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THE IMPACT OF CRUDE OIL PRICE CHANGES ON MONEY SUPPLY (M2) IN OMAN (1990-2016)

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Abstract

Omani economy sustained its dynamic growth and retained its high growth profile up until the year 2014, as soon as oil price sustained to average over USD100 per barrel. On the other hand, with a drop in hydrocarbon prices primarily due to the oversupply, the petrodollars received by Oman have seen sharp decline which have eventually caused a drop in the whole financial position of the economy (Oman Strategy Report, 2017). Based on the aforementioned, the importance of assessing to what extent the Omani money supply responds positively or negatively to changing crude oil prices, emerged and became a hard topic of discussion among various policy makers and economists as well. This study focuses entirely on the nature of this link and tries to make sure whether this relationship exists through employing the approach of Autoregressive Distributed Lag (ARDL) bounds test, covering a time period from 1990 to 2016. The outcome of the statistical analysis confirms the existence of long run connection between the variables of interest.

Key Words: Crude Oil Price Changes, Money Supply (M2) and Autoregressive Distributed Lag (ARDL)

1. Introduction

1.1 Overview

The performance of Omani economy developed considerably during 1999 because, basically, of the mid-year recovery in oil prices. The government is heading forwards with privatization of Omani utilities, the growth of commercial law organization in order to assist external investment, and increased budgetary expenses. Oman freed up its markets in an exertion to fit in with the World Trade Organization (WTO) and obtained membership in 2000. (Economy of Oman, 2018)

When Oman dropped as an entrepot for arms and slaves in the middle of 19th century, much of its previous fortune was gone away, and the economy revolved almost solely to agriculture, camel and goat herding, fishing, and traditional handicrafts. Nowadays, petroleum (oil) enriches the economy and revenues from petroleum products have empowered Omani dramatic growth during the previous 30 years. (ibid)

Omani economy sustained its dynamic growth and retained its high growth profile up until the year 2014, once oil price sustained to average over USD100 per barrel. On the other hand, with a drop in hydrocarbon prices primarily due to the oversupply, the petrodollars received by Oman have seen sharp decline which have eventually caused a drop in the whole financial position of the economy. Therefore, nominal GDP during 2016 is anticipated to have dropped by 6.9 per cent in comparison with 2015 whereas real GDP is projected to have grown by 1.8 per cent a year-on-year (YoY) in 2016 on the back of rise in productivity. On the diversification front, Omani economy still remains to be dominated by petroleum activities, which accounted for 28.2 per cent of nominal GDP over 9M16 as compared to 36.4 per cent of nominal GDP over 9M15 and 34.1 per cent over 2015. Whereas average day to day crude oil production was greater in 2016 compared to last years, the breakdown in international oil prices that started in 2014 caused a decline over 9M16 of 29.4 per cent in the nominal GDP funded by the oil and gas sector in comparison with 9M15. Heading forward, IMF projects Omani nominal and real GDP to go up by 10.3 per cent and 2.6 per cent respectively, basically due to the expectation of higher average oil prices and also due to rise in production levels from various economic birthplaces. (Oman Strategy Report, 2017)

In the same vein, the Omani economy tighten up in nominal terms for the second year in a row in 2016, after a continued strong growth during the time period from 2010 to 2014, mainly because of sharp fall in hydrocarbon activities. Regardless of growth in output, the revenues from hydrocarbon sector fell reflecting lower level of oil prices. Omani nominal GDP went down by 5.1 per cent during 2016, on top of a drop of 13.8 per cent in 2015, as a result of weakening of both outer and domestic demand. The external demand worsened severely tailing the average price of the Sultanate's crude declining by 28.9 per cent in 2016, whereas home demand declining as a result of decline in Government spending by 5.8 per cent. Component-wise, nominal oil sector GDP fell by 23.7 per cent over the year 2016; however the non-oil sector recorded a growing of 0.6 per cent over the time period. The share of hydrocarbon sector in total exports declined to 57.9 per cent in 2016 from an average of 66.3 per cent over 2011-2015, while its contribution to Omani GDP at market prices decreased to 27.4 per cent from an average of 47.0 per cent over this period. Non-petroleum (oil) industrial activities also went down by 3.7 per cent in 2016, on top of a drop of 3.0 per cent in 2015, reflecting decreased public expenditure and economic slowdown. Amongst the non-petroleum industrial activities, manufacturing activities recorded a marked contraction of 17.2 per cent in 2016 as compared to a drop of 13.4 per cent in 2015. So as to make the growth process in Oman more resistant to the outer price shocks, 'Vision Document' has established the target for the sectors of agriculture and fishing to add about 3.1 per cent and 2.0 per cent of GDP, correspondingly by 2020. At the same time, the concentrated Governmental exertions targeted at diversification of economyy have funded meaningfully to the development of services sector in economy over the current period. (Economy of Oman, 2018)

1.2 Money Supply

"The supply of money is a stock at a particular point of time, though it conveys the idea of a flow over time." (Jhimgan, 2004, p100)

1.2.1 Definitions

In relation to Keynesian thinking, money supply can be well-defined as cash with people plus demand deposits with commercial banks. These together denoted as ***M1***, the money supply. This considered as a narrower definition of the money supply. The other definition is wider than the previous one and linked with the contemporary quantity theories led by Friedman. Professor Friedman gives definition to the supply of money at any second of time as "factually the number of Riyals people are roaming in accompany with, the number of Riyals they get to their credit at banks or Riyals they have to their credit at banks in the type of demand deposits, and in addition, commercial bank time deposits." So to Friedman, money supply includes M1 plus time deposits, and this denoted as ***M2***. (Jhimgan, 2004)

1.2.2 (M1)

The narrow money supply is currency and demand deposits. The Omani money supply has rose so gradually till 1970 and then after, began to rise roughly up to now. This increase is because of the expansion of the exports of oil, and accordingly the share of its currency turns out to exceed 50 per cent of its money supply in the narrows sense over the time period 1973- 2000. But this proportion began to fall since 2001 in comparison with demand deposits. The econometric analysis arrived at the conclusion of the existence of the positive connection between money supply and such explanatory variables as GDP, government deficit, global reserves and oil export. Further conclusion was also reached that there is a positive association between money supply in the wide sense and oil export. The monetary indicators displayed that the net national credit allowed to the private sector and the net foreign assets of the banking system are the major elements that impact money supply positively. It was also stated that the quasi money such as time deposits, saving deposits, capital account and reserve account has negative impact on money supply during the period 1974- 2003. (Jamil, 2007)

1.2.3 (M2)

Omani Money Supply M2 was stated at 42.37 USD bn in January 2018. This registers a rise from the last number of 41.79 USD bn for December 2017. Omani Money Supply M2 data is updated on monthly basis; its average is of 18.27 USD bn from January 1999 up to January 2018, with the aid of 229 observations. The data touched an all-time high of 42.37 USD bn in the first month of 2018 and a register low of 5.36 USD bn in the 8th month of the year 1999. Omani Money Supply M2 data rests lively status in CEIC and is produced by CEIC. *(CEIC, 2018)*

The monetary policy kept on with its accommodative standpoint over 2016 so as to support real economic activities, in spite of small increase in inflation. The reserve money, the monetary base, dropped by 27.6 per cent in the year of 2016 as a result of sharp decrease in bank deposits held with CBO. Regardless of the harsh decline in reserve money, the growth in money multiplier enhanced broad money to go up at a rate of 1.8 per cent at the end of the year 2016. Reasonable expansion in broad money was, however, in cycle with slowdown in the economy. While, Narrow money stock (M1) also recorded a drop of 7.3 per cent over the

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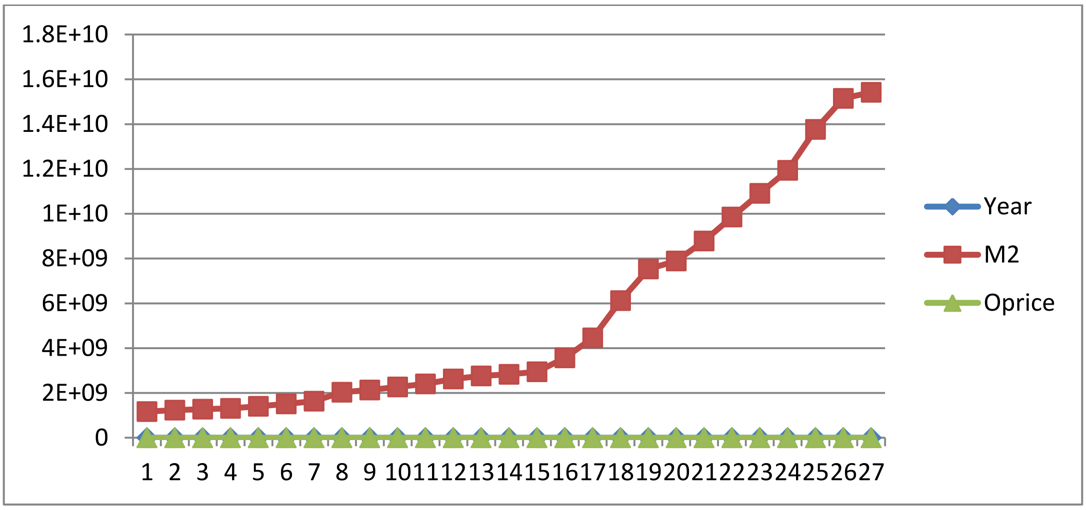
year 2016 mostly on account of decline in local currency demand deposits and to some degree, fall in currency held with the general public. (Economy of Oman, 2018)



This *figure* shows The Value of Omani money supply M2 and crude oil prices (1990-2016) (in USD)

2. Literature Review

The current volatility in international product prices and particularly in the price of crude oil has generated rehabilitated concern in the question of what is the way monetary policymakers ought to react to fluctuations in oil price. This study gives the first quantitative analysis regarding how the U.S.A's monetary policy reactions should vary relying on the source of the observed oil price changes. The examination is conducted in detail by what method the structural shocks underlying fluctuations in the real oil price are transferred to U.S. real activity and inflation. Furthermore, exploration is carried out concerning how the monetary policy response to such shocks might be enhanced within the setting of commonly studied mechanism rules. A significant characteristic of this analysis is that the paper relies on an international energetic stochastic general equilibrium (DSGE) model with endogenous real oil prices and real exchange rates. (Bodenstein, Guerrieri and Kilian, 2012)

Plentiful of the prevailing examination on the behaviour of monetary policy confronting fluctuations in oil price depends on the counterfactual evidence that the real price of crude oil is exogenous respecting the U.S. economy (see, *for instance*, Leduc and Sill, 2004; Carlstrom and Fuerst, 2006; Dhawan and Jeske, 2007; Plante, 2009a, 2009b; Winkler, 2009; Montoro, 2010; Kormilitsina, 2011; Natal, 2012). Even the studies of DSGE that have endogenized the real price of oil have prepared robust and impractical shortening assumptions regarding the factors that influencing the oil price in international markets (see, for instance, Backus and Crucini, 1998), have overlooked monetary policy (see, for example, Backus and Crucini, 1998; Balke, Brown, and Yücel, 2010; Bodenstein, Erceg, and Guerrieri, 2011; Nakov and Nuño, 2011), or have overlooked the open economy feature of the transmission of oil price shocks (see, for instance, Bodenstein, Erceg, and Guerrieri, 2008; Nakov and Pescatori, 2010a, 2010b). This paper displays that some of the accustomed findings from closed-economy models carry through to the open economy with endogenous oil prices, whereas others never do. For example, the "divine coincidence" among stabilizing the output gap and inflation, valid to some closed-economy models, does not welcomed in our model. (Bodenstein, Guerrieri and Kilian, 2012)

The works on the association amongst the real oil price and monetary policy have surfaced since 1980s. There is an agreement that causality in such link might run from proceedings in markets of oil to monetary policy as well as from moves in monetary policy to the oil supply and the oil demand in international markets. Barsky and Kilian (2002), *for example*, debate in the setting of the experience of the 1970s and early 1980s how an exogenous move in the international monetary policy system might make a shift in the demand for crude oil and therefore in the real crude oil price. Kilian (2010) and Erceg, Guerrieri, and Kamin (2011) elucidate why this elucidation fails to fit the more current data, and certainly much of the works started with the 1990s has shed light on the reverse direction of causality moving from oil prices to monetary policy. Outstandingly, Bernanke, Gertler, and Watson (1997) in a powerful experimental study attributed the harshness of the 1974 and 1982 collapses to the Federal Reserve's direct reaction to the previous oil price shocks. Fresh research has cast uncertainty on their empirical examination and on the theoretic evidence of their analysis (see, *for example*, Kilian and Lewis (2011) and the references therein). There is no convincing proof that the Federal Reserve was reacting automatically to oil price shocks beyond the reaction to the price rises or inflation and real output variations linked with such shocks. (Bodenstein, Guerrieri and Kilian, 2012)

A strategic question in current years has been in what way the monetary policymakers in the U.S. ought to reply to a rise in the real oil price determined by increased oil demand from developing markets in particular. A amount of fresh scholarships utilizing a diversity of methods have revealed that positive foreign oil intensity shocks are one of the vital causes of the surge in the real oil price between 2003 and mid-2008 (see, for example, Kilian, 2009; Kilian and Hicks, 2011; Bodenstein and Guerrieri, 2011). *For instance*, Kilian (2009) stated that the international oil demand relies not merely on the speed of overall growth, however also on the way intensely oil is experienced in manufacturing national real output. Thus models cared about alterations in real GDP or in total productivity by itself will not be able to elucidate the degree of the surge in the real price of oil between 2003 and mid-2008. (Bodenstein, Guerrieri and Kilian, 2012)

Suggestion is offered to recognize the prominence of the monetary policy feedback rule in an amended VAR context. So as to do that, nonetheless, one wishes to figure out a suitable indicator of oil price shocks to integrate into the VAR systems. This is a more challenging job than it may seem at first. The greatest natural indicator would appear to be alterations in the nominal oil price; and certainly, in an article which aided to initiate the literature on the impacts of shocks in oil price, Hamilton displays that rises in the nominal oil price Granger-cause downturns in economic doings. Though, the appearance of fresh data has revealed this modest measure to have a fairly unsteady association with macroeconomic results, leading succeeding scholars to use increasingly complicated specifications of the "true" association between oil and the economy. Particularly, Hamilton says in his newest study that the accurate measure of oil shocks relies much more upon the precise instrument with the help of which fluctuations in the oil price are supposed to impact the economy, a question that has several proposed answers but on which there is slight agreement. For our purposes, the precise channels through which oil impacts the economy are not vital. (Bernanke, Gertler, Watson, Sims and Friedman, 1997)

All stagnation starting from 1971 and on has been headed by rises in the oil price and an increase in the federal funds rate. Are recessions resulted due to the spikes in prices of oil or due to a severe contraction of monetary policy? Or are they produced by a combination of both factors, the so-called “perfect storm”? (Carlstrom and Fuerst, 2005)

This Commentary discusses the usefulness of various federal funds rate movements in reply to shocks in oil price. Such changes might be direct reactions to oil prices or, more likely, not direct reactions. For instance, the result of an energy prices shock is an increased inflation, so that an inflation stabilization objective would produce rises in the federal funds rate. To examine the proper policy reaction, we must obtain some notion of the differing economic effects of prices of oil and funds rate fluctuations. Therefore, this Commentary first argues how to sort out the contributions of oil price rises from those of funds rate increases. (Carlstrom and Fuerst, 2005)

One of the dominant questions in current macroeconomic history is the volume the monetary policy as contrasting to oil price shocks funded to the stagflation of the 1970s. The knowledge of what went incorrect in the 1970s is the vital to learning from the history. One elucidation discovered in Barsky and Kilian (2002) is that international movements in monetary policy systems not in relation to the market of oil played a main role in producing both the main oil price rises of the 1970s and stagflation in several countries. A challenging opinion demonstrated by Bernanke, Gertler and Watson (1997) is that the oil price shocks of the 1970s and 1980s took place exogenously with respect to international macroeconomic situations, however were circulated by the response of monetary policy makers, resulting in stagflation in the process. This study reviews the proof for these two main clarifications, interprets current happenings in light of this proof, and outlines implications for monetary policy. (Kilian, L., 2009)

Oil prices have changed histrionically during the last two years. The price of Brent crude oil increased to an all-time high of USD 51 at the end of October 2004 and has then dropped rather and fluctuated about USD 42 (ECB). How ought the ECB to adjust its monetary policy to oil-price changes? The answer to this question tracks from the overall principles for good monetary policy. On the other hand, while the principles for good monetary policy are easy and simple, the practice of good monetary policy is difficult. The same is the situation for the question of in what manner is to adjust monetary policy to oil-price movements: the principles are simple, whereas the practice is difficult. Particularly, there is no simple link between the suitable instrument-rate adjustment and a given change in oil prices. (Svensson, 2005)

Oil is a central input for industrial output. Swells in oil prices transform into greater industrial costs. Increasing costs of production result in cost-push inflation in the country, having a tax on company profits in a greatly competitive market atmosphere where companies miss pricing power. Likewise, an increase in oil price stands like an inflation tax on consumption, cutting the volume of disposable income for households. Such impacts decrease the wealth of company, reducing their dividends. Investigating the Unite States of America's., Canadian, Japanese and United Kingdom's stock markets, Jones and Kaul (1996), display that all the markets react adversely to oil shocks. The main objective of the U.S. monetary policy is to retain price immovability with maintainable maximum economic growth. In expectation of greater inflation succeeding oil price swells, the Central Bank (Federal Reserve) increases short-term interest rate in so doing to cut money supply. On the other hand, the Central Bank

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(Federal Reserve) cuts short-term interest rate to add additional money into the economy in anxiety of unchecking recessionary forces. The responsiveness of stock markets habitually negative to increases in interest rate and becomes positive to decreases in interest rate. The impacts of movements in money supply on stock returns have been an issue of debate amongst economists for several decades. (Rahman, 2008)

According to him, the concentration of this study on oil price and money supply is encouraged by their association with the macro economy and the stock markets. Understanding of this link is of pronounced significance for financial hedgers, portfolio managers, asset allocators and financial analysts. And it is also significant for the formulation of U.S. monetary policy. According to Leduc and Sill (2004), examinations of the role of the relations between oil-price shocks and monetary policy in producing stagnations have mainly been based on practical vector auto regression (VARs) models that make impulse responses of economic variables to oil-price shocks under alternate monetary policy response functions. These reduced-form models are essentially soundless on the stations through which oil-price fluctuations impact real output. Supplementary, any VAR-based investigation of the response of the economy to oil-price shocks under alternate monetary policy specifications runs directly into the Lucas critique: It is difficult to accept that reduced form coefficients are steady across various policy systems.

In his paper Krichene (2006) investigates the linkage between monetary policy and oil prices in the context of a world oil demand and supply model. Small price and great income elasticity of demand and inflexible supply elucidate great price instabilities or volatilities and power of producers' market as well. The variables like Exchange and interest rates have effect on the equilibrium of oil market. The connection between oil prices and interest rates is a two-way connection that relies on the type of oil shock. During a time of supply shock, increasing oil prices made interest rates to rise; while during a time of demand shock, decreasing interest rates made oil prices to fly up. Record less interest rate caused great oil price volatility over 2005. Statistics reveals that international economic growth and price steadiness need unchanging oil markets and so more prudent monetary policies.

On his word, Natal (2012) states that the first support of my work is to reveal that growth in oil prices result in a significant monetary policy trade-off as soon as it is recognized (i) that oil can never simply be replaced by other elements in the short term, (ii) that there is lack of fiscal transfer existing to policymakers to neutralize the constant-state falsehood because of monopolistic competition, and (iii) that oil is a resource input together to production and to consumption as well. Whereas the first two situations are essential to present a micro founded monetary policy trade-off, they are not enough to elucidate the policymakers' worry for the real activity costs of oil price shocks. Therefore, this study emphasis that perfectly stabilizing inflation comes to be in particular expensive at a time the effect of higher oil prices on households' overall consumption is too taken into consideration. In a nutshell, movements in prices of oil directly impact the consumption cost, and then play a role of a distortionary income tax. The little the elasticity of substitution between energy and other consumption goods, the bigger is the tax burden and the more damaging are the costs on employment and output of a given rise in oil prices.

Very high surges in the crude oil price are commonly considered as a main contributor to asymmetries of business cycle. Furthermore, the very fresh highs recorded in the international oil market are creating concern about potential slowdowns in the economic performance of a big number of developed nations. Whereas some authors have cared about the direct channels of transmission of energy price rises, another's have supported the idea that the economic downturns surfaced from the monetary policy reaction to the inflation probably generated by oil price growths. In this study a structural co-integrated VAR model has been used and considered for the G-7 economies so as to test the direct impacts of oil price shocks on production and prices and the response of monetary variables to external shocks. Experimental and practical analysis displays that, for most of the economies considered, there appears to be an effect of unforeseen oil price shocks on interest rates, proposing a tightened monetary policy response straightforwardly to control inflation. Consecutively, rises in interest rates are conveyed to real economy by cutting output growth and the inflation rate. (Cologni and Manera 2008)

3. Method & Methodology

3.1 Theoretical Framework of the Model

This research paper has utilized the Autoregressive Distributed Lag (ARDL) Bounds testing approach in order to assess the impact of crude oil price changes on Omani money supply (M2). The scope of the study ranges from 1990 to 2016 and the main aim is to investigate whether there is long run relationship between the concern variables.

3.2. Hypothesis of the Study

This study is testing the hypothesis of zero impact of independent variables (oil price fluctuations) on dependent variable (Omani Money Supply M2). It tries to figure out whether the independent variable has an important impact on dependent variable in the long run or not, that is π is significantly equal to zero or not. Mathematically this hypothesis can be written as:

$$H0: \pi = 0$$

$$H1: \pi \neq 0$$

3.3 Data Source

The study depends completely on secondary data, with respect to yearly time series; including annual observations from 1990 to 2016 of two variables: crude oil prices and Omani money supply (M2) which gained from IMF, the World Bank, and Central Bank of Oman.

3.4 Methodology

The impact of crude oil price changes on money supply in Oman (1990-201) is examined using ARDL model. Chen, Kuo and Chen (2010) believe that, the Autoregressive Distributed Lag (ARDL) model is a prevalent and lively model which brings together dynamics and interdependence with different explanations grounded on linear equations.

Pahlavani, Wilson and Worthington (2005), Halicioglu (2008), Achsani (2010), Chittedi (2012), Hasan and Nasir (2008), Nkoro and Uko (2016), and Oskenbayev, Yilmaz, and Chagirov (2011) agreed with one other that a huge number of previous studies have employed the Johansen co-integration technique to test the long-term connections between variables of interest. ARDL co-integration technique never needs pre-tests for unit roots dissimilar other models. Therefore, ARDL co-integration model or approach is desirable while working with variables that are integrated of different order, I(0), I(1) or combination of the both and, healthy at a time where there is a single long run relationship between the fundamental variables in a small sample scope. The relationship of the long term between the fundamental variables is detected with the help of the F-statistic (Wald test). In this method, long run relationship of the series is considered to be set whenever the Fstatistic outstrips the critical value band. The main advantage of this method appears in its identification of the co-integrating vectors where there are various co-integrating vectors.

In the same vein, Hasan and Nasir, (2008) presented that, compared to other Vector Autoregressive (VAR) models; ARDL Model has ability to provide accommodations of great number of variables. Consistently and in line with Hasan and Nasir, (2008), Alqattan & Alhayky (2016) indicated that Pesaran, Shin, and Smith (2001) developed a version of the autoregressive distributed lag (**ARDL**) model as an alternative co-integration method named as the error correction version. Such method aids to test the presence of long-run association between variables of interest. With this approach, the short-run and long-run relationships among series of interest caught simultaneously. The ARDL model is very valuable and beneficial in this regard. In accordance with the above said the ARDL model has been selected to govern the short and long run link between the two variables (crude oil prices and money supply). So the steps that have been taken are as follows:

Step1, VAR Lag Order Selection Criteria has been used to decide the number of chosen lags for the dependent and independent variables to assure non-residual autocorrelation. After that, the paper has run Augmented Dickey Fuller (ADF) unit-roots test- for the two variables separately to avoid the possibility of spurious regression. The overall test shows that the dependent and independent variable are stationary after the first difference. The step after was to use diagnostic tests to check for serial correlation. Then, the estimation of the ARDL form of equation has taken place (see ***Table1***) where the optimal lag length is selected based on one of the standard criteria like the Akaike Information (AIC) or Schwartz Bayesian (SIC). Then the restricted version of the equation is resolved for the long-run solution. The following is the estimation equation and its substituted Coefficients.

M2 = C(1)*M2(-1) + C(2)*M2(-2) + C(3)*M2(-3) + C(4)*M2(-4) + C(5)*OPRICE + C(6)*OPRICE(-1) + C(7)*OPRICE(-2) + C(8)*OPRICE(-3) + C(9)

Substituted Coefficients:

M2 = 1.27846463356*M2(-1) - 0.878697185522*M2(-2) - 0.201639647887*M2(3)+0.585230817374*M2(-4)+10007689.0817*OPRICE - 7128357.49314*OPRICE(-1) + 25357320.5792*OPRICE(-2) + 18480198.7129*OPRICE(-3) - 218245204.525

And then, the study has used ARDL Bound testing to estimate whether there is long run link between the variables or not. The outcome shows that the long run relationship is there between the variables (see ***Table2***). Eventually, the error correction representation for the Oil price is applied to measure the speed of adjustment in order to restore equilibrium in the dynamic model (see ***Table3***).

The ARDL equation:

$$d(Yt) = c + \lambda Y\mathrm{t}-1 + \beta X\mathrm{t}-1 + \sum_{i=1}^{m} a1, i * d(Yt-i) + \sum_{i=0}^{k} a2, i * d(Xt-1) + \varepsilon\mathrm{t}$$

$c + \lambda Y\mathrm{t}-1 + \beta X\mathrm{t}-1$: represents the long run relationship

$\sum_{i=1}^{m} \boldsymbol{a1, i} * \boldsymbol{d(Yt-i)} + \sum_{i=0}^{k} \boldsymbol{a2, i} * \boldsymbol{d(Xt-1)} + \boldsymbol{\varepsilon \mathrm{t}}$: represents the short run relationship

3.5 Empirical Analysis

Table No.1 Estimation using Autoregressive Distributed Lag (ARDL) model

Dependent Variable: M2
Method: ARDL
Date: 05/30/18 Time: 01:57
Sample (adjusted): 1994 2016
Included observations: 23 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): OPRICE
Fixed regressors: C
Number of models evalulated: 20
Selected Model: ARDL(4, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
M2(-1)	1.278465	0.236470	5.406450	0.0001
M2(-2)	-0.878697	0.420915	-2.087589	0.0556
M2(-3)	-0.201640	0.523420	-0.385235	0.7059
M2(-4)	0.585231	0.330744	1.769436	0.0986
OPRICE	10007689	4136772.	2.419202	0.0298
OPRICE(-1)	-7128357.	6221947.	-1.145680	0.2711
OPRICE(-2)	25357321	8163503.	3.106182	0.0077
OPRICE(-3)	18480199	10699684	1.727172	0.1061
C	-2.18E+08	1.17E+08	-1.867855	0.0829

R-squared	**0.997976**	Mean dependent var	6.08E+09
Adjusted R-squared	0.996820	S.D. dependent var	4.71E+09
S.E. of regression	2.66E+08	Akaike info criterion	41.91888
Sum squared resid	9.87E+17	Schwarz criterion	42.36320
Log likelihood	-473.0671	Hannan-Quinn criter.	42.03063
F-statistic	863.0789	**Durbin-Watson stat**	**2.096955**
Prob(F-statistic)	0.000000		

Note: **Table1** shows that the R-squared (0.997976) does not exceed the value of Durbin-Watson stat (2.096955), demonstrating that there is no spurious problem**.** And these independent variables (M2(-1), M2(-2), OPRICE, OPRICE(-2)) are statistically significant. Whereas the following (M2(-3), M2(-4), OPRICE(-1), OPRICE(-3)) are not.

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Estimation Command:

ARDL M2 OPRICE @

Estimation Equation:

M2 = C(1)*M2(-1) + C(2)*M2(-2) + C(3)*M2(-3) + C(4)*M2(-4) + C(5)*OPRICE + C(6)*OPRICE(-1) + C(7)*OPRICE(-2) + C(8)*OPRICE(-3) + C(9)

Substituted Coefficients:

M2 = 1.27846463356*M2(-1) - 0.878697185522*M2(-2) - 0.201639647887*M2(-3) + 0.585230817374*M2(-4) + 10007689.0817*OPRICE - 7128357.49314*OPRICE(-1) + 25357320.5792*OPRICE(-2) + 18480198.7129*OPRICE(-3) - 218245204.525

Table2 ARDL Bounds Test (Long run relationship between variables)

ARDL Bounds Test
Date: 05/30/18 Time: 01:59
Sample: 1994 2016
Included observations: 23
Null Hypothesis: No long-run relationships exist

	Test Statistic	Value	k
F-statistic	**6.490144**	1	

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	3.02	**3.51**
5%	3.62	**4.16**
2.5%	4.18	**4.79**
1%	4.94	**5.58**

Test Equation:
Dependent Variable: D(M2)
Method: Least Squares
Date: 05/30/18 Time: 01:59
Sample: 1994 2016
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M2(-1))	0.495106	0.226086	2.189905	0.0460
D(M2(-2))	-0.383591	0.269203	-1.424913	0.1761
D(M2(-3))	-0.585231	0.330744	-1.769436	0.0986
D(OPRICE)	10007689	4136772.	2.419202	0.0298
D(OPRICE(-1))	-43837519	13124169	-3.340213	0.0049
D(OPRICE(-2))	-18480199	10699684	-1.727172	0.1061
C	-2.18E+08	1.17E+08	-1.867855	0.0829
OPRICE(-1)	46716851	12111556	3.857213	0.0017
M2(-1)	-0.216641	0.081212	-2.667600	0.0184
R-squared	0.862391	Mean dependent var	6.13E+08	
Adjusted R-squared	0.783757	S.D. dependent var	5.71E+08	

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S.E. of regression	2.66E+08	Akaike info criterion	41.91888
Sum squared resid	9.87E+17	Schwarz criterion	42.36320
Log likelihood	-473.0671	Hannan-Quinn criter.	42.03063
F-statistic	10.96715	Durbin-Watson stat	2.096955
Prob(F-statistic)	0.000076		

Note: As F-statistic is greater than I1 Bound, we reject the Null hypothesis (No long-run relationships exist) and accept the Alternative Hypothesis (There is long-run relationship between the concern variables).

Table3

ARDL Cointegrating And Long Run Form

Original dep. variable: M2

Selected Model: ARDL(4, 3)

Date: 05/30/18 Time: 01:59

Sample: 1990 2016

Included observations: 23

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M2(-1))	0.495106	0.192444	2.572723	0.0221
D(M2(-2))	-0.383591	0.238814	-1.606235	0.1305
D(M2(-3))	-0.585231	0.307435	-1.903589	0.0777
D(OPRICE)	10007689.081733	3661759.786828	0.000000	0.0000
D(OPRICE(-1))	-43837519.292092	10567312.130204	0.000000	0.0000
D(OPRICE(-2))	-18480198.712891	8992191.357707	0.000000	0.0000
CointEq(-1)	**-0.216641**	**0.045926**	**-4.717194**	**0.000**3

Cointeq = M2 - (215641399.3808*OPRICE -1007403119.5308)

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPRICE	**215641399.380777**	**38817012.757184**	**5.555332**	**0.0001**
C	-1007403119.530832	573475956.670264	-1.756661	0.1008

Co-integrating Equation:

D(M2) = 0.495106016034*D(M2(-1)) -0.383591169488*D(M2(-2)) -0.585230817374*D(M2(-3)) + 10007689.081733091000*D(OPRICE) -43837519.292092487000*D(OPRICE(-1)) - 18480198.712891437000*(M2 - (215641399.38077730*OPRICE(-1) - 1007403119.53083220) -0.216641382475*CointEq(-1))

Note: **Table3** shows that (CointEq(-1) – (λ)) which represents the Error Correction Representation for the OPRICE. The error correction term CointEq (-1), which measures the speed of adjustment to restore equilibrium in the dynamic model, act with negative sign (-0.216641) and is statistically significant (0.0003) at 5 percent level confirming that long run equilibrium can be reached. The coefficient of CointEq(-1) is equals -0.216641 for short run model indicating that the deviation from the long-term inequality is corrected by 21.6 % over each year. And OPRICE variable is statistically significant.

4. Conclusion

The fresh volatility in international product prices and particularly in the price of crude oil has generated rehabilitated interest in the question of what is the way monetary policymakers should react to fluctuations in oil price. In view of that, the importance of investigating to what extent the Omani money supply responds positively or negatively to changing crude oil prices, emerged and became a hard topic of discussion among various policy makers and many economists as well.

This study focused entirely on the nature of this link and attempted to make sure whether this relationship exists or not, with the help of (ARDL) approach, covering a time period from 1990 to 2016. The results of the statistical analysis confirmed the existence of long run relationship between the variables of interest. Therefore, it is very important to shed more light on fiscal/monetary reform, economic diversification and to take thoughtful steps towards their implementation in order to free Omani economy from the strong grip of hydrocarbons and to have stable and sustainable economic growth.

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