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# Analysis of the Relationship between Oil Prices and Exchange Rates in Tehran Stock Exchange

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**Abstract:** *The money and capital markets, as pillars of the financial sector, have the duty of raising capital for real economy sector. The efficiency of financial sector leads to optimal allocation of scarce resources to economic activities. The money market is a place for short-term financing and capital market is a place for long-term financing of enterprises. Stock Exchange is a capital market in which financial assets are traded as securities. The recession and boom of stock market in some countries affect not only domestic economy, but also the global economy. Alternatively, the major policy makings affect the stock market in each country. For making decision to invest in the stock market, price is an important criterion which reflects investors' purchasing power and financial strength of the companies which are members of the stock market. Macroeconomic variables are important factors that affect the stock price. Therefore, this study aimed to examine the relationship among oil prices, exchange rates, inflation rate, and stock price index in Tehran Stock Exchange. For this purpose, the stock market has been studied in detail. Then, the theoretical foundations of research were studied which included portfolio theory, the theory of Fisher, arbitrage pricing theory, and the theory of commodity market approach. Also, the relationship between the variables for the 12-month period: 1391-1: 1376 was analyzed by Model (VAR) and the method of variance analysis. The causality relationship between variables was studied using Granger causality test (1987) and Wald test. The results showed that in the long term and short term, all variables except the oil shocks had a significant relationship with the Stock Exchange index. Based on the results of these tests, none of the variables used in this study had not causal relationship with oil shock. Therefore, the results were consistent with the expected theoretical studies. Using Johansson cointegration tests and Granger's error correction model, it was found that there was long-term causal relationship among the logarithm of the exchange rate, logarithm of inflation, and the logarithm of stock price index. The greatest impact of inflation was on index logarithm.*

**Keywords:** *oil price, exchange rate, stock market, causality method, Granger test*

## 1. INTRODUCTION

The recent surge in oil prices over the last 8 years has great interests in the relationship among oil prices, financial markets, and the economy. The cost of crude oil using Texas crude oil was calculated to be near the price of $ 42.29 a barrel in 2002. During this period, unlike other modes of exchange and increase of stock market prices, the America dollar was dropped. Although there are articles about the relationship between oil prices and stock prices and the relationship between oil prices and the exchange rate, the relationship between the two has not been well studied, especially in the field of stock prices. Scientifically, the oil prices could affect stock prices in several ways. The price of a share in a country and in every period of time equals to the present value of current spending and future costs (Huang – Masoulys, and Stahl, 2010). The oil price may affect the stock prices directly by influencing on cash flow or indirectly through its effect on interest rates used to reduce the present value of payments and future costs. In the absence of a complete replacement, the affects of production factors will raise oil prices and the costs of carrying out an economic activity and in the non-oil companies will reduce the profits. The increased oil prices appear in increased price of the final products and services. This reduces the demand for goods and services and will result in reduced profitability. The long-term and stable economic development requires the mobilization and allocation of financial resources in the national economy. As a key element of the capital market, Stock

Exchange market plays an important role in collecting the funds and transferring them to individuals and units who request funds. The success of Stock Exchange and its attractiveness to potential investors is possible by increased yields and stock prices of companies listed on the stock exchange. The efficiency and stock prices in stock market of all countries of the world is influenced by different factors. Several factors including companies conditions (such as assets and liabilities, management, development projects, and uncertainty of future profits), stock market characteristics (such as the presence of speculators, stock trading mechanisms, lack of information, change of opportunity cost, and determining the value of shares), and macro-economic factors (such as exchange rates, inflation, money supply, oil prices, and bank's interest rates) has a great influence on developments in the stock market. Understanding the factors affecting this market mechanism such as macro-economic variables and changes in prices of rival has important role in the prediction of stock market behavior. Therefore, this study aims to evaluate the impact of macroeconomic variables and competitor assets of stock market on stock price index in Tehran Stock Exchange market.

Using the information of stock price index variables in stock exchange market, Tehran, exchange rate, index of vehicles prices, and housing price index for the period 1997 – 1990, Barazande (1997) examined the impact of mentioned macroeconomic variables on stock prices index. The results showed that the mentioned variables have small participation in the stock price index changes. This result indicates that disruption and volatility of the currency and vehicles markets is not strongly applicable to the stock market.

Delavi and colleagues (2008) examined the long-term relationship between oil prices and economic growth with quarterly data in the period 1989 to 2007 in Iran. The results show that in Ira as an exporter of oil, oil shocks effect asymmetrically the economic growth. This means that GDP does not increase significantly by Increasing of oil price.

Abrishami and Rahimi (2004) studied the short-term and long-term factors that determine the actual rate of exchange at three commodities framework. They concluded that in long-term, there was a relationship between imports real exchange rate, the terms of trade, the share of investment, central bank reserves, the degree of openness of the economy, and consumption spending of government.

In their study, Abbasian and Moradpour (2008) investigated the effect of exchange rate, trade balance, inflation rate, currency, and interest rates on the Tehran Stock Exchange general index using quarterly data for the years 1998 to 2005. In this study, the cointegration method, error correction model, impulse response functions, and variance analysis were used. The results showed a positive impact of exchange rate and trade balance in the long term on stock exchange and negative impact of inflation rate, liquidity, and interest rate on the stock exchange. Based on the error correction model estimation, 12 percent of imbalance is adjusted in each period.

Chen, Roll and Ross (1986) investigated the relationship between some macroeconomic variables and stock market behavior in New York Stock Exchange for the period 1958-1984. In this study, from the perspective of rational expectations and efficient markets theory, the impact of systematic risk on stock market index has been investigated. The results showed that real per capita consumption and oil prices index have not significant impact on stock price indices. Also, inflation in the short term has a negative relationship with stock price and in the long term, it has positive relationship with stock price.

Mukherjee and Naka (1995) examined the dynamic relationship between macroeconomic variables (official exchange rate, money supply, inflation rate, industrial production, long-term government bond rate, and the rate of deposits) and the Japanese stock market price index. This study was estimated using a vector error correction model (VECM) in a system of seven equations for the period 1971-1991. Based on the results, this assumption was confirmed that there is a long-term equilibrium relationship between stock prices and macroeconomic variables.

Muradoglu and Matin (1996) assessed the long-term relationship between stock price index of the Istanbul Stock Exchange and variables including interest rate, exchange rate, inflation rate, and money supply for the period 1986-1993 using the Engle–Granger and Johansen– Juselius approaches. Based on research results, the long-term relationship between these variables over the studied period is verified. The direction of long-run relationship between stock price index and money volume index is positive and among the stock prices index, exchange rates, interest rates, and inflation rates is negative.

Studying the effect of exchange rate changes on stock market in Ghana, Salifu and et al (2007) showed that 55 percent of studied companies were affected by the price change of dollar America. This relationship was statistically significant. Also, this study showed that there is direct relationship between more stock returns of companies and changes in the dollar exchange rate. By analyzing the weekly data of stock returns and exchange rates for four Swedish companies in forest industry, Rolseth (1996) showed that in December 1992 to December 1995, the exchange rates had a negative impact on efficiency of companies' shares.

## 2. METHODOLOGY

This is a causal correlation study and uses the existing data. The sample data includes stock price index, exchange rate of Tehran's free market, inflation rate, and Iran's oil price. They have been obtained from iran's national accounts data published by the Central Bank and the Tehran Stock Exchange for monthly time series of 1391: 12- 1376-1. The data analysis was conducted using econometrics and time series with model (VAR) to investigate the Granger causality according to Valet statistic. To investigate the long term relationship between the variables, the cointegration and related tests such as Granger cointegration method (1978), Joselius Johansson cointegration method (1991), and self noting with wide lags (1999) were used based on the dynamic relationship and long-term equilibrium relationship.

### Theoretical framework (the effects of oil price and exchange rate)

The exchange rate fluctuations influence the total demand of the economy through the import, export, and supply, and the supply of economy through the channel of importing intermediate goods cost. Therefore, the result of these two effects in production and prices depends on the initial conditions of the countries' economy. The effect of exchange rate fluctuations can be investigated by total demand using exports and imports elasticity. In this method, according to Marshall and Lerner condition, if the total exports and imports elasticity will be greater than one, the devaluation of the money (exchange rate increase) will lead to improvement in trade balance and consequently in GDP. If the total of this elasticity will be less than one, the value of money will increase (exchange rate decrease) and trade balance will improve. Thus, the effect of exchange rate changes on the demand side depends on the elasticity of exports and imports. The decline in investment section is one of the other factors of demand side which is affected by changes in exchange rates. In most developing countries, the domestic investment depends greatly on importing capital goods which will be exploited after getting combined with domestic capital and resources. In such circumstances, the import costs will increase with increase of exchange rate and decrease of domestic money value. With any decrease in imports of capital goods, the domestic investment and subsequently the total demand will be reduced (Qetmiri and Sherafatian Jahromi, 2007: 26). In addition, many developing countries have large external debts due to receiving foreign loans. The devaluation of money in these countries has increased their debt in terms of domestic currency. The extension of these debts' pressure has lead to the loss of resources in production and decline in GDP (Bahmani –Oskooee, et al (2006), p50). In the commodities market, the positive shocks cause an increase in the price of imported goods and decrease in the price of imported goods. As a result, demand for domestic goods will increase (Kazerooni and Rostami, 2007: 180). On the supply side, it can be argued that in developing countries, positive shocks to the exchange rate (national currency devaluation) will lead to an increase in the cost of imported intermediate goods and, therefore, the import of intermediate goods will be more expensive. This may have a negative effect on production.

Also, the oil and its price affects on oil exporter and importer countries through various mechanisms. In the oil-importing countries, the oil price influence through two channels of supply and demand on real activities. In terms of oil supply side, it can be said that crude oil is a major factor in production. By increasing of oil price, the production costs will increase and production will decrease. On the demand side, it can be said that by increase of oil price, the consumption will reduce because the available income (in oil-importing countries) is decreased. Also, the increase in price leads to a decrease in investment because the increase in oil price increases cost of firms (Jin, 2012: 99-98). Given their economic structure, the petroleum exporting countries are not much impacted by above oil prices trends. The oil price impacts through different mechanisms on the economies of these countries. The increase in oil prices stimulates both the supply and demand sides in the oil-dependent

economies. But because of government subsidies and support systems, the costs of activities which use energy (petroleum and petroleum products) as input to production will not increase. As a result, it does not shift the macro supply curve and only stimulate the demand (Jong-wook, 2013: 73). The increase of oil price causes more revenues to be transferred from oil importing countries to oil-exporting countries. Also, the oil sector is one economic part of the petroleum exporting countries and has a large share of value added in these countries (Delavari et al, 2008: 69).

Rising of oil prices will boost this sector and attract domestic and foreign investments which lead to an increase in total production. Also, the oil-exporting countries have mostly state economy and run by oil revenues. Therefore, major investments in infrastructure and other investments are financed from the state's oil revenues. The decline of oil prices in oil-exporting countries will reduce the government's oil revenues. Since current expenditures have relatively low viscosity and they cannot easily be reduced when there is a decline in oil revenues, the decline in oil revenues will reduce infrastructure investments. This reduces the production in society. However, studies have shown that oil prices have asymmetric effects on oil-exporting countries. This means that the rate of reduction in production when oil prices decrease is not the same as the rate of increase in production when oil prices increase. Also, the effect of oil price on the economy of oil exporting countries is also investigated in the resource curse literature. The resource curse phenomenon refers to multiple deleterious effects which are applied from rising prices of oil and other natural resources on the economic, social, and political sections of exporter communities. In this regard, the economists raised the issue of Dutch disease. According to the Dutch disease phenomenon, if the economy faces with an increase in export prices of basic commodities such as crude oil, this will lead to an increase in revenue and increase in domestic demand. The main response of the economy in this time is increase of labor demand and subsequently increases in wages. As the price of non-trade products increases, thus the increased wages will decrease the export sector benefits. Finally, the effects of sudden oil price shocks will lead to real exchange rate devaluation. This would reduce the country's competitiveness in the international arena, decrease productivity in the tradable sector of the economy, and reduce the value added in these sectors (Abbasian et al., 2007: 110). In general, theoretically, the volatility of oil prices has different effects in opposite directions on economic growth in developing countries and the general effect is dependent on the outcome of these effects.

## 3. ANALYSIS OF RESEARCH

The required data in this study are extracted for the years 1997 to 2012 from monthly time series of the Central Bank and the Statistical Center of Iran. In the studies which are based on these data, it is assumed that the time series data are stationary. However, these data are stationary if their mean and variance will be constant over time and the covariance between their time intervals depends on only time interval and the gap between the two periods. Otherwise, the studied variables are non- stationary and due to facing with spurious regression phenomenon, the conventional tests such as t and F do not have enough credits. The main reason for this is the desire of time series variables to ascending and descending time oscillations which causes the result of statistical correlation between these variables and the $R^2$ value will not be reliable. When using time series data, therefore, it is needed to test the static variables (Gujarati, 1998).

In this study, the Augmented Dickey – Fuller statistic and unit root test are used to investigate the stationary of used variables. Also the viability of variables is studied by Phillips Perron unit root test to ensure about the validity of generalized Dickey-Fuller test results due to the possibility of a structural break in the pattern variables. First, the software EViews 5 was used to investigate the viability of variables assuming the intercept at 5% probability level. This software allows automatically the choice of optimal number of lags to eliminate serial correlation in the residuals based on the Schwarz Info Criteria, Hannan-Quinn information criterion, generalized Dickey Fuller, Final Predication Error criteria, and a measure of LR. In this study, the Schwarz Info Criteria is considered to be determining criteria of optimal lag.

The studies suggest that the logarithm variables of inflation rate are viable and the logarithm of oil price is different at data level. The results also show that the logarithm variables of stock general index and logarithm of exchange rate at data level are non-viable and get viable by a difference I (1) (Table 1).

**Table1.** *The generalized Dickey-Fuller test in the first- order level and difference of variables*

| Variable | | Model with latitude from origin | | |
|---|---|---|---|---|
| | | statistic | Critical value | Result |
| Level | *LnTepix* | - 0/062754 | - 2/876595 | I(1) |
| | *LnExchange* | 0/269621 | - 2/876595 | I(1) |
| | *LmInflation* | - 6/986503 | - 2/876595 | I(0) |
| | *dLnOil* | - 5/669263 | - 2/876595 | I(0) |
| First order difference | *LnTepix* | - 8/247958 | - 2/876595 | I(0) |
| | *LnExchange* | - 16/99596 | - 2/876595 | I(0) |

Source: the research results

As mentioned above, due to structural failure in variables and not considering this failure in generalized Dickey- Fuller test, the Phillips Perron test in the software EViews 5 is used to ensure the results of Dyky- Fuller test.

The Phillips-Perron test results show that the results of generalized Dickey- Fuller test are not affected by structural failures, the unit root in variables does not result from structural failure, and the logarithm variables of general stock index and the logarithm of stock exchange actually has a unit root.

**Table 2.** *Phillips-Perron test at the first order level and difference of variables*

| Model with latitude from the origin | | | Variable | |
|---|---|---|---|---|
| Result | Critical value | Statistic | | |
| I(1) | - 2/8765 | - 0/101587 | *LnTepix* | Level |
| I(1) | - 2/8765 | 0/151567 | *LnExchange* | |
| I(0) | - 2/8765 | -10/89003 | *LmInflation* | |
| I(0) | - 2/8765 | - 10/06298 | *dLnOil* | |
| I(0) | - 2/8765 | -13/97337 | *LnTepix* | First order difference |
| I(0) | - 2/8765 | - 16/83952 | *LnExchange* | |

Source: research results

- Determining the optimal lag length

As you know, the optimal lag VAR models can be determined by Schwarz information criteria, Hnnan Queen Information criteria, generalized Dickey Fuller, maximum likelihood, and final prediction error criteria. The EViews 5 software enables automatic calculation and determination of the optimal lag. Thus, the values of LR, FPE, AIC, SC, HQ criteria are provided in Table 3. The results of above criteria show that the second lag is the optimal lag for vector auto-return model.

**Table 3.** *The values of different criteria for determining the optimal lag in VAR model*

| Result | HQ | SC | AIC | FPE | LR | Lag |
|---|---|---|---|---|---|---|
| *2K=* | 39/96095 | 40/00221 | 39/93284 | 2/59 e+12 | NA | 0 |
| | 31/97428 | 32/18058 | 31/83373 | 7/86 e+08 | 1497/080 | 1 |
| | 31/78607* | 32/15740* | 31/53306* | 5/82 e+08* | 83/66860* | 2 |
| | 31/93292 | 32/46929 | 31/56747 | 6/03 e+08 | 93/81092 | 3 |
| | 32/10956 | 32/81096 | 31/63166 | 6/43 e+08 | 99/22757 | 4 |
| | 32/20551 | 33/07196 | 31/61517 | 6/34 e+08 | 101/1083 | 5 |

Source: research results

- Autoregresive vector model and the results of Granger causality test results and Valet statistic:

Since the optimal lag of autoregresive vector model, based on Schwartz criterion, is equal to 2, the autoregresive model is estimated with two lags (equations (5-1) to (5-4)).

$$(LnTepix_t = c_1 + \sum_{i=1}^{2} \alpha_{1t} LnTepix_{t-i} + \sum_{i=1}^{2} \beta_{1t} LnEx_{t-i} + \sum_{i=1}^{2} \lambda_{1t} LnInflation_{t-i} + \sum_{i=1}^{2} \gamma_{1t} dLnOil_{t-i} + \varepsilon_{1i} \qquad (1\text{-}5)$$

$$LnEx_t = c_1 + \sum_{i=1}^{2} \alpha_{2t} LnTepix_{t-i} + \sum_{i=1}^{2} \beta_{2t} LnEx_{t-i} + \sum_{i=1}^{2} \lambda_{2t} LnInflation_{t-i} + \sum_{i=1}^{2} \gamma_{2t} dLnOil_{t-i} + \varepsilon_{2i} \quad (2\text{-}5)$$

$$LnInflation_t = c_1 + \sum_{i=1}^{2} \alpha_{3t} LnTepix_{t-i} + \sum_{i=1}^{2} \beta_{3t} LnEx_{t-i} + \sum_{i=1}^{2} \lambda_{3t} LnInflation_{t-i} + \sum_{i=1}^{2} \gamma_{3t} dLnOil_{t-i} + \varepsilon_{3i} \quad (3\text{-}5)$$

$$LndOil_t = c_1 + \sum_{i=1}^{2} \alpha_{4t} LnTepix_{t-i} + \sum_{i=1}^{2} \beta_{4t} LnEx_{t-i} + \sum_{i=1}^{2} \lambda_{4t} LnInflation_{t-i} + \sum_{i=1}^{2} \gamma_{4t} dLnOil_{t-i} + \varepsilon_{4i} \quad (4\text{-}5)$$

With the help of Valet test, the above equations are used to study the Granger causality test from the variables on the right to the variables on the left side. For example, the simultaneous significance of lag coefficients in logarithm variable of exchange rate ($B_{1i}$) in equation (5-1) through the Wald test (with the distribution of $X^2$) indicates the presence of Granger causality relationship from exchange rates to stock price index. The results of Wald test for the coefficients of variables lag in equations (5-1) to (5-4) are summarized in Table 4.

**Table 4.** *Wald test results*

| Conclusion | Wald statistic ($x^2$) (Prob) | Affecting variable | Dependent variable |
|---|---|---|---|
| $LnEx \rightarrow LnTepix$ | (0/0453) 5/455999 | *LnEx* | *LnTepix* |
| $LnInflation \rightarrow LnTepix$ | (0/0000) 39/74458 | *LnInflation* | |
| $dLnOil \not\rightarrow LnTepix$ | (0/4206) 1/732302 | *dLnOil* | |
| $LnTepix \not\rightarrow LnEx$ | (0/0561) 6/154009 | *LnTepix* | *LnEx* |
| $LnInflation \rightarrow LnEx$ | (0/0000) 46/10294 | *LnInflation* | |
| $dLnOil \not\rightarrow LnEx$ | (0/7221) 0/651270 | *dLnOil* | |
| $LnTepix \rightarrow LnInflation$ | (0/0495) 6/010399 | *LnTepix* | *LnInflation* |
| $LnEx \rightarrow LnInflation$ | (0/0491) 6/026157 | *LnEx* | |
| $dLnOil \not\rightarrow LnInflation$ | (0/9147) 0/178275 | *dLnOil* | |
| $LnTepix \not\rightarrow dLnOil$ | (0/2385) 7/505315 | *LnTepix* | *dLnOil* |
| $LnEx \not\rightarrow dLnOil$ | (0/1251) 7/371899 | *LnEx* | |
| $LnInflation \not\rightarrow dLnOil$ | (0/1052) 4/503367 | *LnInflation* | |

Source: research calculations

Based on the experimental results presented in Table 4, there is a causal relationship from the exchange rate and banking inflation rate to the stock price index. There is a unidirectional causal relationship from stock price index and exchange rate to inflation rate. Also, there is a unidirectional causal relationship from inflation to the exchange rate. According to Fisher's theory theoretical principles, the commodity markets approach and identifying factors affecting the stock price index, there is causal relationship from exchange rate and inflation index to the general stock market index. Also, the results of Zadefar and Samimi (2008) confirm the unidirectional causality relationship from inflation rate to the stock market index. Mohammadi, Taghavi, and Barazandeh (2008) also confirm unidirectional causality relationship from exchange rate to the total stock market index. Also it is expected that there will be causal relationship from exchange rate to inflation rate. The reduced local currency value will increase the import price and the cost of imported inputs and will impact on the production and domestic prices. Therefore, the increase in import prices due to devaluations of domestic currency is one reason for the increase in domestic inflation. The studies of Abasinejad and Teshini (2004) also confirm the impact of exchange rate on inflation.

One of the main tasks of the stock exchange in the economy is helping to absorb liquidity and reducing inflation in the community. Therefore, it is not unexpected that a causal relationship will exist from the stock price index to inflation rate.

However, oil price in the economy of Iran is an exogenous variable and it is a function of global oil supply and demand and its internal variables such as changes in stock prices, exchange rates, and inflation rates will not change world oil prices. The central bank in Iran controls the exchange rates and prevents from great changes in assets and directs the substantial financial investments of investors to the market. For example, after one period of increase in oil price, the government sells one part of the foreign currency obtained from oil sales to the central bank and increases the net assets of the Central Bank and thus increases the monetary base. Before the exchange rate mutates because of decline in oil prices and the demand of financial investors increases, the central bank intervene in the currency market because of having sufficient financial resources and controls the exchange rate within the target area.

The importance of oil revenues in the economy of Iran and its impact on GDP and other macroeconomic variables is undeniable. Oil price volatility is one of the main sources of fluctuations in oil producing countries. The increase of oil prices after 1973 had a significant impact on the economies of oil-producing countries. During this period, the foreign exchange earnings from oil sales rose sharply and lead to the growth of prices, wages rates, and the import rates of Petroleum Exporting Countries. Most studies on the effects of oil shocks on macroeconomic variables have been conducted in oil importers industrialized countries. In these countries, higher oil prices as one of the factors in production have led to inflation and recession simultaneously. The reduced oil prices are also acted as a positive shock on the supply side. In the studies of Petroleum Exporting Countries, the Dutch disease literature is considered to be as the most important theoretical foundation. According to studies conducted in Iran, the role of oil revenues of government in inflation is not one-dimensional and it is completely multidimensional. These earnings have important effects on inflation such as development of imports in the sections which are dependent on imported goods, increase in oil revenues due to its ability to gain foreign currency, and the country's economic boom through the import of capital goods and raw materials. The increase in consumption goods imports hurts domestic production. The government controls temporarily the inflation through commodities like fruits that have the ability to be imported. However, in the case of goods such as housing that cannot be imported, the oil revenues increase will increase the prices of these goods. Also, the increasing dependence on imports increases the imported inflation role (in relation to the increase in international prices) in domestic inflation.

The revenue from inflation which is available for government can be consumed in the form of current and development expenditures in community. The increased oil revenue increases government expenditures. It increases strongly the aggregate demand in society directly and indirectly. Due to structural constraints in the supply of goods and services, the gap between demand and supply in the community increases and inflation rises. With rising of oil revenues, the monetary base increases inflation through foreign assets of the central bank. And by reducing of government's oil revenues, the financing of budget deficit also causes inflation by expanding the monetary base.

Given the above, generally, the price of oil and oil revenues affect inflation through channels of exchange rate, budget deficit, imports, imported inflation, monetary base, GDP growth, and investment in the public sector. In some cases, they have opposite effects on inflation. Therefore necessarily, the increase or decrease of prices and oil revenues do not cause Inflation. But, it is the management of the revenues in these channels that can be the cause of inflation (Hosseinpoor).

- Response Functions:

As you know, the estimated coefficients may difficultly be interpreted in Model VAR, especially when the coefficients' symbols change according to variable lag. For this purpose, the reaction excitation function is estimated and on its basis, the behavior of variables is examined over time. The reaction excitation function shows the effect of an endogenous variable reaction to changes in one of the disruption (stimulation) terms during the time (Noferesti, 1999). Since the purpose of this study is investigating the influence of exchange rate, inflation, and oil prices on the Stock Exchange, the response function of total stock index is presented (Figure 1).

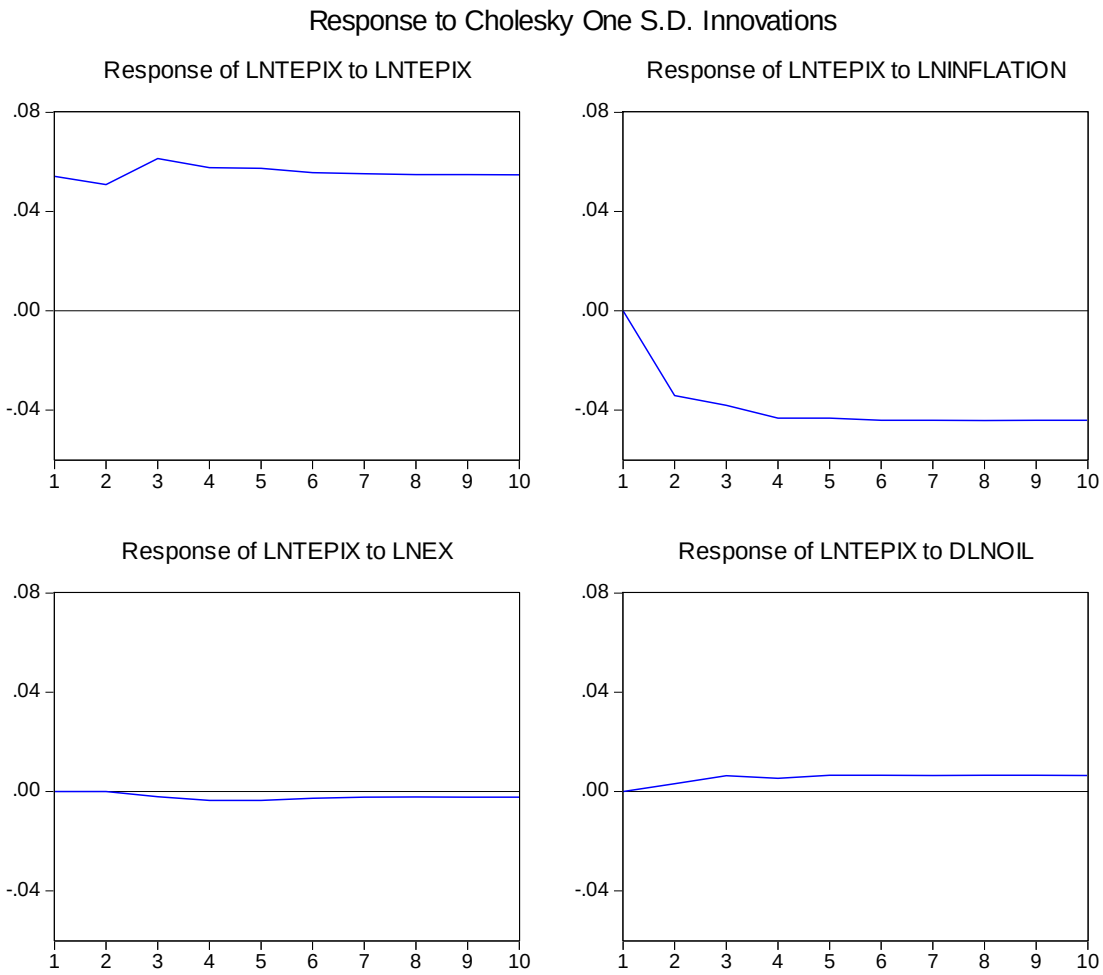


**Figure 1.** *Stimulation response diagrams*

The first diagram shows the effect of one standard deviation shock from the stock index on itself. As you can see, the effect of this variable on itself has been positive during the 10-year period. Its effect does not disappear during this period.

The second diagram shows the effect of one standard deviation shock from the inflation on stock index. According to this diagram, the effect of inflation on stock index has been negative and its effect has not been disappeared during 10 periods.

The third diagram shows the effect of shock from exchange rate on stock index. According to this diagram, the effect of this variable is negative and its effect is low, such that its effect almost disappears during 10 periods.

The fourth diagram shows the effect of shock from oil price on stock index. According to this diagram, the effect of this variable is low in initial period and gets more during next periods and its effect remains constant and does not disappear during 10 periods.

**Table 5.** *The results of variance analysis*

| Variance Decomposition of LNTEPIX: | | | | | |
|---|---|---|---|---|---|
| DLNOIL | LNEX | LNINFLATION | LNTEPIX | S.E. | Period |
| 0/0000000 | 0/000000 | 0/000000 | 100/0000 | 0/054187 | 1 |
| 0/145439 | 2/073005 | 17/46212 | 82/39242 | 0/081882 | 2 |
| 0/418441 | 0/038152 | 21/92271 | 77/62070 | 0/109351 | 3 |
| 0/455672 | 0/102208 | 26/12509 | 73/31703 | 0/131151 | 4 |
| 0/538339 | 0/136591 | 28/38479 | 70/94028 | 0/149763 | 5 |
| 0/594326 | 0/138304 | 30/20784 | 69/05953 | 0/165891 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| 0/630459 | 0/132536 | 31/51729 | 67/71471 | 0/180447 | 7 |
| 0/659613 | 0/128089 | 32/51337 | 66/69893 | 0/193843 | 8 |
| 0/681455 | 0/125352 | 33/26706 | 65/92614 | 0/206351 | 9 |
| 0/698185 | 0/123108 | 33/86310 | 65/31561 | 0/218128 | 10 |

The analysis of variance showed that in the initial periods, most of the changes in stock index variable are explained by the variable itself. But as time passes and during subsequent periods, it is reduced and the explanatory of other variables increases. As you can see, the explanatory of inflation is higher than any other variable and reaches to 33% at tenth period. Then, the greatest impact is on the exchange rate.

- Investigating the long-term and short-term relationship of variables in the stock market index

In this section, the Vector error correction model, which involves determining the dynamic relationship and long-term relationship between the variables, is used to evaluate the long-term relationship among exchange rate, inflation rate and oil price shocks variables on stock market index. So first, we conduct the Johansson cointegration test to determine the long term causal relationship. The presence of at least one cointegration vector between the research variables provides the statistical basis for using error correction model. If there will be a cointegration vector, the vector error correction model will be estimated and its results will be analyzed.

- Johansson Cointegration test

The Johansson cointegration test is used to investigate the long-term equilibrium relationship. In the cointegration analysis, first the Johansson test was used to determine the number of cointegration vectors and the elements of normal cointegration vectors. The results are shown in Table 6.

As you can see, according to Trace Statistic and Maximum Eigen Statistic, the studied variables are cointegration and at least one cointegration vector is approved. Thus, we can conclude that there is a long-term equilibrium relationship between the studied variables and Tehran Stock Exchange (TSE).

**Table 6.** *The results of cointegration using Johansson test*

| Prob | Max-Eigen Statistic | Critical value%5 | Prob | Trace Statistic | critical level %5 | $H_0$ |
|---|---|---|---|---|---|---|
| 0 /0001 | 44 /78313 | 27/58434 | 0 /0000 | 81 /98565 | 47 /85613 | r=0 |
| 0 /0010 | 32 /10386 | 21 /13162 | 0 /0058 | 37 /20252 | 29 /79707 | $1 \leq r$ |
| 0 /8492 | 4 /094667 | 14 /26460 | 0 /7983 | 5 /098656 | 15/49471 | $2 \leq r$ |
| 0 /3163 | 1 /003988 | 3 /841466 | 0 /3163 | 1 /003988 | 15 /49471 | $3 \leq r$ |
| Source: research calculations | | | | | | |

The existence of cointegration between a set of economic variables provides the statistical basis for using error correction models. According to Johansson test (Table 6), there is at least one cointegration vector for studied variables.

The vector error correction model (VECM) was used to evaluate the short-term relationships between the variables in the model. Using Eviews software, the Granger causality test was used to determine the direction of causality.

According to Engel-Granger (1978), the long-term equilibrium values of cointegration variables get related with short-term fluctuations as following vector error correction model.

$$dLnTepix_t = \alpha + \sum_{i=1}^{m} \beta_i dLnTepix_{t-i} + \sum_{i=1}^{m} \gamma_i d\ln Ex_{t-i} + \sum_{i=1}^{m} \delta_i dInflation_{t-i} + \sum_{i=1}^{m} \sigma_i dIndOil_{t-i} + \theta Ect_{t-1} + \varepsilon_t \quad (5\text{-}5)$$

The significance of each coefficient (excluding the error correction coefficient) in vector error correction model is confirmed by Wald test. The significance of independent variables' short-term coefficients indicates the short-term impact of the independent variables on the dependent variable. The simultaneous significance of each of the dependent variables and the error correction term

represents the long term causal relationship from that variable to the dependent variable. The significance of VECM coefficient based on t-test shows that in each period, a percentage of short-term imbalances in stock price index are moderated to reach to long term balance. In other words, this coefficient indicates the time that stock price index takes to return to long-term equilibrium position. The results of estimating error correction model are provided in Table 7 and Table 8.

**Table 7.** *short-term Granger causality test using VECM model*

| | | Short term causality test | | |
|---|---|---|---|---|
| | | *dLnEx* | *dLnInflation* | *dLndOil* |
| Dependent variable | $H_0$ | $\gamma_i$ | $\delta_i$ | $\sigma_i$ |
| *dLnTepix* | | 6/047202 (0/0322) | 7/860573 (0/0196) | 1/601535 (0/4490) |

Testing the significance of variables lag coefficients by Wald test
Source: Results of Survey

**Table 8.** *Long-term Granger causality test using VECM*

| | | Long term causality test | | | |
|---|---|---|---|---|---|
| | | $ECT_{t-i}$ | *dLnEx* | *dLnInflation* | *dLndOil* |
| Dependent variable | $H_0$ | $ECT_{t-i}$ | $\gamma_i$ & $ECT_{t-1}$ | $\delta_i$ & $ECT_{t-1}$ | $\sigma_i$ & $ECT_{t-1}$ |
| *dLnTepix* | Coefficient | – 0/024947 | – 0/350121 | – 3/997584 | 0/156995 |
| | Standard deviation | (0/004231) | (0/04115) | (0/032642) | (0/03595) |
| | statistic t | ]– 5/89568[ | ]– 8/31438[ | ]-6/10640[ | ]2/06704[ |

Source: Results of Survey

According to above table, the changes in the logarithm of these variables cause Granger changes in the logarithm of stock price index. The insignificance of variation coefficient in the logarithm of oil shocks by Wald test indicates that there is no short-term causality relationship from changes in oil shocks logarithm to changes in stock price index logarithm. The correction coefficient of model error is smaller than one and its sign is negative. Also, its value shows that the adjustment in total stock market index in each period is adjusted 2.49% of the total index market imbalances to long-run equilibrium values. Because the studied period is monthly, as a result, about 29.88% of the imbalances in the stock price index are adjusted each year. The simultaneous significance of changes in changes logarithm of exchange rate, inflation change logarithm, and lag error correction term indicates that in the long, these variables are the cause of changes in the logarithm of stock price index.

## 4. CONCLUSIONS AND RECOMMENDATIONS

The results show that all variables, except the oil shocks and inflation, are based on generalized Dickey-Fuller test I (1). The results of Phillips Perron test also confirmed the Dickey-Fuller test results. It showed that the presence of unit root in variables is not due to structural failure, but indeed the variables have a unit root. The Granger causality test and the Wald test were used to determine causality relationship by VAR model in which the optimal lag 2 had determined according to the Schwartz information criterion. The results indicate that there is short-term and long-term causal relationship between the logarithm of exchange rate and the logarithm of inflation rate to the stock price index. The error correction coefficient is 2.49%. This indicates that in each monthly period and in each year, respectively, only 2.49% 29.88% of imbalances in the stock price index are removed in long-term.

The weak and negative relationship between exchange rate and stock price index can be expressed in terms of commodity markets theory. In companies that are more export-oriented, the increase in exchange rate would have a negative impact on the company's shares and the Stock Exchange. The causal relationship from exchange rate to inflation rate is in accordance with expectation. With the devaluation of local currency, the import price and the cost of imported inputs will increase and will affect production and domestic prices. Therefore, the increase in import prices due to devaluation of local currency is one reason for the increase of domestic inflation. The studies of Abasinejad and Teshkini (2008) also confirm the impact of exchange rate on inflation. One of the main tasks of the

stock exchange is absorbing liquidity and reducing inflation in the community. Therefore, the causal relationship from the stock price index to inflation rate is not unexpected.

The importance of oil revenues in the economy of Iran and its impact on GDP and other macroeconomic variables is undeniable. In studies are conducted for oil exporting countries, the Dutch disease is considered to be the most important theoretical foundation. According to studies conducted in Iran, the role of oil revenues in inflation is not one dimensional and it has multidimensional nature. Generally, the price of oil and oil revenues affect inflation through channels of exchange rate, budget deficit, imports, imported inflation, monetary base, GDP growth, and investment in the public sector. In some cases, they have opposite effects on inflation. Therefore necessarily, the increase or decrease of prices and oil revenues do not cause Inflation. But, it is the management of the revenues in these channels that can be the cause of inflation. The central bank in Iran controls the exchange rates and prevents from great changes in assets. According to the conclusions, the following recommendations are offered:

The relationship between stock market index and exchange rate index is helpful for asset owners in optimal allocating of portfolios or investors who are trying to Hedage in front of external risks.

Using the input and output of capital, if possible, the investment in countries have a lower risk than Iran to be considered as an alternative to stock market in Iran.

Due to various results in different time periods, it is recommended that the direction of causality relationships and the direction of long and short term relationships to be studied in shorter time periods and using daily data to conduct the latest political recommendations.

In order to address the poor performance of stock exchange in its main task that is absorbing liquidity and contributing in economic growth, it is recommended that in addition to economic factors affecting the stock market activity, the non-economic variables also be examined to develop the opportunity for growth and prosperity of Tehran Stock Exchange.

For empowering the stock market price index to describe macroeconomic conditions, finally, it is suggested that some actions to be conducted for greater transparency of this market in management level and in mechanisms of market information.

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