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Oil Price and Macroeconomic Variables Nexus in GCC Countries

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Abstract

Is a country's oil resource a benefit or a curse? After the oil price shocks of 1973, the subject of oil prices and economic performance has taken on a great deal of significance. It is an essential component of the contemporary economy, and changes in it have an impact on every sector of the economy (Qianqin 2011). The intension of this paper is to assess how macroeconomic variables (Gross Domestic Product, Inflation, and Trade Openness) are affected by fluctuations in oil price in Gulf cooperation council countries using balanced panel data for six countries – Oman, Bahrain, United Arab Emirates, Saudi Arabia, and Kuwait – covering the period from 1995 to 2020, and adopting panel vector autoregressive model (PVAR). The results showed that most of the variables examined, namely: Gross Domestic Product, and Trade Openness have strong positive correlation to oil prices. On the contrary it was found that inflation has significant and negative association with oil prices.

Keywords: Oil Price, Macroeconomic Variables, GCC Countries, Co-integration, and PVAR.

1. Introduction:

It is difficult to pinpoint some element other than oil price that has had a bigger impact on an economy since the 1970s. Due to the oil embargo imposed by OPEC in 1974 and the subsequent rise in oil prices, the majority of economies experienced an economic downturn. As a result, the relationship between the price of oil and the economy is of considerable interest to both laypeople and economists. A significant benchmark for all countries globally, the price of oil serves as a result of the importance of oil to the international economy.

Theoretically, countries that import oil profit from low oil prices since they can create more at a lower cost. It quickens the economic growth and boosts consumer spending. On the other hand, countries that export oil profit from high oil prices since export revenue increases as oil prices rise. Additionally, this can be used to invest in more infrastructure, which will improve the welfare of the people living in these states. Additionally, the research has noted that variations in the price of oil are a major cause of shocks to macroeconomic variables, such as: Ahmed (2013), Akinsola and Odhiambo (2020), Brown and Yucel (2002). However, depending on whether a country exports or imports, the macroeconomic effects of oil price shocks vary (Krugman, 1983). For instance, a rise in oil prices results in a wealth transfer from oil-importing nations to those that export oil. Furthermore, policymakers in countries that produce oil face major obstacles as a result of oil price shocks (Kilian, 2009). According to the US Energy Information Agency, the Gulf Cooperation Council (GCC) nations own more than 40% of the world's proven crude oil reserves. This indicates the proportional significance of the GCC nations in the world oil market. According to Fasanya et al. (2021), the GCC nations experienced a larger surplus in 2012–2013 than either Germany or Japan due to rising oil prices.

The impact of oil prices on economic growth in this group of countries is particularly important for a number of reasons. The GCC countries play a significant role in the global oil market since they generate around 22134,000 barrels per day, or about 23.4% of the global oil output. Additionally, oil and gas income serve as the primary means of financing government spending in the GCC oil-producing countries. The economy is mostly affected by fiscal policy when there are oil shocks. It is vital to examine how the economy of these countries react to changes in oil prices. This study aims to investigate how changes in oil prices affect key macroeconomic indicators. Using a panel of unbalanced data for the Gulf Cooperation Council countries from 1995 to 2020,

a vector auto regressive model is used. Thus, in order to address the issues raised by this paper, the following research problems will be looked at.

The main motive for this paper is to assess the examination of oil price variations and their impacts on macroeconomic variables in the GCC countries is motivated by the significance of oil to the economic development. In addition, the economies of the GCC countries have changed significantly in recent years due to efforts to diversify away from oil and gas exports. Therefore, studying the impact of oil price fluctuations on these countries' macroeconomic variables can help policymakers to design appropriate policies to minimize the negative effects of oil price fluctuations and promote economic stability and sustainability.

This paper is structured as follows. In Section 2, we review the literature on how changes in the price of oil affect macroeconomic variables. Section 3 describes the data, the main variables, and the methodology. Section 4 presents and discusses the results, while Section 5 concludes.

2. Literature Review:

2.1 Transmission Mechanisms

The transmission mechanisms through which changes in the price of oil affect macroeconomic variables are reviewed and discussed in this section. In-depth analyses of the mechanisms by which changes in the price of oil affect macroeconomic variables have been conducted by researchers such as Davis & Haltiwanger (2001), Mignon & Lardic (2008), Al-Zeaud & Bauchaour (2012), and Oluwaseyi (2018).

2.1.1 Supply-Side Effect Channel

The supply-side effect, which is a result of rising oil prices, is one way that variations in the price of oil connect to macroeconomic issues (Kilian 2009). The marginal cost of production rises as a result of rising oil prices, which reduces productivity and slows GDP growth (Soytas & Dorul 2010; Ahmed 2013; Kocaarslan et al. 2020). Due to rising production costs, businesses may find it difficult to maintain output at present levels or at full capacity (Nabiyev & González 2009), which slows down and downsizes economic growth (Kocaarslan et al., 2020).). Because it could be difficult and expensive to reallocate capital and specialised people from one industry to another, labourers might have to wait for better employment chances (Ahmed 2013; Dogrul and Soytas 2010). Additionally, this can have a negative effect on overall economic activity and growth.

Furthermore, rising oil prices may cause supply shocks, which typically reduce potential output (Kilian 2009). The increase in oil prices is a sign of a shortage of crude oil. Oil is a vital component of production (Kilian 2014), hence a scarcity could result in a decline in productivity and output growth. Additionally, a slowdown in productivity and growth may have an impact on wages, disposable income, and perhaps even purchasing power (Ahmed 2013). If consumers think the rise in oil prices is only transitory, they may borrow more instead of saving more money, which could increase the equilibrium real rate of interest (Brown and Yucel 2002). When the real rate of interest increases and output growth slows, the demand for real cash balances may decrease (Kilian and Zhou 2019). The inflation rate rises together with the level of monetary aggregate growth. As a result, the real interest rate and measured inflation rate rise, and the GDP growth rate slows down (Ratti and Vespignani 2015).

2.1.2 Demand-Side Effect Channel

The demand-side effects of changes in the price of oil on macroeconomic variables are channelled through consumption and investment (Kilian and Zhou 2019). Consumers may try to smooth out their consumption by saving less or taking on more debt if the oil price increase is anticipated to be short-lived or if the consequences of output that were anticipated to be temporary turn out to have long-term implications. The entire demand and supply curves would change as a result (Kilian 2014; Kilian and Zhou 2019). A change in supply and demand of this kind could accelerate a slowdown in GDP growth as investment falls. Academics agree, nonetheless, that exogenous shocks to the price of oil cause recessionary and inflationary impacts (Hamilton 1996).

In the absence of real wage rigidities, Kilian (2014) asserted that even if an exogenous shock to the price of oil resulted in a negative shift in the entire supply curve and an increase in price level, it would not be predicted to lead to persistent inflation. According to Bruno and Sachs (1982), this interpretation is at odds with his theories. In assessing the transmission of oil price shocks to inflation, Brown, and Yucel (2002) suggested that as interest rates rise in response to monetary policy, demand for real cash balances decreases. Falling investment and consumption rates because of higher borrowing costs brought on by rising interest rates cause a decline in the pace of output growth.

2.2 Theoretical Background

Examining the asymmetric relationship between the price of oil and macroeconomic factors in the context of the GCC, a net oil exporter, is the aim of this paper's study of pertinent concepts. In order to comprehend the relationship between the price of oil and macroeconomics better, a few significant existing theories will also be examined. These include the theories of economic growth, linear/symmetric relationships, the reallocation effect, income transfer, and the real business cycle (George, 1994; Gnonzalez and Nabiyev, 2009; Davis, 1986; Hamilton, 1988; Loungani, 1992). The analysis of how these five theories' dynamics aided in the investigation of the relationship between oil prices and macroeconomic factors frequently makes use of their own foci and characteristics (Trang et al. 2017).

2.2.1 Theory of economic growth:

According to economic theory, changes in the price of oil have an impact on the economy through the supply and demand channels (that were previously described). Supply side effects could be explained by the fact that oil is a crucial production input. Because of this, a decline in oil demand caused by increased oil prices affects the productivity of other inputs and lowers corporate production. Demand is also impacted by variations in oil prices through investment and consumption.

The positive relationship between disposable income and consumption has an indirect impact on consumption. Oil-importing countries send money transfers to oil-exporting countries as the price of oil rises (Ahmed, 2018). As a result, consumption declines, lengthening the apparent duration of shocks in oil-importing nations due to the extent of this effect. Additionally, a company's expenses go up as a result of increased oil prices, which is unfavorable for investment. In addition to these effects of supply and demand, changes in oil prices may also have an impact on the economy through changes in inflation and the foreign exchange markets. The importance of oil is typically underestimated in favor of traditional production inputs like land, labor, and capital by common economic growth models (Ahmed, 2018).

It is important to keep in mind that numerous academics have updated the conventional knowledge to consider the problem of oil prices and its influence on economic growth. Production is also the most important component of economic growth, according to Cobb and Douglas' (1928) production theory. Capital, land, and labor are introduced during the beginning stages of

production; however, these factors of production can only degrade and cannot be exhausted. Additionally, a few examples of intermediate inputs that are added around halfway through the production process and are fully utilized during the process include electricity, coal, oil, and gas. Additionally, crude oil's marginal product is what gives it its intrinsic value. The marginal product should serve as the basis for any oil price. The theory does stress the need to additionally consider other features of the oil being utilized, such as efficiency, sturdiness, storage ability, safety, and conversion costs. The state of the land, labor, and other resources that are used in combination with the oil must also be evaluated.

2.2.2 Real business cycle

Real business cycle theory holds that oil price shocks, which have an impact on the dynamics of the global market, are the primary cause of business cycle fluctuations (Yucel & Brown 2002; Su et. al. 2021). According to proponents of the real business cycle, exogenous shocks like technological shocks are mostly caused by economic crises and fluctuations (González and Nabiyev 2009). A previous study indicated that a model driven solely by technological shocks cannot adequately explain various cyclical events (Dixit and Pindyck 1994).

Because of this, other disruption models like environmental laws, oil shocks, natural disasters, and pandemics like the coronavirus 2019 were urged to remain uncorrupted (George 1994; González and Nabiyev 2009; Su et al. 2021). George (1994) also claimed that the most significant variables influencing the cycle can be identified by identifying whether they are effects of supply shock or demand shock in the economy. According to several authors, like Baffes et al. (2015) and Prest (2017), the 2014–2015 oil price shocks were mostly brought on by supply shocks as opposed to demand shocks, technical shocks, and the strengthening US currency. Real business cycle theory's central tenet, according to Baffes et al. (2015) and Chen et al. (2015), is that if an external shock occurred that directly affected the efficiency and changes of labor and capital, it might have an impact on employers' and employees' decisions, changing their consumption and production patterns and, ultimately, negatively affecting output. According to this argument, the volatility of oil prices may have an effect on economic expansion. The effects of business cycles fluctuate in strength and duration, making them look inconsistent (González and Nabiyev 2009).

2.2.3 Linear/Symmetric Relationship Theory

The econometric component of the linear/symmetric theory describes the mechanisms through which variations in the price of oil affect economic growth. Additionally, according to the Linear/Symmetric Relationship Theory of Growth, which includes supporters like (Hamilton 1983; Hooker 1986; Laser 1987), it is important to take into account the volatility and unpredictability of oil prices when estimating economic growth. Furthermore, this idea was largely based on what transpired in the oil market between 1948 and 1972 and how that affected the nations that import or export oil. Hamilton also looked into the macroeconomic implications of oil price volatility in the US in 1983. He concluded that variations in oil prices have influenced different economic downturns in the United States. Thus, he concluded that the macroeconomic indicators are significantly impacted by the fluctuation of oil prices. The volatility of the oil price and its impact on GNI growth from 1948 to 1972 were both significant variables, according to Hooker's extensive empirical analysis from 2002. Laser (1987) provided evidence of the symmetric relationship between economic growth and oil price volatility. She discovered through her econometric research that an increase in oil prices would produce a reduction in GDP; nevertheless, the effect of an increase in oil prices on GDP is debatable because they had varied effects in other nations.

2.3 Previous Empirical Studies

The effect of oil price shocks on macroeconomic indicators will be shown in this section using empirical data. This is important since it describes the main goal of the paper. Examining various studies in this area will also help to identify the various ways that oil price shocks may impact the economy. Additionally, there haven't been many empirical studies that have sought to investigate how changes in oil prices may affect the macroeconomics of the GCC nations.

Using an error correction approach and co-integration, Fasano and Wang (2002) seeked to investigate the causal relationship between total government spending and revenue for the GCC from 1980 to 2000. Thus, a boost in revenue for GCC countries in the first period automatically translates into an increase in government spending, according to their findings.

Berument et al. (2010) examined the effects of oil price volatility on economic growth in 16 MENA countries using annual data from 1952 to 2005. They used the SVAR model to illustrate the dynamics of the global oil price shocks on output growth by utilizing the exchange rate and

inflation as their measuring sticks. The expansion of net oil exporting nations Oman, Qatar, Kuwait, and UAE was found to be positively and statistically impacted by oil price shocks of one standard deviation. Contrarily, based on their findings, Bahrain's economy does not appear to be much impacted by fluctuations in the price of oil.

Al-mulali et al. (2011) used data from 1970 to 2000 to investigate how the oil price shock affected Qatar's economy. This study primarily employed the VAR model to examine four indicators: investments, GDP, exchange rate, and inflation. The authors discovered that oil price shocks had a favorable long- and short-term impact on the GDP. They have discovered that the oil price shock has a negative influence on inflation, nevertheless.

With annual data for six OPEC members, including Kuwait and Saudi Arabia, from 1979 to 2009, Moshiri and Banijashem (2012) used a VAR model. Despite assuming a linear relationship, the authors find no conclusive correlation between oil price shocks and economic growth. However, when asymmetries are taken into account, they find that positive and negative shocks have different and robust relationships. They find that higher oil prices do not lead to long-term economic growth, whereas lower oil prices result in large income reductions and economic stagnation. The authors find that negative oil price shocks have little effect on economic growth in Saudi Arabia and Kuwait.

Al Obaid (2017) examined the effects of oil price volatility on government spending in Saudi Arabia using data from 1981 to 2016 that spanned the primary period of oscillations. Consequently, the VAR (vector autoregressive) model was used to investigate the long-term relationships between the variables. The results suggest that there is a significant and significantly positive relationship between changes in oil prices and government investment in the targeted industries over the long run.

According to research by Alkhateeb et al. (2017) into the asymmetrical impact of oil prices on job growth in Saudi Arabia, both rising and dropping oil prices have a favorable and inelastic impact on employment in the country. The variance in the coefficients' magnitudes further supported the asymmetry. As opposed to dropping oil prices, rising oil prices had a greater impact on employment. Growth in the economy also helped the job market in the Kingdom.

Ahmed (2018) aimed to objectively analyse whether there is a correlation between changes in crude oil prices and Oman's inflation patterns between 1990 and 2017. The results demonstrated that the fluctuations in the price of crude oil only had a long-term direct and significant impact on inflation in Oman by utilizing the bound test of ARDL. Utilizing the ARDL bound test. The results show that Oman's inflation was only directly and significantly affected by crude oil price changes over the long term.

Koseolgu et al. (2019) employed asymmetric causation to analyses the relationship between the price of oil and the GCC nations from 1996 to 2018. The results of the usual bootstrap causality test indicate a bidirectional causal relationship between the OP and the GDP per capita of Saudi Arabia and Qatar. The asymmetric causality tests yielded different results for other countries, demonstrating that OP+ and GDP+ are causally associated in a single direction in Oman and Saudi Arabia. While there is a one-way association between OP and GDP per capita in Bahrain, Qatar, and the United Arab Emirates, there is a bidirectional causal relationship between GDP and OP in Kuwait and Oman. The findings are consistent with the Real Business Cycle Theory, which holds that the GDP per capita is significantly impacted by external positive or negative shocks through channels related to consumption and investment.

Examining the asymmetric and symmetric effects of oil price fluctuations on inflation (CPI) in GCC countries from 1970 to 2016 is the goal of Nusair (2019). This study employs the pooled mean group method, the linear autoregressive distributed lag model, and the asymmetric nonlinear ARDL model. The author discovered that the variables are co-integrated and that there is substantial evidence of long-run asymmetry. As a result, this suggests that there are variations in how rising and dropping oil prices affect inflation. Additionally, whereas an increase in the price of oil regularly has a considerable beneficial impact on inflation, an increase in the price of oil either has no impact at all or a negative impact.

Additionally, the PMG model asserts that the sole factor positively and significantly affecting inflation is an increase in oil prices. Last but not least, the findings imply that positive changes in the price of oil have a greater influence than negative ones, that an oil price shock has a greater long-term effect than a short-term one, and that the effect of the oil price on domestic inflation only has a partial spillover.

3. Methodology and Data:

3.1 Data collection

This study is focused on the nations of the GCC. They are major producers and exporters of oil, where their economies are strongly reliant on their exports of oil. Hence, to reduce the negative effects of oil price variations and to promote economic stability and sustainability, policy makers can be assisted by research into the effects of oil price changes on these countries' macroeconomic variables. Further, the research utilized a panel data analysis. Most importantly panel data approach was chosen to provide a more comprehensive and robust analysis of the impact of oil price fluctuations on macroeconomic variables on the GCC.

The paper decided to use a sample period that spanned 25 years, from 1995 to 2020. Moreover, while developing the model, a few years were missing; however, these years were estimated by using the average mean. And that's because the period of 1995 until 2020 is a long enough period to capture the long-term effects of oil price fluctuations on macroeconomic variables in the GCC. Additionally, Statista and the World Bank were also used as sources of secondary data.

3.2 Variables of Study

Crude oil price represents, on the world market, the average annual price of oil. **GDP growth rate** denotes annual GDP growth rate. **Inflation** is measured by the index of consumer price and **Trade openness** tests how much the country is integrated with the world economy.

3.3 Methodology

Descriptive statistics is mainly used in this study to identify the study prime characteristics. Hence, the mean depicts the value that is in the middle of the variables in the data, whereas the standard displays the average distance between the mean value and the observation. Furthermore, a variable's behavior across time—whether at its peaks or bottoms—is determined by both the maximum and minimum values.

Correlation analysis is mostly carried out to assess the strength and direction of a linear correlation between each pair of variables. Additionally, the correlation coefficient value can be used to gauge how strong the association is—whether it is weak, high, or even moderate. Additionally, the

correlation coefficient's significance tells whether there is a linear relationship. The null hypothesis is that there is no linear relationship between two variables.

For the purpose of unit root, co-integration and proposed model to be well-established, the ideal number of lags is needed. However, for our model theory of economics is silent on what's the appropriate number of lags that should be applied. The ideal lag duration for our VAR model is chosen using a variety of lag selection factors. These comprise the Schwarz Information Criterion; Akaike Information Criterion; and the ratio of likelihood. Further, The Akaike information criterion (AIC) and the Schwartz information criterion (SIC) are notable scenarios, though which of the lag lengths generated by them is chosen depends on the model and is usually determined by which of the two criteria is the least.

Due to the inclusion of time dimension, testing for unit root is a prerequisite for dynamic models. The panel data under consideration is non-stationary around a deterministic trend in case of the presence of unit root. For this purpose, the study uses the Augmented-Dickey Fuller (ADF) (Dickey & Fuller, 1979), (Dickey & Fuller, 1981), (M. Hashem Pesaran & Shin, 1999) and (M. H. Pesaran, Shin, & Smith, 2001) tests to evaluate the presence of unit roots. The decision is made using the P-value, and the null hypothesis assumes that the data set has a unit root issue. Additionally, this test is carried out since the econometric model cannot be created without first checking the stationarity of the provided variables.

To evaluate the existence of co-integration between the variables this paper implied the KOA co-integration test. The KOA identifies homogeneous coefficients on the first stage regressors and cross-section individual intercepts (Suleman, 2013). Moreover, to ascertain whether one or more equations in the multivariate panel data system are co-integrated. Therefore, the main objective of this test is to lay a strong foundation for the planning process. Under the null hypothesis the variables of study are not co-integrated.

The concept of Granger-causality test was introduced by (Granger, 1969), (Granger, 1981), (Granger, 1988), (Granger & Lin, 1995) and Sims (1972) which is widely used to determine the importance of the interaction between two series. Further, Granger's original work in 1969 of the definition of non-causality Granger (1969) has attracted an attention in economics that it hardly needs any introduction. Under the null hypothesis a certain variable does not cause the other.

The model of Vector Auto-Regressive (VAR) is chosen to be applied. VAR model includes the lags terms for both the independent and dependent variables. Hence, we expect to have the problem of endogeneity during the expected correlation between the independent variables in terms of error term observations and the lags. As a result, this paper will use the instrumental lags variable in order to minimize/ handle the problem of endogeneity. Further, the VAR model also does not impose illogical or arbitrary assumptions or limits on economic data and is an independently expanded macro econometric model of economic variable interconnection. Following authors such as Boheman and Maxen (2015), Akinleye and Ekpo (2013), this study specifies a vector autoregressive model to study the interaction among oil price and macroeconomic variables in GCC.

4. Results

Table (1): shows descriptive statistics for variables of study.

Variable	Obs	Mean	Std. Dev.	Min	Max
Oil price	182	54.66231	31.22596	12.76	111.63
GDP	182	1.52e+11	1.79e+11	5.85e+09	8.17e+11
Inflation	182	10.42106	39.61785	-16.11733	387.3108
Trade of GDP	182	102.4834	32.24766	.0209992	191.8726

As per table (1), provides a detailed statistics of the variables in the model. Furthermore, the study number of observations is equal to (182). Adding to that, for each of the model's chosen variables, the descriptive statistics table displays the mean, standard deviation, minimum and maximum values. And it is used to explain the behavior of the variables study. The min for oil price is equal to 12.76 with a percentage of max equal to 111.63. Further, the min for GDP as shown is 5.85 billion, while the percentage of the maximum is equal to 8.17. Further, the min value for inflation is -16.11733 while the percentage of the max is equal to 387.31. Finally, the min value for trade is equal to 0.020992 and the percentage of maximum is equal to 191.87.

Table (2): shows correlation coefficients among variables of study.

Variables	lOilprice	lGDPCurrents	linfa	lTradeofGDP
lOilprice	1.000			
lGDPCurrents	0.563	1.000		
linfa	-0.171	-0.200	1.000	
lTradeofGDP	0.181	0.062	-0.045	1.000

*, **, *** denote 1%, 5% and 10% levels of significance respectively

The correlation matrix will look at the direction and magnitude of the linear relationship between the explanatory and dependent variables. Additionally, the correlation coefficient value determines the strength of the relationship, which can be (Weak, Moderate, and Strong). Table (2) shows the correlation matrix of study variables. Hence, there is a linear/ positive and strong relationship between the oil price and the gross domestic product. While inflation have a negative nonlinear and weak relationship with oil price. Finally, trade has a linear positive however, weak association with oil price.

Table (3): shows lag length criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-351.0470	NA	0.001472	4.830572	4.911944	4.863634
1	321.2100	1298.782	1.95e-07	-4.098095	-3.691233*	-3.932782*
2	333.6491	23.35508	2.05e-07*	-4.049647*	-3.317296*	-3.752085*
3	351.8653	33.21053	1.99e-07	-4.079800	-3.021960	-3.649988
4	366.7715	26.36477	2.03e-07	-4.064919	-2.681590	-3.502857
5	403.2370	62.51218*	1.54e-07*	-4.343360*	-2.634542	-3.649049

After conducting the lag-length selection it can be determined that at lags (2) the HQ and SC which are the most appropriate criteria are significant and at lags (2) there are less problem of co-integration (LR & Logl) therefore, this study will adopt the model at lags (2). Since at lags 3,4,5 there is a problem of co-integration.

Table (4): Kao co-integration Test

ADF	t-Statistic	Prob.
	-1.435895	0.0755
Residual variance	0.012630	
HAC variance	0.019004	

In table (4), a co-integration association within the test variables was found through using KAO test. Further, it indicates the existence of a long-run relationship between and among the variables. And that's as shown in table (4) the p-value is less than level of significance (0.10) which means null hypothesis is rejected and accept alternative hypothesis. Hence, after finding that the variables are integrated at level, and that there's a co-integration between them. Thus, the model of VAR will be utilized.

Table (5): Granger Causality Test

	F-statistic	P-value
OP does not granger cause GDP	196.521	0.000
GDP does not granger cause OP	225.541	0.000
INFA does not granger cause OP	149.698	0.000
OP does not granger cause INFA	40.026	0.000
Trade does not granger cause OP	7.684	0.021
OP does not granger cause Trade	10.443	0.000
GDP does not granger cause INFA	24.417	0.004
INFA does not granger cause GDP	198.898	0.000
Trade does not granger cause GDP	31.492	0.000
GDP does not granger cause Trade	140.270	0.000
INFA does not granger cause Trade	32.239	0.000
Trade does not granger cause INFA	190.935	0.000

***, **, *** denote 1%, 5% and 10% levels of significance respectively**

As it can be determined from the table (5) is that oil price volatility granger causes gross domestic product (GDP) and trade openness in these countries without feedback. Further, the positive sign of the sum of lagged coefficient for both variables indicates that oil price volatility increases both GDP and trade openness which in other words implies that positive oil price volatility is beneficial to the economic growth of the gulf cooperation council countries. Additionally, these findings support the view by both Olomola & Adjumo (2006) and Omojolaibi & Egwaikhide (2013).

On the contrary, the results showed that volatility of oil price does not cause granger to inflation. And that's make sense as other factors such as global economic conditions, also government policies and economic diversification efforts plays a crucial role in shaping inflation dynamics in these countries. Also, it is supported by Shukri (2016) who tends to test the relationship between oil price and inflation in these economies and found no evidence of a granger causal relationship between them.

Table (6): Unit Root Tests

Variable	LLC		IPS		ADF	
	t-stat	**P-value**	**t-stat**	**P-value**	**t-stat**	**P-value**
LOIL	-6.604	0.000	-350346	0.000	34.561	0.002
LGDP	-8.518	0.000	-3.4154	0.000	34.816	0.002
LINF	-3.381	0.001	-4.5379	0.000	48.503	0.000
LTRADE	-1.872	0.031	-2.7901	0.001	37.129	0.001

*, **, *** denote 1%, 5% and 10% levels of significance respectively

Further, a unit-root test will be used to assess if the variables are stationary or not. To avoid wrong specification of the model further, if any of the variables faces the problem of non-stationarity it will be solved by taking the first difference. Hence, this study implements three different unit root tests which are n (Levin, Lin and Chu test (2002), Im, Pesaran and Shin test (2003) and ADF Fisher-type (Dickey & Fuller, 1979) and (Dickey & Fuller, 1981) to examine whether the variables follow a stationarity procedure. The results from the three tests as shown in table (6) showed that (LOP, LGDP, LINFA & lTRADE) are stationary at level with p-values less than Alva (0.05) therefore, the tested variables do not face the problem of unit-root. Hence, we

will reject the null hypothesis and accept the alternative. Hence, there is no need to use 1st difference.

Table (7): VAR models outputs

	Model 1	Model 2	Model 3	Model 4
VARIABLES	lOilprice	lGDPCurrentus	linflation	lTradeofGDP
L.lOilprice	0.28*	-0.72***	1.02***	0.06
	(0.15)	(0.10)	(0.09)	(0.04)
L2.lOilprice	0.89***	0.85***	-0.65***	-0.00
	(0.13)	(0.08)	(0.07)	(0.04)
L.lGDPCurrentus	0.65***	1.95***	-1.84***	-0.16**
	(0.25)	(0.17)	(0.14)	(0.07)
L2.lGDPCurrentus	-1.01***	-1.16***	1.50***	0.07
	(0.23)	(0.16)	(0.13)	(0.06)
L.linfa	0.08	0.01	0.54***	0.01
	(0.05)	(0.04)	(0.06)	(0.02)
L2.linfa	-0.13***	0.08***	-0.09***	-0.19***
	(0.03)	(0.02)	(0.02)	(0.01)
L.lTradeofGDP	0.75***	0.82***	-1.04***	0.61***
	(0.20)	(0.16)	(0.19)	(0.08)
L2.lTradeofGDP	-0.31	-1.28***	0.77***	0.51***
	(0.20)	(0.12)	(0.15)	(0.07)
Observations	126	126	126	126

*, **, *** denote 1%, 5% and 10% levels of significance respectively

The empirical results section provides the generalized method of moments (GMM) regressions to estimate the association between oil price and macroeconomic variables.

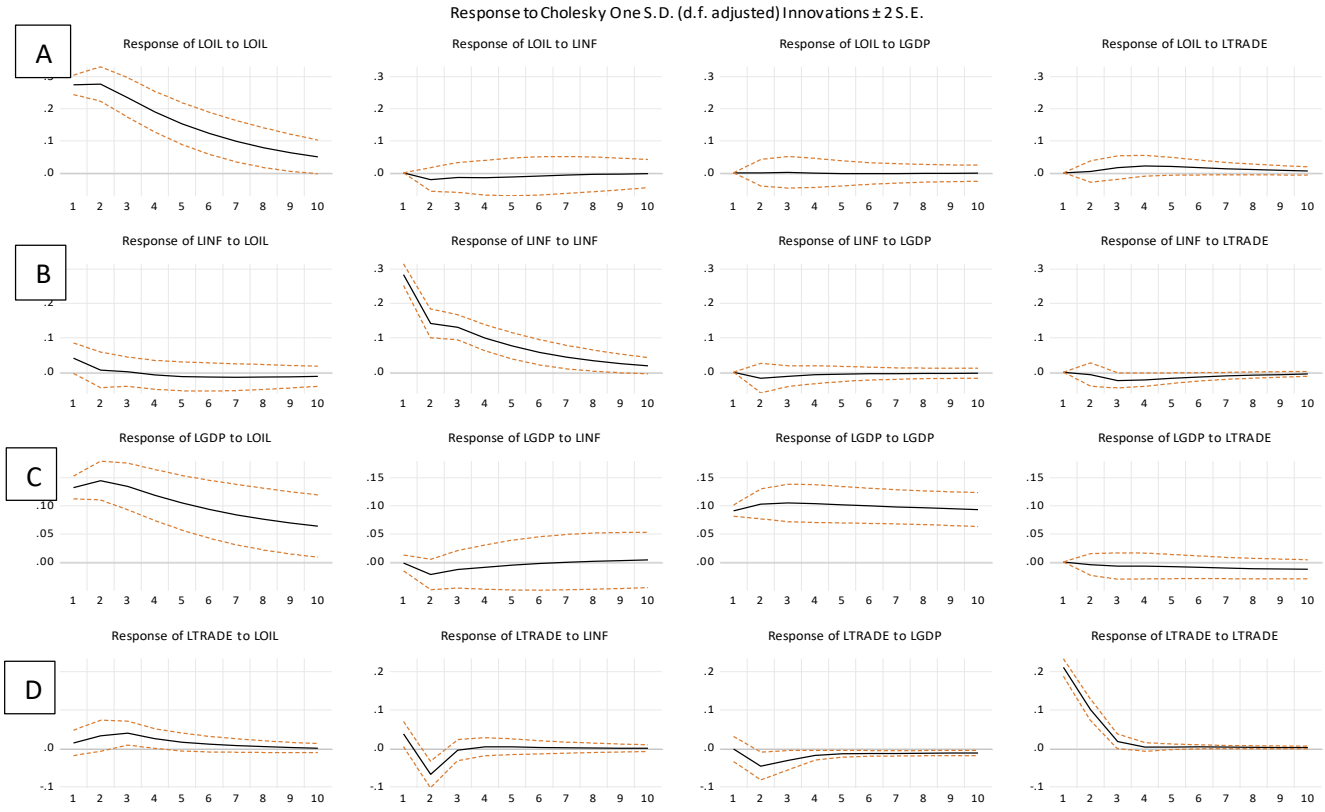
Hence, table (7) provides the impact of Loilprice on LGDP, Linfa and LTradeofGDP. Further, the table results indicate that all variables of the study are significant within lagged one and two.

Furthermore, the table indicates that 1% increase in oil price leads to 0.89% increase in oil price at 1 percent significant level.

Adding to that, 1% increase in LGDP causes 0.65% increase in oil price at 1% significant level. Furthermore, 1% increase in inflation (LINFA) is equal to 0.13% fall in oil prices.

Moreover, 1 % increase in trade openness (LTradeofGDP) leads to 0.75 % increase in oil price at 1 percent significant level.

Graph (1): shows Impulse response function



To explain how unexpected immediate shocks to the price of oil affect the relevant macroeconomic study variables. The impulse response function is utilized. Further, the presented VAR test in Graph (1) serves as framework for this test. Hence, Graph (1) displays the IRF (IMPULSE RESPONSE FUNCTION) results and demonstrates how each indicator of macroeconomics responded to the shocks of oil price. Additionally, Graph. (1 A) findings show

that from period 1 to period 3, a standard deviation shock to (LOILPRICE) has a significant upward trend. Afterwards, the price of oil steadily decreased in response to itself.

Moreover, Graph. (1 B) from period (1) to period (3), (LINF) responded favorably to shocks in the price of oil. Then, from period 4 to period 10, it starts to fall towards the negative zone. However, Graph. (1 C) from period (1) to period (4), a standard deviation to (LOP) results in high GDP (Gross Domestic Product). Then, from period 5 to period 10, it began to rapidly decline. It is, nevertheless, still in the favorable area. The findings Graph. (1 D) also indicate that a standard deviation innovation of trade to oil exhibits a significant response beginning in the first period and gradually declining until the tenth period. The outcomes, however, were all favorable.

5. Discussion

This paper examined the impact of oil prices fluctuations on the macroeconomic variables and filled that gap by examining the relationship between oil price and the economy in gulf cooperation council countries (Kuwait, Bahrain, Qatar, Oman, UAE, and KSA). However, most of the literature studies mainly focused on the impacts of oil price on the macro-economy either on single countries in GCC or using another indicator such as stock market. Hence, the study covers the period from 1995 to 2020 in the GCC nation, based on the authors' best knowledge, it is the first empirical work to adopt the latest data in GCC countries using these indicators.

Moreover, theoretical framework mainly consisted of theories which explains how fluctuations of oil price have an impact on the economy. Furthermore, the majority of earlier studies examined in section 2.3 that investigated the relationship between oil price and macro-economy found a positive correlation between the price of oil and the macroeconomic indicators. As a result, this research main hypothesis is that fluctuations of oil price and macroeconomic indicators are related. Hence, using the secondary data from World Bank and Statista covering the period of 1995 until 2020.

The findings illustrate that oil price has a significant positively impact on both the gross domestic product (lgdp) and trade openness (ltradeofgdp) and this finding is in line with the previous empirical studies discussed earlier. See for instance (Jouini & Galoul, 2021: Chang et al., 2011).

In addition, the economies of the GCC are highly dependent on oil exports and mostly rely on procedures for setting oil prices that are driven by the market. As a result, the impact of crude oil prices on these economies is still substantial. On the other hand, the world economic performance is impacted heavily by global oil prices and its amount of production. Therefore, this phenomenon gives the GCC economies the ability to affect the global economic performance.

However, it can be examined that unexpectedly, at lag 7, the effect of oil price on inflation rate (LINFA) was discovered to be negative and statistically significant. Which claims that it will almost take seven years for the price of oil to have an impact on the inflation of GCC (Gulf Cooperation Council) countries. These findings match Ahmed (2018) empirical study.

6. Conclusion

Even though economists' knowledge of the fluctuations of oil price has improved greatly recently. Oil prices however still remain an amazement for financial-market participants, decision makers and economists. Accordingly, this paper was conducted to ascertain how fluctuations of oil price affected the macro-economy of the gulf cooperation council countries (GCC).

Moreover, this paper used three vital macroeconomic indicators such as: (Gross domestic product, inflation, and trade openness). Therefore, for econometric analysis, models using a panel data analysis and using the (VAR) model has been applied. Further, this study used unit root in order to check for the variable stationarity and it has been showed that all the variables achieved stationarity at level I (0).

Furthermore, we applied the correlation matrix along with descriptive statistics and granger, co-integration and IRF. Furthermore, according to the system of GMM, the empirical results revealed that both gross domestic product as well as trade openness and inflation are impacted changes of oil price positively at 1% significance level. Thus, the study showed that oil price is an important variable in the macroeconomic stabilization of GCC as it significantly affects the GDP, inflation, and trade. As such, findings assured that economic growth is also impacted by oil price, a relationship that was established by earlier research.

In addition, the results of the impulse-response functions of the linear impact model show a positive correlation between the GDP of the GCC countries and global crude oil prices. The GDP

growth in these oil exporting economies should have boosted as a result of higher public revenues brought on by higher crude oil prices.

Based on the findings, it is recommended that GCC countries adjust their economic policies to lessen their reliance on oil and to promote the use of renewable and green energy sources by providing incentives and basic information to relevant companies. This will aid the GCC economies in increasing both their profitability and environmental quality. Second, greater taxes should be levied on outdated technology to encourage enterprises to adopt newer technology while giving preference to new/advanced technology for industrial output. In the end, this will increase production effectiveness, decrease energy consumption, and promote overall economic growth.

The macro-economic effects of oil prices were the only factor that the present study concentrated on; however, future research can look into how the price of oil affects public health, life expectancy, and environmental degradation. It would be fascinating to theoretically and practically explain the odd phenomenon in future studies.

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