Mukhtarov, Shahriyar; Aliyev, Sannur; Zeynalov, Javid

Article

The effects of oil prices on macroeconomic variables : evidence from Azerbaijan

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Mukhtarov, Shahriyar/Aliyev, Sannur et. al. (2020). The effects of oil prices on macroeconomic variables : evidence from Azerbaijan. In: International Journal of Energy Economics and Policy 10 (1), S. 72 - 80. https://www.econjournals.com/index.php/ijeep/article/download/8446/4746. doi:10.32479/ijeep.8446.

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2020, 10(1), 72-80.

The Effect of Oil Prices on Macroeconomic Variables: Evidence from Azerbaijan

Shahriyar Mukhtarov[1,2,3]*, Sannur Aliyev[4], Javid Zeynalov[5]

[1]Department of World Economy, Baku Engineering University, Baku AZ0101, Azerbaijan, [2]Department of Economics and Management, Azerbaijan State University of Economics (UNEC), Istiqlaliyyat Str. 6, Baku AZ1141, Azerbaijan, [3]UNEC Empirical Research Center, Azerbaijan State University of Economics (UNEC), Istiqlaliyyat Str. 6, Baku AZ1141, Azerbaijan, [4]Department of International Economics, Azerbaijan State University of Economics (UNEC), Istiqlaliyyat Str. 6, Baku AZ1141, Azerbaijan, [5]Department of Finance, Baku Engineering University, Baku AZ0101, Azerbaijan. *Email: smuxtarov@beu.edu.az

Received: 23 July 2019 **Accepted:** 29 September 2019 **DOI:** https://doi.org/10.32479/ijeep.8446

ABSTRACT

This study investigates the impact of oil prices on economic growth, export, inflation and exchange rate in Azerbaijan, employing Johansen cointegration and VECM methods to the data spanning from January, 2005 to January, 2019. The results from the Johansen cointegration method confirm the presence of a long-run relationship among the variables. Estimation results impulse-response and variance decomposition tests reveal that there is a positive and statistically significant impact of oil prices on economic growth, export and inflation for the Azerbaijani case. On the other hand, we find that oil prices have a negative impact on exchange rate. The results of this article will suggest to researchers and policy makers to comprehend the role of oil price shocks on economy in the case of Azerbaijan and other developing oil-rich countries.

Keywords: Oil Prices, Economic Growth, Export, Exchange Rate, Inflation, Vector Error Correction Method, Azerbaijan
JEL Classifications: E31, Q4

1. INTRODUCTION

Oil represents one of the most important macroeconomic factors in the world economy and economic performance of countries is highly correlated with oil prices. Compared with other internationally traded commodities, oil can be considered the only production input that can affect both positively and negatively economic growth, and even that it might lead to an extreme change in the economy. Depending on the types of the economy, oil price changes affect economic stability of the countries negatively or positively. Some empirical studies conclude that the oil price has a negative effect on economic growth in the case of different countries (Hamilton, 1983; Guo and Klieses, 2005; Jiménez-Rodríguez and Sánchez, 2005; Malik, 2008; Bhusal, 2010; Berk and Aydogan, 20012; Farhani, 2012; Ahmad, 2013; Nazir and Qayyum, 2014; Eyden et al., 2019). On the other hand, several studies conducted by Cunado and Perez de Gracia (2004), Berument et al. (2010), Saibu (2013), Akinlo and Apanisile (2015), Hamilton and Abdullah (2015), Musa (2017) supported the positive relationship between crude oil prices and economic growth.

The empirical evidence from a growing body of academic literature and reports from government institutions clearly suggests that oil price increases dull macroeconomic growth by increasing inflation and unemployment and depressing the value of financial and other assets, at least in oil importing nations (Awerbuch and Sauter, 2003). In developing countries, oil prices not only negatively affect economic growth but further affect the consumption balances of households, the poor farmers in rural areas and the transporters in urban areas (Kiani, 2011). In terms of unemployment, it has positive effect in those countries because of high cost of production which also causes high cost of inputs and later increases unemployment rate (Ahmad, 2013).

Price increase of oil means transfer of wealth from importing to exporting countries according to their terms of trade. Knowing the degree of dependence on imported oil, one can estimate the magnitude of the direct effect of a given price increase in national income of the countries (IEA, 2006).

As one of the most resource-rich countries in Eurasia, Azerbaijan has faced serious, rapidly changing and contradictory development of its economy for the last 10 years. Starting in 2005, the country became the beneficiary of an oil boom that resulted in some USD 125 billion in oil revenues being transferred to state coffers.

Starting in 2014, the negative oil price shock (and declining oil revenue) also caused a recession in Azerbaijan (from 2% in 2014 to 1.10% in 2015 and −3.10% in 2016). That influx of cash was accompanied by two currency devaluations and a decade of economic problems outside of the oil sector (Mukhtarov et al., 2019a; Mukhtarov et al., 2019b). The commodity crash in 2014 saw prices for Azeri oil go from over USD 100/barrel in 2014 to just over USD 50/barrel in 2015. At that point, ordinary people started feeling in their own lives the volatility resulting from an economic dependence on resource revenues.

While considering abovementioned facts, it become obvious that oil price fluctuation have a great influence on macroeconomic variables of Azerbaijan. For this purpose, we investigate the impact of oil price on economic growth, exchange rate, inflation and export in Azerbaijan.

The main contribution of this study is examine the impact of oil price fluctuation on different macroeconomic variables such as economic growth, exchange rate, inflation and export using quarterly data which cover both the boom and dumped periods of oil prices in the case of Azerbaijan. In addition, to our best knowledge this is the first study that investigate the relationship between oil price and selected macroeconomic variables all together employing time series techniques. Finally, It is the first study using quarterly data which cover the period after devaluation for assessing the long-run effect of bank credits on non-oil GDP in Azerbaijan. Finally, this also can be considered the first study covers the period after devaluation that assess oil price changes effect on the economy of Azerbaijan.

2. LITERATURE REVIEW

In this section, the similar studies devoted to the impact of oil prices on macroeconomics variable in the case of different countries are reviewed. There are a large number of studies in economics literature investigating the impact of oil prices on economic variables. Therefore, we have reviewed some of the relevant articles and classified literature into three parts. Table 1, summarizes the similar studies investigating the impact of oil prices on macroeconomic variables in the case of different countries

2.1. Relationship between Oil Prices and Economic Growth

Berument et al. (2010) investigated the effect of oil prices on output growth especially in the MENA countries, which are exporting and importing oil. They found that increase in oil price cause a statistically significant and positive effect on the outputs of the oil exporters. Interestingly, oil price shocks do not lead to a statistically remarkable effect on the outputs growth of the oil importers. Elmi and Jahadi (2011) used Vector Auto Regression (VAR) model in some OPEC and OECD countries from 1970 to 2008 and the result appears that those countries` economy are affected by oil price shocks in different aspects. However, Omojolaibi and Egwaikhide (2013) analyzed the relationship between oil prices and the macroecnomic variables by using a panel vector autoregressive model and they revealed that all the oil price volatility has considerable effects on gross investment rather than fiscal deficit, real GDP and money supply. Eyden et al. (2019) found that oil price fluctuation has a negative and statistically significant impact on GDP growth in the case of OECD countries.

Akinlo and Apanisile (2015) examined oil price shocks on economic growth for sub-Saharan African countries The research results showed that the oil price has a positive effect on economic growth in the countries which are oil exporters. Musa (2017) investigated the long term impacts of oil price growth rates on the economic growth. Similarly, the result shows that there is a positive effect of oil price on the GDP growth in the Kingdom of Saudi Arabia. Another empirical study was done by Burakov (2017) and found that there is a long-run relationship between oil prices, GDP growth and emigration. On the other hand, Trang et al. (2017) analyzed the impacts of oil prices on economic growth in the case of Vietnam.

2.2. The Relationship between Oil Prices and Inflation Rate

Tang et al. (2010) indicated that when oil price rises it has negative effects on output and investment in the case of China. He also found that oil price affects inflation and interest rate positively. Similarly, another empirical studies were done by Qianqian (2011) and Chen et al. (2015) to examine the relationship between oil price and inflation rate. They found that an oil price rises leads to increase in CPI for China. Abounoori et al. (2014) found that the oil price affects inflation positively and incompletely in both short-and-long run in the case of Iran. However, Katircioglu et al. (2015) found that that the oil price has statistically and negatively significant impacts on inflation for the OECD countries.

Zhao et al. (2016) implemented dynamic stochastic general equilibrium method to investigate the effect of oil price on CPI. The result showed that oil supply shocks lead to long-term inflation in China's economy. Trang et al. (2017) investigated oil price shocks on general price level in Vietnam and suggests that rises in oil prices would cause higher inflation rate. Bala and Chin (2018) employed dynamic panels ARDL to measure the oil price shocks on inflation rate in Algeria, Angola, Libya and Nigeria. They concluded that increase of oil prices lead to higher inflation rate for those countries.

2.3. The Impact of Oil Prices on Exchange Rate

Chen and Chen (2007) analyzed the long-term impact of oil price on exchange rate by using panel co-integration tests in G-7 countries. Their empirical study revealed that the real exchange rates volatility mainly were affected by the oil price shocks. In

Table 1: Summary of similar empirical studies in the literature

Author (s)	Time period	Country	Method (s)	Result
Chen and Chen (2007)	Monthly, 1972-2005	G-7	Panel tests of unit roots and cointegration	Oil price changes affect real exchange rates
Lizardo and Mollick (2010)	Annual, 1970-2008	Three oil exporters	OLS, DOLS, JOH-ML	Oil price increases resulted in a depreciation in USD against national currencies.
Berument et al. (2010)	Annaul, Different time period for each country	MENA countries	VAR, OLS	Oil price rises has a effect on the oil-exporting countries' outputs.
Tang et al. (2010)	Monthly, 1998-2008	China	SVAR	Oil price changes are positively related with inflation rate.
Qianqian (2011)	Monthly, 1999-2008	China	VECM	Oil price shocks leads an increase in China's CPI.
Elmi and Jahadi (2011)	Annual, 1970-2008	OPEC and OECD countries	VAR	Oil price changes have different causes on these countries' economies.
Omojolaibi and Egwaikhide (2013)	Quarterly, 1990-2010	Five (5) oil exporting countries in Africa	PVAR	Oil price has a influence over the macroeconomic performance considering the gross investment.
Abounoori et al. (2014)	Monthly, 2003-2013	Iran	Dynamic ECT	Oil price increases causes an inflation in both short-and-long run.
Chen et al. (2015)	Quarterly, 1994-2012	China	SVAR	Oil price changes has an effect on China's price level.
Katircioglu et al. (2015)	Annual, 1980-2011	OECD countries	Panel CT	Oil price leads negatively significant impact on CPI.
Akinlo and Apanisile (2015)	Annual, 1986-2012	20 sub-Saharan African countries	OLS, FEM, GMM	Oil price fluctuation has a positive and significant effect on the economic growth.
Blokhina et al. (2016)	Monthly, 2000-2016	Russia	OLS	Oil price closely interrelated with the currency rate of dollar to ruble, at least in the long term.
Volkov and Yuhn (2016)	Monthly, 1998-2012	5 major oil-exporting countries	GARCH-M, Toda and Yamamoto	Oil price shocks that associated with fluctuation in exchange rates is significant in those countries.
Zhao et al. (2016)	Annaul, 1990-2013	China	DSGE	Oil supply shocks causes a long-term inflation in China's economy.
Trang et al. (2017)	Quarterly, 2000-2015	Vietnam	VAR	Oil price rises leads to higher inflation rate.
Mensah et al. (2017)	Weekly, 2000-2007 and 2010-2016	Five (5) oil-exporting countries	VAR	Oil price, in the long run, has an equilibrium relationship with exchange rate, especially for national currencies of the key oil-rich countries.
Musa (2017)	Annual, 1995-2015	Saudi Arabia	ARDL	OS has a considerably high positive effect on the GDP growth rates.
Burakov (2017)	Annual, 1990-2015	Russia	VECM	Oil prices has a long-run relationship with economic growth and it has direct effect on economic growth in the short-run.
Trang et al. (2017)	Quarterly, 2000-2015	Vietnam	VAR	Oil price increases would lead to higher inflation. However, effect of oil price on the gross domestic product growth is unclear.
Lacheheb and Sirag (2017)	Annual, 1979-2014	Algeria	NARDL	Oil price rises has a close relation with inflation. Nevertheless, relation between oil price decrease and inflation is undefined.
Bala and Chin (2018)	Annual, 1995-2014	Algeria, Angola, Libya, and Nigeria	ARDL dynamic panels	Oil price changes has a positive impact on inflation rate.
Davari and Kamalian (2018)	Quarterly, 2003-2015	Iran	Non-linear ARDL	Oil-price increase has no tight relationship with inflation, on the other hand, decrease in oil price has close relationship with inflation rate.
Delgado et al. (2018)	Monthly, 1992-2017	Mexico	VAR	Oil prices increase cause an increase in exchange rate.
Eyden et al. (2019)	Annual, 1870-2013	17 member countries of OECD	LSDVC, GMM, FGLS, RC	Oil price fluctuation leads to a negative and statistically remarkable results on economic growth in the OECD countries.
Jarrett et al. (2019)	Annual, 1980-2016	30 oil-producing countries	Cross-sectionally augmented autoregressive distributed lag	Oil volatility impacts on growth is mitigated by financial institutions. Moreover, a strong case for the support of the positive role of financial development in improving energy security and fostering growth.
Mukhtarov et al. (2019c)	Annual, 1995-2017	Azerbaijan	VECM	Oil prices has a positive and statistically effect on inflation in the long-run.

Legend: OLSL: Ordinary least squares, DOLS: Dynamic ordinary least squares, ARDL: Autoregressive distributed lags bounds testing, PVAR: Panel vector autoregression, FEM: Fixed effect model, GMM: Generalized method of moment, GARCH-M: Generalized autoregressive conditional heteroskedasticity, NARDL: Nonlinear autoregressive distributed lag, LSDVC: Bias-corrected least squares dummy variables, FGLS: Feasible generalised least squares, RC: Random coefficients, VECM: Vector error correction method, CT: Cointegration test, GCT: Granger causality test, ECT: Error correction model, DSGE: Dynamic stochastic general equilibrium, SVAR: Structural vector autoregression, VAR: Vector autoregression OECD: The Organisation for economic co-operation and development, INF: Inflation, CPI: Consumer price index, EC: Energy consumption, OS: Oil sector, OPEC: Organization of the petroleum exporting countries, MENA: Middle East and North Africa

addition, Lizardo and Mollick (2010) examined the long-term positive impact of real oil price shocks on exchange rate in oil rich countries such as Canada, Mexico and Russia. Blokhina et al. (2016) investigated the relationship between oil price and exchange rate in Russia and found that changes in the oil price rate has a close interrelation with the value of the national currency of Russia. In a pioneering work, Volkov and Yuhn (2016) concluded that oil price shocks lead to changes in exchange rate significantly in the five major oil-exporting countries.

Similarly, Mensah et al. (2017) revealed that there is a close relationship between oil price shocks and exchange rate in the long term. Delgado et al. (2018) used also the Vector Autoregressive Model to analyze link between oil price shocks and exchange rate in Mexico. The result provided that an increase in oil prices lead to an appreciation of the exchange rate.

In the case of Azerbaijan, prior research conducted by Mukhtarov et al. (2019c) examined the oil prices effect on inflation by employing the Vector Error Correction Model (VECM) to the data ranging from 1995 to 2017. Authors found that the oil prices have a positive and statistically significant impact on inflation in the long-run.

After reviewing the related studies devoted to the investigation the impacts of oil prices on economic variables, we can say that the oil prices shocks have a significant effect on economic variables for oil-rich economies. In the outcomes of the above-mentioned studies, there is a few study related the relationship between the oil prices and economic variables in the case of Azerbaijan. Therefore, the main purpose of this paper is to fill in this gap by employing impulse-response and variance decomposition tests to observe the relationship between oil prices shocks and macroeconomic variables.

3. MODEL AND DATA

3.1. Data

For empirical analysis, we uses quarterly data over the period 2001:Q1-2018:Q4 for the, economic growth (GDP), Brent crude oil price (OP), inflation (CPI), exchange rate (EXC) and export (Ex) in this study. All data set have been obtained from World Development Indicators of World Bank (WB, 2018) and The State Statistical Committee of the Republic of Azerbaijan (The State Statistical Comitee of Azerbaijan, 2018). Economic growth (Y) is measured by real GDP (2010 US $). The OP is measured in U.S. dollars per barrel whereas the EXC is measured in national currency per US dollar. The inflation is measured in the consumer price index (2010=100). EXPORT is exports of goods and services in per capita terms, measured in constant 2010 USD. In empirical analyses all variables are used in logarithmic form.

3.2. Methodology

In this study, we analyze the impact of oil prices on economic growth, export, inflation and exchange rate employing impulse-response and variance decomposition tests in the framework of the VECM method. In empirical part first, we will test the variables for unit root. The Augmented Dickey Fuller unit root test (Dickey and Fuller, 1981, ADF) will be employed for checking non-stationarity characteristics of variables. Since this test is widely used one, we do not describe it here. Interested readers can refer to Dickey and Fuller (1981).

Second, if the orders of integration of the variables are the same, then the cointegration tes(s) will be applied to see whether they are cointegrated. For testing the cointegration relationship the Johansen test (Johansen, 1988) is utilized.

Lastly, After confirming the existence of cointegration between the variables, we will apply the impulse-response and variance decomposition under the Vector Error Correction Model (VECM) assumption to investigate the relationship among the variables. If between variables does exist one cointegration, the first-best solution would be using VECM model. The above mentioned methods are widely used techniques in similar studies, we do not describe them.

4. EMPIRICAL RESULTS AND DISCUSSION

First, the stationarity properties of the employed variables are tested using ADF unit root test and the results are presented in Table 2. As can be seen from Table 2, all the variables are stationary at first difference, thus we can test them for the cointegration.

So as to apply the Johansen procedure firstly, the optimal lag number should first be defined. In order to determine the optimal lag interval in the study, A Vector Auto Regressive (VAR) model was initially specified including the endogenous variables of *GDP, Oil price, EXC, CPI* and Ex with a randomly selected lag interval and determination test of lag interval was applied to the residuals. The details of this test were explained on Table 3. As a result of this test, it was decided that lag interval will be 2 in this study because four different criteria indicate this aspect.

Additionally, Lagrange Multiplier (LM) test was also performed to understand wheter there is autocorrelation problem in the error terms of VAR model. H_0 hypothesis of LM test indicates that there is not an autocorrelation problem. Since probability value of the fifth lag is more than 0.05, this null hypothesis cannot be rejected and it was identified that there is not an autocorrelation problem. The details of this test were demonstrated in Table 4.

To ensure the stability of the VAR model, AR roots must be smaller than 1. As it can be seen from Graph 1, it was determined that all

Table 2: Results of ADF unit root tests

Variable	Panel A: Level		Panel B: 1st difference		Result
	k	Actual value	k	Actual value	
GDP	0	0.7477	0	−7.1486***	İ (1)
OP	0	−2.1418	0	−7.3321***	I (1)
EXC	1	−2.7975	0	−7.3100***	I (1)
CPI	1	−2.7558	0	−6.4352***	I (1)
Ex	0	−1.7317	1	−7.1415***	I (1)

*, ** and *** accordingly indicates rejection of null hypothesis at 10%, 5% and 1% significance levels; critical values are taken from the table prepared by MacKinnonun (1996). Time period: 2001:Q1-2018:Q4

Table 3: Lag interval tests

Lag	LogL		Information criteria				
			LR	FPE	AIC	SC	HQ
0	−252.2178	NA	0.001487	7.678144	7.842674	7.743249	−252.2178
1	458.6172	1294.356	1.91e-12	−12.79454	−11.80737*	−12.40392	458.6172
2	500.4400	69.91267*	1.17e-12*	−13.29672*	−11.48689	−12.58056*	500.4400
3	518.3983	27.33957	1.50e-12	−13.08652	−10.45405	−12.04484	518.3983
4	543.1539	33.99268	1.60e-12	−13.07922	−9.624105	−11.71202	543.1539

* indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Table 4: Lagrange multiplier test results

Lag	LM statistics	Probability
1	35.75491	0.0754
2	28.03395	0.3063
3	26.39026	0.3870
4	36.43447	0.0653
5	31.10641	0.1855
6	9.182033	0.9983
7	24.71362	0.4785
8	35.59664	0.0779
9	31.91579	0.1605
10	26.83754	0.3640
11	18.11838	0.8373
12	28.33806	0.2925

Table 5: White test results

Chi-square	df	Probability
335.6889	315	0.2023

inverse roots are in the unit circle. Owing to this situation, it was identified that VAR model provides stability requirement.

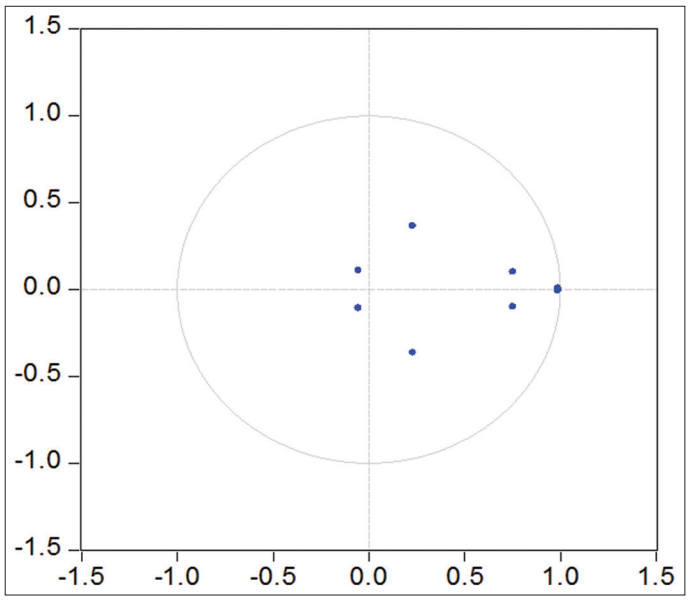
Moreover, White Test was used to determine if there is heteroscedasticity problem in the model. In this test, the null hypothesis explains that there is homoscedasticity. The details of this test were explained in Table 5. As it can be seen, this null hypothesis cannot be rejected because probability value is more than 0.05. In other words, it was determined that there is not heteroscedasticity problem in this model.

The Johansen test (Johansen, 1998) approach to cointegration was employed for testing the cointegration relationship. The Johansen cointegration test results are presented in Panels A and B of Table 6.

Both the trace and the max-eigenvalue test statistics indicate one cointegration relationship among the variables. Therefore, we conclude that there is a cointegrating relationship among the variables. If between variables exist one cointegration relationship among the variables, the first-best solution would be using VECM model. Lastly, After confirming the existence of cointegration among the variables, we applied impulse-response and variance decomposition tests under VECM assumptions to investigate the relationship among the variables. Furthermore, we applied diagnostic tests to residuals of VECM. The results of this tests are given in Table 7.

As it can be seen from the Table 7 residuals of VECM have no issues with instability, serial correlation and heteroscedasticity

Graph 1: Inverse roots of AR characteristic polynomial



problems. Thus, the residuals of the estimated specifications successfully pass the residuals diagnostics tests which is indication of the robustness of the estimation results.

After this test, impulse-response analysis was employed to understand the effects of the shocks on the variables. That is to say, by making this test, it will be possible to see which variables are affected by the shocks and the reactions given by these variables. Within this scope, it was aimed to identify the responses of the variables against any shock in oil price in order to evaluate the impact of the oil price on macroeconomic variables in Azerbaijan. The results of the impulse-response test are illustrated in Graph 2.

The responses of macro variables to oil price shocks for 10 quarter forecast horizon are presented in Graph 2. Evidently, the response of GDP to one-standard deviation shock to the price of oil is positive until reaching a stable level. It implies that increase in oil price result in increase in GDP over the time period. The CPI response positively to oil price increase until reaching a stable level. The impact of oil price shock on export is positive. The plotted impulses reveal that export increase during the first quarter then decline during the second quarter but, since third quarter starts to increase until reaching a stable level. On the other hand, we find increase in oil prices lead to decrease exchange rate (the appreciation of the national currency) within quarter one and two. After that it increase during quarter three, but since

Graph 2: The results of impulse-response functions

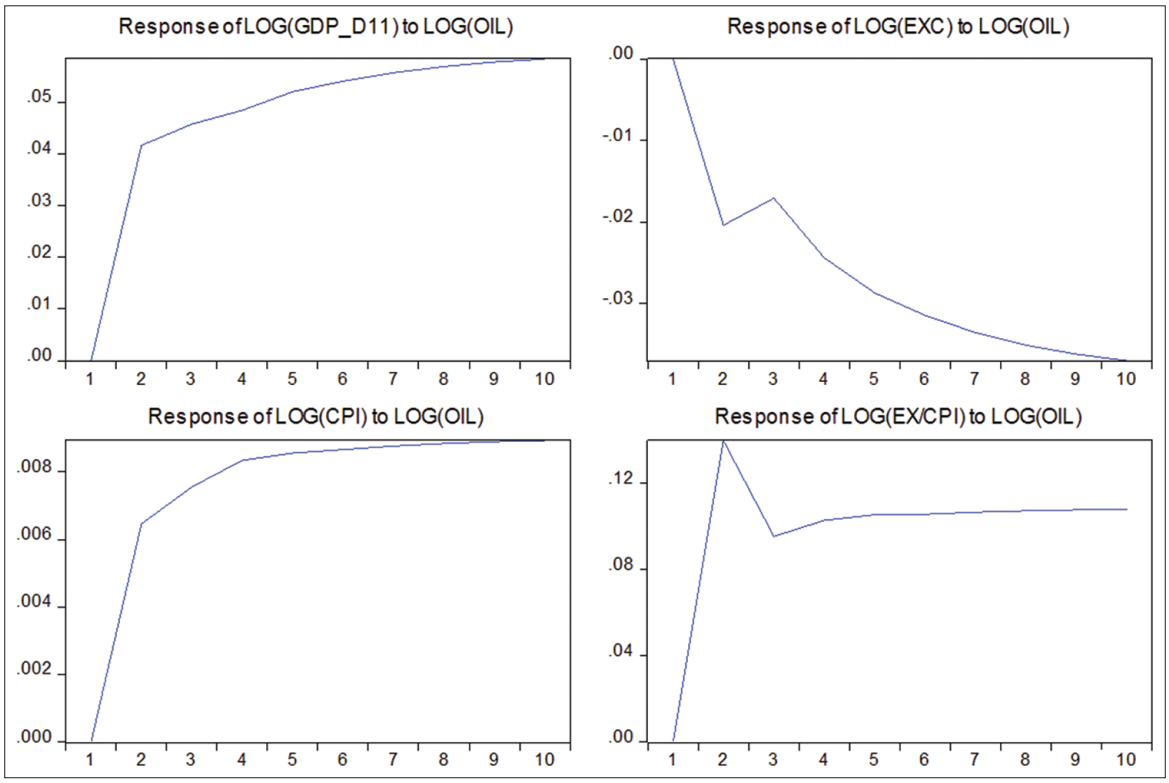


Table 6: Johansen cointegration test results

Panel A: Johansen cointegration rank test (Trace)				
Null hiphthesis	**Eigenvalue**	**Trace statistics**	**0.05 Criticial value**	**P-value**
None*	0.544913	93.84699	69.81889	0.0002
At most 1	0.303332	39.52566	47.85613	0.2399
At most 2	0.143929	14.58586	29.79707	0.8062
At most 3	0.051486	3.863115	15.49471	0.9143
Panel B: Johansen cointegration rank test (Maximum eigenvalue)				
Null hypothesis:	**Eigenvalue**	**Max-eigen statistic**	**0.05 Criticial value**	**P-value**
None*	0.544913	54.32133	33.87687	0.0001
At most 1	0.303332	24.93980	27.58434	0.1051
At most 2	0.143929	10.72274	21.13162	0.6749
At most 3	0.051486	3.647232	14.26460	0.8946

Table 7: Residuals diagnostics tests results of VECM

LMsc	15.71665 [0.9230]
x^2_{HETR}	22.25337 [0.9982]
Q_{AR} (2)	18.33669 [0.9173]

Probabilities are in brackets; *LMsc*: Lagrange multiplier statistic of serial correlation test; x^2_{HETR} : Chi-squared statistic for heteroscedasticity test; Q_{AR} (2): Q-statistic from testing AR (2) process

the third period starts to decline until reach a stable level over the remaining time period.

Finally, we also applied variance decomposition test to see impact of oil price on macroeconomic variables. Table 8, shows the forecast variance decomposition analysis of the GDP, EXC, EX and CPI variables over 10 quarter time horizon. The variance decomposition of GDP indicates that oil price shock explains about 41.6% of GDP variation. The variance decomposition of EXC indicates that oil price shock explains about 19% of EXC variation. The variance decomposition of CPI shows that EXC and oil price shock explains about 67. 5% and 5% of CPI variation, respectively. The oil price shock explains about 67.8% of EX variation. The result of the decomposition analysis is consistent with the IRFs results.

In conclusion, oil prices has a positive effect on economic growth, CPI and export in Azerbaijan. This implies that increase in oil price resulted in increase in economic growth, inflation and export. It can be explained by the fact that Azerbaijan has had significant economic growth trend due to its massive crude oil and gas exports, which occupied on average over 92% of total exports according to the State Statistical Committee of the Republic of Azerbaijan (SSCA, 2018). On the other hand, oil prices has a negative impact on exchange rate. The rising oil prices increase oil revenue and foreign currency inflow, and as a result, the huge foreign currency inflow decrease exchange rate (increase the value of domestic currency). The results are in line with expectations for Azerbaijan, as an oil rich country.

Table 8: Variance decomposition

Variance decomposition of LOG (GDP_D11)						
Period	S.E.	LOG (GDP_D11)	LOG (OIL)	LOG (EXC)	LOG (CPI)	LOG (EX/CPI)
1	0.044027	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.083659	63.34562	30.54569	0.751628	3.707730	1.649330
3	0.116921	52.73975	37.27553	0.518637	6.653110	2.812975
4	0.146507	47.78797	40.14498	0.332553	8.265099	3.469393
5	0.173956	44.41822	42.14785	0.237111	9.295302	3.901512
6	0.199496	42.02720	43.51875	0.185483	10.03379	4.234779
7	0.223410	40.25994	44.51891	0.156586	10.57705	4.487510
8	0.245893	38.90237	45.27963	0.139747	10.99266	4.685590
9	0.267091	37.83767	45.87048	0.129789	11.31865	4.843411
10	0.287140	36.98620	46.33965	0.123824	11.57929	4.971033
Variance decomposition of LOG (EXC)						
Period	S.E.	LOG (GDP_D11)	LOG (OIL)	LOG (EXC)	LOG (CPI)	LOG (EX/CPI)
1	0.178539	2.922638	2.933081	94.14428	0.000000	0.000000
2	0.269572	1.814398	10.98751	86.79459	0.400742	0.002759
3	0.321626	1.566139	14.13082	82.64542	1.288038	0.369588
4	0.365408	1.664321	17.75471	77.82761	2.083443	0.669907
5	0.403325	1.768695	21.04596	73.21991	2.920215	1.045223
6	0.436916	1.886765	23.58566	69.51592	3.639557	1.372097
7	0.467627	1.990546	25.59338	66.52598	4.239261	1.650829
8	0.496076	2.078348	27.18053	64.12507	4.733076	1.882975
9	0.522726	2.151711	28.44818	62.18500	5.139273	2.075834
10	0.547911	2.212916	29.47386	60.60227	5.474792	2.236170
Variance decomposition of LOG (CPI)						
Period	S.E.	LOG (GDP_D11)	LOG (OIL)	LOG (EXC)	LOG (CPI)	LOG (EX/CPI)
1	0.062336	8.308888	0.023007	55.96392	35.70418	0.000000
2	0.093768	6.192980	2.150159	64.11972	27.46198	0.075160
3	0.119904	5.250286	3.577889	67.30636	23.58757	0.277901
4	0.145333	4.713344	4.604590	68.63877	21.65557	0.387721
5	0.169726	4.399297	5.332937	69.35713	20.43638	0.474256
6	0.193061	4.187931	5.863361	69.79356	19.61669	0.538453
7	0.215302	4.034675	6.279247	70.08228	19.01400	0.589798
8	0.236436	3.917473	6.615605	70.28610	18.54899	0.631833
9	0.256508	3.824662	6.893472	70.43672	18.17820	0.666944
10	0.275589	3.749281	7.126546	70.55202	17.87555	0.696599
Variance decomposition of LOG (EX/CPI)						
Period	S.E.	LOG (GDP_D11)	LOG (OIL)	LOG (EXC)	LOG (CPI)	LOG (EX/CPI)
1	0.023561	11.08542	42.82516	1.867956	0.351212	43.87025
2	0.038509	8.688618	68.83263	0.814330	0.560036	21.10439
3	0.049657	7.606516	69.93277	0.569077	1.437772	20.45387
4	0.058585	7.651388	70.87395	0.630483	1.648712	19.19547
5	0.066262	7.481867	71.48193	0.617291	1.847408	18.57151
6	0.073093	7.406450	71.82420	0.622632	1.989929	18.15679
7	0.079324	7.347107	72.05816	0.627258	2.101622	17.86586
8	0.085094	7.302347	72.22675	0.631944	2.191551	17.64741
9	0.090492	7.267203	72.35059	0.636398	2.265554	17.48025
10	0.095583	7.239142	72.44595	0.640540	2.327062	17.34731

Cholesky ordering: LOG (GDP_D11) LOG (OIL) LOG (EXC) LOG (CPI) LOG (EX/CPI)

5. CONCLUSION

The impact of oil price on macroeconomics variables is one of the hot topics for the case of oil-rich countries since its direct influence on the economic performance. One strand of the research devoted to the above-mentioned problem is the impact of oil price within a certain country on the macroeconomics variables. In this regard, this paper investigates the impact of oil prices on economic growth, exchange rate, inflation and export in Azerbaijan. For this purpose, VECM technique was used over the period of 2001:Q1-2018:Q4. After testing variables for unit root, the results showed their stationarity at first differenced form. The Johansen cointegration test was used to analyze the long-run relationships between the variables. The results indicated that there is a long-run co-movement among the variables. After confirming the existence of cointegration among the variables, we applied impulse-response and variance decomposition tests under VECM assumptions. The estimation results indicate that oil price increases seem to have a positive effect on economic growth, CPI and export while a negative effect on exchange rate in Azerbaijan.

Our findings give us an opportunity to argue all used macroeconomic variables are vulnerable to oil price shocks. In oil rich developing countries, policy makers should diversify their economies in order

to hamper the shocks of oil price fluctuations and increase the share of non-oil sector in economy. Thus, economy will be resistant to unpredicted shocks and will sustain the stability in the long run. Therefore, this will strengthen economic growth, will increase confidence in the national currency, will diversify export goods, and will keep the inflation under control.

In fact, these consequences convince the common acceptance of Azerbaijan's dependence on external factors, we study the importance of various factors and determine concrete parameter estimates for key economic variables.

REFERENCES

Abounoori, A.A., Nazarian, R., Amiri, A. (2014), Oil price pass-through into domestic inflation: The case of Iran. International Journal of Energy Economics and Policy, 4(4), 662-669.

Ahmad, F. (2013), The effect of oil prices on employment; evidence from Pakistan. Business and Economic Research Journal, 4(1), 1-43.

Akinlo, T., Apanisile, O.T. (2015), The impact of volatility of oil price on the economic growth in Sub-Saharan Africa. British Journal of Economics, Management and Trade, 5(3), 338-349.

Awerbuch, S., Sauter, R. (2003), Oil Price Volatility and Economic Activity: A Survey and Literature Review. Paris: IEA Research Paper.

Bala, U., Chin, L. (2018), Asymmetric impacts of oil price on inflation: An empirical study of African OPEC member countries. Energies, 11(11), 1-21.

Berk, I., Aydogan, B. (2012), Crude Oil Price Shocks and Stock Returns; evidence from Turkish Stock Market Under Global Liquidity Conditions. Department of International Trade and Finance, Izmir University of Economics and Cologne Graduate School, EWI Working Papers. University of Cologne.

Berument, M.H., Ceylan, N.B., Dogan, N. (2010), The impact of oil price shocks on the economic growth of selected MENA countries. The Energy Journal, 31(1), 149-176.

Bhusal, T.F. (2010), Econometric analysis of oil consumption and economic growth in Nepal. Economic Journal of Development Issues, 11, 135-143.

Blokhina, T.K., Karpenko, O.A., Guirinskiy, A.V. (2016), The relationship between oil prices and exchange rate in Russia. International Journal of Energy Economics and Policy, 6(4), 721-726.

Burakov, D. (2017), Oil prices, economic growth and emigration: An empirical study of transmission channel. International Journal of Energy Economics and Policy, 7(1), 90-98.

Chen, D., Chen, S., Härdle, W.K. (2015), The influence of oil price shocks on china's macro-economy: A perspective of international trade. Journal of Governance and Regulation, 4(1), 178-189.

Chen, S., Chen, H. (2007), Oil prices and real exchange rates. Energy Economics, 29(3), 390-404.

Cunado, J., Perez de Gracia, F. (2005), Oil prices, economic activity and inflation: Evidence for some Asian countries. The Quarterly Review of Economics and Finance, 45(1), 65-83.

Davari, H., Kamalian, A. (2018), Oil price and inflation in Iran: Non-lenear ARDL approach. International Journal of Energy Economics and Policy, 8(3), 295-300.

Delgado, N.A.B., Delgado, E.B., Saucedo, E. (2018), The relationship between oil prices, the stock market and the exchange rate: Evidence from Mexico. The North American Journal of Economics and Finance, 45, 266-275.

Dickey, D., Fuller, W. (1981), Likelihood ratio statistics for autoregressive time series with a unit root. Econometrica, 49, 1057-1072.

Elmi, Z.M., Jahadi, M. (2011), Oil price shocks and economic growth: Evidence from OPEC and OECD. Australian Journal of Basic and Applied Sciences, 5(6), 627-635.

Energy Information Administration (IEA). (2006), World Petroleum Consumption, Annual Energy Review. Washington, DC: Energy Information Administration.

Eyden, R., Difeto, M., Gupta, R., Wohar, M.E. (2019), Oil price volatility and economic growth: Evidence from advanced economies using more than a century's data. Applied Energy, 233-234, 612-621.

Farhani, S. (2012), Impact of oil price increases on U.S. economic growth: Causality analysis and study of the weakening effects in relationship. International Journal of Energy Economics and Policy, 2(3), 108-122.

Guo, H., Klieses, K.L. (2005), Oil price volatility and the U.S. Macroeconomic activity. Federal Reserve Bank of St. Louis Review, 86, 669-683.

Hamilton, J.D. (1983), Oil and the macroeconomy since World War II. Journal of Political Economy, 91, 228-248.

Hassan, K., Abdullah, A. (2015), Effect of oil revenue and the Sudan economy: Econometric model for services sector GDP. Procedia Social and Behavioral Sciences, 172, 223-229.

Jarrett, U., Mohaddes, K., Mohtadi, H. (2019), Oil price volatility, financial institutions and economic growth. Energy Policy, 126, 131-144.

Jiménez-Rodríguez, R., Sánchez, M. (2005), Oil price shocks and real GDP growth: Empirical evidence for some OECD countries. Applied Economics, 37(2), 201-228.

Johansen, S. (1988), Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12, 231-254.

Katircioglu, S.T., Sertoglu, K., Candemir, M., Mercan, M. (2015), Oil price movements and macroeconomic performance: Evidence from twenty-six OECD countries. Renewable and Sustainable Energy Reviews, 44, 257-270.

Kiani, A. (2011), Impact of high oil prices on Pakistan's economic growth. International Journal of Business and Social Science, 2(17), 209-216.

Lacheheb, M., Sirag, A. (2019), Oil price and inflation in Algeria: A nonlinear ARDL approach. The Quarterly Review of Economics and Finance, 73, 217-222.

Lizardo, R.A., Mollick, A.V. (2010), Oil price fluctuations and U.S. dollar exchange rates. Energy Economics, 32(2), 399-408.

Malik, A. (2008), Crude oil price, monetary policy and output: the case of Pakistan. The Pakistan Development Review, 47, 425-436.

Mensah, L., Obi, P., Bokpin, G. (2017), Cointegration test of oil price and us dollar exchange rates for some oil dependent economies. Research in International Business and Finance, 42, 304-311.

Mukhtarov, S., Humbatova, S., Seyfullayev, I. (2019b), The impact of bank credits on non-oil GDP: Evidence from Azerbaijan. Banks and Bank Systems, 14(2), 120-127.

Mukhtarov, S., Mammadov, J., Ahmadov, F. (2019c), The impact of oil prices on inflation: The case of Azerbaijan. International Journal of Energy Economics and Policy, 2019, 9(4), 97-102.

Mukhtarov, S., Yüksel, S., Ibadov, E., Hamidov, H. (2019a), The effectiveness of exchange rate channel in Azerbaijan: An empirical analysis. Banks and Bank Systems, 14(1), 111-121.

Musa, F. (2017), The long run effects of oil prices on economic growth: The case of Saudi Arabia. International Journal of Energy Economics and Policy, 7(6), 171-192.

Nazir, S., Qayyum, A. (2014), Impact of Oil Price and Shocks on Economic Growth of Pakistan: Multivariate Analysis. Pakistan Institute of Development Economics Islamabad (PIDE). MPRA Paper No. 55929.

Omojolaibi, J.A., Egwaikhide, O. (2013), A panel analysis of oil price dynamics, fiscal stance and macroeconomic effects: The case of some selected African countries. Central Bank of Nigeria Economic and Financial Review, 51(1), 61-91.

Qianqian, Z. (2011), The impact of international oil price fluctuation on

China's economy. Energy Procedia, 5, 1360-1364.
Tang, W., Wu, L., Zhang, Z. (2010), Oil price shocks and their short and long-term effects on The Chinese economy. Energy Economics, 32, 3-14.
The State Statistical Committee of the Republic of Azerbaijan. Available from: http://www.azstat.org/MESearch/details. [Last accessed on 2019 May 20].
Trang, N.T.N., Tho, T.N., Hong, D.T. (2017), The impact of oil price on the growth, inflation, unemployment and budget deficit of Vietnam. International Journal of Energy Economics and Policy, 7(3), 42-49.
Volkov, N.I., Yuhn, K. (2016), Oil price shocks and exchange rate movements. Global Finance Journal, 31, 18-30.
World Bank. (2018), World Development Indicators. Available from: https://www.data.worldbank.org/indicator. [Last accessed on 2019 May 11].
Zhao, L., Zhang, X., Wang, S., Xu, S. (2016), The effects of oil price shocks on output and inflation in China. Energy Economics, 53, 101-110.