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Oil Revenues and Macroeconomic Instability in Oil-Exporting Countries: A GMM Approach

Ingresos Petroleros e Inestabilidad Macroeconómica en Países Exportadores de Petróleo: un enfoque GMM

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Abstract.

In most of oil exporting countries, oil revenue is considered as one of the main drivers of the economy. These revenues, as the important source of currency, at least, enables the country import various capital goods, intermediaries and consumables and usually covers part of the government's current and development expenditures. However, oil revenues are volatile and uncertain due to the changing nature of the global oil price. This indicate that a significant part of the economy in these countries is exposed to potential instability which is supposed as an anti-growth factor. The present study seeks to examine the effect of oil revenues on inflation and real exchange rate as dominant proxies of macroeconomic stability along with economic growth in oil exporting countries using the GMM method during the 1980 to 2015 period. The results show that oil revenues have different effects on these indicators in selected countries.

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Keywords: oil revenues; macroeconomic instability indicators; economic growth; oil-exporting countries; GMM approach.

Resumen

En la mayoría de los países exportadores de petróleo, los ingresos petroleros se consideran uno de los principales impulsores de la economía. Estos ingresos, como fuente importante de divisas, al menos, permiten al país importar diversos bienes de capital, intermediarios y consumibles, y generalmente cubren parte de los gastos corrientes y de desarrollo del gobierno. Sin embargo, los ingresos del petróleo son volátiles e inciertos debido a la naturaleza cambiante del precio global del petróleo. Esto indica que una parte importante de la economía en estos países está expuesta a una inestabilidad potencial que se supone como un factor anti-crecimiento. El presente estudio busca examinar el efecto de los ingresos petroleros sobre la inflación y el tipo de cambio real como indicadores dominantes de la estabilidad macroeconómica junto con el crecimiento económico en los países exportadores de petróleo utilizando el método GMM durante el período 1980-2015. Los resultados muestran que los ingresos del petróleo tienen diferentes efectos en estos indicadores en países seleccionados.

Palabras Claves: ingresos petroleros; indicadores de inestabilidad macroeconómica; crecimiento económico; países exportadores de petróleo; Enfoque GMM

Introduction

Oil revenue is accounted to be the key driver of the economy in most of oil exporting countries. However, the excessive reliance of these countries on resource revenues is considered by economists to be undesirable. This is mainly due to the exogenous nature of oil prices and the deep impacts of oil shocks on exporters' economy. In recent years, there has been an expanding literature on characteristics of revenues from such a natural resources and their impacts on the economic indicators. The basic idea is that, these countries generally have lower rates of economic growth than resource-poor countries, despite the utilization of these revenues within the economy (so-called problem of "resource curse", also known as the paradox of plenty or the Dutch disease) which even led to a variety of problems such as high inflation rate and sudden and drastic changes in nation's currency (Lindahl, 1996).

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Oil revenues usually have two distinct but different main roles in the economy of oil-exporting countries. First, as the important source of currency, it enables the country import various capital goods, intermediaries and consumables. Second, it forms part of the government's revenues and is used to finance its current and development expenditures. On the other hand, these revenues are volatile and uncertain due to the changing nature of the global oil price and the exhaustion of available resources in comparison with other source of revenue. Therefore, the dependence of this group of countries on oil-exporting revenue and the unpredictable volatility of the oil price indicate that a significant part of the macroeconomic in these countries is exposed to exogenous shocks and instability.

Rising oil prices lead to massive, unexpected increase in the revenues of these countries which stimulates their economy from both demand and supply sides—from the demand side through the state budget and from the supply side by affecting public and private investments—which, in turn, leads inflation and acceleration or deceleration of their economic growth, while a drop in oil prices significantly reduces their foreign exchange revenues and limits their sources of income. In other words, the growth of the oil sector as a factor contributing to national income, increases the overall demands of the economy, resulting in higher prices and profitability in the non-tradable sector compared to the tradable's.

In summary, this exogenous nature and volatility of oil revenues has had direct and indirect effects on many macroeconomic variables in oil-exporting countries, thus posing new challenges to officials in these countries by creating macroeconomic instability. Macroeconomic instability is an anti-growth factor, as it leads to a drop in investments, reduces economic growth rate, worsens income distribution, and increases poverty (Ramezanpour 2000). Therefore, as one of the main responsibilities of government is to bring discipline, stability and growth to the economy, recognizing the nature and intensity of the effect of oil revenue on macroeconomic stability indicators and growth is of prime importance for optimal economic policymaking in these countries.

This article is organized in four sections. The first section is the introduction, followed by literature review, methodology, and conclusion.

1. Literature Review and Theoretical Foundation

Studies have shown that resource dependent oil-exporters are more vulnerable to macroeconomic instability than other countries, since rents from natural resources are very volatile due to low price elasticity. Based on the report of the Iran's Parliament Research Center (2016), the standard deviation of annual oil price changes has been 30 to 35 percent. Accordingly, for a country in which about 20 percent of GDP is financed through oil revenues, one percent change in oil price leads to 6 percent change in GDP, while this value is only 2 percent for developed countries. In other words, oil exporters' dependence on oil revenues on the one hand and the fluctuating and unpredictable nature of the oil on the other hand shows that a major part of the economy is vulnerable to international shocks.

2-1. Macroeconomic Instability and its Indicators

Economic instability is a serious obstacle to real and sustainable growth in any country. It greatly contribute to economic growth through reducing uncertainty, providing the possibility of long-term planning, encouraging investment, entrepreneurship, efficient allocation of resources and in short improving the business environment. Economic stability is counted as the necessary condition (but not sufficient) in providing right environment for employment creation, balance of payments and achieving sustainable improvement in other macroeconomic indicators. In addition, the success of any economic plan, policy and reform such as liberalization or adjustment will require macroeconomic stability.

According to popular thinking, an economy with steady output growth and low and constant price level would be considered stable and vice versa, economy with frequent large recessions, a pronounced business cycle, and fluctuating or high inflation would be described as an instable one which sometimes is the result of external factor (e.g. changes in terms of trade or fluctuations in global interest rates) but it also may has policy roots. In another way, macroeconomic stability is defined as the minimized vulnerability of a national economy to external shocks (Reut Institute's definition).

Researchers point different indicators as a proxies of economic instability such as inflation rate, percent changes in gross domestic product (GDP), real exchange rate, interest rate, percentage of national debt to GDP, budget deficit, energy consumption, purchasing power parity, per capita income, unemployment rate, literacy rate and etc. According to the Maastricht criteria¹, it is measured by five factors: (1) low and stable inflation (inflation capped at 3 %.); (2) currency stability (fluctuation of at most 2.5%); (3) low long-term interest rates (restricted to the range of 9%); (4) low national debt relative to GDP (debt capped at 60% of GDP) and (5) low deficits (deficit capped at 60%) which have been used by the World Bank (1991, 1993), Hadjimichael et al. (1994), and Fischer (1996). In another way, Bleaney (1996) describes instability in terms of inflation rate, budget deficit as a percentage of GDP, and current debt to GDP ratio. In addition, Khalili Araqi and Ramezpour (2011) express macroeconomic instability in terms of inflation rate, percent change in real exchange rate, budget deficit as a percentage of GDP and the standard deviation of the terms of trade.

2-2. Oil Revenues and Economic Instability

¹ A set of requirements for European Union member states to enter the third stage of the European Economic and Monetary Union (EMU) and adopt the euro as their currency.

Since oil revenues are not the result of the activity of economic sectors, increase in these revenues is not a real indicator of economic prosperity. However, injection of oil revenues into the economy increases the money supply along with aggregate demand and lead to inflation, which in turn affects other economic and sociopolitical factors. In this situation, governments usually try to offset the surplus demand through imports in case of tradable goods, while increases in the price of non-tradable goods such as housing seems to be inevitable. Either way, this result in higher prices, profitability and growing share of non-tradable sector in the economy compared to the tradable. This phenomenon is referred to as the “Dutch disease” and occurs in most oil-rich countries. The main idea is that dominance of oil revenues in government budgets undermines the role and share of the private sector in investment and production, and thus the economy becomes seriously vulnerable to oil revenue shocks.

Furthermore, in most oil-exporting countries, fiscal and monetary policies depend on oil prices as the government directly receives and spends the oil revenue (Rosser and Sheehan 1995). In these economies, oil price fluctuations transmit to real exchange rate and its deviation from the long-term equilibrium level through shocks such as surplus money supply and budget deficit is unavoidable (Davis et al. 2001), if preventive actions are not taken. More importantly, continuous and sometimes strong fluctuations in global oil prices create unstable and irregular financial behaviors in the economy of this group of countries (Aizenman and Glick 2008). Since rise or fall in the oil price is not permanent, oil revenue variation leads to economic instability. In this situation, the so-called resource curse occurs. When oil price rises, the government has more money to spend. That is, when the country’s terms of trade are favorable, government’s spending can be easily financed through oil revenues (Chalk 1998). Although this revenue can be used to finance developmental projects to increase the welfare, inefficient public spending and fiscal expansion lead to wastes. Over time, this destructive strategy exposes the economy to oil price volatility, particularly in the presence of capital market imperfections (Hausmann and Rigobon 2003).

The other side of this coin is even worse. When oil price significantly decreases, the public sector cannot reduce its spending immediately and proportionately, thus facing huge deficits. The fiscal imbalances following an oil price decrease can be devastating if the country is highly dependent on oil revenues (Devlin and Lewin 2004). Falling oil prices cause huge debts and forces the government to reduce its development expenditures in favor of current expenditures. Therefore, it first manifests itself in a large number of unfinished development projects. This leads to unemployment, especially in sectors that mainly use unskilled workers and as a result, instability spreads from the economy to political and social spheres (Cuñado and De Garcia, 2005).

Given this backgrounds confirmed by some harsh experiences, oil price variation and related revenue volatility can significantly stimulate economic instability in oil-exporting countries, since it lay the groundwork for increase in budget deficit, inflation rate, exchange rate fluctuations, and undesirable changes in other economic variables. Therefore, it is imperative to study this subject and identify the impacts of oil shocks on related macroeconomic indicators.

2-3. Oil revenues, Inflation, Real Exchange Rate and Economic Growth

In the present research, inflation and real exchange rates are considered the dominant causes of macroeconomic instability in the resource-rich countries’ as currency fluctuations and unmanaged inflation can cause economic crises and collapse in GDP. In addition, economic growth rate is

considered in this research's model which always is a very important measure of economic activity as it reflects changes in the sum of consumer spending, investment spending, government spending, and net exports (dramatic changes in any individual of these components can have impact on economic stability and often affected through oil revenues in its exporters based on the various studies have done by researchers).

As statistics have shown, developing oil exporters have a more volatile inflation and exchange rates than other countries. In most oil-exporting countries, the government directly receives and spends the oil revenue. Since the funds needed for government's expenditure come from oil revenue, fiscal and monetary policies will depend on oil prices and revenues (Rosser and Sheehan 1995).

As mentioned above, inflation rate is regarded as one of the most important indicators of economic stability. The increase in foreign exchange earnings due to oil exporting, and its conversion into domestic currency enable the government to compensate budget deficit and increase imports, which lead to uncontrolled increase in money supply that is not the result of productive activities and lead to the deviation of inflation from the equilibrium, especially in housing and service sectors. High inflation rate and its fluctuations impose many costs on the economy. It increases the variability of relative prices and distorts the decisions made by economic agents. Since the price of all commodities does not increase at a common rate in the inflationary process, economic agents cannot accurately differentiate relative price changes from general price changes. This distortion reduces the strength of price signaling and undermines optimal resource allocation. Indeed, the higher the fluctuations of the inflation rate, the greater will be the distortions in the price system. This can create uncertainty in economic agents, which negatively will affect investment. Another most important cost of high and unstable inflation is the reduction of economic growth rate and, consequently, worsening the distribution of income, wealth and welfare especially in low-income groups. (Dehghan and Pourrahim 2013).

Exchange rate policies are also of such significance in the economy that researchers consider states' related policies to be one of the main reasons behind the 1930s Great Depression. In most oil-rich countries, real exchange rate is affected by shocks such as surplus money supply or budget deficit in the short term, which leads to its deviation from the long-term balance (Dehghani and Pourrahim 2013). This is one of the factors whose volatility and deviation from the equilibrium level can affect macroeconomic indicators, especially economic growth. Nominal exchange rate usually decreases in several consecutive years in oil exporting countries as it is not often adjusted to the annual inflation rate, thus increasing imports and reducing foreign-exchange reserves. Therefore, reduction in foreign-exchange reserves increases the nominal exchange rate.

Oil revenues also affect economic growth rate, through various avenues specially volume of money, exchange rate and government budget (Dehghani and Pourrahim, 2013).

Following table shows the list of related studies and their results as a background and empirical evidences.

2-4. Background and Empirical Evidence

Table 1. A list of studies on the effect of oil revenues

| Authors | Aim | Method | Time Period | Result |
|-----------------------------|--|------------------------|-------------|--|
| Alotaibi (2006) | Examining the effect of oil price fluctuations on the real exchange rate and the price level in the GCC economies | SVAR model | 1960-2004 | The results support the real business-cycle (RBC) theory by showing that supply shocks have a greater impact than demand shocks which are rooted in oil revenues. Therefore, they argue that oil price shock directly affects the price level, but inversely affects the real exchange rate. |
| Mehrara And Oskoui (2007) | Investigating the sources of macroeconomic fluctuations in four oil-exporting countries | SVAR model | | Oil price shocks are shown to be the main source of output fluctuations in Saudi Arabia and Iran, but not in Kuwait and Indonesia where production fluctuations are mainly due to aggregate supply shocks. The results also show that an oil price shock increases prices in Saudi Arabia, while it does not have any important effect on long-run prices in Iran, Kuwait and Indonesia. |
| Lescaroux and Mignon (2008) | Investigating the links between oil prices and GDP, CPI, unemployment rate in OPEC, oil-exporting countries and oil-importing countries | Causality tests | | The results show that in the long-term, causality runs from oil prices to other variables. |
| Berument et al. (2010) | Examining the effects of oil price shocks on the output growth of MENA countries that are considered net exporters or net importers of oil | Individual SVAR models | | The results suggest that oil price increases have a statistically significant and positive effect on the outputs of Algeria, Iran, Iraq, Kuwait, Libya, Oman, Qatar and the United Arab Emirates. However, oil price shocks do not appear to have a statistically significant effect on the outputs of Bahrain and Jordan as an oil exporters. |

| Authors | Aim | Method | Time Period | Result |
|------------------------------|---|-----------------|-------------|---|
| Mehrara and Mohaghegh (2011) | Studying the macroeconomic dynamics of oil-exporting countries | Panel VAR model | 1985-2009 | (1) oil shocks are not necessarily inflationary; (2) money is not neutral in these countries; (3) money is the main source of macroeconomic fluctuations; (4) oil shocks significantly affect economic output and money supply; (5) although oil price is mainly driven by oil shocks, domestic shocks, especially output and money shocks, can significantly affect oil price in the world market. |
| Esfahani et al. (2012) | Developing an empirical growth model for major Oil exporters | VECM model | 1979-2009 | The results confirmed the existence of long-run relationships between real output, foreign output, and real oil income for six out of nine studied countries. |
| Khodaparast and Izadi (2013) | Examining the links between oil revenue, its fluctuations, and macroeconomic performance and exploring the role of institutions | Panel VAR model | 1996-2012 | The results indicate that oil revenues have had a positive impact on the output of the studied countries, while fluctuations in these revenues and low institutional quality have led to unfavorable outcomes. |
| Renani et al. (2013) | Investigating the effect of oil shocks on domestic output, general price level, volume of money, and exchange rate | SVEC model | 1970-2010 | The results show that the positive shock in the real price of oil has a significant positive effect on real GDP. Also, real oil price shock has a significant effect on domestic prices, with a positive shock decreasing domestic prices. In addition, it has a significant negative effect on the exchange rate. |
| Mustapha and Masih (2016) | Examining the relationship between natural resources and macroeconomic instability | ARDL model | 1981-2014 | This study finds that abundance of natural resources leads to instabilities via poorer governance, corruption, rent-seeking activities, and conflicts. |

Methods and materials

In this article the model proposed by Juselius et al. (2011) has been used along with panel data method for estimation, to examine the effects of oil revenues on selected proxies of economic stability. The model is expressed as follows:

$$\Delta y_t = \alpha(\beta' y_{t-1}) + \Pi \Delta y_{t-1} + \varphi D_t + \varepsilon_t$$

where y_t is a p -dimensional vector of non-constant variables, α is a $p \times r$ coefficient matrix, $\beta' y_{t-1}$ denotes the cointegration relation, D_t is a $n \times r$ vector of dummy and deterministic variables, φ is a $p \times n$ coefficient matrix, Π is a $p \times p$ matrix of short-run adjustment coefficients, Δ is the first difference operator, and ε_t is a $p \times 1$ vector of errors with a NIID(0, Ω) distribution.

Models are developed based on three scenarios as follows, since here, inflation rate, real exchange rate and economic growth are considered the dominant indicators of economic stability in oil exporting countries.

1. **Scenario A:** The effect of oil revenues on economic growth

$$ly_{it} = \alpha + \beta_0 (ly)_{it-1} + \beta_1 (oilrevenue)_{it} + \beta_2 (l\ inf)_{it} + \beta_3 (lopen)_{it} + \beta_3 (lexc)_{it} + \varepsilon_{it}$$

2. **Scenario B:** The effect of oil revenues on inflation rate

$$l\ inf_{it} = \alpha + \beta_0 (l\ inf)_{it-1} + \beta_1 (oilrevenue)_{it} + \beta_2 (ly)_{it} + \beta_3 (lopen)_{it} + \beta_3 (lm2)_{it} + \varepsilon_{it}$$

3. **Scenario C:** The effect of oil revenues on exchange rate

$$lexc_{it} = \alpha + \beta_0 (lexc)_{it-1} + \beta_1 (oilrevenue)_{it} + \beta_2 (ly)_{it} + \beta_3 (lopen)_{it} + \beta_3 (lm2)_{it} + \varepsilon_{it}$$

where y is the GDP, exc is the real exchange rate, $oilrev$ is oil revenues, inf is the inflation rate, $open$ is the degree of economic openness, $m2$ is the volume of money, and i and t respectively denote country and time period.

These models are used along with the statistical information of selected oil-exporting countries² that are obtained from World Development Indicators (WDI), OPEC Annual Statistical Bulletin (ASB), and the Statistical, Economic and Social Research and

² Ecuador, England, Indonesia, Angola, Algeria, Russia, Saudi Arabia, Iraq, Qatar, Canada, Kuwait, Libya, Norway, Nigeria, Venezuela, United Arab Emirates.

Training Centre for Islamic Countries (SESRIC) for the period 1980-2015. The data are estimated using the generalized method of moments (GMM).

The generalized method of moments (GMM) is one method for estimating model parameters in the dynamic panel data approach that can be used for time series, cross-sectional, and panel data. GMM accounts for the dynamic adjustments of the dependent variable. A dependent variable with lagged values causes a correlation between explanatory variables (regressors) and error terms, and thus using ordinary least squares (OLS) will lead to biased and inconsistent results. GMM can solve this problem by using instrumental variables. The following dynamic model is the mathematical expression of GMM:

$$y_{it} = \alpha y_{it-1} + \beta' x_{it} + \eta_i + \phi_t + \varepsilon_{it} \quad (1)$$

where y is the dependent variable, x is the vector of explanatory variables, η denotes individual and country fixed effects, ϕ is the fixed effect of time, ε is the error term, i denotes country, and t denotes time. In Equation 1, it is assumed that error terms are not correlated with individual and country fixed effects and lagged values of the dependent variable. If η is correlated with some of the explanatory variables, one way to remove individual and country fixed effects is through first-order differencing; otherwise, using the fixed effects model will lead to biased estimators from coefficients. Therefore, Equation 1 is converted to the following:

$$\Delta y_{it} = \alpha \Delta y_{it-1} + \beta' \Delta X_{it} + \Delta \phi_t + \Delta \varepsilon_{it} \quad (2)$$

In this equation, the lagged difference of the dependent variable (Δy_{it-1}) is correlated with the first order difference of error terms ($\Delta \varepsilon_{it}$). There is also the problem of endogeneity for some of the explanatory variables, which is not accounted for in the model. Therefore, it is necessary to use instrumental variables to address this problem.

The following moment is true about Equation 2:

$$E(y_{i-t-s} \Delta \varepsilon_{it}) = 0 ; s \geq 2 ; t = 3, 4, \dots, T \quad (3)$$

$$E(X_{i-t-s} \Delta \varepsilon_{it}) = 0 ; s \geq 2 ; t = 3, 4, \dots, T \quad (4)$$

The following matrix of instrumental variables is used to estimate the parameters of Equation 2:

$$z_i = \text{diag}(y_{i1}, y_{i2}, \dots, y_{i,t-2}, X_{i1}, X_{i2}, \dots, X_{i,t-2}) \quad (5)$$

The estimators of GMM $\hat{\delta}$ are defined as follows:

$$\hat{\delta} = (\hat{B}zA_N\hat{z}B)^{-1}\hat{B}zA_N\hat{z}Y \quad (6)$$

After estimating the coefficients, it is necessary to use the Sargan test to examine the validity of the instrumental variables that are incorporated into the model and test for over-identification of the equation. In addition, the order of autocorrelation in error terms must be determined, since first-order differencing is effective only when autocorrelation in error terms is not of the second order. The Sargan test (1958) has an asymptotic χ^2 distribution, which is defined as:

$$S = \hat{\varepsilon}\hat{z}\left(\sum_{i=1}^N \hat{z}_i H_i \hat{z}_i\right)^{-1}\hat{z}\hat{\varepsilon} \quad (7)$$

In this test, $\hat{\varepsilon} = Y - X\hat{\delta}$, $\hat{\delta}$ is a $k \times 1$ matrix of estimated coefficients, z is a matrix of instrumental variables, and H is a square matrix with $(T - q - 1)$ dimensions, where T is the number of observations and q is the number of explanatory variables in the model. If the null hypothesis of the test is not rejected, the instrumental variables are valid and sufficient. Otherwise, more appropriate instrumental variables must be defined for the model (Baltagi 2005).

Results and Analysis

The first step in time series estimation is testing for stationarity of the variables. Unlike time series data, the Dickey–Fuller or augmented Dickey–Fuller tests cannot be used in panel data (Ashrafzadeh and Mehregan 2010). In this research, the Levin-Lin-Chu Test (LLC) is used to test stationary of the variables as one of the tests proposed for this purpose in panel data

The results of this test are provided in Table 3.

Table 3. The results of unit root test using LLC

| Variable | Proxy | Test Conditions | Test Statistic | p-Value | Test Conditions | Test Statistic | p-Value | Result |
|---------------------------|---------|-----------------|----------------|---------|--------------------------|----------------|---------|--------|
| Log of GDP per capita | LGDPCC | With intercept | -0.76 | 0.22 | With intercept and trend | -9.71 | 0.000 | I(0) |
| Log of oil revenues | LOILREV | With intercept | 0.64 | 0.74 | With intercept and trend | -1.82 | 0.03 | I(0) |
| Log of real exchange rate | LEXC | With intercept | -19.44 | 0.000 | With intercept and trend | -16.8 | 0.000 | I(1) |
| Log of inflation rate | LINF | With intercept | -4.036 | 0.000 | With intercept and trend | -3.94 | 0.000 | I(0) |
| Log of economic openness | LOPEN | With intercept | -18.04 | 0.000 | With intercept and trend | -16.68 | 0.000 | I(1) |
| Log of money volume | LMONEY | With intercept | -11.40 | 0.000 | With intercept and trend | -11.95 | 0.000 | I(1) |

Source: Present research calculations

The results of the LLC test indicate that LGDPCC, LEXC, LMONEY, and LOPEN contain a unit root ($p < 0.05$) and are stationary once differentiated. LOILREV and LINF are stationary at level.

Results of Model Estimation

Table 4 shows the results of model estimation for the effect of oil revenues on economic growth using Arellano-Bond dynamic panel data model in selected oil-exporting countries over the period 1980-2015. Estimation is done in EViews.

Table 4. The results of estimating the first model: Effect of oil revenues on economic growth in selected oil-exporting groups (dependent variable: log of GDP)

| VARIABLE | PROXY | COEFFICIENT | t-STATISTIC | p-VALUE |
|-------------------------------|------------|-------------|-------------|---------|
| LOG OF GDP | LGDPCC(-1) | 0.37* | 26.28 | 0.000 |
| LOG OF OIL REVENUES | LOILREV | 0.35* | 13.65 | 0.000 |
| LOG OF INFLATION RATE | LINF | 0.037** | 2.55 | 0.011 |
| LOG OF ECONOMIC OPENNESS | LOPEN | -0.08** | -2.48 | 0.013 |
| LOG OF REAL EXCHANGE RATE | LEXC | -0.17** | -12.11 | 0.0354 |
| SARGAN TEST PROBABILITY: 0.98 | | | | |

Source: Present research calculations; * and ** indicate significance at 0.01 and 0.05 respectively

The results of estimating the first model show that Oil revenues with a coefficient of 0.35 have a significant positive effect on economic growth in selected oil-exporting countries. In addition, GDP changes with one lag and inflation rate have a significant positive effect on economic growth with same coefficients i.e. 0.37. However, the effect of real exchange rate and economic openness on economic growth are both negative and significant with a coefficient of -0.17 and -0.08 relatively.

The results of Sargan test for examining the validity of the instrumental variables used in the Arellano-Bond panel data model suggest that these variables are indeed valid ($p = 0.98$).

Table 5. The results of estimating the second model: The effect of oil revenues on inflation rate in selected oil-exporting countries (dependent variable: log of inflation rate)

| VARIABLE | PROXY | COEFFICIENT | t-STATISTIC | p-VALUE |
|---------------------------------|----------|-------------|-------------|---------|
| LOG OF INFLATION RATE | LINF(-1) | 0.07** | 2.44 | 0.015 |
| LOG OF OIL REVENUES | LOILREV | -0.04 | -0.42 | 0.67 |
| LOG OF GDP PER CAPITA | LGDPPC | -0.74* | -9.47 | 0.000 |
| LOG OF ECONOMIC OPENNESS | LOPEN | 0.81* | 3.86 | 0.000 |
| LOG OF MONEY VOLUME | LM2 | 0.53*** | 2.61 | 0.0985 |
| SARGAN TEST PROBABILITY: 0.3468 | | | | |

Source: Present research calculations; *, **, and *** indicate significance at 0.01, 0.05, and 0.1 respectively

The results of estimating the second model show that Oil revenues in the current period have no significant effect on inflation rate in selected oil-exporting countries. In fact, the positive and negative impact of oil revenues on inflation has led to vague and non-significant inflationary responses in these countries. Additionally inflation rate of previous period with a coefficient of 0.07, money volume with a coefficient of 0.53 and Degree of economic openness with a coefficient of 0.81 has a significant positive on inflation rate. However, GDP changes have significant negative effect on inflation rate with a coefficient of -0.74.

The probability of the Sargan test is 0.34, indicating the validity of the instrumental variables used in the Arellano-Bond dynamic panel data model.

Table 6. The results of estimating the third model: The effect of oil revenues on exchange rate in selected oil-exporting countries (dependent variable: log of exchange rate)

| VARIABLE | PROXY | COEFFICIENT | t-STATISTIC | p-VALUE | REICE 393 |
|------------------------------------|----------|-------------|-------------|---------|--------------|
| LOG OF EXCHANGE RATE | LEXC(-1) | 0.46* | 3.15 | 0.0018 | |
| LOG OF OIL REVENUES | LOILREV | -0.4* | -5.56 | 0.000 | |
| LOG OF GDP | LGDPPC | 0.97* | 6.32 | 0.000 | |
| LOG OF ECONOMIC OPENNESS | LOPEN | -0.37** | -2.09 | 0.036 | |
| LOG OF MONEY VOLUME | LM2 | -0.09 | -1.32 | 0.18 | |
| SARGAN TEST PROBABILITY: 0.3698 | | | | | |

SOURCE: PRESENT RESEARCH CALCULATIONS; * AND ** INDICATE SIGNIFICANCE AT 0.01 AND 0.05 RESPECTIVELY

The results of estimating the third model shows that oil revenues have a significant negative effect on exchange rate in the selected oil-exporting countries with a coefficient of -0.4. Moreover, the exchange rate of the previous period and GDP changes have significant positive effect on exchange rate with coefficients of 0.46 and 0.97 relatively, while the coefficient of economic openness is -0.37, indicating the significant negative effect of this variable but money volume has no significant effect on real exchange rate in selected oil exporters.

The probability of the Sargan test is 0.36, indicating the validity of the instrumental variables used in the Arellano-Bond dynamic panel data model.

Conclusions

Decades of oil extraction and sales have made most of oil-exporting countries extremely dependent on this resource's volatile revenues. These revenues usually have two distinct but different main roles in the economy of oil exporters. First, as the important source of foreign currency, it enables the country import various goods and services. Second, it forms part of the government's revenues and is used to finance its current and development expenditures. However, oil price unpredictable variation and related revenue volatility can significantly stimulate economic instability in oil-exporting countries, since it lay the groundwork for increase in budget deficit, inflation rate, exchange rate fluctuations, and undesirable changes in other economic variables. In this paper, we have analyzed the effects of oil revenues on certain proxies of economic stability i.e. inflation rate,

exchange rate and economic growth in selected oil-exporting countries, using the generalized method of moments (GMM). The results suggest that oil revenues has a significant positive effect on GDP (0.35), no significant effect on inflation rate, and a significant negative effect on real exchange rate (-0.4). We can thus argue that unexpected volatile oil prices -with annual standard deviation changes of 30 to 35 percent (Iran's Parliament Research Center, 2016)-, which lead to continuous and sudden falls or rise in oil revenues relatively, affect macroeconomic stability in selected oil-exporting countries, through the channels of real exchange rates and GDP changes, while the positive and negative impact of oil revenues on inflation has led to vague and non-significant inflationary responses in studied countries.

Since, economic instability is a serious obstacle to real and sustainable growth in any country, oil revenues must be managed in such a way as to prevent transmission of its fluctuations into the economy and at the same time to reinforce other sources of wealth. Of course, addressing this challenge requires developing a proper framework and implementing meticulous policies that can serve as a useful guide for productive investing or efficient saving of oil revenues. Highest standards of transparency and accountability in management of hydrocarbon revenues along with appropriate institutional and governance structures are also highly recommended to cope the challenge.

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