Channels of Crisis Transmission in the Global Banking Network

Discussion by Ben Craig

Frankfurt am Main

October 21, 2013

Standard Disclaimer

This discussion represents only my views not the views of the Deutsche Bundesbank, the Federal Reserve Bank of Cleveland, nor the Board of Governors

What does this paper do?

It does a lot.

This paper does a lot

- Defines three separate networks in the global banking system (actually four or five depending on how one uses the term.)
- Uses these networks to describe the international transmission of crisis shocks
  - Decomposes the transmission into several channels Exposure, Information, and Countrywide

It does this with several sources of data

- Syndicated loan data from Dealogic
- BIS country by country data on bank exposures to countries and to banks
- BankScope balance sheet data for the left hand performance measure and for right hand control variables
- Country variables for instruments

This is a very ambitious work in progress, so my comments will be limited to explorations for future research.

Further, because this paper already seems to be four papers some of my comments may not apply to this particular paper.

Empirical Strategy

$$Y_{iht} = \alpha_h + \alpha_t + \sum_{d=1}^{D} \beta_d E_{ihdt-s} + \sum_{d=1}^{D} \gamma_d P_{ihdt-s} + \sum_{d=1}^{D} \delta_d R_{ihdt-s} + \eta N_{iht-s} + \sum_{d=1}^{D} \kappa_d CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \lambda_d E_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \mu_d P_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \nu_d R_{ihdt-s} CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \xi_d N_{iht-s} CRIS_{dt} + \zeta Z_{iht} + \varepsilon_{iht},$$
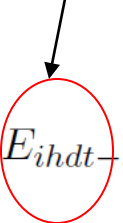
Empirical Strategy

Performance measure of a bank
(ROA or ROE or weighted average
thereof)

$$Y_{iht} = \alpha_h + \alpha_t + \sum_{d=1}^{D} \beta_d E_{ihdt-s} + \sum_{d=1}^{D} \gamma_d P_{ihdt-s} + \sum_{d=1}^{D} \delta_d R_{ihdt-s} + \eta N_{iht-s} + \sum_{d=1}^{D} \kappa_d CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \lambda_d E_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \mu_d P_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \nu_d R_{ihdt-s} CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \xi_d N_{iht-s} CRIS_{dt} + \zeta Z_{iht} + \varepsilon_{iht},$$

Empirical Strategy

Direct **E**xposures to other banks
at the bank level

$$Y_{iht} = \alpha_h + \alpha_t + \sum_{d=1}^{D} \beta_d E_{ihdt-s} + \sum_{d=1}^{D} \gamma_d P_{ihdt-s} + \sum_{d=1}^{D} \delta_d R_{ihdt-s} + \eta N_{iht-s} + \sum_{d=1}^{D} \kappa_d CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \lambda_d E_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \mu_d P_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \nu_d R_{ihdt-s} CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \xi_d N_{iht-s} CRIS_{dt} + \zeta Z_{iht} + \varepsilon_{iht},$$

Empirical Strategy

Network **P**roximity Variables in the Exposure Network

$$Y_{iht} = \alpha_h + \alpha_t + \sum_{d=1}^{D} \beta_d E_{ihdt-s} + \sum_{d=1}^{D} \gamma_d P_{ihdt-s} + \sum_{d=1}^{D} \delta_d R_{ihdt-s} + \eta N_{iht-s} + \sum_{d=1}^{D} \kappa_d CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \lambda_d E_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \mu_d P_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \nu_d R_{ihdt-s} CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \xi_d N_{iht-s} CRIS_{dt} + \zeta Z_{iht} + \varepsilon_{iht},$$

Empirical Strategy

Relationship measures calculated from the long run exposure data

$$Y_{iht} = \alpha_h + \alpha_t + \sum_{d=1}^{D} \beta_d E_{ihdt-s} + \sum_{d=1}^{D} \gamma_d P_{ihdt-s} + \sum_{d=1}^{D} \delta_d R_{ihdt-s} + \eta N_{iht-s} + \sum_{d=1}^{D} \kappa_d CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \lambda_d E_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \mu_d P_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \nu_d R_{ihdt-s} CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \xi_d N_{iht-s} CRIS_{dt} + \zeta Z_{iht} + \varepsilon_{iht},$$

Empirical Strategy

Network variables such as centrality calculated from the exposure and relationship networks

$$Y_{iht} = \alpha_h + \alpha_t + \sum_{d=1}^{D} \beta_d E_{ihdt-s} + \sum_{d=1}^{D} \gamma_d P_{ihdt-s} + \sum_{d=1}^{D} \delta_d R_{ihdt-s} + \eta N_{iht-s} + \sum_{d=1}^{D} \kappa_d CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \lambda_d E_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \mu_d P_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \nu_d R_{ihdt-s} CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \xi_d N_{iht-s} CRIS_{dt} + \zeta Z_{iht} + \varepsilon_{iht},$$

Empirical Strategy

$$Y_{iht} = \alpha_h + \alpha_t + \sum_{d=1}^{D} \beta_d E_{ihdt-s} + \sum_{d=1}^{D} \gamma_d P_{ihdt-s} + \sum_{d=1}^{D} \delta_d R_{ihdt-s} + \eta N_{iht-s} + \sum_{d=1}^{D} \kappa_d CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \lambda_d E_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \mu_d P_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \nu_d R_{ihdt-s} CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \xi_d N_{iht-s} CRIS_{dt} + \zeta Z_{iht} + \varepsilon_{iht},$$

Controls

Empirical Strategy

$$Y_{iht} = \alpha_h + \alpha_t + \sum_{d=1}^{D} \beta_d E_{ihdt-s} + \sum_{d=1}^{D} \gamma_d P_{ihdt-s} + \sum_{d=1}^{D} \delta_d R_{ihdt-s} + \eta N_{iht-s} + \sum_{d=1}^{D} \kappa_d CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \lambda_d E_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \mu_d P_{ihdt-s} CRIS_{dt} + \sum_{d=1}^{D} \nu_d R_{ihdt-s} CRIS_{dt}$$

$$+ \sum_{d=1}^{D} \xi_d N_{iht-s} CRIS_{dt} + \zeta Z_{iht} + \varepsilon_{iht},$$

Binary Crisis indicator along with cross effects with all variables.

Already there is much going on.

but to step back a bit

More needs to be written about the advantages of the syndicated loan networks compared to other possible networks.

- It is individual banks rather than aggregates (a great thing)
  - But what is the nature of the exposure?
  - Is the loan the only exposure?

What does this network tell us?
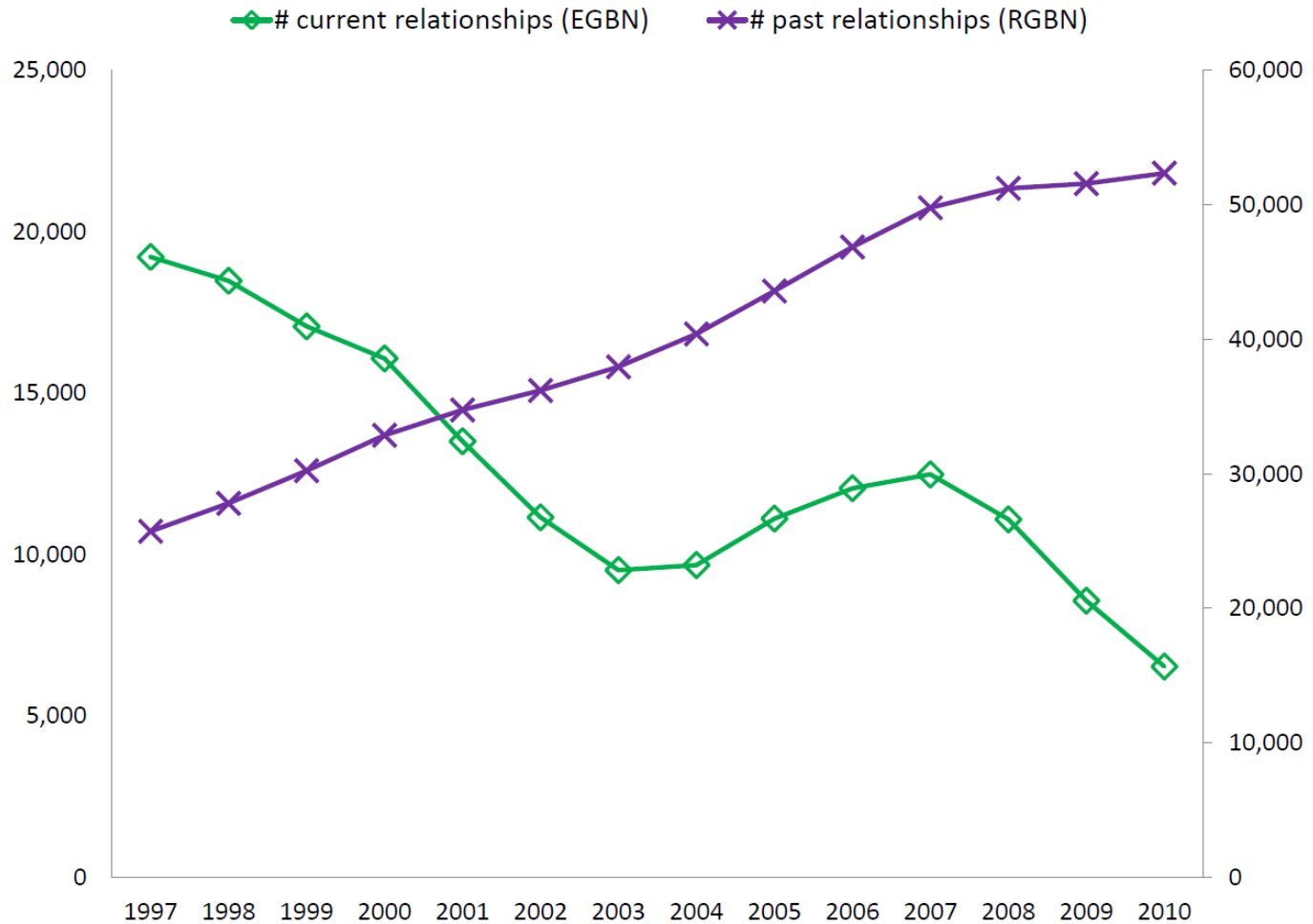
On the one hand

- It is clearly endogenous.
- Further,
  - Identifying past loans with "relationship" or informational linkages may confuse a time effect, or a time growth effect with information.
  - Identifying an exposure effect may confuse the endogenous link with the crisis or exposure effect.

But they have thought about this…

- The exposure matrix is made exogenous with instruments…

  - Each possible link from the country network is estimated with a predictor from the gravity model.

  - This is also added to a binary choice model which minimizes Type I and Type II error in the prediction model

  - The country predictors are then used to instrument both the **R** and **E** networks as well as the **P** and **N** measures.

There are advantages to this approach…

We understand the gravity model from trade extremely well.

But there is a lot going on here.

What is the nature of the identifying assumption here?

We already have a lot of identifications that need to be examined…

- In the association of R, E, N, and P with specific ideas.
- In the assumption that these represent something that the aggregate data, estimated or simulated networks, or fixed or time effects or cross products with these do not represent.

Now we have added an entire layer to this.

- How do R, E, N, and P correlate with the gravity based instruments in different ways than from each other?

- How do the gravity instruments avoid the endogenous network formation that causes the original problem?

Each of these represent complex non-linear constructs.

- Often a good thing. Non-linearities identify a Heckit approach, and we use these non-linearities to identify equations more often than we empirical economists care to admit.

- However, there is a bit of discipline involved in first identifying things linearly.
  - When unidentified, estimates blow up
    - If one has programmed it right.
  - We come to an awareness of how sensitive our results are to our identification assumptions.

A few remarks on the results…

L. Exposure to current borrowers	[1]	0.021
		(0.028)
L. Exposure to current lenders	[2]	-0.015
		(0.014)
L. Exposure to current borrowers in crisis countries	[3]	-0.018
		(0.063)
L. Exposure to current lenders in crisis countries	[4]	-0.105
		(0.078)
L. Number of past borrowers	[5]	0.001
		(0.001)
L. Number of past lenders	[6]	-0.011***
		(0.003)
L. Number of past borrowers in crisis countries	[7]	-0.004
		(0.004)
L. Number of past lenders in crisis countries	[8]	0.004
		(0.003)
Equity/Assets		0.110***
		(0.016)
Log-assets		0.435***
		(0.091)
I(Crisis in bank's home country)		-0.714***
		(0.071)
Type of entity FEs		YES
Specialization FEs		YES
Observations		9,114

Are network skeptics right?

L. Number of past borrowers	[1]	0.003
		(0.002)
L. Number of past lenders	[2]	-0.015***
		(0.004)
L. Number of past borrowers in crisis countries	[3]	-0.003
		(0.003)
L. Number of past lenders in crisis countries	[4]	0.004*
		(0.002)
L.Current lending LCC	[5]	-0.049
		(0.301)
L.Current lending LCC * N	[6]	-0.030
		(0.019)
L.Past lending LCC	[7]	0.232
		(0.291)
L.Past lending LCC * N	[8]	0.007
		(0.024)
Equity/Assets		0.109***
		(0.017)
Log-assets		0.482***
		(0.104)
I(Crisis in bank's home country)		-0.704***
		(0.073)
Type of entity FEs		YES
Specialization FEs		YES

Oh no, say it isn't so…

L. Number of past borrowers	[1]	0.003
L. Number of past lenders	[2]	-0.013***
L. Number of past borrowers in crisis countries	[3]	-0.004
L. Number of past lenders in crisis countries	[4]	0.006**
L.Current lending centrality	[5]	-1.288*
		(0.709)
L.Current borrowing centrality	[6]	0.889
		(0.893)
L.Current lending centrality * N	[7]	0.030
		(0.044)
L.Current borrowing centrality * N	[8]	-0.127**
		(0.053)
L.Past lending centrality	[9]	-0.515
		(0.546)
L.Past borrowing centrality	[10]	0.021
		(0.035)
L.Past lending centrality * N	[11]	0.829
		(0.929)
L.Past borrowing centrality * N	[12]	-0.112
		(0.072)
Equity/Assets		0.109***
Log-assets		0.498***
I(Crisis in bank's home country)		-0.713***

Much happier now…

Concluding Remarks

- I am very envious of this paper.
  - When I first saw early elements of this work two years ago, I thought this line was worth pursuing. I both wish that I had and am glad that I did not (because this is very capable work, and they would have beaten me to it.)
  - They carry the trade notions of identification to fruition.

But…

there is still room for lots of people
to play in this toy room.

The data are strange,

- Diameter is huge, about 19, in an earlier version of the paper.

- They are very specific.

Still…

- All bilateral networks only present a partial picture of the entire story. We are a long way from developing the way all of these networks work together.

- Lots of identification schemes that should be explored.
  - Some from the networks themselves, largely unexplored in the trade literature.
    - Not just from trying out facets that one can associate more directly with relationship lending.
    - Also the form of the network itself gives a lot of identification potential.
  - Some from unexplored facets of the data themselves—for example what does it mean to have common exposures.

- Great potential for structural modeling.

I love structural modeling…

So thank you.