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Predicting the Effective Factors on Concurrency of Stock Price Considering Corporative Governing Based on Neural Network

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Abstract

The aim of this research is predicting the effective factors on concurrency of stock price considering corporative governing based on neural network. This study is based on Neural Network. The data of 93 financial companies listed on Tehran Stock Exchange during the period of 6 years (2009-2015) have been studied. The sample is divided into two categories of testing and training. The results of analysis suggest that since the amount of error in testing sample is equal to training sample, thus model fitness is acceptable; Also, the results of table 7 represent that financial leverage, company size, growth opportunity, standard deviation of unlevered cash flow, standard deviation of daily yield, and controlling shareholders is effective on the concurrency of stock price.

Keywords: Concurrency of stock price, controlling shareholders, neural network.

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Introduction

Wide presence of institutional investors as a group of investors, because of access to huge financial sources has important results both for corporative decisions and for the behavior of stock price which this is originated from supervising activities the investors perform. Using the abilities of institutional investors for supervision on corporate performance and management is a function of their investment rate. The aim of this research is to investigate the relationship between institutional investors and concurrency of stock price in the accepted companies in Tehran stock exchange; therefore, in this research institutional investors are divided to two groups of stable (long-term) and unstable (contemporary) institutional investors in terms of their tendencies for controlling and supervising companies to investigate their relation with concurrency of stock price. Concurrency of stock price is a degree of market and industry information that is reflected in stock price and its measurement criterion is the ratio of systematic risk to non-systematic risk. The stock price of companies that represents the value of company is one of the most prominent criteria of investments and valuation by companies. Concurrency of price is a scope in which yield of market and industry shows the difference of stock yield in company level. The performance of stock market has a positive significant relation with the concentration of hidden information ownership and number of external shareholders, and has a negative relation with ownership concentration and number of financial shareholder. Therefore, the ownership structure of hidden data-holders and ownership concentration in explaining stock price adjustment plays an important role especially during the period of crisis in stock market (Kamyabi et al, 2016). Therefore, in this research, our main goal is the relationship between controlling shareholders and concurrency of stock cost in the companies accepted in Tehran stock exchange.

Theoretical framework of research

In the recent years, institutional ownership in European and American stock exchanges has had dramatic growth. In Iran also, it is observed that it includes insurance institutes including social security organization, pension funds, commercial insurance companies and also investment companies and public and quasi-public institutes. Institutional investors as a group of investors, because of access to huge financial sources play important role in economic development of capital market; wide presence of institutional investors has important consequences both for corporative decisions and for the behavior of stock price. Institutional shareholders, because of their power on management, can supply the benefits of all shareholders in addition to their benefits by supervision on management. Researchers believe, such influence has special importance towards realizing social goals of capital markets. Therefore, nature of ownership can surely expose positive aspect of ownership concentration. For example, Shleifer and Vishny (1997) consider beneficiary the high concentration of institutional ownership and believe that in this state, concentration of ownership leads to the decrease of agency issues and support of shareholders. Dargahi and Pashanezhad (2012) believe that institutional investors because of including high-diversity scale economic efficiency in their portfolio are able to minimize the problems of delegacy. In the other words, the existence of institutional shareholders causes the separation of ownership and control while their increasing involvement in companies and concentration of ownership creates a way for supervision on company management (Kamyabi and Parhizgar, 2016).

Generally, it is conceptualized that the presence of institutional investors may lead to the change in the behavior of companies which this issue is originated from supervisory activities that these investors do. Institutional investors' use of their abilities for supervision on management and performance of company is a function of their investment amount. The more, the amount of their investment, the better the supervision on management, "this is a direct relationship" (Maug, 1998).

Literature review

Boubaker et al (2013) in their research addressed the investigation of big control shareholders and concurrency of stock price by using the data of 654 companies accepter in France stock exchange during 1998-2007. The results of this research represent that concurrency of stock price and extra control supports this reasoning that controlling shareholders increase the tendency to expose lower information of specific company for hiding opportunistic practices.

Chan (2008) investigated the relationship between the price of concurrency stock and investment sensitivity to stock price. Having a sample including 68277 companies from 1981 to 2001, they achieved a positive relationship between lower level of concurrency stock price and investment sensitivity to stock price. The results represent that stock price may contain the information that the managers don't have and the information of managers (private information) helps them in decision making to be the information of Criterion Company for price measurement.

Baqeri Salimi and Kamyabi (2015) investigated the structure of ownership and concurrency of price. Location range of this research is the companies accepted in Tehran's stock exchange and temporal range between 2009 and 2013. The results showed that there is a positive significant relationship between institutional ownership, managerial ownership and corporative ownership to concurrency of stock price.

Hypothesis

H_1: *Prediction of effective factors on concurrency of stock price based on neural network method is possible.*

Methodology

Research method

This is an applied research in terms of goal-based categorization. The goal of applied research is to develop knowledge in a specific area. Also, this method is descriptive type in terms of method-based research categorization. Descriptive research describes and anticipates the thing without any manipulation. Also, this is ex-post facto research i.e. follows discovering and investigating the relations between specific factors and conditions that are occurred in the past.

Analysis method

To analyze information, two methods of inferential statistics and descriptive statistics were used. In descriptive statistics, mean, middle, standard deviation, skewness, elongation, minimum and maximum are used and in inferential statistics, neural network method are used. Also, SPSS23 software is used for analysis in this research.

Research model

In this research, the following method is used for the test of research hypothesis.

$$SYNCH_{it} = \beta_0 + \beta_1 EXCRESS_{it} + \beta_2 UCF_{it} + \beta_3 LEV_{it} + \beta_4 STDER_{it} + \beta_6 SIZE_{it} + B_7 MB_{it} + \varepsilon_{it}$$

SYNCH: Concurrency of stock price

EXCRESS: Control concurrency

UCF: Standard deviation of unlevered cash flow

LEV: Financial pyramid

$STDER_{it}$: Standard deviation of daily yield

SIZE: Company size

MB: Growth opportunity

Concurrency of stock price ($SYNCH_{it}$): In order to measure concurrency of price, Piotroski and Roulstone model (2004) is followed

$$synch = \log(\frac{R^2}{1-R^2})$$

Where R^2 is the determination coefficient of the changes in two factors market's and industry's monthly yield during one fiscal year and its influence on stock's monthly yield

$$R_{it} = \alpha + \beta R_{mt} + \gamma R_{it} + e$$

R_{it} : Yield of company stock

R_{mt} : Yield of company market

R_{it} : Yield of industry

We obtain the above equation for 12 months period in each year. In the equation R^2 operates as a scale for measuring concurrency of price.

Control shareholders ($EXCRESS_{it}$): In this research, we use institutional shareholders as control shareholders and it is obtained from the ratio the sum of the stock by institutional owners to total shared stock of company (Boubaker ,2013).

Standard deviation of unlevered cash flow (UCF_{it}): Standard deviation of unlevered cash flow for I company in the year T (Boubaker, 2013).

Standard deviation of daily yield ($STDER_{it}$): Standard deviation of daily yield for I company in the year T (Boubaker, 2013).

Financial leverage (LEV_{it}): Financial leverage is the ratio of total debt to total asset (Boubaker, 2013).

Company size ($SIZE_{it}$): Natural logarithm of total company assets (Boubaker, 2013).

Growth opportunity (MB_{it}): The ratio of market value for shareholders salaries to book value of shareholders' salaries (Boubaker, 2013).

Population

The population of the study is all listed companies in Tehran Stock Exchange during the period of 2006- 2011, of the 520 companies listed in Tehran Stock Exchange, which meet all of the following criteria:

1 - To March 2006 are listed, and their names until the end of March 2012 from the list of listed companies are not removed.

2 - During the desired period, their shares are traded actively on an exchange.

3 - Their financial period must be ended 29 March, and in the course of the study, the financial terms have not changed.

4 They are not among financial intermediation companies (investment, holding, leasing, and banking and insurance) because of their different performances.

5 - The information you need is available.

In this study, 93 companies as sample are selected.

Descriptive statistics

In the section of descriptive statistics, data analysis is performed using central indicators such as mean, middle, and disperse indicators of standard deviation, skewness and elongation. In this regard, mean is the most main central indicator and shows data average such that if data are rowed on an axis, mean value exactly locates on balance point or gravity center. Standard deviation is among dispersion parameters and shows dispersion rate of data. Skewness is also among the parameters to determine deviation

from symmetry and is the indicator of symmetry in data. If the socity includes symmetric distribution, skewness coefficient is equal to zero, if the society has deflection to left, skewness coefficient is negative and if it has deflection to right, skewness coefficient is positive. Elongation is also measurement indicator of society dispersion than normal distribution. In table 1, we observe descriptive statistics of variables after removing outliers.

Table 1 Descriptive Statistics

	SYNCH	EXPRESS	UCF	LEV	STDER	SIZE	MB
Mean	0.006	68.980	23403.64	0.618	0.059	13.259	2.171
Median	- 0.000	78.150	7223.031	0.639	0.035	13.175	1.833
Maximum	1.059	97.700	419791.9	1.049	0.288	16.384	8.569
Minimum	- 0.474	0.000	116.833	0.154	0.002	10.131	- 0.559
Std. Dev.	0.103	27.464	51134.93	0.187	0.055	1.213	1.518
Skewness	4.142	-1.050	4.533	- 0.228	1.392	0.179	1.263
Kurtosis	40.192	2.905	26.459	2.616	4.308	3.003	4.912
N	534	534	534	534	534	534	534

Normality of dependent variable

In order to implement statistical methods and calculate appropriate test statistics and logic inference about research hypothesis, the most important action before any other is to select appropriate statistical method for research. For this purpose, Kolmogorov-Smirnov Test was used in this research for investigating the hypothesis of normality for research data which the results are shown in table 2.

Table 2 One-Sample Kolmogorov-Smirnov Test

		SYNCH
N		534
Normal Parameters	Mean	0.006
	Std. Deviation	0.103
Most Extreme Differences	Absolute	0.295
	Positive	0.295
	Negative	0.243
Test Statistic		0.295
Sig. (2-tailed)		0.000[c]

With regard to the table of Kolmogorov-Smirnov Test if significance level for dependent variable is lower than test level (0.05), data distribution is not normal. Since significance level of dependent variable is lower than 0.5. Therefore, it doesn't have normal distribution. In this research, we used Johnson transformation for normalization.

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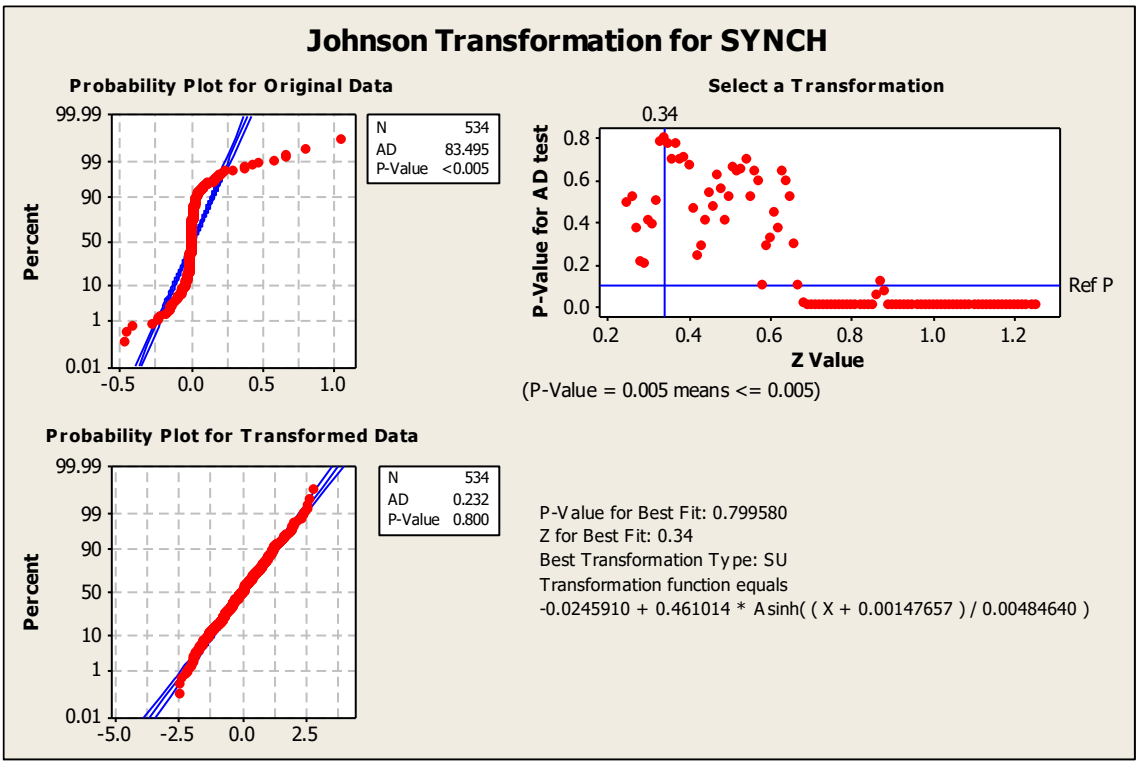


Graph 1 Johnson Transformation for SYNCH

The results from Kolmogorov-Smirnov Test are shown in table 3 after normalization process:

Table 3 One-Sample Kolmogorov-Smirnov Test

		SYNCH
N		534
Normal Parameters	Mean	0.019
	Std. Deviation	0.990
Most Extreme Differences	Absolute	0.021
	Positive	0.021
	Negative	-0.014
Test Statistic		0.021
Asymp. Sig. (2-tailed)		0.200

Findings of the research hypothesis

Allocation of the number of sample members

Allocation of the number of sample members is presented in table 4 and represents that in this research, 66.7% equivalent to 356 data sample are selected as training sample and 178 data equivalent to 33.3% are selected as testing.

Table 4 Case Processing Summary

		N	Percent
Sample	Training	356	66.7%
	Testing	178	33.3%
Valid		534	100.0%
Excluded		0	
Total		534	

Network Information

The table shows information neural network model related to neural networks and is applicable for ensure about the correctness of allocated cases. Summary of neural network model is presented in table 5.

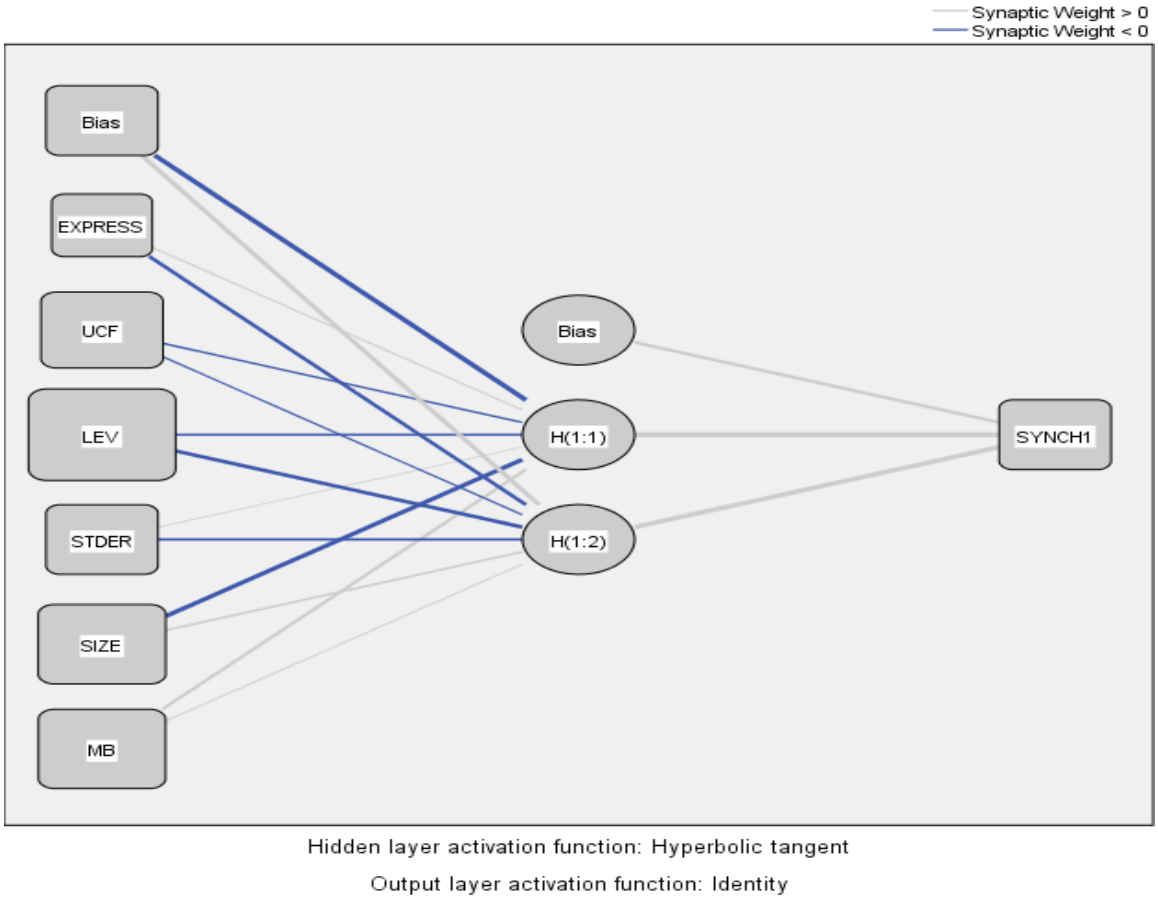
Table 5 Network Information

Input Layer	Covariates	1	EXPRESS
		2	UCF
		3	LEV
		4	STDER
		5	SIZE
		6	MB
	Number of Units		6
	Rescaling Method for Covariates		Standardized
Hidden Layer (s)	Number of Hidden Layers		1
	Number of Units in Hidden Layer 1[a]		2
	Activation Function		Hyperbolic tangent
Output Layer	Dependent Variables	1	SYNCH
	Number of Units		1
	Rescaling Method for Scale Dependents		Standardized
	Activation Function		Identity
	Error Function		Sum of Squares

Table 5 shows the summary of neural network model that the resulting neural network includes 6 input layers, 1 middle layer with 2 units and 1 output layer. The operation function used in middle layer is hyperbolic tangent function and the used error function is Sum of Squares.

Neural Network Structure

Although neural networks impose minimal demands on model structure and assumptions, it is useful to understand the general network architecture. The multilayer perceptron (MLP) or radial basis function (RBF) network is a function of predictors (also called inputs or independent variables) that minimize the prediction error of target variables (also called outputs).



Graph 2 Feedforward architecture with one hidden layer

This structure is known as a feedforward architecture because the connections in the network flow forward from the input layer to the output layer without any feedback loops. In this figure:

– The input layer contains the predictors.

– The hidden layer contains unobservable nodes, or units. The value of each hidden unit is some function of the predictors; the exact form of the function depends in part upon the network type and in part upon user-controllable specifications.

– The output layer contains the responses. Since the history of default is a categorical variable with two categories, it is recoded as two indicator variables. Each output unit

is some function of the hidden units. Again, the exact form of the function depends in part on the network type and in part on user-controllable specifications.

Model summary

In table 6, sum of squares error is shown since output layer has variables dependent on scale. This is the error function that network tries to minimize it during education operation.

Table 6 Model Summary

Sum of Squares Error	0.274
Relative Error	0.002
Sum of Squares Error	0.187
Relative Error	0.002

Dependent Variable: SYNCH

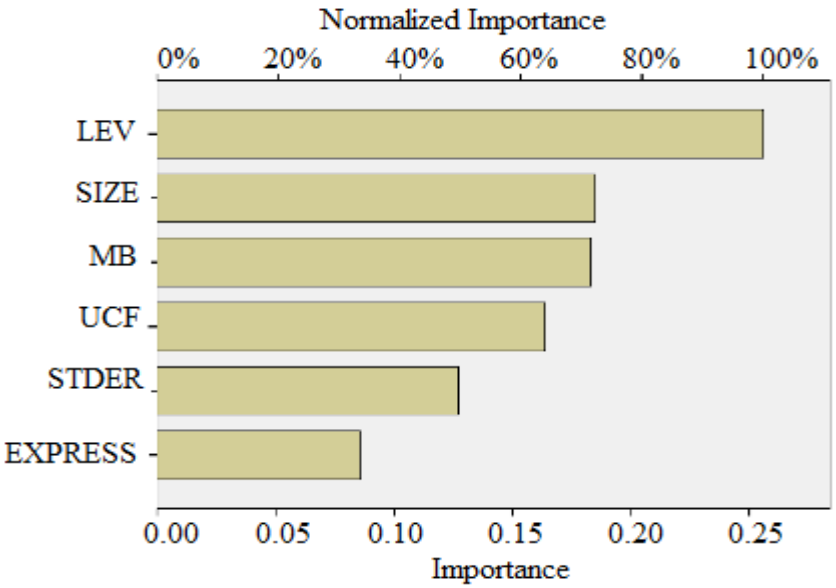
Error sum of squares for training is equal to 0.274 and its relative error is equal to 0.002. Also, error sum of squares for testing is equal to 0.187 and its relative error is equal to 0.002, and because relative error level of both samples are equal, therefore model fitness is acceptable.

Independent variable importance

This is a sensitive analysis that calculates the importance of each predictor in determination of neural network. The analysis can be performed on the basis of education samples and integrated test or only on education sample if there is no test sample. Finally, a table is presented that shows the importance and normalized importance of each forecaster. The results of importance level of independent variable are briefly presented in graph 2 and table 7.

Table 7 Independent Variable Importance

	Importance	Normalized Importance
EXPRESS	0.086	33.5%
UCF	0.164	64.0%
LEV	0.256	100.0%
STDER	0.127	49.7%
SIZE	0.185	72.2%
MB	0.183	71.5%



Graph 3 Independent Variable Importance

Conclusion

The aim of this research is predicting the effective factors on concurrency of stock price considering corporative governing based on neural network. This study is based on Neural Network. The data of 93 financial companies listed on Tehran Stock Exchange during the period of6 years (2009-2015) have been studied. The sample is divided into two categories of testing and training.

Allocation of the number of sample members is presented in table 4 and represents that in this research, 66.7% equivalent to 356 data sample are selected as training sample and 178 data equivalent to 33.3% are selected as testing. Also the results of Table 5 show the summary of neural network model that the resulting neural network includes 6 input layers, 1 middle layer with 2 units and 1 output layer. The operation function used in middle layer is hyperbolic tangent function and the used error function is Sum of Squares. Also the results of table 6 show that Error sum of squares for training is equal to 0.274 and its relative error is equal to 0.002. Also, error sum of squares for testing is equal to 0.187 and its relative error is equal to 0.002, and because relative error level of both samples are equal, therefore model fitness is acceptable. The results of this research are consistent to Boubaker (2013) and Chan (2008).

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