

Preface

The management of financial portfolios or funds constitutes a widely known problem in financial markets which normally requires a rigorous analysis in order to select the most profitable assets. This subject is becoming popular among computer scientists who try to adapt known Intelligent Computation techniques to the market's domain. Among those intelligent methodologies, it is possible to highlight techniques such as Genetic Algorithms, Genetic Programming, Neural Networks, Simulated Annealing, and Tabu Search. The mentioned techniques can be applied to financial markets in a variety of ways; as to predict the future movement of a stock's price, or to optimize a collection of investment assets, such as a fund or a portfolio. This innovation is of special importance due to the high volume of securities (financial instruments) involved; normally, it is very hard to a simple investor optimize his profits without requiring the skills of financial market's specialists.

The goal of this work is to provide an application which tries to replace those specialists in order to help an investor or an investment company to achieve a significant profit on buying and selling (trading) financial instruments. In order to apply such procedures we need to believe that the historical data related to stocks and markets form appropriated indications about the market future performance. This premise constitutes the basis of Technical Analysis which simply tries to analyze the securities past performance in order to evaluate these investments at the present time. This philosophy relies on three bases: (1) the fact that market action discounts everything; (2) the fact that price moves in trends; and (3) that history tends to repeat itself. These considerations allow us, through the study of charts and financial data, recognizing which way the market is most likely to go. Despite the fact that technical analysis is becoming widely used, there are still some criticisms to this perception on market's evolution. For instance, Burton Malkiel stated that the "past movement or direction of the price of a stock, or overall market cannot be used to predict its future movement". His findings become popular, leading to a new investment theory called The Random Walk Theory where the author stipulates that if we cannot beat the market, then the best investment strategy we can apply is buy-and-hold in which an investor buys stocks and holds them for a long period of time, regardless of market fluctuations. For the

technical community, this idea of purely random movements of prices is totally rejected, and more recent studies try to evidence their beliefs. Also, if we consider the price movement as unpredictable, how can we explain that price moves in trends? If we observe several stock charts considering a predefined period we can easily detect an uptrend or a downtrend.

The work presented in this book proposes a potential system, based on those techniques, in particular Genetic Algorithms, which aims to manage a financial portfolio by using technical analysis indicators (EMA, HMA, ROC, RSI, MACD, TSI, OBV). In order to validate the developed solution an extensive evaluation was performed, comparing the designed strategy against the market itself (DJI, S&P500) and several other investment methodologies, such as Buy & Hold, Momentum, and a purely random strategy. The time span (2003–2009) employed on the evaluation allowed the performance investigation under distinct market conditions, culminating with the most recent financial crash. The results are promising since the developed approach beats the remaining procedures during the crash. Also, to highlight the fact that this application is available to be used on a practical and realistic point of view since it is capable of considering real time data, and presenting a potential set of market assets to invest.

This book is organized in five chapters and three appendices.

Chapter 1 presents a brief description on the problematic addressed by this book, namely the management of financial portfolios using intelligent computation techniques. Additionally, the main goals for the work presented in this book, as well as, the document's structure are, also, highlighted in this chapter.

Chapter 2 addresses some of the fundamental concepts needed to understand the developed work. Further, a substantial part of the several methodologies applied to the portfolio problematic are analyzed and the problem related with portfolio theory and investment's analysis is discussed. Subsequently, the evolutionary techniques which can be used to solve this problem are focused. Finally, the connection between the presented financial domain and the evolutionary techniques is presented, through an extended analysis on the existing solutions.

Chapter 3 provides the description of the developed solution to approach the portfolio management problem. First, presents an overview on the application's architecture, followed by the delineation of the strategies employed, and a detailed characterization of the several modules within the system.

Chapter 4 describes the validation approach used to evaluate the defined system, in particular the employment of the Backtesting test strategy.

Chapter 5 summarizes the provided book and supplies the respective conclusion and future work.

The appendices provide the Markowitz's Model, a list of available applications for both portfolio management and trading, and, also, a description of the classification parameters.

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