

The effect of oil price fluctuation on the economic growth

أثر تقلبات أسعار النفط على النمو الاقتصادي

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Abstract:

In this paper the aim is to investigate the effect of oil price fluctuation on the economic growth, using macroeconomic data consisting of: crude oil prices, CPI, GDP in Algeria from 2000 till 2018. The research method used is structural equation modeling depending on PLS approach, and it results that the oil price fluctuation has an impact negative on corruption and positive on economic growth in Algeria, however the impact of corruption on economic growth is negative.

Keyword: crude oil prices; economic growth; corruption.

JEL classification code : C5, G15, G21, E4

ملخص:

يهدف هذا البحث إلى دراسة أثر تقلبات أسعار النفط على النمو الاقتصادي، باستخدام بيانات الاقتصادية الكلية المكونة من: أسعار النفط الخام ، مؤشر إدراك الفساد (CPI) ، الناتج المحلي الإجمالي (GDP) في الجزائر من عام 2000 إلى 2018. طريقة البحث المستخدمة هي النمذجة بالمعادلات الهيكلية اعتماداً على طريقة المربعات الصغرى الجزئية (منهج PLS) ، وأظهرت النتائج أن لتقلبات أسعار النفط أثر سلبي على الفساد وإيجابي على النمو الاقتصادي في الجزائر ، لكن تأثير الفساد على النمو الاقتصادي هو أثر سلبي.

الكلمات المفتاحية : أسعار النفط الخام ؛ النمو الاقتصادي؛ الفساد.

تصنيف JEL : C5، G15، G21، E4.

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1. introduction:

Petroleum exploration and production industry may be said to have begun in around mid-1800s. There was an oil discovery in Ontario,

Canada, in 1859 (Donwa, Mgbane, & Julius, 2015) . Since petroleum became very important commodity in world's life and economy, the relationship between oil and macroeconomics is mostly investigated through oil prices.

A large body of research suggests that oil price fluctuations have considerable consequences on economic activity. These consequences are expected to be different in oil importing and in oil exporting countries. Whereas an oil price increase should be considered good news in oil exporting countries and bad news in oil importing countries (Ghalayini, 2011).

And one of the greatest threats to economic and political development of any nation is corruption (Donwa, Mgbane, & Julius, 2015). Ancient philosophers, economists, politicians, scientists and policy - makers expressed concern about corruption as a problem since the fourth century BC. Corruption is a symptom and result of institutional weakness, with potential negative effects on the economic performance of a country. However, analysis of the causes and consequences of corruption have increased significantly in the last two decades (Shera, 2014).

Corruption has not only penetrated the government sector but has also penetrated into the oil sector which is seen as the engine growth of the economy (Onyinye Junior, 2015).

This study was premised on the following research question:

How affects oil price fluctuations on the economic growth of Algeria?

To answer this problem we have formulated the following hypothesis:

Oil price fluctuations affects negatively on economic growth through corruption

2. Theoretical side:

2.1. The impact of oil price fluctuation on economic growth:

According to history, it was shown that crude oil export is crucial to the development process and also the sharp increases in gross domestic product are usually accompanied by sharp increase in crude oil export (Onyinye Junior, 2015).

What Drives The Price of Oil?

a) Demand Side

Industrial demand for oil to produce chemicals, manufacture plastics, and for power generation affects demand for oil. Most advanced economies are built on a substantial industrial sector and rely heavily on transportation powered by internal combustible engine. Finally, factors such as population growth, subsidies, taxes and other regulations play a role in the overall demand for petroleum. Investors, traders, hedgers, speculators also affect oil demand.

b) The Dutch Disease Syndrome One of the impacts of oil price shocks on economic growth and performance of an oil exporting countries is the Dutch Disease Syndrome. Resource pull effect and spending effect result when large inflow from oil export hits a less diversified economy. The booming export sector (trading internationally) experiences rise in marginal productivity and thus pay factors employed relatively more than other sectors do. As a result, factor inputs/resources are pulled to the booming sector (oil/export sector) at the expense of other tradable sectors (agriculture and manufacturing) and the non-tradable sector. This results in direct de-industrialization of the economy (Nwanna & Eyedayi, 2016).

c) Non-economic factors are mostly politically motivated. For example instability in the regions of oil producing countries caused by wars, or countries with big oil reserves do not reveal real oil data for investors, so they could be sure of profitability of their investment projects. Countries manipulate oil data for the benefit of their political influence and consider it national security matter. This uncertainty keeps most of the investors reluctant from investing in big perspective projects, which could secure steady supply (González & Nabiyeu, 2009).

2.2. The impact of oil price fluctuation on corruption:

Corruption is a disease, which eats into political, cultural and economic growth of any country and destroys the functioning of various organs of the government.

The World Bank defined corruption as “the abuse of public power for private gain” (Kanu, 2015). It is widely understood as “the acts in which the power of public office is used for personal gain in a manner that contravenes the rules of the game” (Nguyen & Van Dijk, 2012).

Corruption is simply an ability to secure power or wealth illegally, with the sole aim of gaining privately in a public expense. Corruption is not only found in the public sector like democratic and political sector, but can also be seen in every other areas of life (Onyinye Junior, 2015).

In general, natural resources like oil, gas, diamonds, and other precious minerals breed corruption. For the fact that most oil firms do not publish their financial statement and information country by country, they will always hide the amount of fees and taxes paid and as well their royalties (Onyinye Junior, 2015). The natural resources are therefore not only a target of corruption but also an instrument of holding power (Aslaksen, 2007).

The oil investment relationship reflects a firm in direct dealings with the state, increasing the possibility that the analysis may capture a closer approximation of corruption effect (Melo & Quinn, 2015).

2.3. The impact of corruption on economic growth:

The World Bank (1997) has identified corruption as “the single greatest obstacle to economic and social development”. Again, the World Bank (2004) has projected that more than US\$ 1 trillion is paid for bribes over the world as a whole each year (Pulok, 2012).

Over the past years, the question of the economic consequences of corruption on economic growth has long been a subject of analysis and debate. Which are essentially focused on the effect of corruption on economic growth (Ghalwash, 2014).

Corruption is generally perceived as detrimental to economic growth by deterring investment and undermining the government’s ability to implement effective policies. However, a significant number of studies indicate that corruption actually promotes growth based on its role in increasing public officials’ productivity and speeding up bureaucratic delays. Still, others found that there is no significant relationship between the two variables (Chamseddine, 2016).

According to (Igwiki, Ershad Hussain, & Noman, 2012) there are two schools of thoughts exist:

1) Some experts claim that corruption has a positive effect on economic growth. The most popular justification of the beneficial effects of corruption rests on so-called “grease the wheels” hypothesis (Méon & Sekkat, 2005).

Also (Huntington, 1968) stated that: “the only thing worse than a society with rigid, over centralized dishonest bureaucracy is one with a rigid, vercentralized, honest bureaucracy”. He justify his thoughts that bribery act as speed money for the entrepreneurs and businessman to avoid bureaucratic delays and cumbersome rules and regulations in investment mechanisms.

(Lui, 1983) Develop an equilibrium queuing model of bribery, where customers are ranked based on their respective values of time. He suggests that efficiency of the public administration improves as bribing tactics to reduce waiting costs. So that individuals with higher values of time are able to move the front of the queue.

(Ackerman, 1999) Said that: “I begin with cases of low level corruption and then consider the more controversial case of high level or "grand" corruption in the awarding of contracts, concessions, and privatized firms”

2) The alternative view of corruption has a negative impact on economic growth. Proponents of this school of thought point the following transmission channels to support their argument: first, a decline in domestic and foreign investment; second, an increase in the cost of production; third, misallocation of natural resources; fourth, an increase in inequality and poverty; and fifth, uncertainty in decision making, among others (Igwiki, Ershad Hussain, & Noman, 2012).

(Mauro, 1995) became one of the pioneers when he engaged in an empirical analysis of corruption, by studying the relationship between corruption and economic growth, employing a cross sectional panel data consisting of 70 selected countries for a three years period extending from 1980 to 1983. He finds that corruption has a significant negative effect on private investment and economic growth.

(Shleifer & Vishny, 1993) Point out that corruption is more distortionary than taxation and is responsible for raising the cost of doing business, which in turn impedes economic growth.

(Mo, 2001) has shown that corruption reduces economic growth through human capital and political instability channels. His study reveals that 1% rise in the corruption level decreases the growth rate by about 0.72%.

3. literature review:

The research aim of **Latife Ghalayini (2011)** in his study “The interaction between oil price and economic growth” is to investigate whether economic world growth can be explained by changes in the oil price. The author also investigates if there are any differences in oil price effects on economic growth between different countries and group of countries. For the oil importer countries, oil price increase and economic growth are negatively correlated while all things being equal, the relation is positively correlated for oil exporter countries. The data used in this paper covers the G-7 group, OPEC countries in addition to Russia, China and India. The main findings may be summarized as follows: the Granger causality-tests allows the authors to conclude that the interaction between oil price changes and economic growth is not proved for the most countries but for the G-7 group where, a unidirectional relation from oil price to gross domestic product is proven.

The research aim of **Adela Shera, Bernard Dosti, and Perseta Grabova (2014)** in their study “corruption impact on economic growth: An empirical analysis” is to analyze the impact of corruption on economic growth across 22 developing countries for the period of 2001-2012. This model has as dependent variable the growth of real GDP, Index corruption, population growth, government expenditures, level of secondary education enrollment, investment, trade as a percentage of GDP, inflation, and capital formation are going to be tested as dependent variables. The authors used fixed model (FE) and Random effect model (RE). The panel data analyses reveal that there is a statistically significant negative relationship between corruption and economic growth. The relationship is directly related to inclusion of other determinants of economic growth.

The research aim of **Eze Onyinye Junior (2015)** “analysis of oil export and corruption in Nigeria economy” is to analyze the impact of crude

oil export on Nigeria economy and its level of corruption. The data required for this research analysis include Real Gross Domestic product, Oil export and Non-oil export spanning through the period 1980 – 2012. The data for Corruption will be extracted from World Bank Governance and Anti-corruption website and also the Transparency International Corruption Index (1996 – 2012). Multiple regression technique was employed with the use of ordinary least square method. The study focused mainly on the revenue generated from oil export with the purpose of assessing oil exploration and corruption with the objective of investigating Nigeria's oil export and its contribution to the growth of economy and finding out if the level of corruption affects the economic growth in Nigeria. Based on the findings, the result portrays that oil export has significantly impacted on the economy despite its effect by corruption which appears to be negatively related to other economic variables.

Luisa Melo, and Michael A. Quinn (2015) this paper “oil foreign direct investment and corruption” addresses how oil changes the corruption-foreign direct investment relationship. With the advantage of their panel data set consists of 112 countries for the years 1999-2010. The frequency of the data is annual. There were two dependent variables used in the analysis: foreign direct investment and corruption. In the FDI equation, the independent variables are lagged corruption, lagged real GDP, lagged oil production, lagged corruption, labor force and oil rents. In the corruption equation, the independent variables are lagged FDI, lagged oil production, lagged oil production, lagged oil prices, and oil rents. Due to the use of lags, they lose one year of usable data. Therefore, the authors utilized a three stage least squares (3SLS) regression method. They find that corruption has a negative impact on attracting foreign direct investment but this is mitigated based on the amount of oil the receiving country produces. Results show that poor countries without oil may be using institutional corruption to attract foreign direct investment and that receiving these investments is reinforcing this corruption.

Ifeyanyi O. Nwanna, and ayenajah Mannaseh Eyedayi (2016) in their study “impact of oil price volatility on economic growth in Nigeria (1980-2014)”, the main objective of this study is to investigate the impact of crude oil price volatility on economic growth of Nigeria. The variables for the study are classified into dependent and exogenous

variables. The independent variables are the volatility series of the crude oil prices and OPEC basket. The other variables are real GDP per-capita income, real foreign exchange rate, the natural logarithm of government revenue, the natural logarithm of external foreign reserves and the natural logarithm of capital importation. The OLS regressions were used as a tool for data analysis and the findings revealed that oil price volatility does not have a positive impact on the economy but oil price itself does.

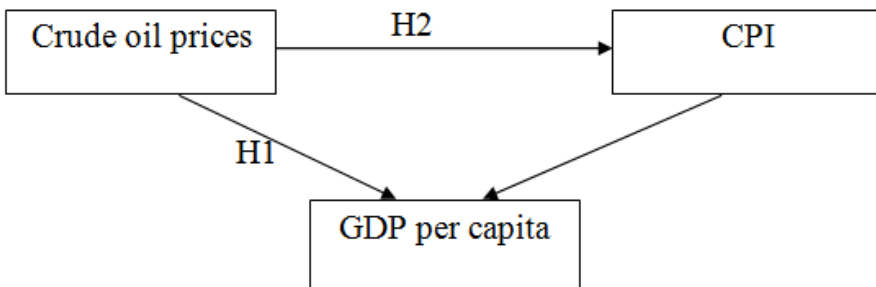
The study of **Nour Chamseddine (2016)** named by “corruption and economic growth in the middle East and north of Africa” examines the effects of corruption on economic growth in the region of the Middle East and North Africa (MENA) by using the Transparency International Corruption Perceptions Index and employing two panel data on the North African and Gulf countries between 2003 and 2013 where GDP (per capita) is a measure of economic growth, FDI is a measure of net inflows of foreign direct investment a country receives, labor is a measure of the labor force, CPI is a measure of corruption, GOV is a measure of government effectiveness, and CPI*GOV is an interactive variable combining both corruption and government effectiveness. The study includes two unit root tests and co-integration analysis, to test for a stable long-run economic structure between the variables in question. The findings suggest a negative but statistically insignificant relationship between the observed countries’ economic growth and the level of corruption.

4. Study methodology:

4.1. Model:

To study the impact of oil price fluctuations on economic growth, and according to literature review we proposed a model comprise three variables, namely crude oil prices, Gross Domestic Product (GDP per capita), and corruption perception index (CPI), as we can visualize it:

Figure1: model of the study and its hypotheses



Source: presented by researchers according to literature review

The study hypotheses are given as follows:

H1: There is a significant and positive direct effect of crude oil price on Gross Domestic Product.

H2: There is a significant and indirect effect of crude oil price on Gross Domestic Product with the existence of corruption perception index (CPI) as intermediate variable.

4.2. Data:

In the empirical analysis we have used information from the World Bank (WB), The International Organization of Transparency (ITO), and The Organization of the Petroleum Exporting Countries (OPEC). This dataset cover Algeria over the period 1999-2018.

The following tables clarify all the data:

Crude oil prices: We measured this variable by calculating the average monthly price per barrel

Table 1: crude oil prices’ data

Years	Oil prices
1999	18,12
2000	28,73
2001	24,72
2002	24,81
2003	28,83
2004	38,33

2005	54,59
2006	66,03
2007	74,66
2008	98,60
2009	62,16
2010	80,25
2011	112,90
2012	111,52
2013	109,44
2014	99,62
2015	52,82
2016	44,21
2017	54,20
2018	71,17

Source: OPEC

Economic growth: we measured this variables by GDP per capita, PPP (current international \$)

Table 2: GDP's DATA

Years	GDP
1999	7 795,27
2000	8 093,288
2001	8 416,500
2002	8 911,413
2003	9 620,872
2004	10 176,370
2005	10 971,517
2006	11 332,450
2007	11 843,364
2008	12 161,899
2009	12 241,811
2010	12 609,869
2011	12 989,955
2012	13 404,009
2013	13 715,332
2014	14 202,866
2015	14 612,680

2016	15 074,925
2017	15 266,485
2018	15 621,589

Source: World Bank

Corruption: is a dependent and an independent variable in this study, we measured this variable by the corruption perception index (CPI), this is limited between 0 (**highly corruption**) to 100 (**very clean**). For this reasons we reversed the index to show that 0 is (low corruption).

Table 3: CPI's data

Years	CPI	100-CPI
1999	24	76
2000	24	76
2001	25	75
2002	26	74
2003	26	74
2004	27	73
2005	28	72
2006	31	69
2007	30	70
2008	32	68
2009	28	72
2010	29	71
2011	29	71
2012	34	66
2013	36	64
2014	36	64
2015	36	64
2016	34	66
2017	33	67
2018	35	65

Source: international transparency organization (ITO)

5. Study results:

5.1. Correlation between the study variables:

Table 5 shows the correlation between the study variables: crude oil prices, CPI, and GDP.

Table 4: correlation between study variables

	Crude oil prices	CPI	GDP per capita
Crude oil prices	1		
CPI	-0.6598	1	
GDP per capita	0.6226	-0.9140	1

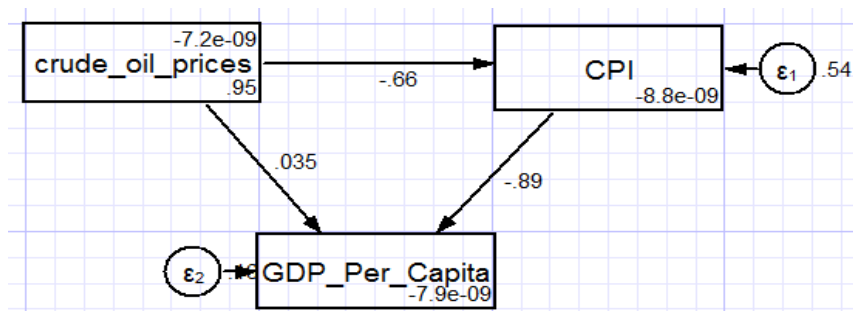
Source: presented by researchers using STATA 14 outputs

From the above table, there is: a strong negative correlation between CPI and GDP per capita with correlation coefficient of (-0.9140); however a medium correlation coefficient of (-0.6598) between crude oil prices and CPI; While the correlation between crude oil prices and GDP per capita is positive (0.6226).

5.2. Path analysis:

In this study, we have used the structural equation modeling (SEM) by STATA v14 software to test the conceptual model. Therefore by default, SEM does maximum likelihood (ML) estimation (Allison, 2016). Thus, we estimate likelihood that crude oil prices affect positively on GDP, and corruption perception index is an intermediate variable between them.

Figure 2: path analysis



Source: presented by researchers using STATA v14 outputs

From the figure (2) above it's clear that the direct effect of crude oil prices on GDP per capita is 0.035 and it's significant, so we accept the hypothesis H1: There is a significant and positive direct effect of crude oil price on Gross Domestic Product.

The direct impact of crude oil prices on CPI is -0.66 and the impact of this last on the GPD per capita is -0.89. Which makes the indirect impact (0.5874) and it's significant and bigger than the direct impact of crude oil prices on GDP per capita that leads us to accept the hypothesis H2: There is a significant and indirect effect of crude oil price on Gross Domestic Product with the existence of corruption perception index as intermediate variable.

5.3. CFA:

Figure 3: endogenous and exogenous variables

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Endogenous variables
Observed:  CPI GDP_Per_Capita

Exogenous variables
Observed:  crude_oil_prices

Fitting target model:

Iteration 0:  log likelihood = -59.796504
Iteration 1:  log likelihood = -59.796504

Structural equation model                                Number of obs   =           20
Estimation method = ml
Log likelihood    = -59.796504
  
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Source: presented by researchers using STATA v14 outputs

This first part shows us a few things. First, it identifies our three observed variables. It also shows how many iteration it took to set the target model (1 is good). It also tells us our number of observation (20) (Salas-wright, 2012)

Next we can look at the rest of the output

Table 5: estimation of the model

	Coef	Std. Err	Z	P> z	[95% Conf. Interval]	
Structural						
CPI <-						
Crude_oil_prices	-0.659	0.168	-3.93	0.000	-0.989	-0.330
_cons	-8.83 e-09	0.163	-0.00	1.000	-0.320	0.320
GDP_per_capita <-						
CPI	-0.891	0.120	-7.40	0.000	-1.127	-0.655
Crude_oil_prices	0.034	0.120	0.29	0.000	-0.201	0.270
_cons	-7.87 e-09	0.088	-0.00	1.000	-0.172	0.172
Var (e.CPI)	0.536	0.169			0.288	0.996
Var(e.GDP_per_capita)	0.155	0.049			0.083	0.289

Source: presented by researchers using STATA v14 outputs

This output gives us standardized factor loading values for each of the three observed variables as well as their standard error, significance, and confidence intervals (Salas-wright, 2012). For example, the

standardized factor loading for crude oil prices onto CPI was -0.66 with a standard error of 0.168. It is significant at $p < 0.05$ and had a 95% confidence interval that ranged from [-0.9891 to -0.3304].

Table 6: test of chi-square

Fit statistic	Value	Description
Likelihood ratio		
Chi2_ms (0)	0.000	model vs saturated
P> chi2		
Chi2_bs (3)	47.602	baseline vs saturated
P> chi2	0.000	

Source: presented by researchers using STATA v14 outputs

The output provides the chi-square value of 47.602; the degrees of freedom of 3, and the significance of the chi-square test ($p < 0.05$). This preliminary goodness of fit statistics suggests that the model may not fit the data all that well (Salas-wright, 2012). As general approach to model evaluation, chi-square may be sensitive to sample size. Many alternative statistics have been proposed. Here are some that are reported by STATA (Allison, 2016).

Table 7: goodness of fit statistics

Fit statistic	Value	Description
Likelihood ratio		
Chi2_ms (0)	0.000	Model vs saturated
P> chi2		
Chi2_bs (3)	47.602	Model vs saturated
P> chi2	0.000	

Population error			
RMSEA	0.000	Root mean squared error of approximation	
90% CI, lower bound	0.000		
Upper bound	0.000		
Pelose	1.000	Probability RMSEA \leq 0.05	
Information criteria			
AIC	133.593	Akaike's information criterion	
BIC	140.563	Bayesian information criterion	
Baseline comparison			
CFI	1.000	Comparative fit index	
TLI	1.000	Tucker-lewis index	
Size of residuals			
SRMR	0.000	Standardized root mean squared residual	
CD	0.438	Coefficient of determination	

Source: presented by researchers using STATA v14 outputs

This provides us with some of goodness of fit statistics. For instance, we can see that the RMSEA (Root Mean Square Error of Approximation) value is 0.000. According to (Allison, 2016) good models have an RMSEA of 0,05 or less. Models whose RMSEA is 0,10 or more have poor fit. He also said that the one nice thing about this statistic is that you can get a confidence interval (Allison, 2016). We also see that the CFI (Comparative Fit Index) value is 1.000, and that the SRMR (Standardized Root Mean square Residual) value is 0.000. The CD value of 0.438 provides information similar to the R-squared

value. In all, looking at these goodness of fit statistics suggest that the fit of the model to the data is good.

At this point, it would be helpful to examine the modification indices and see if –purely in empirical sense- any additional paths could be specified that may improve model fit (Salas-wright, 2012).

Figure 4 : modification indices

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(no modification indices to report, all MI values less than 3.841458820694123)
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Source: presented by researchers using STATA v14 outputs

6. Conclusion:

Oil prices will continue to have an impact on the economy as suggested by an OECD study. It suggests that the global dependence for oil will continue, especially in the transportation sector (Abdul Rezak, Yahya, & Shaari, 2009).

All things being equal, an oil price increase should be considered, positive in oil exporting countries and negative in oil importing countries. An oil price increase leads to a transfer of income from importing to exporting countries through a shift in the terms of trade (Ghalayini, 2011).

studies carried on before indicate that higher oil prices have a potential effect on the global economy through a variety of channels, including transfer of wealth from oil consumers to oil producers, an increase in the cost of production of goods, and impact on inflation, consumer confidence, policy adjustments and financial markets. (González & Nabiye, 2009).

Despite the increase of crude oil export to other foreign countries, some economists are still encouraging the government to look into other sectors (non-oil exports) which can also improve the economy and also increase the level of development in the country (Onyinye Junior, 2015)

Corruption it is an evil, certainly universal, but more wide spread in developing countries because conditions favor it (Gbentnk, 2012).

Corruption is a disease similar to cancer which impedes cultural, economic and political development of any country and destroys the functioning of several organs of the governments (Kanu, 2015).

The fight against corruption should include moral education, values and norms of society which play an important role. However, mechanisms should be established to observe and make responsible the individuals who have abused (Shera, 2014).

From using SEM by STATA v14 to maximum likelihood estimation we found that:

- There is a significant and positive effect to crude oil prices on GDP per capita.
- There is a significant and negative effect to crude oil prices on CPI.
- There is a significant and negative effect to CPI (Corruption perception index) on GDP per capita.
- The findings from these study shows that crude oil prices affects on GDP per capita in Algeria, also the CPI is an intermediate variables, which leads us to say that crude oil prices affect negatively on GDP per capita through corruption.

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