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Oil Price Dynamics and the Nigerian Stock Market: An Industry Level Analysis

[1] Kehinde John Akomolafe, [2] Jonathan, D. Danladi
[1] Affiliation: Department of Economics, AfeBabalola University, Ado-Ekiti, Nigeria
[2] Affiliation: Department of Economics, University of Ibadan, Ibadan, Nigeria
[1] akjohn2@yahoo.com, [2] jonathandanladi@yahoo.com

ABSTRACT

The Nigerian economy is blighted by a series of instabilities, when there is a significant fluctuation in the international price of crude oil, thanks to the economy's over-reliance on the oil sector. This paper analyses the relationship between the industrial stock returns and changes in oil price. The variables considered include stock market returns for the selected industries are; banking, oil and gas, and construction industries. World oil price and market all share index to capture stock market size. Co-integration and Vector Error Correction mechanism result indicates that industries belonging to sectors apparently do not directly affected by oil prices, are also sensitive to oil price changes. The banking sector responds mostly to change in oil price. The paper concludes with recommendation that policy makers have to take into cognizance the trend in oil prices in the formulation of policies that affect the stock market.

Keywords: *Oil price, all share index, sartorial return, VECM*

1. THE MOTIVATION

Stock market development plays an important role in economic growth of the developed and developing countries. Shahbaz et.al. (2008) argues that stock market development is an important factor for economic growth as there is a long-run relationship between stock market development and economic growth. However, understanding the dynamics of stock returns is an issue of ongoing research in financial market literature. In particular, identifying the factors that drive stock market returns is of utmost relevance and importance to investors and policy makers. The recent research has focused on oil price and its impacts on stock market returns. Since Hamilton's 1983 work, the existence of a negative relationship between oil prices and macroeconomic activities has become widely accepted. Oil price shocks can lead to inflation, especially to the oil-importing countries. Raising oil price decreases the cash flows of companies and expectation of increasing interest rate, also reduces the value of stocks. Therefore, oil price booming may become an important risk to stock markets.

The oil industry is very important to the Nigerian economy. It provides among other things the largest part of the foreign exchange earnings and total revenue needed for socio-economic and political development of the country. Thus, a small oil price change can have a large impact on the economy. The recent changes in oil prices in the global economy are so rapid and unprecedented, partly due to increased demand of oil by China and India. The bulk of Nigerian crude oil is sold unrefined. Changes in the prices of either the crude oil or any of the end products are expected to have impact on users and the nation at large. The sensitivity of oil prices is of continuing interest because of its unique role as an input into production, in many sectors of the economy. In as much as there have been studies on the impact of oil prices on stock market, there have been no significant studies of the effect on individual industrial stock prices. There is the need to examine the industrial classification of firms mostly affected by oil price shocks. It remains to be seeing how industries belonging to sectors apparently are not directly affected by oil prices, are sensitive to oil price changes. This paper aims to provide the answer to this question by investigating the industry level analysis of the impact of oil price change on stock market return in Nigeria. The rest of the paper is organized as follows; Section two reviews some past literatures and empirical trends. Data sources and Methodology are discussed in section three. Section four presents and discusses the results. Section five concludes with some recommendations.

2. NIGERIAN STOCK AND OIL MARKET: STYLIZED FACTS

Nigeria is one of the World's leading oil and gas producing countries. However, price of the domestic oil has been on the increase since the 1970s in the country. This can be traced to the fact that Nigeria, in addition to having three major oil refineries, imports refined products to satisfy its domestic consumption. The constant retail price increase in the country has been traced to the inefficiencies of the nation's refineries in addition to the sabotage from bunkers, oil spillages and attitude of some marketers. This leads to constant fuel supply disruptions leading to both economic and environmental problems.

In 1965 and thereafter, crude oil production gradually dominated the Nigerian economy when it replaced agricultural production which resulted in the enactment of Petroleum Act of 1969. This and other legislations marked a turning point in the history of production of petroleum products in the country. In the 1970s, Nigeria enjoyed wind falls from the sales of crude oil and was able to finance her major capital projects and fund development plans. In 1999, the Nigerian government decided to remove the subsidies on the production of all petroleum products and also decided to deregulate the market price for the petroleum products as well as domestic crude oil allocation to the Nigerian

National Petroleum Corporation (NNPC). The deregulation of the downstream sector of the oil industry did not bring forth any rapid development. Instead, it led to an increase in pump prices, low investments, smuggling and pipeline vandalization, hoarding of petroleum products and speculation that price hikes are imminent every year.

The Nigerian Stock Exchange (formally called Lagos Stock Exchange) was established in 1961 with the primary aim of mobilizing long-term funds. It is principally a market for long-term investments where corporate equities and long-term debt securities are issued and traded. The Nigerian Stock Exchange was established to promote private capital investment for growth and development in order to develop the capital market. It is the center point of the capital market while the Securities and Exchange Commission (SEC) serves as the apex regulatory body. It provides a mechanism for mobilizing private and public savings, and makes such funds available for productive purposes. The Exchange also provides a means for trading in existing securities, to enable small as well as large-scale enterprises gain access to public listing. The Nigeria Stock Exchange operates the main exchange for relatively large enterprises and the Second-Tier Security Market (SSM) where listing requirements are less stringent for small and medium-scale enterprises.

3. REVIEW OF PREVIOUS LITERATURE

There is a wide range of academic literature focusing on the economic impact of oil prices on stock prices and the impact of oil price shocks and stock prices on economic growth as a whole. The findings of Aloui et al (2008) provide another piece of evidence that crude oil markets matter in forecasting major stock market behavior. They adopted an Unrestricted Vector Autoregressive model and Multivariate GARCH type process to analyze crude oil volatility shocks and stock market returns in six major industrial countries; France, Japan, U.S.A., Germany ,and Canada from 1989 -2007. Their results showed that oil price changes have a negative impact on major stock market equity returns. Also, the findings of Bjorn land (2008) are consistent with what we would expect from oil producing country. He used Structural Vector Autoregressive model to study the relationship between oil price shocks and stock market booms in an oil exporting country using Norway as example for the period 1993 to 2005. He concluded that higher oil prices increase stock returns. Asaolu and ilo (2012) used Cointegration analysis and Vector Error Correction framework to analyze the impact of oil price on the Nigerian stock market performance. The found out that oil prices and stock market performance are tied together in the long run. A rise in price of oil leads to a decline in the return performance of the stock market. Somoye and Ilo (2008) examined the Nigerian stock market performance using vecto-autoregressive (VAR). The study concluded that among the variables examined in the VAR model the price of the Nigerian crude oil, exchange rate and the rate of inflation are the most significant macroeconomic variables influencing the aggregate stock market returns in Nigeria. Gunu and Kilishi (2010) studied the impact of crude oil prices on key macroeconomic variable in Nigeria. They employed Vector Autoregressive model The study concluded that crude oil prices have significant effect on the three key macroeconomic variables in Nigeria; GDP, money supply and unemployment. Despite the significant nature of this topic, not many studies have been undertaken to analyze the individual industrial effect of oil price shock in Nigeria. This paper aims to fill the gap.

4. DATA AND METHODOLOGY

This paper tests the impact of oil price on the industrial stock returns in Nigerian within a VAR framework. The first step in developing a VAR model is choosing the variables that are necessary for the analysis. The variables used in this paper are world oil prices using West Texas Intermediate (WTI) Spot Price which is the main benchmark for world oil prices, industrial stock market returns gotten from the Nigerian Stock Exchange. Industry stock returns comprise of index from three different sectors namely construction, banking, and oil and gas industries. The data used are daily data from February 2000 to July 2009

4.1 Diagnostics

It is important to establish the stationarity of data because a non-stationary data produces spurious regression and this may produce misleading results. Therefore Unit root tests are performed on the levels and first differences of the variables. For this purpose, Augmented Dickey-Fuller test and Phillip-Perron tests are employed in this paper.

If two or more time series are individually integrated but some linear combination of them has a lower order of integration, then the series are said to be cointegrated. This work employs the Johansen (1991) test for cointegration that allows for more than one cointegrating relationship, unlike the Engle–Granger (1987) method. The Johansen method applies the maximum likelihood procedure to determine the presence of co-integrated vectors in non-stationary time-series. Johansen’s cointegration test is used as a starting point in the vector auto regression (VAR) model and it is applied in this research.

The study carries out the Granger causality test, which is a statistical hypothesis test for determining whether one time series is useful in forecasting another, in order to examine the direction of causation among the key variables. A time series X is said to Granger-cause Y if it can be shown, usually through a series of t-tests and F-tests on lagged values of X (and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y. Granger causality test requires the null hypothesis of no causality being tested on a joint test that the coefficients of the lagged causal variable are significantly different from

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zero. The Johnasen Granger causality test is employed in this work.

4.2 Vector Autoregressive Model

Longer and more frequently observed macroeconomic time series calls for models that describe the dynamic structure of the variables and the VAR model is apposite for this purpose. It is setup such that current values of a set of variables are partly explained by its own lagged values, plus current and past values of the remaining variables involved in the equation. The VAR model is a natural tool for forecasting, impulse responses and variance decomposition. Impulse response analysis, forecast error variance decompositions, historical decompositions and the analysis of forecast scenarios are the tools which have been proposed for disentangling the relations between the variables in a VAR model. Traditionally VAR models are designed for stationary variables without time trends. VAR model is appropriate in this research because it is able to characterize the dynamic impact and structure of the model and it is also able to avoid imposition of excessive identifying restrictions often found in different economics and finance theory. The VAR model specified here focuses on three variables for the three sectors: sector market return (ΔRm), All Share Index (ΔASI) as proxy for stock market development, and oil price (Δoil). All variables are in the log form. The general VAR model is given as follows:

$$\Delta Rm_t = c_0 + \sum_{j=0}^{p} b_{yy,j}\, \Delta Rm_{t-1-j} + \sum_{j=0}^{p} b_{yk,j}\, \Delta ASI_{t-1-j} + \sum_{j=0}^{p} b_{yo,j}\, \Delta oilP_{t-1-j}$$

$$\Delta ASI = c_0 + \sum_{j=0}^{p} b_{ky,j}\, \Delta Rm_{t-1-j} + \sum_{j=0}^{p} b_{kk,j}\, \Delta ASI_{t-1-j} + \sum_{j=0}^{p} b_{ko,j}\, \Delta oilP_{t-1-j}$$

$$\Delta oilP = c_0 + \sum_{j=0}^{p} b_{oy,j}\, \Delta Rm_{t-1-j} + \sum_{j=0}^{p} b_{ok,j}\, \Delta ASI_{t-1-j} + \sum_{j=0}^{p} b_{oo,j}\, \Delta oilP_{t-1-j}$$

A critical element in the specification of a VAR model is the determination of the lag length of the VAR. The lag length in this research is chosen based on Schwarz's information criterion (SIC). From the highest possible lag order, we perform sequential testing to find minimum SIC values

4.3 Impulse Response Function and Variance Decomposition

Impulse response function (IRF) tracks the impact of any variable on others in the system. Impulse responses trace out the response of current and future values of an endogenous variable to a change in the current value of one of the VAR errors, assuming that this error returns to zero in subsequent periods and that all other errors are equal to zero. Simulations for each of the aggregates are solved in response to a 1 percent innovation of the respective aggregate. In other words, the IRF is able to trace out the dynamic effect adjustments for the purpose of comparative stability of the index market return, GDP and oil prices. The variance decomposition or forecast error variance decomposition is also used in the interpretation of a vector auto regression (VAR) model once it has been fitted. The variance decomposition indicates the amount of information each variable contributes to the other variables. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables.

5. RESULTS AND FINDINGS

5.1 Diagnostics

5.1.1 Stationary Tests

This paper conducts unit root tests of the variables with Augmented Dickey Fuller (ADF) and Phillip-Perron tests. The results are presented in the table below

Table 1: ADF and PP Unit Root Test Results

AT LEVEL	ADF TEST		PHILIPS- PERRON	
Variables	t-test	Prob	t-test	Prob
LNASI	1.584112	0.9727	1.329156	0.9541
LNBANK	0.341165	0.7836	0.149881	0.7295
LNCONST	-0.376667	0.5489	-2.280952	0.0218
LNOILGAS	-0.138765	0.6359	-1.677338	0.0885
LNOILP	0.412582	0.8021	0.471810	0.8167

FIRST DIFFERENCE Variables	ADF TEST		PHILPS- PERON	
	t-test	Prob	t-test	Prob
D(LNASI)	-45.83851	0.0001	-45.8385	0.0001
D(LNBANK)	-25.25301	0.0000	-290.6510	0.0001
LNCONST	-22.61764	0.000	-534.1708	0.0001
LNOILGAS	-24.17594	0.0000	-442.9232	0.0001
LNOILP	-50.02813	0.0001	-50.13979	0.0001

NOTE: ASI represents all share index, CONS represents construction sector indices, BANK represents banking industry, OILP represents world crude oil prices, OILANDGAS represents oil and gas industry.

5.1.2 Autocorrelation Test

Diagnostic tests are performed to guarantee that the residuals from the model are Gaussian that the assumptions are not violated and the estimation results and inferences are trustworthy. The diagnostic test results could also be used as indicators of the validity of employing impulse-response functions and variance-decomposition analyses.

Table 2: Residual autocorrelation

Test	Statistic		P-value
	lags	Chi Square	
	1	85.33497	0.0000
	2	119.4556	0.0000
	3	146.7898	0.0000
	4	5.152302	0.8208
	5	12.95766	0.1645
	6	12.29493	0.1972

The above result of the autocorrelation test shows that there is presence of autocorrelation but it dies out in the time-series.

5.2 Cointegration Test

The procedure used for co-integration testing and estimation of the VECM in this study follows the methodology developed and used by Johansen (1991).The presence of a co-integration relation(s) forms the basis of the VECM specification. The results is shown in the tables below:

Table 3A: Results for cointegration test for banking industry

Variables	LNBANK LNOILP LNASI						
HYPOTHESIZED NO OF CE(s)	Eigen value	TRACE	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None *	0.158486	414.1360	29.79707	0.0001	407.5705	21.13162	0.0001
At most 1	0.001899	6.565461	15.49471	0.6286	4.489816	14.26460	0.8044
At most 2	0.000878	2.075646	3.841466	0.1497	2.075646	3.841466	0.1497

(* denotes significance at the 1% level)

Table 3B: Results for cointegration test for construction industry

Variables	LNCONS LNASI LNOILP						
HYPOTHESIZED NO OF CE(s)	Eigen value	TRACE	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None *	0.304797	865.2895	29.79707	0.0001	858.7095	21.13162	0.0001
At most 1	0.001904	6.579960	15.49471	0.6269	4.500877	14.26460	0.8031
At most 2	0.000880	2.079083	3.841466	0.1493	2.079083	3.841466	0.1493

(* denotes significance at the 1% level)

Table 3C: Results for cointegration test for oil and gas industry

Variables	LNOILGAS LNOILP LNASI						
HYPOTHESIZED NO OF CE(s)	Eigen value	TRACE	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None *	0.268611	745.4237	29.79707	0.0001	738.8577	21.13162	0.0001
At most 1	0.001897	6.566016	15.49471	0.6286	4.483904	14.26460	0.8051
At most 2	0.000881	2.082113	3.841466	0.1490	2.082113	3.841466	0.1490

(* denotes significance at the 1% level)

In all models, the results of the unrestricted Johansen Co-integration Tests indicate the presence of co-integration relation for both the Trace and the Maximum Eigen value Tests. This establishes a long-run relationship in the models. Since the Johansen Cointegration test indicates the existence of cointegration in the models, then the VAR model gives the long run causality which is analogous to the long run relationship in a single-equation model. Similarly, the short run dynamics of the VAR model are captured with the Vector Error Correction Model which is similar to the short run adjustment. Hence, we determine the short-run relationship of the parameters using the Vector Error Correction Model (VECM).It shows that the individual coefficients of the explanatory variable (OILP) are in conformity with theory.

5.2.1 The Long Run Relationship

The number of co-integrating relationships obtained in the previous step, the number of lags and the deterministic trend assumption used in the co-integration test are all used to specify a VECM. The VECM allows us to distinguish between the long and short run impact of oil price on industrial stock returns. The Tables below presents the results for each sector examined.

Table 4A: Normalized Co-integration Coefficients for Banking Sector

Normalized co-integrating coefficients (standard error in parentheses)		
LNBANK	LNOILP	LNASI
1.0	-2.145146	-0.155810
	(0.19497)	(0.19688)
	[-11.0025]	[-0.79140]

Table 4B: Normalized Co-integration Coefficients for Construction Sector

Normalized co-integrating coefficients (standard error in parentheses)		
LNCONST	LNOILP	LNASI
1.0	-2.278927	-0.533500
	(0.20078)	(0.20274)
	[-11.3506]	[-2.63141]

Table 4C: Normalized Co-integration Coefficients for Oil and Gas Sector

Normalized cointegrating coefficients (standard error in parentheses)		
LNOILANDGAS	LNOILP	LNASI
1.0	-0.234598	-0.008205
	(0.16878)	(0.17044)
	[-1.38993]	[-0.04814]

The co-integrating vector indicates a long-run impact of oil price and stock market size on the stock return of the various industries examined. In all, oil price has contractionary effect on the stock return of all the sectors.

5.2.2 The Short Run Relationship

In the previous section the co-integrating relationships of the variables in each model are identified, and are included explicitly as error-correction terms into a short-run system. We test to see if the short-run dynamics are influenced by the estimated long-run equilibrium conditions, i.e. the co-integrating vectors. It is important to investigate whether the parameters of the error-correction terms implied by co-integrating vectors in the short-run equations are negative and significant. This result would demonstrate that the long-run equilibrium conditions hold and that the industry responds to deviations from equilibrium in a balancing manner.

Table 5 A: Vector Error Correction Model for Banking Sector

Error Correction	Dependent Variable : D(LNBANK)	
	Coefficient	t-value
D(LNASI(-1))	0.313314	-0.001040
D(LNOILP(-1)	0.001000	1.66941

Table 5 B: Vector Error Correction Model for Construction Sector

Error Correction	Dependent Variable : D(LNCONS)	
	Coefficient	t-value
Coint.Eq1	-0.360410	-15.5064
D(LNALS(-1))	0.933830	0.60298
D(LNOILP(-1)	-2.265486	-1.82001

Table 5 C: Vector Error Correction Model for Oil and Gas Sector

Error Correction	Dependent Variable : D(LNOILANDGAS)	
	Coefficient	t-value
Coint.Eq1	-0.314367	-14.6433
D(LNASI(-1))	-1.463903	[-1.24762]
D(LNOILP(-1)	-1.977317	-2.10658

As can be seeing from the results above, oil price is negatively related to stock returns of all industries. This is consistent with the apriori expectation of negative relationship between oil price and stock market returns.

5.3 Granger Causality

The Granger causality test is carried out to find the causal direction between market returns on all industries and oil prices as well as all share index returns as described by Granger. The presence of co-integrating vectors allows for the use of a vector error correction model to test causality. The block exogeneity test was conducted to investigate whether any of the variables assumed to be endogenous in the system was at least exogenous in the short run. The Granger causality test result is presented in the appendix A. Probabilities are indicated in parenthesis.

For the banking industry, we may reject the null hypothesis at 10% level of statistical significance .There is a unidirectional causality between oil price and banking sector stock return. This means oil prices granger causes banking sector stock return and reverse is not the case. In construction industry, we may also reject the null hypothesis at10% level of statistical significance. There is unidirectional causality from oil price to construction sector stock return. For oil and gas industry, we may reject the null hypothesis 10% level of statistical significance. There is unidirectional causality from oil price to oil and gas industry stock return.

5.4 Impulse Response and Variance Decomposition

The impulse response functions (IRFs) show the effects of shocks on the adjustment path of the variables in the model. It shows how these variables react to different shocks in the model. The results are presented in the appendix B. The IRF for all the sectors shows that the immediate impact of a unit shock in oil price is marginal. Oil price has immediate contractionary effect on each sector stock return up to certain quarter, and then becomes expansionary. For the banking sector, the immediate contractionary impact only lasted till the third quarter. It becomes expansionary afterwards.

Variance decomposition analysis provides a way of determining the relative importance of shocks to sect oral stock return. The results of the variance decomposition analysis are presented in the appendix C. The variance decomposition result shows that the oil price variables in explaining the variance of the market return of all sectors is very small. In construction sector, stock market size is more important in explaining variation than oil price. This is not so in all other sectors. In banking, the importance of oil price in explaining variation is more than in other sectors.

6. SUMMARY, CONCLUSION AND RECOMMENDATIONS

This study analyzed the relationship between the industrial stock returns and changes in oil price, a topic of interest that has not been addressed in studies in Nigeria. The factors considered in this study include stock market returns for the selected industries, world oil price using West Texas Intermediate prices as benchmark, market all share index to capture stock market size. Co-integration and Vector Error Correction mechanism have been applied to examine the relationship in both the long run and the short run. The result indicates a long-run impact of oil price and stock market size on the stock return of the various industries examined. The error correction results showed that oil price is negatively related to stock returns of all industries in the short run.

The granger causality results show that changes in oil price granger cause changes in stock returns for all the industries. Furthermore, The Impulse response analysis shows that the immediate impact of a unit shock is marginal for each sector with. The returns on the banking sector have the lowest response to the oil prices.

Variance decomposition is also computed for each variable and it shows that the oil price in explaining the variance of the market return of all sectors is very small and the importance of oil price in explaining variation in banking is more than in other sectors. The study reveals that in addition to the returns of oil-intensive industries, returns of some industries that are not oil-intensive are sensitive to oil price changes.

The significance of oil price both in the short-run and the long-run suggests that movement in sectoral stock returns in Nigeria is highly sensitive to crude oil prices. Thus, investors are aware and guided in making choices of investment. Hence, policy makers have to take into cognizance the trend in oil prices in the formulation of policies that affect the stock market. Government has to revamp the various refineries in the country and build new refineries where possible so that import bills on petroleum products will be kept at minimum; so as to reap the full benefits of oil production in Nigeria.

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APPENDIX A
RESULTS OF GRANGER CAUSALITY TEST

Results of the Granger Causality/Block Exogeneity Tests for banking industry

Equation / Excluded	D(LNBANK)	D(LNOILP)	D(LNALLSHAREINDEX)
D(LNBANK))		2.920030 (0.2322)	4.187835 (0.1232)
D(LNOILP)	5.712199 (0.0575)		0.696933 (0.7058)
D(LNALLSHAREINDEX)	0.666284 (0.7167)	0.554783 (0.7578)	

Results of the Granger Causality/Block Exogeneity Tests for construction industry

Equation / Excluded	D(LNCONST)	D(LNOILP)	D(LNALLSHAREINDEX)
D(LNCON))		1.048790 (0.5919)	0.551668 (0.7589)
D(LNOILP)	4.684700 (0.0961)		0.742440 (0.6899)
D(LNALLSHAREINDEX)	1.711305 (0.4250)	0.427893 (0.8074)	

Results of the Granger Causality/Block Exogeneity Tests for Oil and Gas

Equation Excluded	D(LN oil and Gas)	D(LNOILP)	D(LNALLSHAREINDEX)
D(LN Oil and Gas)		2.116814 0.3470	1.706432 0.4260
D(LNOILP)	4.438644 0.1087		0.712441 0.7003
D(LNALLSHAREINDEX)	5.068911 0.0793	0.598637 0.7413	

APPENDIX B
VARIANCE DECOMPOSITION ANALYSIS

Variance Decomposition of Banking industry

Period	S.E.	LNBANK	LNOILP	LNALLSHAREINDEX
1	0.715747	100.0000	0.000000	0.000000
2	0.743411	99.81816	0.158445	0.023399
3	0.765263	99.81137	0.165515	0.023120
4	0.777431	99.75890	0.214593	0.026506
5	0.791925	99.59545	0.347265	0.057282
6	0.802375	99.47867	0.413830	0.107504
7	0.816501	99.49047	0.405346	0.104182
8	0.834825	99.44312	0.398540	0.158340
9	0.853060	99.39778	0.432457	0.169765
10	0.870982	99.40825	0.428703	0.163050

Variance Decomposition of Construction industry

Period	S.E.	LNCONS	LNOILP	LNALLSHAREINDEX
1	1.621290	100.0000	0.000000	0.000000
2	1.645580	99.86264	0.105940	0.031422
3	1.675402	99.81545	0.145962	0.038585
4	1.702728	99.66040	0.203096	0.136500
5	1.723743	99.48153	0.234681	0.283785
6	1.747272	99.48272	0.240657	0.276624
7	1.761492	99.45025	0.271070	0.278684
8	1.775577	99.41972	0.303191	0.277086
9	1.789826	99.32521	0.318308	0.356478
10	1.808917	99.32748	0.311664	0.360854

Variance Decomposition for Oil and Gas industry

Period	S.E.	LNOILGAS	LNOILP	LNALLSHAREINDEX
1	1.216156	100.0000	0.000000	0.000000
2	1.246751	99.79342	0.152993	0.053582
3	1.277518	99.61045	0.151749	0.237805
4	1.295938	99.38315	0.264641	0.352210
5	1.309596	99.38750	0.267358	0.345144
6	1.322872	99.37939	0.282281	0.338328
7	1.337291	99.34914	0.284046	0.366815
8	1.349953	99.24822	0.299555	0.452229
9	1.366378	98.91450	0.316916	0.768589
10	1.389589	98.87371	0.307913	0.818381

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APPENDIX C
IMPULSE RESPONSE FUNCTIONS