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Nexus among Oil Prices, Current Account Balance and GDP in Pakistan

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Abstract
Current Account Balances (CAB) and Gross Domestic Product (GDP), are few of important determinant of country's economic position. However, for developing countries CAB is almost found in deficit, but still it plays a vital role in Economic performance. With industrialization oil has been one of most important need of economies to grow and survive. Countries with oil reserve have enjoyed fruits of rapid development while others pay millions of dollars to buy oil. Certainly fluctuation on oil prices have affected balance sheet of economies over time. This research focuses on bilateral relation between CAB and oil prices in Pakistan during the period of 1980-2010. Using vector auto regression model it was found that in Pakistan GDP has positive while CAB has negative relation with oil prices.
Keywords: Oil prices, Current account balance, GDP, Pakistan

1. Introduction

Real oil prices are one of important determines to evaluate current account balance. Real oil prices imports and exports in Pakistan leaves highly unpredictable effects on current account balance. Since early 90s real oil prices has shown a smooth rise in Pakistan. Demand and supply are major factors for oil prices steady rises. One of objectives of this research paper is to review all possible reasons, consequences and all challenges faced by Pakistan due to unstable oil prices. In Pakistan daily oil production is approximately 63,580 barrel; where one barrel contains 42 gallons or 159 liters, and oil consumptions per day is 410,000 barrels. Pakistan exports approximately 29,840 barrel of oil per day and oil imports is 346,400 barrel per day. Price of one barrel of crude oil in Pakistan is PKR 5084.8, (US$ 56 multiply by PKR. 90.08)[1]. Freight premium is equal to 196.127 rupees. Handling, bank and marine insurance at rate of 0.9% that equals to rupees 302, wharf age charge at rate of 3.85% equals to PKR 129.36, Oil Company's margin at rate of 3.5% PKR 117.6. So, prices of one barrel of crude oil become PKR 5829.9. Further refine cost at rate 10% i.e. 582.99. Therefore price of one barrel of refine petrol is 6412.89 rupees and hence on liter petrol price is 40.33, where excise duty per liter is PKR 0.88, and 15% GST is rupees 6.05 per liter, thus price per liter of petrol is PKR 47.26. Petrol prices have sharply increased when we compare with 1990. Price of real oil gradually increases year by year and effect on current account balance remains at deficit. Real oil prices have direct impacts on gross domestic product (GDP).

Oil prices fluctuations affects current account balances not only in a short run but also effects long run. From year 1990 to 2008 most of closing balance of current account is in deficit, because imports exceeds exports, expenditure exceeds income, liability exceeds assets, which shows long term effects on current account balance. Some years like 2001- 2003 current account balance is in surplus due to foreign investment in country. We not only say that oil prices affected current account balance but there are some other variable which affect current account balance, most proper statement for this is that oil prices and current account balance has bilateral effect on each other.

This research study will focus on relationship of oil prices and current account balance in Pakistan. When oil prices increase or are about to increase, demand also increases and more imports of oil are required, this leaves a negative impact on current account and vice versa. This study examines bilateral effects of oil prices and current account balance on each other.

2. LITRATURE REVIEW

Wide array of literature is available on effects of oil prices on total economy. Li (2010) studied impacts of international oil prices on Chinese development. Their research used computable general equilibrium (CGE) model and highlighted impacts of international oil prices changes on Chinese economy. It was found that oil prices affected macro economy and industrial sector. Fixed asset investment and sharp rise in oil prices usually are considered as constraint on economic development (Li, 2010). In last two decades Chinese economy has grown sharply, and with this sharp growth many potential issues were raised. It was found that rapid changes (increasing) in oil prices were directly or indirectly related to most of issues faced by China during development. Li (2010) found that international oil prices change had direct impact on industrial sector; and almost on whole macro economy, in China. Akram (2004) showed relationship between oil prices and Norwegian exchange rate.

[1] US $ 56 is international price per barrel of crude oil and 90.08 is exchange rate with Pakistan Rupee (PKR)

Norway is an oil exporting country. Possibility of a non-liner relationship was predicted in paper. Akram (2004) found a negative relationship between oil price and Norwegian exchange rate. They found that domestic currency appreciated when price of oil depreciated, and was stronger when international oil prices were US $ 14 or below. However with 10% increase in oil prices, stock return increased 2.5% (Bjørnland, 2009). paper captured interaction between variables and VAR long-term relationship between oil prices and other variables. All variables predict that in Norway economy higher oil prices respond to increased demand and wealth. Norway economy responded to higher oil prices by increase in money and demand (Akram, 2004; Bjørnland, 2009).

Ozsoz and Akinkunmi (2012), evaluated determinants of real exchange rate for Nigerian naira. Oil exporting countries peg their currencies to US dollar, which create inflation behavioral equilibrium rate approach to identify misalignment in real naira rate by using monthly data from 2004-2010. Correlation model approach evaluated that real exchange rate for Nigerian naira has significantly depreciated (Ozsoz & Akinkunmi, 2012). Struthers (1990) analyzed impacts of increasing oil prices on non-oil sector of Nigeria during period of 1960-1985/6.In OPEC Nigerian membership helped to explained that Nigeria had disagreements with in cartel and undercutting prices and exceed production and IMF pressure to devalue currency of Nigeria. During decade of 1970 and early 1980, key indicators of economic performance were in fluctuations with fluctuation in oil prices. It's hard nut to crack that oil prices fluctuations effects on devaluation of currency and two edged sword in way it effect exports and imports. government sector investment and high real exchange rate give benefits to non- oil sectors (Struthers, 1990). However, some studies like Ayadi (2005), argue that it is not always true that increase in international oil price may lead to appreciation on oil exporting country. Neither is industrial production increased with higher oil prices in rest of world. Rather than government should diversify its investment in more productive sectors to cope against rigid attitude of oil prices on economic growth (Aliyu, 2009).

Similar kind of results were found by Iwayemi and Fowowe (2011). They found that oil shock have negative impact on economy in both, short and long run. Their main focus was on four largest African oil exporters (ALGERIA, EGYPT, and LIBYA AND NIGERIA). Current account dynamics and their relationship with oil price were examined by (Chuku, Akpan, Sam, & Effiong, 2011). They used data on Nigeria from first quarter of 2007 to fourth quarter of 2008. Their results suggest that approximately 15.77% fluctuations in current account dynamics are caused by oil prices. For international trade, US firms bear less exchange rate risk then foreign firms. US has a comparative advantage in oil trading and exchange rate (Devereux, Shi, & Xu, 2010).

Coudert, Couharde, and Mignon (2011) studied relationship between exchange rate and oil prices and their effects on macro-economic variables.it was found that in long run exchange rate moves with commodity prices rather than oil prices, but oil prices do have direct impact on commodity prices. Oil prices, in recent years have been more stable in Euros than in dollars. Euros have replaced dollars and become an attractive currency for storing value (Noreng, 2008). Yousefi and Wirjanto (2005) found that oil exporting countries tend to adjust their prices in order to stable their international purchasing power. Kim, Hammoudeh, and Aleisa (2012) used structure vector auto regression to examine influence of external shocks originated from US and its effects oil prices and exchange rate. Their findings suggest that US dollar and Euro being strong currencies should focus on exchange rate with oil exporting currencies. This can help bring stability in these countries during time of oil prices shocks.

In United Arab Emirates (UAE), impact and effects of oil prices shock on real exchange rate were examined by Al-mulali and Che Sab (2011). They argued that fixed exchange rate with US dollar is not applicable for UAE, because with increase in international value of oil, GDP and liquidity will increase unconditionally in UAE. This will lead to messy picture of economic situation on UAE regime. Chortareas, Cipollini, and Eissa (2011) reviewed oil prices and exchange rate relationship in MENA(middle east north Africa) markets. They found a positive relationship between oil prices and exchange rate. Ferraro, Rogoff, and Rossi (2012) investigated short terms relation between oil prices and exchange rate at daily basis. Their study also captures fluctuations in oil prices and US - Canadian nominal exchange rate effects. This research paper delivered relationship of dollar exchange rate and oil prices. They have put to test between two variables to prove relationship of oil prices and exchange rate which are major variable of economy (Coudert et al., 2011; Coudert, Mignon, & Penot, 2008).

3. Methodology

This research uses oil prices as dependent variable and current account and GDP as independent variable. In this research we assume bilateral relationship between oil prices and current account. Vector auto regression (VAR) is used to examine effects of oil prices on current account and vice versa.

Research particularly relates to oil prices in Pakistan and their impact on current account and vice versa. Data has been collected for period of thirty years (i.e. 1980-2010) from online sources including official websites of OPEC and Asian development bank and has been cross checked with IMF and World Bank's official websites. In this research natural log of every variable has been taken and LNCAB, LNGDP and LNOIL terms have been used for capital account balance, gross domestic product and oil prices respectively. Based on research objective,

it was hypnotized;
H_0: Oil Prices have effect on Current account balance
H_1: Oil prices do not have effect on Current account Balance.

4. Data Analysis and Results:

This research used time series data for thirty years for Pakistan. As, mentioned above data has been collected from different sources. Knowing the fact that, one of property of time series data is, it has relationship with time i.e. data changes with time. This property of data is called non-stationarity. This implies that most of time series data (especially macro-economic data) is non-stationary. Running statistical analysis with non-stationary data will generate biased results. So, it is necessary to check whether data is stationary. Unit root test have been employed to check if three variables; $LNOIL, LNCAB \text{ and } LNGDP$, are stationary at levels, first difference or second difference. This research uses Augmented Dickey-Fuller (ADF) unit root test to check stationarity properties. ADF checks stationarity of data on three different levels 1) it assumes random selection process with intercept and trend, 2) it follows only intercept and no trend, and 3) ADF include lag length of variables. Results of ADF are presented in table 1.

The results from ADF analysis indicate that all three variables; oil prices, current account balance and GDP, contain unit root (i.e. are non-stationary) at levels, and become stationary at 1st differences. Significance level for ADF test is set to 5% (i.e. $\alpha = 0.05$). It can be seen from above table that probability value of each variable; at levels, is higher than significance levels (i.e. $p \geq 0.05$), which implies acceptance of null hypothesis of unit root. Variables with unit roots are not suitable for statistical analysis, so all three variables are checked again for unit roots at first differences. Results in tables 1 show that probability values for ADF test of all three variables is less than significance level. (i.e. $p \leq 0.05$). This implies rejection of null hypothesis and acceptance of alternative hypothesis, which suggest that variable do not contain unit root. Hence variables become stationary at first differences. Durbin-Watson statistics also suggest that all three variables are free from serial correlation at 1st differences. All variables chosen for this study are cointegrated of order one, which implies that there are possibilities of long-run relationship among variables.

Table 1: Unit root test

Variable	ADF Statistics	Probability	D-W statistics	Results
$LNOIL$	-2.1284	0.5155	1.815691	Non-stationary at levels I(0)
$D(LNOIL)$	-7.8028	0.0000	2.021659	Stationary at first difference I(1)
$LNCAB$	0.8797	0.993	2.191036	Non-stationary at levels I(0)
$D(LNCAB)$	4.3066	0.002	1.861653	Stationary at first difference I(1)
$LNGDP$	2.4257	0.444	2.028119	Non-stationary at levels I(0)
$D(LNGDP)$	6.9599	0.000	1.787994	Stationary at first difference I(1)

Source: Author's Own calculations.

These long-run relationships are further checked with cointegration equations among variables. This study estimates cointegration equations with Johansen cointegration test. Johansen cointegration test uses two methods to estimate cointegrations among variables. First is trace statistics and second is Max-Eigen value. In most cases results of both tests are identical. If output of both methods varies, researcher can use any of results depending upon the needs of study. However, literature has put more emphasis on trace statistics. Results of Johansen cointegration test are presented in table 2. First column of tables 2 describes null hypothesis of no cointegration ($r = 0$) at most one cointegration ($r \leq 1$) and at most two cointegrations ($r \leq 2$). Second column exhibits Eigen values. Third and fourth column contain trace statistics and Max-Eigen values respectively with critical values in brackets. Decisions about cointegrations are made upon comparison between trace statistics/max-Eigen value and critical values. If trace statistics/max-Eigen values is greater than critical values than null hypothesis of NO cointegration is rejected.

Table 2: Cointegration Analysis

Hypothesis	Eigen Value	Trace Statistics (5% critical values)	Max Eigen Values (5% critical values)
$r = 0$	0.43	30.59 (29.79)	14.66 (29.79)
$r \leq 1$	0.36	15.93 (15.49)	11.92 (15.49)
$r \leq 2$	0.14	4.00 (4.84)	3.62 (4.84)

Source: Author's Own Calculations

Table 2 represents the results for three hypothesis; no cointegration, at most one cointegration and at most two cointegrations. For $r = 0$, values of trace statistics is higher than critical values much means that

alternative hypothesis of cointegration is accepted. Whereas, Max-Eigen value suggest acceptance of null hypothesis. As, there are no pre-specified rule to choose between trace and Max-Eigen statistics, we follow trace statistics to check number of cointegrations among chosen variables. Similarly trace statistics for $r \leq 1$ suggest acceptance of alternative hypothesis, which is more than one cointegration equations among variable. For $r \leq 2$, values of trace test are less than critical values, which implies acceptance of null hypothesis. Results obtained from Johansen cointegration analysis suggest that oil price, GDP and CAB have long term relationship and they can influence each other in long run[1].

Further to check the direction and magnitude of impact of GDP and CAB on oil price in Pakistan, this research estimates linear regression on differenced variables considering LNOIL as dependent variables and GDP and CAB as independent variable[2]. Results of OLS are presented in following equation and detailed view or results is presented in table 3.

$$LNOIL = -18.912 + 9.712(LNGDP) - 11.23(LNCAB)$$

Table 3: Magnitude and Direction of Impacts

Variable	Coefficient	Std.Error	T-Statistic	Prob
Constant (β)	-18.91262	10.45464	-1.809017	0.0825
LNGDP	9.712604	3.621188	2.682159	0.0128
LNCAB	-11.23757	4.029832	-2.788596	0.0100
$R^2 = 67\%$		D-W Stat: 2.09		
$\bar{R}^2 = 64.3\%$		F-stat: 29.39**		

** indicate significance at 5%

Source 1: Author's own calculations

Results from table 3 show that value of constant coefficient is 18.91 with negative sign, and is significant at 10%. This values of β implies that without any fluctuation in either of variables oil prices will independently fluctuate by 18.91%. This fluctuation is; however, not independent. If we closely examine bottom row of table 3, it suggest that value of R-squares and adjusted R-squared are 67% and 64% respectively. These values define the fitness of model and extent to which these chosen independent variable can effect dependent variable. Values of R-squared and adjusted R-square are above 60% which suggest that mode is quite good and 64% of fluctuation in oil prices is caused by GDP and CAB. Whereas, there are other possible variables that may affect oil prices in Pakistan. β value of -18.91 refects the shadow of those variables which are not considered in this study. Results further suggest that there is strong positive relation between GDP and oil prices. For every one percent increase in GDP oil prices will go up by 9.7% and vise versa. While on other hand CAB and oil prices are inversely related. 1% decrease in CAB will increase oil prices by 11.23% in Pakistan. CAB for Pakistan is mostly observed in deficit so, here decrease in CAB value

5. Conclusions

Current account balance is an important part of the economy, especially for a highly oil-imported -dependent country like Pakistan. Although current account balance have been widely studied in the literature, they are only a handful of studies that analyses the impact of current account balances and GDP on oil prices This paper pioneers research on the relationship between oil price shocks and current Account balance in Pakistan. VAR is applied to annually data from 1980 to 2008 to identify real oil price shocks where the CAB is assumed to be strictly endogenous. Overall, results reveal that there is no one-for-one effect of oil prices on the current account balances and GDP. The paper shows that in change in GDP has impact on change in oil prices and they have positive relationship with the oil prices, whereas, on other hand CAB have negative relationship with oil prices if the change in CAB increases the oil prices decreases randomly and fluctuation in oil prices occurs.

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[1] These results are based on trace statistics. While Max-Eigen Values suggested the acceptance of null hypothesis, which suggested no cointegration among variables.

[2] For OLS these variables are used as 1st differences rather than levels. Because unit root analysis show that these variables are stationary at first difference and using these variables at levels might NOT generate robust results.

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