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Article

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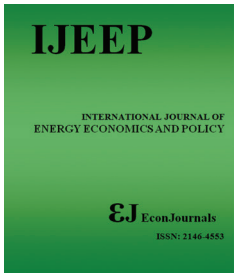

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Can Oil Prices Volatility Explain Economic Growth?

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ABSTRACT

The research focuses on the relationship between oil price volatility and economic activity in the context of a sample of six GCC countries. The study derives the results from an annual data set (1998-2021) and involves correlations, linear regression, curvilinear regression, panel data regression and causality tests to draw conclusions. It was observed that panel data analysis with random effects was best able to explain the positive relationship between oil price volatility and economic activity. Kuwait was observed as an exception country in the study as it demonstrated insignificant relationships and differentiating behavior. The global financial crisis was observed as a significant event on global oil volatility.

Keywords: Oil Price, Economic Growth, Regressions, Gulf Cooperation Council
JEL Classifications: Q31, F43, Q32, C13

1. INTRODUCTION

Natural science suggests that energy is crucial to economic production but mainstream economic growth theory largely ignores the role of energy (Stern, 2018). The economic activity in a country is driven by energy, largely contributed by oil energy. Different economics react differently to oil price shock. There may be a scenario where the oil prices are increasing but the economy is prospering (Shahbaz et al., 2017). Growth and feedback effects indicate that more aggressive power policies should be put in place in the short run to achieve long-term sustainable economic growth. Oil prices can forecast economic activity (Narayan, 2014). Ftiti et al. (2015) found that the medium-term impact of oil price on an economy had a bigger influence than the short-term impact. The negative effects of oil shocks on aggregate demand could be used to explain the relationship between oil prices and business cycles. Indeed, a rise in oil prices lowered overall supply because businesses bought less energy as a result of increased energy costs. As a result, potential output decreased and the productivity of a given amount of capital and labour lowered.

Crude oil is a crucial input in various sectors of the economy, particularly transportation, manufacturing, and energy production. When oil prices rise, it can increase production costs for businesses, leading to higher prices for goods and services. This can potentially dampen economic growth as businesses face increased expenses. High oil prices can have an impact on consumer behavior. When oil prices rise, it can increase the cost of transportation and energy, reducing consumers' discretionary income. This can lead to decreased consumer spending, affecting businesses and overall economic growth. Conversely, lower oil prices can put more money in consumers' pockets, boosting spending and economic growth. Oil-exporting countries heavily rely on oil revenues to support government spending and investment. Higher oil prices can increase their fiscal capacity and stimulate economic growth through increased government spending and investment in various sectors. Conversely, lower oil prices can constrain their budgets and investment capabilities, potentially impacting economic growth. It's important to note that the relationship between crude oil prices and economic growth is not always linear or immediate. Other factors such as geopolitical events, supply and demand dynamics, monetary policy, and market sentiment can also

influence the relationship. Additionally, the impact of oil price changes on economic growth can vary across different countries and regions, depending on their level of oil dependence, economic structure, and policy responses.

A major factor in the relationship between oil prices and economic growth is the region's reliance on oil exports and production. The economies of several Middle Eastern nations, many of which are significant oil exporters, are greatly impacted by changes in oil prices. Maghyereh et al. (2019) reported that Jordan and Turkey's industrial output is negatively impacted by the volatility of the oil market. The Gulf Cooperation Council (GCC) countries are oil exporters and oil driven economies and volatility in oil prices is a bidirectional phenomenon for them. According to Malik and Masood (2018), economies that depend on oil have experienced significant growth variations that are related to changes in the price of oil. They report that expansion rates of GDP per capita and GDP per worker were found to be quite low as a result of the rapid population and labour force expansion in the majority of oil-based countries. With Kuwait as an exception, the results by Mohammed et al. (2016) revealed that oil exporting nations' economies respond to changes in oil prices with a rather high degree of elasticity. It can be said that in reaction to changes in the price of oil, the Middle East has gone through numerous cycles of economic expansion and contraction through the years. The region's governments are increasingly aware of the need to diversify their economies, support non-oil industries, and enact economic reforms in order to lessen their reliance on oil and lessen the negative consequences of oil price volatility. Miamo and Achuo (2022) found evidence of a significant positive effect of crude oil price on economic growth both in the short run and long run. However, after splitting the panel into net oil exporters and importers, the results for net oil importers remain consistent with those obtained for the whole panel, unlike those for net oil exporters revealing a positive and negative effect of crude oil price on economic growth in the short-run and long-run periods. They also found evidence of a bidirectional causality between crude oil price and real GDP.

As per the data (www.asb.opec.orgin), in 2021 the top three exporters of Crude Petroleum across the globe were Saudi Arabia ($138B), Russia ($113B) and Canada ($81.2B). The top three importers were China ($208B), United States ($120B) and India ($93.5B).

1.1. Need of the Study

Since ancient times, oil dominance (energy acquisition) has been one of the reason for local and international conflicts. Settling the oil ownership issue, the pricing and allocation of oil resources is a contentious issue of the modern times. The importance of raw petroleum in the overall financial system and the effects of oil prices instability on financial development have captured huge attention. The crude oil is one of the most traded items around the globe. Countries with significant oil production and exports can experience a direct impact on their GDP when oil prices fluctuate. Higher oil prices can lead to increased government revenue, investment, and economic growth in these countries. Conversely, lower oil prices can strain their economies and hinder growth. Berk and Yetkiner (2014) test the role of energy prices on economic growth and found a significant cointegration between energy prices and real GDP per capita. The Gulf Cooperation Council (GCC) countries are oil exporters and oil driven economies and the volatility in oil prices is a bidirectional phenomenon for them. It is imperative to understand that the economic effects of oil prices on specific Middle Eastern nations will vary as within GCC the country's economic activity differentiates. The relationship between crude oil prices and economic growth is complex and can vary depending on several factors. The theory of economic growth (Samuelson and Nordhaus, 1985) proposes that the economic growth is determined principally by production which in turn depends on energy. This also has concurrence in the "Physical" theory of economics. Saleem et al. (2022) reported that crude oil prices have raised the ramifications for countries and possibilities of macroeconomic advancement. Hooker (1996) observed that there is no association between oil costs and macro-economic factors while (Mork, 1989) have shown the straight association between the oil costs and money related movements. A study focused on the oil exporting GCC countries will surely add to the existing literature on the interdependence of oil prices and economic growth. This research contributes to the literature in novelty as it relies on different types of regression to validate the relationship between oil price volatility and economic activity on a sample of six GCC countries.

2. LITERATURE REVIEW

A major factor in the relationship between oil prices and economic growth is the region's reliance on oil exports and production. The economies of several Middle Eastern nations, many of which are significant oil exporters, are greatly impacted by changes in oil prices. Herrera et al. (2015) observed that direct-supply effect of an increase in crude oil price is symmetric although its sign is ambiguous for oil-exporting countries depending on the size of the oil sector to the country's GDP. The interactions between crude oil price and growth (Lee and Ratti, 1995) is analyzed by differentiating between oil price volatility and oil price changes. Miamo and Achuo (2022) worked on a panel data for 32 African countries (1980-2017) and used the panel vector auto regression (VAR) estimation technique to analyze the interactions between oil prices and economic growth. Leduc and Sill (2004) analyzed the economy's reaction to oil value under an assortment of money-related strategy rules. Cologni and Manera (2007) applied a basic VAR model for G-7 nations to contemplate the immediate impact of oil value on the economy. Akinlo and Apanisile (2015) found that the volatility of oil price has a positive and insignificant impact on the economic growth of non-oil producing countries while it has a positive and significant impact on oil producing countries. Aslanoğlu and Deniz (2013) confirm that the rise in oil price brings about a trade surplus which contributes to the growth of Middle East economies. Based on empirical findings from the dynamic panel data estimations, Bilgin et al. (2015) observed that that the volatility in world energy price is negatively associated with the aggregate economic activity.

A study conducted by Shahbaz et al. (2017) demonstrated that despite rising oil prices, the economic prosperity of developing

nations is mostly dependent on electricity consumption. Growth and feedback effects indicate that more aggressive power policies should be put in place in the short run to achieve long-term sustainable economic growth. Sarwar et al. (2017) in another study of 210 nations examined the empirical connections between population, gross fixed capital formation, oil price, electricity consumption, and economic development. The findings supported a bidirectional link between population, fixed capital formation, fixed capital consumption, oil price and GDP. Narayan (2014) established a proof that for 37 countries (16 developing and 21 developed) the nominal oil price forecasted economic development. Ftiti et al. (2015) investigated the macroeconomic effects of oil shocks. They found that shocks to the price of oil had an impact on economic growth both immediately and over the next few months and that the medium term impacts had a bigger influence than the short term ones. Maghyereh et al. (2019) revealed that Jordan and Turkey's industrial output is negatively impacted by the volatility of the oil market. Aslanoğlu and Deniz (2013) were of the view that since the oil demand of India and China constitutes a significant portion of the global oil demand, the rates of economic growth in China and India are relevant for global oil dynamics.

Mohammad et al. (2023) examined the effect of global oil price on the GDP and several economic sectors in the Middle East for the time period (2007-2021). Through causality analysis, it was determined that oil prices had a considerable negative impact on all industries and the overall GDP. However, the results of multiple regression did not reveal the negative impact of oil prices on the GDP impact of all sectors taken together. The data suggested that the oil price had a negative impact on the GDP contribution of the construction industry (Mohammad et al., 2023).

The price of crude oil has a short-term impact on economic expansion while the economic growth and crude oil prices do not correlate over the long term (Saidi et al., 2019). According to Malik and Masood (2018), economies that depend on oil have experienced significant growth variations that are related to changes in the price of oil. They also observed that the oil-producing nations influenced the economic performance of non-oil nations. Oil prices did, however, had a favorable impact on the GDP of the non-profit sector (Mohammad et al., 2023). With Kuwait as an exception, the results by Mohammed et al. (2016) revealed that oil exporting economies respond to changes in oil prices with a rather high degree of elasticity. In contrast, oil importing economies appear to be relatively stable with an almost zero impact. Similar findings could be drawn for each oil importing and exporting nation during the time of crisis also. The impact of oil prices on Azerbaijan's economic expansion, exports, inflation, and exchange rate was examined by Mukhtarov et al. (2020). The outcomes supported the existence of a long-term link between the variables. Additionally, it was discovered that there is a favorable and statistically significant effect of oil prices on economic development, export, and inflation.

The economy of the Middle East region is dependent on global oil prices and demonstrates a bidirectional causality. The local governments are increasingly planning to diversify their economy and reduce their reliance on oil. Saudi Arabia's vision 2030 is one such example. Miamo and Achuo (2022) reexamined the resource curse hypothesis by examining the nexus between crude oil price and economic growth. Wang et al. (2022) found that oil price volatility negatively affect the financial development and economic growth of oil importer and exporter countries. Additionally, they observed that the oil exporter countries are affected by oil cost vulnerability. Samimi and Shahryar (2009) employ the Structural VAR model on annual data for six OPEC member states (Saudi Arabia, Iran, Kuwait, Nigeria, Venezuela and Indonesia) and found a positive long run effect of oil shocks on the real GDP for all countries, except Kuwait where the impact was, respectively, positive and negative in the short and long run. Conversely, Qazi (2013) found that while the effect of an oil shock on GDP growth was significantly negative for Algeria, it was significantly positive for Venezuela. Berument et al. (2010) employed the VAR model for the Middle East and North Africa (MENA) zone and different results were found for net oil exporters and importers. While they found a significant positive effect of oil price increases on output growth for oil exporters, the effect was insignificant for oil importers. Similar results have been reported for oil exporters Venezuela (Mendoza and Vera 2010) and Azerbaijan (Mukhtarov et al., 2020). On the contrary, Ftiti et al. (2016) observed this relationship as negative in a study on four OPEC countries conforming to Aziz and Dahalan (2015) for ASEAN countries. Yoshino and Taghizadeh-Hesary (2014) investigated the impact of crude oil price fluctuations on GDP growth rate and inflation in China, Japan and the United States of America (USA) and assert that while an oil price increase negatively impacts Chinese GDP growth, the effect is positive on the GDP growth of Japan and the USA.

Different researches have observed different results while analyzing the relationship between oil prices, oil volatility and economic activity. This research employs different types of regression analysis to draw inference on a similar theme and expects the findings to add to the existing literature.

3. RESEARCH METHODOLOGY

The objective of the research is to understand more about the relationship between oil prices, oil volatility and the economic growth (Bilgin et al., 2015; Aslanoğlu and Deniz, 2013; Akinlo and Apanisile, 2015). The research attempts to validate this relationship for six sample GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates). The rationale for this sample is that these countries are affected by oil prices as a producer as well a consumer and hence it is prudent to study this relationship for them. As a latent secondary objective, the research also successfully does a comparative analysis of different regression techniques to be used in such researches. Hooker (1986) hypothesizes the existence of a significant negative relation between oil price hikes and GDP growth. Wang et al. (2022) studied variables such as oil price volatility, inflation rate, and economic growth.

The research uses an annual data set (1998-2021) which has been extracted from the World Bank database *(source: www.databank.*

worldbank.org). Wang et al. (2022) studied an annual dataset of 30 years from the time period (1990-2019). The study variables used in the research are Europe Brent Spot Price (United States Dollar (US$) per barrel) and GDP per capita (current prices in US$). Natural logarithm values are used for Brent spot price and GDP per capita. IBM SPSS version 21 and GRETL software have been used for data analysis. The list of sample countries and the data for their oil exports are given in Table 1.

Previous studies (Yoshino and Taghizadeh-Hesary, 2014; Samimi and Shahryar, 2009) have used standard deviation of the oil prices to represent the oil price volatility. This study used the realized volatility method followed by Andersen et al. (2005) to compute oil price volatility. Here, the Short-Medium term volatility (SMV) is measured as the moving standard deviation of oil prices for 5 years while the Long Term Volatility (LTV) is measured as the moving standard deviation of oil prices for 10 years.

Analyzing the time series data, high price fluctuations were observed during the time period 2008-2009 and 2019-2021 where the former includes the subprime crisis time period and the later includes the COVID-19 pandemic. Considering the data availability constraint, an event study (difference of means "t" test) is also conducted to validate the significance of the global financial crisis (year 2008) on the volatility in the oil prices. Accordingly, null and alternative hypothesis are formulated.

Null Hypothesis (H0): There is no significant difference between the means of the paired measurements. (Event is not significant).

Alternative Hypothesis (H1): There is a significant difference between the means of the paired measurements. (Event is significant).

Apart from analysis of basic statistics, correlation analysis, linear regression, curvilinear regression, panel data regression analysis and causality tests are conducted in the study. To analyze for fixed effects or random effects in panels, "Hausman test" has been used. The "null hypothesis" for the Hausman test is "Random effect is appropriate." Granger causality test (Granger, 1969) was applied to test for causality between variables. The null hypothesis of "no causality" has to be rejected by variables to demonstrate causality. The linear regression is represented as equation 1. The curvilinear regression is represented as equation 2. The panel regression used in the research is represented as equation 3. In equation 3, "j" represents the number of countries represented in cross sectional data and "t" represents the yearly time period from (1998-2021).

Table 1: Data for sample countries

Sl. No.	Country	Oil exports
1	Bahrain	389 Million US$ as in 2021
2	Kuwait	95352 Million US$ as in 2022
3	Oman	32200 Million US$ as in 2022
4	Qatar	14800 Million US$ as in 2021
5	Saudi Arabia (SA)	326289 Million US$ as in 2022
6	United Arab Emirates (UAE)	94677 Million US$ as in 2022

(Source: www.oec.world)

$$Log(GDP) = \beta_0 + \beta_1 * Volatility \quad (1)$$

$$Log(GDP) = \beta_0 + \beta_1 * Volatility + \beta_2 * Volatility^2 \quad (2)$$

$$Log(GDP) = f(LTV_{j,t}) \quad (3)$$

4. EMPRICAL RESULTS AND DISCCUSSION

This segment presents the findings from analysis of the data.

Analyzing the Coefficient of Variation (CV, Table 2) for the variables, the highest volatility was observed for Kuwait (21.4%) and the lowest was observed for Saudi Arabia (2.2%) and UAE (2.2%).

The Table 3, indicates the Spearman's correlation coefficients amongst the study variables. Oil prices is observed to be significantly and positively correlated with the economies of Bahrain (0.83), Oman (0.84), Qatar (0.87), Saudi Arabia (0.84) and UAE (0.86). Only Kuwait does not follows this relationship. Short term volatility is observed as not statistically significant with any of the economies. Long term volatility is observed positively and significantly correlated with oil prices (0.85) and all other economies except Kuwait. Subsequently, the impact of long term volatility is studied on the economic activity for each of the countries based on different regressions. The results for linear regressions are given in Table 4 and for quadratic equations is given in Table 5.

Analyzing Table 4, it is observed that except Kuwait, the economic activity for all other countries are significantly explained by long term volatility. The highest R-squared value for significant relationships is observed for UAE (45.5%) and the lowest is observed for Saudi Arabia (41.2%).

Analyzing Table 5, it is observed that except for Kuwait, the economic activity for all other countries are significantly explained by long term volatility in quadratic regression equations. The highest R-squared value amongst the significant relationships is observed for Bahrain (76.3%) and the lowest is observed for Oman (69.1%).

The linear and curvilinear relationships indicate a similar pattern for all sample countries (except Kuwait) where the long

Table 2: Descriptive statistics of the sample

Variable	Codes	Mean	Standard deviation	CV
Oil prices	Oil.P	1.584	0.305	0.193
GDP for Bahrain	GDP.B	10.312	0.261	0.025
GDP for Kuwait	GDP.K	10.485	2.248	0.214
GDP for Oman	GDP.O	10.670	0.288	0.027
GDP for Qatar	GDP.Q	10.870	0.443	0.041
GDP for Kingdom of Saudi Arabia	GDP.SA	11.634	0.260	0.022
GDP for United Arab Emirates	GDP.UAE	11.376	0.255	0.022

Table 3: Correlations coefficients

Variables	Oil price	GDP.B	GDP.K	GDP.O	GDP.Q	GDP.SA	GDP.UAE	SMV	LTV
Oil price	1	0.834**	−0.004	0.842**	0.874**	0.839**	0.860**	0.267	0.846**
SMV	0.267	0.334	0.123	0.268	0.292	0.266	0.326	1	0.369
LTV	0.846**	0.657**	0.02	0.647**	0.700**	0.642**	0.675**	0.369	1

**Correlation is significant at the 0.01 level (2-tailed)

Table 4: Regression results (linear)

Dependent variable: GDP.B			
Independent variable	R-squared (%)	P-value	beta
LTV	43.2	0	3.1
Dependent variable: GDP.K			
LTV	0	0.93	0.81
Dependent variable: GDP.O			
LTV	41.8	0.001	3.38
Dependent variable: GDP.Q			
LTV	49	0	5.6
Dependent variable: GDP.SA			
LTV	41.2	0.001	3.03
Dependent variable: GDP.UAE			
LTV	45.5	0	3.12

Table 5: Regression results (quadratic)

Dependent variable: GDP.B				
Independent variable	R-squared (%)	P-value	beta1	beta2
LTV	76.3	0	19.25	−52.3
Dependent variable: GDP.K				
LTV	2.1	0.8	−34.28	113.78
Dependent variable: GDP.O				
LTV	69.1	0	19.58	−52.49
Dependent variable: GDP.Q				
LTV	75.3	0	30.1	−79.32
Dependent variable: GDP.SA				
LTV	72.2	0	18.58	−50.42
Dependent variable: GDP.UAE				
LTV	75.4	0	18.12	−48.61

term volatility is observed to affect the economic growth in a similar manner. The curvilinear relationships seems to better explain (higher R-squared values) the relationship between oil price volatility and the economic activity of the sample countries.

The R-squared values from the pooled ordinary least squared (POLS) regression (Table 6), is observed as 14% and the long term volatility is observed as statistically significant (P = 0). Hausman test was conducted to check if random effects or fixed effects are statistically significant in the panel regression. The results (Table 7) indicate that random effects are more relevant as the null hypothesis of presence of random effect could not be rejected (P = 0.96). The results from the POLS regression under random effects is given in Table 8. The R-squared value here is observed as 82.64%.

The Granger causality test results (Table 9) indicate that the long term volatility and oil prices causes economic activity (GDP) and that long term volatility also causes oil prices.

As per Table 10, it is observed that the null hypothesis is rejected and alternative hypothesis is accepted (P = 0.05) implying that

Table 6: Regression results (POLS)

Dependent variable: GDP		
Variable	Coefficient	P-value
Constant	10.4	0
LTV	3.68	0

Table 7: Correlated random effects (Hausman test)

Test summary	Chi-square statistic	Chi-square degree of freedom	P-value
Cross-section random	0.0023	1	0.96

Table 8: Cross-section random effects test equation

Dependent variable: GDP		
Variable	Coefficient	P-value
Constant	10.41	0
LTV	3.68	0

Table 9: Results from the pairwise Granger causality tests (lag 2)

Null hypothesis	P-value
LTV does not Granger Cause GDP	0.002
GDP does not Granger Cause LTV	0.31
OILP does not Granger Cause GDP	0.001
GDP does not Granger Cause OILP	0.84
OILP does not Granger Cause LTV	0.52
LTV does not Granger Cause OILP	2.00E-09

Table 10: Results from the mean paired t-test

Pair 1	Before event - after event	Mean	Standard deviation	P-value
		−0.06	0.08	0.05

the event (2008 financial crisis) is statistically significant to the global oil price volatility.

The study is aimed to analyze the interactions between oil price, oil price volatility and the economic activity of selected GCC countries based on different regression techniques. The increase in oil prices results in a trade surplus for oil exporting countries and several empirical studies confirmed that the economic growth of these economies is dependent on the surge in global oil consumption (Narayan, 2014; Mohammad et al., 2023). Long term volatility is observed positively and significantly correlated with oil prices (0.85) for all other economies except Kuwait. The different behavior of the Kuwait economy conforms to the findings from Mohammed et al. (2016). Short term oil price volatility is not found to be statistically significant with any of the economies implying a better utility of long term volatility over short term

volatility. The economies of Saudi Arabia (CV = 2.2%) and UAE (CV = 2.2%) demonstrated a consistency in their economic growth in comparison to other countries (Table 2). Thus, SA and UAE were able to manage the impact of global oil price volatility and the 2008 global financial crisis better than other countries.

All the regression equations in the study demonstrated that oil price volatility significantly and positively explains the changes in economic activity. This validates Mukhtarov et al. (2020) where they found evidence of a significant effect of oil prices on economic development. The linear regression indicated an average R-squared value of 36.78% while the curvilinear regression indicated an R-squared value of 61.73%. The POLS regression indicated R-squared as 14% while the random effect panel regression indicated it as 82.64%. The random effect model was found to be a good fit to predict economic activity based on long term volatility of the oil prices (see equation 4). Contrary to Herrera et al. (2015) the results indicated a positive relationship between oil prices and economic activity for oil exporting countries. This conforms to Narayan (2014) for 16 developing and 21 developed countries. Maghyereh et al. (2019) reported that Jordan and Turkey's industrial output is negatively impacted by the volatility of the oil market but the regression results indicated a positive impact of oil prices on the GDP of all industrial sectors taken together.

$$Log\ (GDP) = 10.41 + 3.68 * long\ term\ volatility \quad (4)$$

For further validation of the panel regressions, country wise regression analysis (linear and curvilinear) was done with long term volatility as independent variable and GDP as the dependent variable. The best R-squared value (linear) was observed for UAE (45.5%) while the best model fit (curvilinear) was observed for Bahrain with an R-squared value of 76.3% with positive coefficients.

Exceptionally, Kuwait as a country was observed as an outlier to the sample by demonstrating an insignificant relationships and low coefficients in almost all regressions. Samimi and Shahryar (2009) also found a mixed results for Kuwait. This finding conforms to Wang et al. (2022) where they found that oil price volatility negatively affect the financial development and economic growth of oil importer and exporter countries. Kuwait also demonstrated a high coefficient of variation for its GDP (21.4%). The different behavior of Kuwait needs to be probed separately which may result in useful findings.

The correlation of oil prices is observed to be significantly and positively correlated with the economies of Bahrain (0.83), Oman (0.84), Qatar (0.87), Saudi Arabia (0.84) and UAE (0.86). Kuwait was an exception with a low negative correlation (−0.004). This is contrary to (Saidi et al., 2019) where they state that the economic growth and crude oil prices do not correlate over the long term. Granger causality results indicate that the long term volatility and oil prices causes economic activity (GDP) and that volatility also causes oil prices. The financial crisis of the year 2008 was observed as a significant event for oil price volatility indicating that crisis did affect the price volatility.

5. CONCLUSION

The effect of oil prices and the volatility in these prices effects the economic activity of a country positively or negatively (Aslanoğlu and Deniz, 2013; Akinlo and Apanisile, 2015). This was the basic rationale and objective of the research. The research did found a significant and positive relationship between oil price volatility and the economic activity at country level for five of the six sample countries. As an exception, Kuwait, did not demonstrated a significant relationship in this context. The study also concludes that a random effect based panel data regression is a good fit to model oil price volatility over the GDP as this indicated the highest R-squared value (82.64%) amongst all types of regression used in the study. Thus, as a latent objective the research also successfully does a comparative analysis of different regression techniques to be used in such researches. The curvilinear regression was found to be more effective than the linear regression while working on a time series data. Economist and managers working on similar researches should use equation 4 as a forecasting model for economic activity of a GCC country.

5.1. Future Research and Limitations

The outlier country, Kuwait, needs to be further probed for behaving differently than other GCC countries. Since the financial crisis of the year 2008 is found to be statistically significant to the global oil price volatility, a similar future study may be conducted on the significance of the COVID-19 crisis to oil prices. The study is constrained by a small number of sample countries according to the focus of the study. A similar future study may use a wider sample of countries to validate and generalize the findings of this research.

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