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Check contagion of price fluctuations in the index of currency and oil with the index of stock prices in the Stock Exchange

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ABSTRACT

Objective: Presence of the efficient financial markets and institutes is considered as one of the characteristics of the developed countries which play important role in economy of these countries and straighten the economic growth and development of these countries. Tehran stock exchange is able to accelerate movement toward growth and development as the most main pillar of the capital market in country meanwhile equipping and injecting the stagnant savings in country and leading them into production**. Methodology:** Since, the present shares value in the stock exchange is affecting by some various factors especially the macro-economical variables, so price fluctuation transmissibility of some macro-economical variables has been studied with stock price index in the present research. **Results:** For this purpose, VAR method has been used to study the capital market transmissibility from markets of foreign exchange, oil and gold. The research data was collected daily (since March, 2008 until end of August, 2014) and they have been tested using Eviews software. **Conclusion:** The results of this research revealed the capital market transmissibility from both foreign exchange and oil markets.

1. Introduction

The performed studies indicate that the information related to financial variables is transmitted to each other during time (Sukcharoen et al., 2014). This subject has been become more important through progressing the information systems and the more dependence of financial markets on each other. The transmission of the agitation among the financial indexes indicates the information transmission process between the markets.

Considering this matter that the financial markets are related to each other, the created information in a market can effect on other markets. Meanwhile, modeling the returns agitation in the different markets and relations of these markets to each other is accounted as the important subject from academic persons' viewpoint and the financial science suppliers' viewpoint according to its applications in prediction. Therefore, this research is going to determine the direction of this relation via studying the effect of economical important macro-variables and shares return, also this research is going to answer this question: Are the economical important macro-variables in relation with stock exchange market which its agent is stock price index in this research?

1.1 Research background

Lee and Ni (2002) analyzed the effects of oil shares price on the demand and supply in the various industries using VAR model. Their results indicate that the applied shocks in essentially oil price decrease the oil supply for some industries which have high shares of oil in their financial basket such as crude oil refinery and chemical industry and shocks in essentially oil price essentially decrease demand for other industries such as automobile manufacturing industry. Their research reveals that the oil price shocks effect on economical activity with time delay that has been explained by effects of direct input cost (Ajayi and Mougouė, 1996).

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Kilian and Park (2009) and Guesmi and Fattoum (2014), have investigated the relationship between growth rate of gold cost and stock market return using vector error correction model and Johansson's convergence test and ordinary least squares. The results of their study indicate that there is not any long-time relationship between growth rate of gold price and stock market return during long times up to 10 years, but there is reverse relationship between growth rate of gold price and short time stock market return. This result indicates that is a sock is applied on the stock market return from one of the independent variables like growth of gold price; this sock is adjusted gradually in each period and will come back to its long-time relation (Aloui et al., 2012).

Moon and Yu (2009), studied the short-term overflow effects of return and daily oscillation (swing) in stock between stock markets of America and china. They studied the information overflow effect using GARCH-M models for s&p500 return and index swing in America and stock market index of Shanghai in China in time return 1999-2007. They found some evidences of swing overflow effects in America stocks market to China stocks market. The accurate investigation about the carried out studies indicates that a model that can investigate the swing between the socks indexes considering memory effect has not been done until present time. So, theoretical progression and subsequently the experimental analysis that was performed in this article, is the first step in this direction.

Aloui and Jammazi (2009) studied the relationship between swing of crude oil price and stocks markets. The results of their price study indicated that the prices of energy and especially oil affect potentially on the cost.

Wei et al. (2010) have studied the predictability power of crude oil price using various models of daily data GARCH class in two different periods. During ages 2007-2009, crude oil price encountered with significant changes up to 30-145 $ per each barrel. In the full swing interval, the GARCH class nonlinear models are more effective than long term swing prediction linear models of crude oil price swing.

Reboredo et al. (2014) considered the countries of Brazil, Mexico, Canada as the exporter and USA, German and Netherland as the importer in order to investigate the relation between the markets of these countries and oil price.

In this research, two multi variable DCC and GJR-GARCH models and monthly data from 1987 to 2009 were used and the obtained results revealed the asymmetric transmission between oil exporter and importer countries. Also, this research indicated that the shocks of oil price supply section do not affect anymore on the relationship between these countries. But the shocks due to the demand (that is change in commercial cycles or war) have more effect on the countries than the shocks due to (decrease in production supply of OPEC members).

Bjørnland (2009) studied the time series delay correlation of these countries and indicated that oil prices apply negative effect on all stock markets neglecting the origin of swing and it is not assured place to prevent from stock market risk during market critical periods.

1.2 Statistical community, sampling method, and sample size

Statistical community of the present research is the financial market such as Stock market, oil market and gold market.

The collected data in this research is included daily numerical value of stock market total index and also daily prices of free market dollar, Full BahareAzadi coin and Texas oil that is from J.A.A Central bank and stock exchange site and Rahavard-e- Novin Software from March, 2009 to August, 2014.

1.3 Research hypotheses

Considering the above-mentioned questions, the research hypotheses are stated as follows:

- Price swing in exchange market is transmissible on the price index of stock market
- Price swing in oil market is transmissible on the price index of stock market

2. Materials and methods

2.1 Research methodology and under studied variables

Data collection method was library and inferential study. The theoretical base and the performed studies are used in order to make a model.

First, the data stagnation is studied using generalized Dickey-Fuller test. In the next stage, the relationships between the variables and their effect at considered periods are investigated. After studying stagnation and cointegrating the applied variables in the model, using VAR model, the model is estimated for the considered variables.

The dynamic relationship between index shocks of sock price and main variables in macro-economic such as exchange rate, oil price, and gold price was studied and instant response functions technique will be used in order to observe the effects of these shocks.

In the present research, all applied numbers and information are extracted from Islamic republic central bank and OPEC site and stock exchange organization and also using Rahavard-e-Novin software.

2.2 Research model and test

For error correction model fitness to estimate VECM model using Johnson test vector the below mentioned steps shall be done.

1) Unit root test for each variable.
2) Ordinary VAR model fitness to determine the optimized delay number.
3) Using Laglen function to determine the optimized delay number.
4) Johnson co-integration test.
5) Variance analysis test.
6) VECM final model fitness.

2.2.1 Unit root test

The unit root of Dickey-FULLER GLS(ERS4) has been used in order to test that do the considered variables have unit root?

To suppose H0 or the same supposition of including unit root can be rejected considering the critical values of supposition. That is index swing of stocks section and exchange rate and prices of oil and gold have not unit root. In the other words, this variable has not 1% unique root even in significant level. Thus, here both series are similar. Therefore, VAR initial model can be performed considering the results of this test.

2.2.2 Determination of optimized delays number

In this section, first the ordinary VAR model should be fitted on the considered variables to determine the optimized delays number. Then, the optimized model delays number can be determined using Laglen function and it can be applied for Johnson co-integration test.

SC and AIC with more ability than other criteria are considered to determine the optimized delays number and the delay is selected according to them.

2.2.3 Final model of vector error correction model

After Johnson co-integration test indicated that there is a co-integration relationship between these variables, the next step for error correction model is that the final model shall be entered into the model despite presence of a long term relationship between the mentioned variables to run the model.

Considering the observed output, there is a significant and positive long term relationship between both price swing of exchange market and oil market with capital market. To analyze VECM interaction diagrams after analyzing the final model output indicates the behavior of each variable against the arrived shocks and general conclusion from interpretation of these algorithms can be summarized that the stocks market is affected by swings of exchange, oil market specially the shocks of these markets. In the other words, the shocks of exchange, oil market can create strategic role for some time in the stocks market (Ghorbel et al., 2014).

3. Discussion and results

3.1 The data and results of under studied stagnancy variables test

In order to evaluate the effect of exchange , oil price swings on total index according to Das study methodology and Anand and K night's study, First, the stR variables (total index of stocks price) and exR(exchange rate variations) and OilR (oil price variations) are considered as logarithm variations of stocks market price index.

$$stR = \ln(st_t) - \ln(st_{t-1})$$
$$exR = \ln(ex_t) - \ln(ex_{t-1}) \quad (1)$$
$$oilR = \ln(oil_t) - \ln(oil_{t-1})$$
$$goldR = \ln(gold_t) - \ln(gold_{t-1})$$

Since in evaluation of VAR models, the transactions are evaluated by least squares approach, it is necessary to make sure about stagnancy method and co-integration of the studied variables before evaluation of this model, the results related to the generalized Dickey-Fuller test have been given in table 1.

Table 1. Results of generalized Dickey-Fuller unit root test

Variables	Dickey-FULLER statistic	Critical vale		Significant level
exR	-9.694532	1%	-2.567551	**0.0000**
		5%	-1.941178	
		10%	-1.616461	
oilR	-30.20674	1%	-2.567531	**0.0000**
		5%	-1.941175	
		10%	-1.616463	
stR	-12.03415	1%	-2.567537	**0.0000**
		5%	-1.941176	
		10%	-1.616462	

The results of table (1) show that the applied variables (exR ،oilR،stR) all are co-integration of I(0) and stagnant.

On the other hand, Johnson test in tables (2) and (3) indicates presence of co-integration between the pattern variables. On the other hand, this is possible to obtain the long-term equilibrium relationship between price swings stock market using co-integration approach.

Table 2. Co-integration test based on effect test

Hypothesis	Special values	Effect statistic	Critical values 5%	Significant level
non	o.205188	642.3100	47.85613	0.0001
Maximum one vector	0.195172	436.3145	29.79707	0.0001
Maximum two vectors	0.152744	241.5522	15.49471	0.0001
Maximum three vectors	0.098357	. 92.87250	3.841466	0.0001

Table 3. Infinite co-integration test (Maximum special value)

Hypothesis	Special values	Maximum numbers	Critical values 5%	Significant level
non	o.205188	205.9955	27.58434	0.0001
Maximum one vector	0.195172	194.7623	21.13162	0.0001
Maximum two vectors	0.152744	148.6797	14.26460	0.0001
Maximum three vectors	0.098357	. 92.87250	3.841466	0.0000

Using the effect test, the results of tables (2 and 3) indicate that in significant level 5% there are three convergence or co-integration vectors between exchange rate, and oil and gold price and this subject indicates the presence of long-term relationships between these both variables. Since all considered variables are I (0) and also are co- integrated, thus it is possible to apply them in order to observe the stagnancy condition in VAR evaluated model.

3.2 Experimental results

In this section, co-integrated vectors (and the coefficients relevant to long-term equilibrium equations) are evaluated between the variables, using VAR model coefficients and also using Johnson method, because the present relationship between VAR model and co-integration provides this possibility to obtain co-integration vectors via VAR model coefficients. Therefore, at first, VAR pattern and proper delays number are evaluated and determined in order to make sure that the error sentences related to VECM are white noise and finally are stable. The results related to evaluation of VAR model and optimized delays number are given in table (4).

Table 4. Determination of the optimized delays number in VAR model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	12060.58	NA	2.27e-17	-26.97222	-26.95076	-26.96402
1	12120.67	119.5103	2.06e-17	-27.07086	-26.96357*	-27.02986*
2	12142.22	42.65712	2.03e-17*	-27.08327*	-26.89015	-27.00947
3	12157.58	30.28006	2.04e-17	-27.08184	-26.80290	-26.97525
4	12165.61	15.75620	2.07e-17	-27.06401	-26.69924	-26.92462
5	12176.47	21.19786	2.10e-17	-27.05250	-26.60190	-26.88031
6	12189.99	26.28049	2.11e-17	-27.04695	-26.51052	-26.84196
7	12203.71	26.56527	2.12e-17	-27.04187	-26.41960	-26.80408
8	12235.14	60.52358*	2.05e-17	-27.07637	-26.36828	-26.80578

As the above table shows, the optimized delay of VAR model is the variables of OilR, exR and stR of second delay. Therefore, VAR model is estimated again with second delay, and in order to make sure about result stability of the VAR model are estimated, and the stagnancy results of this model have been given in figure 1.

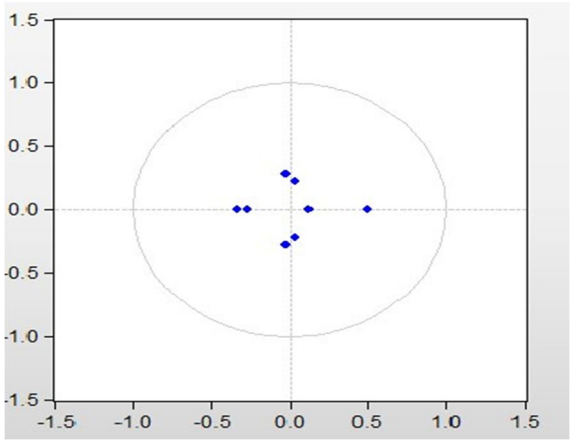

Figure 1. Specification roots and VAR model stagnancy test

Figure 1 indicates that VAR model applied with research variables is fully stagnant, because reverse of all polynomial VAR specification roots are less than one and are inside the circle. Considering that all evaluated VAR model specification roots are placed inside the circle, so the evaluated VAR model has necessary stable.

3.3 First hypothesis

price swing is transmissible on price index of capital market in exchange market.

Considering the results of t statistic VCEM model evaluation relevant to variable coefficient of exchange market indicate their significance in the model. Thus, EXR independent coefficients -4.754614 indicates that there is direct relationship between exchange rate and dependent variable of stocks price index, that is if one unit is added to exchange rate, total index is increased up to 4.754614.

The price swings in exchange market is transmissible on price index of capital market during long-term and swings of exchange market lead to positive and significant effect on stocks price index.

Table 5. Results of statistic tests relevant to the first hypothesis

Statistical test results		Variable coefficient in model	Dependent variable	Independent variable	Description
✓	Research hypothesis remained	4.754614	Exchange rate	Total price index of capital market	First hypothesis

3.4 Second hypothesis

Price swing in oil market is transmissible on price index of capital market.

Considering the results of t statistic VCEM model evaluation relevant to variable coefficient of oil market indicate their significance in the model, thus oil independent coefficient 2.659228 indicates that there is a direct relationship between oil price and independent variable of stocks price index, that is if a unit is added to oil price , total index is increased up to 2.659228 and price swing in oil market is transmissible on price index of capital market and swings of oil market lead to positive and significant effect on stocks price index.

Table 6. Results of statistic tests relevant to second hypothesis

Statistical test results		Variable coefficient in model	Dependent variable	Independent variable	Description
✓	Research hypothesis remained	**2.659228**	Oil price	Total price index of capital market	First hypothesis

4. Conclusion

Regarding the present subject that has studied the transmissibility of capital market; the results of the research can be stated as the follows.

Generally, the daily data results of this research emphasize on the relation of capital market transmissibility from oil and exchange markets and on lack of capital market transmissibility from exchange and oil market. It seems that increase in exchange rate during long-term is due to increase in exporter industries profitability that leads to capital market boom. Also, this result can be obtained that the major companies which are member of Stock exchange are exportoriented. With increase in oil price, expected economic boom will be occurred in Iran. And it would provide increase in the stock price index. In the other worlds, economic growth due to oil income can has positive effects on country economic activities. Gold price index is among the most important effective indexes on the economic and political factors in each country.

4.1 Suggestions

1) It is suggested to measure the effect of index return swing transmissibility of imports and exports oriented industries on stock exchanges total index, because the present suggested research indicates the rate and way of transmission of index return swing separate from these industries and it makes the researcher able to predict the effectiveness time delays.
2) It is suggested that the effectiveness of the import-oriented companies is studied and tested separately in capital market from the markets parallel with the capital market; the extraction model of this research will be effective to predict return swing in the related industry.
3) In order to remove the performance weakness of stock exchanges in doing their most important duty that is cash absorption and help for economic growth, it is suggested to study uneconomical variables in addition to economic variables affecting on stock exchanges activity to provide more stock exchanges growth and boom.

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