An Algorithmic Approach to Contagion Risk in the Interbank Network

Background

The recent financial crises have shown how complex interdependencies among financial institutions, such as banks and hedge funds, can amplify exogenous shocks and cause financial distress and default cascades. The increased awareness of the importance of such interdependencies has lead to study financial systems as complex networks where nodes are financial institutions and links are financial dependencies, like credit lines, interbank lending and derivative contracts.

While the relevance of network effects towards the robustness of the financial system is widely recognized, little is known about the actual topology of the interbank network. This lack of knowledge is due to a number of causes. First, banks are not forced by law to report their connections to other banks. Second, the interbank network is evolving extremely fast, resulting in the practical impossibility of keeping track of interbank links. Third, most of the transactions are still conducted in over-the-counter trades. As a consequence, the regulator has little information available to intervene in case of (potential) financial instability. Financial audits can provide the required information, but they are costly and time-consuming.

Goals

The goal of this thesis is to investigate what is the optimal approach for the regulator to collect enough information about the interbank network to be able to intervene and prevent default cascades. Under limited resources (e.g. time to intervene), which banks should the regulator audit to discover the network topology? How can the partial information retrieved be used to drive the following exploration? And finally, which banks should the regulator target to reduce the contagion risk?

The approach will rely on algorithmic results on influence maximization and network discovery recently developed in computer science.

Candidate’s profile

We look for a candidate with a strong background on computer science and in particular on graph theory and algorithms. Prior knowledge of financial markets would be an important plus.

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References

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