Network theory to strengthen the banking system

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Since the beginning of the financial crises that erupted in 2008, numerous governments have injected public funds into the banking system in order to prevent the failure of some entities and avoid the collective collapse of the system itself. Furthermore, to strengthen the robustness of the banking system, central banks increase the reserve capital requirements, that is, the percentage of money that banks must

hold, and not loan out. "This cash ratio has been uniformly applied to all of the firms, without taking into account which banks are the most important from a systemic perspective, and nothing has been done about the relationship between entities to reform the network and make it more resistant to a financial shock", explains Anxo Sánchez, of UC3M's Interdisciplinary Complex Systems Group.

The study, which recently appeared in the journal *PLoS ONE*, includes a systemic analysis of the way in which the structure of financial connections affects the spread of economic crises, taking into account changes in several network variables simultaneously. This way, rather than evaluating the volume of business and strength of each bank separately, the study looks at the way in which one entity influences the health of the entire network. Following the ecosystem analogy, it would be somewhat similar to analyzing how the extinction of one species would affect the food chain and the viability of the natural surroundings. In fact, this study is part of a research project in which the robustness of economic networks and ecological networks are compared.

Banking epidemiology

According to the actual data on corporate networks that were analyzed by the authors, among whom there is also a researcher from the University College London, the current financial system may be very sensitive to small structural changes. The conclusion is that work should be done not only on the entities themselves, but also on the relationships between them. "A very good way of increasing the robustness of the network and thus prevent a failure or 'shock' from spreading throughout the entire system might be to modify the links between the entities," points out Professor Sánchez. To do this "some interbank loans could be restructured, reorganizing the network in subgroups, because asking the banks to increase their reserves may not be as useful as regulators currently believe. Depending on the type of entity it affects, the measure

may even be completely useless," he states.

According to the researchers, these results offer a new vision and arguments for the politicians in charge so that they can focus on, not only the capital requirements that are directed at the nodes, but also on the connection between the firms that make up the financial network. To put this into practice, however, it would be necessary to have a precise knowledge of the data and the relationships between the entities of interest, in addition to the processes defined in the connections (interbank loans, belonging to one company or another, joint properties, etc.) "In many cases this is very difficult, if not impossible, for reasons of confidentiality, although the central banks could actually apply the methodology that we propose and study the applicability of the policies we suggest, given that they know every last detail of the system's data," says Professor Sánchez.

More information: "Towards a Proper Assignment of Systemic Risk: The Combined Roles of Network Topology and Shock Characteristics." Lasse Loepfe, Antonio Cabrales, Angel Sánchez *PLoS ONE* 8(10): e77526 (17 October 2013).DOI: 10.1371/journal.pone.0077526

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