Currency Risk Premia and Covered Interest Rate Parity

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Covered Interest Rate Parity

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Introduction
Definition of the Cross-Currency Basis: \( x_{t,t+n} \)

- CIP for multi-period interest rates:

\[
(1 + y_{t,t+n})^n = (1 + y_{t,t+n})^n \frac{S_t}{F_{t,t+n}}.
\]

- Cross-currency basis: Deviation from CIP

\[
(1 + y_{t,t+n})^n = (1 + y_{t,t+n} + x_{t,t+n})^n \frac{S_t}{F_{t,t+n}}.
\]

Therefore, we have

\[
x_{t,t+n} = y_{t,t+n} - \left[ y_{t,t+n} - \rho_{t,t+n} \right],
\]

where the forward premium is given by

\[
\rho_{t,t+n} \equiv \left( \frac{F_{t,t+n} - S_t}{S_t} \right)^{1/n}.
\]
How to construct the cross-currency basis? (<1-year)

- Maturities less than 1Y: need to download FX spot, forwards, day counts, and interest rates to calculate.
  - General formula:
    \[ \rho = \frac{360}{ACT(t_1, t_2)} \frac{F_{t_1, t_2} - S_{t_1}}{S_{t_1}} \]
  - \( t_1 \) = spot settlement date (typically \( T + 2 \) after trading date);
  - \( t_2 \) = forward settlement date;
  - \( ACT(t_1, t_2) \) : actual calendar days between \( t_1 \) and \( t_2 \).

- Special formula for overnight cross-currency basis: Footnote #16 in Correa, Du and Liao (2020)
How to construct the cross-currency basis? (≥1-year)

▶ Maturities equal to or greater than 1Y: cross-currency basis (indexed to benchmark interbank rates, IBOR) is directly traded for G10 currencies, equal to the spread on the cross-currency basis swap (⟨XCCY⟩ on Bloomberg).

▶ To calculate long-term forward premium for G10 currencies:
  ▶ For G10 currencies, combine XCCY with two IRS:

\[
\rho_{i,n,t} = r_{t,t+n}^{i,IRS} + xccy_{t,t+n} - r_{t,t+n}^{\$,IRS}
\]

▶ For EM currencies, combine NDS with U.S. IRS:

\[
\rho_{t,t+n} = r_{t,t+n}^{i,NDS} - r_{t,t+n}^{\$,IRS}
\]

▶ More details: data and tickers for G10 and EM countries available at https://sites.google.com/site/wenxindu/data?authuser=0
3M IBOR-based Cross-Currency Basis
3M OIS-based Cross-Currency Basis
Why does CIP matter?
CIP deviations: indicator of offshore $ funding condition

- CIP deviations measure **offshore dollar funding conditions**.
- The more negative the cross-currency basis, the tighter the dollar funding condition for market participants who need to borrow from the FX swap markets.
- Matter for external transmission of U.S. monetary policy.

Direct and implied dollar funding costs

Source: Bloomberg and author’s calculations
CIP deviations: shadow costs of balance sheet constraints

- CIP violations represent failure of textbook no-arbitrage.

- Usual culprits (such as credit risk, transaction costs) cannot explain away the arbitrage profits.

- Since arbitrage exists at very short horizon (e.g. overnight), the classical limits to arbitrage due to “convergence risk” (Shleifer and Vishny, 1993) do not apply.

- CIP deviations reflect **shadow costs of balance sheet constraints** on financial intermediaries post-GFC.
The CIP deviations are highly correlated with the broad strength of the U.S. dollar. When the dollar is strong, CIP deviations are wide (Advijev, Du, Koch and Shin, 2019).
CIP Arbitrage and Intermediary Constraints
CIP Arbitrage ($x < 0$): $x_{t,t+n} = y_{t,t+n} - (y_{t,t+n} - \rho_{t,t+n})$. 

Net Cash Flow: $0 \text{ USD}$
Usual culprits are not enough

- Libor rates are indicative: manipulation?
  - Profits exist using actual CD/CP funding costs (Anderson, Du and Schlusche, 2019)

- Libor is unsecured: default risk for Libor panel banks?
  - Can invest in repo rates.
  - How about cost of collateral? –Borrow unsecured and lend secured (no need to have collateral to begin with).
  - Can also park the money at central banks (i.e. ECB/BOJ) earn overnight CIP deviations (Correa, Du and Liao, 2020).

- Counterparty risk in foreign exchange forwards and swaps?
  - FX swaps are already collateralized to the first-order by design. Plus, initial and variation margins are required (in cash) to further reduce counterparty risk.

- Transaction costs?
  - Arbitrage profits remain positive after taking into account bid-ask spreads.
Example: Unsecured wholesale funding by rates

Source: Anderson, Du and Schlusche (2019)

- The bulk of all wholesale funding was issued at rates below the implied dollar rate from the dollar-yen swap.
Example: CIP deviations for central bank deposit rates

- FX IOR Basis (USDJPY or USD-EUR): **overnight** CIP deviation between interests on excess reserves between the ECB /BOJ and the Fed: 25 bps /15 bps on average outside month-ends. (Correa, Gordon, and Liao, 2020)
Overview: CIP deviations and constraints facing banks

- Balance sheet constraints of financial intermediaries limit the size and exposure that can be taken to narrow CIP deviations.

- Post-crisis banking regulations have important effects on CIP deviations.
  1. Constraints on the total leverage (size) of bank balance sheets (Basel III LR, GSIB surcharge).
  2. Constraints on the composition of bank balance sheets.

- Constraints on banks have spillover effects on other levered entities (e.g. hedge funds) that borrow from banks.
Quarter-end Effects in CIP Deviations

Source: Du, Tepper and Verdelhan (2018) updated
Comparing CIP Deviations and Other Arbitrages

- We check for co-movement with other near-arbitrages:
  - bond-CDS, CDS-CDX, Libor tenor basis, 30Y swap spread, KfW vs Bunds, Refco vs Treasurys, TIPS vs. nominal treasury with inflation swaps
- High correlation correlation between 1st PC and AUD-JPY 3M spot basis

Source: Du, Hebert and Huber (2020)
CIP Deviations and Interest Rates
Recall cross-currency basis = direct $ rate - synthetic $ rate

Low-interest rate currencies have high synthetic $ interest rates and high-interest-rate currencies have low synthetic $ interest rates.
Implications for cross-sectional relationship

- The trading direction for UIP and CIP violations are the opposite to each other.
- Carry trades take advantage of UIP violations, which go long in high-interest-rate currencies (e.g. AUD), and short low-interest-rate currencies (e.g. JPY).
- To take advantage of CIP violations, an arbitrageur has to go long in low-interest-rate currencies (e.g. JPY), and short in high-interest-rate currencies (e.g. AUD).
Sophisticated global issuers do issue disproportionately more in high-interest-rate currencies and issue disproportionately less in low-interest-rate currencies.
CIP deviations and corporate bond issuance

- Corporate issuers can face different funding conditions across different funding markets. Firms shift debt borrowing to the cheaper funding currency on the FX-hedged basis (Liao, 2020).
- For example, the ECB QE compressed credit spreads for risky borrowers in Europe, making it more cheaper to issue in EUR and then swap back into USD.
There is also a positive relationship between the cross-currency basis and the foreign-US interest rate spread in the time series.

Monetary policy normalization in the US ($y_{US} \uparrow$) and low rates in Europe and Japan push the cross-currency basis more negative $\rightarrow$ an increase in demand for dollar funding/hedging

\[
\Delta x_i = 0.024 + 0.150^{***} (\Delta y_i^{GE} - \Delta y_i^{US}).
\]

(0.056)     (0.025)
Demand shocks can move CIP deviations post-GFC

Pre-GFC

Post-GFC

CIP Deviations

Swap Quantity

Demand

Demand'

Pre-GFC Supply

Post-GFC Supply

0
There can be complicated funding chains

Dollar funding markets can be fragile. Understanding the vulnerabilities requires a deep dive into specific constraints facing specific institutions at specific time.

Where do I start? – Additional Datasets

- Public/vendor datasets:
  - N-MFP: SEC data on month-end portfolio holding of U.S. MMFs at the cusip level
  - BIS international banking/debt securities/derivatives statistics
  - IMF Coordinated Portfolio Investment Survey (CPIS)
  - U.S. Treasury International Capital
  - Global Capital Allocation Project (Morningstar/SDC/Factset): [https://www.globalcapitalallocation.com/](https://www.globalcapitalallocation.com/)
  - EPFR (Emerging Portfolio Fund Research)
  - Markit Securities Finance (securities lending)

- Granular data covering different market segments often only available to regulators: find coauthors/internship at central banks and other regulatory bodies
References