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Stock Price Forecasting Using Artificial Neural Networks in Shiraz city

Sead Hesam Bostani; Sead Ehsan Sherafat; Sead Jamal Bostani; Ali Ranjbar

Young Researchers and Elite Club, Dariun Barnch, Islamic Azad University, Dariun, Iran.

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ABSTRACT

In this research, forecasting stock prices using artificial neural networks are evaluated. This paper presents a model of fuzzy multi-criteria decision-making, performed to predict the stock price. Universal set of fuzzy sets, all available information about an issue. In a classic series, the membership functions with 0 or 1 expression, and this means that the element is a member or not. But in fuzzy sets, membership function takes a value between one and zero. The purpose of stock market data that are reported daily is used. First three independent neural networks to predict the stock price, trade volume and price changes in the second phase of a neural network is designed as a combination of other factors, to predict the stock price was final. To evaluate the efficiency of this method is a simple neural network were compared with the predicted values. Different and independent characteristics, can decrease the error and increase the prediction accuracy.

KEY WORDS: Fuzzy theory, the stock price, rating.

I. INTRODUCTION

Stock price index as the most important factor in making an investment decision on the exchange of interest is, therefore, important factors affecting share prices Is. Stock price index reflects the capital market's ability to absorb liquidity in the community and often represent market expectations of the economic situation of the company. The stock price index and changes in the expression of market risk.

Knowledge of ranking and the relative importance of factors affecting stock prices could provide an appropriate model to predict the stock price is used. The field research was conducted to rank the factors affecting stock prices. Such research can be carried out in the study by Lee et al.

2008, based on the Gordon model and by taking three major factors that influence the price of stocks within such unforeseen stock dividend, discount rate, the growth rate of dividends, as the general criteria and the following 8 criteria: income, cash flows operating earnings growth rate of dividends, industry prospects, market risk, risk-free rate of return, revenue growth rate, dividend yield rate, the factors used to determine the relative weight Network analysis (ANP) have paid. The results show that the systematic risk, income growth rate and risk-free rate, the most important factor [1].

II. GOALS HAIR

The overall objectives:

Stock price forecasting using artificial neural networks in shiraz sity.

MATERIALS AND METHOD

The purpose of this study Bafrz ranking factors, a model to predict the stock price. To rank the factors affecting stock prices have taken a variety of studies. According to the research In the field of forecasting stock prices, and comparisons were made according to the methods of predicting observed in some studies is developed methods based on while for the other classical methods such as regression and Exponential Smoothing methods have been looking for a better solution. In this paper, in order to predict the stock price of a fuzzy MCDM model is designed based on multiple decision-making.

III. IDENTIFICATION AND CLASSIFICATION OF FACTORS AFFECTING SHARE PRICES

After research study [2,3,4,5,6,7,8,9] and investment books and interviews with experts, as well as the use of plant resources and dissertations in the center of documents and sites Internet, internal and external factors affecting the stock price was divided into two categories: quantitative and qualitative factors. Considering the factors that have the ability to measure and communicate with other factors-are the most 21 important factors (internal and economic) in Table 1 were identified.

*** Corresponding Author:** Ali Ranjbar, Young Researchers and Elite Club, Dariun Barnch, Islamic Azad University, Dariun, Iran. moshaver86@yahoo.com

Table 1: Factors affecting stock prices

Type Index	The main factors			Row
Positive	GDP	Real variables	External factors (Economic)	1
Positive	Domestic savings			
Positive	Export			
Negative	Government budget deficit			
Negative	Government development budget			
Negative	Tax on Dividends			
Negative	Inflation rate	Monetary variables		
Negative	Liquidity			
Negative	Bank deposit rates			
Positive	Currency	Alternative assets		
Positive	Gold Price			
Positive	Housing prices			
Positive	Price Vehicles			
Positive	Gold Price	World Indices		
Positive	Price of Oil			
Positive	Dividend	Operating profit	Internal factors	2
Positive	Operating profit			
Negative	Dividend			
Positive	Dividend growth			
Positive	Return on Investment	Efficiency factors	Internal factors	3
Negative	Downside	Efficiency factors		
Negative	Capital increase	Operating Capital	Internal factors	4

I. DECISION MATRIX

After identifying the factors, the relationship between pairs of factors influencing the price of shares determined. Then, to determine the preference indices after adjustment rate study [12] of the judgment, decision matrix composition using the geometric mean of the outcome of the decision makers.

A. Decision procedure

In this study, in order to prioritize the factors affecting stock prices TOPSIS decision method was used. This method was developed in 1984 by Huang and ions. This technique is based on the concept that the option should be the minimum distance to the positive ideal solution (the best Possible,) is.

The decision matrix to use the TOPSIS method, the weight of each factor using the eigenvector [4] The exact values can be obtained.is.

$$\tilde{X}_{ij} = (a_{ij}, b_{ij}, c_{ij}) = \begin{cases} \left(\frac{1}{\frac{1}{\bar{a}_{ij}}+1}, \bar{a}_{ij}, \frac{1}{\frac{1}{\bar{a}_{ij}}-1}\right) & 0 < \bar{a}_{ij} < 1 \\ (1, \bar{a}_{ij}, \bar{a}_{ij}+1) & 1 < \bar{a}_{ij} < 2 \\ (\bar{a}_{ij}-1, \bar{a}_{ij}, \bar{a}_{ij}+1) & \bar{a}_{ij} \geq 2 \end{cases}$$

A. Theoretical Foundations

In order to use the method of ordinary least squares (OLS) technique using the data in Denton proportional to the distance between consecutive quarterly interest. Denton technique is presented in the following simple form.

$$Min\sum_{t=2}^{T}\left[\frac{X_t}{I_t}-\frac{X_{t-1}}{I_{t-1}}\right]$$

$$t\in\{2،\ 0000،\ (4\beta)،\ 000T\ \}$$

With the proviso that the sum should be equal to the annual seasons per year is standard.

$$\sum_{t=2}^{T}X_t=A_y,\mathrm{y}\in\{1...\beta\}$$

Such that t: time, estimate the quarterly accounts for the quarter t,: Level indicator for the season t,: last year an annual measure.

According to the results, the factors that have the highest coefficient and the relative importance of each category are given as factors in predicting stock prices for used these include internal factors: the growth rate of investment dividends, dividends, capital and external factors, and external factors: domestic savings, liquidity, exchange rates, oil prices and the gold price. Since the data is not available on some seasonal factors can be used to rank the relative importance of the factors that have an agent based on fuzzy TOPSIS method is being used there.

Given that some companies do not have the capital increase in all years studied, this factor is not considered. therefore, in order to assess the impact, consider the model without intercept.

However, there is a general rule that what kind of information is important. In addition, a computerized tool ideal utilization of statistics will focus on the mental aspect is fuzzy theory.

Fuzzy theory may be the best way to predict the stock market neural computer, because the patterns and trends without formulas, rules or complex procurement planning.

This method mimics the structure and function of the brain and brain of extraordinary ability, such decision is based on the simulations. Due to the increasing interest in the development of the theory of fuzzy dynamic systems free models are based on experimental data was created.

B. Fuzzy theory

Rule-based fuzzy systems and knowledge. Heart of a fuzzy system is a knowledge base that will Agr- rules, inference and fuzzy decision is made. Fuzzy decision making is a practice that some words are marked by continuous functions [10．[

Despite the apparent similarities with the theory of fuzzy theory is likely to be quite independent of the possibilities.

The best way to obtain the membership functions using mathematical equations, because the use of this neutrality is maintained. Several mathematical functions have been proposed for this purpose, among them three triangular function, Gaussian bell and more used. Our paper will use this method．

To determine the degree of membership of the World Series in a quantity which is a function of the triangular fuzzy follow the following equation is used：

$$\tilde{A}=(c,a,b)=\begin{cases}0 & , \quad x<a\\ \dfrac{x-a}{c-a} & , \quad a\le x<c\\ \dfrac{b-x}{b-c} & , \quad c\le x\le b\\ 0 & , \quad x>b\end{cases} \tag{5}$$

C. Fuzzy decision

The MCDM techniques designed to recognize and help to decide Mnasb¬Tryn solution, in accordance with the wishes of the decisions of the problem．

MCDM techniques into two categories:

D = o1 ^ o2 ^ o3 ^ … ^ on

multi-objective (MODM) and ID (MADM) divided [12]. In the case of fuzzy sets, indicating the importance of objective criteria (criteria weights) and the desirability of fuzzy sets, are indicative of the utility.
Multi-purpose multi-criteria decision making approach
In deciding how to choose the best alternative we aim to achieve a set of goals of care [4]. In this issue of our approach is that a set of goals O = {o1, o2, o3 ...} on the set of alternatives A = {A1, A2, A3 ...} Am we have. Our decision is to set the goals of the o1 and o2, and .... and move on. If you decide to D show, we have:

$$D_{ij} = \max(\bar{B}, a_{ij}) \quad (6)$$

$$D(A_i) = \min_{j=1}^{n} \{D_{ij}\} = \min_{j=1}^{n} \{\max(\bar{B}, a_{ij})\} \quad (7)$$

D. Defuzzification:

There are several methods for defuzzification.
Maximum membership
Weighted average method
The maximum average method
The center of gravity, since the center of gravity method has many applications [13], we proposed procedure, we use this method for defuzzification.

FMSP proposed method in this paper, a method to predict the stock price is based on multi-criteria decision-making methods in the theory of fuzzy multi-objective decision-making acts.
We assume the information on the factors affecting the shares held. Denton method used to rank the factors and we assume that the characteristics of the proposed parameters are as follows:
Each of the factors affecting the value of the shares at the Mqdarhdaksr allowance (max) and minimum allowable value (min) is. We Factors in stock, fuzzy set {very high, high, moderate upward, middle, middle to low, low and very low weight }and to measure the impact of stock, we consider the optimal value.
After calculating the total amount of membership criteria for each factor, calculated according to the formula of fuzzy decision in each start. After accounting for the non-fuzzy Mqadyrbh obtained from the center of gravity and the weight it will also impact factors. According to the information at any time of the day and fuzzy decision table, we expect the stock price. This method substantially, the price of shares and the desire to increase its efficiency.
To evaluate the accuracy and performance of the model and calculate the prediction error, the measures (MSE, NMSE, RMSE, ACCU) was used which are defined as follows

1. the mean square error (MSE)

$$MSE = \frac{\sum (P_{pred,t} - \hat{P}_{true,t})^2}{T}$$

2. The root mean square error (RMSE), which determines how much the price prediction is closer to the real price.

$$RMSE = \sqrt{\frac{\sum (P_{pred,t} - \hat{P}_{true,t})^2}{T}}$$

3. The normalized standard error of the mean square criterion (MSE)

$$NMSE = \frac{\sum (P_{pred,t} - \hat{P}_{true,t})^2}{(P_{pred,t} - \hat{P}_{true,t})^2}$$

4. Standard ACCU: This standard specifies whether the predicted path of prices, often in the course of actual cost data during test runs or not. This value is much larger than would be better.

$$ACCU_{ANN} = \frac{1}{size\text{TEST}} * \sum_{t=2}^{sizeTEST} sameDirection(\Delta o_{pred,t}, \Delta p_{true,t})$$

$$sameDirection(\Delta o_{pred,t}, \Delta p_{true,t}) =$$

$$1 \quad if \ \Delta p_{pred,t} \leq \circ \quad \text{and} \quad \Delta p_{true,t} \leq \circ$$

$$1 \quad if \ \Delta p_{pred,t} \geq \circ \quad \text{and} \quad \Delta p_{true,t} \geq \circ$$

$$\circ \quad otherwise$$

$$\Delta p_{pred,t} = \Delta p_{pred,t} - \Delta p_{pred,t} - 1$$

$$\Delta p_{true,t} = \Delta p_{true,t} - \Delta p_{true,t} - 1$$

E. Simulation results

This paper presents a model of fuzzy multi-criteria decision was made to predict the stock price.
For this purpose, we assume that the data on the factors affecting the stock price Mobarakeh Steel is reported annually in the years 91-86.
To evaluate the efficiency of this method was compared with the actual stock price Mobarakeh. And independent properties and can reduce the amount of errors and increase the prediction accuracy.

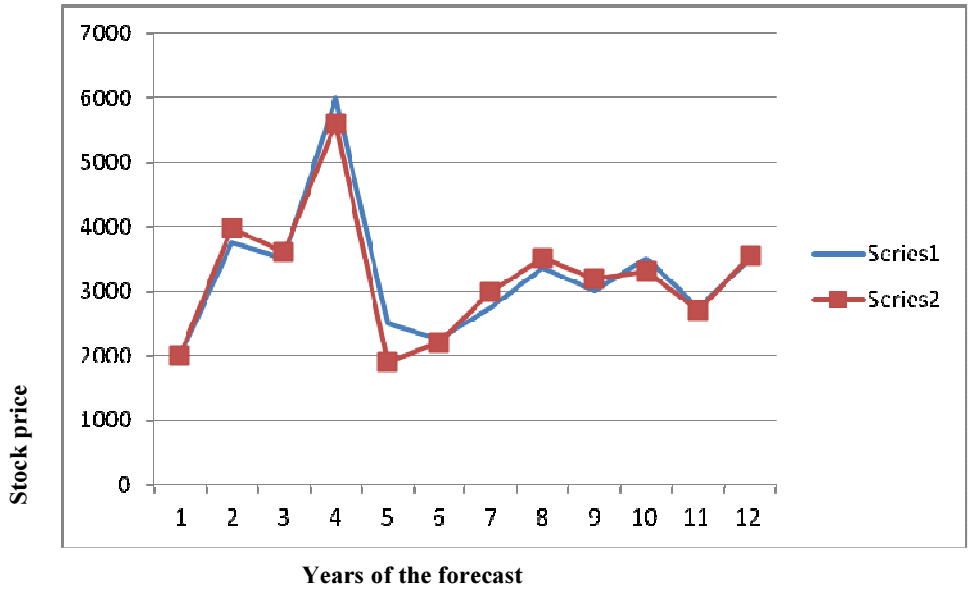

Figure 2: Graph comparing actual and predicted stock price Mobarakeh Steel Company

CONCLUSION

In this research, forecasting stock prices using artificial neural networks, was evaluated. Internal and external factors affecting stock prices that are most relevant to each other in 21 major factors were summarized. After determining the relative importance of using eigenvector, ranked using a fuzzy group decision making was established. The results indicate that increasing the efficiency and speed of the forecast is close to the actual

stock price. According to the model, the four criteria in the hybrid model error is less than the current model is simple. Leading to more accurate prediction of stock prices in the experiment.in fact, it can be said that the use of data and indicators and characteristics are more independent and can decrease the amount of error and increase the prediction accuracy

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