Contagion

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Financial turmoil and crises in the 1990s have been characterized by contagion. In each case (Mexico in 1994-95, East Asia in 1997-98, Russia in 1998, Brazil in 1999, Turkey and Argentina in 2001) a financial shock starting in one emerging market spread to other emerging markets either weakly or strongly (see Figure 1). This "contagion" took many forms:

1. Currency contagion as the fall in one currency in the initial crisis country led to devaluations and depreciations in other countries.

2. Sovereign debt contagion as average sovereign debt spreads sharply increased for many emerging markets (spikes in the average EMBI spread) and many countries temporarily lost market access (see Figure 1).

3. Stock markets contagion as stock markets in different countries became highly correlated.

4. In several episodes (namely Asia) international banks responded to shocks in one country by cutting interbank exposure to other emerging markets.

5. In some episodes, "contagion" spread from emerging markets to advanced economies financial markets. In October of 1997 the deepening of the Asian crisis and a sharp fall in the stock market in Hong Kong led to a one-day 500 points drop in the Dow. In the summer of 1998, the devaluation and default by Russia led to a liquidity seizure in U.S. capital market and the near collapse of a large hedge fund.

There is strong evidence that there are high comovements of asset prices across countries during crises.

A question is whether such "contagion" is "rational" or "irrational", ie. whether it can be explained by fundamental linkages across economies or whether it is due to imperfections in the functioning of financial markets.[1]

Recent academic work suggests that herding, momentum trading, euphoria, panics, irrational boom and busts may occur in financial markets. Keynes noted that investors prefer to fail conventionally rather than succeed unconventionally. In market downturn, hiding in the herding pack beats trying to stand out and lean against the

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[1] Some "irrational" contagion can be explained by the optimal reaction of investors given the incentives that they face: for example, remuneration of fund managers based on performance relative to benchmarks may lead to "herding" and contagion: if every manager dumps Brazil after Russia collapses, no manager would want to behave otherwise even if his/her analysis/information of fundamental links suggests that there should not contagion. Thus, there are many reasons why investors may not fully discriminate between better and worse creditors when a crisis occurs. In reality, some discrimination does occur in these episodes of turmoil but sometimes emerging markets are victims of contagion in excess of what is warranted by their fundamental weaknesses.

wind. Fighting the market can be costly, at least in the short-run.

What are the explanations of contagion, rational or otherwise?

1. Trade linkages. If country A devalues, its trading partner B will lose competitiveness and thus investors will put pressure also on B's currency. This was at work in Asia in 1997-98.

2. Competitive devaluations. If my neighbour devalues and this leads to a loss of my competitiveness, I may be more likely to devalue too to prevent this competitiveness loss. Thus, a competitive devaluation war may start. This was at work in Asia in 1997-98.

3. "Wake-up calls". A crisis in one country leads to investors to wake up from their previous complacent attitude toward similar economies that may have similar macroeconomic problems, similar structural problems or similar exchange rate regimes. Thailand's collapse led investors to take a second look at other Asian economies.

4. "Common creditor" effects. If banks in a money center country have losses on their portfolio of loans to an emerging market that has experienced a crisis, they may cut back their exposure to other emerging markets. This happened with Japanese banks during the Asian crisis and U.S. banks after the Mexican peso crisis. Similarly, dedicated emerging market debt fund managers may cut back their exposure to a wide range of emerging markets if they incur losses in one emerging market. Russia's collapse led to a selloff of Brazil's debt in 1998.

5. Such behavior of banks and fund managers can be explained by the emergence of mark-to-market investors and reliance on value-at-risk risk management rather than 1980s style forberance. Risk management implies that a loss in the portfolio should be associated with an immediate increase in capital or reduction of risk. Sophisticated models of risk management, paradoxically, make investors respond to turmoil in one market with rapid cutbacks in exposure to other markets. Leveraged investors and investors facing margin call on losses have to sell their assets, regardless of fundamentals.

6. Many of the above explanations implicitly imply that is difficult for investors to pick out a buying opportunity from a warning signal. For example, if a sophisticated/informed leveraged investor loses on its Russia positions and is forced to dump its holding of Brazilian assets, the price of Brazilian assets should not change - in spite of this margin-triggered sale - if nothing fundamental has happened to Brazil. But uninformed investors do not know whether the informed investor is dumping Brazil because of a margin constraint or because of superior information that Brazil is also in trouble. Thus, Brazilian asset prices fall even if, based on fundamentals, they should not. Note that many investors may rationally decide not to acquire costly information about a country's conditions because portfolio diversification tends to reduce the portfolio's overall risk.

The overall result is that a crisis in one country often leads to a reduction in risk exposure and/or a generalized increase in risk aversion of international investors, who reduce exposure to many other markets. Examples are: Mexico's tequila effect; the Asian flu; the Russian fever.

Recent Episodes:

- Contagion from the Turkey financial crisis in 2001 was been limited. But the share of Turkey in EM debt portfolios was small and it got bailed out by the IMF.

- Contagion from Argentina to other emerging markets in 2001 was initially significant but has subsided during the peak of the crisis:

- Initially currency in Latin America (Brazil, Chile, et cetera) weakened and bond sovereign spreads increased but not as much as in Argentina. But close to the crisis period this contagion subsided: the Brazilian real has appreciated and sovereign spreads for Emerging markets in November 2001 tightened by 70 bps while the Argentine spread was going through the roof. But contagion to Uruguay.

- The fact that the Argentine crisis was expected (as opposed to the unexpected Russian crisis) may explain the smaller amount of contagion; there is today less leverage and investors adjusted slowly their portfolios.

- Some modest contagion in 2002 Brazil episode.

Figure 1: Emerging Market Spreads , 1994-2001
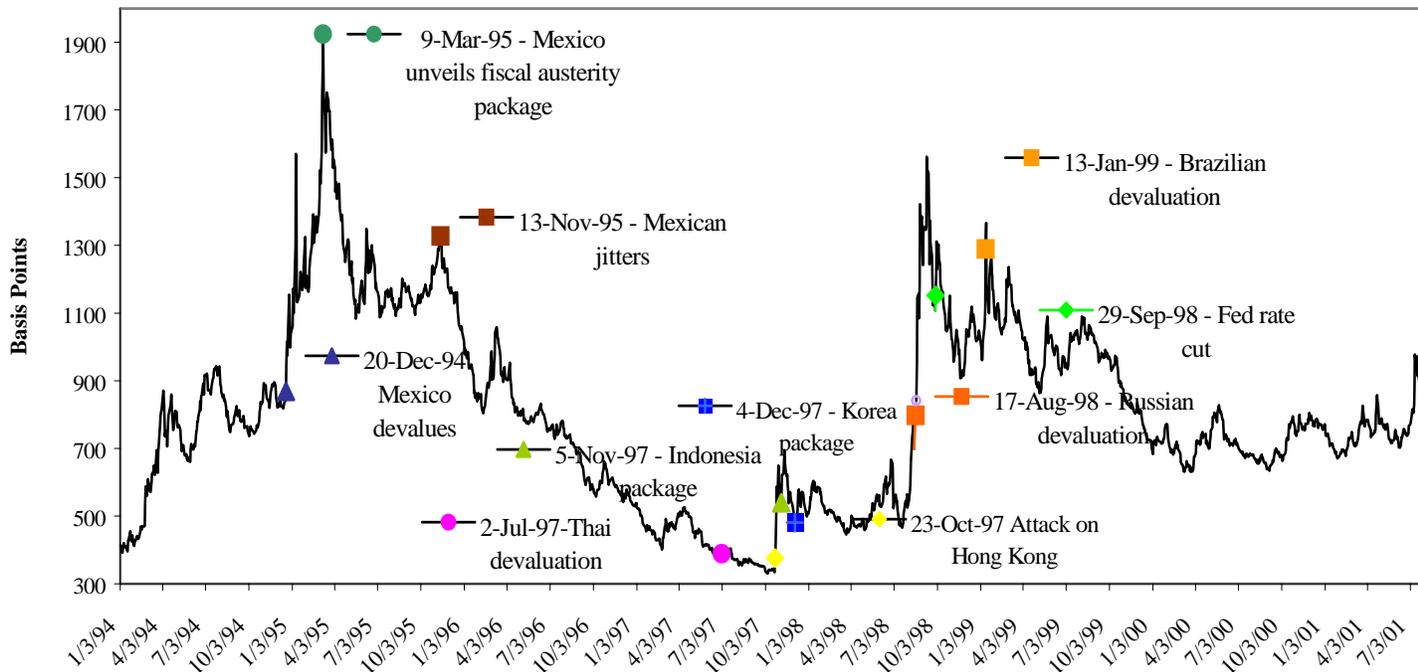
Recent Theoretical Models of Contagion:

- Trade Channel (Corsetti, Pesenti & Roubini)
- Information Channel (Calvo on the Russian Virus)
- External Wealth Shocks (Kyle and Xiong)

Overall, lesson:
Contagion is driven by market participants "behavior" rather than traditional "fundamentals", even if fundamentals matter.

Recent empirical studies:

- Forbes: Evidence on the trade channel as being importance element of contagion.
- Weder et al.: evidence on common banking creditor channel.
- IMF studies (Gelos & Reinhart, et al.): they look at mutual fund behavior during the crisis. Database with the monthly positions of all the mutual funds. This is a very promising avenue suggesting important role of mutual funds.
- Rigobon: he is working on idea about evaluating the degree of contagion and compare it with the degree of predictability of the crises. The intuition is that crises that were surprising (Mexico 94, Asia 97, and Russia 98) were highly contagious, but the ones the markets was expecting to happen almost for sure (Brazil 99, Argentina 2002, Turkey 2000-2001, Ecuador 2000, and others) had almost no contagion even though the trade linkages were as strong, and the economies as large as those from the first group. Use of a new data set on the number of daily news about each particular crisis, and then comparing that with the exchange rate, stock market, and interest rate.

Any consensus summary on how to assess contagion empirically? What are the <u>econometric issues</u>?

1. Serious difficulty in defining and measuring contagion, and especially the econometric problems in testing for its existence; academics have become very hesitant to use the term. Unfortunately, there's nothing close to a consensus on how to measure it. The trend seems to be towards directly measuring the importance of individual cross-country linkages (through mutual funds, bank lending, trade, etc), instead of just overall country comovement.

2. Also, there are serious econometric questions to address when thinking of contagion. They are: endogeneity (or simultaneous equation bias), omitted variables and hetheroskedasticity.

3. Forbes and Rigobon ("No Contagion, Only Interdependence: Measuring Stock Market Comovements") was the first paper to raise the problem of heteroscedasticity in tests for contagion and show how heteroscedasiticity could lead to inaccurate findings of contagion. The paper showed that under the assumption that the source of the shock could be identified, and that the shock from the crisis was greater than the country-specific noise, it was possible to correct for this bias with a simple adjustment. After making this adjustment, there was

virtually no contagion during the Mexican & Asian crises & US crash in 1987.

And, indeed, in 1997 the combination of high leverage and unexpected shocks led to severe contagion.

4. Loretan et al. have 2 similar papers proposing virtually the same adjustment.

5. Corsetti and Sbracia have built on and criticized these approaches. They make several different identifying assumptions and show that in certain cases (namely when country-specific noise is greater than the shock from the crisis), the adjustment proposed in the above papers can overrcorrect & therefore bias tests against finding evidence of contagion. They find more evidence of contagion than in Forbes and Rigobon, but still less than in previous work.

6. Shift contagion: The DCC test (Rigobon in JIE "On the measurement of the international propagation of shocks: is it stable?") is useful.

7. Contagion all the time: The solution here depends on what one wants to estimate. If you want to estimate the contemporaneous relationship, then this is complicated and you have by use techniques as those developed by Mardi Dungey (Garch models with exclusion restrictions), Sentana (the original reference for the identification using Garch models and exclusion restrictions) or Rigobon's paper

("Identification through heteroskedasticity"), that does everything in regimes instead of Garch.

8. Good Survey : Rigobon's "Contagion: how to measure it?"

There are also a few different/newer approaches toward thinking about contagion & how crises spread.

1. One promising strand of literature looks at "extreme moments" in the data, and focuses on if country linkages have changed during different periods of extreme moments. Not clear how far this literature can go, since the extreme moments used as the basis for the tests are extremely limited. A sample of this work is a CEPR working paper by Hartmann, Straetmans & de Vries "Asset Market Linkages in Crisis Periods."

2. Another angle that seems to be gaining support is to look at how crises affect firms around the world. This approach tries to directly measure how crises spread, rather than focus on reduced form correlations. It also avoids some of the problems in measuring how crises spread using macro data, since most cross-country linkages are so highly correlated that it is impossible to separate out their individual affects. Forbes paper on this subject.

3. Many people are starting to think about "contagion" in similar terms. In other words, contagion could be explained through specific channels (direct trade, trade competition in 3rd markets, common bank lenders, portfolio recompositions, country reevaluation, etc), and therefore in order to predict if a crisis would spread we needed to look at the different channels by which it could spread and evaluate the importance of these channels for the crisis country. This technique will obviously only get you part of the way---and it obviously won't help very much in predicting certain market reactions (ie during the Russian crisis)--but it is useful in predicting Argentina's effect on Uruguay for example.

Final observation on contagion: better risk management and mark-to-market behavior may paradoxically lead to systemic risk. In 1987, everyone was doing dynamic hedging and using the same stop-loss rules; and the Dow collapsed. In 1998, the interaction of high leverage and similar risk management led to LTCM and systemic effects after the Russia collapse. So, what looks like sound risk management at the individual investor and firm level may lead to systemic effects, the dynamics of which we still do not fully understand. Need to do more work on this type of systemic contagion.