Clearing Payments in Financial Networks with Credit Default Swaps [Extended Abstract]

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We consider the problem of clearing a system of interconnected banks that have been exposed to a shock on their assets. Due to this shock, some of the banks may go into bankruptcy and default on their obligations towards other banks. *Clearing* means computing the payments to be made from each bank to each other bank in accordance with bankruptcy law. The design of good clearing mechanisms is challenging because of the complex and often cyclic interdependencies in realistic financial networks.

Eisenberg and Noe [2001] showed that when banks can only enter into debt contracts with each other, then there always exists a unique Pareto efficient clearing payment vector and it can be computed in polynomial time. Rogers and Veraart [2013] extended this result to a setting where defaulting banks can only recover part of their assets.

In the present paper, we show that the situation changes radically when banks can also enter into *credit default swaps* (*CDSs*), i.e., financial derivative contracts that depend on the default of another bank. Extending the models in both abovementioned pieces of work, we first prove that in financial networks with CDSs, a clearing payment vector may not even exist. This implies that the value of a contract may not be well-defined. In other cases, there may be several clearing vectors, none of which is individually preferred by all banks, thus forcing the clearing mechanism to favor one bank over another. On the computational side, we prove that determining whether a clearing vector exists is already NP-hard. We then develop a new analysis framework to derive constraints on the contract space under which these problems are alleviated.

Our results can be used to inform the discussion on different policy proposals. We show that routing all contracts via a central counterparty would not even guarantee existence. In contrast, we show that banning "naked" (speculative) CDSs would re-establish an existence guarantee for a unique Pareto efficient clearing payment vector.

References

Larry Eisenberg and Thomas H. Noe. 2001. Systemic risk in financial systems. *Management Science* 47, 2 (2001), 236–249.

L.C.G. Rogers and Luitgard A.M. Veraart. 2013. Failure and rescue in an interbank network. *Management Science* 59, 4 (2013), 882–898.

The full version of this paper is available at http://www.ifi.uzh.ch/ce/publications/Clearing_CDSs.pdf
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