IJEEP
INTERNATIONAL JOURNAL OF ENERGY ECONOMICS AND POLICY
EJ EconJournals
ISSN: 2146-4553

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2024, 14(6), 32-39.

EJ EconJournals

The Oil Price Shocks and the Monetary Stability in Saudi Arabia

Jumah Ahmad Alzyadat*

Department of Finance and Banking, College of Business Administration, Dar Aluloom University, Riyadh-Saudi Arabia.
*Email: jalzyadat@dau.edu.sa

Received: 30 April 2024 **Accepted:** 15 August 2024 **DOI:** https://doi.org/10.32479/ijeep.16882

ABSTRACT

The exposure of major oil exporters to severe shocks in oil prices makes it a strategic factor in determining economic policies, including monetary policy. This paper discusses the interaction of oil price shocks and monetary stability variables in Saudi Arabia. The study used vector autoregression (VAR) techniques. The results from the analysis of impulse response functions and variance analysis indicate that oil price shocks play a major role in fluctuations in the money supply and inflation. The results showed that oil prices are the second most influential factor on the price level after money supply during the response period as well as an important role in the stability of the exchange rate in the Saudi economy. Oil price shocks have a negative impact on exchange rates. In analyzing the components of exchange rate variation, the oil price shock did not play an important role in explaining the exchange rate variation. This suggests that the price of oil is not the most important factor in explaining changes in exchange rates. The price level and money supply are the two factors that most influence the value of the local currency. Therefore, the study suggests that monetary stability can be achieved in Saudi Arabia through a monetary policy capable of controlling liquidity, stabilizing the exchange rate, preserving the purchasing power of the local currency, and combating inflationary pressures, taking into account changes in oil prices.

Keywords: Saudi Arabia, Oil Price Shocks, Monetary Stability, Monetary Policy
JEL Classifications: E52, E31, Q48, Q43, Q41

1. INTRODUCTION

Oil price shocks and their macroeconomic impact have become an important area of research in economics, following the first oil price shock in 1973, and the second oil shock in 1979 caused by interruptions in oil supplies, which once again highlighted the importance of an immediate change in energy prices. Interest in oil price fluctuations and their role in the economy was renewed again due to the sharp rise in oil prices in early 2000 and the immediate decline in 2008 (Alekhina and Yoshino, 2018). To the decline in prices in 2014 as a result of the increased supply of crude oil in the market, which resulted from the production policy in the Saudi Arabia, in 2020, crude oil prices witnessed a sharp decline due to the (Covid-19) pandemic that affected the world and the deterioration of oil markets, which generated a contraction in global demand, in addition to the supply shock resulting from the end of OPEC and Russia's production cuts, as prices fell to their lowest levels since 2002 (Muhammad and Shaaibith, 2022). Oil price shocks are usually an issue for oil exporter and importer countries. Oil importer countries use oil for consumption and as an input into production. The oil-exporter country produces oil and consumes imported goods (De Fiore et al. 2006). This has led to a vast empirical literature on the impacts of oil price shocks on the economic indicators essentially economic growth. Various studies have proved that oil prices have an important impact on economic activities. Oil has been the main energy used as an input into economic activities, and high oil prices increase the cost of production, and thus increase the price of production, which leads to inflation (Belloumi et al. 2023). There is also a large literature that investigates whether the economic effects of oil price changes also depend on how monetary policy responds (Rahman and Serletis, 2010). The literature on the relationship between the oil price and monetary policy dates back to the 1980s. There is a consensus that causality in this relationship may run from events in oil markets to monetary policy as well as from monetary policy to the supply and the demand for oil in global markets (Bodenstein et al. 2012). And indeed, much of the literature since the 1990s has focused on how monetary policymakers should respond to oil price shocks (Bodenstein et al. 2012; Emam, 2024; Mandal and Dattal, 2024).

The effects of oil prices are transmitted to the economy of the exporting country through the export channel. Whenever oil prices increase, capital flows in the form of foreign currencies increase, leading to domestic exchange rate appreciation, this leads to a decline in the prices of imported goods, which constitute a large portion of total consumer goods. Therefore, as oil prices rise, the general price level falls, and the interest rate also falls as monetary policy reacts (Alekhina and Yoshino, 2018). The other channel is the government budget channel, as the rise in oil prices means an increase in the fiscal surplus of the oil-exporting country and thus an increase in government spending, which leads to an increase in aggregate demand (Alekhina and Yoshino, 2018). Moreover, oil price fluctuations have historically presented a challenge to policymakers tended to keep inflation low at the expense of further slowdowns in economic activity (Bernanke et al. (1997). This means that monetary policy is responsible for part of the decline in GDP growth following the oil price shock (Aastveit, 2013). Part of the impact of oil price shocks on the economy results not only from changes in oil prices, but also from tightening monetary policy (Bernanke et al. (1997). The optimal monetary policy response will be different depending on the source of the oil price shock (Bodenstein et al. 2012).

Saudi monetary policy seeks to maintain the monetary stability. This is essential for achieving sustainable economic growth. The Saudi economy depends largely on oil revenues, Oil prices, as a raw commodity, fluctuate in the same way as most primary exports (Raid et al. 2024). Previous literature confirmed the effect of oil prices on the Saudi economic growth (see for example: Elneel and AlMulhim, 2022; Almutairi, 2020; Foudeh, 2017; Ftiti et al. 2016; among others). Since the Saudi government is the main recipient of oil revenues, fiscal policy is more dominant than monetary policy in influencing the economy. The role of monetary policy is limited by the exchange rate regime, while monetary aggregates are largely determined by government expenditures (Al-Jasser and Banafe, 1999). It is worth noting that little work has been done regarding monetary policy response to oil prices shocks in Saudi Arabia, while most papers study the impact of oil price shocks on macroeconomic variables. Saudi Arabia is an open, oil-based economy with fixed exchange rates. Therefore, it has limited monetary policy independence (Alsamara et al., 2017).

This study attempts to make a contribution to the research on how oil price shocks affect monetary stability in the Saudi economy, to provide some recommendations related to monetary policies. Studies have been conducted for years. However, more information is still expected as oil price shocks and their impacts on oil economies remain of interest to policymakers and researchers. This study focuses on the Saudi Arabia, which is the second largest oil producer and third largest oil exporter. Thus, the Saudi Arabia plays a leading role in pricing oil in the global market. KSA relied heavily on oil to finance its development programs, making its economy insecure against shocks to oil prices. This paper examines the interaction between oil price shocks and monetary stability variables in the KSA during the period 1980-2022 using appropriate econometric methods.

2. LITERATURE REVIEW

The extensive literature has addressed many issues related to the impact of oil prices in oil-exporting and importing countries. The most prominent of these issues is the study of the effects of the oil price shock on economic growth, while some research has addressed the impact of oil prices shocks on monetary variables. The studies addressed not only the transmission mechanisms of oil price shocks, but also the consequences of these shocks and the appropriateness of the monetary policy response. However, the relevant literature has focused on the relationship between oil prices, inflation, interest rates, exchange rates and money supply. Bodenstein et al. (2012) Provide the first quantitative analysis of how US monetary policy responses vary depending on the source of observed oil price fluctuations. Hoover and Perez. (1994) point out that recessions in the US were preceded by oil shocks and contractionary monetary policies. Moreover, Bernanke et al. (1997) also revealed that the majority of the impact of the oil price shock on the economy is due to the central bank's response to the inflationary pressures caused by the oil price shock. As well, Lee et al. (2001) found that between 30% and 50% of the negative impact of oil price shocks on Japanese production is attributable to monetary tightening caused by oil price shocks. Jumah and Pastuszyn (2007) also noted that monetary policy was initially eased in response to higher oil prices in order to minimize any consequences on growth, but at the expense of higher inflation. Rahman, and Serletis, (2010) suggest that monetary policy not only enhances the effects of oil price shocks on output, but also contributes to the asymmetric response of output to oil price shocks. Furthermore, Wu and Ni (2011) Show that changes in oil prices affect inflation in both symmetric and asymmetric models. Also, the feedback effects that exist between oil price changes, money growth, and interest rate. Kamps and Pierdzioch (2002) demonstrate that targeting a change in the GDP deflator represents a less efficient monetary policy strategy under oil price shocks. Natal, (2012) finds that the optimal monetary policy response to a sustained increase in oil prices actually resembles the typical response to central bank inflation targeting.

Kormilitsina (2011) found that monetary policy amplified the negative impact of the oil price shock. Castillo et al. (2020) show that higher oil price volatility leads to higher levels of inflation. Also, when oil has low substitutability in the production function, the more weight the central bank allocates to inflation in its monetary policy. Then, Köse and Ünal (2021) stated that oil prices are considered an external factor to which alternative methods must be found in order to reduce its inflationary impact. However, following stable economic policies, taking into account monetary policy, provides important dynamics to control inflation. Thankgod and Maxwell, (2013) conclude that the oil price shock is an important determinant of real exchange rates and the long-run money supply in Nigeria. Ahmed and Wadud (2011) found that the Malaysian central bank is adopting an expansionary monetary policy in response to oil price uncertainty. Alekhina and Yoshino, (2018) suggest that oil price fluctuations have a significant impact on the oil exporting country's real GDP, inflation rate, interest rate, and exchange rate. While, Omotosho (2022) found that in a small open oil-exporting economy, a negative oil price shock leads to a contraction in domestic output, a reduction in domestic inflation, a depreciation in the exchange rate, an increase in headline inflation, and leads to monetary policy contraction. Saliu et al. (2020) showed that in the selected African oil producing countries the expansionary monetary policy is more effective in compensating and offsetting the negative effect of the decline in global oil price. Oloko et al. (2021) investigated the effect of oil price shocks on the inflation of the top ten oil-exporting and oil-importing countries. The results show that inflation rate of oil-exporting and oil-importing countries does not increase due to oil price shocks suggesting that the monetary policy of these countries accommodates oil price shocks, and may not necessarily be changed due to oil price shocks. This holds for countries operating floating regimes and inflation targeting, and those operating pegged regimes and non-inflation targeting monetary policy framework.

In contrast, Bachmeier (2008) concluded that systematic monetary policy is not effective, and that oil shocks have impacts on the economy beyond their impact on monetary policy. Kilian, and Lewis, (2011) show that there is no reliable evidence that monetary policy responses to oil price shocks caused significant aggregate volatility in the 1970s and 1980s. They suggest that the traditional monetary policy reaction framework should be replaced with models that take into account the authenticity of the real oil price and allow policy responses to depend on the underlying causes of oil price shocks. Recently, Abokwah (2019) points out that Nigeria's monetary policy does not respond to oil price shocks. More recently, Mohammed, (2021) concluded that oil price shocks are not important for monetary policy in Ghana.

In the context of the Saudi economy, as mentioned previously, few studies have dealt with the relationship between oil price shocks and monetary stability variables. However, Dibooğlu and Aleisa (2004) turn out that the price level in Saudi Arabia, the real exchange rate, and to a lesser extent output are vulnerable to terms of trade shocks. To achieve stability in the real exchange rate, the study indicates that Saudi Arabia should continue to diversify its production base and strive to achieve a stable nominal oil price. Ziaei (2012) evaluated the various channels of monetary policy transmission mechanisms in Saudi Arabia, he finds that the large fluctuations in economic activity are related to the systematic reaction to monetary aggregates and foreign stocks, such as international oil prices and foreign interest rates. Aloui et al. (2018) Show that the Saudi economy is exposed to several global risk factors, mainly related to oil market fluctuations and the peg of the local currency to the US dollar. These risk factors strongly and negatively affect real economic growth, exert more pressure on inflation, and restrict monetary policy. Recently, Belloumi et al. (2023) stated that high crude oil prices lead to higher inflation in Saudi Arabia, while lower prices lead to lower inflation. As well, Rumzi Tausif et al. (2023) indicate that an increase in oil prices by 10% leads to an increase in the consumer price index by 0.15%. Nusair (2019) indicates that the changes in oil prices have different effects on inflation in the Gulf Cooperation Council countries. While higher oil prices have a significant positive effect on inflation, lower oil prices either have a negligible or negative effect on inflation. Moreover, the results indicate that positive changes in oil prices have a greater impact than negative changes, that the impact of an oil price shock is greater in the long run than in the short run, and that there is an incomplete effect of oil prices on domestic inflation.

3. DATA AND METHODOLOGY

To investigate the response of monetary stability variables to oil prices shocks, flowing (Alekhina and Yoshino, 2018; Ziaei, 2012; Baroudi and Filali, 2021; among others), an unrestricted Vector Autoregressive model (VAR) is adopted. The VAR is commonly used for forecasting system of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. It provides a multivariate framework where changes in a particular variable (monetary stability variables) are related to changes in its own lags and to changes in other variables and the lags of those variables. The unrestricted autoregressive VAR model in reduced form of order p is presented in the following equation, the VAR (p) form is written as

$$X_t = C + AX_{t-i} + U_t$$

$$X_t = [CPI_t, Mt, REER_t, OP_t]$$

X_t the vector of variables, Where CPI: the consumer price index, M: the monetary aggregate (M2). REER: Real effective exchange rate is the nominal effective exchange rate a measure of the value of a currency against a weighted average of several foreign currencies divided by a price deflator or index of costs. OP: oil price (OPEC basket). The interest rate was excluded from the model due to the lack of sufficient time series data. X_{t-i}: Indiçâtes the variables value with i time lag. C: Is a k Vector of constants as the intercept of the model. A: is (k × k) matrix, and Ut is a k- vector of errer termes. The study employs annual secondary data from Saudi Central Bank. The data cover the period from 1980 to 2022. The study adopts VAR approach for data analysis.

4. DISCUSSION OF THE ECONOMETRICS RESULTS

Descriptive statistics indicate that the mean and standard deviation of the variables of monetary stability and oil price. The standard deviation was large in value, which reflects the magnitude of fluctuations in oil prices and monetary stability variables, as shown in Table 1.

Time series behavior for most economic variables are likely to be nonstationary. Usually, in practice, this time series is subjected to tests to classify the series as stationary or non-stationary. Unit root tests are performed on time series to avoid the spurious regression. The pre-tests include individual time series unit root tests as the Augmented Dickey-Fuller test (ADF), which determine whether the model should be estimated as a VAR in differences (no cointegration), or Vector Error-Correction Model (VECM) In the case of cointegration or a VAR in levels if the null hypotheses are rejected (Gospodinov et al. 2013). The results of the ADF in Table 2, show that the all-time series are non-stationary in its level. But they are stationary at first differences I(1).

Cointegration has an important property in time series analysis. Time series often have trends either deterministic or stochastic. all of the series must be integrated of order d if a linear combination of this collection is integrated of the order less than d, then are cointegrated. The results of the Cointegration Rank Test in Table 3 show that the Trace and Max-eigenvalue tests indicate no cointegration at the 0.05 level. So When the time series I(1) and not cointegrated, in this case, the appropriate model is VAR in first differences.

The VAR model requires selecting the optimal lag length. Economic theory suggests that economic processes are dynamic, but it does not help much with regard to the length of those dynamic processes. There are several criteria that provide the possibility of selecting the optimal lag length. Three criteria that are most often used are the Akaike Information criteria (AIC), the Schwarz Information criteria (SC), and the Hannan-Quinn Information criteria (HQC) (Scott Hacker and Hatemi-J, 2008). The results of the lag order selection criteria in Table 4 show that one lag lengths for Akaike Information criteria (AIC), one lag length for Schwarz Information Criteria (SC), and one lag lengths for Hannan-Quinn Information criteria (HQC). That is, the optimal lag length based on the results is one lag period. It is the lowest of the three criteria

The estimated coefficients for the monetary stability variables in Saudi Arabia indicate that the change in oil prices is directly related to the monetary stability variable, as shown in Table 5. Below, this relationship will be verified using impulse response function and analysis of variance decomposition.

Table 1: The descriptive statistics

Measures	CPI	M2	REER	OP
Mean	87.91587	665271.0	133.9048	43.65953
Median	77.56347	271080.5	118.2406	29.04000
Maximum	129.3542	2182890.	247.0004	109.4500
Minimum	67.04045	83403.40	94.29624	12.28000
SD	20.12469	667528.6	45.43803	29.94894
Skewness	0.824133	0.951331	1.720979	0.934219
Kurtosis	2.040808	2.391445	4.507306	2.600270
Jarque-Bera	6.515984	7.149571	25.29663	6.541099
Probability	0.038466	0.028021	0.000003	0.037986
Sum	3780.383	28606655	5757.907	1877.360
Sum square deviation	17010.14	1.87E+13	86713.80	37671.44
Observations	43	43	43	43

Effects of the oil price shock on inflation: By analyzing the impulse response function of the CPI in Figure 1, it was noted that the occurrence of an oil price shock of 1% will have a positive impact on the CPI during the response period, with an initial value of (0.021) in the 2nd year and increasing to its value maximum (1.52) in the 10th year. This confirms that in the long run, the response of inflation to the oil price shock increases, reaching a maximum in the 10th year. The results of the variance decomposition analysis in Table 6, also indicate that the oil price shock has a significant contribution to explaining changes in inflation, as during the initial period it explained 6% of the inflationary changes and this percentage increased slightly over time, reaching its highest contribution of 28% in the tenth period. The results showed that oil prices are the second most influential factor on the price level after money supply during the response period. These results are consistent with studies by (Nazer, 2016; Alnefaee, 2018; Osman et al. 2019). That inflation in Saudi Arabia is mainly affected by the money supply, domestic demand, and the value of import prices, high oil prices also cause a direct relationship with the Saudi CPI. The results are also consistent with other studies such as: (Samimi and Shahryar, 2009; Al-Qenaie and Al-Shammari, 2016; Naseem, 2018; Algaeed, 2018; Nusair, 2019; Abbaq and Ahmad, 2021; Belloumi et al., 2023; Rumzi Tausif et al., 2023) confirmed the positive impact of oil price shocks on inflation in KSA. Gunwant et al. (2024) indicate that a positive shock in oil price volatility tends to generate higher volatility in inflation, while a negative shock does not appear to have any significant impact on inflation volatility. The significant contribution of oil prices in explaining inflation fluctuations supported the fact that inflation in Saudi Arabia is greatly affected by fluctuations in oil prices. Which can be attributed to government policies and its expansion in spending during periods of high oil prices. A study by Alzyadat, (2022) indicated that the price level is greatly affected by fiscal policy. Moreover, money supply does not appear to play a pivotal role in explaining changes in the CPI. Therefore, changes in the price level are not a monetary phenomenon. The study suggests that policymakers responsible for targeting price stability adopt strict fiscal policies.

The effect of oil price shocks on money supply shows that if a 1% oil price shock occurs, there will be a positive impact on money supply during the response period. in the 2nd year and will increase in subsequent years to reach its highest value during the 10th year. In the long run, its influence is increasing. Variance decomposition analysis of the money supply in Table7 shows that the impact of the oil price shock has a major role in explaining the amount of money supplied, as in the second period its contribution to the explanation reached 8%, which increased during the following years to reach 26% in the 5th year. After that, it continued to rise and reached 28% in the 10th year. Thus,

Table 2: The augmented dickey-fuller test

Variable	Level			1st difference		The result
	Intercept	Trend and intercept	The result	Intercept	Trend and intercept	
CPI	0.272451	−2.317052	Non	−1.889986	−2.449281*	I (1)
M	1.918876	−0.638354	Non	−2.935001	−3.885979*	I (1)
REER	−2.847257	−1.287290	Non	−3.389069*	−3.896952*	I (1)
OP	−1.069092	−2.284456	Non	−5.360038*	−5.363940*	I (1)

the oil price shock explains changes in the money supply in the years after the shock. The positive impact of the oil price shock on the money supply in KSA is due to increased liquidity in the economy due to higher oil revenues. These results are consistent with the results of studies by Baroudi and Filali, 2021. Among the related studies Akikina, and Al-Hoshan, (2003) indicate that the Saudi Central Bank has weak control over the money supply. The results are not consistent with Almutairi, (2023) that oil price has an insignificant impact on money supply.

Table 3: The cointegration rank test

Unrestricted cointegration rank test (trace)				
Hypothesized Number of CE (s)	Eigenvalue	Trace statistic	0.05 Critical value	P**
None*	0.541376	54.16515	40.17493	0.0011
At most 1	0.348949	22.98413	24.27596	0.0721
At most 2	0.119136	5.817431	12.32090	0.4586
At most 3	0.018412	0.743332	4.129906	0.4466
Unrestricted cointegration rank test (maximum eigenvalue)				
Number of CE (s)	**Eigenvalue**	**Statistic**	**Critical value**	**P****
None*	0.541376	31.18102	24.15921	0.0047
At most 1	0.348949	17.16670	17.79730	0.0620
At most 2	0.119136	5.074099	11.22480	0.4669
At most 3	0.018412	0.743332	4.129906	0.4466

Max-eigenvalue test indicates 1 cointegrating eqn (s) at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) P values

The effects of oil price shocks on exchange rates. Through the analysis of response functions, it is noted that a 1% shock in oil prices will have a negative impact on exchange rates during response periods. With the exception of the second and third periods, the impact was positive, with the response rate to the shock reaching (0.32%) and (0.09%), respectively, and in the following years the negative impact of the oil price shock continued to decline. This appears clearly in the 10th year, when it reaches its lowest value (0.25%). The negative impact shows that the rise in oil prices will lead to a decrease in the Saudi riyal units that can be obtained for one dollar, which is in line with economic theory. This result also reflects the role that oil prices play in maintaining the stability of the Saudi riyal. In analyzing the variance decomposition of the exchange rate in Table 8, the oil price shock did not play an important role in explaining changes in exchange rates. The estimated initial impact of the shock was (0.02%) and increases annually, reaching (0.05%) in the 10th year. This indicates that the price of oil is not the most important factor explaining changes in exchange rates.

Analysis of exchange rate fluctuations shows that the price level and money supply are the factors that most influence the value of the local currency. Therefore, it can be said, as it turns out, that oil prices have a strong impact on prices and the money supply and thus affect the exchange rate through the money supply channels and the price level. This can be attributed to the fixed exchange rate system in the KSA and the relatively stable local pricing compared

Table 4: Lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−1069.313	NA	2.38e+18	53.66565	53.83454	53.72671
1	−840.7297	400.0208*	5.79e+13*	43.03648*	43.88092*	43.34181*
2	−827.2313	20.92254	6.74e+13	43.16156	44.68156	43.71114
3	−813.8843	18.01844	8.22e+13	43.29421	45.48976	44.08805

*Lag order selected by the criterion. NA: Not available, AIC: Akaike Information criteria, SC: Schwarz information criteria, HQ: Hannan-Quinn

Figure 1: The impulse response function of variables to OP

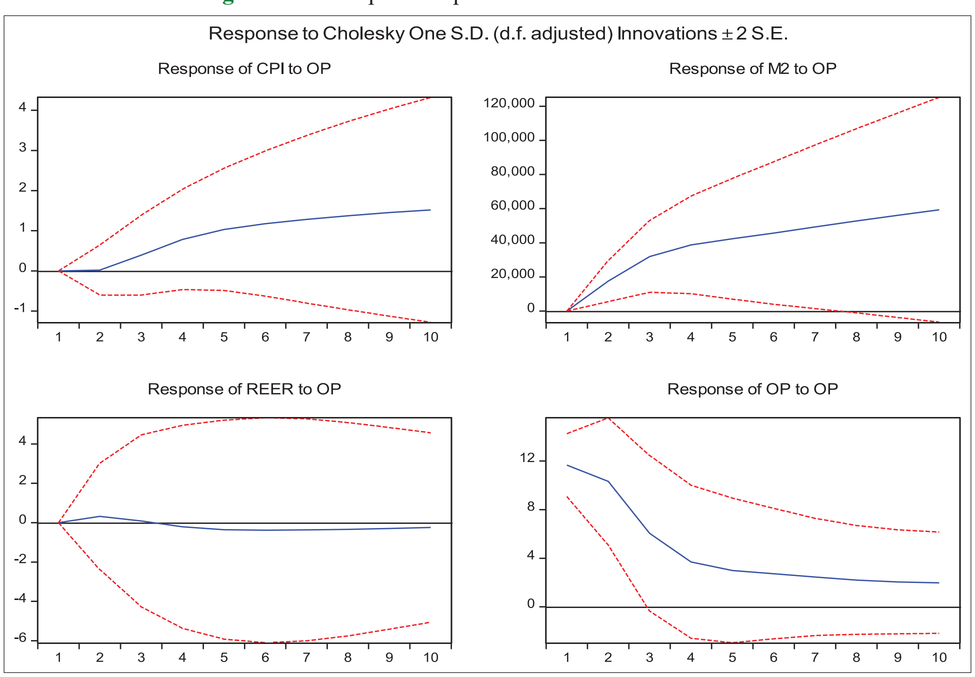

Table 5: Vector autoregression estimates

Standard errors in ( ) and t-statistics in [ ]				
Variables	CPI	M2	REER	OP
CPI (−1)	1.263769	−3492.037	0.702996	2.390128
	(0.18363)	(3352.00)	(0.79465)	(1.38907)
	(6.88230)	(−1.04178)	(0.88466)	(1.72067)
M2 (−1)	8.82E−06	1.147730	1.69E−05	−2.59E−05
	(1.0E−05)	(0.19118)	(4.5E−05)	(7.9E−05)
	(0.84200)	(6.00330)	(0.37295)	(−0.32748)
REER (−1)	−0.023770	−266.0704	1.348994	−0.166283
	(0.03497)	(638.273)	(0.15131)	(0.26450)
	(−0.67982)	(−0.41686)	(8.91523)	(−0.62867)
OP (−1)	0.001860	1504.501	0.027214	0.884965
	(0.02666)	(486.754)	(0.11539)	(0.20171)
	(0.06974)	(3.09088)	(0.23584)	(4.38728)
R^2	0.992564	0.997737	0.963294	0.812182
Adjusted R^2	0.990987	0.997257	0.955508	0.772341
Sum square resids	122.4397	4.08E+10	2292.999	7006.537
SE equation	1.926212	35162.02	8.335756	14.57118
F-statistic	629.2792	2078.377	123.7211	20.38594
Log likelihood	−80.60443	−482.9033	−140.6694	−163.5675

SE: Standard error

Table 6: Variance decomposition of CPI

Period	SE	CPI	M2	REER	OP
1	1.701322	100.0000	0.000000	0.000000	0.000000
2	2.541426	98.20902	1.046367	0.153323	0.591288
3	3.287356	86.29820	7.421271	0.205704	6.074823
4	4.150103	68.01133	16.00533	1.394571	14.58877
5	5.088334	51.66220	23.51079	3.482305	21.34470
6	6.045587	39.10998	29.69148	5.756106	25.44243
7	7.006378	29.87795	34.76779	7.793527	27.56073
8	7.962092	23.28177	38.87297	9.412408	28.43285
9	8.899562	18.64143	42.18238	10.57710	28.59910
10	9.808086	15.35530	44.90085	11.33003	28.41381

SE: Standard error

Table 7: Variance decomposition of M

Period	SE	CPI	M2	REER	OP
1	35169.69	8.937387	91.06261	0.000000	0.000000
2	62,982.32	6.466867	84.15958	0.384724	8.988833
3	93,322.69	7.286031	73.25542	1.455559	18.00299
4	123,029.1	7.868390	66.68812	2.511477	22.93201
5	152,124.3	7.435688	63.49822	3.469333	25.59676
6	181,513.9	6.424821	62.03536	4.379198	27.16063
7	211,501.3	5.314698	61.36913	5.237428	28.07874
8	241,893.3	4.332125	61.11047	6.004673	28.55273
9	272,459.2	3.533679	61.09773	6.647050	28.72154
10	303,107.3	2.907022	61.24072	7.152120	28.70014

SE: Standard error

to oil prices in the global market. A fixed exchange rate system helps reduce inflation caused by rising costs and Dutch disease, limiting real exchange rate appreciations during oil boom periods. Al-Mulali, and Che Sab, (2012) showed that increases in oil prices caused the real exchange rate appreciation in oil-exporting countries, including KSA. As well, Mohammed Suliman and Abid, (2020) confirm the existence of a unidirectional causal relationship from the oil price to the exchange rate. But in the long run, the causality is bidirectional between these two variables. As well the results by Algaeed, (2020) showed that the short-run appreciation of the real exchange rate response to oil price shocks and to real

Table 8: Variance decomposition of REER

Period	SE	CPI	M2	REER	OP
1	8.427302	2.721006	3.329998	93.94900	0.000000
2	14.17966	7.791601	1.993922	90.19870	0.015777
3	18.65495	10.78816	1.696454	87.50454	0.010844
4	21.91669	12.50188	1.583768	85.89084	0.023512
5	24.17565	13.57628	1.501631	84.89240	0.029685
6	25.68455	14.33686	1.433038	84.20237	0.027730
7	26.66468	14.90029	1.377840	83.69566	0.026209
8	27.28415	15.30681	1.334641	83.32916	0.029392
9	27.66421	15.58401	1.302520	83.07546	0.038011
10	27.89034	15.76112	1.281514	82.90604	0.051324

SE: Standard error

government spending. Although this result is consistent with Dutch disease. However, long-run symmetric oil price shocks cancel out the real exchange rate. The study showed that the directional map of causality is as follows: Identical oil price shocks affect the total revenues of the Saudi government, and thus on government spending. Then, the formation of expenditures causes the real exchange rate to rise. On the other hand, Aleisa, and Dibooĝlu, (2002) found that oil production shocks, not real oil price shocks, are responsible for real exchange rate movements in KSA.

5. CONCLUSION

Saudi monetary policy aims to achieve monetary stability. It includes the stability of money growth rates, inflation rate, exchange rate and interest rates. The monetary authority faces difficulties in achieving goals because sometimes changes are required through monetary policy or fiscal policy. Moreover, the Saudi economy depends on oil revenues, which makes achieving monetary stability linked to oil price fluctuations. This study attempted to shed light on the impact of the oil price shock on monetary stability indicators. The study concluded with the following results:

Oil price shocks had a positive impact on the CPI during the response period. The response of inflation to an oil price shock increases in the long run. The results of the variance decomposition analysis indicated that the oil price shock has a significant contribution to explaining changes in inflation. The results showed that oil prices are the second most influential factor on the price level after money supply during the response period. These results are consistent with several previous studies indicating that a positive shock in oil price volatility tends to generate higher volatility in inflation. The significant contribution of oil price shocks in explaining inflationary fluctuations supports the fact that inflation in Saudi Arabia is significantly affected by oil price fluctuations. This can be attributed to the expansion in spending during periods of high oil prices.

Oil price shocks have a positive impact on the money supply during the response period, and their impact increases in the long run. Analysis of the variance decomposition of the money supply shows that the oil price shock has a major role in explaining the amount of money supplied, and the positive effect of the oil price shock on the money supply in Saudi Arabia is due to increased liquidity in the economy due to higher oil revenues.

Oil price shocks have a negative impact on exchange rates during response periods. The negative impact shows that higher oil prices will lead to a decrease in the units of Saudi riyals that can be obtained for one dollar. In analyzing the components of exchange rate variation, the oil price shock did not play an important role in explaining the exchange rate variation. This suggests that the price of oil is not the most important factor in explaining changes in exchange rates. The price level and money supply are the two factors that most influence the value of the local currency. Therefore, it can be said, as it turns out, that oil prices have a strong impact on prices and money supply and thus affect the exchange rate through the money supply and price level channels. This can be attributed to Saudi Arabia's fixed exchange rate system and relatively stable domestic pricing compared to oil prices in the global market. Previous studies showed the impact of oil price shocks on Saudi government revenues, and thus on government spending. The formation of expenditures then leads to an appreciation of the real exchange rate.

Saudi monetary stability indicators as an oil-exporting countries are highly vulnerable to changes in oil prices. As the results of this study showed, oil price shocks continuously affect the money supply, inflation, and the domestic exchange rate. Changes in the exchange rate tend to increase uncertainty in estimating the cost of imported goods and services. The exchange rate plays a crucial role in monetary policy in Saudi Arabia. Therefore, the study suggests that monetary stability can be achieved in Saudi Arabia through a monetary policy capable of controlling liquidity, stabilizing the exchange rate, preserving the purchasing power of the local currency, and combating inflationary pressures, taking into account changes in oil prices.

6. ACKNOWLEDGEMENT

The author extends the appreciation to the General Directorate of Scientific Research & Innovation, Dar Al Uloom University for supporting this research through the Scientific Publishing Funding Program

REFERENCES

Aastveit, K.A. (2013), Oil Price Shocks and Monetary Policy in a Data-rich Environment. Norges Bank Working Paper 2013/10.

Abbaq, S., Ahmad, S. (2021), An impulse response functions analysis of oil price effect on key elements of the Saudi economy. PalArch's Journal of Archaeology of Egypt/Egyptology, 18(13), 853-864.

Abokwah, A.A. (2019), Effect of oil price shock on monetary policy in Nigeria: A vector autoregressive analysis. International Journal of African Development, 5(2), 82-90.

Ahmed, H.J.A., Wadud, I.M. (2011), Role of oil price shocks on macroeconomic activities: SVAR approach to the Malaysian economy and monetary responses. Energy Policy, 39(12), 8062-8069.

Akikina, K.R., Al-Hoshan, H. (2003), Independence of monetary policy under fixed exchange rates: The case of Saudi Arabia. Applied Economics, 35(4), 437-448.

Aleisa, E.A., Dibooĝlu, S. (2002), Sources of real exchange rate movements in Saudi Arabia. Journal of Economics and Finance, 26(1), 101-110.

Alekhina, V., Yoshino, N. (2018), Impact of world oil prices on an energy exporting economy including monetary policy. ADBI Working Paper. No. 828. Tokyo: Asian Development Bank Institute (ADBI). Available from: https://hdl.handle.net/10419/190249

Algaeed, A.H. (2018), The exchange rate pass-through into inflation with symmetric oil price shocks: An empirical analysis for Saudi Arabia: 1970-2015. American Journal of Applied Sciences, 15(1), 30-42.

Algaeed, A.H. (2020), Symmetric oil price shocks and government expenditure-real exchange rate nexus: ARDL and SVAR models for an oil-based economy, 1970-2018. Cogent Economics and Finance, 8(1), 1782076.

Al-Jasser, M., Banafe, A. (1999), Monetary policy instruments and procedures in Saudi Arabia. BIS Policy Papers, 5, 203-217.

Al-mulali, U., Che Sab, C.N.B. (2012), Oil prices and the real exchange rate in oil-exporting countries. OPEC Energy Review, 36(4), 375-382.

Almutairi, E. (2023), Assessing The Impact of Oil Price Fluctuations on The Saudi Economy, and Monetary Policy Uncertainty Shocks. Available from: https://hdl.handle.net/2346/96595

Almutairi, N. (2020), The effects of oil price shocks on the macroeconomy: Economic growth and unemployment in Saudi Arabia. OPEC Energy Review, 44(2), 181-204.

Alnefaee, S.M. (2018), Short and long-run determinants of inflation in Saudi Arabia: A cointegration analysis. International Journal of Financial Research, 9(4), 35-42.

Aloui, C., Hkiri, B., Hammoudeh, S., Shahbaz, M. (2018), A multiple and partial wavelet analysis of the oil price, inflation, exchange rate, and economic growth nexus in Saudi Arabia. Emerging Markets Finance and Trade, 54(4), 935-956.

Al-Qenaie, J., Al-Shammari, N. (2016), Causes of inflation across main oil exporting countries. Journal of the Faculty of Commerce for Scientific Research, 54(2), 93-116.

Alsamara, M., Mrabet, Z., Dombrecht, M., Barkat, K. (2017), Asymmetric responses of money demand to oil price shocks in Saudi Arabia: A non-linear ARDL approach. Applied Economics, 49(37), 3758-3769.

Alzyadat, J.A. (2022), Economic policies and price stability in Jordan. Res Militaris, 12(2), 7078-7093.

Bachmeier, L. (2008), Monetary policy and the transmission of oil shocks. Journal of Macroeconomics, 30(4), 1738-1755.

Baroudi, N., Filali, Y. (2021), The impact of oil price on monetary stability in Algeria over the period 1980-2019: An econometric study using The SVAR model. Finance and Markets Review, 8(01), 205-225.

Belloumi, M., Aljazea, A., Alshehry, A. (2023), Study of the impact of oil prices on economic output and inflation in Saudi Arabia. Resources Policy, 86, 104179.

Bernanke, B.S., Gertler, M., Watson, M., Sims, C.A., Friedman, B.M. (1997), Systematic monetary policy and the effects of oil price shocks. Brookings Papers on Economic Activity, 1997(1), 91-157.

Bodenstein, M., Guerrieri, L., Kilian, L. (2012), Monetary policy responses to oil price fluctuations. IMF Economic Review, 60(4), 470-504.

Castillo, P., Montoro, C., Tuesta, V. (2020), Inflation, oil price volatility and monetary policy. Journal of Macroeconomics, 66, 103259.

De Fiore, F., Lombardo, G., Stebunovs, V. (2006), Oil price shocks, monetary policy rules and welfare. Computing in Economics and Finance, Society for Computational Economics, 402, 1-39.

Dibooğlu, S., Aleisa, E. (2004), Oil prices, terms of trade shocks, and macroeconomic fluctuations in Saudi Arabia. Contemporary Economic Policy, 22(1), 50-62.

Elneel, F.A., AlMulhim, A.F. (2022), The effect of oil price shocks on Saudi Arabia's economic growth in the light of vision 2030 "A combination of VECM and ARDL models". Journal of the Knowledge Economy, 13(4), 3401-3423.

Emam, H.A. (2024), Examining monetary policy cyclicality in Egypt during crisis time: Global financial crisis versus COVID-19 pandemic. International Journal of Economics and Financial Issues, 14(1), 107-116.

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

Ftiti, Z., Guesmi, K., Teulon, F., Chouachi, S. (2016), Relationship between crude oil prices and economic growth in selected OPEC countries. Journal of Applied Business Research, 32(1), 11-22.

Gospodinov, N., María Herrera, A., Pesavento, E. (2013), Unit roots, cointegration, and pretesting in var models. In: VAR models in Macroeconomics-New Developments and Applications: Essays in Honor of Christopher A Sims. United Kingdom: Emerald Group Publishing Limited. p81-115.

Gunwant, D.F., Rather, S.R., Zargar, F.N. (2024), Oil price volatility shocks and the macroeconomic indicators: Evidence from Saudi Arabia. International Journal of Energy Economics and Policy, 14(3), 138-141.

Hoover, K.D., Perez, S.J. (1994), Post hoc ergo propter once more an evaluation of 'does monetary policy matter?' In the spirit of James Tobin. Journal of Monetary Economics, 34(1), 47-74.

Jumah, A., Pastuszyn, G. (2007), Oil Price Shocks, Monetary Policy and Aggregate Demand in Ghana (No. 212). Reihe Ökonomie/Economics Series. Available from: https://hdl.handle.net/10419/72684

Kamps, C., Pierdzioch, C. (2002), Monetary Policy Rules and Oil Price Shocks. Kiel Working Paper No. 1090.

Kilian, L., Lewis, L.T. (2011), Does the Fed respond to oil price shocks? The Economic Journal, 121(555), 1047-1072.

Kormilitsina, A. (2011), Oil price shocks and the optimality of monetary policy. Review of Economic Dynamics, 14(1), 199-223.

Köse, N., Ünal, E. (2021), The effects of the oil price and oil price volatility on inflation in Turkey. Energy, 226, 120392.

Lee, B.R., Lee, K., Ratti, R.A. (2001), Monetary policy, oil price shocks, and the Japanese economy. Japan and the World Economy, 13(3), 321-349.

Mandal, K., Datta, R.P. (2024), Oil price dynamics and sectoral indices in India - Pre, Post and during COVID Pandemic: A comparative evidence from wavelet-based causality and NARDL. International Journal of Economics and Financial Issues, 14(4), 18-33.

Mohammed Suliman, T.H., Abid, M. (2020), The impacts of oil price on exchange rates: Evidence from Saudi Arabia. Energy Exploration and Exploitation, 38(5), 2037-2058.

Mohammed, M. (2021), The differential effects of oil price shocks on exchange rate, inflation, and monetary policy rate in Ghana. Studies in Economics and Econometrics, 45(1), 23-41.

Muhammad, M.A., Shaaibith, S.J. (2022), Oil shocks and their impact on the money supply in Iraq for the period 2004-2020. AL-Qadisiyah Journal for Administrative and Economic Sciences, 24(2), 339-347.

Naseem, S. (2018), Macroeconomics determinants of Saudi Arabia's inflation 2000-2016: Evidence and analysis. International Journal of Economics and Financial Issues, 8(3), 137-141.

Natal, J.M. (2012), Monetary policy response to oil price shocks. Journal of Money, Credit and Banking, 44(1), 53-101.

Nazer, Y. (2016), Causes of inflation in Saudi Arabia. The Business and Management Review, 7(3), 147-154.

Nusair, S.A. (2019), Oil price and inflation dynamics in the Gulf Cooperation Council countries. Energy, 181, 997-1011.

Oloko, T.F., Ogbonna, A.E., Adedeji, A.A., Lakhani, N. (2021), Oil price shocks and inflation rate persistence: A fractional cointegration VAR approach. Economic Analysis and Policy, 70, 259-275.

Omotosho, B.S. (2022), Oil price shocks and monetary policy in resource-rich economies: Does capital matter? Journal of Economic Dynamics and Control, 143, 104479.

Osman, A.M., Ahmed, A.O., Eltahir, M.N., Mohamed, A.S., Shidwan, O.S., Ghada, M. (2019), Investigating the causes of inflation in Saudi Arabia: An Application of Autoregressive Distributed Lag (ARDL) model. International Journal of Applied Engineering Research, 14(21), 3980-3986.

Rahman, S., Serletis, A. (2010), The asymmetric effects of oil price and monetary policy shocks: A nonlinear VAR approach. Energy Economics, 32(6), 1460-1466.

Raid, M., Ahmad, N., Bagadeem, S.A., Alzyadat, J., Alhawal, H. (2024), The non-oil institutional sectors and economic growth in Saudi Arabia. Cogent Economics and Finance, 12(1), 2300819.

Rumzi Tausif, M., Haque, M.I., Khan, M.R. (2023), Effect of oil price shocks on output and prices: Evidence from Saudi Arabia. Environmental Science and Pollution Research, 30(50), 108855-108864.

Saliu, M.O., Adedeji, A.S., Ogunleye, E.O. (2020), Crude oil price shocks, monetary policy and output growth in African oil producing countries. Journal of Applied Economic Sciences, 15(1), 219-228.

Samimi, A.J., Shahryar, B. (2009), Oil price shocks, output and inflation: Evidence from some OPEC countries. Australian Journal of Basic and Applied Sciences, 3(3), 2791-2800.

Scott Hacker, R., Hatemi-J, A. (2008), Optimal lag-length choice in stable and unstable VAR models under situations of homoscedasticity and ARCH. Journal of Applied Statistics, 35(6), 601-615.

Thankgod, A.O., Maxwell, I.A. (2013), The effects of oil price shocks on monetary policy in Nigeria. International Review of Social Sciences and Humanities, 5(1), 58-66.

Wu, M.H., Ni, Y.S. (2011), The effects of oil prices on inflation, interest rates and money. Energy, 36(7), 4158-4164.

Ziaei, S.M. (2012), Transmission mechanisms of monetary policy in Saudi Arabia: Evidence from SVAR analysis. Journal of Modern Accounting and Auditing, 8(7), 990-1012.