**Oil price volatility and exchange rate of USA dollar on point of Iranian paper and wood products**

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**Abstract**

Iran is second largest producer within the OPEC and reference basket price of OPEC and dollar exchange rate of USA have dominated Iranian economic growth. Wood or paper products are playing important roles in the structure of countries economy. Volatile prices caused the paper and wood industries prosperity or depression. Therefore, the basic of questions as fallow: What is the price volatility of OPEC crude oil and exchange rate of USA dollar on point of Iranian paper and wood products? The research methodologies are analytical and estimation. Vector Auto Regressive (VAR), estimating equations and Impulse Response Functions (IRF) were used. Our results were showed that relate between points of paper or wood products with USA$ exchange rate better than relate between points of paper or wood products with OPEC reference basket price. Results of Vector Auto Regressive revealed that if OPEC reference basket price is increase, point of paper or wood products will increase in next year. Shocks of OPEC crude oil price on the point of paper and paper products were diverged, but the shock of USA dollar price hadn’t effected on the paper point. Response of wood product point to oil price impulse was divergence and their relationship was positive. Exchange rate volatile cause was not increasing of wood product point. Volatile of wood product point from exchange rate will disappear in ten next years.

***Keywords:*** *Point of paper or wood product; VAR; IRF; OPEC reference basket price; USA$ exchange rate.*

# Introduction:

Iran is second largest producer within the OPEC (Organization of the Petroleum Exporting Countries). OPEC reference basket price and USA dollar exchange rate to Rial affected Iranian economic growth. Their price volatility can have an effect on the wood or paper industries prosperity or depression. Paper or wood products are strategic commodity in Iran and these play important roles in the structure of countries economy. Several studies have been conducted in this area. Some of the studies are as fallows;

Study of Kim et al (2003) estimated the impacts of the currency value change on the forest products import quantities in Korea using vector autoregressive model. The relationship between the currency value and the import quantity was represented by vector autoregressive model. Change in the currency value causes change in the hardwood roundwood import quantity in Korea. Kim (2008) compared the plywood demand prediction accuracy of econometric and vector autoregressive models using Korean data. The results showed that the plywood demand prediction can be performed more accurately by econometric model than by vector autoregressive model. Study reports of Koonnathamdee (2009) showed that deviations in the U.S. exchange rate contemporaneously affect exports and trade balances in selected forest product trade, while imports do not respond simultaneously to exchange rate innovations. However, a shock in the exchange rate has long-lasting effects on future forest product trade components. A shock in exports does not affect imports in the short run, but slightly affects import levels in the long-run. Daigneault et al. (2008) were stated that a 20% increase in value of the US $ compared to all other currencies can reduce harvests by 4–7% in the United States over the next 50 years, while a similar reduction in currency values in South America can reduce U.S. production less than 1%. A 20% devaluation of the US $ can increase annual domestic timber harvests by 2–3% and net present value of producer surplus by 3–10%. Bolkesjø, and Buongiorno (2006) were tested the short- and long-run impacts of exchange rates on the trade of various forest products. In the short run, exports were very elastic with respect to the exchange rate (-2.6), while imports were moderately elastic (1.2). In the long run, the elasticity decreased but remained signiﬁcant (0.5 for both exports and imports). Appreciation of the US dollar tended to matter more than depreciation, but the hypothesis that the effect of exchange rate was symmetric could not be rejected. Sun and Zhang (2003) are showed that exchange rate volatility has a negative impact on U.S. exports in the long term, but short-term dynamics vary for different commodities. In the short term, the effect is significantly positive for wood chips and bleached sulphate wood pulp, but negative for softwood logs and dissolving wood pulp. A stable currency policy in the long run helps promote U.S. exports of forest commodities, although some commodities may benefit from exchange rate volatility in the short term.

Farzanegan and Markwardt, (2009) analyzes the dynamic relationship between oil price shocks and major macroeconomic variables in Iran by applying a VAR approach. Strong positive relationship between positive oil price changes and industrial output growth. Furthermore, the”Dutch Disease” syndrome through signiﬁcant real effective exchange rate appreciation. Results of Ewing and Thompson (2007) suggest that crude oil prices are pro cyclical and lag industrial production and additionally, oil prices lead consumer prices. The results of the model using both linear and non-linear speciﬁcations indicate that there is no direct impact of oil price shock on the economic activity. The shock of oil prices affects economic activity indirectly (Jbir and Zouari-Ghorbel, 2009).

The vector autoregressive model results show exports fell dramatically with the imposition of the tax. This research showed that the imposition of an export tax has long-lasting, negative effects on competitiveness of the Indonesian palm oil industry (Hasan et al, 2001). Ndlela, T. and Nkala, P. (2003) provides a Vector Auto Regression (VAR) empirical analysis of macroeconomic fluctuations in the South African economy. The analysis shows that although South Africa recently experienced marked fluctuations in macroeconomic fundamentals, the economy has a strong resilience to the permanent effects of shocks. Sharifi-Renani, H. (2010), using the vector Autoregressive approach, the effects of each of economic growth, international trade and environmental regulations in relation to the others was systematically studied.

Variables of wood or paper products point have different effects on each others. These effects can be studied by VAR. One purpose of the study is to find models and shocks effects that will best explain relationships among variables of the paper or wood products market in Iran. Therefore, the aim of this research is study of effects of oil price and exchange rate on paper or wood product point. Therefore, the basic of questions as fallow: What is the price volatility of OPEC crude oil and USA dollar on Iranian point of wood products? What is the effect of Shocks of oil price and exchange rate (USA$) on the Iranian point of paper and paper products? Since, the research methodologies are analytical and estimation and Vector Auto Regressive (VAR), estimating equations and Impulse Response Functions (IRF) were used.

**Material and methods:**

We measure the effect or shocks oil price and USA dollar on point of paper or wood products. The price or point data were monthly price of oil and point of paper and wood products from January 2002 to October 2008, compiled from the database of central bank of Iran and Organization of the Petroleum Exporting Countries (OPEC). The data are available at http://www.opec.org and www.cbi.ir. Also. the exchange rate data, values of the foreign currency (US dollars) in Iran Rial, were monthly averages of daily buying rates in Iran, compiled from central bank of Iran (available from www.cbi.ir). These variables were collected for world from 2002 to 2008. All variables are defined in real terms. The general model is expressed as:

WOODPRODUCTPOINT = F (OILPRICE, DOLARPRICE)

PAPERPOINT = F (OILPRICE, DOLARPRICE)

Vector autoregressive model (VAR) was used. The VAR model provides a multivariate framework where changes in a particular variable are related to changes in its own lags and to changes in other variables and the lags of those variables. The structural VAR model has been seen as particularly useful in modern analysis. The response of variables to innovations in a particular variable can also be traced out using the simulated responses of the estimated VAR system (Impulse Response Functions (IRF)). This method imposes an ordering of the variables in the VAR and attributes all of the effects of any common components to the first variable in the VAR system. An impulse response function (IRF) traces the effects of a one-time shock to one of the innovations on current and future values of the endogenous variables. Response of one variable to cholesky one S.D. another variable innovation (Impulse Response Functions) or unit shocks on equations for these variables are presented.

**Result and discussion:**

Point of wood products and point of paper products were investigated in the changes of oil and dollar price. Results of covariance analysis and VAR related to point of wood products are showed in table 1 and 2, and also results related to point of paper products are showed in table 3 and 4.

VAR models of point of paper or wood products were estimated on the basis of dollar price or exchange rate and oil price. Estimation of VAR model for both points is as following.

WOODPOINT = 1.09242626334\*WOODPOINT(-1) - 0.113230759076\*WOODPOINT(-2) + 10.7458315437 - 0.000997069902691\*DOLARPRICE + 0.110981566557\*OILPRICE

PAPERPOINT = 0.87994733386\*PAPERPOINT(-1) + 0.112489930027\*PAPERPOINT(-2) + 6.43843495703 + 0.131991292651\*OILPRICE - 0.000976844013363\*DOLARPRICE

Response of wood product point to the shock effect of oil price is showed in figure 1 and its response to the shock effect of dollar price is showed in figure 2. Also, Response of paper point to the shock effect of oil price is showed in figure 3 and its response to the shock effect of dollar price is showed in figure 4.

Our results were showed that relate between points of wood product with USA$ exchange rate to Rial better than OPEC reference basket price (table1). Results of Vector Auto Regressive revealed that if OPEC reference basket price is increase, point of wood product will increase in next year (table2). Response of wood product point to oil price impulse was divergence and their relationship was positive (figure1). Result of exchange rate volatile cause was not increasing of wood product point (figure2). Volatile of wood product point from exchange rate will disappear in ten next years.

Econometric criteria were showed that point of paper and paper products had related to USA dollar price and then OPEC reference basket price (table3). If crude oil price is increase, point of paper and paper products will increase in next year (table4). Shocks of OPEC crude oil price on the point of paper and paper products were diverged (figure3), but the shock of USA dollar price hadn’t effected on the paper point (figure4).

Previous studies have indicated that changes of exchanges rate are affected on the economic component. This effect was found in the forest product such as forest products import or export quantity (Kim et al., 2003, Kim 2008, Koonnathamdee 2009 and Daigneault et al. 2008). There, exchange rate to rial had related to point of paper or wood products. Responses of forest products to exchange rate innovation are different. Impacts of exchange rates on the trade of various forest products were visible by literature review such as Koonnathamdee (2009), Bolkesjø, and Buongiorno (2006) and Zhang (2003). Responses of paper or wood point to dollar price innovation were convergence and the shock of exchange rate hadn’t effected on the point of paper or wood products.

Iranian economy is strong relationship with product of petroleum quantity or their price (Farzanegan and Markwardt, 2009) and significant effect on their commodities. Paper or wood products of Iran are affected by the price change. Ewing and Thompson (2007) and Jbir and Zouari-Ghorbel (2009) were stated that oil prices lead consumer prices and affects economic activity. Exchange rate has more effect than oil price on both products, because domestic supplies are limited and Iran economy is dependent commodities imports. The relationship between exchanges rates and forest products trade such as timber harvests has been studied previously (Daigneault et al. 2008). Now, export ban of Iran is shown that effect of exchange rate change is more than oil price, because the consumer prices are increasing in line with dollar price. Also, these products price are increasing in the situation. Oil price increasing was presented in ago periods and this increasing had an adverse effects on the Iran economy such as”Dutch Disease” syndrome (Farzanegan and Markwardt, 2009), but rising of exchange rate in now has more desirable than ago periods. Therefore, point of paper or wood products in the economy condition are depended to both exchange rate and oil price, especially dollar price. The subject is observed in the macroeconomic conditions and previous studies.

**Conclusion**; this article show effects and shocks of oil or dollar price on point of paper or wood products in Iran economy. Point of both products had related to USA dollar price and then OPEC reference basket price. If the crude oil price and the dollar price are expensive, both point products will increase in next year. Responses of both products point to oil price impulse were diverged, but exchange rate volatile cause was not increasing of both product points. Effect of exchange rate change on the both points is more than oil price and these impacts on the Iran economy were visible by rising of dollar price in recent years. Consumer prices have increased sharply by increase in the dollar price.

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Table1. Results of covariance analysis are related to wood product point.

|  |  |  |  |
| --- | --- | --- | --- |
| Sample (adjusted): 2002M01 2008M09 | | |  |
| Included observations: 81 after adjustments | | | |
| Balanced sample (listwise missing value deletion) | | | |
| Covariance | |  |  |
| Correlation | |  |  |
| t-Statistic | |  |  |
| Probability | WOODPOINT | OILPRICE | DOLARPRICE |
| WOODPOINT | 3519.697 |  |  |
|  | 1.000000 |  |  |
| OILPRICE | 1296.119 | 661.6553 |  |
|  | 0.849330 | 1.000000 |  |
|  | 14.30108 | ----- |  |
|  | 0.0000 | ----- |  |
| DOLARPRICE | 29534.25 | 10076.90 | 291278.2 |
|  | 0.922400 | 0.725867 | 1.000000 |
|  | 21.22660 | 9.379647 | ----- |
|  | 0.0000 | 0.0000 | ----- |

Table2. Results of Vector Autoregression Estimates are related to wood product point.

|  |  |
| --- | --- |
| Sample (adjusted): 2002M03 2008M09 | |
| Included observations: 79 after | |
| adjustments | |
| Standard errors in ( ) & t-statistics in [ ] | |
|  | WOODPOINT |
| WOODPOINT(-1) | 1.092426 |
|  | (0.11252) |
|  | [ 9.70847] |
| WOODPOINT(-2) | -0.113231 |
|  | (0.11689) |
|  | [-0.96873] |
| C | 10.74583 |
|  | (15.0582) |
|  | [ 0.71362] |
| DOLARPRICE | -0.000997 |
|  | (0.00227) |
|  | [-0.43959] |
| OILPRICE | 0.110982 |
|  | (0.03048) |
|  | [ 3.64122] |
| R-squared | 0.996227 |
| Adj. R-squared | 0.996023 |
| Sum sq. resids | 1013.686 |
| S.E. equation | 3.701143 |
| F-statistic | 4885.284 |
| Log likelihood | -212.8962 |
| Akaike AIC | 5.516360 |
| Schwarz SC | 5.666325 |
| Mean dependent | 260.6380 |
| S.D. dependent | 58.69272 |

Table3. Results of covariance analysis are related to paper point.

|  |  |  |  |
| --- | --- | --- | --- |
| Sample (adjusted): 2002M01 2008M09 | | |  |
| Included observations: 81 after adjustments | | | |
| Balanced sample (listwise missing value deletion) | | | |
| Covariance | |  |  |
| Correlation | |  |  |
| t-Statistic | |  |  |
| Probability | PAPERPOINT | OILPRICE | DOLARPRICE |
| PAPERPOINT | 4035.795 |  |  |
|  | 1.000000 |  |  |
| OILPRICE | 1392.274 | 661.6553 |  |
|  | 0.852009 | 1.000000 |  |
|  | 14.46502 | ----- |  |
|  | 0.0000 | ----- |  |
| DOLARPRICE | 30561.86 | 10076.90 | 291278.2 |
|  | 0.891377 | 0.725867 | 1.000000 |
|  | 17.47930 | 9.379647 | ----- |
|  | 0.0000 | 0.0000 | ----- |

Table4. Results of Vector Autoregression Estimates are related to paper point.

|  |  |
| --- | --- |
| Sample (adjusted): 2002M03 2008M09 | |
| Included observations: 79 after | |
| adjustments | |
| Standard errors in ( ) & t-statistics in [ ] | |
|  | PAPERPOINT |
|  |  |
|  |  |
| PAPERPOINT(-1) | 0.879947 |
|  | (0.11991) |
|  | [ 7.33857] |
| PAPERPOINT(-2) | 0.112490 |
|  | (0.12396) |
|  | [ 0.90748] |
| C | 6.438435 |
|  | (11.4966) |
|  | [ 0.56003] |
| OILPRICE | 0.131991 |
|  | (0.02702) |
|  | [ 4.88463] |
| DOLARPRICE | -0.000977 |
|  | (0.00162) |
|  | [-0.60216] |
| R-squared | 0.997466 |
| Adj. R-squared | 0.997329 |
| Sum sq. resids | 803.0654 |
| S.E. equation | 3.294273 |
| F-statistic | 7281.536 |
| Log likelihood | -203.6962 |
| Akaike AIC | 5.283448 |
| Schwarz SC | 5.433413 |
| Mean dependent | 233.0937 |
| S.D. dependent | 63.73893 |



Figure1. Response of wood product point to the shock effect of oil price in paper products



Figure2. Response of wood product point to the shock effect of dollar price in paper products



Figure3. Response of paper point to the shock effect of oil price in paper products



Figure4. Response of paper point to the shock effect of dollar price in paper products