Currency Market

Frontier Research and Chinese Currency Market

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Deviation from Interest Rate Parity

• Covered Interest Rate Parity (CIP): The FX forward premium should equal to interest difference between two currencies.

\[ e^{ny_{t,t+n}} = e^{ny_{t,t+n}} \frac{S_t}{F_{t,t+n}} \]

\[ \rho_{t,t+n} = \frac{1}{n} (f_{t,t+n} - s_t) = y_{t,t+n} - y^d_{t,t+n} \]

• Deviation from Covered Interest Rate Parity (CIP): cross-currency basis \((x_{t,t+n})\)

\[ e^{ny_{t,t+n}} = e^{ny_{t,t+n} + nx_{t,t+n}} \frac{S_t}{F_{t,t+n}} \]

\[ x_{t,t+n} = y^d_{t,t+n} - (y_{t,t+n} - \rho_{t,t+n}) \]

• Uncovered Interest Rate Parity: Carry Trade
  • Carry trade and volatility shock - safe currency (JPY/CHF): LUKAS MENKHOFF, LUCIO SARNO, MAIK SCHMELING, and ANDREAS SCHRIMPF (JF 2012)
  • Term Structure of Currency Carry Trade Risk Premia: Hanno Lustig, Andreas Stathopoulos, and Adrien Verdelhan (AER 2019)
Deviation from Interest Rate Parity

- Wendi Du, Alexander Tepper and Adrien Verdelhan (JF 2018)

- CIP has been systematically and persistently violated among G10 currencies since the global financial crisis in 2008 (annualized basis 24 basis bps at three-month, 27 bps at the five-year horizon 2010-2016)
- Hypothesis: constraints on financial intermediaries following the crisis and international imbalances in investment demand and supply across currencies.

Findings:
- CIP deviation increases toward the quarter-ends, tighter balance sheet constraint.
- Shadow cost of banks’ balance sheet (spread between IOER and Fed Fund Rate) accounts for 1/3 of the CIP deviation. (leverage ratio 5% for important banks Basel 3)
- Both in cross section and time series, the cross-currency basis is positively correlated with the level of nominal interest rates. (opposite direction with carry trade)

- Wenxin Du, Benjamin M. Hébert and Amy Wang Huber (2019): Are Intermediary Constraints Priced?
Deviation from Interest Rate Parity

Figure 1: Cash Flow Diagram for CIP Arbitrage with a Negative Basis ($x_{t,t+n} < 0$). This figure plots the cash flow exchanges of an arbitrageur profiting from a negative cross-currency basis between the Yen and the U.S. dollar. To arbitrage the negative cross-currency basis, the USD arbitrageur borrows 1 U.S. dollar at the interest rate $y^S_{t,t+n}$, converts it into $S_t$ yen, lends in yen at the interest rate $y^F_{t,t+n}$, and finally signs a forward contract at date $t$. There is no cash flow at date $t$. At date $t+n$, the arbitrageur receives $(1 + y^F_{t,t+n})S_t/F_{t,t+n}$ U.S. dollars thanks to the forward contract. The arbitrageur reimburses her debt in U.S. dollars and is left with a profit equal to the negative of the cross-currency basis $x_{t,t+n}$. In essence, the arbitrageur is going long in JPY and short in USD, with the JPY cash flow fully hedged by a forward contract.
Deviation from Interest Rate Parity

Figure 2: Short-Term Libor-Based Deviations from Covered Interest Rate Parity:
This figure plots the 10-day moving averages of the three-month Libor cross-currency basis, measured in basis points, for G10 currencies. The covered interest rate parity implies that the basis should be zero. One-hundred basis points equal one percent. The Libor basis is equal to $B_{t+3} = (\frac{L_{t+3}}{L_{t+3}} - \frac{f_{t+3}}{f_{t+3}})$ where $n = \text{three months}$, $L_{t+3}$ and $f_{t+3}$ denote the U.S. and foreign three-month Libor rates, and $\rho_t = \frac{1}{2}(f_{t+3} - s_t)$ denotes the forward premium obtained from the forward $f_{t+3}$ and spot $s_t$ exchange rates.
Figure 5: Long-Term Libor-Based Deviations from Covered Interest Rate Parity. This figure plots the 10-day moving averages of the five-year Libor cross-currency basis, measured in basis points, for G10 currencies. The covered interest rate parity implies that the basis should be zero. One hundred basis points equal one percent.
Deviation from Interest Rate Parity
How Banks Really Manage FX Positions?

- Banks take net positions in FX spot and swap by rolling a one-day opposite FX swap tomorrow-to-next (TN).
  - Banks have balance sheet constraints and don’t have enough cash to settle all trades in FX spot and swap market.
  - T/N reflects the most direct funding and liquidity cost in FX market.
  - T/N could be quite volatile – asset pricing consequence for carry trade and CIP deviation.
  - For USD currency pair, FX swap normally uses OIS (overnight index swap instead of LIBOR).
Chinese Currency Market: CIP Deviation

Real CNY Interest Rate - Synthetic CNY Interest Rate (SWAP Implied Annualized)
Chinese Currency Market – Government Currency Intervention

- August 11, 2015 The PBOC reformed on the formation mechanism of the central parity (fixing) to make it more market driven.
  - Each day at 9:15 AM, PBOC announce USD/CNY central parity price (fixing, +/- 2%).
  - Very important for both onshore and offshore (CNH/CNY NDF) currency market.
  - Reflecting potential government intervention in the currency market.

- Statistical model for the PBOC CNY fixing price – two-pillar policy:

\[
\log \left( \frac{S_{t+1}^{CP}}{S_t} \right) = \alpha + \beta_1 \log \left( \frac{X_{t+1}^{Open}}{X_t^{Close}} \right) + \beta_2 \log \left( \frac{X_t^{Close}}{X_{t}^{Open}} \right) + \beta_3 \log \left( \frac{S_t^{Close}}{S_t^{CP}} \right) + \varepsilon_{t+1}
\]

| Whole Sample: 2015/12/11 - 2019/11/29 |
|---|---|---|---|---|
| Intercept | b1 | b2 | b3 | R-square |
| -3.22 | 0.40 | 0.21 | 0.44 | 64.71% |
| (7.77) | (21.21) | (12.45) | (30.98) |
Chinese Currency Market – Government Currency Intervention

USD/CNY Fixing R-square Explained by Model (20 day rolling regression)

USD/CNY Fixing Residual (bps) (20 day rolling regression)