

# Crude oil prices and Pakistani Rupee-US dollar Exchange Rate: An analysis of Preliminary Evidence

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## Abstract

The objective of this paper is to analyze the effects of crude oil price on exchange rate of Pakistani rupee against US dollar, employing time series data from 1986-2010. The method of simple linear regression models are used for the analysis of the data. The model result indicates that as the price of crude oil increases its imports also increases. In Pakistani foreign exchange market there is increase demand for dollar to import crude oil, which leads to depreciation of Pakistani rupee against US dollar. Some recommendations like increase in domestic production of crude oil, political stability, import of advance technology, and looking for alternative sources of energy have been suggested to avoid depreciation of Pakistani rupee against US dollar.

**Key word:** Crude oil price, Exchange rate, Crude oil Import

## 1. Introduction

Pakistan is a developing country ranking 26<sup>th</sup> in terms of Purchasing Power Parity (PPP) and 44<sup>th</sup> in terms of nominal GDP having a population of over 186 million making it the sixth populous country in the world. Pakistan ranks 33<sup>th</sup> in terms of oil consumption. According to U.S. Energy Information Administration (EIA) the current crude oil production in Pakistan is 64,000 barrels per day (EIA 2012). This amount is not sufficient to fulfill the needs of the country which is 437,000 bbl/d. Pakistan heavily depends on the imported oil to fulfill its needs. Almost 82 percent of the demand for oil and petroleum products is met through imports mainly from Middle East countries (Saudi Arab in playing the leading role). About 44 Percent of export earning is spent on oil imports during 2006-07. This percentage was only 27 percent in 2004-05. And this is continues to rise. The increase in international oil prices has a direct impact on the economy of a country; specially it depreciates domestic currency and leads to inflation.

Oil is always been an imported source of energy for Pakistan, the price of which has increasing continuously. The price of oil was \$10 per barrel in 1995 which increased to \$110 per barrel in May 2014 showing an increase of almost hundred times as compared to its prices in 1995 and due to this increase in oil prices it leads to an increase in oil prices domestically escalating to Rs 107 per liter in May 2014 from Rs 9 per liter in 1995. (Pakistan Economic Survey). According to Pakistan Energy Outlook by Petroleum Institute of Pakistan (2007) the per capita consumption in Pakistan is increasing. In 2009-10 the per capita consumption was 0.42, in 2014-15 it will be 0.52 and in 2019-20 it would be 0.64. According to Pakistan Energy Outlook by Petroleum Institute of Pakistan (2007) the increase in imports will be high in the coming years. In 2009-10 the imports of crude oil were 26.5 (37%), in 2014-15 it would be 33.4 (35%) and in 2019-20 it would be 43.4 (34%). Exchange rate can be defined as the price of Pakistani Currency (Rupee) against other country currency. In this case it would be the price of Pakistani Rupee in terms of US dollar meaning how many Pakistani rupees are required to buy one US dollar. And due to increase in crude oil prices, our exchange rate depreciates causing inflation which reduces the purchasing power of the people.

Since the oil price shocks of the 1970s many economist, policy makers and businesses attracted to the fluctuation in crude oil prices. They attempt to develop models how oil prices affect various economic magnitudes. Early studies undertaken such as Hamilton (1983) and Darby (1982) pointed out that the 1970s and 1980s recessions were caused by large increase in oil prices. One of the most important variables of interest is exchange rate, and the reason for this is clear, because oil prices are quoted in US dollar and so the US dollar exchange rate is the key channel through which changes in oil prices are transmitted to the real economy (Reboredo, 2012).

The objective of my study is to investigate the consequences of oil price hikes on Pakistan's exchange rate against US dollar. My study will contribute to the literature in an important ways. Pakistan is an oil importing country and thus we will try to find out whether the empirical results obtained for advanced oil importing countries regarding the effect of oil price increase on the exchange rate, hold for a developing country like Pakistan.

Pakistan is a developing country. It needs huge amount of oil to carry on its day to day activities. Currently Pakistan is short of energy sources and due to increase in oil prices in international market, it put an extra burden on our foreign exchange reserves, because we fulfill our oil demand mainly through import. The study

is worth important because about 60 percent of the people are living below the poverty line, and when the prices of oil increase it reduces their purchasing power, and they are unable to avail many basic necessities of life, causing many economic and social problems.

The rest of the study is organized as follows. Next section deals with the literature review on crude oil prices and exchange rate, section third is about methodology and data, section fourth shows empirical result and the last section is the conclusion and policy recommendation.

## **2. An overview of Literature crude oil prices and exchange rate relationship**

This section will review the previous studies that have been conducted to investigate the oil price–exchange rate nexus. Many studies have been conducted on oil price and exchange rate co-movements including (e.g., Huang and Guo, 2007., Chaudhuri and Daniel, 1998., Amano and Noden, 1998). There is significant influence of USD Exchange rate on crude oil price. This statement is supported by (e.g., Yousefi and Wirjanto, 2004., Sadosky, 2000., Zhang et al, 2008). Indirect relation between USD Exchange rate and crude oil prices were found by all of them. They documented that oil price is significantly responsible for the fluctuation in exchange rate.

A study carried out for South Africa to find out the relationship of oil prices and exchange rates by utilizing the method of GARCH autoregressive conditional jump intensity model of Chan and Maheu. The result indicates that in case of Africa, the increase in oil prices leads to a depreciation of South African rand relative to the US dollar. (Fowowe 2014).

A study conducted by Hacıhasanoglu et al (2012) for selected countries to investigate the role of oil prices in explaining their exchange rates. Divided the data taken from 2003 to 2010 into three subsamples, generalized impulse response function was used to find out the role of oil price changes on exchange rate movements. The study concludes that a rise in oil prices leads to appreciation of domestic currency against US dollar. Within the sample period of our study the oil price dynamics changes significantly, while after 2008 financial crisis, the relation between oil prices and exchange rates becomes much more relevant. Study conducted by Basher et al. (2012) support that oil price plays a major role in determining exchange rate moments among emerging economies. By using impulse response functions they shows that the exchange rate of emerging economies become weak upon the rise in oil prices.

Ghosh (2011) utilized GARCH and EGARCH models to investigate the relationship between oil price and exchange rate for India. In his study he found out that increase in oil prices leads to a depreciation of the exchange rate

A study undertaken by Nkbakht (2010) to study the relationship between exchange rate and oil prices for OPEC members. Utilized the monthly panel data from 2001 to 2007 for seven OPEC members. The result indicates that oil prices may be the possible reason in real exchange rate movements. Though there is no relation found for exchange rate and oil price in individual country's case, while the pooled results showed long run linkage between real exchange rate and real oil prices.

The Generalized autoregressive conditional Heteroskedasticity (GARCH) and exponential GARCH (EGARCH) have been used utilizing daily data for the period 2000–2006 for Fiji to examine the relation between oil price and Fiji–US exchange rate. The above two models have been used to estimate the impact of oil price on the nominal exchange rate. The result indicates that rise in oil price leads to appreciation of the Fijian dollar (Narayan et al, 2008).

Huang and Guo (2007) investigated the price shock and three other macro economic shocks impact on the china's real exchange rate by using VAR model. They found that oil price shocks would cause a minor appreciation of the long term real exchange rate and it is due to less dependency of china on imported oil. The real shocks are dominant as compared to nominal shocks in determining variation in real exchange rate.

By employing the method of vector autoregressive (VAR) modeling and co-integration techniques for Russian economy to find out the relationship between oil prices and real exchange rate. The result indicates that Russian economy is affected by fluctuation in oil prices and real exchange rates, through both long run equilibrium condition and short un direct impacts. Due to the growth trends observed in Russian economy no evidence has been found against the diminished role of oil prices (Rautava 2004).

Sadosky (2000) investigated the relationship between future energy prices and exchange rates. Results show that crude oil future prices, heating oil, and unleaded gasoline are con-integrated with a trade-weighted index of exchange rates. This is important because it shows that long –run relationship exists among these variables. It is also highlighted that exogenous shocks in energy prices, e.g. oil is caused by fluctuation in exchange rate.

### 3. Methodology and Data

The method of simple linear regression has been used for the estimation of the data. The study employs an empirical analysis and only focuses on three variables. The variables of interest are imports of crude oil in thousand barrels per day by Pakistan, Exchange rate of Pakistan rupee per US dollar, and world crude oil prices in US dollars. The data on Rupee US dollar is taken from state bank of Pakistan, world crude oil prices from knomea.com. And Imports of crude oil from United States Energy Association. Time series data have been taken 1986-2010 for all three variables. To analyze the relationship two separate models have been developed one on imports and price of crude oil and the other on Exchange of Pakistani rupee against UD dollar and crude oil import.

First the relationship between crude oil imports and world crude oil prices can be examined using the equation

$$COIt = \beta_0 + \beta_1 COPt + \mu \dots\dots\dots (a)$$

Where

COIt = Crude oil imports (thousand barrels) for the time period ‘t’

COPt = Crude oil prices for the time period ‘t’

$\mu$  = Error term

Second, in order to analyze the relationship between Exchange rate of Pakistani Rupee against US dollar and imports of crude oil, the following equation is constructed.

$$\text{\$X Ratet} = \beta_0 + \beta_1 COIt + \mu \dots\dots\dots (b)$$

Where

\\$X Ratet = Exchange rate of Pakistani rupee against US dollar for the time period ‘t’

COIt = Crude oil imports (thousand barrels) for the time period ‘t’

In order to investigate the relationship between Exchange rate of Pakistani rupee against US dollar and Crude oil prices, two separate models are constructed, because the exchange rate is influenced by crude oil price.

### 4. Empirical Results

The model (a) result shows that due to increase in crude oil prices, the demand for crude oil increases. Thus in Pakistani’s foreign exchange market, the demand for dollar increases, because oil is traded in international market in US dollar. Due to high demand for dollar Pakistani rupee depreciates against US dollar. Our estimated model indicates that one dollar increase in crude oil prices will lead to increase of oil demand by 1.357 thousand tones. The value of R2 is 0.632 showing that pretty much of increase in crude oil imports in explained by its prices. This can be shown in table No 1.

Table 1 Relationship between oil imports and oil prices

	Dependent Variable	Independent Variable	R2	$\beta_0$	$\beta_1$	Significance	F	t
(a)	Oil Imports	Oil prices	0.632	69.767	1.357	0.000	39.52	6.29

Equation (b) shows the relationship between exchange rate of Pakistani rupee against US dollar and crude oil imports. Result indicates that every one thousand tons of crude oil imports leads to appreciation of the US dollar by about 0.407 against Pakistani rupee. In other we can say that due to every thousand tons of crude oil imports, Pakistani rupee depreciates by 0.407 against US dollar. The R2 value of 0.831 clearly shows that that large of variation in exchange rate is explained by crude oil imports. Table no 2 shows the result.

Table 2 Relationship between Exchange rate of PKR-USD and Oil imports

	Dependent Variable	Independent Variable	R2	$\beta_0$	$\beta_1$	Significance	F	t
(b)	Exchange Rate	Oil imports	0.813	-	0.407	0.000	100.18	10.01

The combining result of the two equations (a) and (b) can be shown collectively in a single table.

Table 3 Table 1 & Table 2

	Dependent Variable	Independent Variable	R2	$\beta_0$	$\beta_1$	Significance	F	t
(a)	Oil Imports	Oil prices	0.6321	69.767	1.357	0.000	39.52	6.29
(b)	Exchange Rate	Oil Imports	0.8133	-	0.407	0.000	100.18	10.01

## 5. Conclusion and Policy Recommendation

This paper examined the relationship between crude oil prices and exchange rate. Our basic objective was to find whether an import of crude oil leads to depreciation of the domestic currency. We employ a time series data from 1986-2010. It is found that oil prices and imports are raising continuously, this cause a huge cost to the economy because Pakistan is a net importer of crude oil. A lot of foreign exchange reserve is spent on the import of crude oil. The demand for dollar increases which leads to depreciation of Pakistani rupee

against US dollar. A high oil price reduces the purchasing power of Pakistani rupee in international market, and also domestically people lose faith on rupee.

### 5.1 Policy Recommendation

In order to decrease the dependency on imported crude oil and to overcome the depreciation of Pakistani rupee some policy suggestion has been put forward.

First: The government should initiate such policies and give incentives which may not only attract the domestic investors but also foreign investors, to come and invest in oil exploration projects. This will not only increase FDI, but also help to fulfill the energy needs of our country.

Second: The economic performance of a country is very much related with the political stability. If there are frequent changes in government, the policies will also change and it will discourage investors and therefore they will shy to invest in long term risky projects like oil exploration. So if the government wants to increase domestic oil production then they have to devise such policies which are not affected by the change of a government.

Third: The government should launch such projects which results in the production of educated, technical and skillful peoples. Because we need technical and skillful peoples for the successful completion of difficult projects like oil exploration.

Fourth: The government should focus on the law and order situation prevailing in our country, they should provide safe and secure environment to investors so that they may invest in the oil exploration projects.

Fifth: The government should emphasize on the achievement of advance technology. Instead of importing oil, the government should import heavy machinery necessary for oil exploration, so that the domestic oil production may increase.

Sixth: The government should not wholly and solely depend on oil, but also look for alternative energy sources like

- Coal energy: As coal is a cheap source of energy in Pakistan due to its abundance. The major source of coal in Pakistan is Ther Coal. So the government should initiate such projects to utilize this source of energy in order to bridge the gap between demand and supply of energy.
- Wind energy: Another cheapest source of energy is wind energy. Government should install wind turbines in those areas with high average wind speeds.
- Hydro energy: Water being a natural resource available in abundance in our country, so the government should install hydraulic turbines on water sources like rivers, canals etc.
- Nuclear energy: Being a nuclear power, the government should install nuclear power plants for the generation of nuclear energy which can be used to offset the energy crisis.
- Solar energy: Sun being the biggest source of energy in the universe and particularly in Pakistan because there are virtually 300 sunny days out of 365. So the government should take steps to promote use of solar energy through easy availability of solar cells.

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**Appendix**

Figure: 1 Crude Oil Price per Barrel in US Dollar

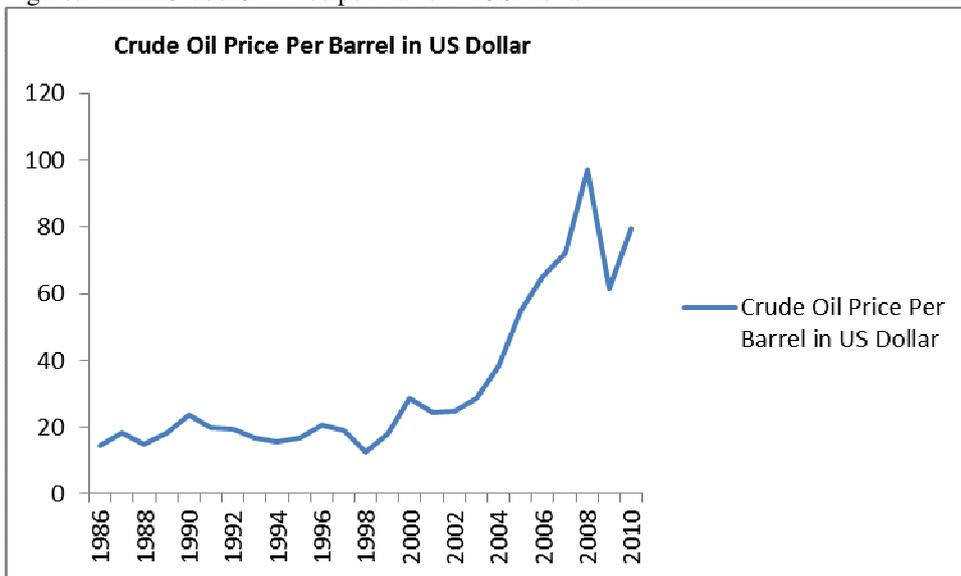
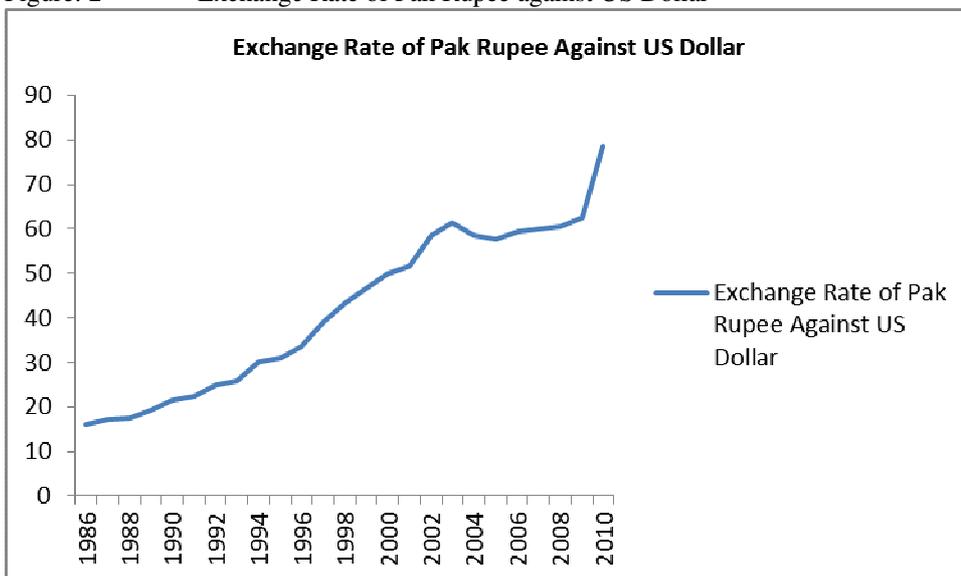


Figure: 2 Exchange Rate of Pak Rupee against US Dollar



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