

A Dataset for Covered Interest Rate Parity Deviations Between Government Bond Yields

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1 Introduction

In this dataset, we measure the deviation from covered interest rate parity (CIP) between government bond yields in the United States and other countries. In particular, we define the n -year CIP deviations between government bond yields in the United States and country i as

$$\Phi_{i,n,t} = y_{i,n,t}^{Govt} - \rho_{i,n,t} - y_{USD,n,t}^{Govt}, \quad (1)$$

where $y_{i,n,t}^{Govt}$ is the n -year local-currency government bond yield in country i , $\rho_{i,n,t}$ is the n -year market-implied forward premium for hedging currency i against the U.S. dollar, and $y_{USD,n,t}^{Govt}$ is the n -year U.S. Treasury bond yield.

The Treasury CIP deviation measures the difference between the synthetic dollar borrowing cost of country i and the direct dollar borrowing cost of the United States. It allows us to compare sovereign borrowing costs after swapping the promised cash flows of local currency sovereign bonds into U.S. dollars. The main drivers of CIP deviations for government bond yields are (1) default risk differentials between U.S. and foreign government bonds; (2) convenience yield differentials between U.S. and foreign government bonds; and (3) market segmentation and other financial frictions. The relative importance of these drivers depend on the specific country and maturity under study.

In the context of emerging markets, Du and Schreger (2016) refer to Treasury CIP deviations between an emerging market sovereign and the United States as the “local currency credit spread” of that emerging market sovereign. Local currency credit spreads are highly correlated with credit spreads on dollar-denominated debt issued by the same emerging market sovereigns, suggesting that credit risk plays a first-order role in determining CIP

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deviations for emerging markets. For developed markets such as Germany and safe havens outside the euro area, sovereign default risks are negligible and capital accounts are open. Du, Im and Schreger (2018) argue that CIP deviations for G10 countries provide a measure of the convenience yield differential between U.S. and foreign government bonds.

This dataset provides an update of CIP deviations for government bonds used in Du and Schreger (2016) and Du, Im and Schreger (2018). We also provide a detailed spreadsheet documenting Bloomberg and Thomson Reuters tickers used in the calculation, together with a few data caveats. We note that this dataset is not identical to that used in either published paper as some Bloomberg tickers have been updated. The current choice of data tickers represents best available data to our knowledge.

2 Our Sample

We provide our $\Phi_{i,n,t}$ estimates for both developed and emerging markets across benchmark maturities at 3-month, 1-year, 2-year, 3-year, 5-year and 10-year between 2000 and 2017. The sample period starts later for some emerging markets as their domestic bond markets and cross-currency swap markets became more developed, and good prices became available. Our sample countries cover 10 developed countries and 15 emerging markets as follows (currency abbreviations provided in parentheses).

- Developed markets (G10): Australia (AUD), Canada (CAD), Switzerland (CHF), Denmark (DKK), Germany (EUR), United Kingdom (GBP), Japan (JPY), Norway (NOK), New Zealand (NZD), Sweden (SEK);
- Emerging markets (EM): Brazil (BRL), Colombia (COP), Hungary (HUF), Indonesia (IDR), Israel (ILS), Korea (KRW), Mexico (MXN), Malaysia (MYR), Peru (PEN), Philippines (PHP), Poland (PLN), Russia (RUB), Thailand (THB), Turkey (TRY), South Africa (ZAR).

We use estimated yield curves for government bonds from Bloomberg for most of the sample countries. Next, we discuss how to calculate the forward premium at various maturities.

3 Construction of the Forward Premium

In order to construct CIP deviations for government bond yields, the key is to calculate the market-implied forward premium $\rho_{i,n,t}$. At short maturities of less than one year, we use

forward and spot exchange rates to calculate $\rho_{i,n,t}$. At medium to long maturities, which are those equal to or greater than one year, forward markets are illiquid and so we calculate $\rho_{i,n,t}$ by constructing a fixed-for-fixed cross-currency swap.

More specifically, at the 3-month maturity, the forward premium can be calculated as the percentage difference between the outright forward and spot exchange rate:

$$\rho_{i,3M,t} = \frac{360}{n_t}(F_{i,3M,t} - S_{i,t})/S_{i,t}, \quad (2)$$

where $F_{i,3M,t}$ is the 3-month outright forward exchange rate of currency i against the U.S. dollar at time t , and $S_{i,t}$ is the the spot exchange rate at time t , and n is the number of days for a benchmark 3-month contract at time t (the exact calculation depends on weekends and holidays covered by the contract period, but it is usually around 90 days). Both forward and spot exchange rates are defined as units of currency i per U.S. dollar.² We use Bloomberg to obtain FX rates for G10 currencies, and WM/Reuters from Thomson Reuters DataStream for the majority of EM currencies.

At maturities of 1-year or greater, we calculate $\rho_{i,n,t}$ using a number of derivatives. The main idea is to construct a fixed-for-fixed cross-currency swap rate that allows investors pay fixed foreign currency cash flows and receive fixed U.S. dollar cash flows. As explained in detail in Du and Schreger (2016) and Du, Tepper and Verdelhan (2018), the spread on the fixed-for-fixed swap is equal to the long-term forward premium for hedging foreign currency risk against the U.S. dollar. We obtain all swap data from Bloomberg.

For G10 currencies, the market convention is to price the long-term forward premium through a collection of interest rate swaps and cross-currency basis swaps with the following formula:

$$\rho_{i,n,t} = irs_{i,n,t} + bs_{i,n,t} - irs_{USD,n,t}, \quad (3)$$

where $irs_{i,n,t}$ denotes the n -year interest rate swap rate for exchanging fixed currency i cash flows into the floating interbank interest rate benchmark (referred to as the Libor interest rate swap) in country i , $bs_{i,n,t}$ denotes the n -year cross-currency basis swap rate for exchanging the floating benchmark interbank rate in country i for U.S. Libor, and $irs_{USD,n,t}$ denotes the n -year U.S. Libor interest rate swap rate for exchanging fixed dollar cash flows into U.S. Libor. In order to hedge long-term currency risk for currency i , a dollar investor has to go through three steps. First, the investor pays the foreign currency interest rate swap, $irs_{i,n,t}$, to swap fixed foreign currency cash flows into floating foreign currency Libor cash flows. Second, she pays the cross-currency basis swap, $bs_{i,n,t}$, to swap floating foreign currency

²Alternatively, we can calculate the log forward premium $\rho_{i,3M,t} = \log(F_{i,3M,t}) - \log(S_{i,t})$, which is very close to the $\rho_{i,3M,t}$ given in Equation 2.

Libor into U.S. dollar Libor cash flows. Third, she receives the U.S. interest rate swap, $irs_{USD,n,t}$, to swap floating dollar U.S. Libor cash flows into fixed U.S. dollar cash flows. The combination of the three steps eliminates all floating cash flows and only exchanges of fixed cash flows in foreign currency and the U.S. dollar at the inception and maturity of the swap remain, which exactly replicates a long-term forward contract.

For many EM currencies with capital controls, dollar investors can hedge foreign currency risk via non-deliverable swap markets. The market convention is to quote the long-term forward premium as

$$\rho_{i,n,t} = nds_{i,n,t} - irs_{USD,n,t}, \quad (4)$$

where $nds_{i,n,t}$ denotes the n -year non-deliverable cross-currency swap that exchanges fixed currency i cash flows into the floating U.S. Libor, which is cash settled in U.S. dollars. In other words, by paying $nds_{i,n,t}$, the dollar investor is able to convert n -year fixed, foreign currency cash flows into a spread over U.S. Libor, similar to paying $irs_{i,n,t} + bs_{i,n,t}$ for G10 currencies. The final step is to swap the floating U.S. Libor cash flows into fixed U.S. dollar cash flows by receiving the U.S. interest rate swap $irs_{USD,n,t}$.

One technical note is that in the case in which there is a mismatch between the frequency of floating interbank benchmark between the plain-vanilla interest rate swap and the cross-currency basis swap (for example, the Brazilian non-deliverable swap is indexed to 6-month U.S. Libor and the benchmark U.S. interest rate swap is indexed to the 3-month U.S. Libor), the mismatch is corrected using an additional tenor basis swap.

4 Our Dataset

By Bloomberg's licensing agreement, we cannot publish the raw data for computing $\Phi_{i,n,t}$. However, we are able to make the following data series available. The variables in the dataset are as follows:

- `diff_y`: interest rate differential on government bonds in percentage points, or $y_{i,n,t}^{Govt} - y_{USD,n,t}^{Govt}$,
- `rho`: market implied forward premium in percentage points, or $\rho_{i,n,t}$,
- `cip_govt`: CIP deviations for government bonds in basis points, or $\Phi_{i,n,t}$.

5 Data Caveats

There are two important caveats to our dataset for emerging markets. First, illiquidity in the FX forward and swap markets can lead to measurement problems. For example, our 3-month measure is very noisy for Malaysia, Thailand, and Indonesia. More generally, FX forwards and swaps become more illiquid during time of distress, which tends to introduce a downward bias to $\Phi_{i,n,t}$.

Second, market segmentation and capital controls in emerging markets complicate the interpretation of our measure. In the event of extreme market segmentation (for example, Russia), $\Phi_{i,n,t}$ can even go negative, which reflects depressed domestic government bond yields of emerging markets when compared with the U.S. Treasury yield on the currency-hedged basis.

References

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