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Predict the Price of Steel Products - A Building Using the Neural Network

Mina Paknahad[1], Maryam Mosleh[2*]

[1] Department of Business Management, FiroozkoohBranch, Islamic Azad University, Firoozkooh, Iran .
[2] Department of Business Management, Firoozkooh Branch, Islamic Azad University, Firoozkooh, Iran.

ABSTRACT

Today, stock markets are affected not only by macroeconomic parameters, but also by many other factors. The multiplicity and uncertainty of the factors affecting the price of products usually causes uncertainty in the field of investment. Therefore, naturally, all investors' efforts are to reduce uncertainty, and therefore, price prediction is one of the tools to reduce uncertainty and is considered as one of the most important branches of science and develops day by day. Managers of various economic and commercial sectors, because of the large number of influential variables, prefer to have a mechanism that can help them in their decision making. For this reason, they try to come up with methods for predicting that their estimates are close to reality and their error is very low. The purpose of this research is to predict the price of steel products - construction using a neural network. The research results are that all the predicted factors have a positive effect on the price of steel-construction products. Finally, the results of the research showed that all the variables described and used to predict the price of steel-construction products are effective: inflation, P / E index, global price, dividends and exchange rate.

Keywords: Price forecast, steel products - construction, neural network, GMDH.

1. Introduction

Since the Tehran Stock Exchange is one of the pillars of the capital market, the development and expansion of this organization can lead to the growth of the national economy.The study of all factors affecting this organization is one of the factors that leads to the tendency of more investors to the stock market, is of particular importance.In recent years, manufacturing and data collection technologies have been growing rapidly.The issue facing organizations, especially in the area of other financial forecasts, is not mere data gathering, but the ability to extract useful knowledge in data is a major concern for organizations.In such a situation, it is necessary to exploit the growth of technology for the effective use of this potentially useful knowledge to find the right answer for extracting this wealth.

There are many techniques and methods, such as regression, neural networks, categorization, categorization, decision trees, and more. For data mining, their roots are all in mathematics, statistics, computational intelligence, and machine learning.In theory, most data mining techniques tend to have large data sets, because larger data sets will have more accurate models.An artificial neural network approach is a relatively new, proactive, and promising way of predicting share price behavior.Artificial neural networks are like mathematical models for learning and decision-making processes of the human mind, because their nature is easily adapted to silent data and solves nonlinear and complex problems. They are suitable for environments that are predictive of price behavior.

The industrial and economic development of the country in the coming years will be subject to increased attention and investment by companies admitted to the stock exchange.It is expedited to achieve economic growth and incentives to invest in a country once it has active and reliable capital markets.The existence of active stock markets has always invaded several investors and accelerated the flow of capital and funds to productive sectors.

To predict stock prices in world stock markets, various methods have been used for analyzes such as data mining techniques, regressions, time series, and so on. (JahanKhani, 2000 and Safranodah, 2000)

More precise methods that can be used in any kind of prediction are data mining techniques, including the neural network and ARIMA.The prediction of the stock price of listed companies in Tehran Stock Exchange using data mining techniques and considering financial criteria is one of the important issues that, unfortunately, little has been done in relation to that.The reason for the boom of neural network models is their promising functions in the field of control, prediction and pattern recognition. Many studies have proved that the neural network is more accurate than other conventional methods.Fuzzy neurons realize the fuzzy systems using the neural network. The main advantage of these networks is their ability to solve complex problems in mathematical modeling, using high-level language models instead of low-level models of complex mathematical expressions (Ali Kalts, 2008)

Given the above, we will answer this question as to what factors affect the price of steel construction products and how did you can the price of steel construction products be predicted for the coming year by using the neural network?

2. Literature Review

Mazandaranyan, SaberiKemerpashti and Eskandiripour (2014) in an article entitled "Projection of the price of the industrial group by the Artificial Neural Network (GMDH)" explored and identified the variables affecting stock prices of the company and the modeling, and therefore the stock price forecast Participated in the Tehran Stock Exchange with the help of the GMDH Neural Network.Four economic vehicle market variables whose data are collected on a monthly basis are the impact of the exchange rate, the inflation rate, the global price of crude oil, and the price of the company's stock prices over the past years.The results show the upside of the stock price of the company, which is the most influential factor in the study, respectively.

NasrinNazerHizani (2012) predicted the crude oil price using a fuzzy neural network.In this research, we use the artificial neural network of multilayer perceptron based on preexposure pricing with a back propagation error under the Lorenberg-Marcoat algorithm, which consists of three layers with three neurons in the input layer, one neuron in the output layer And twenty neurons The fuzzy neural network has been used with the error-back propagation algorithm and the Takagi Sogen's fuzzy inference system, and ultimately this method is more appropriate in the classical way to predict the oil.

Mehrara et al. (2010) using genetic algorithm (GMDH) neural network models, GARCH (1.1) and Neural Network combined (GMDH) and GARCH (1.1) econometrics studies the oil price instability Brent and West Texas intermediated daily data during the period 1990- 2010.Another study by Mehrara et al (2009) with the approach of the GMDH neural network has been used to model and predict the price index and cash returns of Tehran Stock Exchange.This research attempts to identify the variables affecting the stock market index and eleven macroeconomic variables related to the capital market, with one and two month intervals of each of them and dependent variable breaks, created a pattern with 35 input variables.The results show strong and significant impact of land price index, housing cost, monetary base, fare, CPI, rental housing and global crude oil prices on the price index and cash returns of the stock exchange. In contrast, the foreign exchange market and gold have had fewer links to the stock market.

Also, Abrishami et al. (2009) modeling the economic growth of Iran during the period of 1959-2006 using Neural Network Model (GMDH) and ARIMA model.

Ming Chi Li (2009) predicted the NASDAQ index with a combined vector estimator (SVR) model and compared it with neural networks. In this study, the SVR model was combined with the FSSFS function and by the 29 technical indicators as a set of Full features are used to change the index.The research data from 2001 to 2007 were 80% of the data used to train the model and 20% of the data used for the test. The results of this study indicate the superiority of the vector-supported vector estimator (SVR) compared to the neural network.

JakobKaraohamkaran (2011) in his research predicted the movement of the stock index of Istanbul Stock Exchange with neural-fuzzy and SVM models, and the daily data from 1997 to

2007, along with 10 technical indicators, were used as input variables of the model.Neural network-fuzzy 75.74% and backup car model 52.71% predicted and better performance of neural-fuzzy network compared to the supported car model. It was also the best performance prediction of 2001.

In addition to the ANN model, PremcaySuad (2010), Mehrera et al. (2010), Tang Sang (2007) and Kiewang et al. (2005), in addition to the ANN model, are models of BPNN, GMDH, MBNN and ANFIS for predicting prices have used the stock market.All the research concluded that various models of the neural network have a very high predictive accuracy.

Malik (2010) predicted stock returns using neural networks in the Istanbul Stock Exchange. The goal of this study was to determine whether fuzzy neural networks can accurately predict eleven stocks.For this purpose, using macroeconomic variables such as gold price, interest rate, US dollar, inflation (consumer price index), exchange rate, industrial output index for the period from January 1990 to December 2008, as independent variables (inputs) Designed to optimize the network to predict monthly stock returns.The fuzzy neural system provided by the property was designed based on R2, RMSE, and Co variance based on hybrid learning algorithm with two different types of Gaussian membership functions and bell-free membership function with 5 membership functions for each variable.Experimental results show that the designed model with a 98% accuracy and accuracy is a useful tool for predicting monthly stock returns in Istanbul Stock Exchange.

Mosleh et al. (2011) approximated the subjectivity of fuzzy regression polynomials using the fuzzy neural network. This paper evaluates other methods such as Cao (2003) and Tanaka (1991), which show the high accuracy of fuzzy regression for approximation.

Mosleh et al. (2012), in a paper on the evaluation of a completely fuzzy nonlinear regression model using fuzzy neural network, showed that this model can be used to increase the accuracy of approximation in prediction of fuzzy neural network.

Otadi (2014), in an essay entitled Fully Fuzzy Polynomial Regression Using Fuzzy Neural Network to discuss fuzzy independent variables, to obtain a dependent variable from a simple algorithm with fuzzy neural network cost function, and also in This article validates their method with a few practical issues.

3. Methodology

The main objective

Predict the price of steel products - building using the neural network

Sub-goals

1- Determine the factors affecting the price of steel-construction products.

2- Determine the effect of each of the factors on the price of steel-construction products.

3. Determine the order of the effect of factors affecting the price of steel products – construction.

Theoretical Foundations of Research

Management scholars have invented various techniques and techniques to predict that each of these techniques has its own application and can make better predictions with the knowledge of their collections. Managers should try to design a model for prediction that can meet the needs of

the organization and its activity. To select the appropriate model, it is necessary to pay attention to the following items (Alwani, 1993: 67).

- ✓ Timeline
- ✓ Given figures and figures
- ✓ Cost
- ✓ Simplicity

It should be noted that the purpose of identifying and predicting technology in the future is not prediction, but with this action the researcher wants to determine the best way of moving and planning and policy for the future in the future and to provide managers and decision makers to give. (Bahrami, 1953).

Types of predictive methods

Judgmental Forecast

This kind of prediction is used when there is no accurate and complete information about the problem. In this way, subjective opinions are sought in a small amount of predictions. Types of predictive judgments that are considered as qualitative predictions include:

1- Delphi Technique

In this way, it is extremely useful for experts. First, a group of experts and expert experts are selected and collected by a questionnaire of their views on the subject matter. Then they will inform the other members of the group about the new members and new comments will be collected.In this way, all members of the information and ideas of each other are regularly informed and make a new comment. By continuing the flow of information and comments, the new manager can base the prediction on the basis of homogeneous collected opinions.It is worth reminding that the Delphi method is used more for long-term forecasts (more than two years) (Alwani, 1995: 71).

2- Panel consensus

In this way, it is believed that the opinion of the top experts is superior to one person. Hence, during the meetings, the opinions of the people are gathered and after the discussion, what is agreed upon is the basis of the prediction.

2- Extensions of Past History

In this type of prediction, based on past statistics, figures and data are the basis of the future prediction, in other words, it is assumed that in the short term, the process of the past can be extended to the future (SeyyedHosseini, 2001: 17) .Types of past-based forecasting methods include last-resort demand method, moving average method, weighted moving average method, sampling method, Box-Jenkins method.

3- The Box-Jenkins Method

If we have enough information about the subject of prediction and relationships between variables, we can use this method. Various methods of prediction of cause and effect include regression, econometric model, data modeling model, guide index model, and neural network, artificial and fuzzy network models, which are more explicitly investigated.In another division, predictions can be divided into quantitative predictive methods and quantitative predictive

methods. For example, the Delphi method and the collective agreement method are considered as qualitative predictions and basically quantitative predictions in two types specifically, one-variable methods and multivariate methods (causal prediction) can be explained and analyzed.

4- One-way predictions

In quantitative methods, the univariate data sets the past figures and figures as the basis for predicting the future. In other words, our assumption is that in the short term, the process can be extended to the future. In these methods, time series data is used to perform the prediction operation.

4. Finding

Neural Networks

Neural Networks are one of the most useful and practical methods for modeling complex and large issues involving hundreds of variables. Neural Networks can be used for classifying issues (that is, the output of a class) or regression issues (whose output is a numerical value).

Each neural network contains an input layer; each node in this layer is equivalent to one of the predictive variables. The nodes in the middle layer connect to a number of nodes in the hidden layer. Each input node is connected to all hidden node nodes.

The nodes in the hidden layer can be connected to the nodes of the other hidden layer, or they can be connected to the output layer.

The output layer contains one or more output variables (Hand, et.al, 2005).

In the following figure, a neural network with a hidden layer is shown.

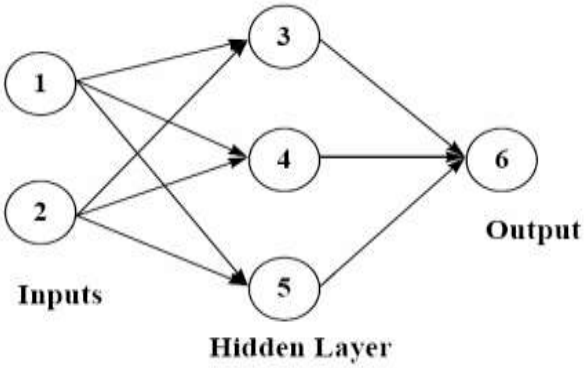

Figure 1: Neural network with a hidden layer

Each edge between nodes has a weight that is displayed. These weights are used in the calculation of the middle layers, and their use is such that each node in the middle layers (layers other than the first layer) has multiple inputs from different edges, which, as we said, each one Have a specific weight.

Each ninety-five intermediate layer multiplies the amount of each input in its corresponding edge weight and collects the resulting multiplications, and then a predetermined function (activation function) applies this result and returns the result to the output title returns to the next layer nodes.

The weights of the edges are unknown parameters that are determined by the training function and the training data given to the system.

The number of nodes and the number of hidden layers and how the nodes connect to each other determines the architecture of the neural network. The user or software that designs the neural network should specify the nodes, the number of hidden layers, the activation function, and the limits of the weight of the edges.

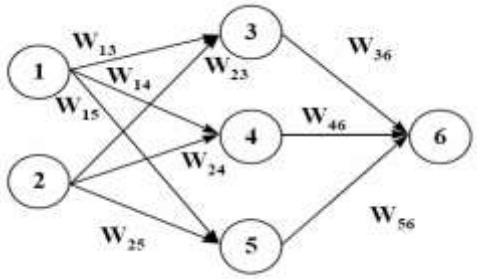

Figure 2: The $W_{x,y}$ is between Y and X .

Artifical Neural Network (ANN)

An artificial neural network is an information processing system that shares common characteristics with natural neural networks. Artificial neural networks are generalized mathematical models of human diagnosis based on biology and are based on the following assumptions:

1. Information processing is carried out in simple components with a large number, called neurons.
2. Signals are transmitted through the network neurons through their links or connections.
3. Each link has its own weight multiplied by common neural networks in the signals transmitted from that link.
4. Each neuron activates a (usually nonlinear) activation function on its inputs, which weighs the input signals, to generate its own output signal.

Given the above assumptions, an artificial neural network can be identified with the following characteristics:

1. The pattern of links between different neurons of the network, which is called the structure or network architecture,
2. The method for determining the weights on the network links called the learning or learning algorithm.
3. Network activation function, which each neuron applies to its inputs.

Further, the defining characteristics of the neural networks are further investigated. A neural network consists of a large number of simple processor components called neurons, units, cells or nodes. Each neuron is connected to other neurons by links or directional arms each having their own weight. These weights represent the information used by the network to solve the problem. Each neuron has an internal state called activation or activity level, and is a function of its inputs. For example, a neuron transmits itself in the form of a signal to several other neurons. It should be noted that a neuron can only send a signal at any one time, although this signal can be sent to several other neurons.

A simple example of an artificial neuron is shown in Fig. 3. In this form, the neuron Y receives inputs from three neurons $X_{3,}, X_2, X_1$. The activations or output signals of the input neurons are respectively $X_{3,}, X_2, X_1$, and the weights associated with the $X_{3,}, X_2, X_1$ binding of the neurons to the neuron Y are respectively $W_{3,}, W_2, W_1$. The network entry to the neuron Y, shown with y_in, is the sum of the weighed signals of the signals entered from the $X_{3,}, X_2, X_1$ neurons:

$y\_in = w_1x_1 + w_2x_2 + w_3x_3$ Relationship 1

The y activation of the neuron Y is obtained by applying the activation function $y = f(y\_in)$ of this neuron to its input, i.e. A function can be a sigmoid function, $f(x) = \frac{1}{1+\exp(-x)}$ which is a curve similar to S, or any other activation function.

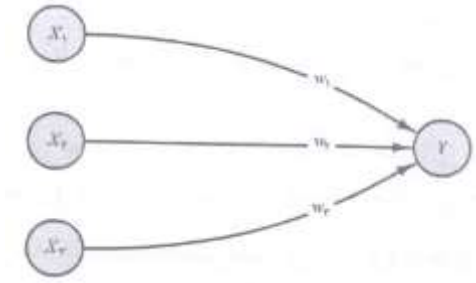

Figure 3: Simple artificial neuron (Foset, 2009)

Now assume that the neuron Y, as shown in Fig. 4, is connected to the neurons with the weights v_2, v_1, respectively. Neuron Y sends y signal to each of these units z_2, z_1. Nevertheless, the quantities received by the neurons will be different because each signal v_1 , v_2 has its own weight, or that these weights are multiplied by the y signal and make up the inputs z_2, z_1. As shown in this figure, a neuron in a network can receive various inputs not only from a neuron, but also from a few or even a large number of neurons.

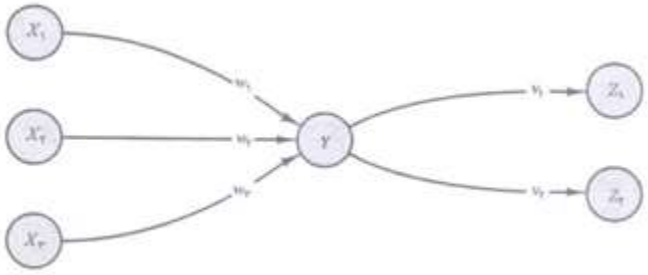

Figure 4: A very simple neural network (Foset, 2009)

Although the neural network shown in Figure 4 is very simple, the existence of a hidden unit (neuron) with a nonlinear activation function enables the network to have a network that only has input and output units. Solve more complex issues.

On the other hand, teaching (that is, finding the best values for weights) is a network with hidden units that is much more difficult than learning a network without secret units (Foset, 2009).

Neural network models based on GMDH algorithm

Essentially, evolutionary methods such as genetic algorithms are widely used in different stages of designing neural networks (Mehrara et al., 2010), as having unique capabilities in finding optimum values and the ability to search in non-predictive spaces (Jamali et al., 2006). Therefore, in this research, a genetic algorithm was used to design the shape of the neural network and determine its coefficients. Because the Genetic Algorithm-based GMDH neural network is a powerful tool in the modeling of complex dynamic nonlinear systems.

The GMDH neural network encompasses a set of neurons that arises from the bonding of different pairs through a quadratic polynomial.

Suppose a set of m variables including x1, x2, ...xm, and a variable y exist. The data for each of xi and the target variable y are also output variables for a period of time, in the sense that each of the variables is A vector containing the time series related to that variable (Zamani, 2009). The initial information that must be collected to generate the GMDH algorithm. The set of n observations is shown in the following matrix:

Figure 1: Input variables to the GMDH algorithm

$$\begin{bmatrix} y_1 \\ y_2 \\ . \\ . \\ y_{\eta t} \\ \dots \\ . \\ . \\ y_n \end{bmatrix} = \begin{bmatrix} x_{11} \vdots x_{12} \ldots \vdots x_{1m} \\ x_{21} \vdots x_{22} \ldots \vdots x_{2m} \\ . \vdots \vdots . \\ . \vdots \vdots . \\ x_{\eta} \vdots x_{\eta 2} \ldots \vdots x_{\eta m} \\ \dots \vdots \dots\dots\dots\dots \\ . \vdots \vdots . \\ . \vdots \vdots . \\ x_n \vdots x_{n2} \ldots \vdots x_{nm} \end{bmatrix}$$

Source:(Zamani, 2009)

To start the algorithm, we encounter two problems. Detection of the relationship that produces the output variable based on the input variables xi. The prediction of y for known values of xi means the need to identify the model and the relationship between the variables (modeling), which then can predict the future value model of the target variable (Iwakhnenko, 1995).

The basis of the GMDH algorithm is the process for constructing a high-level polynomial that is known as the Volterra function series and is presented as follows: (These are also called Iwakhnenko.)

$$\hat{y} = a_0 + \sum_{i=1}^{m} a_i x_i + \sum_{i=1}^{m}\sum_{j=1}^{m} a_{ij} x_i x_j + \sum_{i=1}^{m}\sum_{j=1}^{m}\sum_{k=1}^{m} a_{ijk} x_i x_j x_k + \dots \quad (1)$$

For this purpose, in the GMDH algorithm we begin by analyzing the Volterra functions series into quadratic two-parameter polynomials.

$$G(x_i, x_j) = a_0 + a_1 x_i + a_2 x_j + a_3 x_i^2 + a_1 x_j^2 + a_5 x_i x_j \quad (2)$$

In this analysis, the Volterra series is converted into a set of returning chain equations, so that again, with the algebraic placement of each of the recurrence relations, Volterra series is established.

$$y_i = f(x_{i1}, x_{i2}, x_{i3}, \ldots, x_{im}) \qquad i = 1,2,3,\ldots,m \tag{3}$$

Is approximated by the f function:

$$\hat{y}_i = \hat{f}(x_{i1}, x_{i2}, x_{i3}, \ldots, x_{im}) \qquad i = 1,2,3,\ldots,m \tag{4}$$

And if the ffunction is expressed as follows:

$$\hat{y} = a_0 + \sum_{i=1}^{m} a_i x_i + \sum_{i=1}^{m}\sum_{j=1}^{m} a_{ij} x_i x_j + \sum_{i=1}^{m}\sum_{j=1}^{m}\sum_{k=1}^{m} a_{ijk} x_i x_j x_k + \ldots \tag{5}$$

In this case, the F-relationship can be decomposed into the following form:

$$\begin{aligned}
&\hat{y}_k = G(u_i, u_j) && i, j = 1,2 (i \neq j) && k = 1\\
&\hat{u}_k = G(s_i, s_j) && i, j = 1,2, k, F_1 (i \neq j) && F_1 \leq C_{F_2}^2 \qquad k = 2\\
&\hat{s}_k = G(p_i, p_j) && i, j = 1,2, k, F_2 (i \neq j) && F_2 \leq C_{F_3}^2 \qquad k = 3\\
&\vdots\\
&\hat{z}_k = G(w_i, w_j) && i, j = 1,2, k, F_l (i \neq j) && F_l \leq C_m^2 \qquad k = F_{l+1}\\
&\hat{w}_k = G(x_i, x_j) && i, j = 1,2, k, F_m (i \neq j) && k = F_m
\end{aligned} \tag{6}$$

As above is seen in the above equations, we arrange the above relations from the top to bottom view of the process of decomposition of equation (7) into quadratic polynomials; on the other hand, the arrangement of these relations from the bottom up represents the completion of relation (7) By recursive equations. In fact, the goal of this algorithm is to find the unknown coefficients of α in the Volterra functions series. It should be noted that all partial models generated from a similar structure are as follows:

$$\hat{f}(x_i, x_j) = v_0 + v_1 x_i + v_2 x_j + v_3 x_i^2 + v_1 x_j^2 + v_5 x_i x_j \tag{7}$$

Given that the purpose we follow in this algorithm is nothing but basic system modeling, so by combining the model of partial systems and repeating this, we can achieve the main model of the system, which is in the form of relation (8).

$$\hat{y} = v_0 + \sum_{i=1}^{m} v_i x_i + \sum_{i=1}^{m}\sum_{j=1}^{m} v_{ij} x_i x_j + \sum_{i=1}^{m}\sum_{j=1}^{m}\sum_{k=1}^{m} v_{ijk} x_i x_j x_k + \ldots \tag{8}$$

After decomposing the original system, the number of C_m^2 partial systems of a model with two input variables is computed for each of them. Then the smallest models are combined into two or more of the two, which is the result of this combination, the number of systems or partial new model with At least three and four input variables. However, the number of variables dependent on the model, or, in other words, the number of $\frac{C_m^2 (C_m^2 - 1)}{2}$ system inputs is not important, and only the accuracy of the actual estimation of the original system is important by the created

models, so considering this rule to reduce the double calculation and Excessive and increasing the efficiency and accuracy of modeling of a number of small-scale modeling models that have high accuracy and Hearts are entitled to select and delete the rest (Abrishami et al., 2009).

In the second stage, the combination of selected partial models, or, in other words, the ideal systems formed in the previous stage, are again combined into two or more of the previous stages, and new partial systems with at least five and a maximum of six input variables are formed. In the same way In the next steps, we will continue to combine them with the selection and removal of a number of partial models, in order to finally achieve a relatively ideal model.

A goal that is always sought in the process of combining the models is to achieve a model in which almost all the variables in the system appear and play a role, and another goal that is to perform repeated combinations is to reach a model that Its output error rate is lower than the other calculated models in the previous stages (Sharzehie et al., 2008).

Research method

The purpose of the research is to carry out a systematic and planned effort by people who, in addition to focusing on ordinary life, seek to discover the many facts and the basic mysteries of this continuous search by its specific scientific methods and Systematically, with the aim of expanding the human epistemic domain, the scientific method is called research (Abbasi, 2003).

Prediction methods are divided into two main groups of qualitative methods and quantitative methods based on the degree of dependence on mathematical and statistical methods. In quantitative methods whose operations are completely mathematical, past data are analyzed with the aim of predicting the future value of the variable in question. In general, we can divide predictive quantization into regression and non-trigonometric groups. Regression methods can be used to highlight ARIMA process. One of the non-trans missive methods is the neural network. In this study, using any method of neural network, we will predict the price of steel-construction products. Therefore, the present research method is analytical-inferential based on different stages of research.

Statistical Society

This research is done to predict the price of steel-construction products. Due to the availability of the information required by the following companies in Tehran Stock Exchange, the data of companies accepted in Tehran Stock Exchange were used. Information was also extracted from the information available on the Internet and on the websites providing other statistical information and data.

Data were limited from April 2010 to the end of October 2016. The variables were selected based on the weight of their effects, and the modeling and main analyses using the GMDH neural network were investigated.

Data analysis method

Considering the impact of many factors on fluctuations in the price of steel products - a building that is predicted to have a significant impact. The method of data analysis and analysis in this research is done using the neural network method. The reason for choosing this high power

method is to predict it and to be a suitable model for solving nonlinear problems. Then, using mathematical software such as GMDH, we analyze data and results.

In this research, several important variables including global price, exchange rate, inflation, P / E index and dividend are used. The neural network model, which is a model for solving nonlinear problems, has been used to predict the price of steel products (construction), and to compare the performance of the model, we compared it to the prices available in the past months. The use of irrelevant and additional variables in learning nervous networks disrupts learning and increases learning time. Therefore, in order to minimize the effect of inaccurate and additional variables as inputs, they should select those that have a meaningful relationship with the output.

The variables studied in this study are as follows:

- ✓ **Inflation:**

Increasing inflation leads to higher prices for goods and services, thus reducing demand in the market. This will reduce the company's income and thus reduce the company's profit and stock prices.

As the inflation chart shows, inflation has been steadily increasing in our country, which has contributed to the increase in corporate spending and profit cuts. Of course, inflation has been decreasing since 2013, which has led to lower costs and increased corporate profits. The results are shown in the following chart.

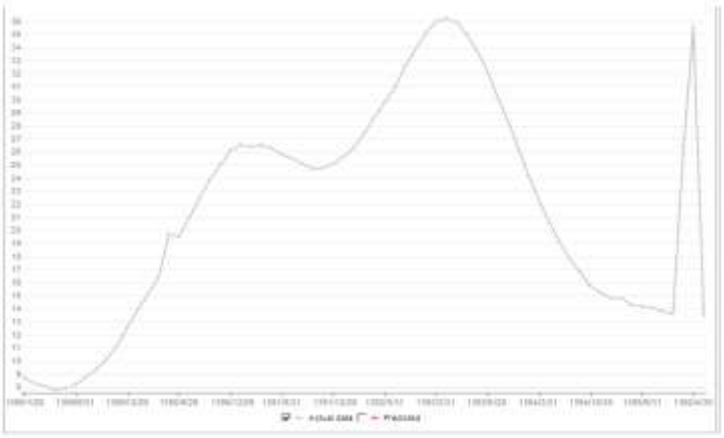

Figure 2: Inflation Chart Between2010 and 2016

- ✓ **Exchange Rate:**

Changing the exchange rate can have two implications on the stock price index:

1. Income of companies entering and exporting goods and services of exchange rate changes (exchange rate and currency equivalents)

2- Impact of price and exchange rate and its impact on buying and selling stocks

Regarding the exchange rate chart, we find that the exchange rate has increased over the review period, which has affected both the price of products in two ways.

In the first place, with the appreciation of the currency, the value of the rial assets of the companies has increased, which has led to an increase in stock prices and prices of steel products. Indirectly, however, the inappropriate effects of an increase in exchange rates on the cost of activities of manufacturing companies and commerce It has lowered stock prices.

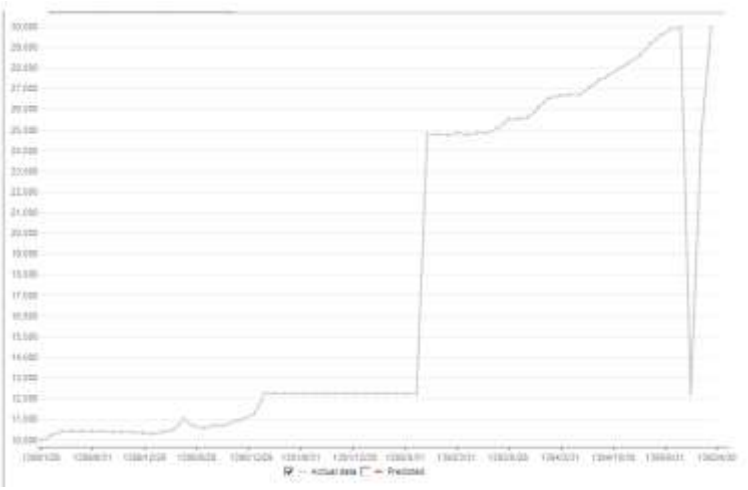

Figure 3: Chart of exchange rates between 2010 and 2016

- ✓ **P / E indicator:**

The price / income ratio, or P / E, is one of the oldest and most used tools for stock valuation of companies**.**

Calculating P / E stands for Price / Earnings Ratio, although it looks simple, but its analysis is difficult. Capital market investors usually refer to the price-to-income ratio, which is P / E, as a means of displaying the value of a company.

This ratio (P / E) is the most commonly used ratio in the capital market for investors, analysts, portfolio managers, consultants, and so on. The reason for this popularity is the ability to show the relationship between market value and earnings per share with a mathematical number.

The purpose of this ratio is to express the relationship between the price of an investor for a share and the future prospects of the company, its expected profit and price.

The proportion of price to earnings helps determine the return period of the investment from the future profits of a share. For example, if you buy a stock with a P / E ratio of 10, it means that it takes 10 years to reinstate your entire initial capital company from its profits.

As indicated in the P / E index, it is seen in recent years as a result of severe economic fluctuations, which has fallen significantly since 2011 and returned to its peak in the middle of 2014, but then again, a descending trend Therefore, it can be said that the index has dropped dramatically in recent years, and its growth has been completely declining.

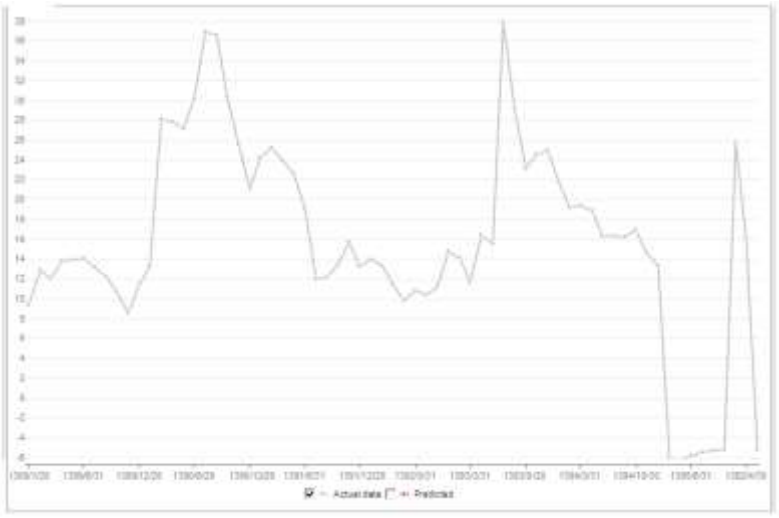

Figure 4: P / E Index Charting Between 2010 and 2016

- ✓ **Dividend:**

The chart below shows the changes in the dividends of steel companies and steel producers from the 18th of January to 2010 in the month of 2016. The increase and decrease in stock prices, as mentioned above, depends on factors such as exchange rate, inflation rate, profit rate, P / E, etc., that the increase or decrease of dividends of a company can be a factor in rising prices and stock values. That company, as well as the price of its products, can play a role as an effective variable on the future price of steel products.

As indicated in the chart of dividends, stock prices have been affected by the economic situation of the country since the beginning of the 2010year to late last month, reflecting the gradual decline in the company's profits and its impact on the price of steel-construction products.

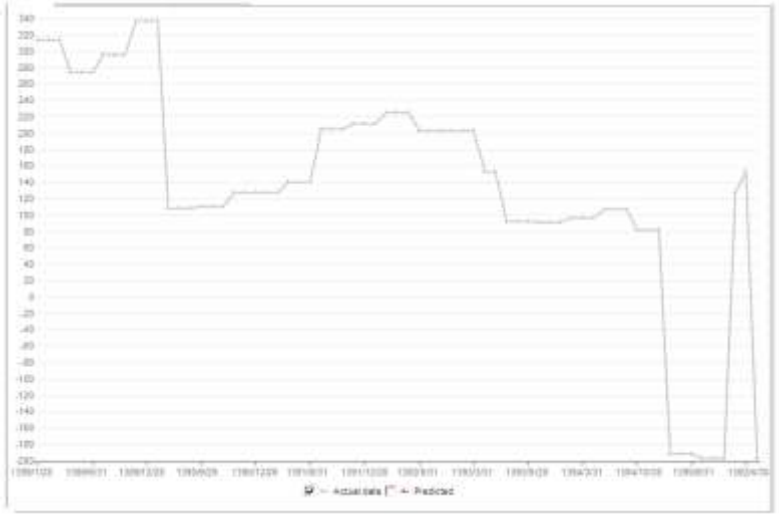

Figure 5: Dividend Indicator Chart between 2010 and 2016

- ✓ **Global price index**

One of the factors influencing the stock price and the company's products is the global price of the company or industry. Considering that all companies in Iran also have a particular impact on

this index, the researcher has been studying this variable and its impact. On the predicted price of steel-construction products.

According to the following graph, the global metal market rate has been slowing down since the beginning of 2010 to the end of 2013, after a slight uptrend, and from the beginning of 2015 to the end of the research range has been relatively downtrend, and the chart also shows that the downturn is continuous and also low. Therefore, it can be claimed that the price of steel and construction has been in a downward trend, just like stock prices.

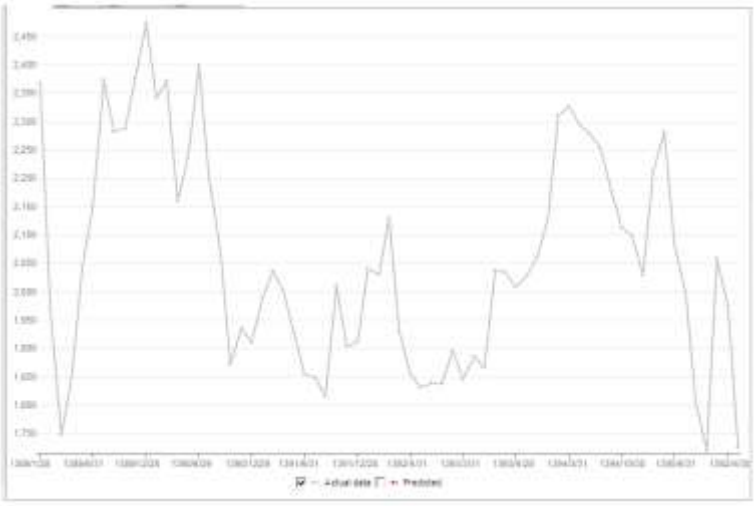

Figure 6: Global steel and steel prices index for the period from 2010 to 2016

Chart 6, using realistic data drawn in gray, has designed a blue LED model that is based on the prediction model for the upcoming periods, which is set to red. Therefore, in this research, according to the indicators of the price of steel products, we expect a construction for the next 5 months. Accordingly, the price of the products in the first month will drop to 15671 Rials. Also, this amount for the second month with a slight Reduction of 15400 Rials, for the third month with a slight increase of 15578 Rials, for the fourth month 15400 Rials, and for the fifth month, will be slightly increased by 15671 Rials. The ranking of the impact indicators is as follows: inflation, P / E index. , Global price, profit and exchange rate (dollar price).

Of course, we should also pay attention to the fact that stock prices in the Tehran Stock Exchange, especially Iranian metals, are affected by domestic political and social events and events. Given the sanctions, it is impossible to predict these numbers and to eliminate sanctions and the post-traumatic state of these numbers will definitely change, so the results of this research are purely predictions based on past numbers and it is possible to change these numbers in the near future.

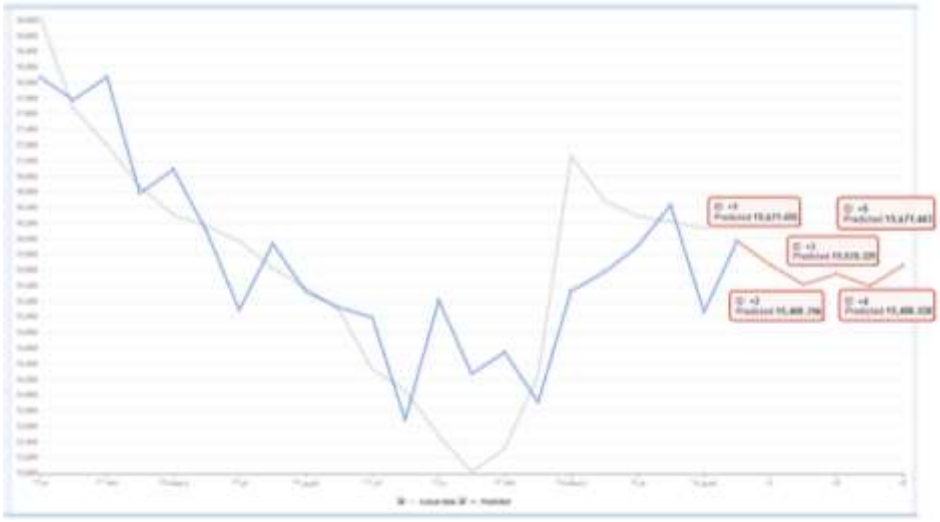

Figure 7: Final Linear Chart Forecast of Company Stock Prices for 5 Periods

Table 1: The effect of each variable on the stock price for the next 5 periods

ranking	Effect level	Variable
1	9	inflation
2	7	P / E indicator
3	6	global price
4	6	Profit
5	4	Exchange rate (dollar price)

5. Discussion & Conclusion

As a result of this research, it can be explicitly emphasized the method of using a neural network based on specific systems and the easy implementation of the algorithm both in terms of software and computation, because the results are accurate and with low error. . Therefore, considering the high intercept and routing capability and the minimum error of its use, this method can be suggested in comparison with other methods. In conclusion, the inference that this research can make is that if the number of main and most influential parameters is greater, the error display is reduced to the same extent, and in many cases economic and commercial firms, Management cases, etc. Finally, the results of the research showed that all the variables described and used to predict the price of steel-construction products are effective and are arranged as: Inflation, P / E index, global price, dividends and exchange rate.

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