

NETWORK ANALYSIS OF STOCK PORTFOLIOS

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[dx.doi.org/10.18374/JABE-24-3.4](https://doi.org/10.18374/JABE-24-3.4)

ABSTRACT

This paper studies the topological properties of stock portfolio graphs to test hypotheses that a diversified stock portfolio outperforms a non-diversified stock portfolio through a risk reduction, and that a diversified portfolio exhibits the topological properties of a random network. A total of 120 stock portfolios which were derived from two groups of the equal size based on the stock portfolio performance were converted into stock portfolio graphs and their topological properties were examined. Statistical analysis was conducted to test the correlations among indices as well as the significance of differences between the good-performing group and the poor-performing group. The findings confirm that more diversified stock portfolios generally outperform less diversified stock portfolios. However, this paper also finds that the topological properties of Random Networks are present in the poor-performing group while the good-performing group tend to have the topological properties of scale-free networks.

Keywords: Stock portfolios, diversification, network analysis, random network, scale-free network

1. INTRODUCTION

A stock portfolio is an investor's collection of financial securities such as stocks, funds, and other market-traded securities. The purpose of a stock portfolio is to reduce investment risk without reducing the expected return. Portfolio diversification is the process of randomly selecting different assets for the portfolio. Through portfolio diversification, investors try to maximize the expected return on investment at a certain level of risk or minimize investment risk for a certain target return on investment.

Portfolio analysis is an important part of the investment management. Investors assess performance of the portfolio in terms of return on investment including capital gains, dividends, and interest; analyze risk of the portfolio by assessing the portfolio's volatility and sensitivity to market movements; and if necessary, make adjustments in their portfolios based on market conditions and their financial goals.

This paper is an application of the network theory to the analysis of stock portfolios. Network theory is a part of graph theory which studies a mathematical structure of a graph as a model representing pairwise relationships between distinct elements in a network.

This paper analyzes the topological properties of stock portfolios to examine hypotheses that a more diversified stock portfolio outperforms a less diversified stock portfolio and that a well-diversified stock portfolio has the topological properties of a Random Network.

A total of 120 stock portfolios managed by six investment gurus from the first quarter of 2010 to the fourth quarter of 2014 were converted into stock portfolio graphs and their topological properties were analyzed to determine the characteristics of stock portfolios. The six investment gurus are classified into two groups of the equal size based on the stock portfolio performance (G1 = Good performing group G2 = Poor-performing group).

Statistical analysis was conducted to test the significance of differences between two groups. This paper aims to enhance the understanding of portfolio diversification from the network perspective.