

## **COLLECTIVE BEHAVIOUR DETECTION OF STOCK MARKETS: EVIDENCE FROM 2007-2008 CRISIS**

**HEBA ELSEGAI**

Department of Applied Statistics, Faculty of Commerce, Mansoura University, Dakahlia, Egypt  
Ph.D. in Mathematics, University of Aberdeen, Scotland, United Kingdom

### **ABSTRACT**

The inference of interconnectivity structure between different stochastic processes is of particular interest, in many fields such as the study of stock markets. A typical assumption in the estimation process of causal inference is stationarity, which violates the applicability of existing statistical analysis techniques. For this purpose, the most recent numerical algorithm called Auto-Regressive Estimation (ARE) algorithm has been successfully applied to EEG Brain data for detecting diseases. This manuscript introduces its application, for the first time, to stock market data. The applications, here, can contribute to a substantially deeper understanding of stock market dynamics and interdependencies before, during and after the crisis. This provides investors and market players with valuable information, which enables them to efficiently selecting less risky portfolios. From this, I argue that the utilised algorithm provides novel information regarding the detection of early warnings, which previous approaches could not assess. Furthermore, the distinction between markets that will fall into a crisis and the ones that will not, was evidenced.

**KEYWORDS:** Expectation-Maximisation algorithm, Financial markets, Interconnectivity structure, Kalman filter, State-Space Modelling