Assignment COMP0046 – Networks and systemic risk

Data

Please download the data in the folder "Coursework data". The data set contains information about balance sheets of 145 banks. A matrix of interbank exposures is provided in file "interbankExposures.csv". Entry (i,j) of such matrix represents the exposure of i towards j. File "bankAssetWeightedNetwork.csv" contains a matrix that specifies the investment of each bank in 20 external assets, entry (i,j) represents the amount invested by bank i in asset j. A vector of bank equities is also provided in file "bankEquities.csv".

Tasks

1. You should present a statistical characterization of the system for what concern the distributional properties of balance sheets and interbank exposures, and you should describe the topological properties (e.g. degree distribution, clustering, assortativity) of the interbank exposure network.

2. You will then perform stress tests using the Furfine algorithm assuming shocks propagate only because of counterparty default risk.

3. You will then perform additional stress tests where shocks simultaneously propagate because of counterparty risk and overlapping portfolios, and you will compare these results with those of point 2. In relation to contagion due to overlapping portfolios, the suggestion is to consider a linear devaluation function for the assets, with $P_i(t)= (1-a*q_i(t))$, where $P_i(t)$ is the price of asset i at time t, we assume the initial price of each asset equal to 1, and $q_i(t)$ is the fraction of asset i owned by banks that have defaulted up to time t, where such fraction is computed with respect to the total amount owned by the 145 in the system. Finally, "a" is a market impact parameter.

You are free to explore scenarios of your choice for what concern the initial exogenous shock, and to make assumptions for what concern the recovery rate and the liquidity of external assets (the parameter "a"), as long as all assumptions and scenarios are clearly stated and justified in your written report.

Written report

A brief written report (indicatively around 2500 words plus figures and tables) containing the justification of the approach, the presentation of the results, the discussion of the results and conclusions should be **submitted to moodle before the deadline.**

Marking This assignment is worth **100% of the total exam mark**. The marking will be based on the following criteria:

1) Clarity of the report (is the report clear and well structured, are figures informative, is the methodology explained well? Are modeling assumptions discussed?)

2) Results (are results sound?)

3) Critical discussion (are results correctly interpreted? Is there a discussion of limitations and further challenges?)