

Preface

The investment problem of achieving higher returns and at the same time reducing the risk is a very complex and non-deterministic problem. This brought the attention of computer science in general and artificial intelligence in particular to address the problem of financial investing. Scientists and engineers are using artificial intelligence to create algorithms to manage portfolios with very low human intervention to take decisions. Some of the techniques used are genetic algorithms, genetic programming, neural networks, simulated annealing, and tabu search. These algorithms are used to predict price movements, find graphical patterns, select the best ones from a range of assets, for doing arbitrage and hedging. More recently, they have been applied to high-frequency trading by analyzing the supply and demand in the market. The goal to achieve is a higher return than the market with a lower risk, and using stocks instead of another type of financial instruments such as options, futures, and Forex, it is probability the best choice to take to constitute a portfolio. The advantage in selecting this type of assets is related to the diversity of available stocks, the lower correlations between them, and the lower volatility of some stocks.

This work presents a new approach to portfolio composition in the stock market. It incorporates a fundamental approach using financial ratios and technical indicators with a multi-objective evolutionary algorithms to choose the portfolio composition with two objectives, the return and the risk. Here, two different chromosomes structures are used for representing different investment models with real constraints equivalent to the ones faced by managers of mutual funds, hedge funds, and pension funds. In order to validate the present solution, two case studies are considered using the SP&500 from June 2010 until the end of 2012. The simulations demonstrate that stock selection based on financial ratios is a combination that can be used to choose the best companies in operational terms, obtaining returns above the market average with low variances in their returns. In this case, the optimizer found stocks with high returns on investment in a conjunction with a high rate of growth of the net income and a high profit margin. To obtain stocks with a high valuation potential it is necessary to choose companies with a lower or

average market capitalization, low PER, high rates of revenue growth, and high operating leverage.

Chapter 1 describes the problematic addressed by this book, the portfolio optimization using EA.

Chapter 2 presents background information and reviews the existing literature, discussing existing approaches that are relevant for developing this project.

Chapter 3 describes the components needed to evaluate companies such as the financial analysis and the meaning of the important item in each statement. Additionally, a brief explanation is given on the technical analysis approach used to evaluate the market and to enter or exit a position.

In Chap. 4 a detailed description on the multi-objective approach used in this work is presented.

In Chap. 5 the experiences performed in single and multi-objective optimization are explained, and the results are discussed.

Chapter 6 presents the conclusions and the future work.

António Daniel Silva
Rui Ferreira Neves
Nuno Horta

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Based on Multi-Objective EA

Silva, A.D.; Neves, R.; Horta, N.

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