SPOTLIGHT FINTECH LAB RESEARCH

A Data Science Approach to Predict the Impact of Collateralization on Systemic Risk.

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Summary

- Follow-on research from topics covered in Spring 2017 SIPA Capstone course, adding modern data science techniques like data mining, anomaly detection, and visualization.

Abstract

We simulate and analyze the impact of recent US Swap Margin regulations (concerning the collateralization of derivative trades) on systemic risk. In an effort to quantify the efficacy of these regulations, we adapt a simulation technology to randomly generate entire financial systems sampled from realistic distributions using the Open Source Risk Engine to compute risks under different regulatory assumptions. This allows us to consistently evaluate, predict, and optimize the impact of financial regulations on all levels before they are implemented.

Conclusion

Collateralization, specifically initial and variation margin, reduces the costs of resolving a financial system in crisis, yet it does not change the distribution of those costs within the system and can have adverse effects on individual participants in extreme situations (if deeply out-of-the-money, VM collateralization can actually cause an increase in exposure).

Future Research

1. Larger Scale Simulation – run future systems on a cloud environment or HPC Cluster.
2. Capitalization – rather than analyzing pure credit exposure, include capital adequacy ratios, allowing us to model a bank failure and study how some counterparty default causes potential chain reactions of defaults (with applications to central clearing).
3. Agency in Trade Relations – rather than relying on Pareto distributions, add a trading strategy for each bank and form dynamic trade relations.
4. Money Markets – because initial margin cannot be re-hypothecated, funding often necessitates borrowing activity in the money markets. Including this could potentially diminish the net reductions in systemic risk observed from collateralization regulation.
5. Funding Cost – study the net reduction in risk weighted assets and cost of capital brought about by collateralization compared to the increased costs of funding initial margin.
6. Credit vs. Liquidity vs. Market vs. Model Risk – we only considered systemic counterparty credit risk. Given that segregation of initial margin pulls large amounts of money out of the financial system, does this increase systemic liquidity risk? Collateralization amounts are calculated by models – what are the potential differences in two counterparties attempting to calculate the same amount, and what are the costs of these disputes?