

STRESS TESTING THE RESILIENCE OF FINANCIAL NETWORKS

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We propose a simulation-free framework for stress testing the resilience of a financial network to external shocks affecting balance sheets. Whereas previous studies of contagion effects in financial networks have relied on large scale simulations, our approach uses a simple analytical criterion for resilience to contagion, based on an asymptotic analysis of default cascades in heterogeneous networks. In particular, our methodology does not require to observe the whole network but focuses on the characteristics of the network which contribute to its resilience. Applying this framework to a sample network, we observe that the size of the default cascade generated by a macroeconomic shock across balance sheets may exhibit a sharp transition when the magnitude of the shock reaches a certain threshold: Beyond this threshold, contagion spreads to a large fraction of the financial system. An upper bound is given for the threshold in terms of the characteristics of the network.

Keywords: Systemic risk; random graphs; stress test; default risk; macro-prudential regulation.

1. Introduction

In the Supervisory Capital Assessment Program, implemented by the Board of Governors of the Federal Reserve System in 2009 [21], the 19 largest US banks were asked to project their losses and resources under various macroeconomic shock scenarios. The program determined which of the large banks needed to augment its capital base in order to withstand the projected losses. Although underlying this

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