

Abstract

Connectedness of financial asset networks is an active research area where much effort has been devoted recently. Our focus in this thesis is a particular connectedness framework developed through decomposing the forecast error variance that results from a vector auto regressive model. The model is estimated using daily returns on stock indices, yielding a spillover table which can be interpreted as a network structure and summarized in a measure so-called spillover index.

Departing from a sequence of spillover tables, this framework has been enhanced in several directions. Firstly, with a concept to quantify a market's potential to spread information. Secondly, with a Markov chain approach which allows the definition of relative market entropy, quantifying the amount of information gained from day to day. Thirdly, a further entropy concept that can be related to the speed of information (shock) processing and the degree of network stability.

In this thesis, using certain network measures borrowed from the above-mentioned network connectedness framework, we evaluate the performance of the extant model and forecast error variance decomposition identification approaches, i.e. Cholesky decomposition and Pesaran–Shin, and show that they are arbitrarily misestimating with respect to these measures. This justifies our efforts to search for better performing identification method alternatives and constitutes our methodological hypothesis.

As an alternative identification approach, we propose the use of identification through heteroscedasticity which utilizes heteroscedasticity, by means of regime breaks in the structural errors, in the data towards model identifi-

cation and derive conditions for identification of general (in the form of A, B and AB) structural vector auto regressive models.

As an empirical example, we analyze a system of five markets (“Systemic Five”) represented by stock indices Dow Jones Industrial Average (USA), FTSE (UK), Euro Stoxx 50 (euro area), Nikkei 225 (Japan) and SSE Composite (China).

We have estimated the system using a large set of specifications, with respect to rolling data window size and regime break determination approach.

Compared to Pesaran-Shin approach results, we found that identification through heteroscedasticity uncovers certain network dynamics that can not be captured through Pesaran-Shin lens. At prosperous and stable times, eastern markets’ relative importance with respect to the western ones’ increase significantly, and during times of trouble their importance decrease drastically.

In the spillover series, we observe periods of shakiness with a very particular behavior. To investigate these periods, we applied several robust filters to smooth spillover series and concluded that the resulting filtered series also convey the messages of the unfiltered ones.

In terms of network stability, we observe that there is a threshold upto which the system stability increases linearly with increasing spillovers, which then stays constant up to a certain level. Followed by a temporary decrease, network stability increases with increasing spillover levels again. This type of analysis could potentially be useful as an input for the financial network regulation frameworks.

We conclude that identification through heteroscedasticity could be a viable candidate as an identification method alternative in the network connectedness framework to investigate a richer set of network dynamics.