Application of Second Order Markov Chain for Analysis of Sector Wise Stock Trends during Different Business Cycles

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Abstract

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United States of America, China, and India are projected to be the top three leading economies of the world by the year 2030 in terms of GDP. The leading stock exchanges of these three economies are New York Stock Exchange, Shanghai Stock Exchange and National Stock Exchange of India. Each stock trading on a stock exchange is categorized into a specific sector by Morgan Stanley Capital International (MSCI). Each economy reaches trough and peak of its business cycle during different time. Based on peak and trough data of Economic Cycle Research Institute, the period of expansion business cycle as well as period of contraction business cycle is identified. This research focuses on relative performance of different sectors, where portfolio of sector of stocks is dynamic and comprises of all stocks of a sector at a particular time as defined by MSCI, and available on Thomson Reuters Eikon database. The relative performance is studied within exchange and across exchange during different business cycle and is based on limiting probability distribution of states of second order Markov chain model. The second order Markov chain is a time series stochastic dynamic programming model based on sequence of states. In the present research work three states UP, UNCHANGED and DOWN are considered. The states are defined using mean absolute deviation method for each business cycle. The relative performance is based on ranking of sectors during different business cycle, where the rankings are based on limiting probability distribution. The limiting probability distribution is obtained by considering the

joint probability distribution of second order Markov chain having three states as the probability distribution of third order and third dimension tensor. There are certain sectors within an exchange which shows similar trend during same state for different business cycle but there is no such trend across exchanges for any sector during any business cycle.

Key words: Second order Markov chain model in stock exchange, States of sector wise index during different business cycle, Limiting distribution for second order Markov chain using tensor for sector wise index

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