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Article

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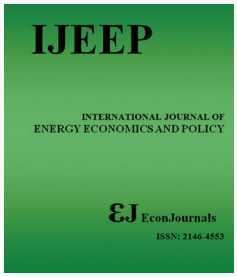

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Sensitivity of Fiscal Balances to Oil Price Shocks: Short and Long Term Effects in the Context of Oman

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ABSTRACT

This paper examines the fiscal balances in Oman and their sensitivity to oil price shocks in the short and long term, using annual data for the period 1980–2016, and employing the vector auto regression model. Results of the study indicated that oil prices Granger cause gross domestic product (GDP) growth, capital formation and inflation. Impulse response analysis showed that an innovation in the oil prices and consequent oil revenues have a similar effect on most of the macroeconomic variables in Oman. Most of these variables show an increase in the first four quarters except for government expenditure and inflation. However, in many cases, this increase has quickly shifted to decrease over the successive quarters except for inflation, which showed a steady increase over time. Variance decomposition analysis, on the other hand, indicated that net oil price shock appears to be a key factor contributing to the volatility of GDP growth over time in Oman.

Keywords: Fiscal Balances, Oil Price Shocks, Oman
JEL Classification: H30, C320, Q430, O503

1. INTRODUCTION

The high dependence of the economies of the gulf cooperation council (GCC) countries on the petroleum ector rendethem vulnerable to oil price shocks. According to the World Fact Book (2017), the petroleum sector contributes roughly 80% of the budget revenues and 45% of the gross domestic product (GDP) of Saudi Arabia, and half of the GDP and 90% of the government's income for Kuwait. For Qatar, 56% of the government revenues and 92% of the export earnings originate from the oil sector, and for Oman, oil constitutes 46% of the country's GDP (CIA, 2016). The recent rock bottom oil prices which started in mid-2014 have greatly impacted the economies of the GCC countries resulting in a slowdown of their GDP growth, declining export earnings, mounting budget deficits and shrinking current accounts (CIA, 2016). To mitigate the impacts of oil price volatility, most of the GCC countries started a series of diversification programs from the early 1990s, focusing on non-oil sectors such as manufacturing, tourism, and logistics (Shayah, 2015; Soofi et al., 2017; Shahine, 2015). However, the recent decline.in oil prices, and the likelihood of their staying low for a longer period, have affected the government revenues and spending abilities of the GCC countries, creating many challenges to their long-term development goals and sustainability of their diversification programs. Decrease in oil prices has severely affected the countries in the GCC, lowering government revenues, which has negatively affected spending plans. Bahrain and Oman have experienced low growth, owing to fewer financial buffers. Meanwhile, Kuwait, Qatar and the UAE have comparatively more financial assets to support them over the short to medium term (Ernst and Young Report, 2016). Among the GCC countries, Oman is considered one of the least diversified economies, with limited resources. Oil contributes 79% of the government revenues, 52.1% of the merchandise exports and 33.9% of its GDP (NCSI, 2016). The recent decline in oil price has severely impacted Oman's economy, resulting in a massive budget deficit and slow GDP growth. In

2009, for example, Oman's budget deficit was 3.7% of the GDP; this increased to 17.1% in 2016 (Cash Surplus/Deficit, % of GDP, 2016). The dampening of government revenues is likely to impact the levels of spending on health and education sectors, and thus the long-term development goals. The impact of oil price shocks on fiscal balances in Oman, and their effect on its developmental goals need to be explored. Understanding the dynamics of oil price decline and their impact on government revenues, expenditures and GDP growth is important for policy makers in Oman, so that diversification objectives are maintained, without compromising the country's long-term goals. The main objective of this paper is to explore the sensitivity of Oman's fiscal balances to oil price shocks and assess their short- and long-term effects. The study attempts to answer the following questions:

What is the impact of oil price shocks on government revenue and expenditure?

What is the nature of the causality between fiscal balances, GDP and oil price shocks?

To achieve its objectives, the study will validate the following hypotheses:

H_1: Oil price shocks impact government revenues negatively and reduce the government's ability for current and development spending.

H_2: There is causality running from oil prices to government revenues, expenditure and GDP, for Oman.

2. LITERATURE REVIEW

The world has been exposed to several oil price shocks during the last three decades. These shocks created lower economic activity and caused a global recession (Bjrnland, 2000; Hamilton, 2009; Peersman and Van Robays, 2012). Most of these shocks were caused by geopolitical tensions within the oil exporting countries, or slow growth within the importing countries (Hamilton, 2011). Lower oil prices can be a shock that drives the global economic activity, or a response to other shocks driving global growth. In the first case, the decline may be driven by factors that are not related to current global economic conditions, whereas in the second case, the lower prices would be a result of the unexpected changes to global economic activity (Aasim et al., 2015) Therefore it is not only important to identify the reasons for oil price impact but also to assess its likely global economic impact. The impact depends on whether the country is oil-exporting or oil-importing. Since the 1980s, there has been an immense body of literature investigating the relationship between oil price shocks and the macroeconomic variables, such as GDP growth, general prices and fiscal balance. The literature on this issue can be categorized into three strands. One strand focuses mainly on identifying the effects oil price shocks on oil-exporting countries, particularly the countries for which oil represents the backbone of the economy, such as the GCC countries (Sadeghi, 2017; Rahma et al., 2016; Vohra, 2017). The second strand investigates the impact of oil price shocks on oil-importing countries (Bash, 2015; Gangelhoff, 2015), while the third compares the impact of oil price shocks on oil-exporting and oil-importing countries together (Davis et al., 2001; Killian et al. 2009). Since the context of this study is Oman, the literature related to exporting countries will be emphasized. For oil- exporting countries of the developing world where there is a heavy dependence on oil revenue for foreign exchange earnings and for the government budget, the evolution of the oil price can affect GDP growth negatively with the increase in the oil price (Nweze and Greg, 2016; Jiménez-Rodríguez and Sanchez, 2005). Discussion on the impact of oil price shocks on the GCC economies has attracted many authors. Vohra (2017) studied the impact of oil prices on GCC economies, based on secondary data collected for the six GCC nations, covering the period 2000–2015. The study used regression analysis to investigate the association between the crude oil prices and economic performance, including current account and GDP growth. The study demonstrated that the GCC nations benefitted financially from rising oil prices from 2000 to 2007; however, they suffered after the decline, from 2008 onwards. The study showed evidence of falling and volatile oil prices and economic growth to be a driving force behind growing budget deficits and dwindling current accounts in GCC countries. To be sustainable in a period of lower prices, the study recommended that the rulers of the GCC countries change the structure of their economies to reduce their heavy reliance on oil. Rashid and Hamdi (2013), conducted a study on dynamic relationships between oil revenues, government spending and economic growth in an oil-dependent economy, with reference to the Kingdom of Bahrain. The study used a trivariate cointegration analysis and error–correction model and data for 1960–2010. Overall results suggested that oil revenues remain the principal source for growth and the main channel which finance the government spending. The results of the report by Kitous et al. (2016) showed that oil price drop has different effects across oil exporting countries. There exists a strong correlation between export dependence and oil. Most of the Gulf countries have a very high share of fossil fuel related sectors in the economy (50–65%) and show high elasticity of both GDP and government revenues to oil price. This indicates a high specialization towards oil, and a low degree of diversification of the economy towards other industries or the service sector. The macro-economic impacts of the oil price scenarios are analyzed with the general equilibrium model for economy energy and environment (GEM–E3). The GDP and government revenue was found to be closely correlated to the oil price. Sadeghi (2017) examined the impact of government size on how output and government expenditure responded to oil price shocks in 28 oil-exporting countries between 1990 and 2016, all of whom had been oil exporters for the previous 10 years, except Syria, Yemen, and Sudan. A vector autoregression model was used including real oil price index, government expenditure (current and capital) and real non-oil output, all in log forms. The results indicated that an increase in oil price leads to expansion in government expenditure and the larger the expansion, the larger the government. The study also showed that there exists a direct correlation between government size and macroeconomic stability in oil-exporting countries. The implication of the study is that the fiscal consolidation and economic diversification help to narrow down economic exposure to exogenous oil price shocks and reduce volatility in non-oil output. Rahma et al. (2016) studied the relationship between oil price shocks and aggregate macroeconomic activities for developing economies, taking Sudan

as a case study. The study employed a vector auto-regression model to explore the impact of oil price shocks on the main variables of Sudan's government budget, using quarterly data for the period 2000:q1–2011:q2. The empirical results suggest that oil price decreases significantly influence oil revenues, current expenditure and budget deficit. However, oil price increases do not Granger cause budget variables. Results from the impulse response functions and forecast error variance decomposition analysis suggest that oil price shocks have asymmetric effect on government budget. Odularu (2008) examined the relationship between the crude oil sector and the Nigerian economic performance, using the ordinary least square (OLS) regression method. The study revealed that crude oil consumption and export contributed to the improvement of the Nigerian economy. The study recommended that government should implement policies that would encourage the private sector to participate actively in the crude oil sector. A similar study conducted by Ibeh (2013) investigated the impact of the oil industry on the economic growth performance of Nigeria, using an OLS regression technique, regressing GDP, against oil revenue (OREV) and time. The study found a negative relationship, a result which contradicts that of Odularu (2008), who found a positive relationship between the oil sector and Nigeria's economic performance.

Azhgaliyeva (2014) discussed the implication of oil price shocks for oil-producing countries in terms of oil revenue fund, taking Kazakhstan as a case study. The study used monthly data for the period of January 1994 to July 2013 and employed an error correction model (ECM) with the first differences of the variables used in the model. The study found that an oil revenue fund in Kazakhstan stabilized government expenditure but did not stabilize real effective exchange rates. The study recommended the importance of providing a suitable design of fiscal policy to avoid high volatility of oil revenue. Similarly, Davis et al. (2001) studied the effect oil revenue funds for 12 countries (Chile, Kuwait, Norway, Oman, Papua New Guinea, Algeria, Bahrain, Mexico, Saudi Arabia, UAE, UK and Venezuela over the period 1965–1999. The study showed that a negative correlation between government expenditure and changes in oil prices, with no effect of oil revenue funds on government expenditure and resource export receipts. Unlike Davis et al. (2001), Shabsigh and Ilahi (2007) who studied the impact of oil revenue funds in 15 countries heavily dependent on oil, found that a negative correlation between oil revenues funds and broad money and CPI, with no significant correlation with effective exchange rates.

There are a few studies which have addressed the impact of oil price shocks in Oman. For example, Al-Mawali (2016) studied the impact of the oil sector on Oman's economy for the last three decades (1980–2012), providing some forecasting for the major macroeconomics indicators related to the Omani economy. The researchers used the log linear regression model. The model simulations indicated that the oil sector has large and positive impact on Oman's GDP and its influence spills over to all other non-oil sectors. The study found that the largest influence of oil was on the gas sector, while the economic sector least influenced by oil was the agricultural sector. The findings of the study suggest that Oman's economy is yet to be diversified and that the model helps the policy makers in Oman to identify and forecast the impact of oil on other components of the country's economy.

According to Ahmad and Masan (2015), who investigated the short- and long-term relationships between three main macroeconomic variables: The real GDP, the real government expenditure and the real oil revenues in Oman, there is a long-term relationship between these three variables. Johansen multivariate co-integration techniques and stationary VAR were used for the study, using the data of the period between 1971 and 2013. It was found that the estimated coefficients for the real oil revenues and the real government expenditure are statistically significant, depicting a positive relationship with GDP. The impulse response functions and the variance decomposition from the stationary VAR results showed that these variables are important to the short-term dynamics of the Omani economy. Overall, government expenditure appears to be the main source for long term economic growth, and short-term variations in government expenditure are generally derived from oil revenue shocks. Therefore, the volatility in oil revenue requires public expenditure management reforms and diversification of income sources to enhance economic stability and growth.

Sillah and Al-Sheikh (2012) showed that in all countries in the GCC except Oman, increased international oil price tends to induce increased domestic consumption. This is because increased international oil price generates high revenues from given export volumes, maintaining or increasing domestic oil consumption; whereas in the case of Oman, increased oil price tends to induce more exports of oil and less oil for the domestic market. For Oman and Qatar, the unidirectional relation runs from per capita GDP to domestic oil consumption, whereas for most countries there are bidirectional relationships between international oil price and per capita GDP. Vector Error Correction Model (VECM) was used and showed that there exists a unidirectional relation running from domestic oil consumption to per capita GDP in Bahrain, Kuwait and Saudi Arabia.

Masan's (2016) study, on the other hand, investigated the relationship between oil revenue and government expenditure in Oman for the period 1980-2013, using the VAR model. The study indicated that oil revenue has immediate and significant impact on both Oman's GDP and the government's expenditure. In turn, the government expenditure has a significant impact on the GDP. Findings indicated that the Omani government expenditure is positively related to oil revenue. As a result, the economy becomes vulnerable to shocks, as oil revenue is largely dependent on global oil prices that are highly volatile. As increases in oil revenue are spent, the government will be left with very little fiscal space in the event of a negative oil revenue shock. The researcher also investigated the short term and long-term relationship between the three macroeconomic variables in Oman, using the Johansen co-integration technique as well as the VECM. The results indicated that there is a long-term relationship between the three macroeconomic variables of interest: GDP, government expenditure and oil revenues. The long-term coefficients indicate that there is a positive long-term relationship between these three variables. The actual expenditure appears to have a positive impact

on GDP and variations in government expenditure are generally derived by the changes in oil revenue.

3. METHODOLOGY

3.1. Data and Design

The paper used a quantitative approach to measure the impact of oil price decline in Oman and assess its implications for fiscal balance, GDP growth, and long-term development goals. The study relied on secondary data, compiled mainly from the World Bank, the International Monetary Fund (IMF), in addition to the National Center of Statistics and Information (NCSI) and the Central Bank of Oman (CBO), to develop an econometric model to explore the short- and long-term effects of oil price decline on Oman's economy, particularly fiscal balance and GDP growth. The data of the model is time series covering the period 1960–2016. The data sources include GDP (Y), inflation (INF), government expenditure (GEX) and oil prices (OILP) compiled from the World Bnk database. The data for the nominal oil price is from the IMF's International Financial Statistics. All data are for the period 1980 to 2016. Data for the fiscal balances and budget deficit were collected from the National Center for Statistics and information (NCSI). The annual data were collected from the World Bank and the IMF, while the monthly data was collected from the NCSI.

The paper adopted a co-integration technique to avoid the spurious regression associated with non-stationary time series macro data. A VECM was used to capture the short- and long-term dynamics of oil price shocks on fiscal balances and GDP growth. Impulse analysis was also used, to estimate the rate of adjustment.

3.2. Vector Auto Regression (VAR) Model

Studies modelling the dynamic economic impacts of oil price shocks on the economy, in recent years, have utilized the Vector Autoregression (VAR) methodology. The VAR model has been advantageous in this context as it does not require the arbitrary restrictions of the more-tightly structured and inappropriate models, considering various plausible transmission channels suggested by economic theory (Sims, 1980; Burbidge and Harrison, 1984).

The VAR system of equations can be represented in the following matrix form:

$$y_t=\varphi_0+\Phi_1 y_{t-1}+\ldots+\Phi_p y_{t-p}+\varepsilon_t \quad (1)$$

Where y_t is a (n x 1) vector of endogenous variables. φ_0 is a (k x 1) vector of constants. Φ's are (k × k) coefficient matrices. p is the order of the VAR. ε_t ($\varepsilon_{1t},\ldots \varepsilon_{nt}$)' is the (n × 1) vector of innovations. The first step in developing a VAR model is to choose the macroeconomic variables that are essential for the analysis. The variables in the model consist of one external shock, measured by innovations in the price of Oman crude oil, and other key macroeconomic variables, including GDP, oil revenues, inflation rate, gross capital formation, and government expenditure. Based on the VAR model given in Equation (1), the vector y includes the following variables:

GDP_t: GDP growth (y).
$OILP_t$: Real oil price of Oman crude (OIL).
GCF_t: Gross capital formation.
$OILR_t$: Oil revenue as percentage of (GDP).
GEX_t: Government expenditure as percentage of (GDP).
INF_t: Inflation rate measured by consumer price index (CPI).

The first stage of the estimation and modelling procedure is to identify the order of integration of the data series. The Augmented Dickey-Fuller (ADF) test was applied, using the software package E views 10. Having ascertained the order of integration of each series, the next stage involved short term assessment of oil price shocks on economic growth. This includes Granger causality-type tests, impulse response functions and the error variance decompositions of the VAR model. The impulse response functions and error variance decompositions are estimated, as they are more informative than the estimated variable coefficients and R^2 statistics of the models (Stock and Watson, 2001).

To ascertain whether there is a statistically significant relationship between oil prices and the given macroeconomic variables, pairwise Granger causality-type tests are performed on the system of variables using the standard Wald test. The test is based on an unrestricted VAR (*p*) as given in equation (1).

Selection of the appropriate order of the VAR, *p*, is based on various criteria such as the Akaike Information Criterion and Schwarz Information Criteria (AIC and SBC, respectively). Once the order of the VAR has been determined, the Wald test of Granger causality is performed for various pairs of variables within the system. This primarily determines whether different representations of oil price directly change Granger cause economic growth in Oman. Also, the pairwise tests provide the crucial insights into whether oil price shocks have an impact on the system of the macroeconomic variables for Oman. Under such circumstances, the magnitude of this impact can be quantified using the impulse response function and forecast error variance decomposition mechanisms.

4. EMPIRICAL RESULTS

4.1. Fiscal Balance Performance

Table 1 shows the performance of fiscal balance for Oman during the period 2007-2016. This includes government revenues (oil and non-oil revenues, total government expenditure (current and investment) and the overall balance (surplus/deficit).

Table 1 indicates that government revenues showed a compound average growth rate (CAGR) of 2.8% during the period 2007–2016. The revenues increased from an average of RO 6,769 million during the period 2007–2009, to RO 10,671.9 during the period 2010–2012 and to RO 11,173 million during the period 2013–2016. It can be observed that the slow growth of revenue in the last period, compared to the previous two periods, was mainly due to the declining oil prices from mid-2014 onwards. Oil revenue contribution increased from 77.4% during the period 2007–2009 to 83.7% during 2010–2013, before it declined to 80.9% during the period 2013–2016. This high dependence shows the vulnerability of government revenues to the oil price shocks. Non-oil revenues

Table 1: Average government revenues and expenditures for Oman, 2007-2016

Indicator	2007–2009	2010–2012	2013–2016	CAGR
Government revenues (Mn. RO)	6,769.23	10,671.9	11,173	2.83%
Oil revenues	5,237.97	8,928.8	9,036	1.62%
Share (%)	77.4	83.7	80.9	-
Non-oil revenues	1,531.27	1,743.1	2,136	6.01%
Total expenditure	6,956.47	10,752.8	13,942	9.13%
Current expenditure (Mn. RO)	4,165.47	6,555.9	9,228	10.30%
Investment expenditure	2,223.03	2,814.3	3,237	6.25%
participation and subsidies	567.97	1,382.6	1,477	8.16%
Surplus(+) or deficit(-)(Mn. RO)	–187.23	–80.9	–2,770	–272.01%

Source: NCSI, 2017

contributed <20% during the period 2013–2016. The government needs to increase the share of non-oil revenues to avoid the risk of oil price volatility.

Although total expenditure showed a compound average growth rate (CAGR) of 9.13% during 2007–2016, this growth exhibited a declining trend from 55% in 2010–2012, to 30% in 2013–2016. This again confirms the fact that declining oil prices constrained government spending.

The share of current expenditure increased from 59.8% during the period 2007–2009, to 55.2% from 2013 to 2016, whereas investment expenditures declined from 31.9% to 23.2% during the same periods. This will have adverse repercussions on the country's development and capital spending, whether on education or health. Participation and subsidies showed a CAGR of 8.16% during the period 2007–2016, although the government recently started increasing the prices of oil and government services, to reduce the budget deficit, which increased from RO 187.2 million to RO 2,770 million during the periods 2007–2009 to 2013–2016 respectively.

As shown in Figure 1, Oil prices have experienced a dramatic decline since mid-2014. For instance, Omani crude oil prices showed a sharp decline from $105.65 per barrel in July 2014 to a price of $55.59 per barrel in December 2017, with a monthly compound decline rate of 1.6% during this period. This decline has greatly affected the macroeconomic indicators of the country.

4.2. Unit Root and Stationary Tests

To avoid a spurious relationship that cauterizes non-stationary time series, unit root and stationary tests were employed using Augmented Dicky and Fuller (1979) tests Table 2 shows the results of the tests. All the variables including

, GCF, OILP, $OILR_r$, GEX and INF, exhibit non-stationary at level, then become stationary after taking the first difference, using 1% level of significance. These results imply that at level all series are integrated of order one, and order zero when taking the first difference. Only GDP and OILP variables are stationary at 10% level of significance.

4.3. Optimal Lag Length

Optimal lag length is a critical element in the specification of VAR models and ensures good impulse response analysis and forecasting (Braun and Mittnik, 1993; Hafer and Sheehan, 1989).

Table 2: Results of the ADF unit root tests

Variable	ADF statistic	Result	Variable	ADF t-statistic
GDP	–3.475*	Not I(0)	ΔY	−8.234***
GCF	–1.998	Not I(0)	ΔK	−4.144***
OILP	–2.517	Not I(0)	ΔOL	−8.988***
OILR	–3.443*	Not I(0)	ΔOILr	−5.706***
GEX	–2.617	Not I(0)	Δ GE	−8.998***
INF	–2.544	Not I(0)	ΔINF	−5.396***

Δ is difference operator. 5% critical values for ADF test are−3.51 (levels), −2.93 (first-differences); 5. *, **, *** significance at the 10, 5, and 1% level, respectively. Critical values for the ADF test are from Mackinnon (1996). GDP: Gross domestic product

The order of the VAR model was determined by the information criteria: Akaike information criterion (AIC), Hannan-Quinn information criterion (HQ), Schwarz information criterion (SC), LR, LogL, and FPE. The number of lag that minimizes the value of each of the above mentioned criteria was chosen as the appropriate VAR order. Table 3 shows that lag 3 was found to be the optimal lag length of the VAR model, as suggested by all criteria except Log L.

4.4. Granger Causality Analysis

Granger causality tests explore whether the historical values of one time series is useful in forecasting the values of another series. The null hypothesis is that there is no causality between the variables under investigation. Table 4 reports the results of the Granger causality test between the oil price shocks and the fiscal balance variables.The test postulates that all oil price coefficients are jointly zero in the GDP growth equation of the respective VAR models. The pairwise Wald tests of Granger causality test show whether variables are pairwise causal or not.

Table 4 shows that oil price (OILP) Granger cause GDP growth, oil revenues (OILR), gross capital formation (GCF), while oil revenues (OILR) Granger cause gross capital formation (GCF), oil price (OILP), government expenditure (GEX), and inflation (INF). This indicates that there is a bidirectional causality between oil price (OILP) and oil revenues (OILR). Moreover, there is one directional causality running from Inflation (INF) to GDP growth,and from government expenditure (GEX) to gross capital formation (GCF).

The findings of this study are consistent with most of the literature addressing the impact of oil price shocks on macroeconomic and fiscal balance variables for oil-exporting countries (Hamilton, 2009, Kitous et al., 2016; Peersman and Van Robays, 2012; Sadeghi, 2017; Rahma et al., 2016; Vohra, 2017).

Table 3: Results for choosing the lag length of the VAR model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	–602.4656	NA	6.71e+10	41.95626	42.23915	42.04486
1	–515.0900	132.4184	2.07e+09	38.42000	40.40022	39.04018
2	–473.3527	46.05501	1.98e+09	38.02432	41.70188	39.17609
3	–364.7004	74.93261*	41292244*	33.01382*	38.38871*	34.69717*

*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: Results granger causality

Null hypothesis	F-statistic	P-value	Result	Null hypothesis	F-statistic	P-value	Result
OILR==>GDP	1020	0.432	No causality	INF==>OILR	1.313	0.298	No causality
GDP==>OILR	0367	0.865	No causality	OILR==>GEX	22.449	0.000	Causality
GCF==>GDP	1148	0.368	No causality	OILR==>INF	8.833	0.000	Causality
GDP==>GCF	1918	0.136	No causality	OILP==>GCF	2.732	0.049	Causality
OILP==>GDP	2563	0.060	Causality	GCF==>OILP	0.889	0.507	No causality
GDP==>OILP	2674	0.052	Causality	GEX==>GCF	2.544	0.077	Causality
GEX==>GDP	1800	0.177	No causality	GCF==>GEX	0.249	0.933	No causality
GDP==>GEX	1842	0.169	No causality	INF==>GCF	1.302	0.302	No causality
INF==>GDP	2864	0.041	Causality	GCF==>INF	1.135	0.375	No causality
GDP==>INF	2081	0.110	No causality	GEX ==>OILP	0.160	0.973	No causality
GCF==>OILR	0784	0.573	No causality	OILP==>EX	0.155	0.975	No causality
OILR==>GCF	5486	0.002	Causality	INF==>OILP	0.967	0.461	No causality
OILP==>OILR	3571	0.017	Causality	OILP==>INF	0.573	0.720	No causality
OILR==>OILP	3648	0.016	Causality	INF==>GEX	0.353	0.872	No causality
GEX==>OILR	0.365	0.864	No causality	GEX==>INF	0.399	0.841	No causality

Source: Authors' calculations

The causality found in this study, between oil price and Oman's growth, capital formation and government expenditures confirm the vulnerability of Oman's economy to the oil price shock, as shown by many studies including: Masan, 2016, Ahmad and Masan, 2015 and Al-Mawali, 2016. The bidirectional causality between oil price (OILP) and oil revenues (OILR) from one side, and the one directional causality between oil price (OILR) and government expenditure on the other, emphasize the need for diversification of the Oman economy and the need to provide an appropriate design of fiscal policy to avoid the high volatility of oil revenues, as revealed by Ahmad and Masan, 2015; Al-Mawali, 2016; Azhgaliyeva, 2014; Masan, 2016).

4.5. Impulse Response Analysis

The impulse response analysis shows the reaction of a dynamic system in response to some external change. Figure 2 displays the response of major macroeconomic variables to the shocks given to the oil price and then to the government expenditure, for 10 quarters forecast horizon.

Figure 2 shows that an innovation in oil prices and oil revenues has a similar effect on most of the macroeconomic variables in the model. Most of these variables show an increase in the first four quarters except for government development expenditure and inflation. However, in many cases, this increase has quickly shifted to a decrease over the successive quarters except for inflation, which increased over longer period.

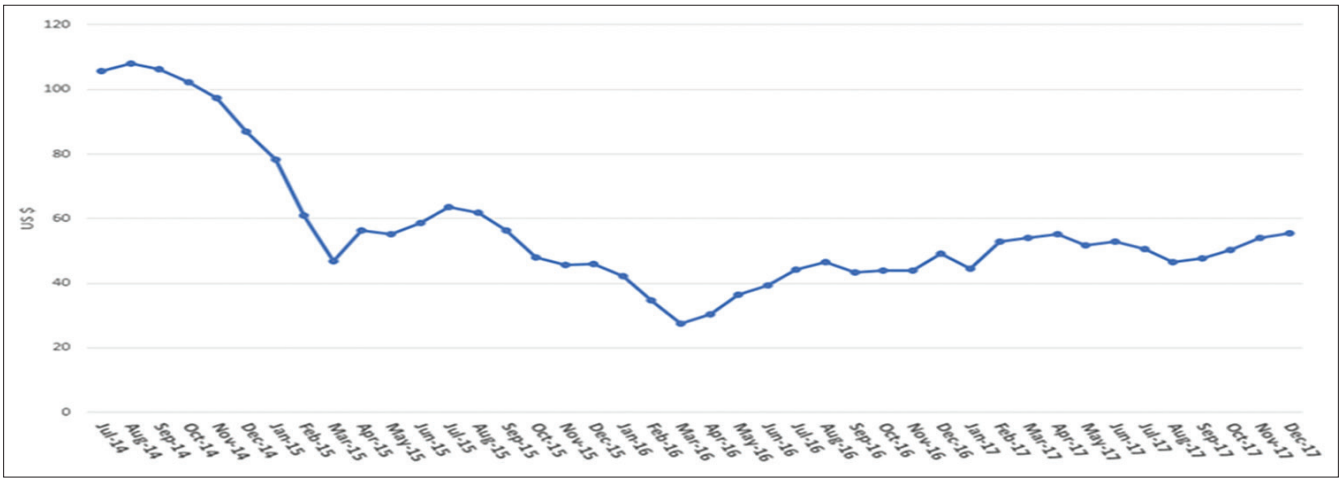
4.6. Variance Decomposition Analysis

The variance deposition analysis determines how much of the forecast error variance of each of the variables in the system can be explained by exogenous shocks to the other variables in the model. Table 5 shows the forecast error decomposition analysis of the fiscal balance variables over a 10-quarter time horizon. As can be seen, the net oil price shock appears to be a key factor contributing to the volatility of output growth in Oman over this period. Also, oil price shock has had a great impact on gross capital formation, oil revenues and inflation. Most of the variables studied in the model show an increase in the first four quarters except for government development expenditure and the inflation. However, in many cases, this increase has quickly shifted to decrease over the successive quarters except for inflation where it increased over longer periods as shown in Figure 3. Inflationary pressures have occurred due to the stringent measures adopted by the government to reduce the growing deficits that reached RO 2.77 million in 2017 due to the decline in oil revenues and increase in government expenditure (NSCI, 2017). The package of the measures included raising the price of locally consumed oil, reducing subsidies and other social expenditures, the result of which is an increase in the rates of inflation and slow in GDP growth. This will have long term implications on Oman's developmental goals.

5. CONCLUSION

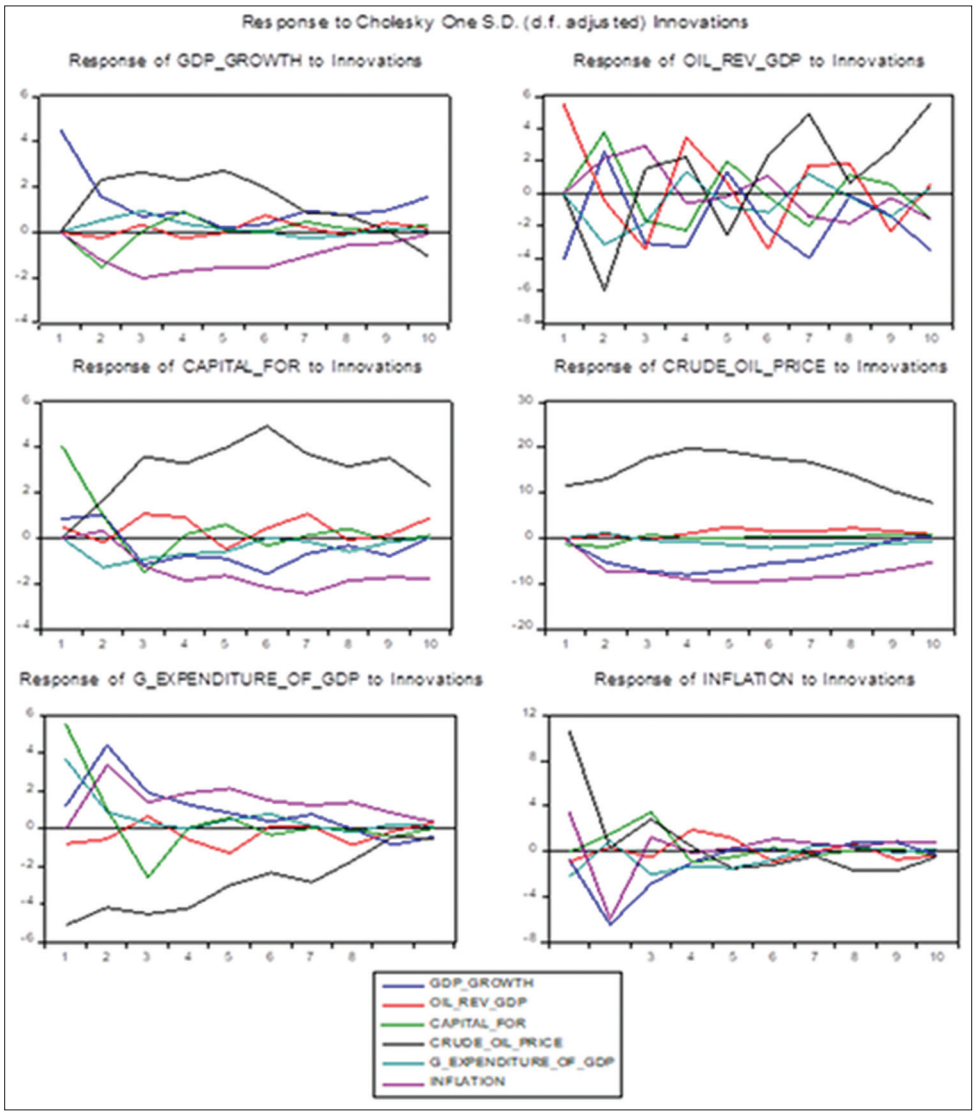
Oil plays an important role in the economies of the GCC, particularly and Oman as it has limited resources. The paper examined the sensitivity of fiscal balances to oil price shocks in Oman; with the aim to establish causality between oil price shocks, GDP, government revenues, expenditures and gross capital formation, and their short- and long-term impacts. Time series data, covering the period 1980–2016, was used, and an autoregressive model (VAR) methodology was employed.

Figure 1: Monthly crude oil price from July 2014 to December 2017



Source: CBO, 2017

Figure 2: Impulse response analysis



The paper showed that because of oil price shocks, Oman's government revenues, expenditures and GDP growth have been severely affected, a typical case for GCC countries and other oil-exporting countries, as shown by Ahmad and Masan, 2015; Jiménez-Rodríguez and and Sanchez, 2005; Kitous et al., 2016; Masan, 2016; Odularu, 2008; Rahma et al., 2016; Sadeghi, 2017.

Figure 3: Variance decomposition analysis

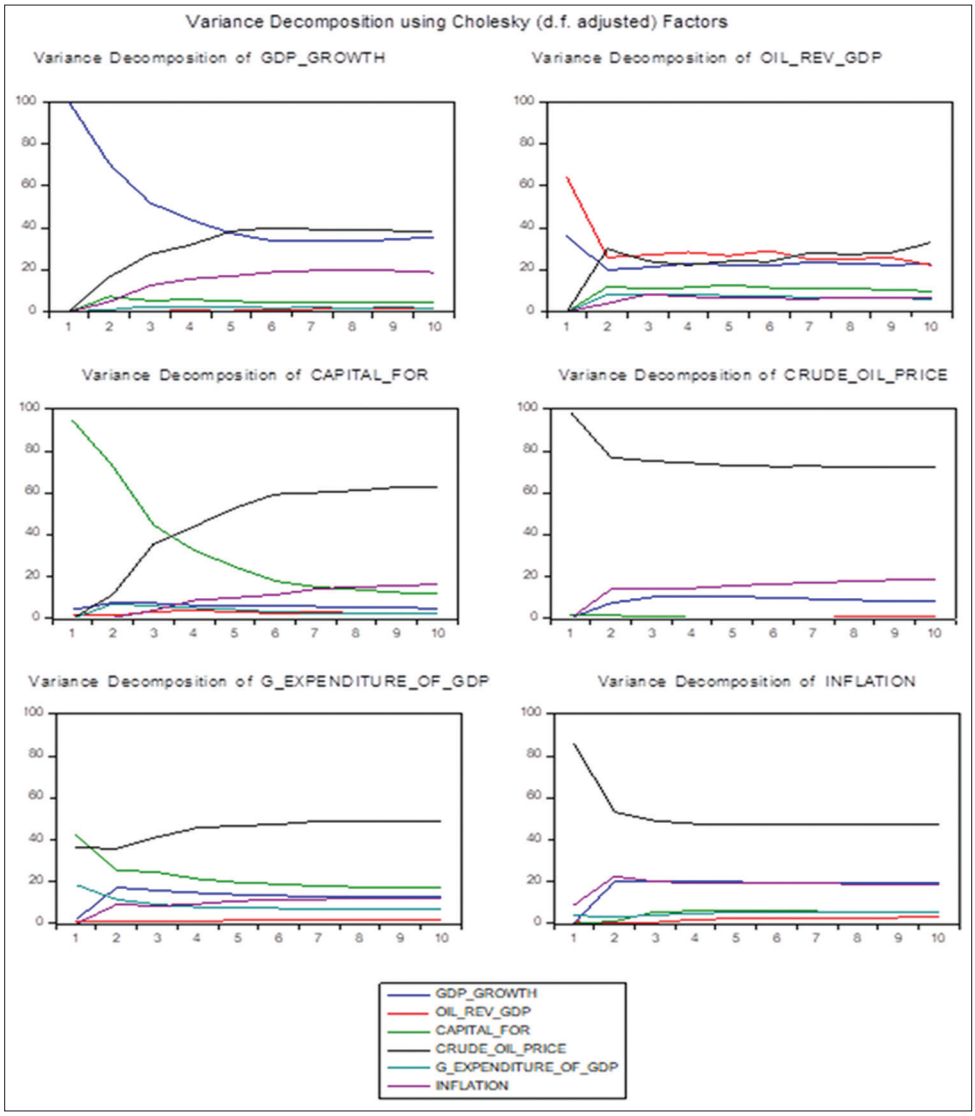


Table 5: Variance decomposition

Period	S.E	GDP	GCF	OILP	GEX	INF	OILR
Variance decomposition of GDP							
1	4.540845	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	7.445757	43.94073	5.772364	31.87582	1.908223	14.50675	1.996115
8	8.779702	33.69913	4.495048	39.29635	1.605129	18.40521	2.499132
10	9.067023	35.68931	4.378270	38.25192	1.505242	17.77929	2.395967
Variance decomposition of GCF							
1	4.170343	4.213676	95.78632	0.000000	0.000000	0.000000	0.000000
4	7.781959	6.251232	32.19552	43.91103	6.445886	10.48405	0.712290
8	12.19421	5.175803	13.50610	60.95786	3.098032	14.57356	2.688641
10	13.19710	4.770306	11.57132	62.23870	2.728773	16.12888	2.562022
Variance decomposition of OILP							
1	11.61358	0.099561	1.432612	98.46783	0.000000	0.000000	0.000000
4	36.87794	10.77613	0.423131	74.11288	0.135259	12.37445	2.178149
8	54.66689	8.644187	0.230483	72.37951	0.737786	15.83202	2.176013
10	56.90413	7.998010	0.261523	71.93528	0.791922	16.73679	2.276471
Variance decomposition of GEX							
1	8.490019	2.055456	40.07950	36.32467	21.54037	0.000000	0.000000
4	13.39287	14.64839	20.08178	45.85727	9.347492	7.990757	2.074300
8	14.84642	12.53805	16.47508	48.94370	8.233714	11.41412	2.395332
10	14.93306	12.81219	16.37476	48.59516	8.171012	11.52666	2.520218

(Contd...)

Table 5: ***(Continued)***

Period	S.E	GDP	GCF	OILP	GEX	INF	OILR
Variance decomposition of INF							
1	11.51974	0.412149	0.029039	85.98228	2.436665	11.13987	0.000000
4	16.01920	20.33048	5.526925	47.70061	3.971099	19.68638	2.784504
8	16.51295	19.42831	5.324133	47.45100	5.113378	19.46112	3.222054
10	16.70253	19.24065	5.294462	47.55664	5.048471	19.67405	3.185734
Variance decomposition of OILR							
1	6.920534	35.98675	0.942121	0.001299	8.961973	10.47243	43.63543
4	13.90879	22.94500	11.28551	22.24405	5.789195	18.87242	18.86383
8	17.05656	22.93779	10.90463	27.38541	4.433510	18.44020	15.89846
10	18.92919	22.81344	9.500452	33.03258	3.651845	16.19520	14.80649

Source: Authors' calculations

The recent decline in oil prices has slowed Oman's GDP growth, reduced government revenues, increased government expenditure and aggravated the country's budget deficit. Causality analysis indicated that oil prices Granger cause GDP growth, gross capital formation, and inflation. Impulse Response analysis indicated that an innovation in oil prices and hence oil revenues has a similar effect on most of the macroeconomic variables used in the model. Moreover, these variables showed an increase in the first four quarters except for government development expenditure and inflation. However, in many cases, this increase has quickly shifted to a decrease over the successive quarters except for inflation, which increased over longer periods. Variance decomposition analysis revealed that net oil price shock appears to be a key factor contributing to the volatility of GDP growth over periods in Oman. The implication of the study is that because Oman's economy is heavily dependent on oil, this has exposed the country to great jeopardy due to oil price volatility. Oman needs to strengthen its diversification strategy by promoting sectors other than oil, such as tourism, manufacturing, agriculture and fishing and logistics. Emphasize of policy makers in Oman should also be given to design an appropriate fiscal policy to avoid the high volatility of oil revenues, to sustain economic growth and development.

REFERENCES

Aasim, M.H., Rabah, A., Peter, B., Vikram, H., Thomas, H., Paulo, M., Martin, S., an IMF Staff Team. (2015), Global Implications of Lower Oil Prices. Washington DC: International Monetary Fund.

Ahmad, H.A., Masan, S. (2015), Dynamic relationships between oil revenue, government spending and economic growth in Oman. International Journal of Business and Economic Development, 3(2), 93-115.

Al-Mawali, N., Hasim, H.M., Al-Busaidi, K. (2016), Modeling the impact of the oil sector on the economy of sultanate of Oman. International Journal of Energy Economics and Policy, 6(1), 120-127.

Azhgaliyeva, D. (2014), The effect of fiscal policy on oil revenue fund: The case of Kazakhstan. Journal of Eurasian Studies, 5(2), 157-183.

Bash, M. (2015), Impact of fluctuations in crude oil prices on the Jordanian public budget for the period of 1995-2013. European Scientific Journal, 11(19), 23-36.

Bjrnland, H. (2000), The dynamic effects of aggregate demand, supply and oil price shocks-a comparative study. The Manchester School of Economic Studies, 68(5), 578-607.

Braun, P., Mittnik, S. (1993), Misspecifications in vector autoregressions and their effects on impulse responses and variance decompositions. Journal of Econometrics, 59, 319-341.

Burbidge, J., Harrison, A. (1984), Testing for the effects of oil-price rises using vector autoregressions. International Economic Review, 25(2), 459-484.

Central Intelligence Agency (CIA). (2016), The World Factbook: Oman. Available from: https://www.cia.gov/library/publications/the-world-factbook/goes/mu.html. [Last accessed on 2017 Dec 26].

Davis, J.M., Ossowski, R., Daniel, J., Barnett, S. (2001), Stabilization and savings funds for nonrenewable resources: Experience and fiscal policy implications. International Monetary Fund Occasional Paper. p205.

Ernst and Young Report. (2016), The Impact of Decreasing Oil Prices on the GCC RHC Market. Available from: https://www.ey.com/Publication/vwLUAssets/ey-decreasing-oil-prices-impact-the-gcc-rhc-market/$FILE/ey-decreasing-oil-prices-impact-the-gcc-rhc-market.pdf. [Last accessed on 2018 Jan 10].

Gangelhoff, G. (2015), The End of the Commodity Super-cycle? Implications for USAID Presence Countries. Washington DC: USAID Economics Brief.

Gulf Corporation Council. (2016), The Economic Outlook and Policy Challenges in the GCC Countries, International Monetary Fund Report Prepared by Staff. Available from: http://www.file:///C:/Users/sonal/Downloads/pp121417gcc-outlook-and-policy-challengs.pdf. [Last accessed on 2017 Nov 28].

Hafer, R., Sheehan, R. (1989), The sensitivity of VAR forecasts to alternative lag structures. International Journal of Forecasting, 5(3), 399-408.

Hamilton, J. (2009), Causes and consequences of the oil shock of 2007-08, NBER Working Papers No. 15002.

Hamilton, J. (2011), Historical oil shocks. In: Parker, R.E., Whaples, R.M., editors. Handbook of Major Events in Economic History. New York: Routledge.

Ibeh, D.S. (2013), Diversification and Development of the UAE's Economy. Messina, Italy: University of Messina.

International Monetary Fund. (2016), Economic Diversification in Oil-Exporting Arab Countries. Manama, Bahrain: Paper Prepared for the Annual Meeting of Arab Ministers of Finance.

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

Kilian, L., Rebucci, A., Spatafora, N. (2009), Oil shocks and external balances. Journal of International Economics, 77(2), 181-194.

Kitous, A., Saveyn, B., Keramidas, K., Vandyck, T., Santos, L.R., Krzysztof, W., Wojtowicz, K. (2016), Impact of Low Oil Prices on Oil Exporting Countries. JRC Science for Policy Report. European Commission. Available from: http://www.publications.jrc.ec.europa.eu/repository/bitstream/JRC101562/jrc101562_impact%20of%20low%20oil%20prices%2020160512.pdf. [Last accessed on 2018 Jan 28].

Liuksila, C., Garcia, A., Bassett, S. (1994), Fiscal Policy Sustainability

in Oil-Producing Countries. International Monetary Fund Working Paper No. 94/137.
Massan, S.S. (2016), Oil and Macroeconomic Policies and Performance in Oman. PhD Thesis. Available from: https://www.dspace.lboro.ac.uk/2134/23320. [Last accessed on 2018 Mar 20].
Naccache, T. (2010), Slow oil shocks and the weakening of the oil price-macroeconomy relationship. Energy Policy, 38(5), 2340-2245.
National Centre for Statistics and Information. (2016), Statistical Year Book Issue 44-2016. Oman: National Centre for Statistics and Information. Available from: http://www.NCSI.Gov.OM. [Last accessed on 2018 Feb 22].
Nweze, P., Greg, E. (2016), An empirical investigation of oil revenue and economic growth in Nigeria. European Scientific Journal, 12(25), 271-294.
Odularu, G.O. (2008), Crude oil and the Nigerian economic performance. World Trade Organisation (WTO), Centre William Rappard, Rue de Lausanne, 3(4),1-29.
Peersman, G., Van Robays, I. (2012), Cross-country differences in the effects of oil shocks. Energy Economics, 34(5), 1532-1547.
Rahma, E., Perera, N., Tan, K. (2016), Impact of oil price shocks on Sudan's government budget. International Journal of Energy Economics and Policy, 6(2), 243-248.
Rashid, S., Hamdi, H. (2013), Dynamic Relationships Between Oil Revenues, Government Spending and Economic Growth in an Oil-Dependent Economy. Germany: MPRA Paper, University Library of Munich. Available from: https://www.mpra.ub.uni-muenchen.de/64150/1/MPRA_paper_64150.pdf. [Last accessed on 2018 Feb 20].
Sadeghi, A. (2017), Oil Price Shocks and Economic Growth in Oil-Exporting Countries: Does the Size of Government Matter? International Monetary Fund Working Paper No. WP/17/287.
Shahine, A. (2015), Oil Rout Means Fewer Freebies in GCC as Subsidies Are Cut. Available from: http://www.bloomberg.com/articles/2015-01-13. [Last accessed on April].
Shabsigh, G., Illahi, N. (2007), Looking Beyond the Fiscal: Do Oil Funds Bring Macroeconomic Stability? IMF Working Papers. Available from: https://www.ssrn.com/abstract=983282. [Last accessed on 2018 Mar 20].
Shayah, H.M. (2015), Economic diversification by boosting non-oil exports (case of UAE). Journal of Economics, Business and Management, 3(7), 735-738.
Sillah, B.M.S., Al-Sheikh, H.M.H. (2012), Income, price, and government expenditure elasticities of oil in the gulf cooperation council countries. International Journal of Energy Economics and Policy, 2(4), 333-341.
Sims, C.A. (1980), Macroeconomics and Reality. Econometrica, 48, 1-48.
Soofi, A.M., Anitha, R.K., Qudsia N. (2017), Economic diversification in sultanate of Oman amidst oil crises. IOSR Journal of Business and Management, 19(6), 9-12.
Stock, J.H., Watson, M.W. (2001), Vector autoregressions. Journal of Economic Perspectives American Economic Association, 15(4), 101-115.
Vohra, R. (2017), The impact of oil prices on GCC economies. International Journal of Business and Social Science, 8(2), 7-14.
World Bank. (2016), GDP Growth (Annual, %). Available from: http://www.data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?page=3. [Last accessed on 2018 Mar 25].