How Does International Capital Flow?

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October 19, 2020
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1 Introduction

- Literature increasingly emphasizes gross capital flows and stocks.

- Empirical work: Can access much better data now.

- Theoretical work:
  - Mostly still relies on net capital flow frameworks.
  - **Payment flows (goods against assets)** = tiny fraction of gross flows.

- This paper:
  - Gross capital flows framework.
  - **Financial flows (assets against assets)** = vast majority of gross flows.
2 Saving versus Financing

• Saving:
  – Goods market concept: Output not consumed.
  – **Foreign saving is the CA by definition.** It does not finance the CA.

• Financing:
  – Money market concept: Bank deposits created through loans.
  – **Foreign financing = two gross flows.** Does not affect CA cet. par.

• “Foreign saving finances the current account”? 
  – Treats saving and financing as identical.
  – But: No necessary connection of foreign saving & foreign financing.
3 Example: US Import Boom

• Saving: Foreign sellers (Toyota Japan) finance US CA deficit?
  – Sellers are not **financing** anything.
  – They merely accept payment from US households.
  – Sellers are **saving** by exporting Toyotas.
  – Their “Toyota saving” is the US CA **by definition**.

• Financing: 4 ways for US households to make payment
  1. Transfer existing $ deposits: No financing.
  2. Transfer existing ¥ deposits: No financing.

⇒ No necessary connection of foreign saving & foreign financing.
4 Policy Debates and Saving vs. Financing

4.1 Current Accounts and Financial Vulnerability

- Literature: CA deficit indicates financial vulnerability.

- Insight:
  - In a financial crisis creditors do not stop financing (net) CAs, they stop financing (gross) debt.
  - CAs can only make a minimal contribution to the required balance sheet adjustments.
4.2 Global Saving Glut

- Bernanke (2005): Abundant foreign saving financed the US CA deficit.

- Prevailing explanations accept equivalence between saving and financing.

- Insight:
  - Domestic HH do not finance CA deficits with physical saving provided by foreign HH.
  - They finance it with digital purchasing power provided by banks.
  - These banks are more likely to be domestic than foreign.
4.3 Triffin’s Current Account Dilemma

- Dilemma: Growing world economy needs growing $ liquidity.
  - This forces the US to run excessive CA deficits.
  - Deficits eventually destroy the quality of the dollar.

- Insight:
  - Creation of $ requires $ credit by banks (US or non-US).
  - $ credit is completely independent of US CA deficits.
  - There is no dilemma.
4.4 High Correlation of Gross In- and Outflows

- Broner et al. (2015): High correlation of gross capital outflows and inflows.

- Interpretation: Synchronized domestic and foreign investment decisions.

- Insight:
  - All financial flows have 2 inseparable gross in- & outflow components.
  - They are therefore necessarily perfectly correlated.

- Only 2 reasons for less than perfect overall correlation:
  - Measurement errors (“errors and omissions”).
  - Significant role for payment flows (one of the flows is physical).
5 The Model

- 2-country New Keynesian DSGE: Closely related to existing literature.

- Financial aspects:
  - Loans create deposits subject to regulatory costs and BGG (1999).
  - Bank deposits reduce transactions costs similar to SGU (2004).

- Open economy aspects:
  - Domestic banks only issue domestic currency HH loans and deposits.
  - HHs need loans/deposits in both currencies ⇒ cross-border positions.
  - Settlement through interbank nostro/vostro accounts.
## Steady State Bank Balance Sheets

### Home Banks

<table>
<thead>
<tr>
<th>Transaction</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans to Home HH</td>
<td>100</td>
</tr>
<tr>
<td>Deposits of Home HH</td>
<td>81</td>
</tr>
<tr>
<td>Loans to Foreign HH</td>
<td>20</td>
</tr>
<tr>
<td>Home Ccy Nostro</td>
<td>10</td>
</tr>
<tr>
<td>Foreign Ccy Vostro</td>
<td>10</td>
</tr>
<tr>
<td><strong>Net Worth</strong></td>
<td>19</td>
</tr>
</tbody>
</table>

### Foreign Banks

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<th>Amount</th>
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<td>Loans to Foreign HH*</td>
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<td><strong>Net Worth</strong></td>
<td>19</td>
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</table>
5.1 Wholesale Banks

- Net worth maximization, subject to:
  - Minimum capital adequacy regulation (MCAR).
  - Foreign exchange mismatch rules (FXMR).

5.2 Retail Deposit Banks

- Monopolistic competitors.

5.3 Retail Lending Banks

- BGG (1999), modified.

- Banks can make loan losses $\Rightarrow$ need capital.

- Collateral = value of land.
5.4 Foreign Exchange Mismatch Rules

- Banks’ management of exposures to foreign households.

- Accommodating FXMR: $D_{F,t}^b - L_{F,t}^b = D_{H,t}^f - L_{H,t}^f$
  
  - Instantaneous, automatic response of banks to x-border flows.

- Strict FXMR: $D_{F,t}^b - L_{F,t}^b = 0$
  
  - Captures lower-frequency bank behavior (regulation, hedging).
5.5 Households

- Standard preferences:
  \[
  \max \mathbb{E}_0 \sum_{t=0}^{\infty} \beta_{0,t} \left\{ \left( 1 - \frac{\nu}{x} \right) S_t^c \log (c_t(j) - \nu c_{t-1}) - \psi \frac{h_t(j)^{1+\frac{1}{\eta}}}{1 + \frac{1}{\eta}} \right\}
  \]

- CES consumption aggregator:
  \[
  c_t(j) = \left[ (b^c)^{1/\theta_c} \left( c_{H,t}(j) \right)^{\theta_c-1} + (1 - b^c)^{1/\theta_c} \left( c_{F,t}(j) \right)^{\theta_c-1} \right]^{\frac{\theta_c}{\theta_c-1}}
  \]

- Money demand - transactions cost:
  \[
  s_t^c(j) = A^c S_t^{md} (v_t^c(j))^{\varpi}, \quad v_t^c = \frac{P_t c_t(j)}{D_{liq,t}(j)}
  \]

- Liquidity aggregator:
  \[
  D_{liq,t}(j) = \left[ \left( b^d S_t^{mm} \right)^{1/\theta_d} \left( D_{h,t}(j) \right)^{\theta_d-1} + \left( 1 - b^d S_t^{mm} \right)^{1/\theta_d} \left( E_t D_{F,t}(j) \right)^{\theta_d-1} \right]^{\frac{\theta_d}{\theta_d-1}}
  \]

Our main capital inflow shock will be to decrease home preference of foreign households
• Monetary UIP condition:
  
  − Excess return $u_t$ of domestic over foreign currency:
    \[
    \ln i_t = \ln i^*_t + \mathbb{E}_t \ln \varepsilon_{t+1} + u_t
    \]
  
  − Spread $u_t$ = relative convenience yield of foreign currency:
    \[
    u_t = \mathbb{E}_t \Xi_{t+1} \left( \frac{1 - b_d S_{mm}^t d_{H,t}}{b_d S_{mm}^t e_t \gamma_{F,t}^h} \frac{1}{\theta_d} - 1 \right)
    \]

• Mechanism:
  
  − Demand for Home currency increases.
  
  − Relative convenience yield of Home currency $u_t$ increases.
  
  − Relative financial return of Home currency decreases.
  
  − How? Appreciation followed by expected depreciation.
• Budget constraint:

\[
\begin{align*}
D_{H,t}^h (j) + E_t D_{F,t}^h (j) + Q_t k_t (j) - L_{H,t}^h (j) - E_t L_{F,t}^h (j) \\
= i_{dH,t-1}^h D_{H,t-1}^h (j) + E_t i_{dF,t-1}^h D_{F,t-1}^h (j) \\
+ Ret_{k,t} Q_{t-1} k_{t-1} (j) \left( 1 - \kappa_{H,t-1}^h \Gamma_{H,t}^h (j) - \kappa_{F,t-1}^h \Gamma_{F,t}^h (j) \right) \\
- P_t (1 + s_t^c (j)) c_t (j) + W_t^{hh} h_t (j) + P_t \Upsilon_t (j)
\end{align*}
\]

- Simultaneous choice of loan and deposit gross position vis-a-vis banks.
- Critical for the modeling of gross flows.
5.6 Manufacturers

- Production function in land and hours.
- Monopolistic competition and sticky goods prices.
- Local currency pricing.

5.7 Unions

- Monopolistic competition and sticky wages.

5.8 Monetary Policy

- Inflation-forecast-based interest rate rule.
6 Simulation Results

Foreign Inflow into Home Currency Deposits
Stylised Example I

\[ \text{HH} \quad \text{HH}^* \]

\[ \text{Bank} \quad \text{Bank}^* \]

\[ D_{F}^{*f} \quad D_{F}^{*f} \]

\( \text{note: } E = 1. \)

- Starting point: F household holds F currency deposit
**Stylised Example II**

<table>
<thead>
<tr>
<th>HH</th>
<th>HH*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank</td>
<td>Bank*</td>
</tr>
<tr>
<td>$D^b_F = D^*_F f$</td>
<td>$D^*_F$</td>
</tr>
<tr>
<td>$D^f_H$</td>
<td>$D^*_f$</td>
</tr>
</tbody>
</table>

Note: $E = 1$.

- **End point**: F household holds H currency deposit. H and F banks settled the trade.
- **No effect on the current account**:

\[ \Delta NFA = D^b_F - D^f_H = 0 \]

- **FX mismatch**

\[ D^b_F \]
Accommodating FXMR: Bank Balance Sheets

(Column 1 = Home Bank Assets, Column 2 = Home Bank Liabilities,
Column 3 = Foreign Bank Assets, Column 4 = Foreign Bank Liabilities)

1. Shock = 10% of GDP Financial Inflow

2. Settlement = decrease in foreign currency vostro account

3. Bank exhibits large FX mismatch

4. Bank lending barely responds
Accommodating FXMR: Real Variables

Very small effects on GDP, interest rates, and real exchange rate
3. Home ccy demand partly met by Home bank loans

4. Home ccy demand partly met by Home HH deposits when Home ccy financial yield declines

1. Same shock but smaller GE effects on Foreign ccy deposits

2. FX mismatch is now prohibited
**Strict FXMR: Real Variables**

### 1. Financial yield of Home ccy down because of higher demand for Home ccy

- **GDP (% Difference)**
- **Consumption (% Difference)**
- **Current Account/GDP (pp Difference)**
- **Real Exchange Rate (% Difference)**
- **Real Policy Rate (pp Difference)**
- **RoW Real Policy Rate (pp Difference)**
- **Expected Real Depreciation (pp Difference)**
- **Inflation (pp Difference)**
- **RoW Consumption (% Difference)**
- **Foreign Saving/GDP (pp Difference)**
- **Foreign Financing/GDP (pp Difference)**
- **NFL/GDP (pp Difference)**
- **Loan Liabilities to RoW/GDP (pp Difference)**
- **Deposit Liabilities to RoW/GDP (pp Difference)**
- **Interbank Liabilities to RoW/GDP (pp Difference)**

### 2. How? Expected depreciation

### 3. Therefore contractionary impact appreciation
1. No change at all in NFL

2. But huge switch from interbank liabilities to deposit liabilities: Key for financial vulnerability.
Correlated Gross Inflows and Outflows (Accommodating FXMR)

Correlated in-/outflows?
Automatic, trivial, consequence of settlement and book-keeping.

Loans to Home HH
(pp of GDP Difference)

Deposits of Home HH
(pp of GDP Difference)

Loans to Foreign HH
(pp of GDP Difference)

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Home Ccy Nostro
(pp of GDP Difference)

Home Ccy Vostro
(pp of GDP Difference)
Triffin's CA Dilemma
(Strict FXMR)

- US$ demand met by US bankers' and HHs' $s (credit)
- US$ demand not met by US CA (widgets)
2. Foreign financing down: Foreign banks lend LESS, no foreign financing. This is not a dis-saving glut

3. Home HHs finance imports through Home banks only

1. Foreign saving up: Foreigners get paid, don't finance anything. This is not a saving glut
7 Summary

1. Insights:
   • Foreign financing and foreign saving are completely different concepts.
   • Net and gross foreign liabilities can send opposite vulnerability signals.

2. Can reframe several important policy debates associated with capital flows:
   • Financial vulnerability: Gross debt positions matter far more than CA.
   • Saving glut: Bank credit ($), not saving (widgets), finances CA.
   • Triffin: Bankers, not the US CA, create $. There is no dilemma.
   • High correlation of gross inflows and outflows: Is automatic and trivial.