A Discussion of

A Network Map of Information Percolation

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This paper

And empirical analysis of “information percolation” in continuous decentralized markets.

One asset, many traders or markets.

There is no market clearing price nor a time when the market clears.

The price discovery process can be thought of as a sequential “percolation” process.

This process can be represented as a graph of interactions (quotes, trades, exposures) among traders – a network.

A network consists of nodes and edges. Traders or markets are the nodes (weighted). What about the edges?

Construction of edges

Step 1: Decompose returns from all traders (markets) into permanent components and transitory components.

Step 2: Project returns from each trader (A, B, C, …) onto a common orthogonal decomposition; compute "fitted values" plus idiosyncratic ("error") terms.

Step 3: Project fitted value of returns of trader B at time t on the fitted value of returns of trader A at time t-1.

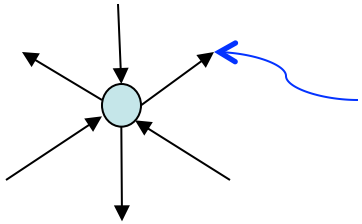
If the coefficient is statistically significantly different from zero, then define it as an edge between B and A.

The sign of the coefficient is the direction, e.g., from B to A.

The weight on the edge is the size of the coefficient.

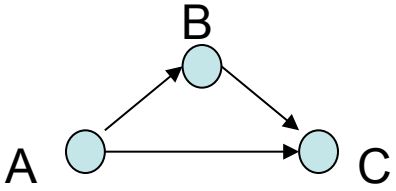
Information percolation networks: Formation

Trader trade or quote – nodes grow stubs

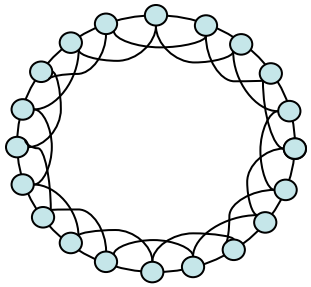


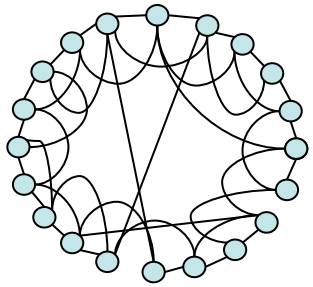
a stub: “a common orthogonal projection”?

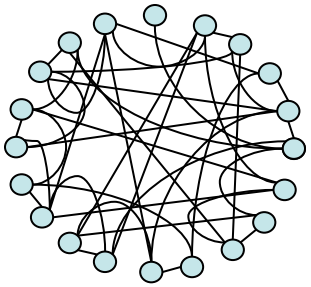
When two traders use the same “common projection”, and edge is created out of stubs (A to B, etc.)



Networks form







Information percolation networks

Formed by a time series econometrician who is extracting components out of prices.

The formation process is a function of the estimation window, t.

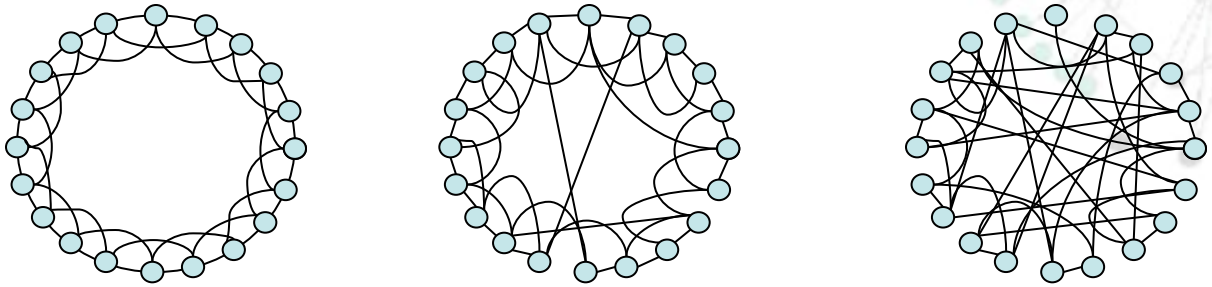
Make the estimation window very large and get a fully connected network.

Make it very small and end up with no edges.

The estimation window is crucial for understanding the network formation process – and, the price formation process too.

How can networks help?

Can the use of network technology help us better understand the price formation process in decentralized continuous markets?

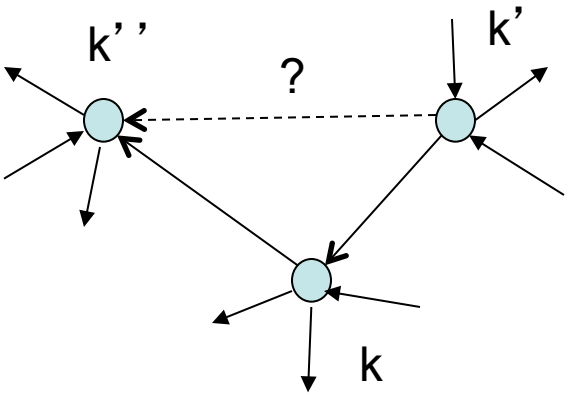


Or is it just a tool to make cool pictures?

We might be able to go beyond time series econometrics and use network variables to construct conditional and joint distributions.

Common network variables: CC

Clustering coefficient: Clustering – Are those you connected with connected with each other?

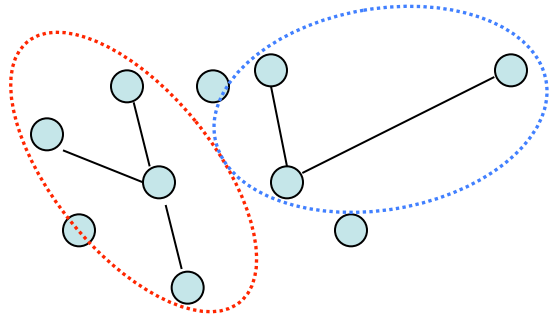


A measure of the conditional probability P(k’’,k’|k)

Clustering coefficient: $$CC = \frac{3 \times (\#\text{ of triangles})}{(\#\text{ of triplet connections})}$$

Common network variable: LSCC

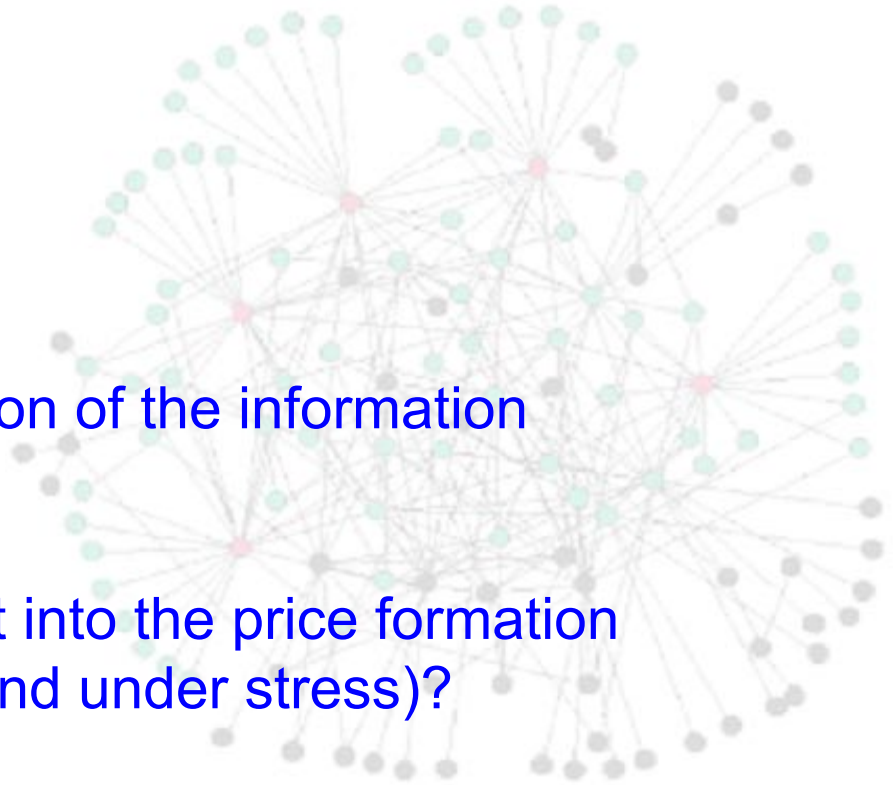
Connectivity: How connected is the whole network?



A measure of the joint degree distribution, P(k, k', k'',…)

Large Strongly Connected Component: The largest subset of nodes such that any node can reach any other node by traversing edges.

Suggestions



Understand and explain the formation of the information percolation network.

Does it provide an additional insight into the price formation process (under normal conditions and under stress)?

Perhaps make use of common network variables to make use of repeated empirical patterns in conditional and joint distributions.

The field of graph theory is rich, but most graphs are a one shot deal. Combining it with time series econometrics might be useful.