Chapter I

Agent Strategies in Economy Market

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Abstract

This chapter presents a method on modelling the economy market using agent-based representation and iterated prisoner’s dilemma (IPD). While IPD has been used widely in various economic problems, most of the studies were based on quantitative data which could be deductive and inappropriate. The main objective of this chapter is to present a unique agent-based approach which places lower demand on data using IPD to model the complexity of the economy market. We create a simulated market environment with agents acting as firms to perform transactions among each other with chosen IPD strategy. From empirical results, we investigate strategic interactions among different firms. In the concluding remarks, we present our observations on the qualities of a winning strategy.
Introduction

The economic world is essentially a large multi-agent system. Computer-based simulations are therefore a useful test bed for developing real world economic models to investigate the dynamic and complex behaviour of such systems. As the real world market is normally driven by numerous players going about their business and interacting with each other through financial transactions, computer models that do not follow the same principles are less likely to be successful than those based on agents interacting with each other. Nevertheless, the agent-based approach and their connectivity through market transactions are somehow not sufficient to create a realistic model. The missing ingredient is the strategy that the agent uses when deciding whether or not to perform a transaction.

Much of strategy research have been based on prisoner’s dilemma (PD), an elegant model of game theory for studying decision making and self-interest. The existing works on PD have shown that a number of different strategies are possible and that they all lead to known but different outcomes. A particularly interesting version of PD occurs when it is played more than once between a range of agents, as it allows for dynamic development and adjustment of strategies by each individual agent. This iterated PD (IPD) is therefore particularly suitable for investigation of the dynamics of the cooperative and competitive behaviour in an economic environment.

Although the IPD has been studied extensively over the past two decades, most of its literature on economics to date focus mainly on measurement techniques, data collection methodology, prediction, empirical findings, and so forth (Paldam & Svendsen, 2002). According to Gilbert (2005), quantitative data that are used normally come from measurements that are taken at a certain point in time, which could be deductive and inappropriate. As such, the main objective of this chapter is to present a unique agent-based approach which places lower demand on data using IPD to model the complexity of the economy market.

The rest of this chapter is organised as follows: the next section introduces the concept of an agent. Subsequently, we review the development of multi-agent simulations and highlight their implications on economy market. We then explain the background of PD and present an analysis on different kinds of strategies proposed for IPD throughout its history. Ensuing sections describe the economy model we use and a market competition simulation. Finally, we present a discussion on the simulation results and draw conclusions highlighting potential future work.
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