Modeling Endogenous Contagion on O/N Interbank Market

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The interbank market activity in many countries has been severely impaired during the recent global financial crisis. The events of 2007 were the hard way to find out how a single shock can lead to disastrous effects on the whole international financial system. The network of complicated relations and dependencies between financial institutions across the globe was the main reason for which a single crash spread through the world like a disease [1]. From this moment on, the term *contagion* became an important topic in financial stability research. As a result, many complex networks researchers decided to follow the emerging subject of *Systemic Risk* [2].

We propose a new model of the liquidity driven banking system focusing on overnight interbank loans [3]. This significant branch of the interbank market is commonly neglected in the banking system modeling and systemic risk analysis. We construct a model where banks are allowed to use both the interbank and the securities markets to manage their liquidity demand and supply as driven by prudential requirements in a volatile environment. The network of interbank loans is dynamic and simulated every day. We show how only the intrasystem cash fluctuations, without any external shocks, may lead to systemic defaults, what may be a symptom of the self-organized criticality of the system, see Fig. 1.

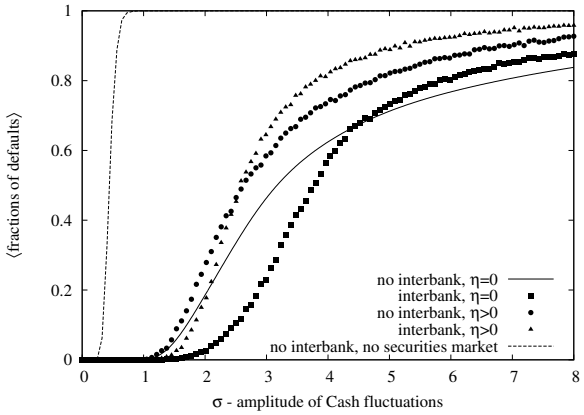

Figure 1: Relation between the size of fluctuations in the model an the fraction of defaults at the end of simulation. Parameter η defines the *depth* of the securities market ($\eta = 0$ is a perfect securities market case).

We also analyze the impact of different prudential regulations and market conditions on the interbank market resilience. Starting with leverage ratio, we also explore more complicated regulations and show which of them are actually effective and which may even amplify losses in a time of distress. Therefore, the model can be used to analyze the interbank market impact of macroprudential tools. Finally, we confirm that central bank's asset purchase programs, limiting the declines in government bond prices, can successfully stabilize bank's liquidity demand.

[1] Helbing, D., *Nature* (2013).

[2] Haldane, A. G. and May, R. M., *Nature* (2011).

[3] Smaga, P., Wiliski, M., Ochnicki, P., Arendarski, P. and Gubiec, T., papers.ssrn.com (2015).