Financial Networks & Crisis

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Objectives

Objectives for today:

- Introducing the project.
- Setting goals.
- Complex Networks.
- Modeling simulations.

Introducing the project

Financial Networks & Crisis

- Systems relying on financial entities (Banks, Firms, investors...) through complex financial relationships (investment relations, inter-bank payment...)
- Graph representation of the financial network.
- Systemic risk, contagion in networks.
- Robustness of networks.

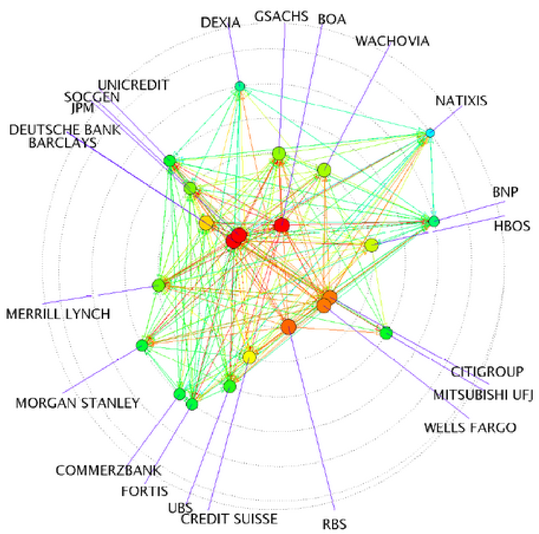

Figure 1: Example of a financial network.

Forecasting Crisis

- Modeling crisis in Networks.
- Prediction of crisis.
- Risk & crisis management.

Setting Goals

In This project we will adopt a broad vision on financial networks, we will investigate the topological properties of the networks, characterize the dynamical processes :

1. Synchronization.
2. Consensus.
3. Spreading/propagation
4. Diffusion.

Framework

In order to study/investigate these networks and phenomena related to it, we need to have a mathematical framework that would allow us to validate our work/model.

Complex Networks

Complex Networks is a part of Complex systems, includes interactions of many elements, could give rise to non linear effects.
It adopts a network perspective on data, by viewing the :

1. Relational Data sets covering and graph abstraction.
2. The different aspects of node centrality.
3. Provides us with null models for networks.

In this framework we can also study aggregate statistics of networks, and how to adapt out graph to fit the real world financial networks.

Motivations

1. The financial crisis of 2008 has demonstrated a critical need for better understanding of the topologies and various economic, social and technical mechanisms of the increasingly interconnected global financial system.
2. Investigate phenomena outside financial networks, and be able to establish links between our project and other similar topics as disease spreading.

Modeling simulations

In this section we will be using python as our main coding language, we will also use different libraries and techniques to implement network based methods and algorithm.

It is also possible to simulate the dynamical processes discussed before, and view how network topology can influence these processes.

Use network-based algorithms to find optimal parameters, explore Markov Chain and Monte Carlo methods (MCMC).

Figure 2: Python Library.

A better world

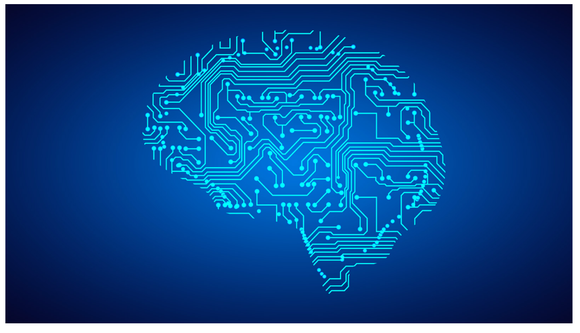

Figure 3: Network engineering.

Conclusion

Finally, network based methods and models are the best we can explore to be able to perform risk and crisis management. Studying and understanding network-underlying phenomena would allow us to prevent not only financial crisis, but also to generalize its methods to all relational data sets as transport networks, biological systems and generally social systems.

References :

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