A Decomposition of Global Linkages in Financial Markets

Global Linkages Preconference
International Monetary Fund
April 26, 2002

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Key Questions

- How important are cross-country linkages in explaining high levels of global integration?
- Which cross-country linkages are most important?
  - Bilateral trade flows
  - Trade competition in third markets
  - Bank lending
  - Investment exposure
- Has the importance of these different linkages changed over time?
- Does the importance of these linkages differ across asset markets (stocks, bonds, ERs, and interest rates)?
Introduction

- High and increasing levels of global integration

- But what explains this increased integration?
  - Cross-country linkages
  - Sectoral composition and/or sectoral shocks
  - Global shocks

- Why understanding this question is important
  - Better understand costs & benefits of integration
Related Literature

- Determinants of stock returns

- Stock-market comovements and transmission of volatility across countries

- Contagion literature tracking the transmission of crises across countries
Estimation Framework

Stage 1: Estimate bilateral linkages between country pairs after controlling for global and sectoral shocks to asset returns.

Stage 2: Decompose bilateral linkages into their various components:
- Bilateral trade flows
- Trade competition in third markets
- Bank lending
- Investment exposure
Model: Stage 1

VAR framework

\[ X_t^i = \phi(L)X_t^j + \Theta(L)S_t + \Phi(L)G_t + \eta_t \]

\[ X_t^i \equiv \{x_t^1, x_t^2 \ldots x_t^c\} \]

\[ X_t^j \equiv \{x_t^1, x_t^2 \ldots x_t^c\} \] w/ \( i \neq j \) for lag zero

\( x_t^i \)= asset return in country \( i \); \( c \) countries; \( t \) periods (days)

\( S_t \)= vector of sectoral shocks; \( G_t \)= vector of global shocks

\( \phi(L), \Theta(L), \) and \( \Phi(L) \) are vectors of lags
Model: Stage 2

\[ \beta_{it}^j = \alpha_i + \alpha_1 \text{DirectTrade}_{it}^j + \alpha_2 \text{TradeCompetition}_{it}^j + \alpha_3 \text{BankExposure}_{it}^j + \alpha_4 \text{InvestmentExposure}_{it}^j + \epsilon_{it} \]

\( \beta_{it}^j \) = estimated impact of asset returns in country \( i \) from country \( j \) after controlling for global and sectoral shocks (from stage 1);

\( \alpha_i \) = country specific effects;

DirectTrade\(_{it}^j\) = bilateral trade flows from \( i \) to \( j \) as share of country \( i \) GDP;

TradeCompetition\(_{it}^j\) = export competition in 3\(^{rd}\) markets between \( i \) and \( j \);

BankExposure\(_{it}^j\) = bank exposure from country \( i \) to country \( j \);

InvestmentExposure\(_{it}^j\) = total investment by country \( i \) in country \( j \);

Estimation issues: nonstationarity; consider panel cointegration estimation methods
Asset returns
- Most literature focuses on stock returns
- Include stock returns, bond spreads, interest rates, exchange rates (main source: Datastream)

Direct Trade
- Bilateral trade flows
- Source: World Trade Data (Feenstra)
- Coverage: Annually from 1980-1997; about 160 countries
- Supplemented by UNCTAD trade data 1994-1999
Data

Trade Competition

- Competition in 3rd markets based on 4-digit SITC export information (over 1,000 industry groups)
- Same underlying source as Direct Trade data

\[ \text{Compete} = \frac{100}{\text{Max}_{\text{Compete}}} \sum_k \left( \frac{\text{Exp}_{ikW}}{\text{GDP}_i} \times \frac{\text{Exp}_{jkW}}{\text{Exp}_{WkW}} \right) \]

- \(\text{Exp}_{ikW}\) = exports from country \(i\) to world in industry \(k\)
- \(\text{Exp}_{WkW}\) = total global exports in industry \(k\)
- \(\text{Max}_{\text{Compete}}\) is maximum value
Data

Bank Exposure

- Bilateral bank exposure as share of total lending from country $i$
- Source: Bank of International Settlements
- Coverage: quarterly from 1985 through 2001
- Only 19 countries as country $i$ but 200 countries as country $j$
Investment Exposure - Suggestions?

- Ideally: decompose into stock investment, bond investment, and FDI by country pairs

- Cross-Border Capital in London (Portes & Rey)
  - Transactions data; records purchases and sales by country residents in portfolio equity markets
  - 8 years of panel data; 1989-96; 14 countries

- OECD *International Direct Investment Statistics Yearbook*
  - FDI flows and stocks, sourced from and received by OECD countries; accounts for 2/3 of FDI flows
  - Data from approximately 1984; some aggregated
Results

- Estimate the relative importance of cross-country linkages versus global and sectoral shocks in explaining global linkages

- Decomposition of bilateral linkages into specific trade and financial linkages

- Test for changes in the relative importance of specific bilateral linkages over time

- Test for differences in the relative importance of various linkages for different asset markets (stocks, bonds, ERs, & interest rates)
Questions for Discussion

- Suggestions for estimation techniques
  - Stage 1: Estimating bilateral linkages after controlling for global and sectoral shocks

- Suggestions for bilateral investment data
  - Equity investment
  - Bond investment
  - FDI
  - Stocks versus flows
Key questions: How important are cross-country linkages in explaining recent increases in global integration? Which cross-country linkages (bilateral trade flows, trade competition in third markets, bank lending, or investment exposure) are most important? Has the importance of these different cross-country linkages changed over time? How important are these various linkages in explaining integration in different types of asset markets (for stocks, bonds, exchange rates and interest rates)?

1) Introduction
   a) High and increasing levels of global integration
      i) Provide examples: correlations in stock returns, bond spreads, interest rate movements, and exchange rate movements
   b) But what explains this increased integration?
      i) Increased cross-country linkages (such as trade integration or financial integration)?
      ii) Greater similarity in the sectoral composition of output (and/or increased importance of sectoral shocks relative to country-specific shocks)
      iii) Increased importance of global shocks relative to country-specific shocks
   c) Why understanding this question is important
      i) Better understand the costs and benefits of global integration
      ii) Insights on how integration is likely to occur in the future

2) Related literature
   a) Extensive finance literature on determinants of stock returns
   b) Extensive finance/international literature on stock-market comovements and the transmission of volatility across countries
   c) Contagion literature tracing the transmission of crises across countries

3) Model and estimation framework
   a) Stage 1: Estimate bilateral linkages between country pairs after controlling for global and sectoral shocks to asset returns. Model will tentatively be a VAR framework:

\[
X_t^i = \phi(L)X_t^i + \Theta(L)S_t + \Phi(L)G_t + \eta_t
\]

\[
X_t^i \equiv \{x_t^i, x_t^{i^2}, ..., x_t^c\}^T
\]

\[
X_t^j \equiv \{x_t^j, x_t^{j^2}, ..., x_t^c\}^T \quad \text{with } i \neq j \text{ for the zero lag term}
\]

where \( x_t^i \) is the asset return in country \( i \);
there are \( c \) countries and \( t \) time periods (in days);
\( X_t \) is a transposed vector of returns in the same set of \( c \) countries;
\( \phi(L) \), \( \Theta(L) \), and \( \Phi(L) \) are vectors of lags;
\( S_t \) is a vector of sectoral shocks;
\( G_t \) is a vector of global shocks; and
\( \eta_t \) is a vector of reduced-form disturbances.
i) This estimation approach has a number of benefits. First, it controls for serial
correlation. Second, by using 2-day or 2-week returns, this framework can control for
different trading hours across countries. Third, it is straightforward to add controls
for day-or-the-week or monthly effects. Fourth, this strategy will allow us to formally
test for the importance of lagged effects (of either other markets or the global or
sectoral shocks) and allow us to control for any significant effects.

b) Stage 2: Decompose bilateral linkages (as estimated above) into their various
components.

\[ \beta_{ij} = \alpha_i + \alpha_i DirectTrade_{ij} + \alpha_i TradeCompetition_{ij} + \alpha_i BankExposure_{ij} + \alpha_i InvestmentExposure_{ij} + \eta_{ij} \]  

(2)

where \( \beta_{ij} \) is the estimated impact on asset returns in country \( i \) from country \( j \) after
controlling for global and sectoral shocks (as estimated in stage 1);
\( \beta_{ij} \) is calculated over annual periods \( t \);
\( \alpha_i \) captures any country-specific effects (such as capital controls) that may affect
asset market integration;
\( DirectTrade_{ij} \) measures bilateral trade flows from country \( i \) to country \( j \) as a
share of country \( i \) GDP;
\( TradeCompetition_{ij} \) measure export competition in 3rd markets between country \( i \)
and country \( j \);
\( BankExposure_{ij} \) measures bank exposure from country \( i \) to country \( j \);
\( InvestmentExposure_{ij} \) is total investment by country \( i \) in country \( j \).

i) Will also test the impact of including control variables for the geographic distance
between countries, regional effects, etc.

ii) Estimation issues: The regression of \( \beta_{ij} \) on explanatory variables will likely be
complicated by issues of nonstationarity, as the right hand side variables (and perhaps
the left hand side) may be characterized by stochastic trends. In this case, it might be
necessary to implement panel cointegration estimation methods (Pedroni, 1999;
Mark, Ogaki and Sul, 2000). In the event that more complicated patterns of
integration and stationarity are obtained, alternative means of inducing stationarity
can be implemented.

4) Data

a. Asset Returns

- Most literature focuses on stock market returns. We examine a larger
range of asset returns and see if the importance of global linkages
varies by asset type.
- Stock returns: daily US$ returns from Datastream
- Bond spreads: daily bond spreads from JPMorgan or Datastream
- Interest rates: daily short-term interest rates as reported by Datastream
- Exchange rates: daily US$ exchange rates as reported by Datastream
b. Direct Trade
- Bilateral trade flows (divided by country $i$ GDP)
- Source: World Trade Data (Feenstra)
- Coverage: Annually from 1980-1997; about 160 countries
- Supplemented by UNCTAD trade data from 1994-1999

\[
\text{TradeCompetition}_i^j = \frac{100}{\text{MaxCompete}} \sum_k \left( \frac{\text{Exp}_{i,k,W}}{\text{GDP}_i} \frac{\text{Exp}_{j,k,W}}{\text{Exp}_{W,k,W}} \right)
\]

Where $\text{Exp}_{i,k,W}$ are exports from country $i$ to the world in industry $k$; $\text{GDP}_i$ is GDP for country $i$; $\text{Exp}_{W,k, W}$ are total global exports in industry $k$; and $\text{MaxCompete}$ is the maximum value for this variable
- See attached table for sample of data from recent crises; source is Forbes (2001)

c. Trade Competition
- Competition in trade based on 4-digit SITC trade information
- Source: World Trade Data (Feenstra)
- Coverage: Annually from 1980-97; about 160 countries
- Supplemented by UNCTAD trade data from 1994-1999
- Defined as:

\[
\text{TradeCompetition}_i^j = \frac{100}{\text{MaxCompete}} \sum_k \left( \frac{\text{Exp}_{i,k,W}}{\text{GDP}_i} \frac{\text{Exp}_{j,k,W}}{\text{Exp}_{W,k,W}} \right)
\]

Where $\text{Exp}_{i,k,W}$ are exports from country $i$ to the world in industry $k$; $\text{GDP}_i$ is GDP for country $i$; $\text{Exp}_{W,k, W}$ are total global exports in industry $k$; and $\text{MaxCompete}$ is the maximum value for this variable
- See attached table for sample of data from recent crises; source is Forbes (2001)

d. Bank Exposure
- Total bilateral bank exposure (as a share of total lending from country $i$)
- Source: Bank of International Settlements
- Coverage: Quarterly from 1985 (Q4) through 2001
- Only 19 countries as country $i$ (Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Taiwan, UK, US)
- But 200 countries as country $j$

e. Investment Exposure: Any suggestions?
- Possibly Cross-Border Capital in London (used in Portes and Rey (2002))
  - 8 years of panel data from 1989-96; 14 countries
  - Transactions data; record purchases and sales by residents of each country in the portfolio equity markets of the other country; ideally want stocks but Portes and Rey argue that for US, the stock data is highly correlated to the flow data
- Possibly OECD International Direct Investment Statistics Yearbook
  - Information on FDI flows and “stocks”, sourced from and received by OECD countries
  - Accounts for about 2/3 of FDI flows
  - Data from approximately 1984, although some of historical data could be aggregated and not bilateral
- Ideally would like to decompose this variable into stock investment, bond investment and FDI by country pairs
5) Estimation results and discussion

a) Estimates of relative importance of cross-country linkages versus other shocks (global and sectoral shocks)

b) Decomposition of cross-country linkages into various trade and financial linkages

c) Test for significant differences in relative importance of different cross-country linkages for different asset types (ie stock returns versus bond spreads, etc)

d) Test for significant changes in relative importance of different cross-country linkages over time (given limited time series of data, will probably involve testing for differences across two periods)

Key Questions for Discussion:
1) Suggestions for estimation techniques
2) Suggestions for bilateral investment data

References


Addendum: Selected “Trade Competition” Statistics for Recent Crisis Countries

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## Addendum: Selected “Trade Competition” Statistics for Recent Crisis Countries (continued)

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## Addendum: Selected “Trade Competition” Statistics for Recent Crisis Countries

*(Summary Statistics)*

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