

Potential Impact of Global COVID-19 Confirmed Cases on Oil Price in the Short-run and Long-run

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Abstract

The study investigates the potential short-run and long-run impact of global Covid-19 confirmed cases on oil price, considering the gradual easing of lockdown measures adopted by countries to limit the spread of the virus which has caused havoc to the global oil price through shattered demand. The ARDL model is adopted to estimate the parameters. From the result, it was observed that oil price increases by 2% for every 1% change in the total number of confirmed Covid-19 cases as economies are considering lockdown easing. In the long-run, about 10% potential increase in oil price is expected for everyone percentage change in the Covid-19 total confirmed cases in the world as economies lockdown easing are increasing. The error correction confirms that as the ease continues, about 21% of the disequilibrium caused by the virus outbreak in the short-run will be corrected in the long-run. From the findings, the study concluded that the submissions are valid considering the time period covered. Therefore, more policies towards stimulating the global economy and encouraging gradual easing for economies experiencing lower daily confirmed cases in increase activities that may increase the demand for oil for its price to appreciate.

Keywords: Covid-19 confirmed cases; Oil Price; ARDL

JEL Classification: C50; I1; Q41

Introduction

The Covid-19 pandemic remains the leading disrupting factor to global economic activities. It should be noted that the fatality rate of the coronavirus pandemic is rising closely above previous influenza pandemics experienced (see Figure 1).

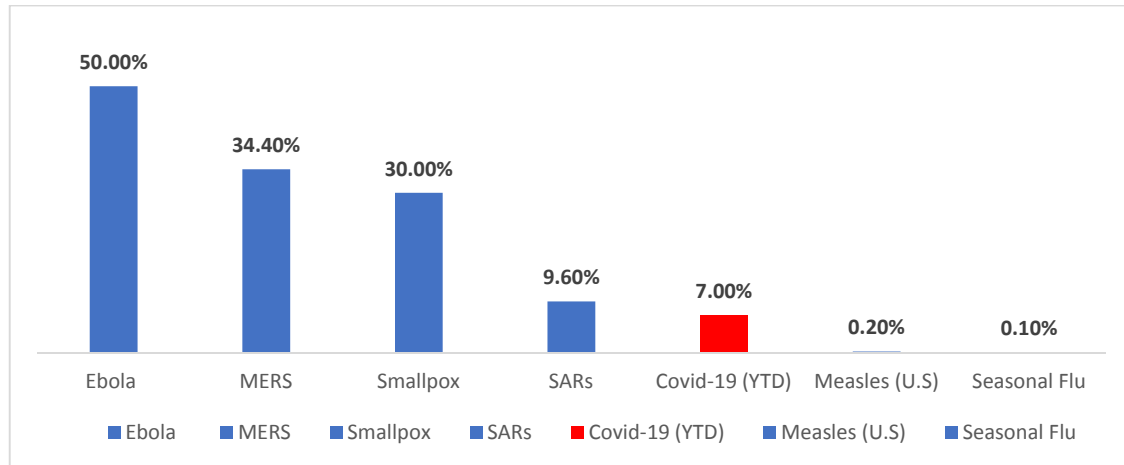


Fig. 1. Fatality Rate

Source: WHO, 2020.

The global economic growth forecast for 2020 has been reviewed downward to -3.0% from 3.3% (pre-Covid forecast) following the slow activities caused by the outbreak. Not limited to the global economy, other regions of the world growth have also been reviewed downward. Among these economies, the advanced economies growth was reviewed downward to -6.1%, emerging markets and developing economies downward to -1.0% and the sub-Sahara Africa with its first negative growth review at -1.6% (See Figure 2). The increasing number of Covid-19 cases remains a major panic for economies and initiating measures for its curb in recent time. Many economies have adopted stay home and lockdown measures to curb its rapid spread. Albeit, the growth is expected to be contained by some fiscal stimulus and quantitative easing measures adopted by economies. Notably, the measures are internally implemented while the economies are shut against bilateral trades.

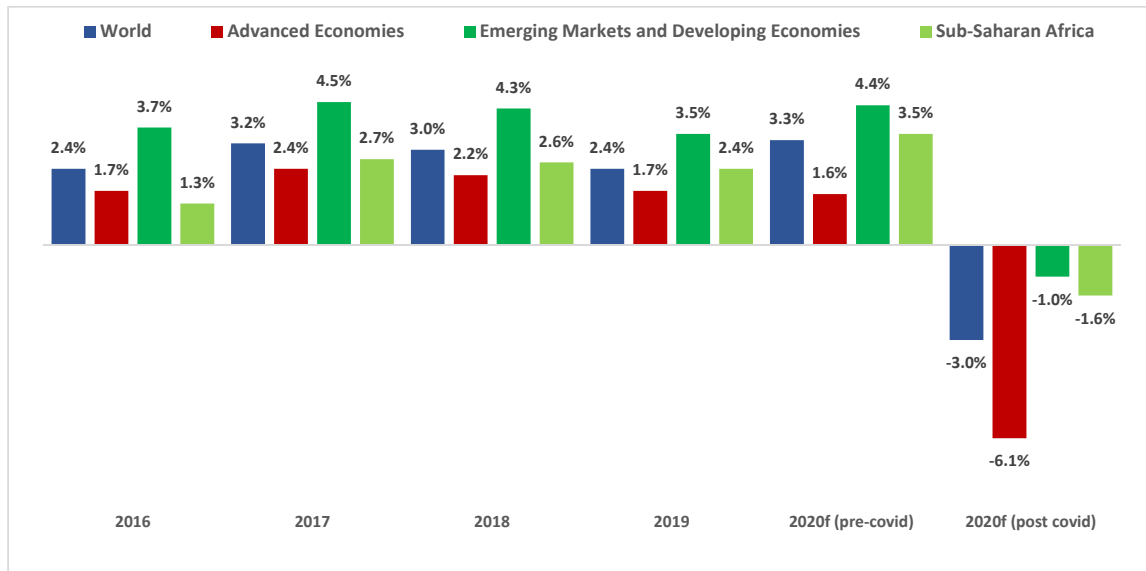


Fig. 2. Global Regional Economic Growth Trend and Forecast for 2020

Source: IMF, 2020.

However, studies have focused on the global and continental impact of the Covid-19 pandemic on the global economy. For example, Adekunle, Onanuga, Wahab, & Akinola (2020) noted

Algeria as the hardest hit of the coronavirus in Africa and one percent increase in the number of confirmed cases of coronavirus leads to about 0.0453 percentage increase in its attributable death. On the social distancing and lockdown measures impact on economic activities and stock market indices, Ozili & Arun (2020) confirmed as the number of lockdown days, monetary policy decisions and international travel restrictions increases; economic activities and the closing, opening, lowest and highest stock price of major stock market indices are severely affected.

The oil market is one of the major markets the novel coronavirus has disrupted through demand. As at the end of 2019, China's crude oil import has risen over that of the United State of America (USA). The lockdown measure taking on China's factories to curb the coronavirus spread meant a significant consequence on the demand side of the oil market. The drop-in oil price persists as demand remains low following other economies adopting lockdown measures to curb the pandemic. According to the International Energy Agency (IEA), China's demand for oil has doubled since 2003 and its growth accounted for more than 80% of global oil demand growth. The oil market experienced the greatest shock in price with first negative record at -\$36.98 for West Texas Intermediate (WTI) in April 20, 2020 and Brent plummeted to \$9.12 per barrel in April 21, 2020. This trend is however against the increasing global number of confirmed cases of coronavirus in the World (see Figure 3). The historic WTI trend influenced oil companies halt production and consider destroy some of the products to get by and avoid what happened in the futures market as things are getting worse through the Pandemic. Record also shows that onshore oil storage is 85% full and if production continues, there may be storage problem as demand remains tepid. According to the International Energy Agency (IEA)¹, global demand for crude oil for April and May 2020 is expected to drop by 29 million barrels/day year-on-year (accounting for about 30% of demand) and 26 million barrels/day lower (about 27% of demand) respectively if the lockdown measures adopted by most economies persist. For the full year 2020, demand is expected to lower by 23million barrels per day following the impact of the pandemic. IEA also projected that as the number of people in confinement is expected to drop at 2.8billion at the end of May 2020 from the recent peak of 4billion, oil price is expected to rise given the need it may bring to demand for oil as people return to work and businesses re-open worldwide.

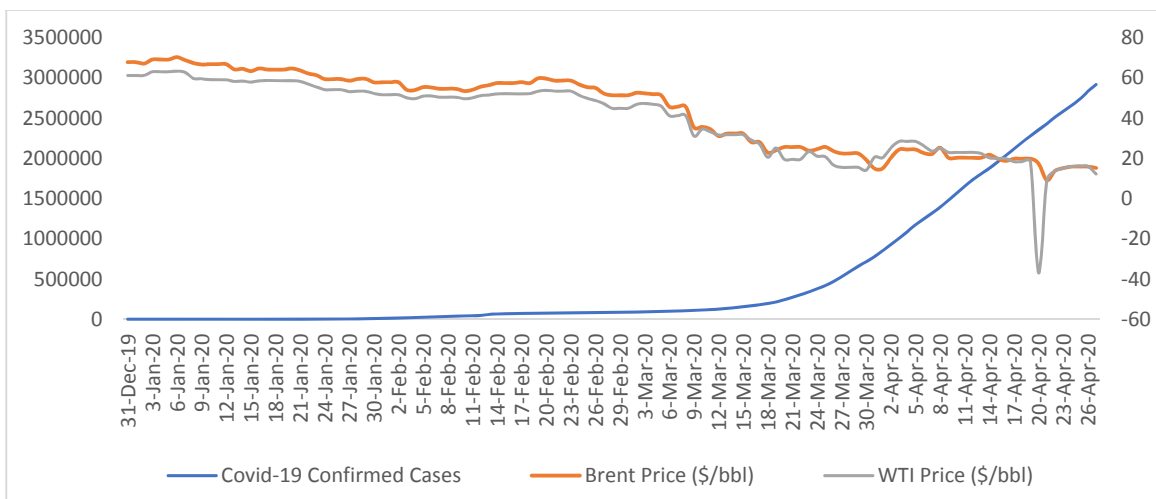


Fig. 3. Global Covid-19 Confirmed Cases and Global Oil Prices

Sources: EIA, OWID, Authors Sketch.

¹ <https://www.iea.org/reports/oil-market-report-may-2020>

The Pandemic curve in Asia and Europe economies is flatten gradually and the economies are gaining confidence on relaxing the lockdown with gradual resumption of business activities (see Figures 4a, 4b). With this attempt, global activities are expected to change.

Fig. 4a. Europe Daily New Cases Per Million

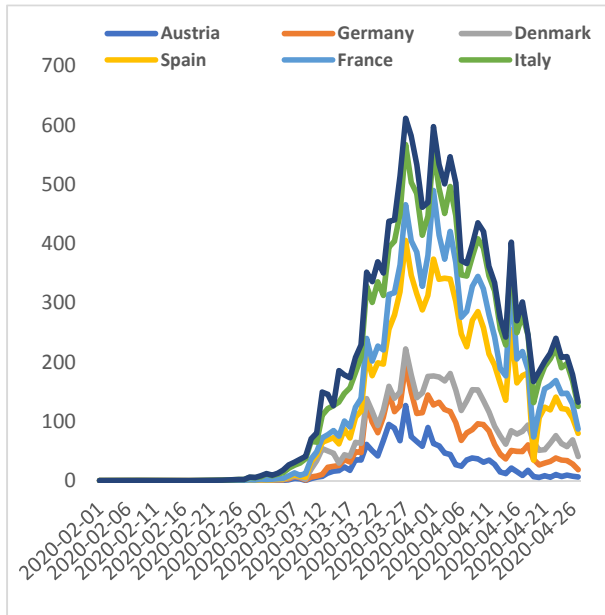
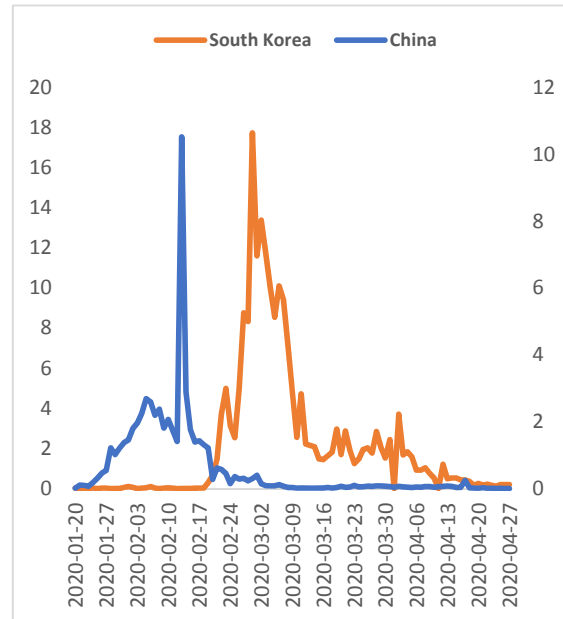


Figure 4b. Asia Daily New cases Per Million



Sources: OWID and Authors, 2020.

To contribute to the ongoing discussion on Covid-19 impact, we considered the short-run and long-run potential effect of daily confirmed cases on daily oil price. This is spurred by the gradual easing of lockdown measures taking by economies (such as France, Spain China, Nigeria, Ghana, Italy among others) internally and the newly signed agreement by Organisation for Petroleum Exporting Countries (OPEC) members where the two oil giants (Russia and Saudi Arabia) submitted to the oil production cut effective 1 May 2020 and voluntary cut in June 2020. For the purpose of this study, we adopt the Autoregressive Distributed Lag (ARDL) model in analyzing the phenomenon.

Materials and Method

In order to examine the relationship between daily confirmed cases of coronavirus and daily oil price in 2020, the study used daily data on the daily number of confirmed cases sourced from Our World In Data (OWID) and daily Brent oil price per barrel from Energy Information Administration (EIA) (2020). The data are used in there absolute terms but converted to their natural logarithm to ensure a consistent and reliable empirical findings as suggested by Friedl and Getzner (2003) and Shahbaz, Loganathan, Muzaffar, Ahmed and Jabran (2016). The linear form of the relationship between daily confirmed Covid-19 cases and oil price is specified as:

$$OP = f(CC) \quad (1)$$

From equation 1; CC is considered as the daily number of confirmed cases globally. While OP is daily Brent oil price.

However, it is important according to Ewing, Sari, & Soytaş (2007), before estimating the parameters, a behavioural estimate should be carried out to understand how the variables trend within the days covered. For the pre-estimation, the data were descriptively analysed using descriptive statistics, a correlation test was done and the unit root of the variables were tested using Augmented Dickey Fuller by Dickey and Fuller (1979) and Phillips-Perron test by Phillips and Perron (1988). An ARDL Bounds test by Pesaran et al. (2001) is adopted as the variables were stationary after first differencing I(1) to verify if a long-run cointegration exists. Based on the ARDL Bounds test result, the study decides if the long-run estimation of the parameters would be reported. For the short-run and long-run estimate, the study adopts the Autoregressive Distributed Lag (ARDL) model as it takes care of endogeneity issues by adding lags of dependent as well as independent variables in the model (Sankaran, Kumar, & Mousumi Das, 2019). The ARDL model is written in the natural logarithm form of the variables as:

$$LOP = \alpha_0 + \sum_{i=1}^n \delta LOP_{t-i} + \sum_{i=1}^{n_1} \beta_1 LCC_{t-i} + \varepsilon_t \quad (2)$$

From equation 2, LCC is the natural logarithm of daily confirmed cases in the world, α_0 is the intercept of the equation, n and n_1 are the optimal lag numbers at which the variables are estimated. δ is the coefficient for the natural logarithm of oil price, β_1 is the coefficient for natural logarithm of total number of confirmed cases, $t - i$ is the time frame considered having lagged. ε_t is the white noise term at time discussed on the oil war between Saudi Arabia and Russia on oil production cut which contributed to the sharp fall in the price of crude oil. According to Sankaran et al., (2019) equation 2 can be transformed into bound testing equation by including both short-run and long-run dynamics. This requires carrying out an F-test on the ARDL bound test equation with appropriate optimal lag length. We enforced an automatic optimal length of 4 based on Akaike Information Criterion (AIC). Following Pesaran et al., (2001), cointegration existence is confirmed if the F-statistic is greater than the lower and upper bound critical values, otherwise not confirmed. However, the decision remains inconclusive if the F-statistics falls in between the lower and upper bound critical values. Since the long-run cointegrating relationship is established, the short-run relationship can be re-captured incorporating the error correction model. Equation (2) is respecified as;

$$LOP = \alpha_0 + \sum_{i=1}^n \delta LOP_{t-i} + \sum_{i=1}^{n_1} \beta_1 LCC_{t-i} + ECM_{t-i} + \varepsilon_t \quad (3)$$

From equation (3), all symbols remain as defined from equation (2) except for ECM a proxy for error correction model.

Results and Discussions

The mean value of daily oil price and the number of confirmed cases falls within the minimum (\$9.12 in April 20, 2020 for oil price and 27 cases confirmed in December 31, 2019) and maximum (\$70.25 per barrel in January 06, 2020 and 2915595 confirmed cases as at April 27, 2020) values. The skewness result shows oil price has a long tail to the left, while Covid-19 confirmed cases have a long-tail to the left. Jarque-Bera statistics confirms the variables are not normally distributed as their probability values are less than 5% significance level (see table 1).

From the correlation test, the result affirms that there is a negative insignificant correlation between the number of Covid-19 confirmed cases and oil price globally (see table 1).

The unit root test confirms that the variables are stationary after first differencing. This implies that they are not mean reverting in the long-run. Therefore, the ARDL bound test is used for the cointegration test (see table 1).

The F-Statistics at 7.55 in the ARDL bound test is above the 5% lower and upper bound critical values (6.56 and 7.3 respectively). It implies there is a long-run cointegrating link between

daily Covid-19 confirmed cases and daily oil price. Therefore the relationship between Covid-19 confirmed cases and global oil price is both a short-run and long-run phenomenon. Based on the ARDL bound test result, the study further to estimate the short-run and long-run potential impact of daily number of confirmed Covid-19 cases and oil price (see table 1).

Table 1. Pre-estimation Tests

Descriptive Statistics		
	OP	CC
Mean	43.69	508230
Maximum	70.25	2915995
Minimum	9.12	27
Skewness	-0.26	1.63
Jarque-Bera	13.616	61.07
Probability	0.00	0.00
Correlation		
	OP	CC
Probability		
LOP	1	
LCC	-0.77	1
	0.00*	
Unit Root Test		
	ADF	PP
LOP	-2.98	-2.71
	-11.78*	-16.10*
LCC	-1.67	-1.20
	-3.97*	-8.43*
ARDL Bound Test		
F-statistic	7.55**	

*, ** connotes 1% and 5% statistical significant level.

The ARDL estimation result confirms the impact of Covid-19 confirmed cases on oil price is positive and significant. One percentage change in the number of confirmed cases causes 2% increase in the oil price in the short-run. The attempt by countries to ease the lockdown measures adopted is expected to increase the demand for oil with a positive impact on its price. The Organisation for the Petroleum Exporting Countries (OPEC) agreement on oil production cut by 10% starting May 1, 2020 and a further voluntary cut by June 2020, may also contribute to the expected positive impact of the global confirmed cases on the global oil price in the short-run and the supply may be within the sluggish demand growth (see table 2).

Table 2. Short-run and Long-run Estimates

Short-run	Coefficient	Std. Error	t-Statistic	Prob.
<i>LCC</i>	0.02	0.01	2.42	0.02**
<i>ECM_{t-1}</i>	-0.21	0.05	-3.88	0.00*
Long-run				
<i>LCC</i>	0.10	0.04	2.95	0.00*

*, ** connotes 1% and 5% statistical significant level.

In the long-run, number of confirmed cases is expected to impact positively on oil price, given a 5% significant level. One percentage change in the number of cases is expected to bring about 10% increase in oil price. This is expected as countries expand their stimulants towards the Covid-19 pandemic. The possibilities of finding vaccines that can cure the virus will initiate full easing of the lockdown and trade restrictions by economies, causing demand for oil to rise. The

error correction model is rightly signed and significant at 5%. This implies that as measures are being taken to curb the spread of the Covid-19 pandemic, 21% of oil price disequilibrium in the short-run is expected to be corrected in the long-run (see table 2 above).

Conclusion

The study measures the potential impact of the increasing number of Covid-19 confirmed cases on oil price in the short-run and long-run using a time series data from 31st of December, 2019 to 27th of April, 2020. ARDL model was adopted for the parameters estimation. From the result, a significant positive impact of Covid-19 confirmed cases on oil price was noted in the short-run and long-run. It should be noted that the findings are based on the period covered and it may deviate if the study had been done prior to gradual easing measures taken by economies or considered after the current date. However based on our findings, we concluded that as measures across countries increase on easing the lockdown internally, oil price are most likely to increase by 2%, as activities may demand the use of oil products. However, in the long-run where borders are fully opened by economies, oil price is expected to increase by 10% due to its increase in demand irrespective of the number of coronavirus cases confirmed. It is clear that the Covid-19 pandemic has disrupted major economic activities globally including the oil market. However, as the number of confirmed cases increases with measures and precautions adopted to curb its spread and economies gradually ease the stay home and lockdown measures, it is expected that the oil price deviation from the equilibrium point in the short-run would be corrected back by 21% in the long-run. This is confirmed by the error correction model. Based on this, we suggest more gradual easing measures to economies with lower confirmed cases record with precautions on limiting the virus spread. This will improve global activities which may increase the demand for crude oil and positively impact on oil price.

However, it should be noted that the curve is expected to flatten in the long-run assuming a vaccine for the virus was discovered and the number of confirmed cases may seem increasing but at a decreasing rate which will restore confidence to economies to ease the lockdown measures. The study is limited to the time covered and it does not account for the impact the recovery rate may have on the global economic activities and oil demand and price. The study may be extended considering country specific impact on activities as well as the impact the Pandemic is having on exchange rate volatility specifically in the developing countries. More advanced methods can also be adopted to better analyse the impact of the Pandemic.

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