A PERFORMANCE COMPARISON BETWEEN GENETIC ALGORITHMS AND PARTICLE SWARM OPTIMIZATION APPLIED IN CONSTRUCTING EQUITY PORTFOLIOS

JUI-FANG CHANG

Department of International Business
National Kaohsiung University of Applied Sciences
Kaohsiung 807, Taiwan
rose@cc.kuas.edu.tw

ABSTRACT. *This research compares Genetic Algorithms (GA) and the Particle Swarm Optimization (PSO) as efficient sourcing solutions for constructing optimal equity portfolios. The h value with Sharpe ratio (HVSR) and Sharpe index are separately adopted to choose stocks. The PSO and GA are applied to these stocks in search for the optimal capital allocation for constructing equity portfolios. Comparing with the results of annual return in all periods, our research model(HVSR) is better than Sharpe ratio. The research also compares the returns of the Equity Portfolios with that of Taiwan Weighted Stock Index (TWSI) and that of the best return of equity fund (the Best Equity Fund). The results show that the portfolio performance constructed by PSO is better than that of GA. In fact, the performance is superior to that of the existing best stock fund rate of return in Taiwan Funds Market and TWSI.*
Keywords: Equity portfolio, Performance evaluation, Particle swarm optimization, Genetic algorithms

1. **Introduction.** Modern portfolio selection theory originated from Harry Markowitz. He introduced the portfolio selection theory and published the Mean-Variance Model (MV Model) in 1952 [1]. Over the years, investors have devoted much effort and resources in the hope of gaining the maximum expected returns, but often failed to take market risk into consideration. The Markowitz's Mean-Variance model means that investors can obtain the highest expected returns when the risk level is fixed; likewise, they can be at the lowest risk when the expected return level is fixed. When investors choose funds, they always refer to the Fund Performance Evaluation. Traditional performance indices were inferred from Capital Assets Pricing Model (CAPM). In 1965, Treynor developed the Treynor Index, which allows investors to obtain the expected return under every Systematic risk [2]. In the following year, Sharpe (1966) investigated 34 funds and promoted the Sharpe Index [3]. Jensen (1968) developed the Jensen Index to compare the investment of the mutual funds with "buy and hold" market portfolios, allowing investors to know which investment can gain higher expected returns [4].

John Holland (1975) introduced the genetic algorithm (GA) as a powerful computational model for optimization, which is based on the optimization searching of the natural selection course [5]. The basic concept of GA is to imitate the evolution law of nature's raw competition and natural selection; it is capable of choosing better species from the mother generation and randomly interchanging gene information in order to produce a better generation [6-9]. With consistent evaluation, the course would provide a generation that is best adjusted to the environment. There are many financial applications of adopting GA [10,11]. Bauer (1994) uses GA to search for the trading strategy regarding the S