Illiquidity and Insolvency: a Double Cascade Model of Financial Crises

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Abstract

In the aftermath of the interbank market collapse of 2007-08, the scope of systemic risk research has broadened to encompass a wide range of channels, notably asset correlations, default contagion, illiquidity contagion, and asset firesales. In current models of systemic risk, two facets of contagion, namely funding illiquidity and insolvency, are treated as two distinct and separate phenomena. The main goal of the double cascade model we introduce is to integrate these two facets as two faces of the same coin. In a default cascade, insolvency of a given bank will create a shock to the asset side of the balance sheet of each of its creditor banks. Under some circumstances, such "downstream" shocks can cause further insolvencies that may build up to create a global insolvency cascade. On the other hand, in a stress cascade, illiquidity that hits a given bank will create a shock to the liability side of the balance sheet of each of its debtor banks. Under some circumstances, such "upstream" shocks can cause further illiquidity stresses that may build up to create a global illiquidity cascade.

Our paper will introduce a deliberately simplified network model of insolvency and illiquidity that can quantify how illiquidity or default of one bank influences the overall level of liquidity stress and default in the network. Under an assumption we call "locally tree-like independence", we derive large-network asymptotic cascade formulas. Results of numerical experiments then demonstrate that these asymptotic formulas agree qualitatively with Monte Carlo results for large finite networks, and quantitatively except when the system is placed in an exceptional "knife-edge" configuration. These experiments illustrate clearly our main conclusion that in financial