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# Corona Virus Outbreak and the Global Energy Demand: A Case of People's Republic of China

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**Abstract:** The study investigates the impact of corona virus outbreak on the global energy demand in china using the time series daily data spanning the period 23<sup>rd</sup> January to 8<sup>th</sup> February 2020 on total cases of corona virus, total population of china, total exchange rate of Chinese currency and international crude oil prices. Using the Philip Perron unit root test for testing the stationarity of the variables, the results revealed that total cases of corona virus, international crude oil price and total population are stationary at level while official exchange of Chinese currency is stationary at first difference. After the testing the existence of co-integration relationship among the variables using Engle Granger test for co-integration, the ordinary least squares test result revealed that total population has positive and significant impact on total cases of corona virus while crude oil price is negative and significantly related to the cases of the virus. The official exchange rate is also negative but insignificant in explaining the cases of the virus. Base on the findings, the researchers therefore recommend that the oil producing countries should reduce their supply of crude oil to the country affected with the virus in order to push the price upward to the desired level and the government of the affected country should maintain restrictions with regards to the movement of its population in order to tackled the spread of the virus.

**Keywords:** Corona Virus, Crude Oil Price, Exchange Rate, Engle Granger Test for Co-integration, Ordinary Least Squares Test

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## 1. Introduction

The condition of patients, according to WHO [1] and based on the 17,000 cases in China which shows 82% mild, 15% severe, 3% critical and the Total Cases accounted for almost 45,171. This figure therefore includes deaths and recovered/discharged patients (cases with an outcome). By removing these from the "total cases" figure, we get "currently infected cases". Some cases of corona virus outbreak that were first reported in Wuhan, China, is changing rapidly. The respiratory infection has been spreading across China, and cases have been diagnosed in several other countries, including the United States. Human

corona viruses were previously known to be responsible for mild and upper respiratory tract diseases. Since then, other members of this family have been identified to be involved in more serious respiratory tract infections. Moreover, these viruses show an environmental resistance that increases their probability of transfer between contaminated hosts via surfaces, hands, etc. This resistance leads to the urgent need for development of efficient and targeted modes of prevention. As no treatment or vaccines are available to cure the infections, it is fundamental to also dispose of adapted antiseptics-disinfectants, whose efficiency should be rigorously evaluated Besty [2].

Obviously, it's hard to get one's head around all the ways that coronavirus is affecting oil markets, energy-related

industries and even carbon emissions. The tragic outbreak underscores that when it comes to energy, China is the straw that stirs the drink as the world's largest oil-and-gas importer, largest auto market and largest carbon emitter, when it comes to oil, it has pushed prices down to their lowest level in a year, stemming largely from reduced travel and economic activity in China and around the world Ben, [3] and Laila, [4]. The impact is also felt on the liquefied natural gas market, which was already weak due to excess supplies, China's near-term gas consumption is in question given the coronavirus quarantines and shutdown of factories, which consume the bulk of the country's imported gas World street journal reports [5]. Concerning, however, is that oil prices have fallen by more than 2 percent over concerns that the coronavirus epidemic will dampen China's demands. Brent crude was down \$2.17, trading at \$54.43 per barrel, its lowest level since last January, for a fifth weekly decline oil prices were weighed down loss of demand in China amid the Corona virus outbreak while OPEC and Russia scramble to come up with a unified position on how to the price slide. Estimates have shown that, the virus outbreak is set to reduce the oil production and consumption per day across the globe Carolyn [6].

**1.1. Research Gap**

Because of the unpredictable tendencies of the Corona virus outbreak scenario and its impacts on the global energy demand, there is urgent needs to fill the research avail by the outbreak, a slowdown in China's economy would impact global energy demand because China is the world's largest crude oil importer, after importing a record of 10.12 million barrels per day in 2019, according to the data from the General Administration of Customs. China is also the second-largest oil consumer, behind the United States.

**1.2. Significance of the Study**

Major oil-producing nations are aiming to reassure the jittery market which is primarily driven by psychological factors and extremely negative expectations adopted by some market participants a reason for more studies in this direction for situation control and eventual market stabilization.

**2. Methodology and Data**

The China's daily data employed in this study spans from 23 January 2020 to 8 February 2020. The data on Corona virus was sourced from China health commission through worldometer [7], china population is obtained, and China

official exchange rate were sourced from national bureau of statistics of china [8] and world daily crude oil price was obtained from S & P Global oil plat through Macrotrends [9].

The econometrics from of the model can be represented by the equation 1 and the equation 2 represent the natural log form of the model. Converting the equation to the natural logarithm form lets to easy interpretation of the variables and it also reduces the difficulty of dissimilar component of measurements among the series Musa et al. [10].

$$Y_t = \beta_0 + \beta_1 x_{1t} + \ln \beta_2 x_{2t} + \beta_3 x_{3t} + \epsilon_t \quad (1)$$

$$\ln TCC_t = \beta_0 + \beta_1 \ln COP_t + \ln \beta_2 \ln POP_t + \beta_3 \ln EXR_t + \mu_t \quad (2)$$

Where:

ln is the natural log; TCC is the total cases of corona virus; COP is the international crude oil price; POP is the total population (in this case China population); EXR is the official exchange rate of china currency to American Dollar;  $\beta_1 - \beta_3$  are the coefficients of independent variables and  $\mu_t$  stands for the error term.

The stationarity test of the series utilized in this research is the widely used Philip Perron [11] unit root test (PP) and the estimation equation for the test is presented below:

$$\Delta Y_t = \alpha_0 + \alpha_1 \chi_{t-1} + \mu_t \quad (3)$$

The estimation result for equation 2 is presented in Table 3 while that of equation 3 is presented in Table 2 below.

**3. Results and Discussion**

This section presents the results of the estimation and discusses the findings of the study. The descriptive statistics are presented in Table 1 with the correlation analysis of the variables used in the study. It is observed that from Table 1 the average total cases of corona virus, total population and official exchange rate are around 15085.71, 1.44E+09, 6.957141 and 36.77529. The study also tested for data normality using Jaque-Bera normality test. There variables out of four variables that include total cases of corona virus, official exchange rate and crude oil price appear to be normally distributed as the P-values for Jarque-Bera test were greater than 0.05 for these variables. Using correlation analysis, all the variables are in natural logarithm form. There is negative correlation between crude oil price and total cases of corona virus and also between crude oil price and official exchange rate.

*Table 1. Descriptive Statistics and Correlation Results.*

	TCC	POP	EXR	COP
Mean	15085.71	1.44E+09	6.957141	36.77529
Median	11948.00	1.44E+09	6.936800	50.76000
Maximum	37552.00	1.44E+09	7.021700	55.59000
Minimum	844.0000	1.44E+09	6.936500	0.000000
Jarque-Bera	1.586 (0.452)	NA (NA)	3.016 (0.221)	3.246 (0.1972)
Observation	17	17	17	17
lnTCC <sub>t</sub>	1.000			

	TCC	POP	EXR	COP
lnPOP <sub>t</sub>	NA	1.000		
lnEXR <sub>t</sub>	0.689	NA	1.000	
lnCOP <sub>t</sub>	-0.935	NA	-0.819	1.000

Sources: Authors Computation using EViews 9; Note: Values in parentheses are the P-values.

Philip-Perron (PP) unit root test result in Table 2 only official exchange rate (EXR) is stationary at first difference while total cases of corona virus (TCC), crude oil price (COP) and total population (INR) were stationary at level. Therefore, the Philip-Perron (PP) unit root test revealed that there is a mixture of order of integration of the variables in Philip-

Perron (PP) unit root test i.e. three variables are I (0) and one variable is purely I (1) which is more competent to be useful as an investigative tool for this study. Since majority of the variables are stationary at level values, then we concluded that ordinary least squares will be more efficient in handling the long run estimation.

Table 2. Philips Perron (PP) Unit Root Test Results.

LevelFirst difference					
Variables	Constant	Constant & trend	Constant	Constant & trend	Interpretation
lnTCC <sub>t</sub>	-13.576*** (0.000)	-2.506 (0.320)	---	---	I (0)
lnCOP <sub>t</sub>	-3.354** (0.043)	-1.996 (0.526)	---	---	I (0)
lnEXC <sub>t</sub>	-1.124 (0.678)	-2.616 (0.278)	-7.007*** (0.000)	-8.228*** (0.000)	I (1)
lnPOP <sub>t</sub>	-3.350** (0.046)	-3.250* (0.096)	---	---	I (0)

Source: Eviews 9; Note: \*\*\* \*\* & \* stands for 1%, 5% & 10% levels of significance and values in parenthesis are the P-values.

Table 3 below indicated that the null hypothesis of no co-integration relationship among the variables was rejected for the period under study (i.e. 23 January to 8 February 2020), at 5% level of significance which is more strong. The T-statistics value of -3.523 is higher than the critical value at the abovementioned level of significance. As such, a co-integration relationship exists in this respect. Meaning the variables are moving in the same direction or that they split an ordinary relationship in the long-run.

Table 3. Engle Granger Test for Co-integration Result.

Model	T-stat.	Critical Values
23 Jan. to 8 Feb. 2020	-3.523	1% level -4.420595
F (lnTCC <sub>t</sub> /lnCOP <sub>t</sub> , lnEXC <sub>t</sub> /lnPOP <sub>t</sub> )		5% level -3.259808
K = 3 & n = 17		10% level -2.771129

Source: Authors' computation 2020 using Eviews 9.

After establishing a co-integration relationship among the variables, the long-run model is estimated to obtain the long-run coefficients as presented in Table 4. The results revealed that the total population is positive and significant at 5% level in influencing the total cases of corona virus (TCC). Meaning that increase in population will increase the total cases of corona virus likewise decrease in population will likely lead to decrease in total cases of corona virus in the country. Precisely, a 1% increase in population will lead to 13.54989% increase in total cases of corona virus. The result also revealed that the official exchange rate is negative but in significant in explaining changes in the total cases of the virus in the country.

The results further demonstrate that crude oil price which is the focal point of this study is negative and significant at 1% level of significance. Meaning that, 1% increase in the total cases of corona virus will lead to -38.98266% fall in the crude oil price in the country.

The R-square value of 0.894174 means that 89% variation

or changes in the dependent variable can be jointly explained by the independent variables and only 19% variation that is explain by the factors that are not captured in the model or by the error term.

Table 4. Ordinary least Squares Test Result.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnPOP <sub>t</sub>	13.54989	5.702663	2.376064	0.0415
lnEXR <sub>t</sub>	-63.14221	50.61459	-1.247510	0.2437
lnCOP <sub>t</sub>	-38.98266	6.528056	-5.971556	0.0002
R <sup>2</sup>	0.894174			

Source: Authors' computation 2020 using Eviews 9.

To guarantee the consistency of the estimates, diagnostic tests of serial correlation, functional form, normality and the heteroskedasticity were conducted and reported in Table 5. The outcomes shows that the null hypotheses for the serial correlation LM test, normality test and heteroskedasticity test and functional form or Ramsey Reset test for specification of the model could not be rejected within the study period. This means that the model is good enough and reliable.

Table 5. The Residuals of Ordinary Least Squares Test.

Test statistics	LM version	F-version
Serial correlation	CHQ (2) = 3.991 [0.135]	F(2,7) = 1.744 [0.242]
Functional form	Not applicable	F(1,8) = 1.516 [0.253]
Normality	CHQ (2) = 0.798 [0.670]	Not applicable
Heteroscedascity	CHQ (9) = 0.070 [0.965]	F(9,23) = 0.026 [0.973]

Note. The values in bracket are the probability values. LM = langrange multiplier test, CHQ = chi-square.

As recommended by Pesaran and Pesaran [12], CUSUM meaning cumulative sum and CUSUMSQ meaning cumulative sum of squares tests for firmness of the model along the study were conducted. The results revealed in figure 1 show that the residual is not within the 5% level of significance critical bound. Figure 2 demonstrates that the

there is slight deviation of the residual from the 5% level of significance critical bound. Therefore, the overall model is unstable along the study period as the residuals were not inside the critical bounds at 5% level of significance.

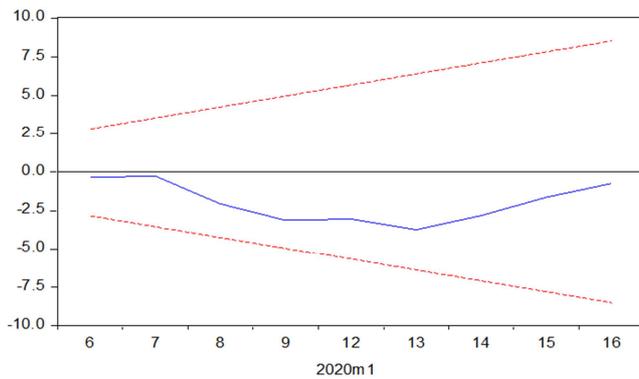


Figure 1. Plot of cumulative sum of residual for the model.

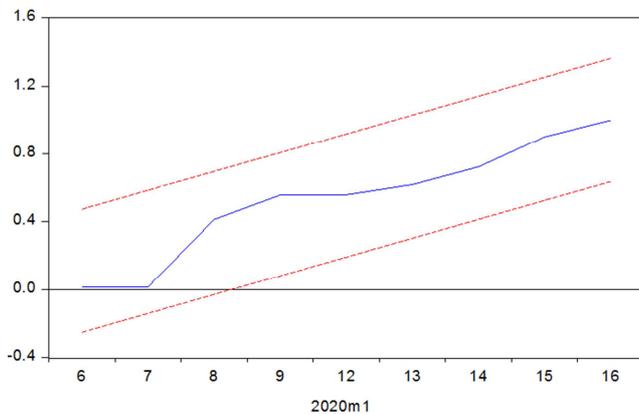


Figure 2. Plot of cumulative sum of squares for residual of the model.

#### 4. Summary, Conclusion and Recommendations

Since the impact of the country's population is positive to the virus, then in order to reduce the cases of the virus the movement of people in and out of the country should be monitored and restricted so that infected people would be given proper treatment and the tendency of spreading the virus to other countries would be minimal. Like the impact of the virus to the international prices of crude oil is negative, then the OPEC member countries should try as much as possible to reduce the quantity of barrels supplied to China

since they are among the largest consumers of crude oil in the world and by doing that it will help to raise the price again to the desired level.

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