The Credit Channel and Financial Shocks in a Small Open Economy

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Motivation

- This study is motivated by *the current financial crisis*, which originates from the credit market and spreads worldwide.

- The literature:
  1. Open Economy
  2. Monetary Policy
  3. Credit Channel

- In this study, we focus on:
  1. The role of the credit channel in a small open economy.
  2. The implications of economic openness for the banking sector.
Literature Review

- Credit Channel
    - Balance Sheet Channel
      - Countercyclical External Finance Premium (EFP)
  - Most of the credit channel literature are in a closed economy
Literature Review

- Goodfriend and McCallum (2007)
  1. DSGE model in a closed economy
  2. Money and Banking Sector

  - Financial Accelerator
  - Banking Attenuator

  ➔ Procyclical EFP

- EFP: banking attenuator ➔ Procyclical
- EFP: increases under financial shock
Core Model

- Following Goodfriend and McCallum (2007):

  DSGE Model with credit channel
  
  - The representative households
  - Firms
  - Banks
  - Government

- A small open economy
  ~ openness in the goods and asset markets
Goods Market

- Openness in the goods markets: imports and exports:

- The domestic consumption bundle:

\[ c_t = \left( \alpha^d \right)^{1-\nu} \left( c_t^d \right)^{\nu} + \left( \alpha^m \right)^{1-\nu} \left( c_t^m \right)^{\nu} \]

- The market clearing condition:

\[ K_t^\eta \left( A_l l_t \right)^{1-\eta} - \alpha^d \left( \frac{P_t^d (s)}{P_t^d} \right)^{-\nu} \left( \frac{P_t^d}{P_t} \right)^{-\theta} c_t^A - \left( \frac{P_t^x (s)}{P_t^x} \right)^{-\nu} \left( \frac{P_t^x}{P_t} \right)^{-\mu} = 0 \]

where \( c_t^A = c_t + q_t \delta K_t \)
International Asset Markets

- There are internationally tradable bonds.
- The Friction in the Global Financial Market:

\[
(1 + R_t^{B^*}) = (1 + R_t^*) - \phi \left( \frac{B_{t+1}^*}{P_t^*} \right) / \chi
\]

- The UIP does not necessarily hold.

- The international bonds do not serve as the collateral for the loans.
The Representative Household

- **Preference**

\[
E_0 \sum_{t=0}^{\infty} \beta^t \left[ \psi \log(c_t) + (1-\psi) \log(1-l_t^s - n_t^s) \right]
\]

- **Budget constraint**

\[
q_t (1-\delta) K_t + \frac{M_{t-1}}{P_t} + \frac{e_t B_t^*}{P_t} + \frac{B_t}{P_t} + w_t (l_t^s + n_t^s) + \\
\alpha^d \left( \frac{P_t^d(s)}{P_t} \right)^{1-\nu} \left( \frac{P_t^d}{P_t} \right)^{1-\theta} c_t^A + \left( \frac{e_t P_t^x(s)}{P_t} \right) \left( \frac{e_t P_t^x}{P_t^x} \right)^{-\nu} \left( \frac{P_t^x}{P_t^*} \right)^{-\mu} \\
- w_t (l_t + n_t) - q_t K_{t+1} - \frac{M_t}{P_t} - T_t - \frac{e_t B_t^*}{P_t (1 + R_t^B)} - \frac{B_t}{P_t (1 + R_t^B)} - c_t = 0
\]
Bank

◆ Provides deposit and loan services

◆ Loan production:

\[ \frac{L_t}{P_t} = Z \left( b_{t+1} + A_t^k \Theta q_t K_{t+1} \right)^\alpha \left( A_t^n n_t \right)^{1-\alpha} \quad 0 < \alpha < 1 \]

- **Z**: The efficiency of loan production
- **A_t^k**: The Shock to the Effectiveness of the Collateral
- **A_t^n**: The Shock to the Monitoring Labor

➤ Only home bonds serve as the collateral for Loans
First-order conditions

- The first-order conditions w.r.t.  \( l^s, l, n, K, B, B^*, P \)
- In particular, the first-order condition w.r.t. the home bond:

\[
\left( \frac{\psi}{c_t \lambda_t} - 1 \right) \Omega_t - 1 + \beta E_t \left( \frac{\lambda_{t+1} P_t}{\lambda_t P_{t+1}} (1 + R_t^B) \right) = 0
\]

\[\text{the liquidity premium of the home bonds}\]

⇒ The liquidity premium exists because the international bonds do not serve as the collateral for loans.
Interest Rates

Interest rates relationships:

\[ R_t^T : \quad 1 + R_t^T = E_t \frac{\lambda_t P_{t+1}}{\beta \lambda_{t+1} P_t} \]

\[ R_t^B : \quad \frac{1 + R_t^B}{1 + R_t^T} = 1 - \left( \frac{\psi}{c_t \lambda_t} - 1 \right) \Omega_t \]

\[ R_t^{IB} : \quad (1 + R_t^T) = (1 + R_t^{IB}) \left[ 1 + \frac{V_{W_t} n_t}{(1 - \alpha)(1 - \tau)c_t} \right] \]

\[ R_t^L : \quad (1 + R_t^L) = (1 + R_t^{IB}) \left[ 1 + \frac{V_{W_t} n_t}{(1 - \tau)c_t} \right] \]

\[ EFP_t : \quad EFP_t = R_t^L - R_t^{IB} \]
Steady State Setting

Assumptions for the steady state:

- The asset prices and exchange rate: \( q = 1, \ e = 1, \)
- The good prices: \( P = P^d = P^m = P^x = 1, \ P^* = 0.67, \)
- The international interest rates: \( R^{B*} = R^* = 1, \)
- The fiscal policy: \( gb = c / b = 0.6 \)

In the steady state analyses, we will examine:

- The benchmark model
- Highly efficient loan production
- Lower economic openness
**Benchmark model:** $Z = 10, \alpha^m = 0.3$

<table>
<thead>
<tr>
<th>Variable</th>
<th>$c$</th>
<th>$c^A$</th>
<th>$l$</th>
<th>$n$</th>
<th>$w$</th>
<th>$K$</th>
<th>$b^*$</th>
<th>$b$</th>
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<tbody>
<tr>
<td>Steady State</td>
<td>1.2399</td>
<td>1.5294</td>
<td>0.3363</td>
<td>0.0035</td>
<td>2.0799</td>
<td>11.575</td>
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<tr>
<th>Variable</th>
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<th>$R^B$</th>
<th>$R^L$</th>
<th>$R^T$</th>
<th>$R^D$</th>
<th>$\lambda$</th>
<th>$\Omega$</th>
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<td>0.0041</td>
<td>0.0056</td>
<td>0.01</td>
<td>0.00322</td>
<td>0.3787</td>
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Highly efficient banking system:
\[ Z = 90, \quad \alpha^m = 0.3 \]

Table 2: Highly efficient banking system \((Z = 90, \alpha^m = 0.3)\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>(c)</th>
<th>(c^A)</th>
<th>(l)</th>
<th>(n)</th>
<th>(w)</th>
<th>(K)</th>
<th>(b^*)</th>
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<th>Variable</th>
<th>(R^B)</th>
<th>(R^E)</th>
<th>(R^L)</th>
<th>(R^f)</th>
<th>(R^D)</th>
<th>(\lambda)</th>
<th>(\Omega)</th>
<th>(EFP)</th>
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<tbody>
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<td>0.01</td>
<td>0.01</td>
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<td>0.01</td>
<td>0.3862</td>
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Less open economy: $Z = 10, \alpha^m = 0.1$

Table 3: Less open market ($Z = 10, \alpha^m = 0.1$)

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<thead>
<tr>
<th>Variable</th>
<th>$c$</th>
<th>$c^A$</th>
<th>$l$</th>
<th>$n$</th>
<th>$w$</th>
<th>$K$</th>
<th>$b^*$</th>
<th>$b$</th>
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<th>$R^B$</th>
<th>$R^L$</th>
<th>$R^F$</th>
<th>$R^Q$</th>
<th>$\lambda$</th>
<th>$\Omega$</th>
<th>$EFP$</th>
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<tbody>
<tr>
<td>Steady State</td>
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<td>0.0069</td>
<td>0.0067</td>
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Dynamics

Calvo’s Staggered Price Adjustment

\[ \Delta p_t^d = \beta E_t \Delta p_{t+1}^d + xmc_t + u_t \quad x > 0 \]

where \[ mc_t = \xi_t / \lambda_t \]

Monetary policies:

- Control over Money Base

\[ \Delta m_t = \rho^m \Delta m_{t-1} + \varepsilon^m_t, \quad 0 < \left| \rho^m \right| < 1 \]

- Interbank Rate Policy

\[ R_t^{IB} = (1 - \mu_3)\left[ \mu_0 + (1 + \mu_1) \Delta p_t^d + \mu_2 mc_t \right] + \mu_3 R_{t-1}^{IB} + \varepsilon_t \]
A Positive Unit Shock to Productivity:

\[ A_t^l = -0.01, \alpha^m = 0.3 \]
A Negative Unit Shock to Monitoring Labor: $A_t^n = -0.01$, $\alpha^m = 0.3$
A Negative Unit Shock to Monitoring Labor: $A_t^n = -0.01, \alpha^m = 0.1$
A Negative Unit Shock to Monitoring Labor under Interbank Rate Policy: $A_t^n = -0.01$, $\alpha^m = 0.3$
A Negative Unit Shock to Effectiveness of Collateral under Interbank Rate Policy: $A_f^k = -0.01, \alpha^m = 0.3$
Conclusion

- The EFP can be procyclical
- The steady state analyses show:
  - The banking sector is crucial in a small open economy.
  - The openness of trades raises the EFP.

- The dynamics analyses:
  - Exchange rate movements amplifies the economy’s responses.