Credit Risk and Intradealer Networks by Nina Boyarchenko, Anna M. Costello, Jennifer LaO and Or Shachar

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Aim

- Study how different financial institutions (banks, hedge funds, asset managers) interact in the corporate bond, syndicated loan, and credit default swap (CDS) markets.
- These three markets represent different ways to trade credit risk. Linking them together allows to investigate how dealers assume and distribute credit risk.

Dataset

- Depository Trust and Clearing Corporate (DTCC): Weekly outstanding credit derivative swap positions for the six biggest complex financial institutions (CFIs) regulated by the Federal Reserve: Bank of America, Citibank, Goldman Sachs, JP Morgan Chase, Morgan Stanley, and Wells Fargo. **The data reflects all transactions where one of the six CFIs act as either a participant (a buyer or seller) to the trade or a clearing agent, on behalf of its client (can you identify the end traders?)**.
  - The data details the counterparties, the pricing terms, the notional amount, the trade date, and maturity.
  - single-name CDS and all North American index CDS contracts.
  - Sample period is December 2013 through January 2015 (**why not a longer period?).**
- Trade Reporting And Compliance Engine (TRACE): weekly buying and selling order flows between pairs member of the Financial Industry Regulatory Authority (FINRA).
  - US corporate bonds,
  - data include trade price, trade size, and unconcealed FINRA members identities.
- Loan Pricing Corporation DealScan (LPCD): information of corporate syndicated loans extended by banks to borrowers
  - from 1986 to the present,
  - including information about the terms of the loan, the borrower, and the lenders. Relationship between lenders and borrowers; relationship choice of syndication members.

Methods

- Network Analysis. Compute for each node: in and out degree (weighted), Eigenvector centrality (directed weighted), Betweenness (directed weighted)
- Econometric Analysis: cross-sectional and time series regressions.

Main Results

The empirical analysis examines four key questions:

- What determines the centrality of a dealer in credit cash and derivative markets? Centrality increases with sizes and leverage of dealers and decreases with the book-to-market ratio.
- Do dealers maintain trading relationships across different markets?
- How do dealers enter into new trading partnerships across markets?
  - The relationship is more likely when the seller has lower leverage and higher profitability than the buyer.
  - Having trading together in the bond market increases the probability of trading CDS. Being members of the same syndicate decreases the probability of having a trading relationship in the CDS market.
  - Trading relationships in the CDS market can be relatively persistent and last as long as 15 weeks.
- Do dealers diversify their trading activities across counterparties?
  - Find that larger, more leveraged, more profitable institutions have more (> 4) counterparties in CDS markets.

Strenghts

- Identity of traders is known. Can control for dealers characteristics in terms of size, risk and profitability.
- Match the CDS positions with weekly positions on Corporate bonds market (only to those participants who are both trading with one of the six CFIs in the CDS market and who are also FINRA members (**how many traders are left?**).
- Has data at weekly frequency and can monitor the dynamics
  - Allows to address interesting questions on how traders interact on different markets.
  - Link to financial multilayer network literature
    - Bargigli, di Iasio, Infante, Lillo,Pierobone (2013) (The multiplex structure of interbank networks of secure and unsecured loans at different maturity in Italian market)
    - Cont et al. (2011) use a set of different kinds of inter-bank exposures (i.e. fixed-income instruments, derivatives, borrowing and lending) and study the potential contagion in the Brazilian market
    - Sebastian Poledna, Jos Luis Molina-Borboa, Serafn Martnez-Jaramillo, Marco van der Leij, Stefan Thurner, (2015) Four layers of exposure among Mexican banks from 2007-2013 (unsecured) interbank credit, securities, foreign exchange and derivative markets.
    - Aldasoro and Alves (2015), Multiplex networks of exposure between large european banks (asset, derivatives and off balance sheet 53 large European banks as of end 2011)
    - Langfield et al. (2014) nalysis of different layers of the U.K. interbank system
    - Leon et al. study the interactions of financial institutions on different financial markets in Colombia (sovereign securities market, foreign exchange market, equity, derivative, interbank funds).

Weakness

- CDS Dataset only includes transactions where one of the six CFIs participates in the trade. Not a complete picture (about 75% of the total activity in single-name, in terms of number of contracts, and gross and net notionals).
- The CDS network is by construction a perfect core-periphery network (but fig 3 suggests this may not be the case?).

Is the dataset representative of the global CDS market?

- Peltonen, Scheicher, and Vuillemey (2013) study the determinants of the network structure of CDS markets.
  - DTCC (Depository Trust & Clearing Corporation): all gross and net exposures worldwide on 642 reference entities, including 40 sovereign and 602 financial. Coverage represents about 32.7% of the global single name CDS market.
  - Snapshot of 30 December 2011. Identity of the counterparties is anonymised.
  - The aggregate CDS network also exhibits the so-called small world(low diameter, clustering higher than density), as well as a scale-free degree distribution. The mean degree of a node in this network is 9.4, whereas the most-connected institution is linked to 470 counterparties.
  - **The top-10 most active traders account for 73%.**
- Chen et al. (2011)
  - analyze data from DTCC using all CDS transactions occurring globally between May 1 and July 31 2010, where at least one G14 dealer was counterparty to the trade,
  - No network analysis. Analyse the aggregate market liquidity and trading activity in the CDS market.
  - **The largest fourteen derivatives dealers (G14) hold 82 percent of the total notional amount outstanding.**
  - The five largest CDS dealers are JPMorgan, the Goldman Sachs Group, Morgan Stanley, **Deutsche Bank** and the **Barclays Group**.

- Girardi,Lewis, Getmansky (2014)
  - Study single name corporate and sovereign CDS.
  - DTCC database: all transactions that include at least one of the following: 1) a U.S. reference entity, 2) a U.S. counterparty, 3) a foreign branch of a U.S. counterparty, or 4) a foreign affiliate of a U.S. counter-party.
  - transactions data from January1, 2012 until December 31st 2012. Daily frequency.
  - Each individual market participant has a consistent identifier but identity is not revealed.
  - There were a total of 398 market participants that only bought CDS protection, 246 that only sold protection, and 808 that were on both sides of the market.
  - **top 10 buyers and sellers are dealers but non dealers entities are represented in the top 20 buyers and sellers of the CDS contracts. Top 20 represents 86% of the market for protection buyer and 92% for protection seller.**
- 2009 ECB report ECB Credit default swaps and counterparty risk
  - According to the BIS (semi-annual volunteer survey), the value of outstanding credit default swaps was USD 41.9 trillion, whereas the DTCC reported USD 29.2 trillion. This difference was mostly due to the more limited coverage of CDS contracts entered into by non-dealers within DTCC data.
  - The DTCC repository contained details of 98% of the CDS contract volumes between dealers reported in the BIS survey. However, in volume terms, only 29% of the CDS contract volumes between non-dealers covered by the BIS survey were reported to the DTCC trade information warehouse.

Overall Picture

- network is highly concentrated
- Some important market players are not fully represented in the available data.

Can you infer missing links via entropy maximization (Markose et al. (2012), Vuillemey and Peltonen (2013)) or other methods (Garlaschelli(2015))?

Network Analysis

- More clarity in terminology
  - Weighted Adjacency Matrix $\rightarrow$ Strength Matrix
  - Degree (k_i) $\rightarrow$ the sum of weights (node strength s_i)
- Degree distribution and unweighted centrality measures have a bimodal distribution in a perfect core-periphery network.
- Using weighted centrality helps to create differentiation among nodes
- However, node strength only takes into consideration a nodes total activity in the network, and not how trades are distributed in the networks.
- Weighted betweenness is also driven by overall node strength as paths are very short (directed unweighted shortest path between nodes is either 1,2 or ∞ in this network).

The network structure does not play a relevant role in determining weighted centrality in this network. Centrality is hightly correlated with activity level. Check?

Econometrics Analysis

- Given the CDS network structure is very simple why not combine the CDS and corporate networks and analyze them together to establish what are the determinants for centrality?
- Given balance sheet data are available quarterly why not aggregate quarterly CDS and Corporate Bonds observation?
- Individual CDS network structures have been reported to depend on the characteristics of the underlying reference entities.
  - Peltonen et al. (2013) find that: higher risk reference entity CDS are characterized by a larger number of active counterparties, higher density, and larger exposures. CDS with high spread or high volatility, are less concentrated suggesting the risk-bearing capacity of the net sellers is limited.
  - eligibility of clearing (indirect indicator of the level of standardization and liquidity of an instrument).
  - collateral posted (partial collateralization is market practice).
  - financial versus non financial (because of the possible correlation between reference entities and CDS counterparties who are themselves financial institutions).
- Role of CDS for hedging. Chen et al. (2011) find that market makers do not rapidly offsets large trades with customers by further trades in the same reference entity. Do market makers use CDS to hedge their positions in the bond markets?
- Use price information
  - Does price matter in determining relationship?
  - Do more central nodes get better price?
  - How does information about prices percolates through the network?

THANK YOU