Internationalizing Like China

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RMB Internationalization and Reserve Currency Competition

How do international currencies develop?

- Core strategy involves gradually liberalizing access to RMB bond market
- Official Chinese government goal to be an international currency like the dollar
- Challenge: become global store of value while foreigners fear outflow restrictions
- Slow and arduous process: government behavior in crises key to building reputation

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How do international currencies compete?

- Harder to build reputation when facing rival issuers

Stylized Facts and Theory

- Empirics: Three facts on internationalization of China's bond market
  1. Rise in foreign investment RMB-denominated bonds. Initial increase from stable-official holders and more recently by flightier private flows
  2. Foreign investor composition a deliberate policy choice of the Chinese government
  3. RMB bonds held by foreign investors as a mix of DM and EM currency bonds

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- Model: Dynamic theory of building reputation as global safe asset provider
  - Investors fear opportunistic govt might impose ex-post capital controls
  - At low reputation, optimal to only borrow from stable investors
  - As reputation improves, endogenously open-up to flighty investors
  - Reputation gained or lost based on policy choices during crises
  - Hard to build, takes time, and might never occur
  - Tractable framework used to study competition, two-way flows

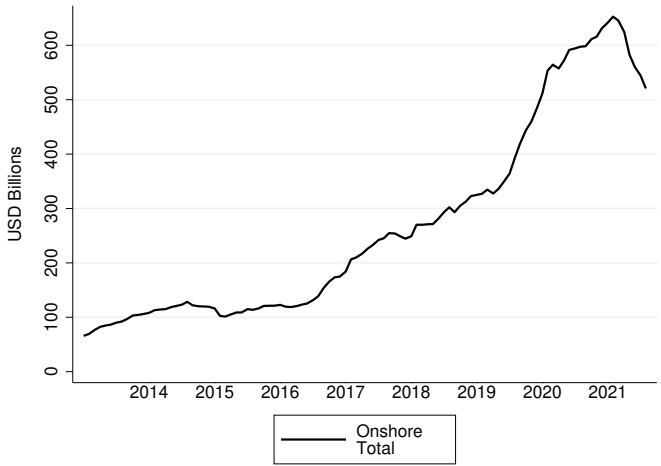
Literature Review

- **China's Financial Markets:** Prasad (2016), Amstad and He (2020), Brunnermeier, Sockin, and Xiong (2017, 2022), Lai (2021), Cerutti and Obstfeld (2018), Mo and Subrahmanyam (2020)

- **International Monetary System:** Eichengreen, Mehl, and Chitu (2017), Bahaj and Reis (2020), Farhi and Maggiori (2018), He, Krishnamurthy, and Milbrandt (2019), Gopinath and Stein (2021), Chahrour and Valchev (2021)

- **Dynamic Reputation:** Phelan (2006), Amador and Phelan (2021), Kreps and Wilson (1982), Milgrom and Roberts (1982), Mailath and Samuelson (2001), Diamond (1989, 1991), Barro and Gordon (1983)

Fact 1: Rise in Foreign Participation, Central Banks then Private



▸ EM ▸ Composition ▸ Offshore

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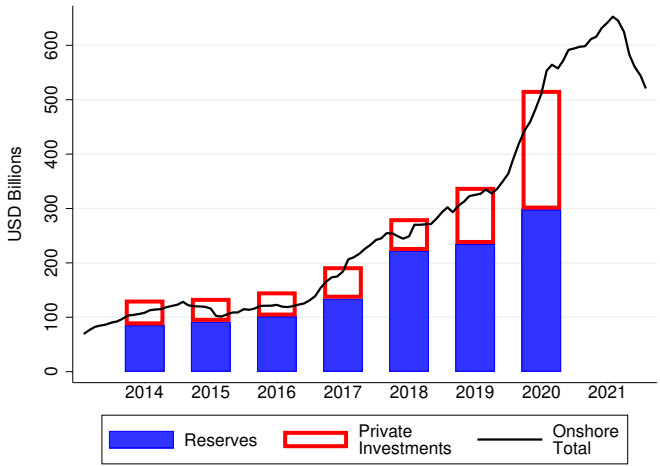

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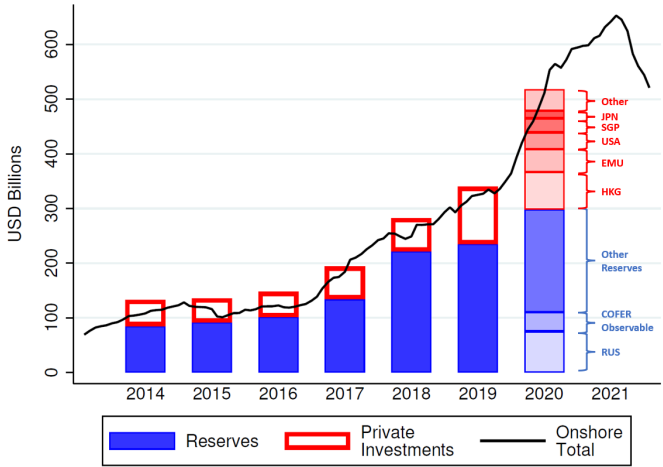


▸ EM ▸ Composition ▸ Offshore

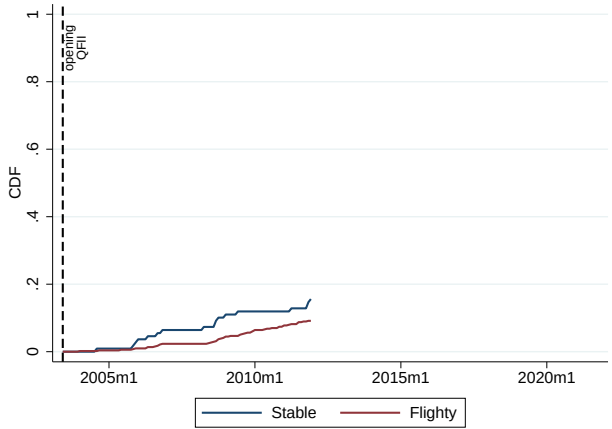
China Staggered Investors' Market Access

- **Early phase:** 2002 Qualified Foreign Institutional Investor (QFII) program and then RQFII. Onerous approval, lock-in periods, only exchange bonds
- **Middle phase:**
  - 2013: QFII and RQFII extended to interbank bond market (CIBM). Some quotas, onshore, not compatible with trading platforms
  - 2015: Full access to CIBM without quotas for direct long-term investors ▸ Quote
  - Feb. 2016: CIBM Direct
- **Latest phase**
  - 2017 Bond Connect. No quotas, offshore, int. trading platforms
  - 2019-21 RMB-bonds entering bond indices (BBG, JP Morgan, FTSE)

Collect data on each investor's first date of access to Chinese bond market

Fact 2: China Selected Investor Base

Early Phase: focused on stocks, long lock-up periods, strict quotas



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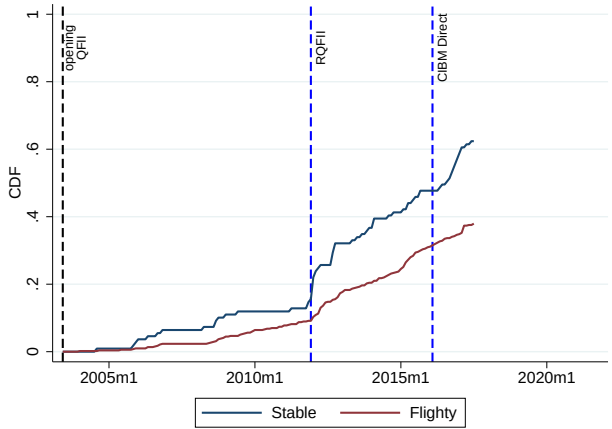
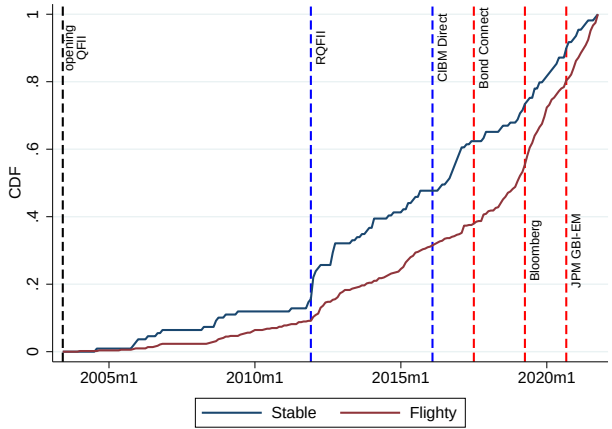
Middle Phase: Gives long-term investors direct access to onshore bond markets



Fact 2: China Selected Investor Base

Recent Phase: Gives flightier investors direct access to onshore bond markets



Do investors hold RMB more in EM or DM Bond Portfolios?

- Use micro-data on fund positions to measure what other type of foreign currency bonds funds holding a particular currency are likely to hold
- For each investor i, measure shares in currency c and in DM currencies

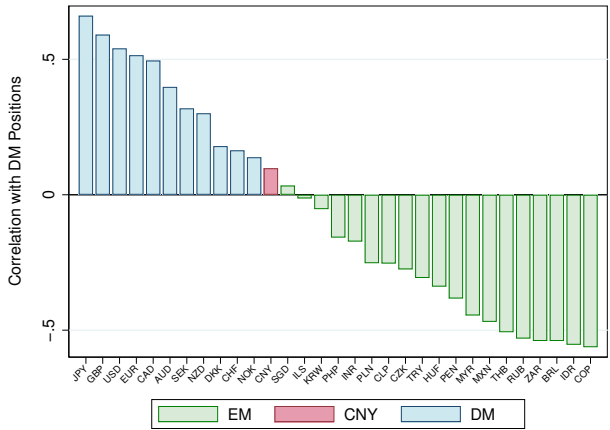
$$\alpha_{c,i} = \frac{\sum_{b \in B_c} MV_{b,i}}{AUM_i} \qquad \alpha_{DM,i} = \frac{\sum_{b \in B_{DM}} MV_{b,i}}{AUM_i(1 - \alpha_{c,i})}$$

- Correlation between c and DM measures distance from DM bonds:

$$corr(\alpha_{c,i}, \alpha_{DM,i})$$

Fact 3: RMB Bonds Held as Part of EM/DM Portfolios

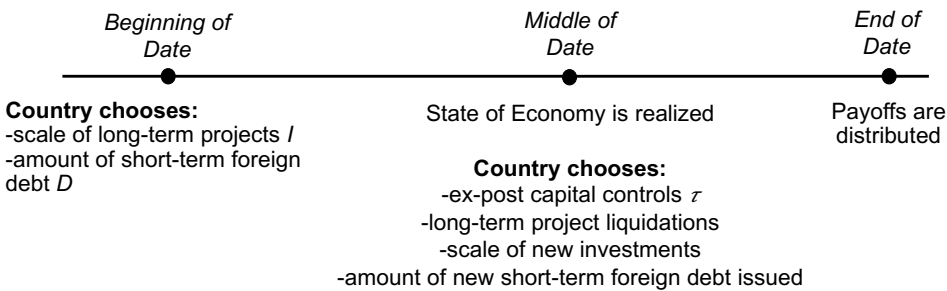
- RMB appears in DM investment portfolios as in between EM and DM currencies



Substitution

Model Overview

- Infinite horizon, discrete time
- Committed or opportunistic government
- **Within date:** Borrowing and costly liquidation subgame
- **Across dates:** Reputation building game



Borrowing and Costly Liquidation Subgame

- Stable (s) and Flighty (f) Investors with homogeneous interest rate schedules

$$R_t = \frac{R + \frac{1}{2} b D_t^i}{1 - (1 - M_t)\bar{\tau}}, \qquad M_t = \Pr(\tau = 0) \text{ is reputation}$$

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- Middle of date: constrained debt rollover in a crisis

$$R^L(1 - \tau)D_t^L \leq (1 - h_t)(QI_t - L_t), \qquad h^f > h^s \text{ higher haircut for Flighty}$$

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- Threshold reputation M^*: open up to flighty investors

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- Subgame payoff increases in ex-post capital control τ

$$V(M_t) = \underbrace{\frac{h_t}{\gamma - \frac{1-h_t}{R^L(1-\tau)}}}_{\text{Net Worth Multiplier}} \underbrace{\left(\gamma QI_t(M_t) - R_t(M_t)D_t(M_t)\right)}_{\text{Liquidation Value of Inside Equity}}$$

Reputation Game

- Government type follows Markov process (Phelan (2006), Amador Phelan (2021))
- Committed type dies with prob ϵ^c, Opportunistic type dies ϵ^o
- Investors update beliefs of facing committed type (π_n) using Bayes rule
  - If no capital control:

$$\pi_{n+1} = \epsilon^O + (1 - \epsilon^C - \epsilon^O)\frac{\pi_n}{M_n}$$

$$M_n = \pi_n + (1 - \pi_n)m_t$$

  - If capital control: revert to $\pi_0 = \epsilon^O$
- Conjectured Markov equilibrium:
  - Cycle interval "steps" $n \in \{0, 1, .., N\}$
  - Opening-up step N^* when let in flighty investors
  - Graduation step N when all remaining opportunistic types deviate

Strategic Choices of Opportunistic Government

- Value of not imposing capital control ($\tau = 0$) at step n

$$W^0(M_n) = V(M_n) + \beta W(M_{n+1})$$

- Value of imposing capital control ($\tau = \bar{\tau}$) at step n

$$W^{\bar{\tau}}(M_n) = g(h_n)V(M_n) + \beta W(M_0)$$

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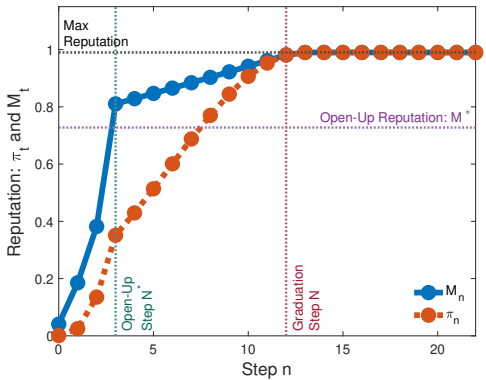
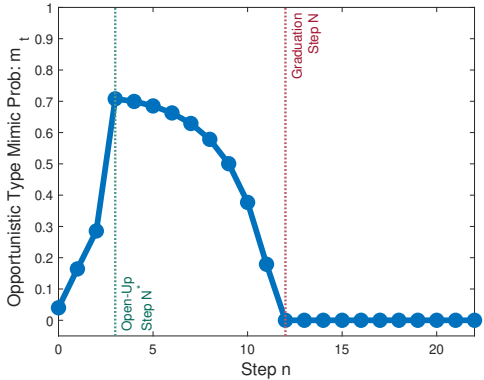
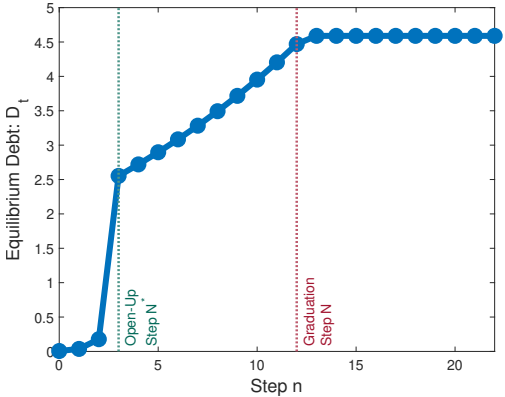
- Value function $W(M_n) = \max\left\{W^0(M_n)\ ,\ W^{\bar{\tau}}(M_n)\right\}$
- Mixing at $n < N$ requires $W^0(M_n) = W^{\bar{\tau}}(M_n)$
- Graduation at N requires $W^{\bar{\tau}}(M_N) \geq W^0(M_N)$

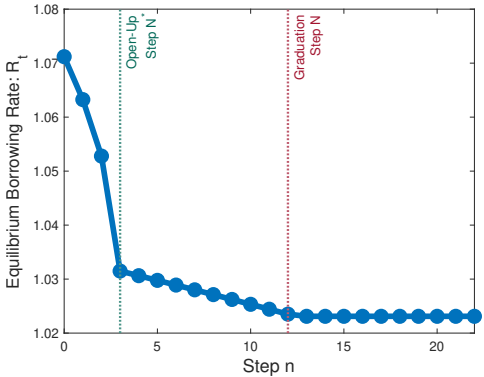
The Dynamics of Reputation and Mimicking





The Dynamics of Debt and Interest Rates





Model Solution

- Homogeneous haircuts: prove existence/uniqueness
- Heterogeneous haircuts: uniqueness conditional on N^*
- Sketch of argument
  - Flow utility dynamics

$$V(M_{n+1}) = \frac{g(h_n)}{g(h_{n+1})}\rho(h_n)V(M_n) + \frac{g(h_0)}{g(h_{n+1})}V(M_0)$$

    AR(1) implies entire path of reputation increasing in initial reputation M_0
  - Bayes' rule implies belief path π_n decreasing in M_0
  - Equilibrium requires $m_N = 0$, that is $M_N = \pi_N$
  - Single crossing used to show existence/uniqueness

International Currency Competition and Heterogeneous Investors

- Monopolistic competition among potential reserve currency issuers
- Heterogeneous investors with taste $\omega_i(M)$:

$$(R^S - R)S_i + \int E[\tilde{R}(M) - R]D_i(M)d\mu(M) - \frac{1}{8}b\left(\lambda S_i + \int \omega_i(M)D_i(M)^2 d\mu(M)\right)^2$$

- Aggregation to representative investor

$$E[\tilde{R}(M)] = R + \frac{1}{2}b^*\omega(M)D(M)$$

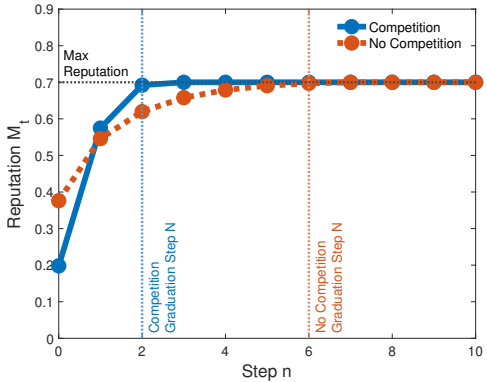
- Can map competition model to different slope of demand curve

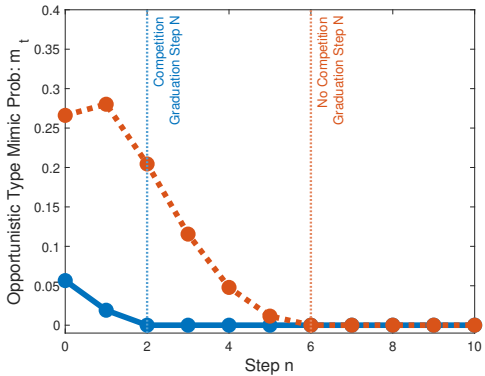
$$b^* = b \cdot \int \frac{1}{2}\omega(M)D(M)^2 d\mu(M)$$

  More competition lowers gains from reputation building

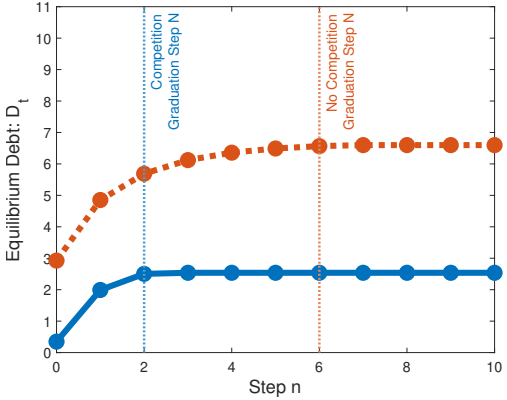
- **Key**: Distribution μ over reputation M is endogenous

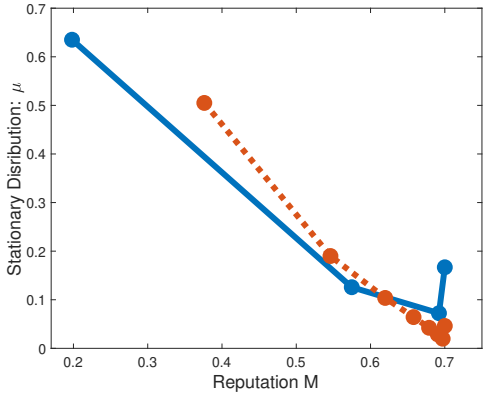
Competition and Reputation Building





Competition and Stationary Distribution





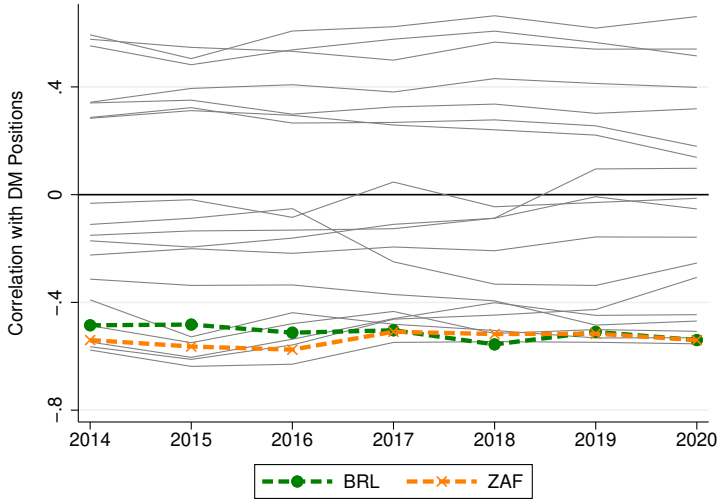
Measuring Reputation in a Multi-Currency Framework

- Portfolio share of investor i in currency c: $\alpha_{c,i} = \dfrac{MV_{c,i}}{AUM_i}$
- An observable measure of reputation rank:

$$corr(\alpha_{c,i}, \alpha_{DM,i}) = corr\left(\frac{1}{\omega_i(M_c)}, \frac{1}{\omega_i(M_{DM})}\right)$$

- Portfolio share correlation increases as reputation of currency c converges to that of developed countries reference set DM
- Can be estimated using private investors bond holdings

Tracking China's Changing Reputation: From Theory to Data



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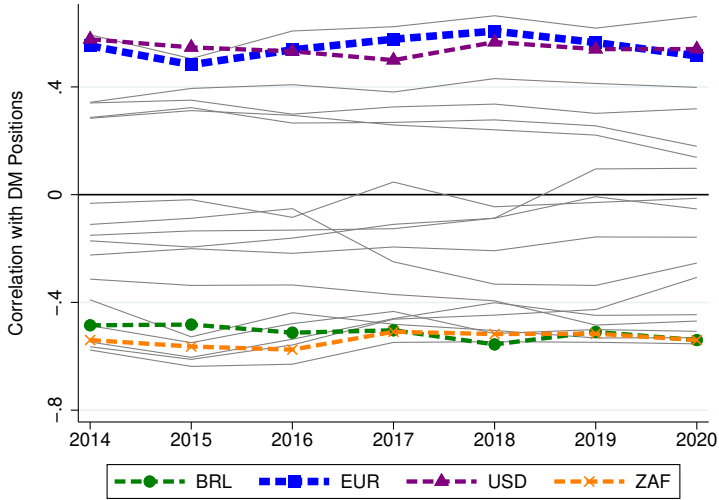

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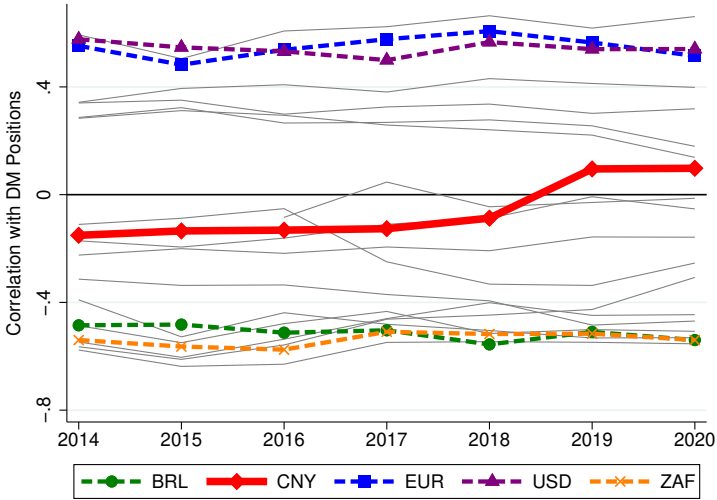


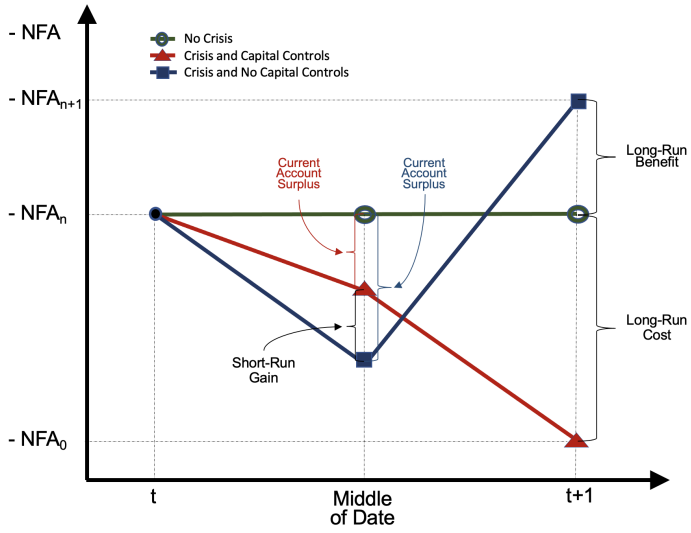
Can the US Prevent China from Becoming an International Currency?

- If competition is sufficiently fierce ($b^* > \bar{b}^*$) countries immediately graduate ▸ Prop. 5
- Suppose a large country ("US") internalizes impact of own issuance on reputation building incentives of other countries ("China")
- **Stackelberg incumbent:** US can flood market with safe assets, undercutting incentives of new entrants like China to build reputation
- More generally, higher issuance of safe assets reduces probability that an opportunistic competitor will advance to step $n > 0$ of the cycle ▸ Prop. 6

Two-Way Capital Flows: From Net Foreign Creditor to Debtor

- Internationalizing a currency not about current account per se, but gross flows
- Extend model to also allow domestic capital to go abroad
- NFA position *deteriorates* as reputation builds-up
  - Creditor at low reputation, debtor at high reputation
- Intuition: reputation is like a pledgable asset. Valuable because one can borrow against it. The higher the reputation, the more the country optimally leverages in international capital markets

NFA Dynamics



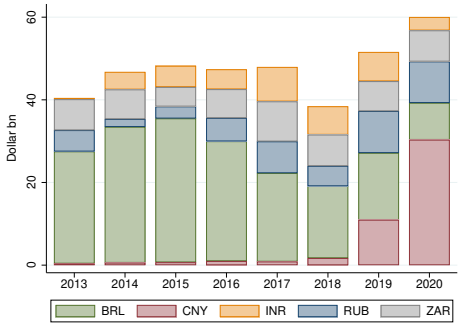
Conclusion

- The integration of China's bond market and currency into global financial system
  - Rise in foreign investment, official then private
  - Staggered entry of investor types a policy choice
  - RMB bonds held in both DM and EM portfolios
- Simple framework of building reputation as international currency provider
- Early in process: model consistent with slow progress and setbacks, difficult road
- Competition, especially from large incumbents like US, can make it difficult to build reputation for newcomers

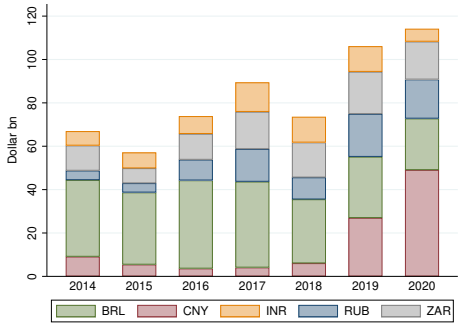
China in the BRICS

- In early phase of internationalization, much room for foreign holdings to grow
- Still, exposure to RMB bonds is already bigger than biggest emerging markets

TIC: US Holdings



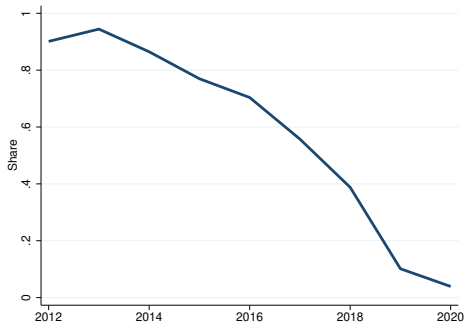
Morningstar: All Countries



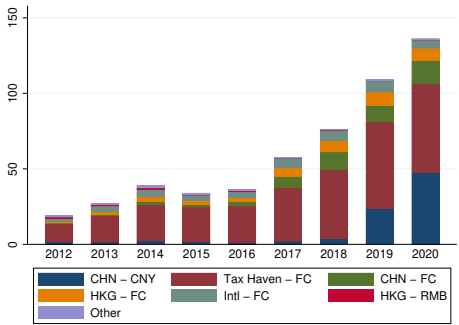
Back

Offshore and Onshore Debt Markets

Share of Foreigned-Owned RMB Debt Issued Offshore



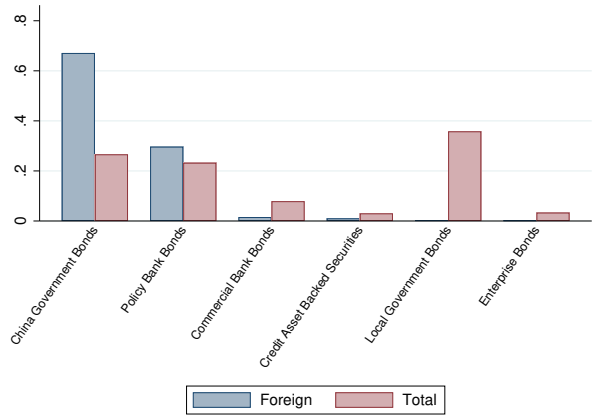
Mutual Fund and ETF Investment in China, Nationality Basis



Back

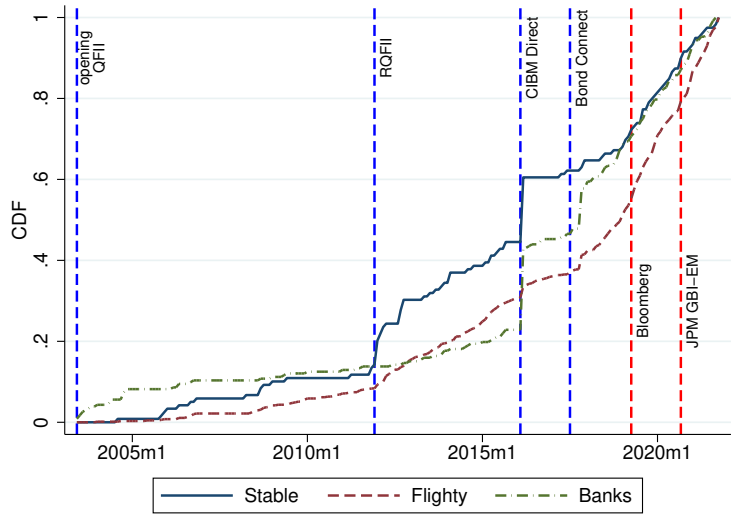
Foreigners Are Buying the Safest Local Bonds

- Foreigners concentrated in government and policy banks bonds (implicit guarantee)
- Little holdings in some large market segments: local govt and corporate bonds



Back

Tracking Investor Access to Chinese Market Including Banks



Back

Tracking Investors Access to Chinese Market

- Collect data on each investor's first date of access to Chinese bond market
  - 1,332 total foreign investors identified
  - Access channel: 643 QFII, 229 RQFII, 484 CIBM, and 720 Bond Connect
- Connect investors to firm identifiers based on name
- Classify investors into types based on NAICS:
  - Stable: central banks, int. org., non-profits, pension funds, and insurance companies
  - Flighty: investment advice or portfolio management industry
  - Banks: investment banks, commercial banks, and broker dealers

Back

Understanding the Portfolio Shift into RMB

Use micro-data on fund positions to decompose portfolio shift:

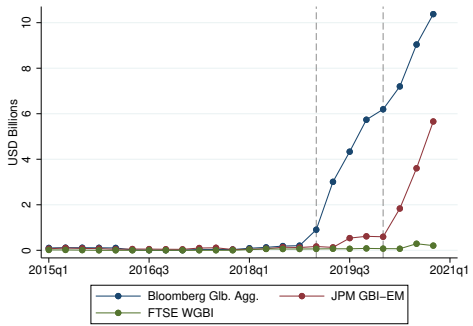
- Security-level mutual fund and ETF holdings from Morningstar, US insurance company holdings from NAIC filings
- Security-level pricing data from various commercial data sources
- Price and quantity data to measure
  - What other assets do funds that invest in RMB also hold?
  - What assets did funds investing in RMB substitute away from?

Back

China's Entrance in Major Bond Indices

Chinese RMB bonds were added to:

- Bloomberg Global Aggregate Bond Index in April 2019
- JP Morgan Government Bond Index - Emerging Markets in February 2020
- FTSE World Government Bond Index in October 2021



Back

PBC No. 220, July 14, 2015

Notice of the People's Bank of China (PBC) on Issues Concerning Investment of Foreign Central Banks, International Financial Institutions and Sovereign Wealth Funds with RMB Funds in the Inter-bank Market

> *With a view to enhancing efficiency of foreign central banks or monetary authorities, international financial institutions, and sovereign wealth funds (hereinafter referred to as relevant overseas institutional investors) investing in the Chinese inter-bank market...* ***Relevant overseas institutional investors shall act as long-term investors, and conduct trading based on reasonable needs for preserving or increasing the value of their assets****. The PBC will, in accordance with the reciprocity principle and macro-prudential requirements, regulate trading behavior of relevant overseas institutional investors.*

Back

Investor Demand Heterogeneity and Limited Capital

- For each class of investors, the interest rate schedule is:

$$R_t = \frac{R^i + \frac{1}{2} b^i D_t^i}{1 - (1 - M_t)\bar{\tau}}$$

- Stable investors have a cap at $\bar{D}^s$ and are cheaper $R^s + \frac{1}{2} b^s \overline{D}^s \leq R^f$

- Interest rate schedule across two investor types is

$$R_t = \begin{cases} \frac{R^s + \frac{1}{2} b^s D_t}{\mathcal{M}_t}, & D_t \leq \overline{D}^s \\ \frac{R^f + \frac{1}{2} b^f (D_t - \overline{D}^s)}{\mathcal{M}_t} & D_t > \overline{D}^s \end{cases}$$

Back

Debt Supply: Details

- First generation lends at Beginning of period, Second at Middle
- Two sources of losses from capital control to first generation
- Direct loss $(R_t D_t - D_t^L)\tau$
- Indirect loss from bargaining τD_t^L
- Second generation has outside option R^L, interest rate is $R^L - \tau$
- Compensatory payment τD_t^L from first generation to second
- Putting it together,

$$\tilde{R}_t(\tau) = \frac{R_t D_t - (R_t D_t - D_t^L)\tau - \tau D_t^\tau}{D_t} = R_t(1-\tau)$$

Back

Optimal Policy of the Committed Type

There exists an opening up threshold $M^* \in [0,1]$ such that optimal policies are

$$D^s(M) = \frac{1}{b}\left[\gamma Q \mathcal{M} - R\right]$$

$$D^f(M) = \begin{cases} 0, & M \leq M^* \\ D^s(M), & M > M^* \end{cases}$$

$$R(M) = \frac{1}{2}\frac{R}{\mathcal{M}} + \frac{1}{2}\gamma Q$$

where $\mathcal{M}_t = 1 - (1 - M_t)\bar{\tau}$ Back

Sketch of Model Solution: One Investor

- If there is only one (flighty) investor, $h_t = h_{t+1} = h^f$ and so

$$V(M_{t+1}) = \rho(h^f)V(M_t) + V(M_0)$$

- Fixed AR(1) process for evolution of flow utility until graduation

$$\rho^f = \frac{1 - \pi_H \beta}{\beta} \frac{g\left(h^f\right) - 1}{g\left(h^f\right)}$$

- Graduate when

$$V(1 - \epsilon^C) \leq \rho(h^f)V(M_T) + V(M_0)$$

Back

Dynamics of Reputation Building

1. Before opening up, faster rate of convergence

$$V(M_{t+1}) = \rho(h^s)V(M_t) + V(M_0)$$

2. At opening up, upward jump in dynamics

$$V(M_{t+1}) = \frac{g(h^s)}{g(h^f)}\left[\rho(h^s)V(M_t) + V(M_0)\right]$$

3. After opening up, slower rate of convergence

$$V(M_{t+1}) = \rho(h^f)V(M_t) + \frac{g(h^s)}{g(h^f)}V(M_0)$$

Back

Existence and Uniqueness

Proposition 1. With only flighty investors, there exists a unique graduation date Markov equilibrium.

Proposition 2. With both stable and flighty investors, there is *at most* one graduation date Markov equilibrium associated with an opening up date, T^*.

May be other types of equilibria. Back

Understanding the Portfolio Shift into RMB

- Index inclusion + Bond Connect lowers cost to private sector of investing in RMB in 2019 and 2020. What does RMB replace in their portfolios?

$$\Delta MV_{t,f,b} = F^{Within}_{t,f,b} + F^{Between}_{t,f,b} + VE_{t,f,b} + F^{NewFunds}_{t,f,b} + F^{Residual}_{t,f,b}$$

- Within-fund portfolio change $F^{Within}_{t,f,b} = \widetilde{AUM}_{f,t}\left(\widetilde{\omega}_{t,f,b} - \omega_{t-1,f,b}\right)$
  - $\tilde{x}$ is x measured at last period price

- Mostly a within-fund portfolio shift Back

Decomposing the Portfolio Shift into RMB

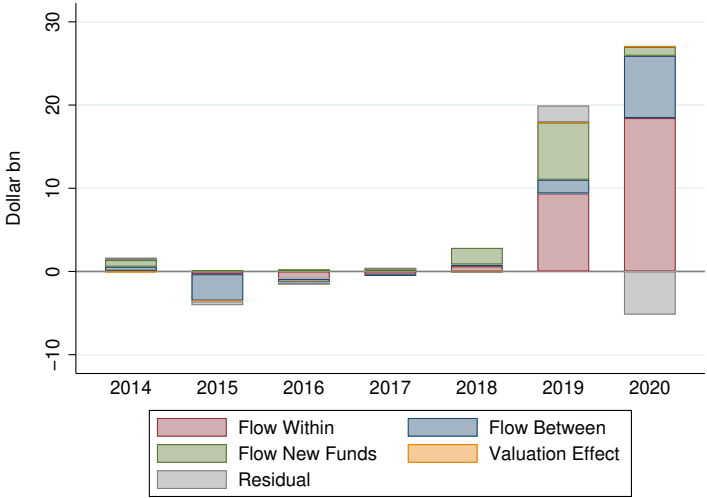
$$\Delta MV_{t,f,b} = F^{Within}_{t,f,b} + F^{Between}_{t,f,b} + VE_{t,f,b} + F^{NewFunds}_{t,f,b} + F^{Residual}_{t,f,b}$$

- Total change in market value $\Delta MV_{t,f,b} = P_{t,b}Q_{t,f,b} - P_{t-1,b}Q_{t-1,f,b}$
- Within-fund portfolio change $F^{Within}_{t,f,b} = \widetilde{AUM}_{f,t}\left(\widetilde{\omega}_{t,f,b} - \omega_{t-1,f,b}\right)$
- Between-funds portfolio change $F^{Between}_{t,f,b} = \omega_{t-1,f,b} \cdot Inflow_{t,f}$
- Valuation effect $VE_{t,f,b} = \left(P_{t,b} - P_{t-1,b}\right) Q_{t,f,b}$

Assumes all trades at beginning of period. $\tilde{x}$ is x measured at last period price

Back

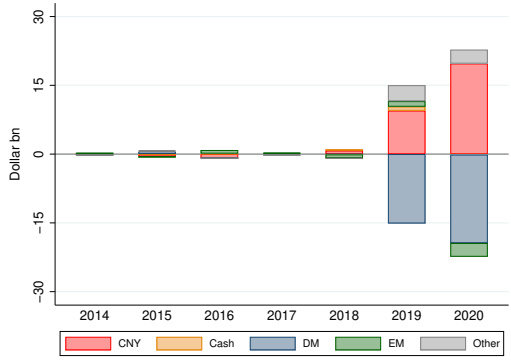
Mostly A Within Fund Portfolio Shift



Back

Fact 3: RMB Substitution Coming out of DM

- Flows into RMB bonds come from sales of DM currency bonds



$$F^{Within}_{t,f,CNY} + \sum_{b \neq CNY} F^{Within}_{t,f,b} = 0$$

▸ Indexation ▸ Price Evidence: Betas ▸ Price Evidence: Mean-Variance ▸ Back

Proposition 5

Proposition

There exists a threshold $\overline{b}^*$ such that if and only if $b^* > \overline{b}^*$, there is a crowd out equilibrium of the competition model in which $\boldsymbol{M} = \{\epsilon^W, 1 - \epsilon^C\}$ and all opportunistic governments immediately graduate.

Intuitively, competition in this case is sufficiently fierce that opportunistic governments cannot build sufficient value from reputation. As a result, they immediately impose capital controls and graduate. Proposition 5 expresses the result in terms of a threshold on the sufficient statistic b^*. This threshold is given by

$$\overline{b}^* = \left(1 + \frac{V(1-\epsilon^C) - (1+\rho)V(\epsilon^O)}{\rho v A}\right) b.$$

Back

Proposition 6

Proposition

The probability that an opportunistic government (e.g. China) starting at step 0 *reaches step* n *of its reputation cycle decreases in competition* b^* *for any* $n \geq 1$*, that is* $\frac{\partial \delta_n}{\partial b^*} < 0$.

Back