Chapter XVII

Analyzing the Influences of Passive Investment Strategies on Financial Markets via Agent-Based Modeling

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ABSTRACT

This chapter develops an agent-based model to analyze microscopic and macroscopic links between investor behaviors and price fluctuations in a financial market. This analysis focuses on the effects of passive investment strategy in a financial market. From the extensive analyses, we have found that (1) passive investment strategy is valid in a realistic efficient market, however, it could have bad influences such as market instability and inadequate asset pricing deviations, and (2) under certain assumptions, passive investment strategy and active investment strategy could coexist in a financial market.

INTRODUCTION

Financial economics researchers have become active since 1950s and many prominent theories regarding asset pricing and corporate finance have been proposed (Markowitz, 1952; Modigliani & Miller, 1958; Sharpe, 1964; Shleifer, 2000). The
assumption of the efficiency of financial markets plays an important role in the literature in traditional financial theory and much research have been conducted based on that assumption (Friedman, 1953; Fama, 1970). For example, capital asset pricing model (CAPM), one of the most popular asset pricing theories in the traditional financial literature, is derived based on the assumptions of the efficient market and rational investors. CAPM indicates that the optimal investment strategy is to hold market portfolio (Sharpe, 1964).

Conventional investment methods are classified into two types: One is active investment strategy and the other is passive investment strategy. The objective of active investment strategy is for an investor to get an excess return better than they would have done if they simply accepted average market returns. However, these strategies sometimes fail because of unpredictable phenomena in the financial markets. On the other hand, passive investment strategy tries to maintain an average return using benchmarks based on market indices. Passive investors invest their assets in company stock in proportion to market weights and maintain it throughout investment periods. Since it is very difficult for investors to get an excess return in an efficient market, passive investment strategy is considered to be an effective investment method.

Recently, researchers in behavioral finance have raised some doubts about the efficient market assumption, by arguing that an irrational trader could influence asset prices (Shiller, 2000; Shleifer, 2000; Kahneman & Tversky, 1979; Kahneman & Tversky, 1992). Therefore, if the inefficient market exists, the passive investment strategy might not be effective. Moreover, we have various other questions: What would happen in a macrolevel when a very large number of investors employed the passive strategy.

To address these problems, we employ an agent-based model (Arthur, 1997; Axelrod, 1997) in order to analyze the relation between microrules and macrobehavior (Axtell, 2000; Russell, 1995).

In the literature, it has frequently been reported that a variety of macrobehavior emerges bottom-up from local microrules (Epstein, 1996; Levy, 2000; Terano, 2001; Terano, 2003; Arthur, 1997; Tesfatsion, 2002). We have developed an artificial financial market model with decision-making agents. So far, we have reported on micro-macro links among agents and markets, investors’ behaviors with various mental models, and risk management strategies of firms (Takahashi, 2003; Takahashi, 2004; Takahashi, 2006). In this chapter, in enhancing the agent-based simulator we have developed, we will uncover the effects of passive investment strategies in a financial market. The objective of the research is to investigate: (1) the influences of micro and macrolevels of passive investment strategies, (2) roles of the evaluation method, and (3) financial behaviors, when there are so many investors with different strategies.

The next section of this chapter describes the model utilized for this analysis, then analysis results are discussed in Section Three. Section Four contains a summary and conclusion.

DESCRIPTION OF AN AGENT-BASED FINANCIAL MARKET MODEL

A computer simulation of the financial market involving 1,000 investors was used as the model for this research; shares and risk-free assets being the two possible transaction methods. Several types of investors exist in the market, each undertaking transactions based on their own stock calculations. This market is composed of three major steps: (1) generation of corporate earnings, (2) formation of investor forecasts, and (3) setting transaction prices. The market will be moving through the repetition of these steps. Regarding the parameters of the model, please refer to the appendix (1).
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