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Investment Strategy Optimization Using Technical Analysis and Predictive Modeling in Emerging Markets

Jelena Stanković^{a*}, Ivana Marković^a, Miloš Stojanović^b

^aUniversity of Niš, Faculty of Economics, Trg kralja Aleksandra Ujedinitelja 11, 18000 Niš, Serbia

^bThe College of Applied Technical Sciences, Aleksandra Medvedeva 20, 18000 Niš, Serbia

Abstract

This research examines the efficacy of technical analysis and predictive modeling in defining the optimal strategy for investing in the stocks indices of emerging markets. Trading strategies are set regarding different technical indicators based on moving averages and volatility of the value and returns on stock indices. Simple trading rules are generated using two moving averages – a long period and a short period moving average, and Moving Average Convergence-Divergence (MACD) and Relative Strength Index (RSI). Selected technical indicators are used as features in defining predictive model based on Least Squares Support Vector Machines (LS-SVMs). A LS-SVM classifier has been used in order to predict trend of the stock indices' value whereby the obtained outputs of the LS-SVM model are binary signals that can be used for defining the trading strategy. Comparing the results obtained from traditional statistical methods for predicting the trend of financial series and proposed LS-SVM model, it can be concluded that machine learning techniques capture the non-linear models which are dominant in the financial markets in more adequate way. Outperforming the results of Buy & Hold strategy and technical trading strategies, application of LS-SVM in decision making process on investing on the financial market significantly can contribute to maximization of profitability on investment.

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Keywords: Technical Analysis; Emerging Markets; Trading Strategy; Predictive Modeling; LS - SVM

*Corresponding author. Tel.: +381-18-528-656; fax: +381-18- 4523-859.
E-mail address: jelenas@eknfak.ni.ac.rs

1. Introduction

The profitability of investing in financial asset depends on the possibility and success of predicting the future movement of the market prices of financial asset. Thus, the constant interest of investors in this particular field comes as no surprise. On the other hand, this issue represents a challenge for science both in terms of the choice of methodology as well as in terms of the theoretical basis of its application. If we were to assume that the financial markets are effective, we would not be able to create a model which would beat the market and provide excess returns to investors. Instead, a weak form of the Efficiency Market Hypothesis (EMH) assumes that all past prices of a stock are reflected in today's stock price, so that any attempt at modelling the future would imply the negation of the most important hypothesis on which the functioning of the financial market is based on in science. In reality, however, investors realize a certain amount of return by applying various methods of prediction, usually technical analyses, which are applied in a variety of asset markets.

Technical analysis is a kind of state-of-the-art method for predicting trends of asset prices. This analysis is based on the idea that prices move in patterns that can be detected and recognized by investors, and that the durations of these patterns are long enough to compensate for any transactional costs and losses that could be incurred due to false signals. The profitability of the trading strategy and investment strategy which is based on technical analysis has proven in several studies in the case of developed markets. Recently, the focus of technical analysis has shifted toward emerging markets, since they are now being recognized as important alternative source of investment opportunities. Nevertheless, the use of technical indicators has constantly been expanding. Technical analysis, in combination with fundamental analysis, increases the power of prediction models. Moreover, by implementing machine learning techniques such as support vector machines, genetic algorithms, artificial neural networks, fuzzy logic and chaos theory in financial market analysis, technical analysis can be used for the purpose of providing the necessary input for more advanced predictive models.

The aim of this paper is twofold. The first topic of study is the profitability of the technical trading rules implemented on a specific group of emerging markets – so called frontier markets - of the Southeast European countries. Starting with the assumption that the movement of stock prices is non-linear, but still implying some kind of trend, trading strategies can be defined based on moving averages and MACD and RSI indicators. Then, the technical indicators which are used to form the most profitable strategies are used as input vectors for the prediction model based on Least Square Support Vector Machine (LS-SVM), which is then evaluated. The results of this research show that in the capital market of Serbia, Croatia, Romania and Bulgaria, we can form a profitable trading strategy by using technical indicators, but that the predictive power of modelling significantly increases though the use of proposed machine learning technique. These analyses complete the insufficiently studied area of trading strategies on the capital markets in the region, and make their contribution in the form of a prediction model, whose use in defining the trading strategies can be considered effective.

The paper is structured as follows: the second section gives an overview of the existing literature on the topic of technical analysis and prediction models based on LS-SVM. How the trading strategies are defined is analyzed in this paper, including the formation of the prediction model, is explained in the third section of the paper. The fourth section of the paper outlines the empirical results and comparison of the effectiveness of the studied trading strategies, while the conclusions and future directions of research which are in accordance with them are presented in the final section.

2. Literature review

The role of the technical analysis and the trading strategies based on it in the optimization of the investment decisions has been studied to a great extent in academic and professional circles. Despite the fact that the participants in the financial markets actively use technical analysis in the formulation of trading strategies (Menkhoff, 1998; Cheung & Chinn, 1999; Gehrig & Menkhoff, 2006), the existing literature on this topic is quite controversial. On the one hand, the initial assumptions of technical analysis are at odds with the widely accepted Efficiency Market Hypothesis (Fama, 1970). It is clear that technical analysis has had its ups and downs over the past few decades, depending on the extent of the prevalence of this theory in academic circles. On the other hand, certain studies have shown that the technical trading strategies have not always provided an acceptable level of profitability, which

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