INFORMATION IDENTIFICATION IN DIFFERENT NETWORKS WITH HETEROGENEOUS INFORMATION SOURCES

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Abstract    Traditional cheap-talk game model with homogeneous information sources provided a conclusion that dishonest information sources will not be identified if he changes strategy stochastically. In this paper, the authors incorporate different information diffusion networks and heterogeneous information sources into an agent-based artificial stock market. The obtained results are different with traditional results that identification ability of uninformed agents has been highly improved with diffusion networks and heterogeneous information sources. Additionally, the authors find uninformed agents can improve identification ability only if there exists a sufficient number of heterogeneous information sources in stock market.

Keywords    Agent-based, heterogeneous information, information diffusion, networks.

1 Introduction

In an informationally efficient capital market, asset price can accurately reflect all efficient information on the future cash flow movement, which is the assets allocating function of stock market and, also, the interest of economists in many years. Actually information diffusion process is the most important part of market information efficiency. The traditional researches on information diffusion in financial market can be divided into three categories:

Trade-based information    Informed (uninformed) individuals trade stocks bring with the changing of volume and price, through which uninformed (informed) agents can speculate the informed (uninformed) agents behaviors\(^{[1, 2]}\).

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Signal-based information Informed agents send a clear trading signal or action signal. Then the uninformed agents decide whether to follow it. Studies on this kind of information concentrate on the information cascade and herd behavior in stock market\[3,4\].

News-based information Informed agents send true or false messages and rumors. Then the uninformed ones try to distinguish them\[5−7\].

In this paper, we focus on the third category information and define the rumors/news as a special part of all the information in the market. The information diffusion in this paper is defined as the process that the senders who may own the information on corporate’s future cash flow modify the information (might distort the information to manipulate the market) and send it to uninformed individuals, and then, the receivers identify and transmit the information into his trading decision in stock market.

2 Literature Review

To accurately describe the information diffusion process in financial market, it needs to answer two related questions below:

(i) How the agents send, transmit, distort the information and identify it in the process of information diffusion?

(ii) What kind of information network structures followed by stock investors changing information?

So far, traditional studies prefer to answer the first question. The framework of this kind of research is the equilibrium between the senders and the receivers in the Game Theory. The researches are based on “cheap-talk” model in [8]: On one hand, informed agents (senders) may send true or false information to uninformed agents; on the other hand, uninformed agents (receivers) will try their best to identify whether the information is distorted through learning to earn maximum payoffs.

[5] used cheap-talk model to describe information diffusion in stock market, finding that the uninformed individual can not identify whether the sender is honest or not in the condition of sender changed his sending strategies stochastically. This theory provides proper explanation for some special manipulation cases in real stock market (e.g., Texas Gulf Sulphur and Rothschild Family mentioned in [5]).

Since then, researchers expanded “cheap-talk” model under [5] to give a better explain of information diffusions in stock market. These researches can be divided into two categories:

Extension model based on agents behavior This kind of model tried to simulate the traditional game process by introducing the irrational behavior of the agents based on [5]. The most typical methods include: [9] and [7] worked on the game equilibrium of information diffusion and the changes of asset pricing efficiency considering receivers’ naive behavior; [6] introduced the equilibrium of informed individual send rumors when he is not able to gain efficient information in time.

Extension model based on cost This kind of model tried to add information cost or punishment cost on information diffusion process. [10] thought about the extension on the