

Directed Acyclic Graph based Information Shares for Price Discovery

Sebastiano Michele Zema*

Institute of Economics, Scuola Superiore Sant'Anna
Piazza Martiri della Libertà 56127, Pisa
sebastianomichele.zema@santannapisa.it

April 22, 2022

Abstract

The possibility to measure the contribution of agents and exchanges to the price formation process in financial markets acquired increasing importance in the literature. In this paper I propose to exploit a data-driven approach to identify structural vector error correction models (SVECM) typically used for price discovery. Exploiting the non-Normal distributions of the variables under consideration, I propose a variant of the widespread Information Share measure, which I will refer to as the *Directed Acyclic Graph based-Information Shares* (DAG-IS), which can identify the leaders and the followers in the price formation process through the exploitation of a causal discovery algorithm well established in the area of machine learning. The approach will be illustrated from a semi-parametric perspective, solving the identification problem with no need to increase the computational complexity which usually arises when working at incredibly short time scales. Finally, an empirical application on IBM intraday data will be provided.

Keywords: Structural VECM; Information Shares; Microstructure noise; Independent Component Analysis; Directed Acyclic Graphs.

JEL classification: C32, C58, G14.

Declaration of interest: none

*I am grateful to Alessio Moneta, Giacomo Bormetti, Fulvio Corsi, and Mattia Guerini for their precious comments. I gratefully acknowledge Joel Hasbrouck for sharing his data and useful clarifications. I am also particularly grateful to Marcelo Fernandes for the valuable suggestions, as well as to the participants of the 13th Annual SoFiE Conference for Young Scholars. I also thank two anonymous referees for their constructive comments which helped me to improve the paper. All errors are my own.

* $p < 0.05$