International Recessions

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FACT 1: Cross-country synchronization of recent crisis
FACT 2: Stronger synchronization in the recent recession
FACT 3: Lower correlation productivity-labor
TO SUM UP

- International synchronization of recent crisis.

- The synchronization has been stronger in the recent recession.

- Weak correlation between productivity and labor.
What do these facts tell us about the business cycle?

1. Productivity may be less important as a source of business cycle:

   *Even if the greater cross-country co-movement can be attributed to greater correlation of cross-country shocks, this does not explain the weak correlation between labor and productivity.*

2. Greater importance of credit shocks:

   *Credit shocks generate a negative correlation between labor and productivity. Furthermore, they induce high cross-country co-movement in macroeconomic variables when capital markets are internationally integrated.*
MODEL WITH SEGMENTED MARKETS AND CREDIT SHOCKS

- Two types of agents:
  - **Investors** with utility $E \sum_{t=0}^{\infty} \beta^t u(c_t)$.
  - **Workers** with utility $E \sum_{t=0}^{\infty} \delta^t U(c_t, h_t)$.

- Workers lend funds to firms with bonds (debt contracts).

- Different discount factors: $\beta < \delta$. 
There is unit mass of firms owned by investors.

A firm has a ‘concave’ production function $F(z_t, h_t)$. No capital for the moment.

Budget constraint: $b_t + d_t = \frac{b_{t+1}}{R_t} + F(z_t, h_t) - w_t l_t$.

The discount factor: $m_{t+1} = \frac{\beta u_c(d_{t+1})}{u_c(d_t)}$. 
• Value of a firm at the beginning of the period:

\[ V_t(b_t) \equiv d_t + E_t \sum_{j=1}^{\infty} \left( \prod_{s=1}^{j} m_{t+s} \right) d_{t+j} \]

• Firms prefer to borrow but there is limited enforcement:

\[ \phi \cdot \left( V_t(b_t) - d_t \right) + \xi_t \geq F(z_t, h_t) \]

\text{Collateral value} \quad \text{Working capital loan}
RECURSIVE PROBLEM

\[ V(s; b) = \max_{d, h, b'} \left\{ d + Em'V(s'; b') \right\} \]

subject to:

\[ b + d = \frac{b'}{R} + F(z, h) - wh \]

\[ \phi Em'V(s'; b') + \xi \geq F(z, h) \]
First order conditions

\[ F_h(z, h) = w \cdot \left( \frac{1}{1 - \mu} \right) \]

\[ (1 + \phi \mu) Rem' = 1 \]

\( \mu \quad \Rightarrow \quad \text{Multiplier for the enforcement constraint.} \)
EQUILIBRIUM IN FINANCIAL MARKET

\[ \mu \]

\[ \xi \]
EQUILIBRIUM IN FINANCIAL MARKET

Credit Expansion
EQUILIBRIUM IN FINANCIAL MARKET

\[ \xi, \mu \]

Credit Contraction
Credit Expansion
OPEN ECONOMY

• Two symmetric countries.

• Households borrow and lend internationally. They own domestic bonds, $b_t$, and foreign bonds, $n_t$.

• Investors hold shares of domestic and foreign firms (full diversification).
OPEN ECONOMY

• Because of investors’ diversification, the common discount factor is:

\[ m_{t+1} = \frac{\beta u_c(d_{t+1}^1 + d_{t+1}^2)}{u_c(d_t^1 + d_t^2)} \]

• Back to first order conditions of firms:

\[ F_h(z_t, h_t) = w_t \cdot \left( \frac{1}{1 - \mu_t} \right) \]

\[ (1 + \phi \mu_t)R_tEm_{t+1} = 1 \]
EQUILIBRIUM WITHOUT MOBILITY
...AND **WITH MOBILITY**
...AND WITH MOBILITY
...AND WITH MOBILITY
Proposition. Consider a credit shock only to country 1. In the autarky regime only the employment of country 1 changes. In the regime with capital mobility the employment in country 2 follows exactly the same dynamics of country 1.
NUMERICAL EXAMPLE

Productivity shock - Autarky

Credit shock - Autarky

Productivity shock - Mobility

Credit shock - Mobility
The production function is:

\[ y_t = \epsilon^z t \left( k_t \theta h_t^{1-\theta} \right)^v \]

There is capital adjustment cost:

\[ k_{t+1} = (1 - \tau)k_t + \gamma(k_t, i_t) \]
QUANTITATIVE EXERCISE


• Estimation of shocks’ parameters for the period 1984-2009.3.

• Since credit shocks cannot be identified with real macroeconomic variables at the country level, in the estimation we assume a common shock. Thus, we have three stochastic disturbances: (i) Productivity in country 1; (ii) Productivity in country 2; (iii) Global credit shock.

• Three data variables: (i) GDP growth in the US; (ii) Labor productivity growth in the US; (iii) Labor productivity growth in remaining G7 countries.
## PARAMETERS

**Calibrated parameters**

- Discount factor for households/workers, $\delta$: 0.9925
- Discount factor for entrepreneurs, $\beta$: 0.9825
- Utility parameter, $\alpha$: 1.4058
- Production technology, $\theta$: 0.3677
- Depreciation rate, $\tau$: 0.0250
- Return to scale, $\nu$: 0.9500
- Enforcement parameter, $\phi$: 0.1089

**Estimated parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Prior</th>
<th>Mode</th>
<th>Percentile 5%</th>
<th>Percentile 95%</th>
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</thead>
<tbody>
<tr>
<td>Productivity persistence, $\rho_z$</td>
<td>Beta[0.5,0.2]</td>
<td>0.9049</td>
<td>0.8935</td>
<td>0.9178</td>
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<td>Productivity volatility, $\sigma_z$</td>
<td>IGamma[0.01,0.05]</td>
<td>0.0094</td>
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<td>Productivity spillover, $\varrho_{1,2}$</td>
<td>Beta[0.25,0.1]</td>
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<td>Credit persistence, $\rho_\xi$</td>
<td>Beta[0.01,0.01]</td>
<td>0.9774</td>
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<td>Credit volatility, $\sigma_\xi$</td>
<td>IGamma[0.001,0.005]</td>
<td>0.0075</td>
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</table>
# DECOMPOSITION OF VARIANCE

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<thead>
<tr>
<th></th>
<th>Domestic ( z )</th>
<th>Foreign ( z )</th>
<th>Dom-For ( \xi )</th>
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<tr>
<td>Output</td>
<td>0.79</td>
<td>0.01</td>
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<tr>
<td>Labor</td>
<td>0.37</td>
<td>0.04</td>
<td>0.60</td>
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<tr>
<td>Investment</td>
<td>0.76</td>
<td>0.07</td>
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<tr>
<td>Total consumption</td>
<td>0.63</td>
<td>0.28</td>
<td>0.09</td>
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<tr>
<td>Labor productivity</td>
<td>0.49</td>
<td>0.05</td>
<td>0.46</td>
</tr>
<tr>
<td>Net exports</td>
<td>0.50</td>
<td>0.49</td>
<td>0.01</td>
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</table>
BETWEEN AND CROSS-COUNTRY CORRELATIONS

<table>
<thead>
<tr>
<th>Country 1</th>
<th>Country 2</th>
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<tbody>
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<td>Output</td>
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<tr>
<td>Labor</td>
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<tr>
<td>Investment</td>
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<tr>
<td>Consumption</td>
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<tr>
<td>Productivity</td>
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<tr>
<td>Net exports</td>
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</table>

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<td>0.86</td>
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<td>0.68</td>
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<td>0.26</td>
<td>0.03</td>
<td>0.66</td>
<td>0.69</td>
<td>0.44</td>
<td>0.94</td>
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<tr>
<td>0.03</td>
<td>0.10</td>
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<td>-0.15</td>
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<td>0.14</td>
<td>0.49</td>
<td>0.06</td>
<td>-0.05</td>
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CONCLUSION

• At a broad level a model with credit shocks and financial integration help understand recent macroeconomic development:

  1. non-productivity driven recessions,
  2. high international correlation.

• More evidence (asset prices?) should be brought in to inform us on the proposed mechanism.

• What’s behind credit shocks? Can policy do something about them?