

From Lehman Brother's to Credit Suisse: Understanding Systemic Risks in Financial Networks

Oscar Clarke Nilsson, Ossian Relander

How can a single bank's failure trigger a financial earthquake? With over 100,000 simulations, we uncover the hidden dynamics that can lead to widespread financial instability.

In today's global economy, banks are highly interconnected, forming a complex and intricate network. Historically, these financial networks have shown unexpected fragility, dramatically highlighted by the collapse of Lehman Brothers and, more recently Credit Suisse. Understanding these tightly woven webs is crucial for maintaining stability and preventing future crises. Our work aims to analyze the interbank market to identify the most systemically important banks, understand how network structure affects stability, and explore how network centrality can help predict systemic loss.

Our findings reveal that network structure plays a crucial role in mitigating default propagation. Specifically, we show that when banks have low buffers, denser networks experience more defaults. Conversely, when buffers are high, more defaults occur in low-density networks. Additionally, networks designed to mimic geographical clustering appear more vulnerable, likely due to increased impact from large Chinese banks in these models. We also find strong correlations between common centrality measures such as PageRank and a bank's systemic importance, indicating that these measures effectively predict systemic risk. Moreover, our results align with the Basel Committee's conclusion that JP Morgan is the most systemically important bank. However, our findings suggest that the largest Chinese banks may be more key players than previously thought.

Our thesis employs various methods for network reconstruction, adjusts banks' buffers, and conducts simulations using the DebtRank algorithm, providing a robust foundation for analysis. This research helps identify which banks play crucial roles in the global financial system and how we can mitigate the risk of systemic crises. Most importantly, our work shows that systemic loss depends on network structure, which is a step toward creating a more stable and resilient financial system capable of withstanding future economic shocks. By identifying key vulnerabilities and understanding how financial distress spreads, we can better prepare for and prevent potential crises. For a deeper dive into our research and findings, we invite you to read our full thesis, where we detail our methodologies, analyses, and conclusions.