1 Introduction

After liberalizing international transaction of financial assets, many countries experience large swings in capital flows, asset prices, and aggregate production

e.g. Latin America from the late 1970s, Nordic countries in the late 80s and early 90s, East Asia in the 90s

Prasad, Rogoff, Wei and Kose (2003), Obstfeld and Taylor (2004):

No robust relationship between liberalization and growth

Benefits with strong institution, and costs outweigh with weak institution
General Features of financial crisis (Reinhart-Rogoff)

1. Varieties of financial crisis

banking crises: failures and/or government bailouts of major financial institutions

debt crises: defaults on external and domestic government debts

inflation crises: annual inflation rate of 20% or more

currency crisis: annual depreciation rate of 15% or more against the key currency
2. Early warning signs of financial crisis

- asset price inflation, in particular real estate price
- credit boom: rise of leverage rate or debt-income ratio
- capital inflows, or current account deficit
- slowing down of economic growth rate

3. Average of major financial crisis of advanced and emerging market economies after WWII

- real GDP falls by 9.3% in 2 years
- equity price falls by 56% in 3.4 years
unemployment rate rises by 7% in 4.8 years

housing price falls by 35% in 6 years

government debt is almost doubled in 3 years, mainly due to fall in tax revenue

Then

Quick recovery: output, working capital investment, stock price

Slow recovery: credit, fixed capital investment, real estate price

Legacy: government debts
In this presentation, we ask

How does the adjustment to capital account liberalization depend upon the development of domestic financial system?

Why may the economy with underdeveloped financial system be vulnerable to shocks to foreign and domestic credits?
Approach:

lenders \[\begin{array}{c}
present \ goods \\
\end{array}\] borrowers

(unproductive) \[\begin{array}{c}
promise \ of \ future \ goods \\
\end{array}\] (productive)

Borrowers may not keep their promises \[\Rightarrow\] use collateral

total assets \[>\] collateral for domestic loan

\[>\] collateral for international loan

value of fixed assets \[\Leftrightarrow\] domestic and foreign credits
2 Model

A small open economy

One homogeneous goods and land

Many entrepreneurs and foreigners

Preference

entrepreneur : \( E_0 \left[ \sum_{t=0}^{\infty} \beta^t \ln c_t \right] \)

foreigner : \( E_0 \left[ \sum_{t=0}^{\infty} \left( \frac{1}{r^*} \right)^t c_t \right], \quad 1 < r^* < \frac{1}{\beta} \)
At date $t$: Entrepreneur A uses $k_t$ land and $m_t$ material goods to start production

Agent B lends and monitors (lead creditor)

Agent C lends and does not monitor (outside creditors)

At date $t+1$: output $y_{t+1} = a_t \left( \frac{k_t}{\kappa} \right)^\kappa \left( \frac{m_t}{1-\kappa} \right)^{1-\kappa} = a_t F(k_t, m_t)$, if A finishes

$y_{t+1} = \theta a_t F(k_t, m_t)$, if B finishes

$y_{t+1} = 0$, if C finishes

Only single home agent can be the monitor of each segment of project
Productivity of each entrepreneur:

\[ a_t = \begin{cases} 
\alpha, & \text{if the entrepreneur is productive} \\
\gamma, & \text{if he is unproductive} 
\end{cases} \]

Idiosyncratic productivity transition:

\[ \text{Prob} (a_{t+1} = \gamma \mid a_t = \alpha) = \delta, \quad \text{Prob} (a_{t+1} = \alpha \mid a_t = \gamma) = n\delta \]

In Competitive Economy, the entrepreneur (borrower) can walk away from production and debt. No reputation

\[ \Rightarrow \text{Fixed asset (land) becomes collateral for domestic and foreign resalable credits} \]

\[ \theta \text{ fraction of output from the present project becomes collateral for domestic bilateral credit} \]
Each entrepreneur takes prices \((q_t, r_t, r^*)\) and initial net worth as given, and chooses quantities \((c_t, k_t, m_t, y_{t+1}, b_{t+1}, b_{t+1}^*)\), subject to the flow-of-funds constraint:

\[
c_t + q_t (k_t - k_{t-1}) + m_t = y_t - b_t - b_t^* + \frac{b_{t+1}}{r_t} + \frac{b_{t+1}^*}{r^*}
\]

and the international and domestic borrowing constraints:

\[
b_{t+1}^* \leq q_{t+1} k_t \\
b_{t+1} + b_{t+1}^* \leq \theta y_{t+1} + q_{t+1} k_t
\]
The markets clear for goods, land, and domestic and international credits

\( \theta \) and \( \kappa \): parameter of domestic financial development

\( \kappa \): share of asset used as collateral for resalable credit
Equilibrium: \((q_t, u_t, r_t, K_t, K'_t, M_t, M'_t, Z_t, s_t, x_t, Z_{t+1}, s_{t+1})\) that satisfies

(1) \(u_t = q_t - q_{t+1}/r^*\)

(2) \(u_tK_t: M_t = \kappa: 1 - \kappa = u_tK'_t: M'_t: \text{factor demand}\)

(3) \(K_t + K'_t = K: \text{land market}\)

(4) \(\gamma/u^\kappa_t \leq r_t: \text{unproductive entrepreneur, = holds if } K'_t > 0\)

(5) \(u_tK_t + M_t \leq \frac{\beta s_tZ_t}{1-(\theta\alpha/r_tu^\kappa_t)}, = \text{ holds if } \alpha/u^\kappa_t > r_t\)

(6) \(Z_t = Y_t + Y'_t + q_tK - B^*_t - B^*_{t'}: \text{total wealth}\)

(7) \(s_t = (Y_t + q_tK_t - B^*_t)/Z_t: \text{share of net worth of productive}\)
(8) \( u_t \bar{K} + M_t + M'_t \leq \beta Z_t \), = holds if \( r_t > r^* \)

(9) \( x_t = \left[ \frac{1 - \theta}{(u_t^\kappa / \alpha)(\theta / r_t)} - r_t \right] / r_t \) : excess rate of return of productive

(10) \( Z_{t+1} = r_t \left( 1 + x_t s_t \right) \beta Z_t \)

(11) \( s_{t+1} = \frac{(1 - \delta)(1 + x_t)s_t + n\delta(1 - s_t)}{1 + s_t x_t} \equiv f(s_t, x_t) \)
• Under financial autarky, if domestic borrowing constraint is tight $\theta < \overline{\theta}(\kappa)$, then the unproductive entrepreneurs produce themselves.

$$\overline{\theta}'(\kappa) < 0$$

• For numerical examples, we use full model with labor:

$$y_{t+1} \leq a_t \left( \frac{k_t}{\kappa} \right)^\kappa \left( \frac{l_t}{\lambda} \right)^\lambda \left( \frac{m_t}{1 - \kappa - \lambda} \right)^{1 - \kappa - \lambda}$$

$$L_t^s = \overline{L}w_t^n$$

$\beta = 0.92, \ \kappa = 0.03, \ \lambda = 0.12, \ \alpha = 1.1, \ \gamma = 1.05, \ \delta = 0.15, \ n = 0.1, \ \eta = 3$
Figure 1: Steady-state interest rate under autarky

The figure shows the steady-state interest rate under autarky as a function of the domestic collateral factor. The interest rate is depicted on the vertical axis, while the domestic collateral factor is on the horizontal axis. There is a notable change in the interest rate around the values of $\bar{\theta}$ and $\theta^*$.
Figure 2: Capital flows after liberalisation

\[ \beta^{-1} \]

\[ r^* \]

\[ \theta_1 \]

\[ \theta_2 \]
3 Capital Account Liberalization

- Region I, $\theta < \theta_1$ : Factor price suppression

Before liberalization, $r^A > r^*$ $\Rightarrow$ liberalization causes capital inflow

\[
\begin{align*}
\text{unproductive} & \rightarrow \text{productive} \\
\uparrow & \quad \nearrow \\
\text{foreigners}
\end{align*}
\]

$\Rightarrow$ initial boom with land price hike and credit expansion

$\Rightarrow$ boom is not sustainable
Figure 3-1: dynamics after liberalisation: capital inflow (low theta)

parameters: \((\theta, \sigma, \lambda, \eta, \alpha, \gamma, \beta, n, \delta) = (0.2, 0.03, 0.12, 3, 1.1, 1.05, 0.92, 0.1, 0.15)\)
Figure 3-2: dynamics after liberalisation: capital inflow (low theta)

Parameters: \( (\theta, \sigma, \lambda, \eta, \alpha, \gamma, \beta, n, \delta) = (0.2, 0.03, 0.12, 3, 1.1, 1.05, 0.92, 0.1, 0.15) \)
• Region II, $\theta_1 < \theta < \theta_2$: Interest rate suppression

Before liberalization, $r^A < r^* \Rightarrow$ liberalization causes capital outflow

unproductive $\rightarrow$ productive

$\downarrow$

foreigners

$\Rightarrow$ land price, credit, TFP and output decrease initially

$\Rightarrow$ international capital market act as "catalyst"
Figure 5-1: dynamics after liberalisation: capital outflow

parameters: \((\theta, \sigma, \lambda, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.03, 0.12, 3, 1.1, 1.05, 0.92, 0.1, 0.15)\)
Figure 5-2: dynamics after liberalisation: capital outflow

parameters: \((\theta, \sigma, \lambda, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.03, 0.12, 3, 1.1, 1.05, 0.92, 0.1, 0.15)\)
Region III, $\theta > \theta_2$ : More advanced financial system

Before liberalization, $r^A > r^* \implies$ liberalization causes capital inflow

unproductive $\rightarrow$ productive

foreigners

$\implies$ boom with land price hike and credit expansion

$\implies$ boom is sustainable
- Welfare

\[ c_t = (1 - \beta) z_t = (1 - \beta) \beta^{t-1} \tilde{r}_0 \tilde{r}_1 \cdots \tilde{r}_{t-1} z_0 \]

entrepreneurs : \[ E_0 \left[ \sum_{t=0}^{\infty} \beta^t \ln c_t \right] \]

workers : \[ E_0 \left[ \sum_{t=0}^{\infty} \beta^t (c_t - v(l_t)) \right] \]

<table>
<thead>
<tr>
<th>Region I</th>
<th>P's ( z )</th>
<th>P's ( \tilde{r} )</th>
<th>P's EU</th>
<th>U's ( z )</th>
<th>U's ( \tilde{r} )</th>
<th>U's EU</th>
<th>Worker</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.53</td>
<td>-0.27</td>
<td>0.27</td>
<td>0.32</td>
<td>-0.27</td>
<td>0.05</td>
<td>5.14</td>
<td></td>
</tr>
<tr>
<td>Region II</td>
<td>-0.30</td>
<td>0.09</td>
<td>-0.20</td>
<td>-0.02</td>
<td>0.09</td>
<td>0.07</td>
<td>-0.12</td>
</tr>
</tbody>
</table>
4 Shocks to foreign and domestic credits in Region I

- Foreign interest rate rises

⇒ land price falls

⇒ domestic and foreign credit contract

⇒ domestic interest rate rises more than foreign rate

⇒ TFP and output decrease initially

⇒⇒ share of net worth of productive agents will recover

⇒⇒ TFP and output will recover, while land price will not
Figure 7-1: dynamics after shock to world interest rate

parameters: $\theta_{\text{old}}, \theta_{\text{new}}, \sigma, \eta, \alpha, \gamma, \beta, n, \delta = (0.6, 0.6, 0.03, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$
Figure 7-2: dynamics after shock to world interest rate

parameters: $(\theta_{\text{old}}, \theta_{\text{new}}, \sigma, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.6, 0.03, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$
- Domestic collateral tightened

⇒ land price falls

⇒ foreign credit tightened (capital outflow)

⇒ TFP and output decrease

⇒⇒ share of net worth of productive agents will not recover

⇒⇒⇒ land price, TFP and output continue to stagnate
Figure 6-1: dynamics after shock to theta

parameters: \((\theta_{old}, \theta_{new}, \sigma, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.2, 0.03, 3, 1.1, 1.05, 0.92, 0.1, 0.15)\)
Figure 6-2: dynamics after shock to theta

Parameters: $(\theta_{old}, \theta_{new}, \sigma, \eta, \alpha, \gamma, \beta, n, \delta) = (0.6, 0.2, 0.03, 3, 1.1, 1.05, 0.92, 0.1, 0.15)$
5 Conclusion

Before liberalization:

With underdeveloped domestic financial system, unproductive agents produce \( \Rightarrow \) low TFP

\( \Rightarrow \) low factor price

\( \Rightarrow \) low interest rate of savers

After capital account liberalization:

Adjustment depends upon the degree of development of domestic institution relative to the rest of the world
<table>
<thead>
<tr>
<th>Domestic collateral\</th>
<th>Short-run</th>
<th>Long-run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Expansionary</td>
<td>Mixed</td>
</tr>
<tr>
<td>Medium</td>
<td>Contractionary</td>
<td>Expansionary</td>
</tr>
<tr>
<td>High</td>
<td>Expansionary</td>
<td>Expansionary</td>
</tr>
</tbody>
</table>
The economy with low domestic collateral is vulnerable to shocks to domestic and foreign credit.

<table>
<thead>
<tr>
<th>Short-run</th>
<th>Long-run</th>
</tr>
</thead>
<tbody>
<tr>
<td>foreign interest rate $\uparrow$</td>
<td>$Contractionary$</td>
</tr>
<tr>
<td>domestic collateral $\downarrow$</td>
<td>$Contractionary$</td>
</tr>
</tbody>
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