Understanding the Evolution of World Business Cycles

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• Global linkages have been increasing
  
  – Volume of trade has increased over time

  – Volume of financial flows has increased substantially over the past 15 years

• Can we find evidence of changes in business cycle comovement over time?

• We are **not** directly linking ‘globalization’ with business cycles
• Empirical Studies

  – Results are inconclusive
  – Heathcote and Perri (2002)
  – Doyle and Faust (2002a, 2002b)
  – Helbling and Bayoumi (2002)
• Some robust facts

  – Average output volatility has gone down.

  – Average investment volatility has gone down.

  – Average consumption volatility has not changed much.
Our Contribution: To understand the evolution of world business cycles over time by estimating common dynamic components in main macroeconomic aggregates

– Are there changes in the characteristics of G7 business cycles over time?

– How do the relationships between macroeconomic aggregates within countries and across countries vary across historical episodes?

– What are the sources for these changes?
Methodology: A Dynamic Factor Model

• Unobservable Index Model
  – Index of Common Economic Activity

• A common factor, $f_0$, accounts for all comovement among a collection of variables.
  \[ y_{it} = a_i + b_i f_{0t} + \varepsilon_{it} \]
  – Factors and errors are autoregressive processes

• Estimation of these models is nontrivial. There are a number of competing approaches
  – We use the method developed in Otrok and Whiteman (IER, 1998) and Kose, Otrok and Whiteman (AER, forthcoming)
\[ O_{t}^{US} = b_{US,O}^{G7} f_{t}^{G7} + b_{US,O}^{Country} f_{t}^{US} + \epsilon_{US,O,t} \]
\[ C_{t}^{US} = b_{US,C}^{G7} f_{t}^{G7} + b_{US,C}^{Country} f_{t}^{US} + \epsilon_{US,C,t} \]
\[ I_{t}^{US} = b_{US,I}^{G7} f_{t}^{G7} + b_{US,I}^{Country} f_{t}^{US} + \epsilon_{US,I,t} \]
\[ \vdots \]
\[ O_{t}^{Japan} = b_{Japan,O}^{G7} f_{t}^{G7} + b_{Japan,O}^{Country} f_{t}^{Can} + \epsilon_{Japan,O,t} \]
\[ C_{t}^{Japan} = b_{Japan,C}^{G7} f_{t}^{G7} + b_{Japan,C}^{Country} f_{t}^{Can} + \epsilon_{Japan,C,t} \]
\[ I_{t}^{Japan} = b_{Japan,I}^{G7} f_{t}^{G7} + b_{Japan,I}^{Country} f_{t}^{Can} + \epsilon_{Japan,I,t} \]
• **Estimate the Model for 3 time periods**


  – 1972:3-1986:2  Common Shock Period

Average Variance Explained by the G7 Factor

Average Variance Explained by the World Factor (%)

Output Consumption Investment

Fraction of Variance (%)

60:1-72:2  72:3-86:2  86:3-01:4
Variance of Output Explained by Factors in Each Period

Variance of Output Explained by the World Factor (%)

Canada
France
Germany
Italy
Japan
U.K.
U.S.

60:1-72:2
72:3-86:2
86:3-01:4
Variance of Consumption Explained by Factors in Each Period

Variance of Consumption Explained by the World Factor (%)

Canada France Germany Italy Japan U.K. U.S.
Variance of Investment Explained by Factors in Each Period

Variance of Investment Explained by the World Factor (%)
Investigating the Sources of the Changing Nature of International Business Cycles

• Link the dynamic factor model to a VAR (FAVAR) following Bernanke et. al. (2002)

\[
\begin{bmatrix}
F_t \\
S_t \\
\end{bmatrix} = \begin{bmatrix}
\Phi(L) & A(L) \\
C(L) & D(L) \\
\end{bmatrix} \begin{bmatrix}
F_{t-1} \\
S_{t-1} \\
\end{bmatrix} + E_t
\]

\[Y_t = B^F F_t + B^S S_t + V_t\]

where \( S_{i,t} \) is a vector of potential sources for comovement

– We use oil prices, terms of trade, interest rates and government spending

• Two sets of results are of interest

– Are the dynamic factors still important?
– How have impulse response functions changed?
Average Variance of Output Explained by Sources in Each Period

Average Variance of Output Explained by Sources (%)

- 60:1-72:2
- 72:3-86:2
- 86:3-01:4
Summary of Empirical Results

- **1960-1972**
  - Comovement across macro aggregates is generally low
  - Little of the comovement we do find can be explained by oil, terms of trade, government spending, interest rates or “productivity”

- **1973-1986**
  - Comovement is much higher
  - Interest rates are the predominant source of comovement for most countries,
  - Oil prices play a critical role in Japan and to a lesser extent the UK.

- **1986-2001**
  - Comovement falls from the second period
  - Productivity *may* be the source of comovement.
• **Interpretation of Results**

  – Increasing trade linkages could increase or decrease comovement (in theory)

  – Increasing financial linkages could increase or decrease output comovement (in theory).