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A clustering based quantitative approach on selecting companies in an investment portfolio in Colombo Stock Exchange

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Portfolio management is a powerful concept in financial sector, heavily studied by both investors and researchers. Conventionally, investment portfolios on stocks available in stock markets, constitute by set of stocks belonging to numerous companies and their associated allocations. Additionally, the standard portfolio procedure results the optimum allocation of shares of selected set of companies, with the minimum risk. Nevertheless, the selection of companies in a portfolio is utterly depends on the experiences as well as the gut-feelings of investor or the broker. Thereby, this selection criterion is essentially conditional on qualitative measures that have no numerical justifications. This research aims to introduce a quantitative approach towards selecting companies into a portfolio based on their historical data so that the portfolio optimization procedure can overcome the qualitative bias. The analysis has been conducted using the stocks belonging to companies registered at the Colombo Stock Exchange (CSE), Sri Lanka. The data consisting of daily share prices of 291 companies registered at CSE for the period 2012-2016. The company risk is measured by the volatility of its stock prices over the time. In standard portfolios, there is a mix of companies with various risks. Technically, here a novel mechanism to determine composition of companies in such portfolio based on risk levels has been introduced. Different risk levels are determined by using K-Mean clustering technique applied on the volatility of companies. Since the history of stock prices essentially determine the risk levels, the volatility has been captured so that it would reflect the historical behavior of the company's stock prices. Consequently, volatility has taken as a vector that has elements consisting of corresponding variance measured by quarterly basis. Number of quarters resulting the dimension of volatility-vector, is selected as four in this study. The clustering procedure determining the risk levels is based on the volatility-vectors computed on each company, used to obtain five classes of companies with different risk levels. Sorting the classes by mean risk from low to high, allows to select the composition of companies in the considered portfolio. In this research, to establish the portfolio, proportion of companies (0:3:4:3:0) belonging to classes from low to high risks, are selected. This selection allows to balance the risk among companies within the portfolio. The study shows that portfolios have higher return can be constructed by such selections from the clusters appropriately. Further investigation of selection criterion based on such proportions have been analyzed.

Keywords: Portfolio optimization, K-Mean clustering, Volatility-vector.