Interest Arbitrage under Capital Controls: Evidence from Reported Entrepôt Trades

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Capital Controls

- Capital Controls or Not?
  - Washington Consensus: No.
  - After Asian Financial Crisis: Really?

- Openness and Stability
  - Macroprudential Regulation v.s. Capital Controls

- Capital controls may be increasingly difficult and/or costly for outward-oriented economies like China.
Questions

• Effectiveness of Capital Controls
  ▶ Capital controls segment currency markets, creating arbitrage opportunities.

• Linkage between Current Accounts & Capital Accounts
  ▶ Do international trades provide means to circumvent capital controls?

• Trade Finance
  ▶ Does bank-intermediation in international trades play a role in capital account liberation?
This Paper

• uses a novel administrative data set;

• documents arbitrage opportunities in onshore-offshore RMB markets;

• demonstrates how bank-intermediation of trades facilitates the interest arbitrages; and

• provides evidence that firms bypass capital controls through supposed “entrepôt trades” to arbitrage;
Related Literature

• Merit of Capital Controls
  ▶ Motiel & Reinhart (1999); Kaplan & Rodrik (2002); Glick et al. (2006); Frasad & Rajan (2008); Jinjarak et al. (2013); Forbes et al. (2015); Mitchener & Wandschneider (2015); Korinek & Sandri (2016)

• International Firms’ Evasion of Capital Controls, Tariff, and Income Tax
  ▶ Fisman & Wei (2004); Auguste et al. (2006); Fisman et al. (2008); Davies et al. (forthcoming)

• RMB Internationalization & Global Monetary System
  ▶ Eichengreen & Flandreau (2012); Chiţu et al. (2014); Cheung & Rime (2014); Funke et al. (2015); IMF (2015); Prasad (2016)

• Trade Finance
  ▶ Schmidt-Eisenlohr (2013)
Cross-border Trade Settlements in RMB

- **July 2009**
  - Guangzhou, Shenzhen, Zhuhai, Dongguan, and Shanghai
  - Settlements with Hong Kong, Macau, and ASEAN
  - Available to selected firms

- **June 2010**
  - Extended to 20 provinces, including the province of our dataset
  - Settlements with all economies
  - Qualified firms

- **August 2011**
  - Nationwide
  - Any firms
CNH HIBOR Fixing Launched

- Shanghai Interbank Offered Rate
- Shanghai-HK Rate Difference
- Hong Kong Interbank Offered Rate

Entrepôt Trades

- Re-exporting imports with little or no processing

- Entrepôt ports:
  - Hong Kong, Singapore, 17th century Amsterdam

- Ideal for bypassing capital controls to arbitrage:
  - Do not need to clear the Chinese custom
  - Both inflows and outflows
  - No exchange risk
Letter of Credit (L/C)

- L/C is the most popular means of trade finance in China and India.

- Mainly dollar-denominated L/C before RMB cross-border settlement allowed.

- RMB L/C
  - No foreign debt management
  - Longer maturity: 360 days
Interest Arbitrage under Capital Controls through Entrepôt Trades

Arbitrageur

Onshore

Offshore
Interest Arbitrage under Capital Controls through Entrepôt Trades

1. Deposit $K$ for L/C

Onshore

Arbitrageur

Onshore Bank

Offshore

Onshore

----------------------------------

Offshore
Interest Arbitrage under Capital Controls through Entrepôt Trades

1. Deposit $K$ for L/C

2. Issue L/C

Arbitrageur

Onshore Bank

Onshore

Offshore

Offshore Bank

Forward Outflow via L/C

Return Inflow $\frac{K}{1 + rh + d}$

Discount L/C for $\frac{K}{1 + rh + d}$
Interest Arbitrage under Capital Controls through Entrepôt Trades

1. Arbitrageur deposits $K$ for L/C.
2. Offshore Bank issues L/C.
4. Buyer returns inflow $K/(1 + r_h + d)$.
5. Forward outflow via L/C.
Interest Arbitrage under Capital Controls through Entrepôt Trades

1. **Arbitrageur** deposits $K$ for L/C.
2. **Onshore Bank** issues an L/C.
3. **Offshore Bank** receives documents and discounts L/C for $K/(1 + r_h + d)$.
4. **Onshore** receives inflow of $K/(1 + r_h + d)$.

**Key Equation:**
\[ K/(1 + r_h + d) \]
Interest Arbitrage under Capital Controls through Entrepôt Trades

1. Deposit $K$ for L/C

2. Issue L/C

3. Deliver Documents for $\frac{K}{1 + r_h + d}$

4. Return Inflow $\frac{K}{1 + r_h + d}$
Data Description

- **Transaction level trade settlements in RMB**
  - Both inflows & outflows
  - A large well-off coastal province
  - 2011 – 2016
  - Value, firm ID, date, means of settlement etc.

- **Onshore and offshore interest and exchange rates of RMB**
  - Bloomberg
  - Hong Kong Treasury Markets Association
### Shares of RMB Inflows by Settlement Means

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (billion ¥)</th>
<th>Letter of Credit</th>
<th>Wire Transfer</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>67.2</td>
<td>0.003</td>
<td>0.961</td>
<td>0.035</td>
</tr>
<tr>
<td>2012</td>
<td>123.1</td>
<td>0.006</td>
<td>0.978</td>
<td>0.016</td>
</tr>
<tr>
<td>2013</td>
<td>227.1</td>
<td>0.004</td>
<td>0.981</td>
<td>0.015</td>
</tr>
<tr>
<td>2014</td>
<td>294.1</td>
<td>0.003</td>
<td>0.991</td>
<td>0.006</td>
</tr>
<tr>
<td>2015</td>
<td>255.7</td>
<td>0.005</td>
<td>0.991</td>
<td>0.003</td>
</tr>
<tr>
<td>2016</td>
<td>84.5</td>
<td>0.014</td>
<td>0.985</td>
<td>0.002</td>
</tr>
<tr>
<td>Total</td>
<td>1051.6</td>
<td>0.005</td>
<td>0.985</td>
<td>0.010</td>
</tr>
</tbody>
</table>

### Shares of RMB Outflows by Settlement Means

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (billion ¥)</th>
<th>Letter of Credit</th>
<th>Wire Transfer</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>14.0</td>
<td>0.567</td>
<td>0.400</td>
<td>0.032</td>
</tr>
<tr>
<td>2012</td>
<td>96.5</td>
<td>0.737</td>
<td>0.249</td>
<td>0.013</td>
</tr>
<tr>
<td>2013</td>
<td>127.9</td>
<td>0.801</td>
<td>0.174</td>
<td>0.025</td>
</tr>
<tr>
<td>2014</td>
<td>271.3</td>
<td>0.907</td>
<td>0.085</td>
<td>0.009</td>
</tr>
<tr>
<td>2015</td>
<td>353.9</td>
<td>0.733</td>
<td>0.255</td>
<td>0.012</td>
</tr>
<tr>
<td>2016</td>
<td>208.9</td>
<td>0.647</td>
<td>0.343</td>
<td>0.009</td>
</tr>
<tr>
<td>Total</td>
<td>1072.5</td>
<td>0.766</td>
<td>0.221</td>
<td>0.013</td>
</tr>
</tbody>
</table>
## Onshore-Offshore Interest Differentials and RMB Inflows and Outflows

<table>
<thead>
<tr>
<th></th>
<th>Inflow (L/C, 1-Year Forward)</th>
<th>Outflow (L/C, 1-Year Forward)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Rate Differential</td>
<td>(1)</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
<td>(5)</td>
</tr>
<tr>
<td></td>
<td>(3)</td>
<td>(6)</td>
</tr>
<tr>
<td>Tuesday</td>
<td>0.154*** (0.014)</td>
<td>-0.678*** (0.052)</td>
</tr>
<tr>
<td></td>
<td>0.152*** (0.015)</td>
<td>-0.677*** (0.053)</td>
</tr>
<tr>
<td>Wednesday</td>
<td>0.274*** (0.017)</td>
<td>-0.779*** (0.081)</td>
</tr>
<tr>
<td></td>
<td>0.272*** (0.018)</td>
<td>-0.778*** (0.082)</td>
</tr>
<tr>
<td>Thursday</td>
<td>0.269*** (0.029)</td>
<td>-0.861*** (0.049)</td>
</tr>
<tr>
<td></td>
<td>0.266*** (0.030)</td>
<td>-0.859*** (0.050)</td>
</tr>
<tr>
<td>Friday</td>
<td>0.277*** (0.022)</td>
<td>-0.702*** (0.062)</td>
</tr>
<tr>
<td></td>
<td>0.273*** (0.022)</td>
<td>-0.698*** (0.063)</td>
</tr>
<tr>
<td>Exchange Rate Differential</td>
<td>-4.127 (2.519)</td>
<td>3.417 (2.516)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( R^2 )</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations (days)</td>
<td>698</td>
<td>698</td>
<td>698</td>
<td>698</td>
<td>698</td>
<td>698</td>
</tr>
</tbody>
</table>

Notes: Newey-West HAC robust S.E.s in parentheses. * \( p < 0.10 \); ** \( p < 0.05 \); *** \( p < 0.01 \).
## Onshore-Offshore Interest Differentials and RMB Inflows and Outflows: Robustness to Timing

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<thead>
<tr>
<th></th>
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</tr>
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<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Interest Rate Differential</td>
<td>0.207***</td>
<td>0.208***</td>
</tr>
<tr>
<td></td>
<td>(0.068)</td>
<td>(0.067)</td>
</tr>
<tr>
<td>Interest Rate Differential (lag)</td>
<td>0.207***</td>
<td>0.208***</td>
</tr>
<tr>
<td></td>
<td>(0.068)</td>
<td>(0.067)</td>
</tr>
<tr>
<td>Interest Rate Differential (1-week moving average)</td>
<td>0.207***</td>
<td>0.208***</td>
</tr>
<tr>
<td></td>
<td>(0.068)</td>
<td>(0.067)</td>
</tr>
</tbody>
</table>

### Notes:
Newey-West HAC robust S.E.s in parentheses. * p < 0.10; ** p < 0.05; *** p < 0.01.
Decomposing the Effects of Onshore-Offshore Interest Differentials on Various Margins of Inflows

<table>
<thead>
<tr>
<th>Outcome Variable (log):</th>
<th>Total Value (A)</th>
<th>Mean Value (I)</th>
<th>Transactions (E)</th>
<th>Transactions per Firm (E_p)</th>
<th>Transacting Firms (E_f)</th>
</tr>
</thead>
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<tr>
<td>Inflow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest Rate Differential</td>
<td>0.207***</td>
<td>0.016</td>
<td>0.191***</td>
<td>-0.005</td>
<td>0.196***</td>
</tr>
<tr>
<td></td>
<td>(0.068)</td>
<td>(0.057)</td>
<td>(0.022)</td>
<td>(0.010)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>R^2</td>
<td>0.236</td>
<td>0.010</td>
<td>0.316</td>
<td>0.043</td>
<td>0.351</td>
</tr>
<tr>
<td>Observations (days)</td>
<td>698</td>
<td>698</td>
<td>698</td>
<td>698</td>
<td>698</td>
</tr>
<tr>
<td>Outcome Variable (no log):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.990</td>
<td>0.018</td>
<td>53.82</td>
<td>1.39</td>
<td>38.8</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.428</td>
<td>0.005</td>
<td>19.04</td>
<td>0.20</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Notes: Newey-West HAC robust S.E.s in parentheses. * p < 0.10; ** p < 0.05; *** p < 0.01.
Decomposing the Effects of Onshore-Offshore Interest Differentials on Various Margins of Outflows

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<th>Transactions per Firm (E_p)</th>
<th>Transacting Firms (E_f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outflow (L/C, 1-Year Forward)</td>
<td>0.279*** (0.062)</td>
<td>0.130*** (0.020)</td>
<td>0.149** (0.064)</td>
<td>-0.094* (0.052)</td>
<td>0.242*** (0.019)</td>
</tr>
<tr>
<td>Interest Rate Differential</td>
<td><strong>R^2</strong></td>
<td>0.282</td>
<td>0.133</td>
<td>0.285</td>
<td>0.179</td>
</tr>
<tr>
<td>Observations (days)</td>
<td>698</td>
<td>698</td>
<td>698</td>
<td>698</td>
<td>698</td>
</tr>
<tr>
<td>Outcome Variable (no log):</td>
<td>Mean</td>
<td>0.774</td>
<td>0.019</td>
<td>40.71</td>
<td>1.50</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.610</td>
<td>0.007</td>
<td>29.13</td>
<td>0.39</td>
<td>15.7</td>
</tr>
</tbody>
</table>

Notes: Newey-West HAC robust S.E.s in parentheses. * p < 0.10; ** p < 0.05; *** p < 0.01.
Inflow
Outflow

Frequency

Value (Yuan in Base-10 Logarithm)

Inflow
Outflow

18 / 24
After infinite rounds of arbitrages, the initial capital $K$ becomes:

$$K' = \sum_{i=0}^{\infty} \frac{r_s K}{(1 + r_h + d)^i} = \frac{r_s (1 + r_h + d) K}{r_h + d}$$

The rate of return to arbitrage $r_a$ is:

$$r_a = r_s + \frac{r_s - r_h - d}{r_h + d}$$
Fixed Costs to Arbitrage

In a frictionless world, arbitrage if and only if:

\[ r_s > r_h + d. \]

With a fixed cost \( F \) to initiate arbitrage, arbitrage if and only if:

\[ K \left( \frac{r_s - r_h - d}{r_h + d} \right) > F \]

With a fixed cost \( L \) for each round of arbitrages, arbitrage if and only if:

\[ \tilde{K} > L \left( \frac{r_s}{1 + r_s} - \frac{r_h + d}{1 + r_h + d} \right)^{-1} := K_{min} \]
The Impacts of Interest Differentials on the Distribution of Forward L/C Outflow

We estimate the quantile effects of interest differential on forward L/C outflows:

\[ Q_{\tau}(Y_{it}) = \delta_{\tau} D_t + X_t' \beta_{\tau} \]

where

- \( Y_{it} \) : one-year forward L/C outflow on day \( t \);
- \( Q_{\tau}(Y_{it}) \) : \( \tau \)-quantile of \( Y_{it} \);
- \( D_t \) : onshore-offshore interest differentials;
- \( X_t \) : controls as before.
Onshore-Offshore Interest Differentials on the Distribution of Outflows

![Graph showing the distribution of outflows with quantiles and coefficients estimates for Letter of Credit (1-Year Forward) and Wire (1-Year Forward) with 95% confidence intervals.]

- Coeff. Estimate (L/C, 1-Yr Forward)
- 95% C.I. (L/C, 1-Yr Forward)
- Coeff. Estimate (Wire, 1-Yr Forward)
- 95% C.I. (Wire, 1-Yr Forward)
- Coeff. Estimate (Wire, Contemporary)
- 95% C.I. (Wire, Contemporary)
Onshore-Offshore Interest Differentials and Entry of Entrepôt Traders

<table>
<thead>
<tr>
<th>Time Trend:</th>
<th>None</th>
<th>Linear</th>
<th>Quadratic</th>
<th>Cubic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable:</td>
<td>Number of New Firms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest Rate Differential</td>
<td>0.603*** (0.122)</td>
<td>0.596*** (0.112)</td>
<td>0.820*** (0.261)</td>
<td>0.811*** (0.237)</td>
</tr>
</tbody>
</table>

| Dependent Variable: | Share of New Firms |
| Interest Rate Differential | 0.004 (0.003) | 0.004** (0.002) | 0.010** (0.004) | 0.009*** (0.003) |

| Dependent Variable: | New Firms’ Share of Transaction Volume |
| Interest Rate Differential | 0.002 (0.004) | 0.002 (0.003) | 0.016*** (0.006) | 0.016*** (0.003) |

Observations (days) | 698 | 698 | 698 | 698 | 698 |

Notes: Newey-West HAC robust S.E.s in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. 
Concluding Remarks

- RMB Interest arbitrages are feasible but costly.
- Entrepôt trades and bank instruments for trade finance facilitate the arbitrages.
- In the short run, the circular arbitraging flows inflate statistics of RMB usage in international trades.
- In the long run, whether the arbitrages opportunities crowd out real international trades.