



## The Effects of Oil Price Volatility on the Economic Sectors of Libya

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### ABSTRACT

Fluctuations in oil price and its impact on economic development is an important issue facing a growing number of world economies. A simple changes in oil prices lead to negative or positive effects on all the economic sectors. This paper seeks to investigate the impact of oil price volatility on economic sectors in the Libyan economy context on the basis of annual data spanning from 1968-2012. The Johansen based Co-integration technique is applied to examine the sensitivity of economic sectors to volatility in oil prices in the long-run. And the short-run relationship is tested by Vector Error Correction Model. Through examining the results, that there is a long-term relationship of oil prices on the agriculture, construction, manufacturing and transport sectors. Finally, this study concludes that increases in oil price did not significantly affect the manufacturing sector in aggregate terms. Moreover, the negative impact on the sector of manufacturing and agriculture. Thus, this study has a significant impact in the Libyan economy in policy development on oil prices. The Libyan government needs to control the price to make sure that price volatility will not harm the manufacturing, agriculture, construction and transport sectors.

**Keywords:** Economic sectors, granger causality, Libyan economy, manufacturing, oil price volatility, VECM.

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### 1.0 INTRODUCTION

Crude oil is one of the world's most heavily traded commodities. Oil still remains the main source of energy for economic sectors. So, the volatility of oil prices may impose a significant impact on the economic conditions in the various countries. Crude oil prices change because of the interaction between the forces of supply and demand in the global commodity markets.

We can see that from the past recent years, oil prices have been quite volatile, there is a strong likelihood that sometimes oil prices will increase again, in addition to, many issues have emerged due to rising crude

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oil prices throughout the world. According to [Moradkhani et al. \(2010\)](#) that higher energy prices lead to other prices increase, such as crude oil, which plays an important role in determining the other goods. Also, the rise in oil prices caused the production costs increase, leading to a decline in production. In addition to, the rise in oil prices leads to increased productivity which negatively affects the economic performance. Several previous studies have proved that an increase in oil price can cause a slowdown in GDP ([Husain et al., 2015](#)). The subsidy is typically provided to mitigate such problems and eschew an economic crisis.

Many economic sectors, such as manufacturing, agriculture, transportation, construction, and use oil to produce outputs. Thus the falling price of oil is a reflection of weak economic sectors. According to [Aimer \(2016\)](#) say that 10% rise in oil prices leads to a 54% increase in GDP of Libya. Furthermore, at the industrial level, low oil prices may not only bring down business expenditures for the manufacturing industries, such as logistic companies and aviation industries, but also affect prices on agricultural products as well.

The slowdown in the agriculture sector as a result of higher oil prices, as this agriculture sector inevitably consumes oil to run activities the field of agriculture. Thus, the high price of oil is causing increased expenditures for the agriculture sector, can trigger increased machinery costs and hardware that agricultural producers have to bear ([Dhuyvetter and Kastens, 2005](#)). In the context of the construction sector, oil prices high can also affect this sector as it pushes to the height the costs of raw materials.

Suppliers inevitably increase prices of raw material to contractors to cover the high costs of transport. It also caused higher prices higher shipping costs. In the construction sector, and the increase in oil prices leads contractors for higher raw material costs ([Copiello, 2016](#)). Similarly, the manufacturing sector is influenced an oil price increase through high production costs. This leads to a decline in the amount of production, which increases the price of products, thus reducing the demand for consumer goods. Rising oil price may impact on the quantity and cost of raw materials purchased principally for producers ([Ee et al., 2015](#)), The transport sector is very energy intensive and thus the impact of rising oil prices translated into higher fuel prices is important. It is generally believed that demand for transport is very rigid and thus should be expected only minor modifications. According to [Seth et al. \(2016\)](#) explained that as oil price increases, transportation costs are affected, thus reducing transport demand.

According to some economists [Syed \(2010\)](#), [Ito \(2008\)](#), and [Mallik and Chowdhury \(2011\)](#) Indicates that if economic growth is not affected fluctuations in the price of oil on economic growth prices policies are not necessary. But these researchers were not considering any nominated sector of the economy for policy making. Before any policy on oil prices, it should first be seen various economic sectors. [Torul and Alper \(2010\)](#), [Hanson et al. \(1993\)](#) Which sectors of the economy were taken into account had done so only to achieve the effects of one or two sectors. The manufacturing, agriculture, construction, and transportation sectors are the main economic sectors that substantially contribute to Libyan GDP. For that, this study is trying influence of oil price fluctuations on manufacturing, agriculture, construction, and transportation sectors.

Movements in oil prices, An important factor in the production process, affecting the financial performance and cash flows of the companies, in turn, influencing firms dividend payments, retained earnings, and equity prices ([Benli, 2008](#)).

Also are important steps in this regard, for example, in Taiwan "renewable energy development plan" of the installed capacity of solar power generation capacity planned between the years 2002-2020 in accordance with the aimed to reach 10 percent ([Kizgin et al., 2013](#)). Due to the expansion of financial derivative instruments, which have often been held accountable for giving rise to the financial crisis in 2008 ([Ulusoy, 2011](#)). According to costs [Erdoğan \(2011\)](#) businesses seeking capital, uncertainties affecting the cost of capital are beneficial because it eliminates and reduces compliance costs. Marketable securities, which can be considered as an indicator of accounting standards increase refers to temporary investments that are bought or sold for companies, the evaluation of the fair value method of marketable securities is another important issue ([Erdoğan et al., 2016](#)). Hierarchical structure may be useful in the

detection of the theoretical description of financial markets and in the search of economic factors affecting special groups of stocks (Ulusoy et al., 2012). The figure 1 shows the annual series of the prices of crude oil (WTI) from 1986-2015.

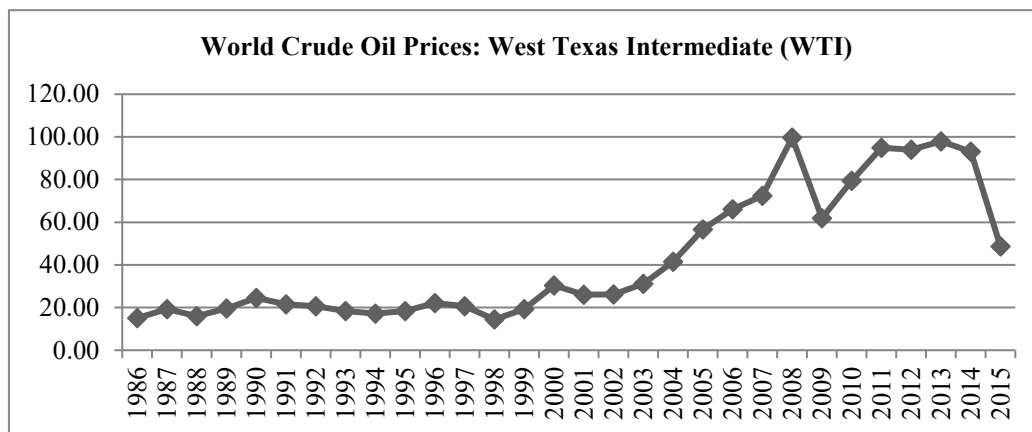


Figure 1: Trends of the annually, world crude oil price US dollars, Source: US. Energy information administration.

Libya is heavily dependent on crude oil exports, thus volatility in crude oil prices is a cause for concern. Leading to, any particular shock in oil prices can have a significant effect on government revenue and the Libyan economy. Thus, this will negatively affect the competitiveness and growth of the non-hydrocarbon economy. This paper seeks to empirically analyze the impact of crude oil price on the manufacturing, agriculture, construction and transportation sectors in Libya. To fill out the gap in the literature that is examining the consequences of oil price shocks on this sectors using annual data from 1986 to 2012, the secondary data were used for the empirical analyses which were derived from the energy information administration. The rest of this paper is structured as follows: The second section provides an overview of the literature review. The third section presents the econometric methodology. While section four describes results and discussion. It concludes with the final section of the paper with the study results.

## 2.0 LITERATURE REVIEW ON METHODOLOGY

The issue of fluctuating oil prices, many researchers to investigate the harmful effects of fluctuations in oil prices on the economy have attracted. Consequently, there are many models that have been used by previous research to study the effects of oil prices.

Guidi (2009), this study examined the effect of oil prices changes on the manufacturing and services sector in the UK, using a VAR model, found that positive impact of changes in oil prices on the manufacturing sector. In addition, the positive changes in oil prices determine the continued contraction in manufacturing. Negative changes in oil prices, showing that manufacturing output does not increase significantly despite the lower oil prices. The services sector is much more affected by oil prices decreases than increases. They found that the manufacturing sector is much more affected by changes in oil prices from the services sector.

Torul and Alper (2010), examined the relationship between oil price and the manufacturing sector in the Turkish economy, using the VAR model for Turkey from 1988 to 2006 data. They conclude that increases in oil price did not significantly affect the manufacturing sector in aggregate terms, some sub-sectors are adversely affected. Fukunaga et al. (2010), analyze the influence of oil price changes on industrial output of the economies of the United States and Japan, the results provided evidence that the inverse impact of oil price changes on industrial output seems in most of the cases with varying degrees, both in the oil industry-intensive industry or not. Shaari et al. (2013), explore the effects of oil price shocks on economic sectors in Malaysia, using the Co-integration model, and the results indicated that the long-term effects

of oil prices on the agriculture, construction, manufacturing, and transportation sectors. In addition, the researcher found that the construction sector depends on the fluctuations in oil prices.

Taghizadeh Hesary et al., (2015) the impact of volatility in oil prices on economic sectors in Japan. Using employ a VAR model by using quarterly data from Q1: 1990 until Q1: 2014. The researchers found that industrial and transport sectors were strongly sensitive to the drastic oil prices volatility. Moreover, The researchers concluded that after the Fukushima disaster in 2011, which led to the shutdown of nuclear power plants in Japan, because of greater reliance on oil imports, the sensitivity of most sectors to volatility declined in oil prices. Riaz et al. (2016), investigate the impact of the uncertainty of oil prices on manufacturing sector of Pakistan. Using the analysis an EGARCH model. Results revealed that manufacturing production is non-linearly related oil price uncertainty, as initially manufacturing production in Pakistan increases with an increase in uncertainty of oil prices but after a threshold level manufacturing production starts declining with the increase in oil price uncertainty. Moreover, impulse response function is shown short run effects of oil price uncertainty contractionary effects on industrial production.

Mahboub and Ahmad (this study examined the effects of oil price shocks on the manufacturing sector in Saudi Arabia during the quarterly period 2002–2014. Using estimate a VAR model. The study showed that there is no long run effect of oil price shocks on the manufacturing sector. The results show that oil price shocks do not affect the manufacturing sector in the short run, and it may have an effect on the manufacturing sector after the tenth quarter.

Although oil prices plays a key role in industrial production and social and economic development of countries, many studies have focused on the existence of a causal relationship between oil price volatility and production. This paper will contribute to the existing knowledge through the study of the impact of oil price volatility on the manufacturing industry, agriculture, and construction sector. In addition, this paper is important because it is the first of its kind in Libya in terms of a more robust estimation technique. It would be interesting to discover whether the conclusions concerning the effects of oil prices shocks on output in the economies of oil exporting also apply to a country such as Libya. The aim of our study is to investigate the effects of oil price volatility on the economic sectors of Libya using Johansen co-integration test and vector error correction model (VECM) for a yearly time series data over the period 1986 to 2012.

### 3.0 METHODOLOGY

In this part of the paper, the impact of oil price volatility on economic sectors through Vector Error Correction Model (VECM) using time series methods of co-integration and Granger Causality techniques. For this purpose, the data set will be determined, thereafter time series properties of the series will be tested. This empirical analysis and focuses on variables (crude oil prices, agriculture, manufacturing, construction and transportation sector) in Libya by the annual time series data from 1986 and 2012. Where:

#### 3.1 DATA ANALYSIS

The five variables used in this analysis are comprised of the crude oil price and the four economic sectors, all in logarithmic terms. Table 1 shows the symbols and definitions of these variables.

GDP gross domestic product by economic sector 1986-2012 (At current factor income and in millions of LYD). All the data used were extracted from the statistic of Central Bank of Libya (2015) and Ministry of Planning. Table 2 shows the regression result for oil price shock and economic sectors in Libya. As both time series are non-stationary, we examine the interdependence between their annual logarithmic returns, which fulfill the condition of stationarity. The annual logarithmic returns are expressed by the equation:  $r_t = \log\left(\frac{x_t}{x_{t-1}}\right)$  (1)

Where,  $\chi$  is the average annual value of the variable at time  $t$  or  $(t-1)$ .

Table 1: Variables and definitions

Variable	Definition
Log (OIL)	ln of crude oil prices: West Texas Intermediate (WTI).
Log (MAN)	ln of manufacturing sector's gross domestic product.
log (Prospects)	ln of building and construction sector's gross domestic product.
log (AGR)	ln of agriculture, hunting, forestry and fishing sector's gross domestic product.
log (TRAN)	ln of transport, storage and telecommunications sector's gross domestic product.

Source: Authors' compilation.

Table 2: The regression results for oil price shock and economic sectors in Libya

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.581667	0.533471	-1.090345	0.2874
LNTRAN	1.082613	0.137819	7.855351	0.0000
LNMAN	0.008647	0.137006	0.063116	0.9502
LNCON	0.349226	0.142414	2.452192	0.0226
LNAGR	-0.924212	0.144369	-6.401724	0.0000
R-squared	0.950173		Mean dependent var	3.442291
Adjusted R-squared	0.941114		S.D. dependent var	0.642763
S.E. of regression	0.155976		Akaike info criterion	-0.712651
Sum squared resid	0.535229		Schwarz criterion	-0.472681
Log likelihood	14.62078		Hannan-Quinn criter.	-0.641295
F-statistic	104.8821		Durbin-Watson stat	1.914313
Prob(F-statistic)	0.000000			

Source: Computed from Appendix 1, using Eviews7.

Table 2 shows that the oil price shock has small opposite impact on the agriculture. In other words, increased oil prices by 1% leads to a decline of \$0.92 agriculture sector. Increased crude oil prices by 1% leads to increased manufacturing industry, construction and transport of \$0.008, \$0.34 and \$1.08 respectively.

The R square value in the Linear Regression equation described that the independent variables describe the dependent variable oil price by almost 84%. The remaining portion of oil price is impacted through other macro-economic variables which is only 16%. The results are described by the following equation

$$LNWTI = 1.08LNTRAN + 0.008*LNMAN + 0.34LNCON - 0.92LNAGR - 0.58$$

The VECM model provides long-term relationship and also short-term dynamics of the variables. This model shows the achievement of long-term equilibrium and the rate of change in the short term to achieve equilibrium. In the long run, endogenous variables must converge to their co-integrated relations. To determine the characteristics of time series for each of the variables in the model, the modeling strategy adopted for this paper passes through three stages.

Must be estimated the stationary of time series. Further steps of modeling are: Firstly, determine the order of integration of variables via Augmented Dickey Fuller test (ADF). Secondly, if the variables are integrated in the same order, by the Johansen test of co-integration, technique which serves to find long-term relationship and short-term dynamics. Based on the theoretical derivation of VECM mode, we determine:

### 3.2 STATIONARY TEST

The first step, natural logarithms of the data have been taken before passing to the analysis process. Then, stationarity tests have been performed for each variant. We must test each of the series in the levels and in the first difference. All variables were tested in levels using the Augmented Dickey-Fuller (ADF) test. Consider the equation below:

### 3.3 CO-INTEGRATION TEST

The Johansen co-integration test (Johansen & Juselius, 1990) is applied to study the long-run equilibrium relationship between the variables. This test reveals whether non-stationary series at the level act together in the long run. In case of determination of co-integration relationship (co-integration vector) that shows the presence of the long run relationship between variables.

$$x_t = c + \sum_{j=1}^p \Gamma_j \Delta x_{t-j} + u_t \quad (2)$$

There are two types of Johansen test, namely; Trace and Maximal Eigenvalue statistics, both commonly use to ascertain the number of Co-integration rank or in determining the number of Co-integrating vectors. Both tests might not always indicate the same number of Co-integrating vectors. A Co-integrating vector is attained when obtained critical values are more the values for trace and maximum Eigenvalue statistics.

### 3.4 THE VECTOR ERROR CORRECTION MODEL

This is based on a vector autoregressive framework; where an error correction term is incorporated into the model. The reason for the error correction term is the same as with the standard error correction model, it measures any movements away from the long run equilibrium and measures the speed of adjustment of the short run dynamics to the long run equilibrium time path. The coefficient is expected to be negatively signed, statistical significant and lie between zero and one.

Moreover, the VECM model treats all series endogenously thereby allowing the predicted variable to explain itself using its own lags, lags of independent variables, the error correction term and the residual. The VECM can be expressed as;

$$\Delta Y_{1t} = \alpha_0 + \sum_{j=1}^k \alpha_{1j} \Delta Y_{1t-j} + \sum_{j=1}^k \alpha_{2j} \Delta Y_{2t-j} + \lambda_1 ECT_{t-1} + \varepsilon_{1t} \quad (3)$$

$$\Delta Y_{2t} = \beta_0 + \sum_{j=1}^k \beta_{1j} \Delta Y_{1t-j} + \sum_{j=1}^k \beta_{2j} \Delta Y_{2t-j} + \lambda_2 ECT_{t-1} + \varepsilon_{2t} \quad (4)$$

$ECT_{t-1}$  is the lagged value of the error correction model. Coefficients  $\lambda_1$  and  $\lambda_2$  show the equilibrium ratio. When Cointegration is considered,  $\alpha_{ij}$  from the equation 6 and  $\beta_{ij}$  from the equation are tested whether they are significant in group of F-test and also coefficients of the error correction model  $\lambda_1$  and  $\lambda_2$  are tested whether significant or not.

### 3.5 GRANGER CAUSALITY TEST

Causality is a kind of statistical feedback concept which is widely used in the building of forecasting models. The Co-integration tests only give an indication of whether there exists a long- run relationship between oil price and economic sectors. However the direction of this relationship is of important. The Granger Causality test is then performed to determine the direction of the relationship between the variables used in the model (Granger, 1980).

Granger (1980) described one variable ( $X_t$ ) to granger cause another variable ( $Y_t$ ) if the lagged values of  $X_t$  can predict  $Y_t$  and vice-versa. The test is based on the equation below:

$$Y_t = \gamma_0 + \sum_{z=1}^p \gamma_z Y_{t-z} + \sum_{i=1}^q \lambda_i X_{t-1} + u_t \quad (5)$$

$$X_t = \theta_0 + \sum_{z=1}^p \delta_z X_{t-z} + \sum_{i=1}^q \psi_i y_{t-1} + v_t \quad (6)$$

Testing the null hypothesis of  $H_0: \lambda_1 = \lambda_2 = \dots = \lambda_z = 0$ , is a test that X does not Granger-cause Y. Similarly, testing the null hypothesis of  $H_0: \psi_1 = \psi_2 = \dots = \psi_z = 0$ , is a test that Y does not Granger-cause X. In each case, a rejection of the null hypothesis implies there is Granger causality.

## 4.0 EMPIRICAL RESULTS

### 4.1 UNIT ROOT TEST

Tables 3 and 4 presents empirical results of the unit root tests and indicate that the natural logarithms of the variables are all I(1) processes at 5% significance level. The null of unit root can therefore be rejected for the first differences of all variables. Tables 2 and 3 report the results of tests of Co-integration.

Table 3: Augmented Dicky Fuller test results

Variable	At Level			First Difference			Order of Integration
	Non	Intercept, Trend	Intercept	Non	Intercept, Trend	Intercept	
lnWTI	1.510 (0.9640)	-1.918 (0.6165)	-0.384 (0.8981)	-5.262 (0.0000)**	-5.723 (0.0005)**	-5.633 (0.0001)**	I(0)
lnAGR	0.588 (0.8370)	-0.8083 (0.9518)	-1.779 (0.3819)	-4.782 (0.0000)**	-5.201 (0.0016)**	-4.770 (0.0008)**	I(0)
lnCON	0.7870 (0.3815)	-1.935 (0.6073)	-1.422 (0.555)	-4.962 (0.0000)**	-4.942 (0.0006)**	-4.942 (0.0006)**	I(0)
lnMAN	0.805 (0.8803)	-3.862 (0.0289)***	-1.520 (0.5070)	-7.330 (0.0000)**	-7.702 (0.0000)**	-7.614 (0.0000)**	I(0)
lnTRAN	4.211 (0.9999)	-1.593 (0.7679)	-0.699 (0.8298)	-2.946 (0.0049)**	-4.134 (0.0168)**	-4.224 (0.0031)**	I(0)

Note: \*, \*\* and \*\*\* indicates the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% Significance level.

Table 4: Phillips & Perron test results

Variable	At Level			First Difference			Order of Integration
	Non	Intercept, Trend	Intercept	Non	Intercept, Trend	Intercept	
D(lnWTI)	1.679 (0.9740)	-1.881 (0.6353)	-0.292 (0.9134)	-5.258 (0.0000)**	-5.739 (0.0005)**	-5.639 (0.0001)**	I(1)
D(lnAGR)	0.585 (0.8364)	-0.848 (0.9472)	-1.780 (0.3812)	-4.782 (0.0000)**	-5.202 (0.0016)**	-4.770 (0.0008)**	I(1)
D(lnCON)	0.3884 (0.7888)	-2.211 (0.4638)	-1.426 (0.5537)	-4.962 (0.0000)**	-5.027 (0.0023)**	-4.942 (0.0006)**	I(1)
D(lnMAN)	1.161 (0.9322)	-3.863 (0.0289)***	-1.2946 (0.6164)	-7.272 (0.0000)**	-7.681 (0.0000)**	-7.592 (0.0000)**	I(1)
D(lnTRAN)	3.932 (0.9999)	-1.797 (0.6767)	-0.699 (0.8299)	-2.818 (0.0068)**	-4.129 (0.0169)**	-4.220 (0.0031)**	I(1)

Note: \*, \*\* and \*\*\* indicates the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% significance level. Note: D refers to first differences. Source: Computed by using Eviews 7.

#### 4.2 CO-INTEGRATION RELATIONS TEST (JOHANSEN CO-INTEGRATION TEST)

The results of the previous section suggest that a long term relationship may exist between oil price and economic sectors which are of the same integration order. Therefore, Johansen Co-integration tests are performed to test the existence of the Co-integration relationship between the variables. The results are shown below:

Table 5: Co-integration relations test

Hypothesis		Max-Eigen	Critical Value	Trace Statistic	Prob
H <sub>0</sub>	H <sub>1</sub>	Statistic	(Eigen) at 5%		
r = 0	r ≥ 1	0.844436	69.818	108.100*	0.0000
r ≤ 1	r ≥ 2	0.706868	47.856	61.583*	0.0016
r ≤ 2	r ≥ 3	0.519100	29.797	30.904*	0.0371
r ≤ 3	r ≥ 4	0.384035	15.494	12.602	0.1302
r ≤ 4	r ≥ 5	0.019344	3.841	0.488	0.4847

Trace test indicates 3 Co-integrating eqn(Guidi) at the 0.05 level. \* denotes rejection of the hypothesis at the 0.05 level. Source: Computed by using Eviews 7.

According to the Trace test statistics in Table 4, that both of the trace statistics and the maximum-Eigen value statistics were statistically significant to reject the null hypotheses  $r=0$ ,  $r \leq 1$  and  $r \leq 2$  is rejected by 5% against the alternative hypotheses  $r \geq 1$  and  $r \geq 2$ . This indicates exists the long-run equilibrium relationship between oil price and all the variables used in the model. According to the Table above, there are three Co-integration relation between variables (the manufacturing industry - construction - Transportation - Agriculture - Oil prices) in the long run.

#### 4.3 VECTOR ERROR CORRECTION MODEL (VECM)

Premised on the results of the Johansen Co-integration test which suggests the existence of a long run Co-integration among variables and coupled with the  $I(1)$  order condition in the series, we further employed VECM estimation to analyze the long-run dynamics in the variables. Consequently, Table 6 below provides the results of oil prices impact on economic sectors.

Table 6: Results of vector error correction model

Dependent Variable: DLNY				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.013907	0.050610	-0.274792	0.7863
DLN (agriculture sector's)	-0.947877	0.328811	-2.882743	0.0092
DLN(construction sector's)	0.374208	0.173503	2.156778	0.0434
DLN(manufacturing sector's)	-0.058940	0.113567	-0.518989	0.6095
DLN(transportation sector's)	1.453051	0.607049	2.393632	0.0266
U(-1)	-0.022071	0.004812	-4.586461	0.0002
R-squared	0.603711		Mean dependent var	0.070479
Adjusted R-squared	0.504639		S.D. dependent var	0.222851
S.E. of regression	0.156847		Akaike info criterion	-0.667918
Sum squared resid	0.492020		Schwarz criterion	-0.377588
Log likelihood	14.68293		Hannan-Quinn criter.	-0.584313
F-statistic	6.093654		Durbin-Watson stat	1.949973
Prob(F-statistic)	0.001388			

Source: Computed by using Eviews 7.

DLN (Oil Prices) =  $-0.013 - 0.947DLN(\text{agriculture sector's}) + 0.374DLN(\text{construction sector's}) - 0.058DLN(\text{manufacturing sector's}) + 1.453DLN(\text{transportation sector's}) - 0.022U(-1)$

From the above error correction model, the effects of oil price volatility on the agriculture sector's are found to be negative. That is, a percentage increase in the agriculture sector's will induce a 0.94%



decrease in the crude oil price and vice versa. The effects of oil price volatility on the manufacturing sector's are negative, which satisfies a priori expectation.

Thus, a 1% increase in crude oil prices will cause about a 0.058% decrease in manufacturing sector's. This affirms the conventional inverse relationship between crude oil prices and manufacturing sector's. In addition, the relationship between the construction sector's, the transportation sector's and the crude oil price is positive which confirms that oil price is also being driven by the growing demand from the emerging economies and from all other demanders of crude oil. Thus, a percentage increase in the construction sector's will trigger a 0.37% increase in the crude oil price. The  $R^2$  shows that 60% variation in the crude oil price is captured in the model while the F-statistics shows the joint significance of all the explanatory variables in explaining the crude oil price.

The estimation of this model shows the existence of a long-term relationship between oil prices and economic sectors. This is explained by the fact that the coefficient of error correction is negative and significant in the model. There is relationship in the short term between oil prices and the sectors of agriculture, transport and construction. In addition, there is a positive relationship between oil prices and the construction sector and agriculture sectors. And that the industry and the agriculture sector is linked to a negative relationship with oil prices. which means that Libya is very vulnerable to external shocks, particularly the fall in oil prices. Due to the high dependence on oil and the weakness of the economic base.

We can deduce that oil price volatility have contributed enormously to the economic sectors volatility in Libya, These results are consistent with evidence found by the (Kandil, 2000) for the Arab States, (Torul and Alper, 2010) who all demonstrated that changes in oil price had a significant effect on the economic sectors .

#### 4.4 GRANGER CAUSALITY TEST

When there is a Co-integration relationship between the model variables, there must be at least one way causal relationship among this variables. The null hypothesis of the first part is "Crude oil prices does not Granger cause each of the economic sectors (the agriculture, construction, manufacturing and transport) and the alternative hypothesis states all of the economic sectors does not Granger cause the crude oil prices". Table 6 provides the causality test results employ (VECM) model in Table 7.

Table 7: The results of pairwise Granger causality test

Null Hypothesis	Obs	F-Statistic	Prob
Crude Oil Prices does not Granger Cause Agriculture sector's	24	3.78988	0.0412
Agriculture sector's does not Granger Cause Crude Oil Prices	24	1.29931	0.2959
Crude Oil Prices does not Granger Cause Construction sector	24	4.03228	0.0347
Construction sector does not Granger Cause Crude Oil Prices	24	0.65841	0.5291
Crude Oil Prices does not Granger Cause Manufacturing sector's	24	2.53740	0.1055
Manufacturing sector's does not Granger Cause Crude Oil Prices	24	0.27759	0.7606
Crude Oil Prices does not Granger Cause Transportation sector's	24	3.24718	0.0612
Transportation sector's does not Granger Cause Crude Oil Prices	24	0.03845	0.9624

Note: \*, and \*\* denote statistical significance at the 1%, and 5% level, respectively.

Source: Computed by using Eviews 7.

Table 7 shows the Granger Causality between the oil price volatility and manufacturing sector, agriculture, construction, and transportation. The Granger causality test was performed on the four economic sectors with oil prices. There was a demonstrated evidence of economic sectors on oil prices for the four economic sectors. These results were in line with the established theoretical framework as postulated by (Hamilton, 2008). The results of the Granger causality test show that the crude oil prices Granger cause the agriculture and Construction sector. Besides, that a unidirectional causality runs from

oil prices to each of agriculture and construction sectors. However, the results of the Granger causality test showed that crude oil prices does not Granger cause the manufacturing and transportation sectors. This result is consistent with economic theory.

#### 4.5 IMPULSE RESPONSE FUNCTION (IRF)

The study uses an impulse response function as an additional check of the Co-integration test findings. The response of variables to a shock or impulse from one of the other variables can be analyzed through impulse-response function. Therefore, the impulse-response function provides an avenue to estimate other variables' responses to the shocks that may occur in the future. Impulse response functions are shown in Figure 2.

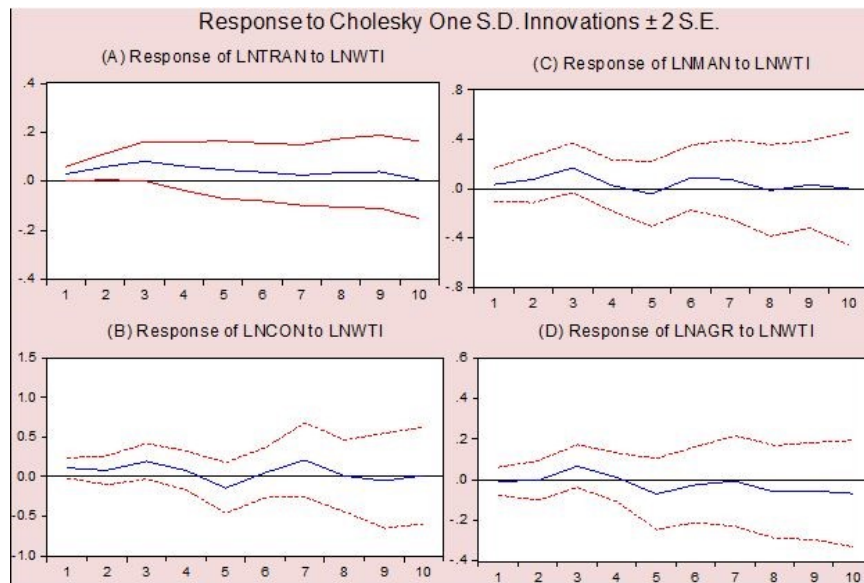


Figure 2: Response of Libya's economic sectors to an oil price volatility, 1986–2012

Based on the graph in (Figure 2) leads us to conclude that oil prices has positive effect on the transportation sector during the next 10 Periods. Interestingly, that a one standard deviation shock to the oil price variation increase the manufacturing sectors 3 years after the shock and returns to decreases it weakly after this date. The similar pattern can be observed in a one standard deviation shock to the oil price variation increase the construction sector 3 years after the shock and returns to falling 5 years and returns to increase 7 years, and returns to falling, afterwards the effects disappear. Also, oil prices has positive effect on the construction sector during the first four years, then became negative

#### 5.0 CONCLUSION

This study sought to examine the impacts of oil price volatility on economic sectors in Libya using a sample of observations from 1986 to 2012 by using a vector error correction methodology. To this end, a unit root test was conducted, in which data were shown to be non-stationary in all levels, and stationary in the first difference for all variables. Furthermore, the co-integration model was applied, and the results indicated that one co-integrating equation exists, suggesting the long-term effects of oil prices on the agriculture, construction, manufacturing, and transportation sectors. Based on the Granger causality test, oil price volatility can affect agriculture. Oil price instability also influences the performance of the agriculture sector. In addition, the construction sector was found to be dependent on oil prices. Our study found results that are similar with those of [Torul and Alper \(2010\)](#), ([Mehrara and Sarem, 2009](#)). Based on the results of this study, this study has an important implication for the Libyan economy in formulating policies on oil price volatility. The Libyan government must policies take that grow dramatically and diversify their economic base. This should go hand in hand with measures needed to

enhance their capacity to withstand adverse external shocks and reduce their exposure to the fluctuations, reduce dependence on oil.

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