Contagion, Herding, and International Financial Reforms

Reuven Glick
Center for Pacific Basin Studies
Federal Reserve Bank of San Francisco

FRBSF/ BOE/ WBI
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Focus of Session

- **What are the channels** through which crises spread from one country to other countries?

- **Who is most vulnerable** to contagion?
  
  Is vulnerability due to
  
  - weak economic *fundamentals* in affected countries
  
  - or to (irrational?) *herding and panic* by investors?

- **Why is contagion more severe in some cases**, but limited in other cases?
Recent Contagion Episodes

Severe Contagion

- Mexican tequila crisis, Dec. 1994
- Asia crisis, July 1997
- Russian crisis, August 1998

Limited Contagion

- Brazil devaluation, Jan. 1999
- Turkey crisis, Feb. 2000
- Argentina crisis, Dec. 2001
Emerging Market Bond Yield Spreads, Russia, Turkey, Thailand

Source: IMF WEO
I. Channels of transmission of contagion

II. Empirical evidence

III. Appropriate policy responses
   - Individual country level
   - System level (e.g. international financial architecture)
I. Channels of Transmission of Contagion?

A. Trade links between countries

B. Financial links between countries
A. Contagion through Trade Links

- **Direct links**: through bilateral exports and imports
  
et.g. Brazil accounts for 30% of Argentina’s trade

- **Indirect links**: through competition for exports to common 3rd-country markets
  
et.g. Asian countries compete for exports to the U.S.
Export Markets of Asian Countries, 1997 as % share of total exports

Source: Baig and Goldfajn
B. Contagion through Financial Links

- **Direct links**: bilateral investment and borrowing
  
  e.g. Uruguay affected by Argentina’s crisis because Argentinians had deposits in Uruguayan banks

- **Indirect links**: through foreign banks, international mutual funds, other institutional investors:
  
  e.g. U.S. banks were common creditors to Latin American countries before the 1994-95 Mexico crisis
  
  e.g. Japanese banks were common creditors to Asian countries before the 1997-98 Asian crisis
U.S. Bank Liabilities in Asia and Latin America, as % of total loans to emerging markets
June 1994

Source: Kaminsky and Reinhart
Japanese Bank Liabilities in Asia and Latin America as % of total loans to emerging markets
December 1996

Source: Kaminsky and Reinhart
Contagion thru Indirect Financial Links

Contagion may reflect *rational* behavior of banks and institutional lenders/investors because of

1. Liquidity and/or capital constraints
2. Portfolio management practices
3. Imperfect information by investors
4. Multiple equilibria and expectation shifts
5. Increased risk aversion among investors
Contagion thru Indirect Financial Links

1. Liquidity and/or capital constraints
   - Capital or collateral value losses in one market
     ➔ asset sales in other markets to raise cash to meet redemptions or margin calls
   - Loan quality deterioration in one market
     ➔ reduction in bank loans in other markets to meet capital-asset constraints

2. Portfolio management practices
   - In response to losses in one market, may be optimal to
     ➔ sell off assets with highly correlated returns in other markets in order to rebalance portfolios
Contagion thru Indirect Financial Links

3. If investors have imperfect information about conditions in foreign countries because of high costs of collecting and analyzing information:

- Crisis in one country can create “wakeup call” by causing investors to re-evaluate their prior views of economic fundamentals of other countries.

- Crisis may spread to other countries perceived to have similarly weak fundamentals.
  
  e.g. After Thai crisis, investors looked at other countries with some of same weaknesses as Thailand.

If information is asymmetrically available:

- “Uninformed” investors may follow and over-react to the actions of the informed without knowing their underlying motivation, i.e. act like a “herd” without making own assessments.
Contagion thru Indirect Financial Links

4. If markets are characterized by multiple equilibria:

- Crisis in one country can shift expectations about another country that pushes the other economy from a ("good") no-crisis equilibrium to a ("bad") crisis equilibrium

  e.g. **Currency crisis**: Loss of confidence in central bank’s commitment to a peg can cause attack on currency. If central bank responds by raising interest rates

  - Attack may create conditions (e.g. higher unemployment, weaker banking system) that make keeping the peg undesirable

- i. Explains why crises may be sudden, triggered by changes in expectations

- ii. Vulnerability to change in expectations still related to fundamentals:

  - Attacks more likely to succeed if fundamentals are weak.
Examples of Multiple Equilibria

- **Currency crisis:**
  Loss of confidence in central bank’s commitment to a peg can cause attack on currency. If central bank responds by raising interest rates
  - Attack may create conditions (e.g. higher unemployment, weaker banking system) that make keeping the peg undesirable

- **Bank run:**
  Fear by individual depositors that others will withdraw their money, can cause all depositors to run on bank to make withdrawals.
  - Bank may experience illiquidity in the presence of the run, validating the expectations of depositors who withdrew their funds, even though the bank is financially solvent in the absence of a run

- **Debt crisis:**
  If foreign creditors become pessimistic and unwilling to roll over loans, and borrower does not have sufficient international liquidity with which to pay off debt.
  - Debt crisis may arise
Contagion thru Indirect Financial Links

5. **Increased risk aversion** ("flight to quality")

If one country unexpectedly imposes capital flow restrictions, or defaults on its debt

- Investors may **reassess risk** of investing in **all** emerging market countries
Bond Spreads on $-Denominated Debt in Latin America, Europe, Asia

Latin America

Europe

Asia
II. Empirical Evidence on Contagion

1. What is the effect of crises on asset price correlations across countries?

2. What factors affect vulnerability to contagion?
   a. weak country fundamentals
   b. trade links
   c. financial links

3. Why has there been less contagion during recent crises?
Stock Market Return Correlations before and during Asia crisis

Thailand with

Korea with

Source: Baig and Goldfajn
Sovereign Bond Spread Correlations before and during Asia crisis

Thailand with

Korea with

Source: Baig and Goldfajn
Recent crises have not spurred the broad based sell-offs witnessed in earlier crises. 


Source: IMF, Emerging Markets Financing
2. What factors affect vulnerability to contagion?

a. Contagion spreads based on fundamentals

Aaron Tornell “Common Fundamentals in the Tequila and Asian Crises” NBER Paper 7139, 1999

- Country is **more vulnerable** to currency attack if
  - real exchange rate is appreciated and **overvalued**
  - it has experienced a lending bubble, and burdened its banking system with **bad loans**

- **Vulnerability declines** with greater foreign exchange reserves (relative to M2)

- **Crises do not spread randomly, depend on fundamentals**
2. What factors affect vulnerability to contagion?
b. Contagion spreads through trade links

Reference:

- Reuven Glick and Andrew Rose “Contagion and Trade” *JIMF* 1999

- Crises more likely to spread across countries competing in same export markets

- To extent countries in the same region tend to be strongly linked through trade, currency crises will be regionally concentrated
### Trade Linkage Indicators, ranking by shared 3rd country export markets

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<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>China (.94)</td>
<td>Brazil (.72)</td>
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<tr>
<td>2</td>
<td>Malaysia (.90)</td>
<td>Colombia (.61)</td>
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<tr>
<td>3</td>
<td>Indonesia (.90)</td>
<td>India (.57)</td>
</tr>
<tr>
<td>4</td>
<td>Korea (.89)</td>
<td>Venezuela (.55)</td>
</tr>
<tr>
<td>5</td>
<td>Hong Kong (.86)</td>
<td>Korea (.55)</td>
</tr>
<tr>
<td>6</td>
<td>Singapore (.85)</td>
<td>China (.54)</td>
</tr>
<tr>
<td>7</td>
<td>Philippines (.83)</td>
<td>South Africa (.53)</td>
</tr>
<tr>
<td>8</td>
<td>India (.75)</td>
<td>Thailand (.52)</td>
</tr>
</tbody>
</table>

Countries listed in order of decreasing degree of trade linkage with either Thailand or Argentina.

**Countries with index above .60 in bold yellow.**

2. What factors affect vulnerability to contagion?

c. Contagion spreads through financial links

References:

- van Rijckeghem and Weder “Sources of Contagion” *JIE* 2001

- Crises more likely to spread between countries that borrow from the same foreign bank lenders or creditors
### Financial Linkage Indicators, ranking by decreasing dependence on common creditors

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Indonesia (.39)</td>
<td>Colombia (.23)</td>
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<tr>
<td>2</td>
<td>China (.32)</td>
<td>Philippines (.22)</td>
</tr>
<tr>
<td>3</td>
<td>Malaysia (.31)</td>
<td>Korea (.22)</td>
</tr>
<tr>
<td>4</td>
<td>Singapore (.27)</td>
<td>Brazil (.22)</td>
</tr>
<tr>
<td>4</td>
<td>Hong Kong (.27)</td>
<td>India (.19)</td>
</tr>
<tr>
<td>6</td>
<td>Korea (.24)</td>
<td>South Africa (.18)</td>
</tr>
<tr>
<td>7</td>
<td>India (.17)</td>
<td>Mexico (.18)</td>
</tr>
<tr>
<td>8</td>
<td>Philippines (.10)</td>
<td>Venezuela (.16)</td>
</tr>
</tbody>
</table>

Countries listed in order of decreasing degree of common creditor linkages with either Thailand or Argentina.  
Countries with index above .20 in **bold yellow**.  
2.c. Contagion spreads through financial links

Links through **mutual funds** behavior:

- When a crisis hits particular country, mutual funds sell assets from other emerging markets in their portfolios
  ➔ Contagion transmitted through actions of mutual funds

Reference:


- Extent of sell-offs has varied across crises
  - e.g. contagion more global during Russia crisis
Mutual Fund Net Purchases, by Country

Source: Kaminsky, Lyons, and Schmukler
3. Why has contagion been less severe during recent crises?

i.e. Brazil (1999), Turkey (2000), Argentina (2001)

a. Recent crises occurred when volume of international capital flows was relatively low
   - Earlier contagion episodes were preceded by capital inflow surges to emerging markets, creating opportunities for sudden capital flow reversals.

b. Recent crises were more anticipated, caused less of a surprise

c. Investors have improved their ability to differentiate among countries

d. Better fundamentals in many emerging key emerging markets ± less vulnerable
Average Cross-Country Correlations, Emerging Market Bond Spreads, 2000-2006

(billions of $)

European Union
ERM crisis (1992-93)

Western Hemisphere
Mexican crisis (1995)

Asia
Asia crisis (1997)

Emerging Markets
Mexican crisis (1995)
Asia crisis (1997)
Russian crisis (1998)
Brazil devaluation (1999)
Argentina devaluation (2001)

Source: IMF World Economic Outlook
Emerging Market Bond Yield Spreads, Mexico, Russia, Argentina, Brazil

1/ Emerging market bond index plus (EMBI+) spreads are plotted.
Source: JP Morgan Chase
Net Buying/Selling by International Mutual Funds in Selected Countries Before Crises (as % of prior peak asset holdings)

Argentina, 4/99-11/01
Hong Kong, 5/97-6/97
Thailand, 1/96-6/97
Korea, 8/96-6/97
Malaysia, 2/97-6/97
Russia, 9/97-7/98

Source: Didier, Mauro, Schmukler
Emerging Market Bond Yield Spreads, Argentina, Brazil, Mexico, 1992 – 2002

1/ Emerging market bond index (EMBI) spreads are plotted through the end of June 2002, and starting 1998, EMBI+ spreads are also plotted.

Source: JP Morgan Chase
Might contagion occur again in the future?

- Trade and finance channels that generated contagion during the crises of the 1990s seem potentially at least as strong today as the degree of international integration has deepened.
- Capital flows to emerging markets have been growing.
Private capital flows to developing countries rising.

**Net Capital Flows to Middle- and Low-Income Countries, 1975-2005**

*Source: IMF WEO, Sept. 2006*
Bond and equity issuance up.

Bond Issuance
(billions of $)

Equity Placements
(billions of $)

EMEA = Europe, Middle East, and Africa.
Source: GFSR, Sept. 2006
Aftermath of Feb. 27, 2007 China “shock,”
Changes in stock market indices across countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Changes on 2/27/07, or on 2/27-2/28</th>
<th>Changes on 2/26/07 – 3/12/07</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>-10%</td>
<td>-3%</td>
</tr>
<tr>
<td>Hong Kong*</td>
<td>-6%</td>
<td>-2%</td>
</tr>
<tr>
<td>Japan*</td>
<td>-4%</td>
<td>-2%</td>
</tr>
<tr>
<td>Korea*</td>
<td>-2%</td>
<td>-1%</td>
</tr>
<tr>
<td>Thailand*</td>
<td>0%</td>
<td>+2%</td>
</tr>
<tr>
<td>US (S&amp;P 500)</td>
<td>-8%</td>
<td>-3%</td>
</tr>
<tr>
<td>Canada</td>
<td>-2%</td>
<td>+1%</td>
</tr>
<tr>
<td>France</td>
<td>-4%</td>
<td>-2%</td>
</tr>
<tr>
<td>Germany</td>
<td>-6%</td>
<td>-4%</td>
</tr>
<tr>
<td>UK (FTSE)</td>
<td>-6%</td>
<td>-3%</td>
</tr>
<tr>
<td>Czech Rep.</td>
<td>-6%</td>
<td>-2%</td>
</tr>
<tr>
<td>Hungary</td>
<td>-8%</td>
<td>-4%</td>
</tr>
<tr>
<td>Poland</td>
<td>-8%</td>
<td>-5%</td>
</tr>
<tr>
<td>Russia</td>
<td>-10%</td>
<td>-6%</td>
</tr>
<tr>
<td>S.Africa</td>
<td>-10%</td>
<td>-8%</td>
</tr>
<tr>
<td>Turkey</td>
<td>-10%</td>
<td>-6%</td>
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<tr>
<td>Argentina</td>
<td>-10%</td>
<td>-8%</td>
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<tr>
<td>Brazil</td>
<td>-10%</td>
<td>-9%</td>
</tr>
<tr>
<td>Chile</td>
<td>-10%</td>
<td>-8%</td>
</tr>
<tr>
<td>Mexico</td>
<td>-10%</td>
<td>-8%</td>
</tr>
</tbody>
</table>

Changes on 2/27/07, or on 2/27-2/28 for markets in Asia
Changes on 2/26/07 – 3/12/07
Summary of Empirical Evidence

1. Trade and financial links can transmit volatility from one country to another

2. Foreign investor behavior creates indirect financial links that may magnify volatility during crises

3. Contagion does not spread randomly or irrationally
   - Generally strikes countries who are weak, not everyone!
   - Most vulnerable countries have:
     - open financial links + weak fundamentals
   - Less vulnerable countries have
     - weak fundamentals with limited links
     - or strong links with strong fundamentals
III. Policy Responses to Contagion

- Domestic policy responses
- Systemic responses
Domestic Policy Responses to Contagion

Perfect vaccines and absolute protection don’t exist, but should take precautions to reduce vulnerability

- Improve macro fundamentals
- Reduce financial sector fragility
  - Provide incentives for sound banking, strict accounting, financial “transparency”
  - Curb short-term foreign debt
  - Diversify funding sources
- Improve public institutions (financial infrastructure, bankruptcy laws)
- Build up reserves
- Slow capital account liberalization?
Systemic Responses to Contagion

- Shift the IMF action agenda from “emergency room” crisis care to “public health” prevention
  - Develop international financial standards, codes of conduct
  - Provide credit access during “legitimate” liquidity crises with ex ante price terms
- Greater regional cooperation
  - Share information
  - Coordinate sharing of FX reserves (e.g. Asia swap arrangements)
  - Develop region-based early warning system for crises
- Enhance global monitoring of international financial activity
  - Closer monitoring of highly-leveraged financial institutions
  - Increase capital requirements on bank loans
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