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Impact of Oil Exports Income on Tehran Stock Exchange Dividend and Price Index (TEDPIX), Model Selection

Mohammadreza Monjazeb and Hamid Hosseinzadeh Gohari

[1]Faculty of Engineering Economics, University of Economic Sciences,
No. 3, Jahan Ave, Taleghani Ave, P. O. Box: 15936-56311, Tehran, Iran
[2]Faculty of Financial Sciences,
University of Economic Sciences, Iran

Abstract: The aim of this study is to choose the preferred model between linear and linear-logarithmic for investigating the impact of oil export incomes on Stock market (TEDPIX) in Iran from 1997 until 2009. According to linear model, oil export incomes, the world price of gold, GDP of Iran, real investment of private sector of Iran and also dummy variable of fundamental changes in stock market affect Tedpix in Iran stock market. And according to linear–logarithmic model, the logarithm of cash, the price index of Stock market with a lag, Logarithm of oil export incomes of Iran, the exchange rate and the dummy variable affect Tedpix in Iran. Also data base is seasonally. To investigate the relationship between these variables, we used OLS method by Eview6 software. The results indicate that the linear model is preferred model, so it can be used in interpreting the results.

JEL Classification: E44 · G18 · C22 · F10
Key words: Linearmodels · linear-logarithmic · Stock market · GDP

INTRODUCTION

Financial markets are one of the original and effective markets in an economy. A stock market boom and stagnation affects not only the national economy but also the global economy. There is a significant relationship between stock market development and economic boom. Mutually, macroeconomic policies, macroeconomic variables and monetary variables affect the stock market. Financialmarketsplay a major roleincreating saving and converting intoinvestment. It isexpected that the result of financial Markets could lead to the increase savingsand investment, the participation of thepeople and FDI.

In this paper we want to choose preferred model between linear and linear – logarithmic by investigating the Impact of Iran oil export incomes on Tehran Stock Exchange Dividend & Price Index (TEDPIX). For this purpose, the variables of model are foreign income from oil exports (including petroleum products, liquefied natural gas, crude oil and natural gas), the price of gold, GDP, real investment of private sector and Liquidity for the period of 1997-2009 extracted as average seasonally.This study showsthe effect ofcrude oilprice fluctuationas well as foreign incomes of Iranonthe Tehran Stock Exchange.

It has been used the method of Ordinary least squares (OLS) in two models of linear model and linear–logarithmic for answering the research question. For this purpose, first of all for each model, we use unit root test for each variable to know whether it is stationary or not.

Review of Literatures: Barezani and Esfahani [1] investigated long-run relationships between macroeconomic variables (especially the control variables of public sector), such as the exchange rate (EX), government expenditure (GE), money stock (MON), Tax (TAX) and a stock market value of a variable, by using vector regression model, Johansson cointegration test and Vector Error Correction in Iran. The results of their

Corresponding Author: Mohammadreza Monjazeb, Faculty of Engineering Economics, University of Economic Sciences, No. 3, Jahan Ave, Taleghani Ave, P. O. Box: 15936-56311, Tehran, Iran.

study showed a long-run and positive relationship between the value of stock market with government expenditure and monetary volume variables and negative relationship with tax variables and exchange rate, by using cointegration Johansson test.

Firoozeh Azizi [2] examined relationship between inflation, return and Stock price index in Iran, by using econometric methods. The research findings indicate that inflation explains cash return index and total return (price and cash) but it does not explain the stock price index. On the other hand, cash returns, total returns (price and cash) and stock price index do not explain inflation. In this study, using monthly inflation data, price index, total return and the monthly return on cash since 1998 to 2003, the correlation between stock returns and inflation have been tested by Granger and VAR causality.

Fereydoon Rahnama Roudposhti and his colleague [5] are looking for the answer to this question: "Do macroeconomic variables have significant effects on the efficiency of investment companies accepted in Tehran Stock Market "? Finally, they have fund that non-oil exports and liquidity have positive impact and Consumer price index and import have negative impact on the efficiency.

Wongbangpo and Sharma [6], in a study about Southeast Asian Nations (ASEAN) countries, namely Indonesia, Malaysia, Singapore, Thailand and the Philippines show that there is a short-run and long-run relationship between stock price index (SP) and some macroeconomic variables such as gross domestic product (GNP), interest rate (INT) and exchange rate (EX), money supply (MON) and consumer price index (CPI) since 1985 to 1996.

Mansour Van and his colleagues [11] have studied the dynamic relationship between stock prices and economic variables in six selected Asian countries (Malaysia, Thailand, Hong Kong, Japan and Australia). The variables are stock price index, exchange rate, consumer price index and the industrial production index in the period since January 1993 to December 2002 and monthly. The focus of their research was on study of long-run and short-run relationship between these variables. The results suggest that there is a long-run relationship in four countries, Japan, Korea, Hong Kong and Australia. Also there is a short-run relationship in countries except Hong Kong and Thailand. The relationship between exchange rates and stock prices in Hong Kong have been approved and while in Thailand only the relationship between the industrial production index and industrial price has been confirmed.Anextensive researchinthis areaissummarized in Table 1.

Variables and Research Hypotheses: In this research, first of all we use unit root test for each variable to know whether it is stationary or not. Dickey Fullerunit roottestsummarized and shown in Table 2.

Linear Model: In this model there are four significant variables as independent variables and a dummy variable for estimation. In Table 3, each of the variables is defined.

Linear-Logarithmic Model: In this model there are three significant variables as independent variables and a dummy variable for estimation. In Table 4, each of the variables is defined.

Table 1: Summary of Performed Researches

1	Kasman[7]	There is a stable and long-runrelationshipbetweenstock pricesand exchange ratein Turkey. But Granger causality testshow that exchange ratecausesindustryindicatorvariables.
2	Nicholas Apergis & Colleagues [8]	Researchers calculated and examined three different structural shocks in the oil market (i.e. oil supply shocks, intense oil demand shocks and special oil demand shocks) on stocks return. The results showed that different shocks have a significant impact on stock market returns. But the results of the case study have different impacts on selected countries.
3	Mark. J.F lannery & Aris A. Protopapadakis [9]	The paper showed that macroeconomic variables used in the model have a strong relationship with stock returns. The researchers concluded that the relationship between GNP and industrial production (as the most important macroeconomic indicators) with stock return are very weak.
4	Maghyereh, Aktham[10]	The results showed that the effect of oil shocks on stock market of major European and Asian countries with high oil consumption is higher than the others. Overall, the findings indicate that oil price shocks do not have enough impact on the index stock returns in most emerging economies.
5	SaeedSamadi and colleagues[3]	Because of small capital market in Iran and impact of oil price changes with lags on the profitability and the company stock price, stock market has limited reactions towards changes in world oil prices.
6	Abbasian and colleagues[4]	The increase of exchange rate in short-run due to withdrawal of funds from the capital market to money market causes reduction of total stock index.
7	Yamak,YakupKüçükkale[12]	The resultsshow thatthe expected changes in money stock have had thepositiveimpact on stock prices.
11	Achsani, N. and H.G. Strohe[13]	The results show that the relationship between stock prices with inflation, short-run and long-run interest rate and oil prices are negative, but with exports and GDP are positive.

Table 2: Augmented Dickey-Fuller (ADF) test

Error (%)	Prob.	ADF's critical value	ADF statistic	Time Series data		Stationary
				First difference of Tehran Stock Exchange		
5	0.0002	2.933158-	4.891280-	Dividend & Price Index(TEDPIX)	DTEDPIX	R
5	0.0002	2.933158-	5.019978-	inflation	INF	R
5	0.0981	2.929734-	2.612763-	First difference of producer price index	DPPI	R
5	0.0000	2.931404-	6.009676-	First difference of GDP	DGDP	R
5	0.0007	2.933158-	4.547518-	First difference of investment of private sector in real estate	DINVE	R
5	0.0001	2.933158-	5.190675-	First difference of exchange rate	DEXCH	R
5	0.0006	2.933158-	4.572605-	First difference of global gold price	DGOLDPRICE	R
5	0.4242	2.931404-	1.699808-	Revenue of Oil export	OIL	Q
5	0.0000	2.933158-	6.084265-	First difference of Revenue of Oil export	DOIL	R

Source: Based on research calculations

Table 3: linear model's Variables

Symbol	Variable's Type	Research's Variables	Symbol	Variable's Type	Research's Variables
TEDPIX(-1)	*Independent*	TEDPIX with a lag	OIL	*Independent*	Revenue of Oil export
GDPP	*Independent*	Gross Domestic Product	GOLDPRICE	*Independent*	DGOLDPRICE
DUMGH	*Dummy*	fundamental changesin thestock market	INVE	*Independent*	Real investment of private sector

Source: Based on research calculations

Table 4: Linear-Logarithmic model's Variables

Symbol	Variable's Type	Research's Variables	Symbol	Variable's Type	Research's Variables
LTEDPIX (-1)	*Independent*	TEDPIX with a lag (Logarithmic)	LOIL	*Independent*	Revenue of Oil export (logarithmic)
DUMGH	*Dummy*	fundamental changesin thestock market	LEXCH	*Independent*	exchange rate (Logarithmic)

Source: Based on research calculations

Table 5: Linear model's t-student statistic& standard deviation

Variables	TEDPIX(-1)	OIL	GOLDPRICE	GDP	INVE	DUMGH
SE	400.979	0.012	0.010	1.163	0.032	0.034
t-student	0.0000	0.014	0.003	0.000	0.003	0.0000

Source: Based on research calculations

In this study we are looking to choose between linear and linear-logarithmic model to examine the impact of foreign exchange revenues (oil) on cash index and the price of Tehran Stock Exchange (TEDPIX) since 1997 to 2009 and the data will be used seasonally.

Methods, Resultsand Analysis ofResults

Linear and Linear-Logarithmic Cointegration Tests: After performing the cointegration test, the results show that both models (linear and log-linear) are cointegrated. Therefore there are a long-run relationship between variables in both models.

White Heteroskedasticity Test: To check the homogeneity of variance, the final models of linear and linear-logarithmic have been examined by white test and the results show that there are homoscedasticity in both models.

The Model Estimation

Linearmodel: The linear model was estimated as below:

$$TEDPIX = c + \beta_1 TEDPIX(-1) + \beta_2 GOLDPRICE + \beta_3 GDP + \beta_4 OIL + \beta_5 INVE + \beta_6 DUMGH + \varepsilon$$

In this model, we have examined the impact of Tehran Stock Exchange Dividend & Price Index with a lag, oil exports income, the world price of gold, GDP, real investment of private sector and dummy variables related to fundamental changes in the stock exchange on TEDPIX. The results are as below:

$$TEDPIX = -3027.313 + 0.910*TEDPIX(-1) + 5.193*GOLDPRICE + 0.032*GDP + 0.099*OIL - 0.032*INVE - 2536.626*DUMGH$$

Linear-Logarithmic Model: Since this study wants to evaluate the impact of oil exports income on TEDPIX, we estimate the model in logarithmic form. The second model estimated as below:

$$LTEDPIX = c + \beta_1 LTEDPIX(-1) + \beta_2 LEXCH + \beta_3 LOIL + \beta_4 T + \beta_5 DUMGH + \beta_6 T + \varepsilon$$

Table 6: Linear -logarithmic model's t-student statistic & standard deviation

Variables	TEDPIX(-1)	OIL	GOLDPRICE	GDP	INVE	DUMGH
SE 400.979	0.012	0.010	1.163	0.032	0.034	
t-student 0.0000	0.014	0.003	0.000	0.003	0.0000	

Source: Based on researchcalculations

Table 7: Choice between linear and linear – logarithmic model

LLHH	LH	LTEDPIX	
0.9902	0.9950	1	LTEDPIX

Source: Based on researchcalculations.

Table 8: Choice between linear and linear – logarithmic model

HH	H	TEDPIX	
0.9864	0.9904	1	TEDPIX

Source: Based on researchcalculations.

In this model, all variables are in logarithmic form and we have examined the impact of Tehran Stock Exchange Dividend & Price Index with a lag, oil exports income, exchange rate in logarithmic form and dummy variables related to fundamental changes in the stock exchange on TEDPIX. The results are as below:

$$LTEDPIX = 0.133 + 0.816*LTEDPIX(-1) + 0.066*LEXCH + 0.092*LOIL + 0.008*T - 0.236*DUMGH$$

$R^2 = 0.98$ Adjusted $R^2 = 0.98$ F = 388.830 D-W = 1.694 H-Durbin = 1.10

Since the h-durbin statistics is between 1.96 and -1.96, so the model is not autocorrelated.

$R^2=0.99$ Adjusted $R^2 =0.98$ F=928.73 DW=1.51 H-Durbin=-1.73

Since the h-durbin statistics is between 1.96 and -1.96, so the model is not autocorrelated.

Choice Between Linear and Linear-Logarithmic Models: In this section, after comparing the two estimated models, linear and linear – logarithmic, the interpretation of the selected models will be discussed:

After fitting the TEDPIXHAT (named H) and making LOG (H) = LLHH and by computing the correlation between LTEDPIX, LH, LLHH, the following results are obtained:

Therefore, regarding the higher correlation between LTEDPIX and LH in comparing with correlation between LTEDPIX and LLHH, it can be said that the linear model is more powerful than linear- logarithmic model.

Also, after obtaining Anti logarithmic of LH named as HH, to evaluate and comparing with HH, H, TEDPIX and by examining the amount of correlation between LHH, LH, LTEDPIX, the following results are obtained:

In other words, to obtain the correlation of above variables, we can say that the linear model is stronger than the linear-logarithmic model, because of higher correlation between fitted TEDPIX and TEDPIX (as dependent variable) in linear model and in comparison with log-linear model. So we will discuss about linear model and its interpretation as below:

The coefficient of determination, R2 with the value of 0.98 indicated that 98 percent of changes of dependent variable (TEDPIX) is explained by independent variables (the impact of Tehran Stock Exchange Dividend & Price Index with a lag, oil exports income, the world price of gold, GDP, real investment of private sector and dummy variables related to fundamental changes in the stock exchange on TEDPIX).

Interpretation of F: This is the statistic for the hypothesis test with null hypothesis; H_0: At least one of the non-constant coefficients in the regression equation is non-zero and alternate hypothesis; H_a: All non-constant coefficients in the regression equation are zero.

Since, the probability of F is less than 5 percent, therefore the estimated regression model is valid.

The t statistics of independent variables show that they are significant. Since thecoefficient of cash index and the price of stock in Tehran Stock market is equal to 0.91 (in linear model), therefore it means that if the cash index and price of stock with a lag increases one unit, the cash index and price of stock will increase 0.91 unit in the next period. In other words, the cash index and the price of stock in Tehran Stock markethas a positive impact on stock index (TEDPIX).

Since the coefficient of oil exports income (oil) is equal to 0.098, therefore it means that if the oil exports income increases one million dollars, the cash index and price of stock will increase 0.098 unit. In other words, oil exports income (oil) has a positive impact on stock index (TEDPIX).

Since the coefficient of GDP is equal to 0.032, therefore it means that if the GDP increases one billion Rials, the cash index and price of stock will increase 0.032 unit. In other words, GDP has a positive impact on stock index (TEDPIX).

Since the coefficient of real investment of private sector is equal to -0.032, therefore It means that if the real investment of private sector increases one unit, then the cash index and price of stock will decrease 0.032 unit. In other words, real investment of private sector has a negative impact on stock index (TEDPIX).

Since the coefficient of world gold price is equal to 5.19, therefore it means that if the world gold price increases one unit, then the cash index and price of stock will increase 5.19unit. In other words, world gold price has a positive impact on stock index (TEDPIX).

Summary and Conclusions: This paper investigate to choose between linear and linear-logarithmic to investigate the relationship between oil exports income and cash index and stock index of Tehran Stock Market. It is important to choose the preferred model by econometric methods because the explanatory variables in each model are different and have a different role for explaining the basic model. The main hypothesis is the positive impact of oil exports income on cash index and stock price of Tehran Stock Market. In order to investigate the mentioned hypothesis, in linear model we have used six variables, such as cash index, stock prices in Tehran Stock Market with a lag, oil exports income, the world price of gold, GDP, real investment of private sector and dummy variables related to changes and laws. Also in linear – logarithmic we have used four variables, such as oil exports income (in logarithmic form), Tehran Stock Exchange Dividend & Price Index(TEDPIX, in logarithmic form) with a lag, exchange rate (in logarithmic form) and dummy variables related to changes and laws. Finally, after testing of cointegration for both models, by obtaining the correlation between the dependent variable and its fitted in both models, it was emphasized that the linear model is stronger than linear – logarithmic model.

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