Investigating the Relationship between Inflation Rates, Exchange Rates, Interest Rates and Stock Prices (Case Study Mapna and Takinco Companies)

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Abstract

Evaluating the effectiveness of macroeconomic variables on the stock market and stock prices is noticeably significant. In this study, by defining the relationship between macroeconomic variables including inflation rates, exchange rates, interest rates, and stock prices, we first try to specify a review of the research literature. Next, we examine the relationship between these variables and share prices and their impact in Mapna and Takinco companies. In this regard, Auto-Regression with Delay Lag has been used. Enjoying the required tests, such as the Dickey-Fuller Test, Co-integration Test, Analysis, Error Correction, and the use of Neural Networks, and using Econometric Evaluation Software, it becomes clear that there is a negative relationship between inflation, exchange, interest rates and share prices. Also, the effectiveness of the variables in short-term and long-term is taken into consideration. It should be noted, Neural Network Model has also been used to enhance the validity and reliability of the current research.

Keywords: Inflation, Exchange, Interest, Share Price, Auto Regression With Delay Lag

Introduction

Since Iran has a state-run economy due to a bureaucratic environment, and a slow decision making process, the reaction in the economic variables takes place with a time delay. In other words, changes in certain variables, such as exchange rate, inflation and interest rates do not immediately affect the costs and revenues of companies and their impacts will appear gradually with the passage of time, and the market reaction is also seen with delay. Micro and macroeconomic factors are changing dynamically over time. The point to be noted is that, different economic sectors are not equally affected by these changes, and this depends on the type and magnitude of that portion of the economy. Given the importance of Tehran Stock Exchange in the economy of the country, identifying the effectual variables can be useful in leading this sector of the economy effectively. The claim that macro-financial variables, such as inflation, exchange and interest rates are stimulating and effective on changes in stock prices, has been accepted as a theory. However, in the past decade, efforts have been made to evaluate the impact of economic forces theoretically and to measure its effects empirically. The dynamic relationship between these variables of macro-financial and stock returns has been investigated extensively. But the key point, which has been less considered in the previous

studies, is investigating this subject in the existing specific industries in Tehran Stock Exchange. In other words, it is possible, due to differences in the type and nature of stock companies in various industries; there are different reactions in different industries to macro-financial variables. So, the question of this study is to investigate the relationship between macro-financial exchange rate, inflation rate, interest rate and stock prices in the industry of technical and engineering services in Tehran Stock Exchange. In other words, what the changes in these variables will be like in the afore-mentioned industry, given the nature of the companies active in this field. This subject, according to the importance of issues such as importing raw materials, exporting products and services, contractual expenses, and the implementation of projects, and receiving and repaying bank loans in the engineering industry of the stock market, due to the nature of the activities of the active companies in this field, has a double significance.

Theoretical Principles

Macro-financial variables of the Research

Macro-financial variables considered in this study along with the expected impacts include:

Inflation rate

In terms of inflation, the average nominal corporate profits increase after a period of time without any real profitability rise. Therefore, the increased inflation lowers the quality of the company's actual earnings and the intrinsic value of per share is likely to decrease, too. On the other hand, with the rising inflation, the investors' expected interest rate will increase, therefore, the falling cash flow rate, and the costs of the lost money opportunity will rise as well. Hence, there is expected to be a negative relationship between inflation rate, share prices and yields, and consequently the stock price index. [6]

Exchange Rate

Exchange rate in developing countries is one of the effectual economic variables. Due to the fact that companies and institutions in this kind of countries mainly supply their needs by imports from developed countries, changes in exchange rate are one of the important factors affecting conversion and paying off debts. Increase in the exchange rate, on the one hand, leads to an increase in the external debt and, on the other hand, causes an increase in the final cost of products and the imported services provided by these companies. Considering that the increase in corporate debt results in the lack of liquidity and lack of liquidity in economic firms has a negative effect on profit distribution, share efficiency and equity price index, and also an increase in the final cost of manufactured products is accompanied with lower margins, lower price and return on equity, and consequently, the reduction in the stock index. [6]

Real bank interest rates

Investors are looking for an efficient basket for investment. Hence, they fill their asset baskets with various items such as cash, stocks, bank deposits, bonds and etc. According to the experiences gained from the results of the investment returns in the Iranian stock market and its being risky, the investors are not satisfied with their investment returns in the stock market in relation to its risks. On the other hand, the existence of risk-free long-term bank deposit interest rates in Iran has made this macro economic variable a competitor for the stock market investment. On the other hand, because of the huge loans taken by the companies active in the country in order to advance their objectives, 'bank interest rate' is regarded asa key variable in debt repayment that the higher the bank interest rate is, the more challenges these companies will face. Hence, it is expected that an increase in the real bank interest rate will have a negative correlation with the growth rate of the stock price index.

Meanwhile, there is the possibility of other macroeconomic factors affecting the stock price, which influence the relationship between dependent and independent variables,among which the political news and disputes between countries, international economy, oil prices, and etc. could be pointed out. This issue in countries which do not have a strong and dynamic economy may lead to this conclusion that the market of these countries might have been more influenced by politics and political issues than their economy. Other economic factors including monetary and…. might have influenced the prices and, consequently, the returns so that the expected relationship between independent and dependent variables is not achieved, or even in some cases, it is possible that the afore-mentioned factors somewhat neutralize each other's positive or negative results, which may be difficult to be identified. Also, since the return on equity is calculated based on stock prices, there is the option for the prices being affected by qualitative factors other than the mentioned ones, such as rumors and psychological atmospheres in the stock market, not to show the effects of macro-financial returns and, in other words, these qualitative factors fade the impact of macro-financial variables, or lead them to unexpected changes. The lack of adequate participation of the public investors in the stock market or, in other words, investment culture can also be involved. Not only can the development of investment culture give rise to public participation in investment, but also it can cause the absorption of the existing liquidity in the society, which plays an important role in building a healthy economy. [6]

Factors affecting the stock price can be divided into the internal and external ones. Internal factors affecting stock prices are those in connection with the company's operations, and the decisions made in the company. External factors are those outside the company's management

authority and somehow affect the company's activities. These factors are those events and decisions that occur outside the company, but affect the stock price. [9] Given the considerable fluctuations in exchange rates, inflation and interest rates in the country and the companies active in the engineering industry, which are noticeably affected by such variables, understanding the relationship between these variables can be of great importance in minimizing or fixing the negative impacts on stock returns and stock prices, and turning threats into opportunities, and can pave the way for the success of any organization, especially in terms of profitability and the return on equity.

Research Background

International research carried out on stock price and effectual variables affecting it in America, Britain, Japan, Germany, France, Canada, Switzerland and Belgium, is indicative of the relationship between the exchange rate, interest rate , inflation rate, and stock prices as macroeconomic variables affecting the stock price. This has been recorded in other studies in Thailand, Taiwan and the Philippines. Also, other studies that have been done in the countries of G7 show that in the long- run, there is no relationship between exchange rate and stock prices, but in the short- run there is a significant relationship. In this research, the economic situation, policies, government policies, expectation patterns and other factors are known as effectual factors. Studies in India, Bangladesh and Sri Lanka, have shown that there is a relationship between interest rates, exchange rates and financial stock return. Furthermore, the research carried out in three areas of banking, financial services and insurance in 16 different countries across Europe, taking advantage of the model GARCH, has represented a relationship between exchange rates , interest rates and stock returns, however, their impact on the banking industry and insurance services was more than that of the insurance industry. Research conducted in Pakistan about the relationship between interest rates, exchange rates and financial stock return shows exchange rates and interest rates have had a significant effect.

Research carried out at an international level indicates that there is significant dependency between the exchange rate and stock prices using different methodologies, but there is no general consensus on the type of dependency. In other words, sometimes the relationship is positive and sometimes negative that, depending on the specific circumstances of each country, the intensity of the dependency can vary.

[19] Numerous studies have been conducted in this regard that a number of them are referenced as the following:

Table 1. Conducted Studies

year	researcher	Research result	Used model
2002	Arango	The non-linear and inverse relationship between interest rates and stock prices. [11]	
2005	Zordan	An inverse relationship between interest rates and stock prices. [11]	
2009	Alam	If there is proper control of interest rates, investors can be found to have positive effects on stock and stock price. [11]	regression analysis
2012	Puja & Pramod	The absence of a meaningf ul relationship between stock prices and exchange rate [9]	Vector error correction
2011	Sayilgan & Suslu	Negative relationship between exchange rate and stock prices [9]	Fixed effects model
2011	Mushtag	Presence of a negative relationship between exchange rate and stock prices [9]	Extended conditional explanation
2010	Wang	A Bilateral relationship between inflation and stock price index, and a one -way relationship between interest rates and stock prices [9]	Model EGarch
2002	Madsen	A Negative relationship between interest rates , inflation rates and stock prices [11]	Unbalanced data model

2008	Anokye & Tweneboach	Indicating The stock price changes by inflation and interest rate variables with delay, and the weak impact of exchange rates on the stock price changes [11]	
2008	Duker & Bordo	Strong and negative impact of inflation and interest rates on stock prices. [11]	
2008	Gay	Weak relationship between exchange rates and stock prices. [11]	ARIMA model
2007	Jayaraman & Puah	Elasticity of the stock price index in relation to exchange rate and inelasticity in relation to interest rate [11]	
2011	Pal & Mittal	Significant effect of inflation rate on stock prices eak effect of interest rates and exchange rates and GDP on stock prices [14]	
2007	Ahmed & Imam	The lack of long-term money supply , industrial production and GDP relation with stock prices, but the impact of interest rates on stock prices [14]	
2008	Liu & Shrestha	Negative relationship between exchange rates, inflation and interest rates, and stock prices [14]	
2012	Aurangzeb	Significant and positive impact of investment and exchange rates on stock prices, a significant negative impact of interest rates and low negative impact of inflation rate on the stock price [14]	multiple regression
2015	Harsh & Sharifi&Rekha	Positive and significant relationship between internal variables, administrative value and earning of per share and investment return to share earnings, and stock price [22]	multiple regression
2010	Butt, Kashif	The negative impact of inflation rate and the negative impact of exchange rate on stock returns (Butt, Kashif, 2010)	Model Garch
2006	Liow	The meaningful relationship between exchange rates , interest rates, inflation rates and stock returns [15]	
2012	Mahfoudh	The positive relationship between exchange rates and stock prices in the short term, and no relationship between interest rates, inflation rates and the stock price and the negative correlation between the exchange rate and the stock price in long term[19]	Regression and correlation
2014	Zhongqiang	Low impact of inflation rate on stock prices [24]	VAR method
2012	Zohaib & Lala	Non-substantial impact of inflation and interest rates on stock returns and significant impact of the exchange rate on return on equity [25]	Multiple regression model

2013	Aishahton & Mansur	Significant negative relationship between the exchange rate and stock price, and a non - significant relationship between interest rates and stock prices. [13]	VECM model
2015	Engel	The more impact of exchange ratescompared with interest rates [16]	VCEM models and regression analysis
2011	Prashanta, Bishnu	The negative influence of exchange rates and the positive impact of interest rates on stock returns [21]	Johansen and ADF Model
2012	Gupta, Chevalier, seyekt	The indirect and weak impact of exchange rates, interest rates and stock prices [17]	ARIMA model
2006	Yutaka	Lack of any relationship between interest rates and stock prices, and a minimal relationship between exchange rates and stock prices [23]	VAR models
2008	Saidi and Amiri	Negative relationship between exchange rates and stock price index, and the positive relationship between the inflation rate and the share price [9]	Autoregressive
2009	Pirani and Shahsavar	Direct relationship between stock prices and the general price level, and a reverse relationship with the exchange rate [9]	And self-explanatory vector error correction model
2006	Nouri and Mosharrafi	A Long -run relationship between the inflation rate, exchange rate and the stock price [9]	ARDL model
2006	Karimzadeh	Negative relationship between exchange rates, interest rates and stock prices [9]	ARDL model
2010	Sajadi and Farazmand and Sufi	Negative relationship between inflation rate, interest rate and stock returns [6]	
2013	Meidani, Shakeri and Ata	Direct and significant relationship between exchange rates and stock prices [9]	Panel data method
2010	Nasrollahi and Mirzababaei	positive rela tionship between exchange rates and stock prices [10]	VAR method
2012	Karimizadeh and Sharifi	The negative effect of inflation and exchange rate s on stock returnsand the positive effect of bank interest on stock returns[7]	Johanson method - Juselius
2011	Heidari and Bashiri	Negative relationship between exchange rates and stock prices [3]	Model Garch
2015	Moghbeli	The negative effect of exchange rates with stock prices [8]	VAR method

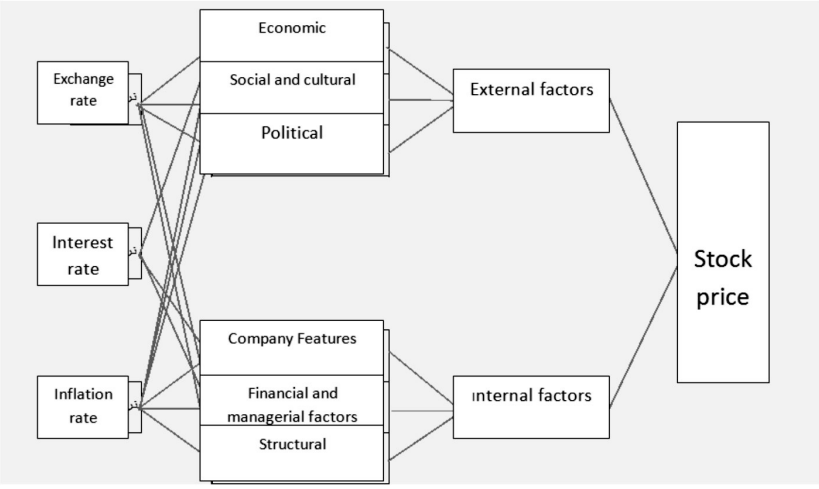
By studying the research literature, it is clear that many variables affect the stock price, including the following.

Budget, the past stock prices, the industry, the country's monetary and fiscal policies, profit-sharing enterprises, development projects and increasing the company's capital, the composition of investment, credit, and company's history, gossips, supply and demand for shares, the company's management, political factors, trading volume, type of ownership [2], operating cash flows, book value of per share, company size, dividend, return on assets, asset turnover rate [5], the exchange rate, consumer price index, real income of the company [9], GDP, money supply, gold prices, housing prices, exchange rates [18], inflation, industrial production growth, interest rates [15] organizational performance, stock prices in other countries, the volume of money, employment, income distribution [19], investors' expectations, rules and regulations [24] oil prices, inflation, exchange rates, interest rates, money supply [12], social and cultural situation, international economy, liquidity, economic growth rate, the state budget, value-added industry, the volume of trade exchange, the stock liquidity, EPS, P/E, ratio of book value to market value, DPS, business and trade and market risks, financial risks [20]

Research Pattern

The conceptual model used in the study is as follows, which is derived from research literature and the previous research conducted in this regard.

Figure 1. Research Conceptual Model



Any research to maintain the integrity and objectivity and their application should be organized following a few basic problem. [4] According to the above pattern, the following hypotheses are proposed:

1. There is a negative relationship between the exchange rate and the stock price growth rate in Mapna and Takinco companies.
2. There is a negative relationship between the inflation rate and the stock price growth rate in Mapna and Takinco companies.
3. There is a negative relationship between the bank interest rate and the stock price growth rate in Mapna and Takinco companies.

ResearchMethodology

In this article, in order to investigate the negative relationship between the exchange rate, interest rate, inflation rate and the stock price, at first, the intended economy evaluation model is devised by means of Auto-Regression Model with Delay Lag as follows:

$Yt=\alpha0+\alpha1Yt-1+ \alpha2Yt-2 +\beta1X1t+ \beta2X2t+ \beta3X3t+ \beta4X1t-1+ \beta5X2t-1+ \beta6X3t-1 + \beta7X1t-2+ \beta8X2t-2+ \beta9X3t-2 + \beta10 X1t X2t + \beta11 X1t X3t+ \beta12 X2t X3t+€t$

The items (components) in the above-mentioned model are as follows:

Yt = share price at the time of t

αl = fixed factors

$Yt-1$ = share price at time of t-1

$X1t$ = inflation rate at the time of t

$X2t$= exchange rate at the time of t

$X3_t$= interest rate at the time of t

X1t-1= inflation rate at the time of t-1

X2t-1= exchange rate at the time of t-1

X3t-1= interest rate at the time of t-1

ϵ_t= degree of error

The research community of this research is the technical and engineering services industry, among which two companies (mapna and takinco) active in this industry were chosen. Regarding the time period of the research, the 7-year period from 1387 to 1393, in terms of seasonal data, is considered. In this article, in order to estimate the model between variables, the method of economy evaluation of Auto-Regression with Delay Lag (ARDL) has been applied. [1] For this purpose, in the first place, the Steady State and static of the variables were investigated and then the factors of the model were attained. To investigate the competency of the model with respect to the underlying hypotheses of the Regression model, the analysis of residuals (RESIDUAL) was utilized. Next, for the accuracy and for increasing the reliability of the intended pattern, the Neural Network has been used.

Data Analysis

Evaluation of the Presented Model

Considering the presented model and applying the economy evaluation software, the attained results are as follows. The results are the preliminary estimates of ARDL:

meaningfulness	Upper level	Lower level	factor	Item in the model
1	27868.71	8173.571	18021.14	α_0
1	1.454728	0.424454	0.939591	Y_{t-1}
0	1.037171	-0.48197	0.277602	Y_{t-2}
1	-3254.68	-95680.2	-49467.5	X^1_t
1	0.012495	0.00123	-1.06437	X^2_t
1	-886.096	-2103.44	-1494.77	X^3_t
1	12657.34	9842.49	1407.425	X^1_{t-1}
1	-0.02606	-0.08249	-0.05427	X^2_{t-1}
1	705.4511	31.1945	337.1283	X^3_{t-1}
0	6039.079	-9038.92	-1499.92	X^1_{t-2}
0	0.051483	-0.06727	-0.00789	X^2_{t-2}
0	278.7453	-237.855	20.44541	X^3_{t-2}
0	0.884995	-0.09999	0.392505	$X^1_t X^2_t$
0	7046.66	-28.3403	3537.5	$X^1_t X^3_t$
0	0.12571	-0.00179	0.061959	$X^2_t X^3_t$

$R^2 = 0.9952$

meaningfulness	Upper level	Lower level	factor	Item in the model
1	11409.89	5765.9	2821.992	α_0
1	1.765342	0.08213	0.841605	Y_{t-1}
1	1.005306	0.34153	-0.66811	Y_{t-2}
1	31148.35	23621.3	-16236.5	X^1_t
1	1.092948	1.00755	-0.1523	X^2_t
1	450.4526	317.567	-183.557	X^3_t
1	6975.354	1662.6	-4827.12	X^1_{t-1}
1	0.08706	0.05838	-0.02566	X^2_{t-1}
1	284.6694	46.2161	119.2266	X^3_{t-1}
0	9000.36	-4217.46	2391.449	X^1_{t-2}
0	0.026727	-0.08583	-0.02955	X^2_{t-2}
0	164.0783	-180.693	-8.30716	X^3_{t-2}
0	0.751784	-0.42368	0.164053	$X^1_t X^2_t$
0	5087.389	-2115.51	1485.94	$X^1_t X^3_t$
0	0.076637	-0.06801	0.004311	$X^2_t X^3_t$

R^2 =0.9754

The meaningfulness column is indicative of the intended variables being meaningful in the model. Based on the results achieved, it is clear that none of the reciprocaleffects nor the time delay (delay lag) of level2 are meaningful. Thus, considering the suitable R2 of the preliminary model, the meaningfulness of the reciprocal effects and the time delay of level2, the model is changed. The intended final economy evaluation, taking advantage of Auto-Regression model with delay lag in regard to the share price is as follows:

$Yt=\alpha0+\alpha1Yt-1+\beta1X1t+\beta2X2t+\beta3X3t+\beta4X1t-1+\beta5X2t-1+\beta6X3t-1+€t$ Share price of Mapna

$Yt=\alpha0+\alpha1Yt-1+\beta1X1t+\beta2X2t+\beta3X3t+\beta4X1t-1+\beta5X2t-1+\beta6X3t-1+€t$ Share price of Takinco

Steady State Test

Static or stationary variables of the model are studied, using improved Dickey-Fuller Test Model.

meaningfulness	Critical level	statistics	variable	
0	-1.9497	1.71663	Y_t	Level 0
0	-1.9497	-0.94458	X^1_t	
0	-1.9497	-1.34271	X^2_t	
0	-1.9497	1.269064	X^3_t	

meaningfulness	Critical level	statistics	variable	
0	-1.9497	1.71663	Y_t	Level 0
0	-1.9497	-0.94458	X^1_t	
0	-1.9497	-1.34271	X^2_t	
0	-1.9497	1.269064	X^3_t	

The results of Dickey-Fuller test, applying economy evaluation software for the static of the final model, indicate that there exists unit root. Therefore, level One subtraction regarding the independent and dependent variables of Auto-Regression is utilized. After repeating Dickey-Fuller test and taking advantage of the subtracted (differences) data, the results in level 1 are as follows:

Dickey-Fuller test results for the static of the final model (level one) in Mapna

Level 1	Variable	Statistics	Critical Level	Sig.
	Y_t	-3.76572	-1.9496	1
	X^1_t	-2.16844	-1.9496	1
	X^2_t	-5.12122	-1.9496	1
	X^3_t	-4.89898	-1.9496	1

Dickey-Fuller test results for the static of the final model (level one), in Takinco

Level 1	Variable	Statistics	Critical Level	Sig.
	Y_t	-3.0484	-1.9496	1
	X^1_t	-2.16844	-1.9496	1
	X^2_t	-5.12122	-1.9496	1
	X^3_t	-4.89898	-1.9496	1

Therefore, the variables in the Level One subtraction are static and Steady State, consequently, the method of Auto-Regression with Delay Lag (ARDL) is used in order to investigate the relationships among variables.

Auto-Regression with Delay Lag

The Intended economy evaluation model; utilizing Auto-Regression with Delay Lag model is as follows:

$\Delta Yt=\alpha 0+\alpha 1\Delta Yt-1+\beta 1\Delta X1t+ \beta 2\Delta X2t+ \beta 3\Delta X3t+ \beta 4\Delta X1t-1+ \beta 5\Delta X2t-1+ \beta 6\Delta X3t-1+€t$

meaningfulness	Upper limit assurance gap	Lower limit assurance gap	deviation	factor	Item in the model
1	355.9269	68.7132	84	143.6069	α_0
1	0.981127	0.477592	0.03	0.809359	ΔY_{t-1}
1	4838.305	706.08	1215	-1114.89	ΔX^1_t
1	0.025268	0.02201	0.001	-0.00037	ΔX^2_t
1	-433.515	-715.497	83	-574.506	ΔX^3_t
1	8875.288	1980.34	2028	3447.472	ΔX^1_{t-1}
1	-0.02082	-0.07181	0.01	-0.04632	ΔX^2_{t-1}
1	500.0621	125.9923	110	313.0272	ΔX^3_{t-1}

The results of esti mating the model of share price of Mapna company by the method of ARDL with $R^2 = 0.8696$

meaningfulness	deviation	Upper level	Lower level	factor	Item in the model
1	64	273.5509	55.4041	109.0734	α_0
1	0.08	0.736448	0.19483	0.270807	ΔY_{t-1}
1	538	2431.875	603.61	-1799.87	ΔX^1_t
1	0.0006	0.010647	0.0085	-0.00893	ΔX^2_t
1	0.87	13.53748	10.567	-86.5149	ΔX^3_t
1	870	5612.009	2653.65	1479.178	ΔX^1_{t-1}
1	0.0007	-0.00275	-0.00042	-0.02238	ΔX^2_{t-1}
1	20	143.0977	75.2886	33.90455	ΔX^3_{t-1}

The results of estimating the model of share price of Takinco company by the method of ARDL with $R^2 = 0.8696$

In Mapna, according to the statistics of R2, independent or explanatory variables of the model have explained 87 percent of the changes of the dependent variable, which represents the high explanatory power of the model.

According to the attained results in the previous table, the intended mathematical model in the company of Mapna is as follows.

$$\Delta Yt=143+0.8\Delta Yt\text{-}1\text{-}1114\ \Delta X1t\text{-}0.0004\ \Delta X2t\ \text{-}574\ X3t+3447\ X1t\text{-}1\ \text{-}0.05\Delta X2t\text{-}1\ +313\Delta X3t\text{-}1+€t$$

As specified in the model, there is a negative relationship between inflation rate, interest rate and exchange rate, and the share price of Mapna, which is also compatible with the theory.

In Takinco, according to the statistics of R2, independent or explanatory variables have explained 88 percent of the changes of the dependent variable, which is indicative of the high explanatory power of the model.

According to the results gained in the previous table, the intended mathematical model in the company of Takinco is as follows.

$$\Delta Yt=109+0.27\ \Delta Yt\text{-}1\text{-}1799\ \Delta X1t\text{-}0.0089\ \Delta X2t\ \text{-}86\ X3t+1479\ X1t\text{-}1\ \text{-}0.022\Delta X2t\text{-}1\ +34\Delta X3t\text{-}1+€t$$

As specified in the model, there is a negative relationship between inflation rate, interest rate exchange rate, and the share price of Takinco, which is consistent with the theory.

Co-integration Test

Considering the fact that the obtained absolute value of t (6.7-) in Mapna company, and also the obtained absolute value of t (9.1-) in the company of Takinco is greater than the absolute value of critical measures provided by Banerjee, crouch and MasterCard (3.9), the null hypothesis, that there is no long-term relationship, is rejected by 95 percent. The result is that there is a long-term relationship between macroeconomic variables and stock index rate.

The Analysis of the Error Correction Equation (ECM)

Error correction factor or (1-) ECM represents the balance in the long-run equilibrium rate. This factor shows how much of an imbalance in the dependent variable of the share price y t over the previous period, will be corrected in the current period. The Model related to share price is as follows.

$$\Delta Yt=\alpha 0+\beta 1\Delta X1t+\beta 2\Delta X2t+\beta 3\Delta X3t+\beta 4ECM(-1)+€t$$

In Mapna, the coefficient of ECM (-1) in the model has been estimated to be equal to -0.57 and, in Takinco, it is -1.17, which implies a suitable speed of fixing the short- term imbalance to a long-term balance. This factor, which is statistically meaningful, suggests that at any period in Mapna 0.57 Riyals and in Takinco 1.17 Riyals of the imbalance in the share price has been adjusted, and it is close to its long-term trend.

Neural Network Model

The results attained show that the neural network model is able to predict the share price of Takinco Company with an accuracy of 96.19 percent and that of Mapna Company with the accuracy of 96.66 percent, which is a very good result. It is noteworthy that, the neural network model with linear correlations and linear impacts is capable of modeling complex non-linear relationships as well because of its network structure. The accuracy achieved in predicting the share price of Takinco is the result of modeling nonlinear relationships between input and output variables. The input variables are the same as inflation, exchange and interest rates in both current and previous periods along with the share price in the previous period. Output variables are the share price in the intended period. The results of NN model are indicative of the very high explanatory power of these variables in determining the share price. Comparing the predicted results, based on neural networks, with the actual values shows that the predicted values coincide with the actual values in most places.

Thefindings of the Research

According to the hypotheses, the results are as follows.

1. **There is a negative relationship between the inflation and growth rates of stock prices in Mapna and Takinco companies.**

Based on the results in the company of Mapna, there will be 1% increase in the inflation rate in the short term, which would be equivalent to 11 Riyals decline in stock prices, as well as a 1% increase in the inflation rate, in the long-term, equivalent to 116 Riyals increase in the share price. Based on the results in the company of Takinco, there will be 1% increase in inflation rate, which is equivalent to18 Riyals decline in the share price in the short term. Also, the inflation rate will see a 1%- increase which is equal to 4.4 Riyals decline in the share price, in the long term.

2. **There is a negative relationship between the exchange and growth rates of stock prices in Mapna and Takinco companies.**

Based on the results of the research carried out in Mapna Company, the exchange rate will see 1000 Riyals increase which is equivalent to a 252-Riyal decline in the share price, in the long run. Also, there will be 1000 Riyals rise in exchange rates, equal to a 0.4-decline in the share price in the short-term. Based on the results in the company of Takinco, 1000 riyals increase in exchange rates, in the short term, will be equal to a decline in the share price with 9 Riyals. Also, 1,000 Riyals increase in the exchange rate, in the long-term, will equal a decline in the share price with 42 Riyals.

3. There is a negative relationship between interest and growth rates of stock prices in Mapna and Takinco companies.

Based on the results of the research conducted in the company of Mapna, 1% increase in interest rates, in the short term, will be equal to a decline in the share price with 574 Riyals. Also, a 1% increase in interest rates, in the long-term, would be equivalent of a 1305-Riyal decline in stock prices. Based on the results of the Company of Takinco, 1% increase in interest rates, in the short term, will be equivalent to an 86-Riyal reduction in the share price. Also, a 1% increase in interest rates, in the long-term, will be equal to a decline in the share price with 71 Riyals.

Conclusion and Discussion

In recent years, the impact of macroeconomic variables on corporate matters is one of the most important topics. The impact of these factors, according to the type and the industry of the companies active in different industries, can vary. The main objective of this study is to evaluate the effectualness of macro-economic variables, including inflation, exchange and interest rates on stock price index in Tehran Stock Exchange; Technical Services Industry, enjoying Auto-Regression model. For this purpose, two companies active in this industry known as Mapna and Takinco were studied in a period of 7 years. The results show that, in Mapna, there will be 1% increase in the inflation rate, in the short term equivalent of a decline in the share price of 11 Riyals and in the long-term, equivalent of 116 Riyals increase in the share price. On the other hand, based on the results gained in the company of Takinco, there will be 1% increase in the inflation rate in the short term, equivalent of an 18- Riyal decline in the share price and in the long-term equivalent of a 4.4-Riyal decline. Also, based on the results attained in the company of Mapna, there will be an increase by 1000 riyals in the exchange rate, equivalent of a 252-Riyal reduction in the share price in the long- run and in the short-run equivalent of a 0.4-Riyal reduction. Based on the results in Takinco Company, there will be a rise by 1000 riyals in the exchange rate, in the short term equivalent of 9 Riyals decline in the share price and in the long term equivalent of 42 Riyals decline. Based on the results in Mapna Company, there will be 1% increase in interest rates, equivalent to 574 Riyals decline in the share price in the short term, and 1305 Riyals decline in the long term. In Takinco, there will be 1% increase in interest rates, in the short term equivalent of 86 Riyals decline in share prices and in the long term equivalent of 71 Riyals. Moreover, in order to enhance the credibility of the results, in addition to Auto-Regression model, and different tests used, the neural network model has also been utilized and the attained results are expressing the accuracy of them.

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Also, in order to collect the required data, the following two sites will be used.

on Central Bank of the Islamic Republic of Iran

site Tehran Stock Exchange