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Retrieving implied financial networks from bank balance-sheet and market data

Discussion

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About the paper

- The paper proposes an approach to complement balance-sheet information with market data in order to enhance our understanding of the expected relevance of these exposures to market participants.

- The paper identifies “implied networks” which are defined as the ones that, respect the total amount loaned and borrowed (obtained from balance-sheet information) and are consistent with market data, according to Merton (1974) theoretical valuation model.

- The paper uses genetic algorithm to find the network that improves upon the weighted mean squared error (WMSE) between the network-based theoretical and observed prices using the commonly used maximum entropy (ME) network as a benchmark.

About the paper

- The paper then applies the above method to data for four UK global systemically important banks (G-SIB) referring to the 2007–09 financial crisis

- Results show that the improvement of the error measure over the ME benchmark was very similar for AUG2008 and DEC2009 – around 40%, but it was lower for the DEC2008 slice – roughly 25%. It follows, that in DEC2008, market participants seemed to perceive a network of exposures closer to the maximum uncertainty benchmark - ME.

- The paper intepretes this as a sign of increased aggregate risk in DEC2008 or like a decreased importance of the distribution of interbank assets for pricing of risk.

Some comments

- The paper makes an original contribution because it tries to use **market information** besides **network information** (from network perspective, the aggregate exposures= the node strengths). The result show that the reconstruction of the networks is improved.

- In fact, it is repeatedly found that knowing only the strength sequence (i.e. the aggregate exposures) is not enough to reconstruct real financial networks.

- Instead, using both the degree (i.e. the total number of connections) as well as strength sequences often leads to a significant improvement (see many empirical applications of the so-called Enhanced Configuration Models maintaining both degree and strength sequences e.g. in Mastrandrea et al., 2014; Squartini et al. 2015 and Cimini et al., 2015).

Some comments

- Therefore, it is interesting if the author could compare his reconstruction technique with other network techniques that use only the network information in addition to the strength sequence such as the information of the degree sequence.

- Following the previous comment, the author could for instance use some successful models (e.g. Enhanced Configuration Models maintaining both degree and strength sequences) as the as a starting point and then add market information to see whether the improvement is significant (e.g. see Di Gangi et al.(2015))

- In the same direction it would be interesting if the author could evaluate his reconstruction technique not against the Maximum Entropy benchmark (which is not very successful in reconstructing the network if constraints are only on the strength sequence) but against the observed network itself.

- To do that, for instance, the author can compare the network properties of the observed network (e.g. assortativity, clustering, community structures, etc.) with those predicted by his method.

Some comments

- The author presents an empirical application using data for **only four UK global systemically important banks (G-SIB)**, and all other banks are aggregated into one representative node. I wonder if the author has the data for the full network and examine whether his method outperforms other methods in the reconstruction of the full network.

- In fact, filling the missing information about the interactions between each periphery/small bank with core/large banks and the interactions among the small banks are also a crucial for a more accurate assessment of systemic risk.

- The above information could also be useful for further applications of the method proposed in the paper. Indeed, network reconstruction techniques have also been used for early warning analysis of systemic risk (e.g. Squartini, Van Lelyveld and Garlaschelli, 2013).