A DATA SCIENCE APPROACH TO PREDICT THE IMPACT OF COLLATERALIZATION ON SYSTEMIC RISK

How to evaluate, predict and optimize financial regulation?

Expert Judgement vs Data Science

Key Challenges:
- Lack of Data (Trade Data is proprietary).
- Large time lag between decision about regulation and implementation.
- Inconsistent metrics and unclear definitions.

1. Representation and Generation of Financial Systems

Key Concepts:
- Represent trade relations in a financial system as an undirected graph. Each node represents a bank and the links represent trading activity.
- Use cutting edge simulation technology to randomly generate a set of financial systems.
- Calibrate the simulation on (publicly) available data.

Trade Relation Graphs

2. Simulation using the Open Source Risk Engine

Key Concepts:
- The Open Source Risk Engine (ORE) uses advanced stochastic and Monte Carlo simulation to predict the future value of trades and netting sets.
- It uses about 400k lines of C++ and is built on top of boost and QuantLib.

Financial Regulations

3. Computing Systemic Risk in a Graph Model

Key Concepts:
- Represent the risks in a financial system as a weighted directed graph. The nodes represent the banks, the arrows represent risk that is induced and the weights are a metric of that risk, for instance EEPE, PFE or CVA.
- The risk metrics on the arrows can be aggregated to the nodes, which tells us how much risk each bank induces into the system.
- Finally, the metrics can be aggregated to a graph level, which gives us a consistent metric of systemic risk.

Risk Graphs

4. Visualization, Aggregation & Drill-Down

Key Concepts:
- Total Impact of different Regulations
- Drill-down on individual banks
- Data Mining on the Netting Sets