrast to the very nearly opposite findings reported in much of the literature and now taken as a stylized fact.

* Tel.: +1 212 636 6147.
E-mail addresses: lothian@fordham.edu, jrmlothian@aol.com.

[1] The recent literature on carry trades is extensive. See for example, Boudoukh et al., forthcoming, Brunnermeier, et al. (2009), Clarida et al. (2009), Menkhoff et al. (2012), Moore and Roche (2012) and Doskov and Swinkels (2015).

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2. Data and theory

The data that I have constructed are for a multi-country panel encompassing 17 countries and over two centuries. These data are for annual US dollar exchange rates and annual long-term bond yields for Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States. At their longest, for the UK–US country pair, the data span 217 years; at their shortest, for Finland–US, they span 92 years and on average, 157 years. Table 1 contains a list showing the lengths of the data series for 17 countries.

A major reason for focusing on yields of long-term bonds as opposed to yields on short-term money market instruments is data availability. For many countries, short-term money market interest rates simply are not available for very lengthy periods. A secondary, but not unimportant, reason for doing so is that over the longer horizons relevant to bonds, as Chinn and Meredith (2004) have argued, economic "fundamentals," become more important. Hence, the UIP relation is less apt to be disturbed by idiosyncratic and accidental influences.

Using very long samples does, however, come with some potential costs. One is that the data are not all exact matches. The bond yields are long-term and not homogeneous across countries and in many instances not completely homogenous over time within the various countries.[2] There are, moreover, wartime disruptions to markets in both bonds and currencies and in several cases missing observations for such periods and observations marred by the controls and the liquidity limitations that come with the thin markets characteristic of wartimes and their immediate aftermaths.

Uncovered interest parity posits a link between the exchange rate currencies two countries' and their respective interest rates of the following form:

$$E[\Delta s_{t+1}]_t = i_t - i_t*, \tag{1}$$

where $E[\Delta s_{t+1}]$ is the expected change from time t to $t+1$ in the log spot exchange rate, conditional on information at time t, and expressed as the foreign-currency price of a unit of the home currency, i_t is the one-period foreign interest rate and i_t* is the one-period home interest rate. If there is a forward market in currencies and covered interest parity is assumed to hold, this equation can be replaced by an equation linking the expected change in the exchange rate to the forward premium:

$$E[\Delta s_{t+1}] = f_t - s_t, \tag{2}$$

where f_t is the log forward exchange rate.

The bulk of the literature features tests using a regression equation based on (2), like:

$$s_{t+1} - s_t = \alpha + \beta(f_t - s_t*) + e_{t+1}. \tag{3}$$

where $s_{t+1} - s_t$ is the rate of depreciation of the log spot exchange rate, α captures risk premia and possibly other disturbing factors and $E[e_{t+1}] = 0$, $E[e_{t+1}^2] = \sigma^2$, $E[e_t e_s]$, $t \neq s$.

A test of unbiasedness in the absence of risk premia is $(\alpha, \beta) = (0, 1)$.

An alternative is to focus on UIP directly and use the interest differential in place of the forward premium as a predictor of the exchange rate change. Because of the long sub-periods in which exchange rates were fixed in the countries in this paper, and because of concerns about resultant errors-in-variables problems, the regressions that I run are based on a variant of this approach that relates the exchange-rate adjusted interest rate in the foreign country to the US interest rate[3]:

$$i_{j,t} - (s_{t+1} - s_t) = \alpha + \beta i_t * + e_{t+1}, \tag{4}$$

where $i_{,j,t}$ is the long-term bond yield for the jth-country, i_t* is the long-term home country (US) bond yield and $s_{t+1} - s_t$, the one-period change in the log of the spot jth-country vs. USD exchange rate. The null hypothesis of uncovered interest rate parity is $(\alpha, \beta) = (0, 1)$ and a lack of serial correlation in e_{t+1}.

The rationale here is that investments in domestic and foreign bonds on average should generate the same return when denominated in the same currency. Investing in a US bond and holding it to maturity will result in a certain return of i_t^*, while investing in a foreign bond, holding it to maturity and converting the proceeds back into the domestic currency, will generate a return of $i_{j,t} - (s_{t+1} - s_t)$, the sum of the foreign yield, which also is certain at time t, plus the currency appreciation or depreciation return, which is uncertain at time t and only becomes known at time $t+1$, the maturity date of the bond.

In the first two decades following the advent of floating rates, there was an outpouring of studies based on Eq. (3) or its UIP variant. The upshot of this research was that the forward rate was a biased predictor of the future spot rate and that UIP was violated. To make matters worse, estimates of the regression slopes, β, were generally found to be negative rather than positive. Hodrick (1987), Lewis (1995) and Engel (1996) summarize this early research. Froot and Thaler (1990) report results of a survey of empirical results obtained in 75 of these studies. In very few cases are the estimates of β positive; on average they are −.88.

[2] The yield data are for varying maturities both across countries and over time within countries. Most are for 10-year maturities or longer. The exceptions are Finland (5 years), Germany (8 to 15 years) and Japan (7 years).

[3] See the discussion in Lothian and Wu (2011) on the problem of errors in variables in standard UIP regressions when exchange rates are fixed.