International Macroeconomics - Session II

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IIES

Stockholm Doctoral Program in Economics
Acknowledgement

This lecture draws partly on lecture notes by Morten Ravn, EUI
Recap: Last section

- Key definitions and concepts
- Obstfeld and Rogoff (2000)
  - Issues:
    - Intratemporal vs. Intertemporal Trade
    - Risk-sharing via financial assets, or terms of trade
    - Difficult to account for empirical behaviour of exchange rates
  - Models
    - Static vs dynamic
    - Perfect foresight vs. uncertainty
    - N country world vs. small-open economy
- Puzzles for the simple theory
  - Home bias in trade
  - Lack of intertemporal trade
  - Home bias in financial assets
  - Lack of risk-sharing
  - (Also: ER puzzles)
This session: International Business Cycles

- Focus on dynamic/short-run effect of shocks, and its transmission to domestic economy and other countries.
- How are shocks transmitted between countries?
- How do business cycles comove between countries?
- Can a 2-country version of the simple neoclassical model, with intertemporal consumption smoothing, capital accumulation, and flexible labour supply account for this?
- Do equilibrium properties differ across asset market structures?
- And what role do the terms of trade play?
What this session doesn’t answer...

- Why might markets be incomplete? (Treated later.)
- Why do we observe very persistent LR movements in foreign asset positions and RER?
- Are frictions in goods trade important?
- How about rigidities in nominal prices?
Learning points

• Capital accumulation dynamics are crucial for trade dynamics with productivity shocks.

• Preference shocks work quite well, government expenditure shocks do not.

• Bond economy surprisingly similar to complete markets, unless shocks are very persistent.

• Next section:
  • In models with several goods, the elasticity of substitution is crucial for equilibrium dynamics.
Roadmap for this section

1. International Business Cycle-Facts
2. The frictionless 2 country real business cycle model and its puzzles
3. Does the model with incomplete markets work better?
4. Next section:
   - Multigood models, terms of trade insurance and the real exchange rate
International Business Cycle-Facts
Moments of the data

- Variance and within-country covariance of main macro variables
- Cross-country correlation
- Var and Cov of Open economy variables (X,M,CA)
- Volatility of international variables (RER, ToT), and correlation with others
Filtering

- Isolate business cycle frequencies, and make data stationary
- Options: Difference, HP- or Band Pass Filter
- Here: HP filter unless o/wise indicated
### Business Cycles in OECD countries

#### B. Volatility relative to own-country output

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>Australia</th>
<th>Austria</th>
<th>Canada</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Japan</th>
<th>Switzerland</th>
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<td>0.71</td>
<td>0.72</td>
<td>0.74</td>
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</table>

Source: Baxter 1995
Business Cycles in OECD countries

C. Correlation with own-country output

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<th>Austria</th>
<th>Canada</th>
<th>France</th>
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<th>Japan</th>
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</table>

Source: Baxter 1995
Export and import in OECD countries

Table 2. Moments of open economy variables

<table>
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<tr>
<th>Country</th>
<th>s(ex)/s(y)</th>
<th>s(im)/s(y)</th>
<th>s(nx/y)</th>
<th>cor(ex,y)</th>
<th>cor(im,y)</th>
<th>cor(nx/y,y)</th>
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<td>0.80</td>
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<td></td>
<td>(0.19)</td>
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<td>(0.06)</td>
<td>(0.07)</td>
<td>(0.04)</td>
<td>(0.10)</td>
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<tr>
<td>Australia</td>
<td>3.16</td>
<td>5.93</td>
<td>1.56</td>
<td>0.17</td>
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<tr>
<td></td>
<td>(0.34)</td>
<td>(0.91)</td>
<td>(0.15)</td>
<td>(0.12)</td>
<td>(0.09)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Canada</td>
<td>2.66</td>
<td>3.20</td>
<td>0.95</td>
<td>0.67</td>
<td>0.82</td>
<td>-0.31</td>
</tr>
<tr>
<td></td>
<td>(0.22)</td>
<td>(0.16)</td>
<td>(0.07)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>Italy</td>
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<td>2.77</td>
<td>0.91</td>
<td>0.25</td>
<td>0.74</td>
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<td></td>
<td>(0.28)</td>
<td>(0.22)</td>
<td>(0.07)</td>
<td>(0.09)</td>
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<td>(0.08)</td>
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<td>(0.07)</td>
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<td></td>
<td>(0.22)</td>
<td>(0.22)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.06)</td>
<td>(0.09)</td>
</tr>
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<td>US</td>
<td>2.58</td>
<td>3.10</td>
<td>0.56</td>
<td>0.34</td>
<td>0.78</td>
<td>-0.40</td>
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<tr>
<td></td>
<td>(0.28)</td>
<td>(0.22)</td>
<td>(0.03)</td>
<td>(0.08)</td>
<td>(0.04)</td>
<td>(0.08)</td>
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<tr>
<td>Germany</td>
<td>2.37</td>
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<td>0.44</td>
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<td>(0.14)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.11)</td>
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<tr>
<td>Sweden</td>
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<td>1.59</td>
<td>0.33</td>
<td>0.26</td>
<td>0.03</td>
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<tr>
<td></td>
<td>(0.30)</td>
<td>(0.37)</td>
<td>(0.16)</td>
<td>(0.10)</td>
<td>(0.10)</td>
<td>(0.10)</td>
</tr>
</tbody>
</table>

All data Hodrick–Prescott filtered. Standard errors computed by GMM. ‘s’ denotes standard deviation. Numbers in parentheses are standard errors; ‘cor’ denotes correlation; ex: exports; im: imports; nx/y: net-exports to output.

Source: Ravn 1997
## Cross-Country Correlations

TABLE 1. Cross country correlations of output components

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Range</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output(^a)</td>
<td>0.420</td>
<td>([-0.123;0.754])</td>
<td>44(38)</td>
<td>1(0)</td>
</tr>
<tr>
<td>Consumption(^a)</td>
<td>0.283</td>
<td>([-0.215;0.709])</td>
<td>38(29)</td>
<td>7(2)</td>
</tr>
<tr>
<td>Government Spending(^a)</td>
<td>0.042</td>
<td>([-0.285;0.435])</td>
<td>28(6)</td>
<td>17(5)</td>
</tr>
<tr>
<td>Total investments(^a)</td>
<td>0.342</td>
<td>([-0.265;0.698])</td>
<td>41(36)</td>
<td>4(1)</td>
</tr>
<tr>
<td>Exports(^a)</td>
<td>0.250</td>
<td>([-0.169;0.607])</td>
<td>36(26)</td>
<td>9(0)</td>
</tr>
<tr>
<td>Imports(^a)</td>
<td>0.340</td>
<td>([-0.191;0.722])</td>
<td>40(34)</td>
<td>5(1)</td>
</tr>
<tr>
<td>Employment(^b)</td>
<td>0.342</td>
<td>([-0.200;0.715])</td>
<td>35(28)</td>
<td>1(1)</td>
</tr>
<tr>
<td>Productivity(^b)</td>
<td>0.376</td>
<td>(0.169;0.725)</td>
<td>36(31)</td>
<td>0(0)</td>
</tr>
</tbody>
</table>

\(^a\)Computed for 45 country pairs  
\(^b\)Computed for 36 country pairs (Sweden excluded)  

Note: Sample moments computed from Hodrick–Prescott filtered variables. Standard errors computed by using GMM. ‘Mean’ is the mean correlation over the country-pairs. ‘Range’ gives the minimum and the maximum correlation within the country pairs. ‘Positive’ (‘Negative’) gives the number of positive (negative) point estimates and the number in parentheses is the number of correlations that are significantly larger (smaller) than zero.

Source: Ravn 1997
## Real Exchange rates and relative consumption

### Table 3. Unconditional Correlations

<table>
<thead>
<tr>
<th>Country</th>
<th>( e^{us} )</th>
<th>( p_us / p_i )</th>
<th>( c_i )</th>
<th>( c_i / e^{us} )</th>
<th>( e^{eff} )</th>
<th>( p_i / p_i )</th>
<th>( c_i )</th>
<th>( c_i / p_i )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. First differences, full sample</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Australia</td>
<td>0.99</td>
<td>0.03</td>
<td>-0.03</td>
<td>-0.02</td>
<td>0.99</td>
<td>0.04</td>
<td>-0.03</td>
<td>-0.03</td>
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<tr>
<td>Canada</td>
<td>0.97</td>
<td>0.18</td>
<td>0.07</td>
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<td>0.97</td>
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<td>Japan</td>
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<td>0.47</td>
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<td>-</td>
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<td><strong>III. First differences, 1973.1-1998.4</strong></td>
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<td>0.99</td>
<td>-0.22</td>
<td>-0.10</td>
<td>-0.18</td>
</tr>
</tbody>
</table>

Source: Ravn 2001
International Business Cycle-Facts - Summary

1. Business cycles are similar across countries

2. Exports are less pro-cyclical than imports, so the TB is counter-cyclical.

3. Output, employment, investment and consumption are positively correlated across countries.

4. Consumption is less correlated across countries than income.

5. RER volatility is an order of magnitude higher in flexible ER regimes.

6. The correlation between the RER and all real variables, incl. relative consumption, is small.
International Business Cycle - Literature and Roadmap

- One good model with complete markets
  1. Backus, Kehoe and Kydland JPE 1992
  2. Ravn, JIMF 1997

- Incomplete markets: trade in bonds and the importance of persistence

- Next session: Country-specific traded goods
A benchmark stochastic 2 country production model
A benchmark model: General setup

- 2 countries of equal size, discrete time
- Agents: representative infinitely lived agents, competitive firms and a government for each country
- Single perishable good used for consumption and investment and government consumption
- Consumers have identical preferences across countries $i$

\[
U_i = E_0 \sum_{t=0}^{\infty} \beta^t u(c_{it}, l_{it})
\] (1)
A benchmark model: Technology, Govmt., Uncertainty

- Technology CRTS with persistent shocks

\[ y_{i,t} = \exp(A_{it} k_{it}^{1-\alpha} n_{it}^\alpha) \]
\[ y_{i,t} = \exp(A_{it}) k_{it}^{1-\alpha} n_{it}^\alpha \]

where \( n_{it} = 1 - l_{it}, A_t = [A_1t, A_2t]' = RA_t + \epsilon_{t+1} \) and \( \epsilon_{t+1} \) has var-cov matrix \( \Omega \).

Note: immobile labour but free trade in goods (and capital).

- Capital accumulates according to \( k_{it+1} = (1 - \delta)k_{it} + x_{it} \)

- Governments finance exogenous spending by lump-sum taxes

\[ \ln g_{t+1} = (1 - \rho)\ln g + \rho\ln g_{t} + u_{it} \]

- Uncertainty summarised by state of the world \( s_t: s_t = \{\epsilon_t, u_{it}\} \)
Complete Markets and First WT

- Complete markets
- Exploit 1st welfare theorem: With complete markets, competitive equilibrium allocation is solution to appropriate social planner’s problem with initial country weights $\mu_1$, $\mu_2$. 
Social planner’s problem

\[
\max_{\{c_{it}, k_{it+1}, l_{it}\}} \mathbb{E}_0\left[\sum_i \mu_i \sum_{t=0}^{\infty} \beta^t u(c_{it}, 1 - n_{it})\right]
\]

subject to

\[
\sum_i c_{it} + x_{it} \leq \sum_i \exp(A_{it})F(k_{it}, n_{it}) - g_{it}
\]  \hspace{1cm} (2)

\[
k_{it+1} = (1 - \delta)k_{it} + x_{it}
\]  \hspace{1cm} (3)

\[
k_{i0} \text{ given}
\]  \hspace{1cm} (4)
First order conditions

∀ s_t:

1. $c_{it} : \mu_i u_c(c_{it}, 1 - n_{it}) = \lambda_t$
   Implies perfect risk sharing - relative marginal utility is
   constant across states $\frac{u_c(c_{it}, 1 - n_{it})}{u_c(c_{jt}, 1 - n_{jt})} = \frac{\mu_j}{\mu_i}$

2. $n_{it} : \frac{u_n(c_{it}, 1 - n_{it})}{u_c(c_{it}, 1 - n_{it})} = \exp(A_{it} F_n(k_{it}, n_{it})$  
   Efficient provision of labour effort requires MRS=MRT state
   by state in both countries.

3. $k_{it+1} : \lambda_t = E_t[\beta \lambda_{t+1} (\exp(A_{it+1}) F_k(k_{it+1}, n_{it+1}) + 1 - \delta)]$
   $= E_t[\beta \lambda_{t+1} (\exp(A_{jt+1}) F_k(k_{jt+1}, n_{jt+1}) + 1 - \delta)]$
   Investment equalises expected marginal productivity of capital.

4. So Consumption risks are perfectly shared, while factors are
   employed according to productivity.
Interpretation
Consumption risk sharing

\[
\frac{u_c(c_{it}, 1 - n_{it})}{u_c(c_{jt}, 1 - n_{jt})} = \frac{\mu_j}{\mu_i}
\]

1. Implies that redistributive shocks (that leave aggregate world variables unchanged) have no impact on allocation. And aggregate volatility has minimum weighted utility cost.

2. Note that (5) does not imply constant consumption ratios. For \( \frac{c_j}{c_i} \) to be constant, need to assume
   2.1 Separability of utility in \( l \) and \( c \) (\( U_c \) unaffected by \( l \))
   2.2 CRRA preferences
Effect of technology shocks $A_{10} > 0$

- $t = 0$:
  - Output and labour productivity are increased on impact. So labour (demand) in 1 rises.
  - Persistence implies higher productivity of capital and labour in country 1 in period 1. So capital moves to country 1 - investment increases there, but decreases in 2.
  - Consumption increases from higher WORLD wealth (wealth effect), but decreases from higher investment to build $k$ for tomorrow (substitution effect), both effects are the same in both countries. Increase in relative labour supply in country 1 may change relative consumption.
Effect of technology shocks $A_{10} > 0$

- $t > 0$: ”Make hay while the sun shines” in country 1 (BKK)
  1. Higher productivity and capital in 1 implies higher labour effort, which may change consumption depending on the cross-elasticity with consumption.
  2. Lower capital in 2 implies optimally lower labour supply.
- Yields strong positive correlation in consumption, negative correlation in investment and hours.
- No relative wealth effects.
Step back: Key elements of the model

1. Capital accumulation: gives chance of countercyclical NX from investment dynamics, as consumption smoothing delivers procyclical NX.

2. Flexible labour supply: increases investment and output response to Prod shocks.

3. Complete markets: Wealth and substitution effects of shocks are shared.
Quantitative Results: BKK 1992

1. 2 country version of Kydland and Prescott (1982), no government shocks
2. Introduce 3rd factor: inventories
3. ”Time to build” capital formation: capital adjusts slowly to investment.
4. Time dependence in utility from leisure.
Calibration

1. Symmetric world (US plus clone)
2. CD preferences over $c, l$
3. Parameters chosen to match great ratios ($c/y, i/y, \text{labour share})$ and real interest rate
4. Shocks estimated on US-Europe, ”symmetricised”: SD 0.00852, correlation 0.258, and AR(1) parameter matrix
   \[
   R = \begin{pmatrix}
   0.906 & 0.088 \\
   0.088 & 0.906
   \end{pmatrix}
   \]
Model Solution and computation

1. Linearisation around symmetric non-stochastic steady state
2. Compute moments from HP-filtered data of 50 sequences of 100 periods
Results
Moments of the model economy

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Data</th>
<th>Benchmark Economy</th>
<th>Spillovers</th>
<th>Alternative Economy</th>
<th>Trading Frictions</th>
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<tr>
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<td>Large</td>
<td>High Rsk Aversion</td>
<td>Durable Leisure</td>
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<td>A. STANDARD DEVIATIONS (%)</td>
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<td>(.06)</td>
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</table>
Response to a technology shock
Summary

1. Model overstates variability of investment, despite time to build, etc.
2. Backus-Smith puzzle: Cross-country correlation of consumption much larger than of output.
3. Comovement puzzle: Cross-country correlations of output, employment, and investment are negative.
4. Net exports are much more volatile and less counter-cyclical than in the data
**Excursion: Taste shocks**

1. Change preferences to

\[ U_i = E_0 \sum_{t=0}^{\infty} \beta^t u(d_{it}^c c_{it}, l_{it}) \]  

with \( d_{it}^c = \rho^d d_{it}^c + h_{it}^c \)

2. Consumption risk sharing

\[ \lambda_t = d_{it}^c u_c(d_{it} c_{it}, 1 - n_{it}) = d_{jt}^c u_c(d_{jt} c_{jt}, 1 - n_{jt}) \]  

then implies

\[ \frac{d_{it}^c u_c(d_{it} c_{it}, 1 - n_{it})}{d_{jt}^c u_c(d_{jt} c_{jt}, 1 - n_{jt})} = \frac{\mu_j}{\mu_i} \]  

→ Taste shocks lead to fluctuations in relative consumption, lower correlation \( c_i, c_j \)

3. First order condition for labour supply reads

\[ \frac{u_n(d_{it} c_{it}, 1 - n_{it})}{d_{it}^c u_c(d_{it} c_{it}, 1 - n_{it})} = \exp(A_{it}) F_n(k_{it}, n_{it}) \]
Taste shocks

1. For simplicity, consider separable log-utility

\[ U_i = E_0 \sum_{t=0}^{\infty} \beta^t d_{it}^c \log c_{it} + B \log(1 - n_{it}) \]  \hspace{1cm} (10)

2. Consumption risk sharing: \( c_{it} = \frac{d_{it}^c}{d_{jt}^c} c_{jt} \)

3. First order condition for labour supply reads

\[ \frac{B c_{it}}{1 - n_{it}} = d_{it} \exp(A_{it} F_n(k_{it}, n_{it})) \]  \hspace{1cm} (11)

→ Taste shocks lead to fluctuations in hours, and positive cross-country correlation, since

\[ \frac{1 - n_{it}}{1 - n_{jt}} = \frac{\exp(A_{it}) F_n(k_{it}, n_{it})}{\exp(A_{jt}) F_n(k_{jt}, n_{jt})} \]  \hspace{1cm} (12)
**Taste shocks**

1. Investment is given by

   \[ 1 = E_t[\beta \exp(A_{it})F_k(k_{it}, n_{it}) \frac{d_{it+1}c_{it}}{d_{it}c_{it+1}}] \]  

   (13)

   (14)

   So investment falls as price of current consumption is high.

2. Investment is positively correlated across countries since

   \[ E_t[\lambda_{t+1}] = E_t[\exp(A_{it})F_k(k_{it}, n_{it})] = E_t[\exp(A_{jt})F_k(k_{jt}, n_{jt})] \]  

   (15)
Impulse responses
So far...

1. Complete markets: Imply...
   1.1 Perfect risk sharing \(\rightarrow\) Backus Smith Cons correlation puzzle
   1.2 Efficient allocation of capital and labour \(\rightarrow\) Comovement puzzle of negative \(i/i^*, n/n^*\) correlation.

2. Now: Incomplete Markets: Trade in bonds only.


**Environment**

1. Preferences and technology as before, but countries only trade in bonds $b_{it}$ that pay interest $R_r$ in all states $s_t$.

2. The budget constraint is thus

$$c_{it} + b_{it+1} + x_{it} + g_{it} \leq R_tb_{it} + y_{it}$$

(16)

plus no Ponzi condition for bonds.

3. 1st WT no longer holds, so look at competitive equilibrium.
Representative HH problem

\[
\max_{\{c_{it}, n_{it}, b_{it}, k_{it+1}\}} E_0 \sum_{t=0}^{\infty} \beta^t u(c_{it}, 1 - n_{it}) 
\]

subject to

\[
c_{it} + b_{it+1} + x_{it} + g_{it} \leq R_t b_{it} + y_{it} \quad (18)
\]

\[
y_{i,t} = \exp(A_{it}) k_{it}^{1-\alpha} n_{it}^\alpha \quad (20)
\]

\[
k_{it+1} = (1 - \delta) k_{it} + x_{it} \quad (21)
\]

\[
b_{i,t} \leq \sum_{s=t}^{\infty} \Pi_{t}^{s} R_{i,t}^{-1} (y_{i,s} - g_{i,s}) \quad (22)
\]
Competitive equilibrium

1. Set of prices $R_t$ and allocation $\{c_{it}, k_{it}, b_{it}, n_{it}, g_{it}\}, i=1,2$ such that
2. Government balances its budget given $g_t$
3. Representative households solve their problem given $R_t$
4. Markets for bonds and capital clear.
Intuition: Productivity shocks in a small open economy

1. Small open economy assumption: Country i has no effect on world prices. Take $S_t$ to be the subset of “world” events in history $s_t$.

2. Simplifies, as can abstract from general equilibrium effect on interest rates.

3. Clarifies intuition for difference between complete markets and trade in bonds only.
Excursion: Productivity shocks in a small open economy

1. Complete markets

\[
\frac{\beta u_c(s_{t+1})}{u_{ct}} = \frac{q(s_{t+1})}{\pi(s_{t+1})} = \frac{q(S_{t+1})}{\pi(S_{t+1})} \tag{23}
\]

2. So world prices determine MRS in c in all states, and country productivity shocks have no effect on consumption.

3. Asset payoffs offset shocks, so country shocks have no wealth effect.
**Intuition: Productivity shocks in a small open economy**

1. **Trade in uncontingent bonds**

\[
R_{t+1} \beta E[u_c(s_{t+1})] = 1
\]  

(24)

2. World prices tie down **expected** MRS.

3. Given \( R \), agents borrow and lend to smooth consumption.

4. E.g. \( R = 1/\beta \), quadratic utility: agents consume annuity value of expected wealth.

5. But shocks have wealth effects, so change consumption.

6. Persistence is important: wealth effects stronger for more persistent shocks.

7. With \( R = 1/\beta \), even transitory shocks have permanent effect on consumption.
Baxter (1995): A 2 country model

1. A positive shock to $A_{it}$ has a positive wealth effect but negative substitution effect on consumption and leisure in i. Effect on j wealth depends on spillovers of productivity process.

2. FOC for bonds equalises expected MRS

$$E\left[ \frac{u_c(c_{it+1}, 1 - n_{it+1})}{u_c(c_{it}, 1 - n_{it})} \right] = E\left[ \frac{u_c(c_{jt+1}, 1 - n_{jt+1})}{u_c(c_{jt}, 1 - n_{jt})} \right]$$

(25)

3. FOC for $k_{t+1}$ makes capital flow to high productivity country

$$E[\exp(A_{it}) F_k(k_{it}, n_{it}) u_c(c_{it+1}, 1 - n_{it+1})] = E[\exp(A_{jt}) F_k(k_{jt}, n_{jt}) u_c(c_{jt+1}, 1 - n_{jt+1})]$$

(26)
Solution and parameters


2. Problem: In SS $R = 1/\beta$, so transitory shocks have permanent effects on relative wealth, consumption and leisure.

3. Solution: Endogenous discount factor or debt-elastic interest rate to tie variables to steady state value.

2 specifications of productivity shocks


2. Correlated near permanent shocks.
Results
Impulse responses with BKK shocks

Source: Baxter 1995
## Moments with CM and IM

### A. Benchmark case: Trend-stationary shocks with correlated innovations

<table>
<thead>
<tr>
<th></th>
<th>Standard deviation</th>
<th>Relative std. dev.</th>
<th>Persistence</th>
<th>corr w/output, lag 0</th>
<th>Other Correlations</th>
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<td>CM (1)</td>
<td>CM</td>
<td>IM</td>
<td>CM</td>
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<td>0.70</td>
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<td>0.76</td>
<td>0.73</td>
<td>0.73</td>
<td>0.94</td>
</tr>
</tbody>
</table>

CM: results for complete markets economy; IM: results for economy trading noncontingent bonds and goods only. Parameterization of this case is: \( \rho = 0.995, \) \( \nu = 0.9, \) \( corr(e, e^*) = 0.258, \) \( \text{var}(e) = \text{var}(e^*) = 0.73. \)

### B. Trend-stationary shocks with large spillovers: The BKK parameterization

<table>
<thead>
<tr>
<th></th>
<th>Standard deviation</th>
<th>Relative std. dev.</th>
<th>Persistence</th>
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<th>Other Correlations</th>
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CM: results for complete markets economy; IM: results for economy trading noncontingent bonds and goods only. Parameterization of this case is: \( \rho = 0.906, \) \( \nu = 0.088, \) \( corr(e, e^*) = 0.258, \) \( \text{var}(e) = \text{var}(e^*) = 0.73. \)

Source: Baxter 1995
Discussion

- CM and IM almost identical for transitory shocks that spill over to the other country.
- Only with near-permanent shocks and no spillovers, the two differ, as wealth effects are important.
- Wealth effects increase consumption at home by more, breaking $c, c^*$ link, and making imports more procyclical, so $NX$ countercyclical.
- Comovement puzzle for labour inputs and investment remains.
So far

- Transmission of shocks entirely via financial markets.
- But how about Real exchange rate movements, and fluctuations in ToT?
- → Need multi-good model.
  1. Traded vs. non-traded goods.
  2. Country specific traded goods.
International Macroeconomics - Session II

Tobias Broer

IIES

Stockholm Doctoral Program in Economics