

Chapter 6

Markov Processes in Finance With Application to Stock Markets

ABSTRACT

Important model that has evolved in the field of finance, is founded on the hypothesis of random walks and most often refers to a special category of Markov chain and Markov process. In these models the human race is presented as nothing more than a system with a large number of individual parts. If every human being acted totally independently of every other human being, then the human race as a whole would behave very much like a thermodynamic system. But people, in general, do not behave independently of each other. They have a tendency to cooperate and compete, which causes the human race to behave less like a thermodynamic system, and more like a complex adaptive system. The performed analysis in this chapter certifies the doubted that the discrete and continuous Markov processes as representations of stationary stochastic processes, cannot accurately anticipate the future trends.

Bad periods in the market are predictably followed by good periods and vice versa (Peter Bernstien, Against The Gods: The Remarkable Story Of Risk, 1998)

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INTRODUCTION

Important model that has evolved in the field of finance, is the theory of random walks. This theory raised a lot of eyebrows in 1973 when author Burton Malkiel published the book “A Random Walk Down Wall Street”, which remains on the top-seller list for finance books.

The question that should be addressed here is: Whether the theory explains the actual stock price fluctuations?

A follower of the random walk theory believes that the markets are efficient and that it is impossible to outperform the market without assuming additional risk; the stock price reflects all available information and the occurrence of new information is seemingly random as well. Under a random walk, historical data on prices and volume have no value in predicting future stock return's; the stock price changes have the same distribution and are independent of each other. In other words, statistical analysis and technical analysis are seen as useless. Buying and selling stocks by just depending only on historical stock prices in an attempt to outperform above the market return will effectively be a game of chance rather than skill. In general, the random walk theory throws serious doubt on many other methods for describing and predicting stock prices and occupy the academic world. Although a number of studies found some statistical evidence against the random walk hypothesis, these were dismissed as economically unimportant and statistically questionable. In support, it is stated that alternative methods could not generate profitable trading rules in the presence of transaction costs, and selection bias can result when the researcher tries to fit a large complex model to a small set of highly correlated time series data.

What is more, The Royal Swedish Academy of Sciences awarded the 2013 Nobel to Eugene Fama at the University of Chicago. The prize was based on the importance of his work, which “laid the foundation for the current understanding of asset prices.” Mr. Fama’s major contribution, notably with the 1965 paper “Random Walks in Stock Market Prices,” has been to show that stock markets are very efficient. The term “efficient” here does not mean what it normally means in economics—namely, that benefits minus costs are maximized. Instead, it means that prices of stocks rapidly incorporate information that is publicly available. That happens because markets are so competitive.

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