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.

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

$$\rho_{t,t+n=} \frac{1}{n}\left(f_{t,t+n} - s_t\right) = y_{t,t+n} - y_{t,t+n}^\$$$

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

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

$$x_{t,t+n} = y_{t,t+n}^\$ - \left(y_{t,t+n} - \rho_{t,t+n}\right)$$

- 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?

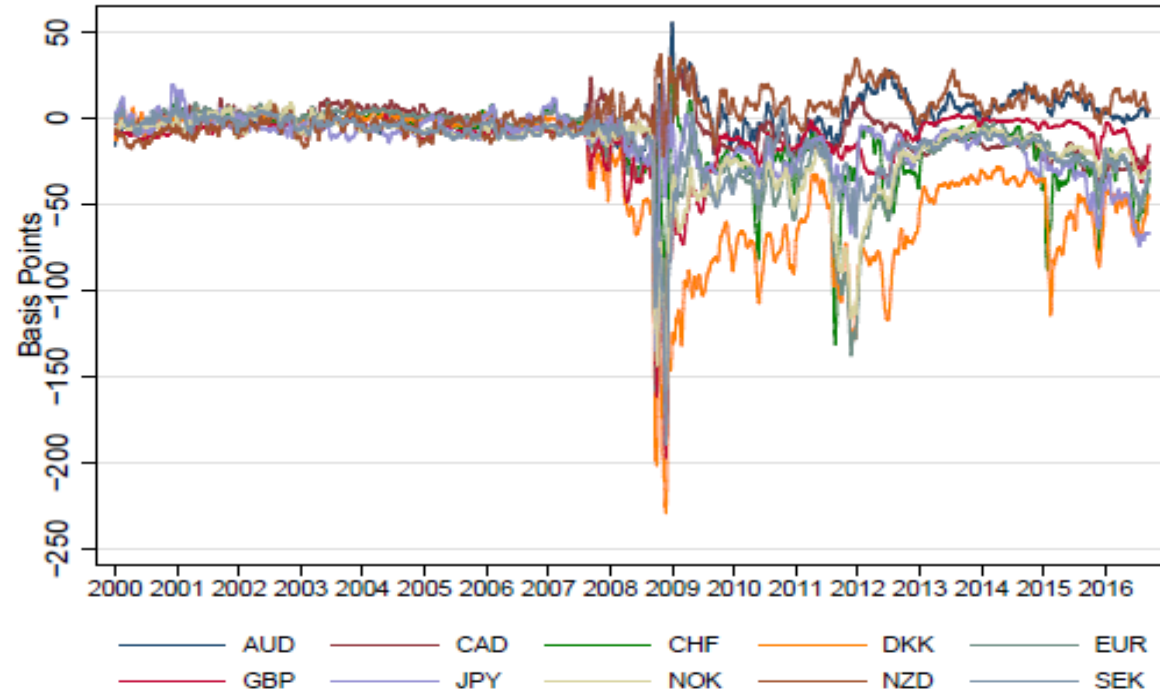# Deviation from Interest Rate Parity

USD Lender

1 USD

USD Arbitrageur

S_t JPY

JPY Borrower

Time t

$(1 + y_{t,t+1})S_t$ JPY

FX Forward Dealer

$(1 + y_{t,t+1})S_t/F_{t,t+1}$ USD

USD Lender

$1 + y^{\$}_{t,t+1}$ USD

USD Arbitrageur

$(1 + y_{t,t+1})S_t$ JPY

JPY Borrower

Time $t + n$

Net Cash Flow   0 USD

$-(1 + y^{\$}_{t,t+1}) + (1 + y_{t,t+1})S_t/F_{t,t+1} \approx -x_{t,t+1} > 0$ USD

Figure 1: **Cash Flow Diagram for CIP Arbitrage with a Negative Basis** $(x_{t,t+1} < 0)$: 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 $y^{\$}_{t,t+n}$, convert it into S_t yen, lends in yen at the interest rate $y_{t,t+n}$, and finally signs a forward contract at date t. There is no cash flow at date t. At date $t + n$, the arbitrageur receives $(1 + y_{t,t+n})^n S_t$ yen, and convert that into $(1 + y_{t,t+n})^n S_t/F_{t,t+n}$ 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 $x_{t,t+1}$. In essence, the arbitrageur is going long in JPY and short in USD, with the JPY cash flow fully hedged by a forward contract.

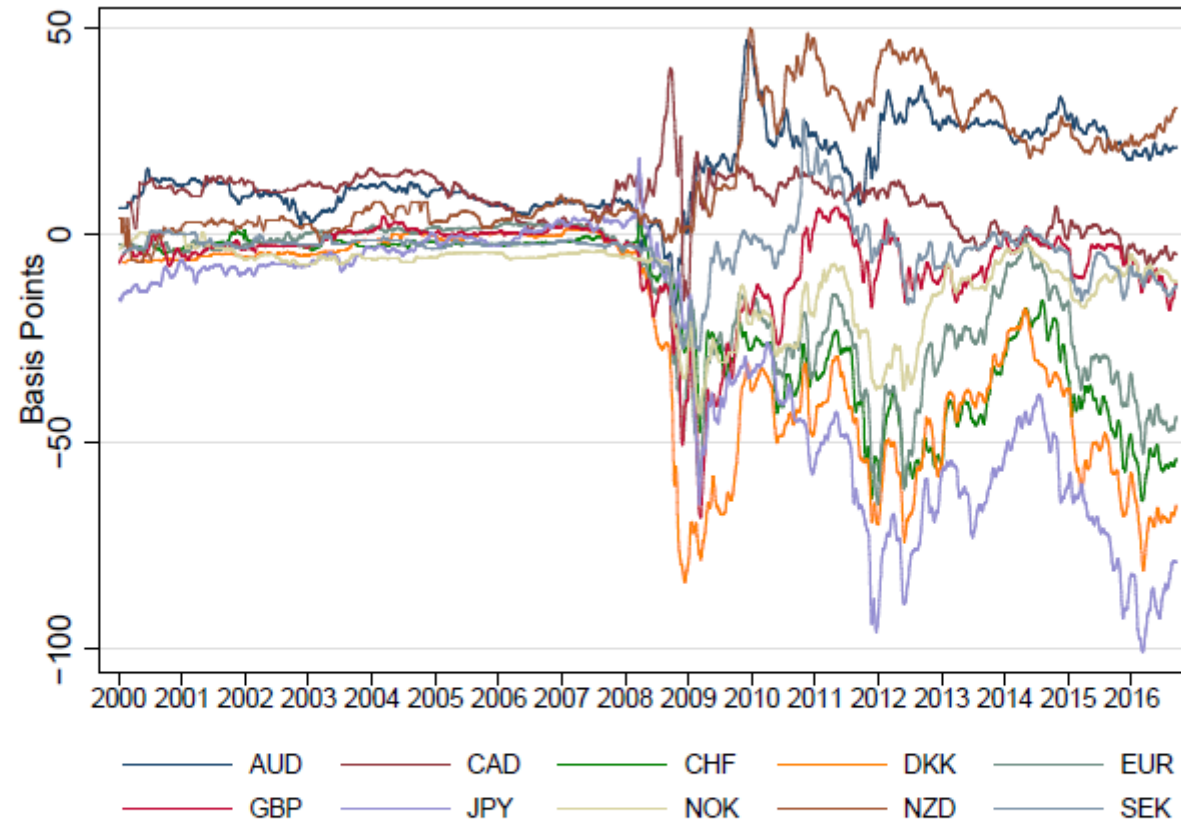# Deviation from Interest Rate Parity

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 $y_{t,t+n}^{\$,Libor} - (y_{t,t+n}^{Libor} - \rho_{t,t+n})$, where n = three months, $y_{t,t+n}^{\$,Libor}$ and $y_{t,t+n}^{Libor}$ denote the U.S. and foreign three-month Libor rates, and $\rho_{t,t+n} \equiv \frac{1}{n}(f_{t,t+n} - s_t)$ denotes the forward premium obtained from the forward $f_{t,t+n}$ and spot s_t exchange rates.

Deviation from Interest Rate Parity

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
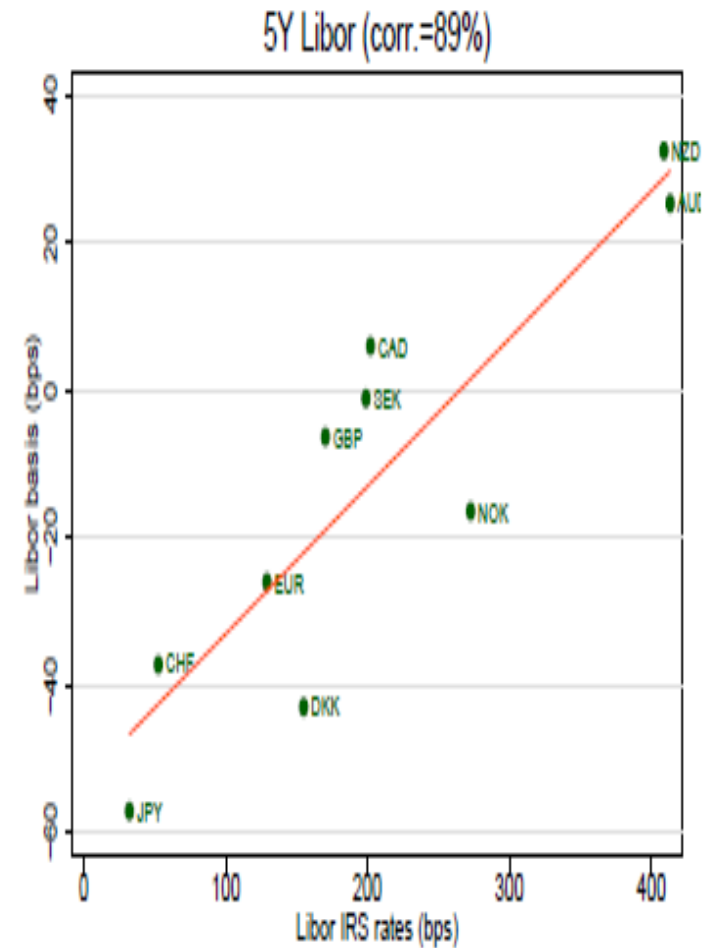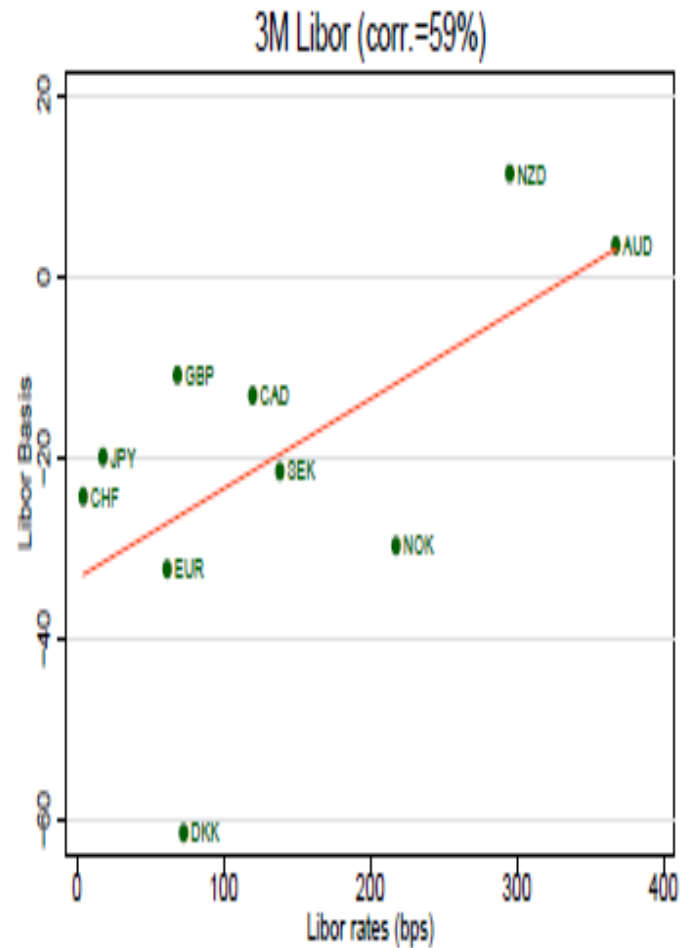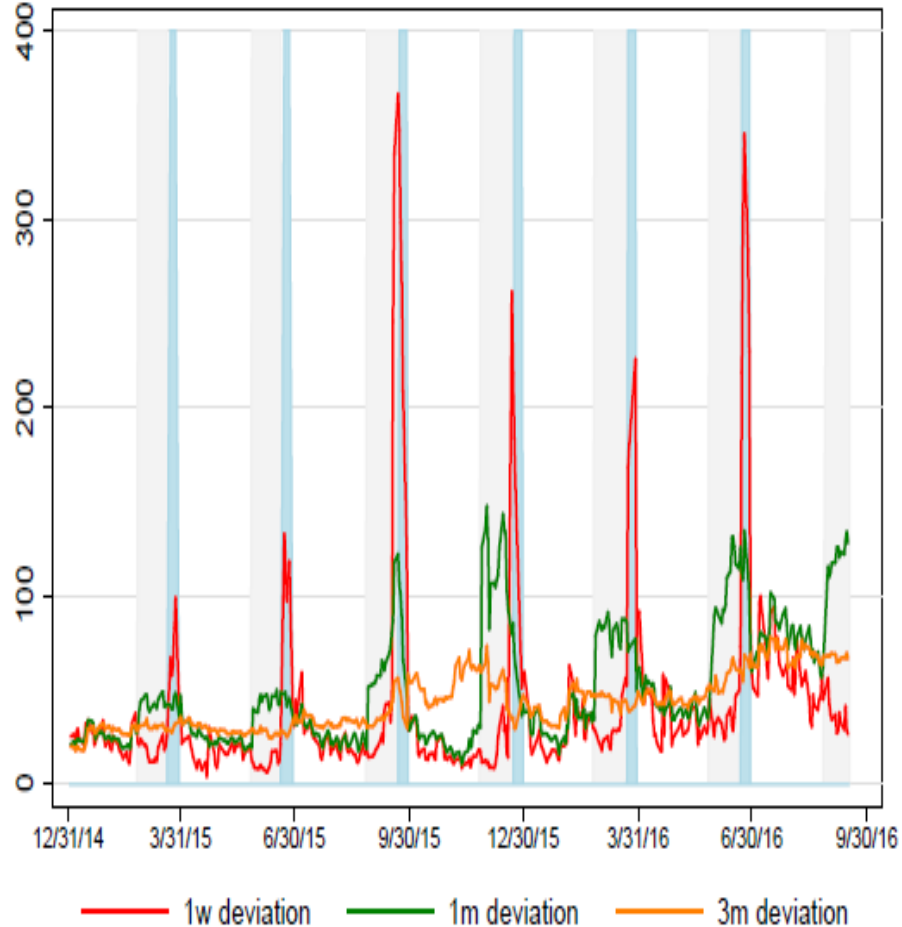
How Banks Really Manage FX Positions ?

- 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)
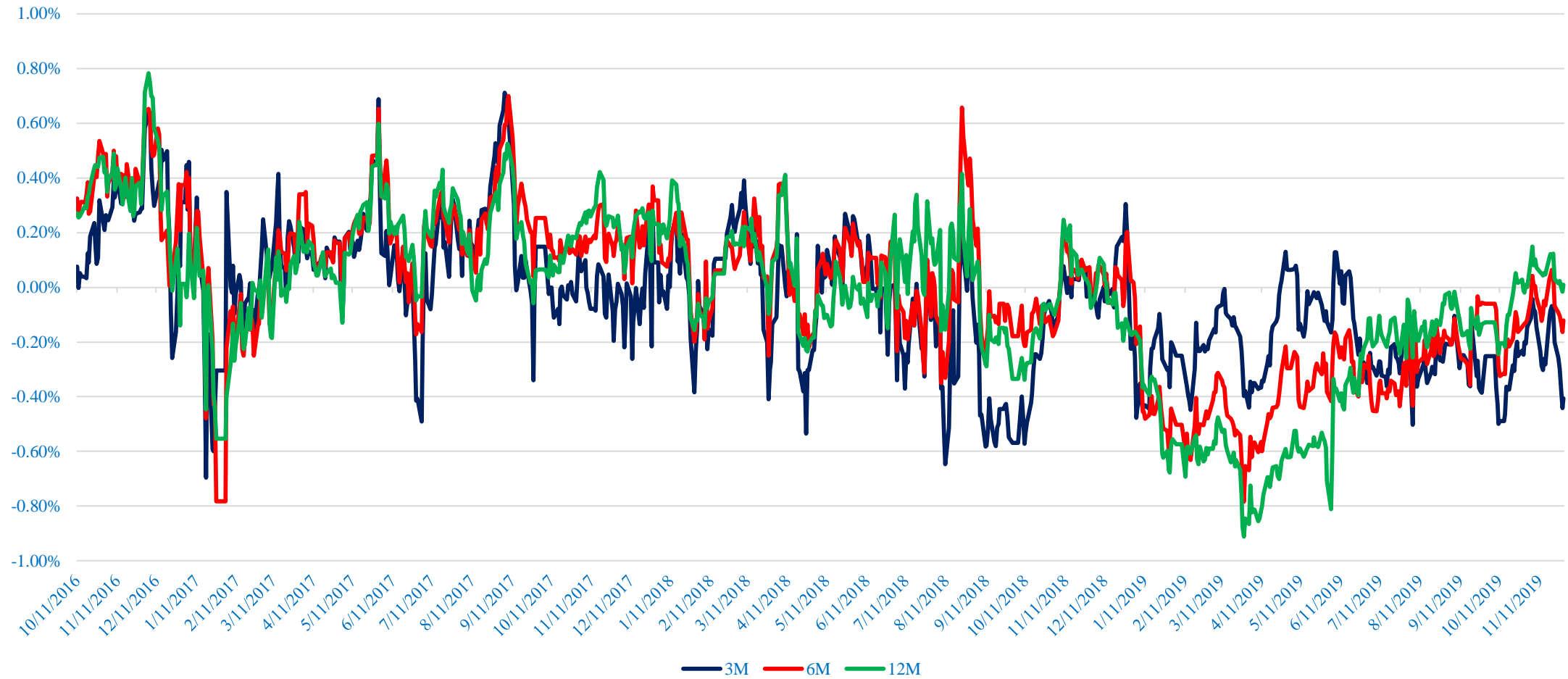

HKDTN Curncy (HONG KONG DOLLAR T/N)
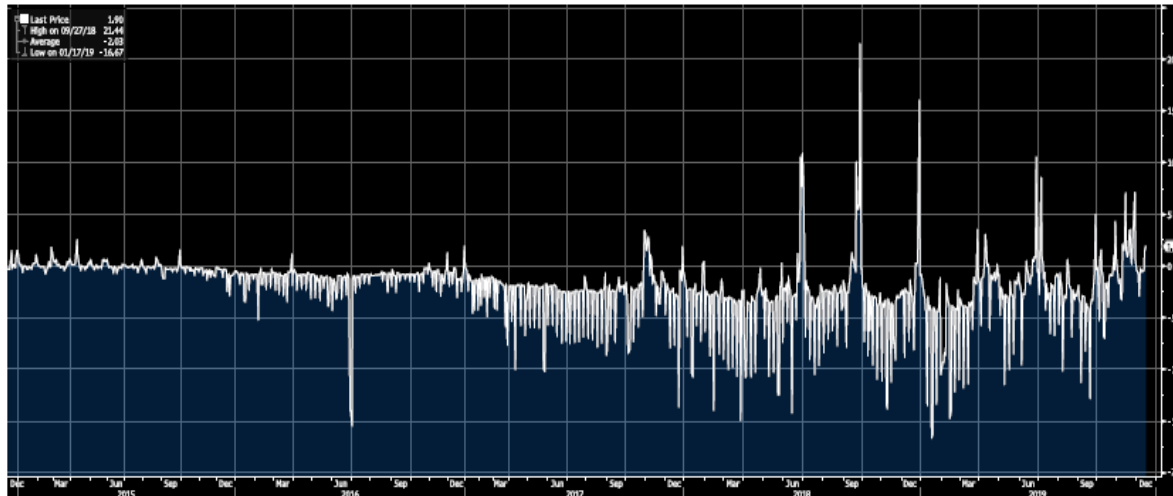
Bloomberg

USDHKD Curncy (USD-HKD X-RATE)

Bloomberg

Chinese Currency Market: CIP Deviation

Real CNY Interest Rate - Synthetic CNY Interest Rate (SWAP Implied Annualized)

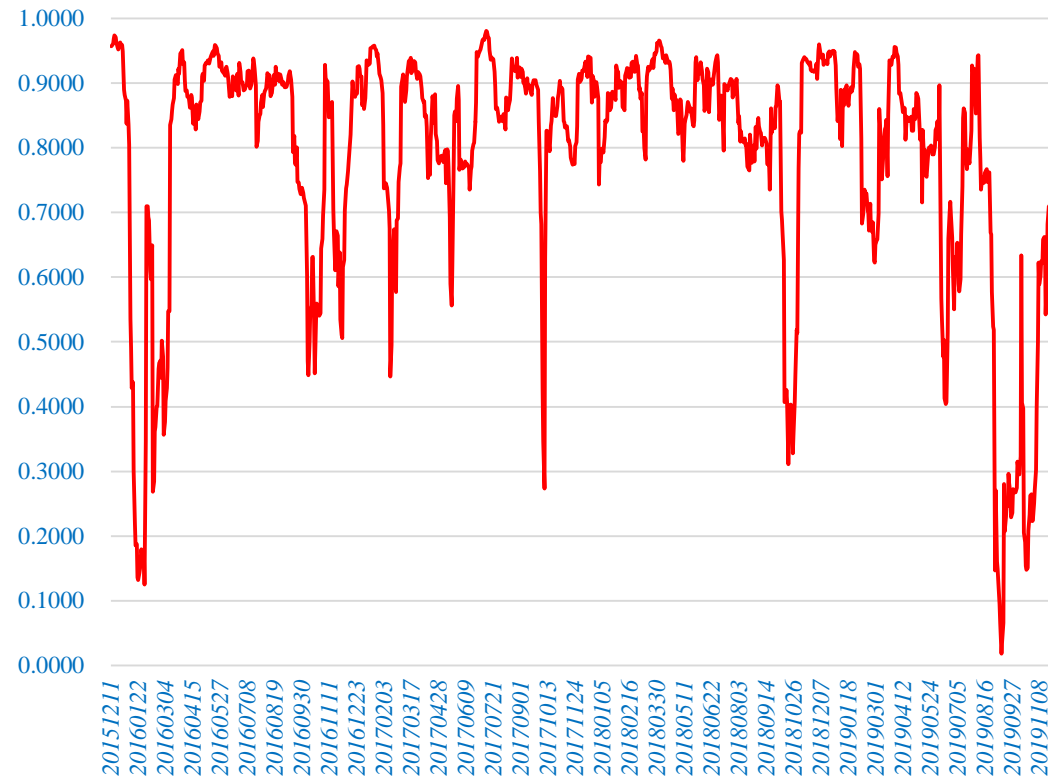# Chinese Currency Market – Government Currency Intervention

- 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:

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

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