

## **Dynamic patterns analysis meets Social Network Analysis in the modeling of financial market behavior.**

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Social Network Analysis methods have been widely applied to detect individual drivers of counterparty selection within a number of inter-individual and inter-organizational settings, like the financial market. Longitudinal methods, like Stochastic Actor-Oriented Models (SAOM), Separable Temporal Exponential Random Graph Models (STERGM) and Relational Event History Models have been proposed to identify the evolution of actors' positioning within a network of relationships.

They provide a detail description of the general tendencies shaping the network dynamics, but do not allow to isolate groups of similar behavior. Standard cluster analysis has been used to accomplish this purpose, but with a main focus on cross-sectional data. Our proposal is to combine Social Network Analysis with a Multiway Factor Analysis (MFA). Such an approach allows to represent the evolutions of the actors behaviors according to the time structure of the data; it also facilitates the visual inspection of the actors' trajectories onto the compromise plan. A clustering of actors based on Muti-way factors is also applied, in order to identify similar patterns and to provide an interpretable solution.

In the first phase, ego-network measures are computed to identify actors market behavior in their neighborhood. Then, according to Structuration des Tableaux A Trois Indices de la Statistique (STATIS) approach a Three-way Factor Analysis is performed, in order to represent actors configurations according to their average distribution. Such solution can be reviewed as the space spanned by a linear combination of multiple factor analysis and it can be consider a "virtual" space where similar actors route paths can be highlighted.

An application to the Euro Electronic Market for Interbank Deposits (e-Mid) during the recent turmoil period will be shown, in order to provide insights into the rationale and benefits of the proposed approach.

**Key Words:** Dynamic pattern, Ego-network measures, panel data, interbank liquidity market