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Crude Oil Prices and Its Effect on Economic Growth; Analyzing Pre and Post Oil Prices Shocks: A Case Study of Pakistan Economy

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Abstract
This study attempts to investigate the effect of crude oil prices on Economic Growth in the presence of controlled variables Remittances, Political Instability and House Hold Consumption in case of Pakistan. This study analyzed the effect of both pre and post oil prices hike of 2008 and its impact on economic growth in case of Pakistan economy**.** This study uses Structural Break Point Unit root test to check the structural break and Structural Break Dummy variables to analyze the effect of both pre and post oil prices hype on Pakistan Economic Growth. The results indicate that there exist negative relationship between crude oil prices and economic growth. Structural break dummy verify a visible change in economic growth, both pre and post oil prices hype. The results also verified positive relationship between remittances inflow and economic growth. However, there exist negative relationship between Political instability and economic growth of Pakistan.
Keywords: Crude oil prices, Economic Growth, Structural Break Point test, Structural Dummy.

1. INTRODUCTION

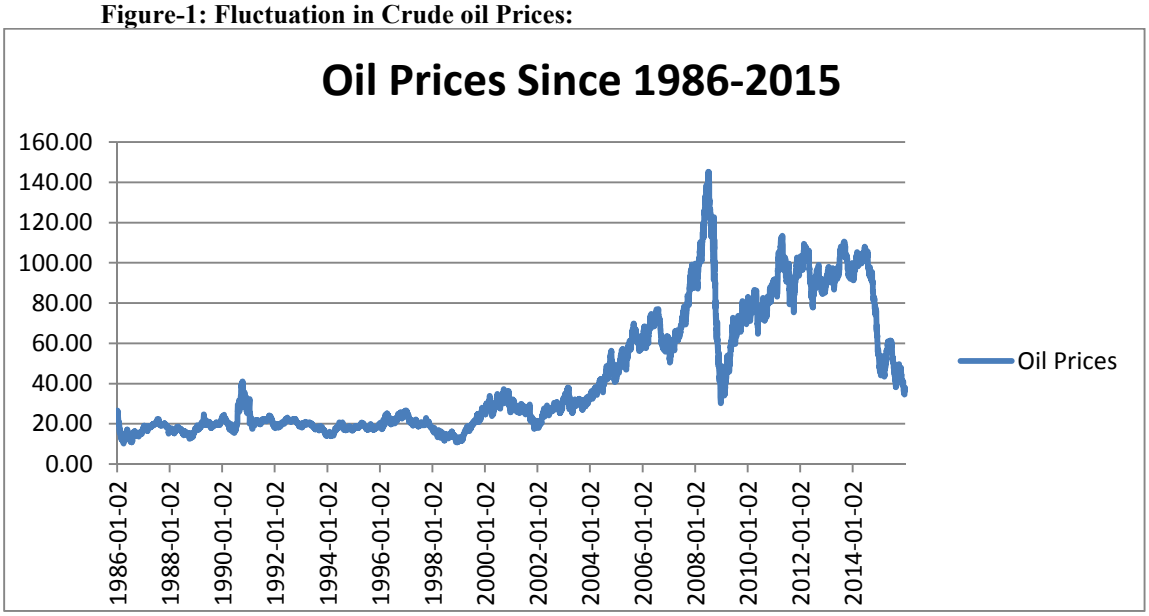
Crude oil is unfinished oil imported by the oil importing countries for refining them after which it is used as an input. Crude oil is used as input by economies across the World for different purposes such as production, fuel, home heating and energy generation. However, fluctuation in crude oil prices affects economic condition of both developed and developing economies which may be negative or positive. Fluctuation in prices of crude oil (COP) will affect macro-economic activities either positively or negatively. These fluctuation in crude oil prices affect the economic growth of crude oil prices negatively such as United States, Malaysia and other developed as well as developing countries (Hamilton, 1983) (Anshul et al., 2012) and (Bekhet, 2009). However, in case of India it affects economic growth negatively but not substantially (Akram, 2011).

Fluctuations in crude oil prices, in the same way also affect Pakistan economy. According to Sidra et al,.(2014), Adiqa (2011), Ahmad, (2013), Malik, (2008) and Imran et al., (2012) crude oil price negatively affect economic growth in case of Pakistan due to the rise in the cost of production making the process of production very costly affecting the end consumer demand.

Changes in crude oil prices not only affect the production side of the economy bus more importantly it affects the energy sector of the economy. According to International Energy Agency (2011) higher crude oil prices directly affect the cost of gasoline, home heating oil, manufacturing and electric power generation. There are several factors responsible for changes in prices of crude oil including production, oil discoveries at global level, financial markets, demand, demand of non- OECD member countries like china, India and Saudi Arabia. Moreover, according to the International Energy Agency (2011) the energy crisis of 1970s in which most of the developed and industrial economies felt the shortage of petroleum products and they were badly effected due to the shortage and hike in oil prices they include countries like United States, Eastern Europe, Japan, Canada, Switzerland.

In case of Pakistan crude oil prices not only negatively affect economic growth but further affect the consumption balances of households, the poor farmers in rural areas and the transporters in urban centers. These are the factors that are responsible for the negative impact of oil prices on economic growth and are a bad sign for economic development (Adiqa, 2011). On the other hand, crude oil prices also affect the level of unemployment positively as using oil as the key input leads to high cost of production which causes high cost of inputs and further swell unemployment rate (Ahmad, 2013).

Figure-1: Fluctuation in Crude oil Prices:



Sources: Migration and Remittances Fact Book (2015)

Figure-1 indicates fluctuation in crude oil prices since 1986. Figure-1 clearly indicates that oil prices were somehow stable till the year 2006. However, starting to rise from 2007-2008 showing substantial rise in the crude oil prices. According to Malik (2008), substantial reliance on the transnational crude oil macro-economy is critically affected through numerous ways. Shocks in crude oil in the year of 2007-08 have widely affected the GDP growth rate of Pakistan. As Pakistan was on the way to attain the peak GDP in this decade but unfortunately it was distressed by the international crude oil prices. In Pakistan for energy perseverance natural gas is used 39% as a source of energy production and the second largest source for energy is petroleum products which amounts 32%. However, 82% demand for petroleum products is met through imports. In the year 2007-08 Pakistan apportioned 44% export earnings for oil imports which are so much higher than ever in 2004, which was 27% due to the (Malik, 2008).

For developing countries like Pakistan crude oil price shocks have significant effect on the internal economic situation as it affects the existing macro-economic discrepancies in the country. This national impact of oil price hikes are then transferred to external level by negatively affecting the balance of payment position and foreign exchange reserves (Rizwan et al., 2007).

Number of empirical literature gauges the effect of crude oil Prices on Economic Growth. Therefore, afore ensuing with this study, it is necessary to have an extensive look about the existing and earlier empirical literature on the effect of crude oil prices on Economic Growth.

The issues of crude oil prices and its impact on economic growth have been widely studied by academia, researchers and Economist. Some of these studies suggest positive as well as some of them argue with negative relationship between crude oil prices and economic growth. As (Sidra et al,. 2014), (Adiqa 2011), (Ahmad, 2013), (Malik, 2008) and (Imran et al., 2012) finds negative relationship between crude oil prices and economic growth in case of Pakistan. Similarly, some other empirical studies finds the same results in different countries supporting the negative relationship between crude oil prices and economic growth, including (Hamilton, 1983), (Bekhet, 2009), (Bhushal, 2010), (Singh, 2001), (Berk et al.,. 20012), (Subhani et al., 2010), (Fernando et al., 2004), (Rodriguez et al., 2004), (Anshul et al., 2012), (Hui Guo et al., 2005) (Akram, 2012) (Cantah 2014) and (Mubariz et al.,2013).

While on the other hand some of the empirical studies oppose the negative relationship between crude oil prices and economic growth and argues that there exist positive relationship between crude oil prices and economic growth. As it includes, (Saibu, 2013), (Trehan, 2008), (Hussain et al., 2009), (Tara 2010) and (Perez et al., 2004), supported the positive relationship between crude oil prices and Economic Growth.

Model Specification, Methodology and Data:

In order to find the relationship Economic Growth and Crude oil prices, this study uses Structural Break Point Unit root test by Perron(1989), Vogelsang and Perron (1998), Zivot and Andrews (1992), Banerjee et al.(1992) and Perron (2006). Further, Structural dummies will be applied to check the effect of structural break on Pakistan economic growth. Moreover, this study uses CUSUM stability test, Jarque-Bera normality test, Serial Correlation LM Test and Heteroscedasticity detection test. The secondary data for this study has been taken from State Bank of Pakistan (SBP), Pakistan Bureau of Statistics (PBS), World Data Bank (WDB) and the Global

Economy, over the period of 2000 to 2015.

Before dealing with structural dummy for the model, it is imperative to find out the structural break in the data. For this purpose this study uses structural break point unit root test to find the structural break in the data. The following result shows the structural break date in the data.

Table-1: Structural Break point Unit root test:

Null Hypothesis: Crude Oil Prices has a unit root

Break Date: 2008

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.100670	< 0.01
Critical Values	1% level	-4.949133	
	5% level	-4.443649	
	10%level	-4.193627	

*Vogelsang (1993) asymptotic one-sided p-values.

In order to analyze the relationship between Crude oil prices and Economic growth, this study uses structural break point unit root analysis to identify the structural break in the data and to deal with it accordingly. The results in table-1 indicates that there is a structural break point in our data and the break date is 2008[1], which verifies the oil prices shocks of 2008. The value of structural break point unit root test is highly significant.

Robust Regression Analysis:

This study will use Robust Regression analysis; it provides both efficient and unbiased Model, having small standard deviation which will help in the measurement of reliable results. The key purpose of using the robust regression is basically to deal with the problem of outliers and to get efficient results in the presence of outliers. In order to get efficient results having outliers, robust regression has been used as it limits the influence of outliers.

Model for Robust Regression Analysis:

Following structural break point unit root test, the following model has been used for this study. This study will first use Model-I in order to analyze the effect of crude oil prices on economic growth irrespective of the structural break.

$$RGDP_t = \beta_0 + \beta_1 COP_t + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots (i)$$

Following with Model-I, this study will then run a separate regression for equation two in order to analyze the effect of Structural Break using Dummy Variables and interactive Dummy variable on economic growth in case of Pakistan for the period of 2000-2015.

$$RGDP_t = \beta_0 + \beta_1 COP_t + \beta_2 \text{ Dummy for Structural Break (2008)} + \beta_3 \text{ Dummy*} COP_t + \mu_t \ldots\ldots\ldots (ii)$$

Where;

t: Denotes the time period.

$RGDP_t$: Denotes Real Gross Domestic Product (RGDP)

COP_t: Denotes Crude Oil Prices

Dummy for structural Break: where "0" for the period before structural Break 2000-2008 and "1" for the period after structural Break 2009-2015.

Dummy*COP_t: Denotes the interaction of Dummy with Crude oil Prices.

μ_t: Denotes error terms

3. RESULTS AND DISCUSSIONS:

Table-1: Results of Robust Regression Analysis for Model-I:

Dependent Variable RGDP	
Regressors	**Coefficients**
COP_t	-11.77 **
Constant	4.65 ***
Adjusted R-Square = 0.60	J-B test: 0.612 (0.736)
Durbin Watson (DW) = 1.81	Heteroscedasticity test: 1.99 (0.31)
F-statistics = 7.03 (0.002)	Serial-Correlation test: 1.61(0.23)

*, ** and *** demonstrate significant at 1, 5, and 10% level. () parenthesis indicates probability of each test.

[1] For more details see Appendix-II

Table-2: Estimated regression Results for Model-I:

Model-I: $RGDP_t = \beta_0 + \beta_1 COP_t$

$\mathbf{RGDP_t = 4.65 - 11.77COPt}$
Std.Error = (0.477) (4.76)
t-stats = (9.73) (2.47)
Adj.R^2 =0.66 F-stats:7.0 (0.002)

The results obtained from the table-2 shows that there exist negative relationship between crude oil prices and economic growth in case of Pakistan, supporting the early findings of (Sidra et al,. 2014), (Adiqa 2011), (Ahmad, 2013), (Malik, 2008) and (Imran et al., 2012) for Pakistan.

Further, 66% of variation in Economic growth has been caused by Crude oil prices in case of Pakistan. F-statistics shows overall model is highly significant and stable[1].

Moreover, in order to check the Normality of the data we applied, Jarque-Bera test of normality. The results clearly indicate that our data is normally distributed. As it Mean, Median and Mode is almost equal, also having insignificant probability value, accepting Null Hypothesis, which is that data is normally distributed.

Further, this model lacks the problem of Autocorrelation and Heteroscedasticity. As it can be seen clearly through the above results, showing insignificant values for both Autocorrelation and Heteroscedasticity, which means absence of Autocorrelation and Heteroscedasticity.

In order to check the stability of the model, we uses CUSUM test, as it's clearly shows that our model is fully stable. As the blue line fall between both the red lines with 5% level of significance, showing that our dependent variable, which is, GDP Growth is fully stable.

Structural Break using Dummy Variables:

In order to analyze the effect of Structural Break in crude oil Prices on Economic of Pakistan, this study uses Dummy Variables for this purpose, assigning 0 and 1 for both before and after structural break.

Whereas;

"O" for the period before structural Break (2000-2008)

"1" for the period after Structural Break (2009-2015)

Table-3: Results of Robust Regression Analysis for Model-II:

Dependent Variable $RGDP_t$	**Selected Model: ARDL (1, 0, 0, 1)**
Regressors	**Coefficients**
COP_t	-29.98***
Dummy for Structural Break	-3.05***
$D*COP_t$	24.61**
Constant	6.32***
F-Stats: 20 (0.001)	
Adj R-Squared: 0.80	

`*, ** and *** demonstrate significant at 1, 5, and 10% level. () parenthesis indicates probability of each test.

Table-4: Estimated regression Results for Model-II:

Model-II: $RGDP_t = \beta_0 + \beta_1 COP_t + \beta_2$ **Dummy for Structural Break (2008)** $+ \beta_3$ **Dummy*** $COP_t + \mu_t$

$RGDP_t = \mathbf{6.32 - 29.98 - 3.05 + 24.61}$
Std.Error = (.3750) (5.25) (.5181) (5.97)
t-stats = (16.87) (5.71) (5.90) (4.12)
R^2 =0.80 D.W: 1.81, F-stats:20 (0.00)

The results for structural break dummy in table-3 and table-4 shows significant results. However, the dummy coefficient is highly significant confirming a visible change in economic growth both pre- and post-2008 oil prices hype. Similarly, both differential slope and intercept values are highly significant which shows that Pakistan economic growth has gone structural change since the structural change in the oil prices of 2008. Further, the overall model is highly significant and 80% of the variation in economic growth is caused by crude oil prices in this model.

[1] For more details see Appendix-I

Table-5: Calculated Results for Structural Break Dummy:

$$Y_t = (\beta_0 + \beta_2) + (\beta_1 + \beta_3) X_t$$

$$Y_t = (\mathbf{6.32 - 3.05}) + (\mathbf{-29.98 + 24.61})COP_t$$

$$Y_t = 3.27 - 5.37COP_t$$

The result in table-4 verifies the existence of structural change in case of Pakistan. The results estimated in table-5 shows that after structural change in crude oil prices of the effect oil price on economic growth of Pakistan are still negative, but it has shown a substantial decrease in the negative effect of crude oil prices on Pakistan economic growth. The reason might be the afterward sharp decline in the crude oil prices.

Table-6: Sensitivity analysis:

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) OLS
COP	-11.77**	-37.88**	-0.432**	-61.42**
	(39.40)	(25.73)	(0.191)	(29.35)
Political instability		-33.02***	-13.60***	-7.22
		(4.02)	(4.32)	(5.36)
Remittances			0.0023***	0.007
			(0.0049)	(0.001)
HH Consumption				0.225
				(0.128)
Constant	4.65***	48.69***	66.03***	65.61***
	(0.47)	(8.93)	(6.20)	(5.54)
R-squared	0.61	0.85	0.86	0.90

Standard errors in parentheses () *** p<0.01, ** p<0.05, * p<0.1

Further, in order to check the impact of different key macro-economic variables on economic growth sensitivity analysis has been used. Table-6 indicates the impact of each variable on economic growth of Pakistan. The result shows that there exist negative relationship between political instability and economic growth, followed by positive relationship among remittances inflow, Household Consumption and economic growth in case of Pakistan.

Conclusion

The main aim of this study was to test the relationship between crude oil Prices (COP) and Gross Domestic Product. This study uses the time period of 2000 till 2015 in case of Pakistan. This study uses Real Gross Domestic Product (RGDP) as our Dependent variable opposite to the Crude oil prices (COP) as our main independent variable.

The findings of this empirical analysis show that there exist a negative relationship between GDP and COP. Rise in the crude oil prices causes GDP to decline. Similarly, our empirical findings are consistent with the early findings of (Sidra et al,. 2014), (Hamilton, 1983), (Bekhet, 2009), (Bhushal, 2010), (Singh, 2001), (Berk et a.,. 20012), (Subhani et al., 2010), (Fernando et al., 2004), (Ahmad, 2013), (Malik, 2008), (Rodriguez et al., 2004), (Anshul et al., 2012), (Adiqa 2011), (Cantah 2014), (Mubariz et al.,2013), and (Imran et al., 2012), as the findings of all these mentioned studies revealed negative relationship between COP and GDP. As the rise in crude oil prices directly affect the cost of production, which adversely affect production level, and ultimately effect the overall economic growth of a country. Moreover, the results also found that there is a clear different between pre and post oil prices hikes of 2008 on economic growth of Pakistan. The results also verified positive relationship between remittances inflow and economic growth supporting the early findings of (Neyapti, 2004) (Heilman, 2006) (Durand et al., 1996) and (Fajnzylber and Lopez, 2005). However, there exist negative relationship between Political instability and economic growth of Pakistan. Therefore, based on the empirical findings, the policy makers needs to control the unnecessary surge in the oil prices which is normally caused through endogenous factors, as we can't control exogenous shocks to oil prices. In this regard Government needs to devise a stable and consistent policy regarding oil prices in order to control its negative impact on Pakistan Economy.

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