THE ANATOMY OF A PEG: LESSONS FROM CHINA'S PARALLEL CURRENCIES
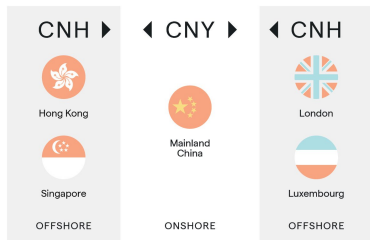
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January 2026

CHINA'S LARGE-SCALE MONETARY EXPERIMENT

- CNY: mainland currency, Chinese

- CNH: parallel currency, anyone

- Officially convert 1:1

Why? Internationalisation strategy

- Foreigners can use CNH freely for payments or to convert to other currencies.
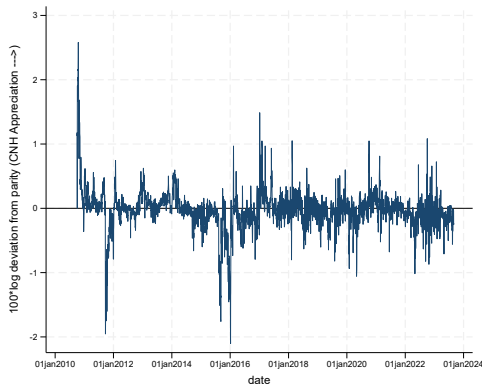
Open current account, closed capital account

- Chinese firms can export/import without restrictions in CNH and convert to CNY against invoices.

- Restrictions and quotas on conversion for capital flows that are closely monitored: FDI, investment, household transfers, bank borrowing/lending.

- Large scale parallel currencies.

TWO TENSIONS
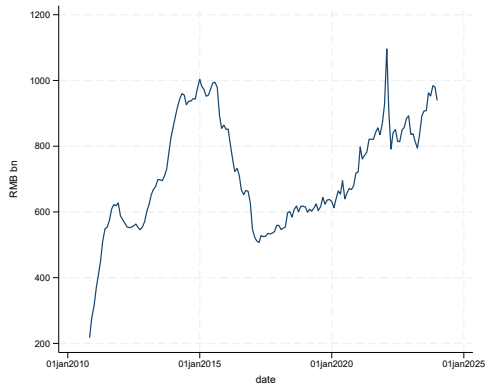
Tension 1): Gresham's law – if $\ln(E) \neq 0$ for too long, capital controls will fail.

Tension 2): Closed capital account – CNH money is a freely traded claim on China.

CNY to CNH (E)

CNH Deposits (D)

THIS PAPER

1) How does the system work?
   - Unusual decentralisation of the supply of money, but conventional economics
   - Quantity-based monetary policy: control scarcity of M to target E

2) Offshore money as a current account management tool
   - Controls on cross-border capital flows plus scarce money implements a capital flow tax
   - Fits in IMF policy toolkit for managing external balances, superior to capital flow taxes

3) Empirically test link between money and exchange rates
   - Causal evidence that 1% rise in money supply depreciates the exchange rate by 0.11pp.
   - Estimate an interest semi-elasticity of reserves of 45-50

4) Anatomy of a peg
   - Elastically supplies money to accommodate changes in demand
   - Use liquidity policies that that alter the costs for banks to issue deposits: discount window rates, reserve requirements, constraints on liquidity flows

2. The CNH monetary regime

MONETARY POLICY OPERATIONS: OPEN MARKET OPERATION

Central Bank

Assets	Liabilities
(A) Govt. Bonds	(D) Reserves
(B) Lending Facilities	(E) Bills
(C) FX and Other Assets	(F) Equity, Others

Commercial Banking System

Assets	Liabilities
(G) Govt. Bonds	(K) Deposits
(H) Central Bank Bills	(L) CB Facilities
(I) Reserves	(M) Equity, Others
(J) Loans, Others	

MONETARY POLICY OPERATIONS: OPEN MARKET OPERATION

Central Bank	
Assets	**Liabilities**
(A) Govt. Bonds	(D) Reserves
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- Open market operation: (A) up, (D) up, (G) down, (I) up.

MONETARY POLICY OPERATIONS: OPEN MARKET OPERATION

Central Bank	
Assets	**Liabilities**
(A) Govt. Bonds	(D) Reserves
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Commercial Banking System	
Assets	**Liabilities**
(G) Govt. Bonds	(K) Deposits
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(I) Reserves	(M) Equity, Others
(J) Loans, Others	

- Open market operation: (A) up, (D) up, (G) down, (I) up. Then, "multiplier" (J) up and (K) up.

MONETARY POLICY OPERATIONS: CENTRAL BANK BILLS

Central Bank		Commercial Banking System	

Assets	**Liabilities**
(A) Govt. Bonds	(D) Reserves
(B) Lending Facilities	(E) Bills
(C) FX and Other Assets	(F) Equity, Others

Assets	**Liabilities**
(G) Govt Bonds	(K) Deposits
(H) Central Bank Bills	(L) CB Facilities
(I) Reserves	(M) Equity, Others
(J) Loans, Others	

- Swap reserves for bills: (D) up, (E) down, (H) down, (I) up.

MONETARY POLICY OPERATIONS: LENDING FACILITY

Central Bank

Assets	Liabilities
(A) Govt. Bonds	(D) Reserves
(B) Lending Facilities	(E) Bills
(C) FX and Other Assets	(F) Equity, Others

Commercial Banking System

Assets	Liabilities
(G) Govt. Bonds	(K) Deposits
(H) Central Bank Bills	(L) CB Facilities
(I) Reserves	(M) Equity, Others
(J) Loans, Others	

- Lending reserves to banks: (B) up, (D) up, (I) up, (L) up.

MONETARY POLICY OPERATIONS: CNH

People's Bank of China

Assets	Liabilities
(a) CNY Assets	(c) CNY Onshore Reserves
(b) FX Assets	(d) CNY Clearing Bank Reserves
	(e) CNH Bills
	(f) Equity, Others

Offshore Clearing Banks

Assets	Liabilities
(g) CNY Clearing Bank Reserves	(i) CNH Commercial Bank Sight Deposits
(h) Other Assets	(j) CNH HKMA Deposits
	(k) CNY Equity, Others

MONETARY POLICY OPERATIONS: CNH

People's Bank of China

Assets	Liabilities
(a) CNY Assets	(c) CNY Onshore Reserves
(b) FX Assets	(d) CNY Clearing Bank Reserves
	(e) CNH Bills
	(f) Equity, Others

Offshore Clearing Banks

Assets	Liabilities
(g) CNY Clearing Bank Reserves	(i) CNH Commercial Bank Sight Deposits
(h) Other Assets	(j) CNH HKMA Deposits
	(k) CNY Equity, Others

Hong Kong Commercial Banks CNH

Assets	Liabilities
(q) Deposits at Clearing Banks	(t) Deposits
(r) PBoC CNH Bills	(u) PLP Balances
(s) Loans, Others	(v) HKMA Facilities
	(w) Equity, Others

Monetary policy operations: CNH

People's Bank of China	
Assets	**Liabilities**
(a) CNY Assets	(c) CNY Onshore Reserves
(b) FX Assets	(d) CNY Clearing Bank Reserves
	(e) CNH Bills
	(f) Equity, Others

Offshore Clearing Banks	
Assets	**Liabilities**
(g) CNY Clearing Bank Reserves	(i) CNH Commercial Bank Sight Deposits
(h) Other Assets	(j) CNH HKMA Deposits
	(k) CNY Equity, Others

Hong Kong Commercial Banks CNH	
Assets	**Liabilities**
(q) Deposits at Clearing Banks	(t) Deposits
(r) PBoC CNH Bills	(u) PLP Balances
(s) Loans, Others	(v) HKMA Facilities
	(w) Equity, Others

- PBoC weekly manages M through bills: (e) down (d) up; (g) up (i) up ; (q) up, (r) down.

MONETARY POLICY OPERATIONS: CNH

People's Bank of China

Assets	Liabilities
(a) CNY Assets	(c) CNY Onshore Reserves
(b) FX Assets	(d) CNY Clearing Bank Reserves
	(e) CNH Bills
	(f) Equity, Others

Offshore Clearing Banks

Assets	Liabilities
(g) CNY Clearing Bank Reserves	(i) CNH Commercial Bank Sight Deposits
(h) Other Assets	(j) CNH HKMA Deposits
	(k) CNY Equity, Others

Hong Kong Monetary Authority CNH

Assets	Liabilities
(l) Deposits at Clearing Banks	(p) Equity, Others
(m) PLP Balances	
(n) Liquidity Facilities	
(o) Other Assets	

Hong Kong Commercial Banks CNH

Assets	Liabilities
(q) Deposits at Clearing Banks	(t) Deposits
(r) PBoC CNH Bills	(u) PLP Balances
(s) Loans, Others	(v) HKMA Facilities
	(w) Equity, Others

- PBoC weekly manages M through bills: (e) down (d) up; (g) up (i) up ; (q) up, (r) down.

- HKMA hourly manages M through lending facility: (l) down (m) up; (q) up (u) up.

Capital Controls   CNY & HKD

3. A model of capital controls with offshore money

CANONICAL MODEL OF A (MANAGED) CURRENT ACCOUNT

- Two-period, perfect foresight, endowment economy. Home (Chinese) rep. consumer:

$$\max \quad u(c_{NT}, c_T) + \beta u(c'_{NT}, c'_T)$$

- Endowment (y_{NT}, y_T), can invest domestically (b^h) or abroad $(b^\$)$, given returns $(R, R^\$)$:

$$b^h + E^\$ b^\$ + E^\$ c_T + c_{NT} = E^\$ y_T + y_{NT}$$
$$E^{\$'} c'_T + c'_{NT} = E^{\$'} y'_T + y'_{NT} + R b^h + (1 + \tau) R^\$ E^{\$'} b^\$ - T'$$

- $E^\$$ is the price of tradeable and τ is a capital flow subsidy (Rebated in equilibrium: $T' = \tau R^\$ E^{\$'} b^\$$).

- Simplifications:
    - $\rightarrow y_{NT} = y'_{NT} = 1$ so $R = \beta^{-1}$.
    - $\rightarrow u(c_{NT}, c_T) = \ln(c_{NT}) + \iota \ln(c_T)$ so trade balance is $E^\$ y_T - \iota$.
    - $\rightarrow \beta y_T > y'_T / R^\$$ so net saver.

MANAGING THE EXTERNAL POSITION WITH TAXES ON CAPITAL FLOWS

- Take $R^\$$ as exogenous. UIP with a wedge:

$$R = \frac{(1 + \tau)R^\$ E^{\$\prime}}{E^\$}$$

Foreign investors: equivalent tax on home investments. Same UIP condition.

- Given net foreign assets $B^\$$ and CA: $(E^\$ y_T - \iota = E^\$ B^\$)$ get the equilibrium:

$$E^\$ = \frac{1 + \beta(1 + \tau)}{1 + R^{\$-1}\frac{y_T'}{y_T}} \frac{\iota}{y_T}$$

- Conclusion: Choosing higher τ will (i) raise the UIP wedge between returns, (ii) depreciate the exchange rate, (iii) raise current account surplus.

ALTERNATIVE: CAPITAL CONTROLS/PARALLEL CURRENCIES

- **Capital controls on households:** cannot have net savings abroad, but can hold useful offshore deposits (and onshore financial markets).

$$u(c_{NT}, c_T) + \mu ln(d^h) + \beta u(c'_{NT}, c'_T)$$
$$E^\$ c_T + c_{NT} + b^h + E d^h = E^\$ y_T + y_{NT}$$
$$E^{\$\prime} c'_T + c'_{NT} = E^{\$\prime} y'_T + y'_{NT} + R b^h + R^d E' d^h + T'$$

(d^h are deposits in offshore currency, E is the price of offshore deposits in onshore units, R^d is the return in offshore units, μ is a demand shifter). Households' demand for deposits:

$$d^h = \mu \left(E - \frac{E' R^d}{R} \right)^{-1} \quad \text{so interest semi-elasticity: } \varepsilon_d = E' d^h / \mu R$$

- **Capital controls on foreigners:** cannot hold onshore assets but can hold offshore deposits (D^f)

$$\frac{R^d E'}{E} = \frac{R^\$ E^{\$\prime}}{E^\$}$$

OFFSHORE BANKS

- Competitive: lend onshore, hold offshore reserves (m), raise deposits offshore (d)

$$\max Rb^l + E'\left(R^m m - R^d d\right) \quad \text{s.t.} \quad b^l + Em + E\phi(m/d, \lambda)d = Ed$$

Liquidity cost: decreasing function of offshore reserve-deposit ratio and liquidity policies, λ.

- Banks' demand for reserves With credible peg $E' = 1$, equilibrium $x = M/D$ and $R = \beta^{-1}$:

$$\beta R^m E^{-1} = 1 + \phi'(x, \lambda)$$

Interest semi-elasticity of reserve demand: $\varepsilon_m = E'/(REx\phi''(x, \lambda))$; negative elasticity wrt E.

- Banks' deposit demand

$$E\beta R^d + \psi(x, \lambda) = 1$$

Liquidity cost of issuing a deposit in equilibrium: $\psi(x, \lambda) \equiv \phi(x, \lambda) - x\phi'(x, \lambda)$

EQUILIBRIUM AND IMPLEMENTATION

- **Proposition:** *There is a unique equilibrium $x, E, E^\$$ for any policy tuple $(M, \lambda, B^\$)$ with capital controls and parallel currencies, Holding $(\lambda, B^\$)$ fixed, for any equilibrium exchange rate $E^\$$ in the model with a tax on capital flows $\tau \in [0, \phi_0/(1 - \phi_0))$, there exists a policy choice $M > 0$ that achieves the same equilibrium $E^\$$ in the model with capital controls and parallel currencies.*

$$E^\$ = \frac{1 + \beta(1 - \psi(x, \lambda))^{-1}}{1 + R^{\$-1} \frac{y'_T}{y_T}} \frac{\iota}{y_T} \quad \text{versus} \quad E^\$ = \frac{1 + \beta(1 + \tau)}{1 + R^{\$-1} \frac{y'_T}{y_T}} \frac{\iota}{y_T}$$

Scarce liquidity creates a wedge, lowering deposit rate. Works just as the tax worked before.

- **Lemma:** *An increase in the supply of reserves deprecuates the offshore-onshore exchange rate:*

$$\frac{d \log(E)}{d \log(M)} = - (\delta + R^m (\varepsilon_m + \delta x \varepsilon_d)^{-1} = \left(0.85 + \varepsilon_m + 0.85 \left(\frac{196}{730} \right) \times 10 \right)^{-1}$$

4. Estimates: money and the exchange rate
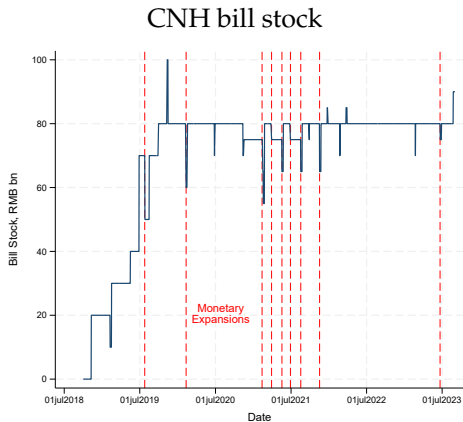
ESTIMATING $d\log(E)/d\log(M)$

CNH bill stock

Bill issuance: November 2018 goal was 40bn of 3M bills and 10bn of 12M bills.

ESTIMATING $d \log(E)/d \log(M)$

CNH bill stock

8 Aug 2019: new goal of 20bn of 3M and 6M and 40bn of 12M. 6 Nov 2020: switch to 10bn of 3M and 6M and 60bn of 12M
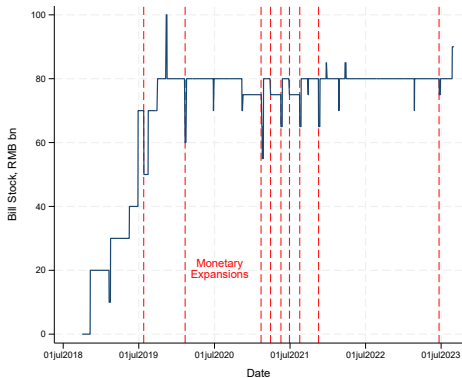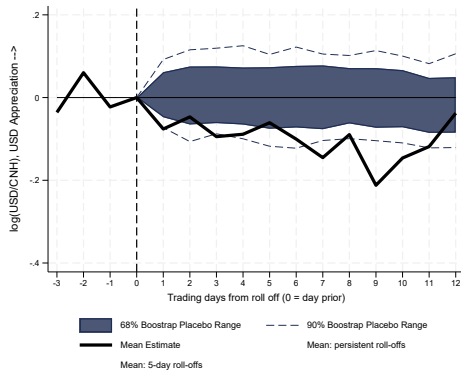
ESTIMATING $d\log(E)/d\log(M)$

CNH bill stock

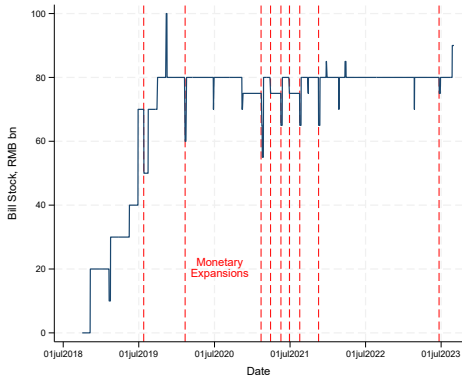Temporary gaps in issuance.

ESTIMATING $d\log(E)/d\log(M)$

CNH bill stock

Response of E to M

Monetary expansion of 5.5% depreciates the exchange rate by 0.11%: $\varepsilon_m \approx \frac{11/196}{0.0011} - \left(\frac{196}{730}\right)\varepsilon_d = 48$

ESTIMATING $d\log(E)/d\log(M)$

CNH bill stock

Response of E to M

More persistent exchange rate response to persistent shocks.

5. An anatomy of the peg

ESTIMATING THE POLICY RULE FOR MONEY SUPPLY

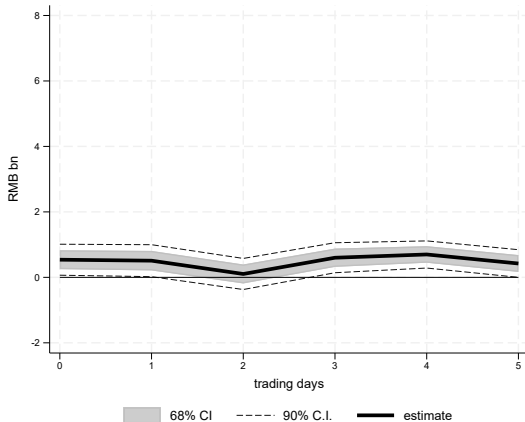Following an increase in the demand for offshore deposits (μ):

a) The onshore currency depreciates relative to the offshore currency (E rises).

b) Increasing the supply of offshore reserves (M rises) dampens it (E rises by less).

c) Liquidity policies λ that either raise the banks' cost of supplying deposits $\psi(x, \lambda)$ or lower the marginal liquidity benefits of reserves $-\phi'(x, \lambda)$ bring the exchange rate back closer to parity (E rises by less).

Isolating money demand shocks. E is contaminated by high frequency policy and other supply shocks. IV strategy based on CNY:
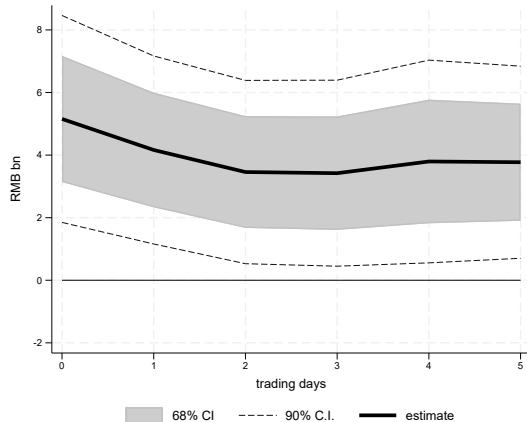
- CNY-USD exchange rate ($E^{\$}$) trades in a 2% corridor around a central parity rate ($\bar{E}^{\$}$).

- $\bar{E}^{\$}$ set in the morning and not set in response to E. usually tracks the previous close of CNY-USD.

- Unfilled pressure on CNY rate to change. CNH adjusts in anticipation of CNY

- Use deviation of $\bar{E}^{\$}$ today from $E^{\$}$ yesterday as instrument for E, F-stat is 20.

RESPONSE OF *M* TO *E* (PLP LENDING)
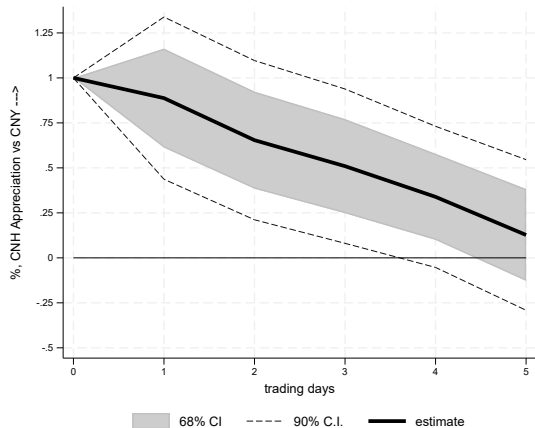
Local Projection – Least Squares

Local Projection – Instrumental Variables

If z is PLP drawing, then plot from regression $z_{t+h} = \beta_h e_t + \gamma_h e_{t-1} + \delta_h z_{t-1} + \text{error}$

IS THE MONEY RESPONSE ENOUGH TO RESTORE PARITY?

After 5 days, 0.83 of 1% increase in the exchange rate has reverted. Channels:

- 0.53 can be accounted for by the shock dissipating (incl CNY adjustment),

- ¥5bn money response: using earlier estimate accounts for 0.05

- Remaining 0.25: must be the λ, the other liquidity policies that shift $\phi(x, \lambda)$

6. Modeling and identifying liquidity policies

MICRO-FOUNDING THE LIQUIDITY COSTS $\phi(.)$

- All banks are identical and have the same excess liquidity $m - \rho d$ given a reserve requirement. Random withdrawal shock ω with distribution $\Omega(\omega, W^d)$ such that $\int_{-1}^{\infty} \omega d\Omega(\omega; W^d) = W^d$. Their liquidity is:

$$s(\omega) = m - \rho d + \omega d (1 - \rho).$$

- Banks with $\omega < \bar{\omega} = \bar{\omega} = \frac{\rho - \frac{m}{d}}{1 - \rho}$ will have a liquidity deficit to meet. Market tightness:

$$\theta = \frac{- \int_{-1}^{\bar{\omega}} s(\omega) d\Omega(\omega; W^d)}{\int_{\bar{\omega}}^{\infty} s(\omega) d\Omega(\omega; W^d) + W^m}$$

- If a bank with a deficit meets a bank with a surplus in the interbank market with probabilities $\Psi_+(\theta), \Psi_-(\theta)$ respectively, they bargain for rate $R^f(\theta)$. If not, they go to discount window R^z.

THE EXPECTED LIQUIDITY COSTS $\phi(.)$

$$\phi(m/d, \lambda)d = - \underbrace{\Psi_+(\theta)}_{\text{prob. find borrower}} \times \underbrace{r^f(\theta)}_{\text{lending profit}} \times \underbrace{\int_{\bar{\omega}}^{\infty} s(\omega)d\Omega(\omega)}_{\text{liquidity surpluses}}$$

$$- \left[\underbrace{\Psi_-(\theta)r^f(\theta)}_{\text{interbank borrowing}} + \underbrace{(1 - \Psi_-(\theta))r^z}_{\text{CB borrowing}} \right] \underbrace{\int_{-1}^{\bar{\omega}} s(\omega)d\Omega(\omega)}_{\text{liquidity deficits}}.$$

What are the $\lambda = (\rho, r^z, W^d, W^m, \varphi)$?

a) Reserve requirements (ρ),

b) Discount window spread (r^z),

c,d) Controls on flows of deposits and reserves W^d, W^m,

e) banking regulation or moral suasion over the interbank market φ that affects $\Psi_-(\theta)$,

A) INTERBANK MARKET TIGHTNESS: BILL AUCTION SUBSCRIPTIONS

Lemma: *A rise in money demand only partially offset by a rise in money supply (E rises) leads to*:

a) an increase in the tightness in the interbank market θ;

b) an increase in the interbank rate $r^f(\theta)$;

c) greater use of the discount window liquidity facilities.

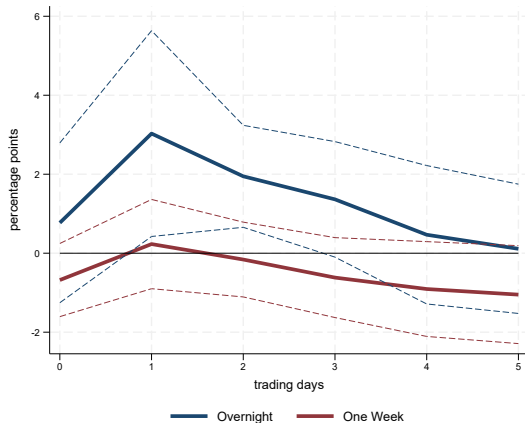**Regression of bill auction subscription rate (bids / bills auctioned) on the exchange rate**

Bill maturities	All	12M	6M	3M
	(1)	(2)	(3)	(4)
$\frac{1}{5}\sum_0^4 \log(E_{t-h})$	-2.76***	-3.38***	-2.78***	-3.38***
	(0.93)	(1.10)	(0.93)	(1.12)
Number of Auctions	35	19	16	19
R^2	0.142	0.335	0.131	0.324

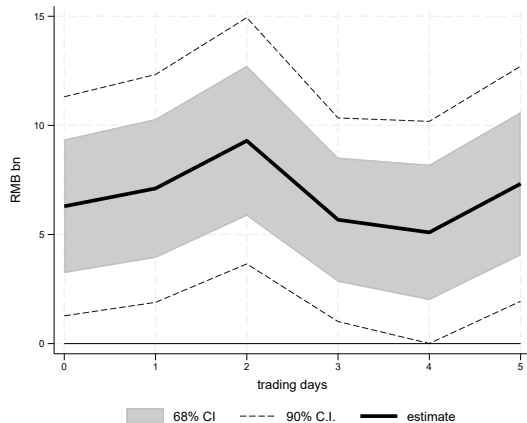Heteroskedasticity robust standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

B/C) INTERBANK RATE AND DISCOUNT WINDOW RESPONSE TO MONEY DEMAND

Interbank Rates

Discount Window Borrowing

z is interbank rate + discount window drawing, plot from LP-IV: $z_{t+h} = \beta_h e_t + \gamma_h e_{t-1} + \delta_h z_{t-1} + \text{error}$

EVIDENCE ON r^z FROM AN HKMA REFORM?

- Prior to 5th of April of 2016 R^z was set as previous day's overnight R^f plus 50bp:

- On 5th of April of 2016, the rule was changed to the average of the previous three days overnight rate plus 50bp:

$$\log(E_t) = \underbrace{-0.04}_{(0.23)} R^f_{t-1} - \underbrace{0.62^{***}}_{(0.23)} R^f_{t-2} - \underbrace{0.51^{***}}_{(0.12)} R^f_{t-3} - \underbrace{0.01}_{(0.17)} R^f_{t-4}$$

$$+ Post_t \times (\underbrace{0.57^{**}}_{(0.28)} R^f_{t-1} - \underbrace{0.52}_{(0.37)} \times R^f_{t-2} + \underbrace{\mathbf{1.25^{***}}}_{\mathbf{(0.29)}} \times \mathbf{R^f_{t-3}} + \underbrace{0.15}_{(0.27)} \times R^f_{t-4})$$
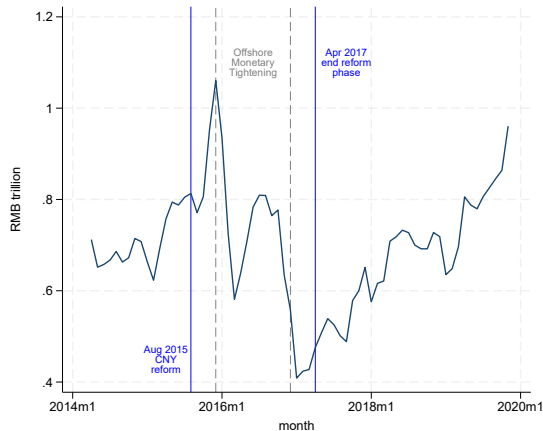
$$+ \text{controls}_t + \text{error}_t.$$

- On 22nd of July of 2022, the spread was cut to 25bp: comparing 10 days before to 10 days: 2bp reduction in E and a 10bp reduction in R^f

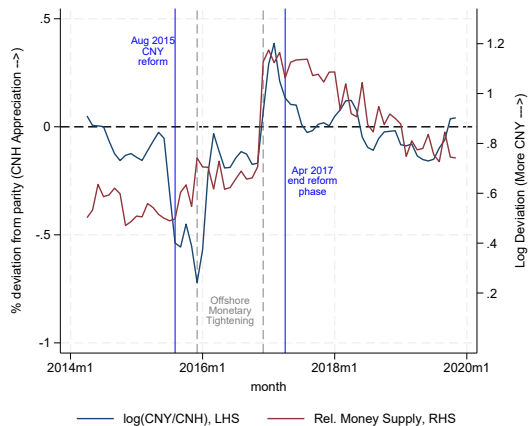**CNH/USD and CNY/USD exchange rates**
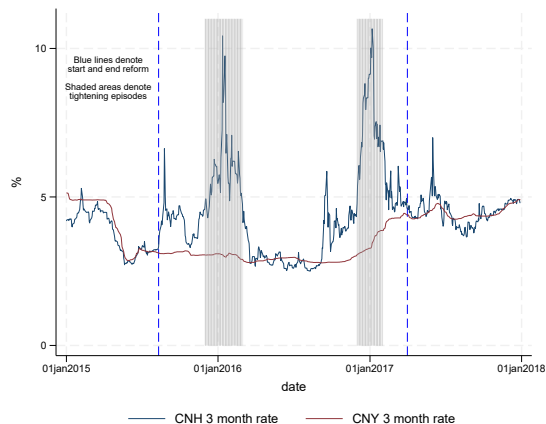

RMB flows from onshore to offshore

EVIDENCE ON W^d, W^m, φ FROM THE 2015–16 FINANCIAL CRISIS

Deposits fall, interbank rate rises

Relative stock of CNH-CNY deposits and E

3-month interbank rates for CNH and CNY

7. The relative merits of parallel currencies

IMPLEMENTATION DISCUSSION

- Comparison with capital flow taxes
  - $\rightarrow$ Brazil 2009-13: law struggles with taxes
  - $\rightarrow$ When taxes are on conversions of currency, get black market
  - $\rightarrow$ Seignorage revenues, and ability to intervene
  - $\rightarrow$ Offshore money circulates with unlimited gross flows; netting with taxes is troublesome
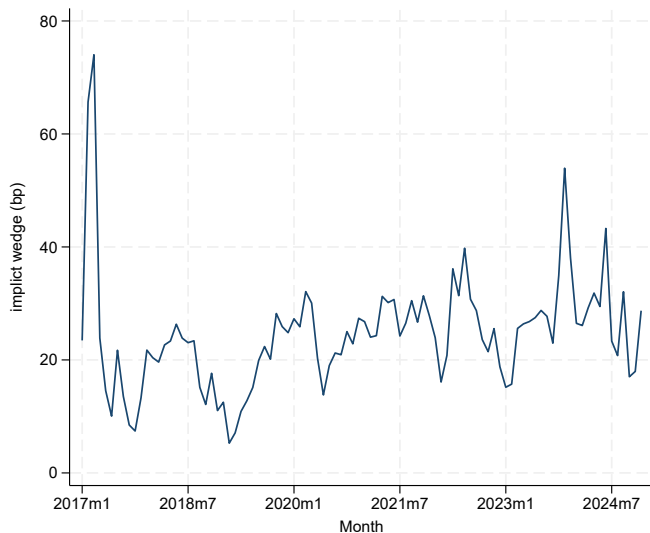
- Interest rates versus quantities
  - $\rightarrow$ Only need two tools: could use R^m instead of M
  - $\rightarrow$ Quantity allows for stealth interventions, and onshore-offshore peg manipulation

- An offshore system in deficit countries
  - $\rightarrow$ if make liquidity scarcer onshore than offshore, can implement a negative τ.
  - $\rightarrow$ with capital flight, the offshore system can mitigate these outflows and stabilize its external position by tightening liquidity offshore and so raise the cost of going short.

QUANTIFYING THE IMPLICIT SUBSIDY τ

- Since $\tau = \psi(.)/(1 - \psi(.))$,

- Have model of $\psi(.)$, use observable interest rates and outstanding quantities in interbank markets and central bank lending facilities.

- Lower bound: ignores operational costs of managing scarce liquidity, the stigma in accessing central bank liquidity, and the opportunity costs of the collateral employed to do so.

8. Conclusion

CONCLUSION

- Key lesson: capital controls and parallel currencies can implement the same outcomes for the net foreign asset position and the foreign exchange rate as a capital flow tax/subsidy.
  - → Evidence for mechanisms in Chinese experience.
  - → Chinese regime is managed using conventional monetary and liquidity tools.

- Along the way, revisited fundamental pillars of monetarism:
  - (i) if you raise the money supply, you will reduce the value of the currency;
  - (ii) if you want to peg this value, respond to rises in it by printing money;
  - (iii) liquidity policies to steer money demand complement control of the money supply;
  - (iv) parallel currencies survive by keeping a tight peg between their values.

- China's unusual offshore system allowed us to test these and find YES, with (i) an elasticity of reserve demand of 50; (ii) money supply one sixth, remaining are liquidity policies; (iii) policies include reserve requirement, discount window rate, liquidity restrictions, regulation; (iv) a coherent overall framework.