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Impact of Oil Price and Exchange Rate on Economic Growth of Pakistan

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Abstract
The primary goal of this study was to investigate how oil price and exchange rate effect the economic growth of Pakistan from 1992 to 2021. The rising oil prices are the major concern for all the developing economies and Pakistan is suffering from it. The unit root test, correlation test, bound test was used to examine the economic trend. The result from multiple linear regression model describe that there is short run and long run relationship between the variables. It indicates that there is a positive impact of oil price on economic growth. The countries like Pakistan who are oil importers should purchase crude oil on less prices.
Keywords: GDP, Oil Price, Exchange Rate, Consumer Price Index, Direct Investment and Labor Force

1. Introduction

Crude oil is an important commodity and its importance cannot be overstated for the health of an economy. Oil exporting economies are expected to have opposite effects of a rise in oil prices. A rise in oil price in oil importing countries lead to high import cost that has negative effect on GDP. High fluctuations in oil prices creates uncertainty in cash flows creating challenges for policy makers and business alike. Some studies conclude that higher oil prices lead to better economic outcome (Abimelech et al., 2017) and hence better stock returns for oil importing countries while some conclude that higher oil prices effect oil importing countries' economies adversely which ultimately has negative impact on stock market (Yanagisawa, 2012; Lemazoshvili, 2014; Shabhaz et al., 2017; Ali, 2022).

It is widely accepted among development economists that the exchange rate plays an important role in resources allocation and economic performance of a country. The exchange rate management policy in Pakistan has primarily been driven by individuals; many of them have a limited understanding of economics. Moreover the exchange rate has been generally overvalued and the misalignment has increased in recent years. Furthermore, Oil prices are always debatable and remain an important variable determine the economic activity of any country. The size of oil costs increment relies upon the 1) portion of expense of oil in overall GDP) utilization of oil locally and dependence on alternative sources of fuel. The time of modest availability of a wide range of fuel has gone due to quick expansion in population, which at last increment the interest for energy locally and publically and generally around the world (Ahmad et al., 2022; Ali, 2022).

Oil price in the energy sector is a key factor for the growth of any country. As the demand for oil price increases in develop and developing economies both, the price of oil is increases rapidly in the world. A rapid increase in oil demand will cause a problem for oil producing countries. An economy of a country can directly or indirectly influence by the fluctuations in oil prices. Macroeconomic indicators like exchange rate and GDP of an economy are directly affected by the oil price. From the independence way back in 1947, Pakistan economy has been fighting with multiple economic problems and challenges and foreign debt is one of them (Bal & Rath, 2015; Audi & Ali, 2023). The exchange rate of Pakistan has been decrease heavily by external pressure of debt (Ahmed, Kashif & Feroz, 2017; Ali et al., 2023). Pakistan is obligate to pay IMF of the debt that put direct pressure on exchange rate. On the other hand, Pakistan had to extremely hard to compete with the challenges. Thus, the study examines the effects of oil prices, exchange rate on economic growth of Pakistan. The study's remaining sections are arranged as follows: A concise summary of the empirical literature is given in the second part, with an emphasis on the impact of oil prices and exchange rate on economic growth. The econometric technique, data sources, and variable building for the empiricals are presented in the third part. The fourth part contains the findings of the econometric model estimate. The conclusion and policy recommendations are presented in the fifth part.

2. Literature Reviews

Ahmad et al (1975-2011) investigates how nominal exchange rate, FDI, and capital stock affect Pakistan's economic growth using time series data. The augmented Dickey Fuller (ADF) test is used to verify the variables' stationary. At level, all variables were found to be stationary. So Common Least Squares technique is applied to actually look at the connection between subordinate variable (Gross domestic product) and free factors (Conversion scale, FDI, capital stock). The aftereffects of OLS show that expansion and swapping scale has negative and huge influence monetary development of Pakistan. A one percent expansion will diminish Gross domestic product by 0.29 percent. The coefficient of the exchange rate is -0.5504, which indicates that GDP will decrease by 0.55 percent for every one percent increase in the exchange rate. Economic expansion is not significantly impacted by capital stock (GFCF). Pakistan's economic expansion benefits significantly from foreign direct investment. GDP will rise by 0.37 percent with a one percent increase in FDI, according to the findings.

Jawad and Niazi (2017) investigations the impact of oil cost instability and macroeconomic factors (Exchange balance, confidential area venture and public area speculation) on monetary development of Pakistan. Linear regression reveals that oil price volatility, private sector investment, and public sector investment have no significant impact on Pakistan's gross domestic product. Johnson co joining test portrayed the long run connection among the factors. The results of vector auto regression, impulse response function, and variance decomposition indicate that the effect of the variables was stable within ten years and that the primary influence on the variable is the result of the variable itself rather than other factors.

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Jawad., (2013) examine the effect of oil cost instability on the monetary development of Pakistan Auxiliary information from 1973 to 2011 were utilized to assess the coefficients. The dependence between the independent and dependent variables is examined using linear regression. Through the ADF test, every variable, including the price of oil, supply and demand for oil, gross domestic product, investment in the public and private sectors, and trade balance, is stationary at the first difference. Trade Balance, Private sector investments have a significant impact on gross domestic product, while public sector investments have a negligible impact on gross domestic product, and oil price volatility has little effect on gross domestic product. The government of Pakistan ought to develop a proper plan and procedure in accordance with Pakistan's economic growth and requirements. This would help to maintain the equilibrium of oil demand and supply and lessen the impact of oil price volatility on economic growth. In the meantime, Pakistan's government is working to improve its trade balance and encourage private sector investment to boost economic growth.

Bibi et al., (2014) determine how trade openness, inflation, imports and exports, the real exchange rate, and foreign direct investment contribute to Pakistan's economic growth. The data used in the time series range from 1980 to 2011. ADF is used in this paper; the estimation was carried out with the assistance of Co-integration and DOLS (Dynamic Ordinary Least Square) methods, as well as the PP and DF-GLS tests to determine the variables' stationary. The results of the integration indicated that the variables were connected over time. However, the production of import substitutes and the creation of conditions for trade surpluses can mitigate the negative effects of trade openness. In addition, trade and foreign direct investment are regarded as essential components that enhance the impact of economic growth.

Shahzad et al (2022) changes in oil prices, exchange rates, and interest rates affect stock returns on the Pakistani stock market, which is represented by the KSE 100 index. Because it provides liquidity for the production process, the stock market is crucial to a nation's development. Conversion standard and oil costs are the most imperative financial factors that influence the securities exchange of an economy other than the loan fee, which clearly fundamentally affects stock returns. The short- and long-term relationships between these variables are examined using monthly data from January 2000 to December 2021 and the bound testing approach to auto regressive distributed lag (ARDL) modeling. The study reveals that Pakistan's stock returns are significantly affected by oil prices, exchange rates, and interest rates. The short run elements and connections of these factors are additionally broke down by a fitting blunder amendment model.

Bakhsh and Khan (2019) investigate how the stock index, crude oil price, and exchange rate influenced one another in Pakistan between September 1997 and April 2018. Concurrent equations are used to examine the interaction. The unit root test, correlation test, co-integration technique, vector autoregressive model, and Granger test are used to examine Pakistan's economic trend. The result indicates that none of the variables have a long-term relationship. In any case, results show the significant impact of unrefined petroleum cost and the gold cost relies upon the conversion standard. The exchange rate, on the other hand, has an impact on Pakistan's stock market. The government should focus more on economic policies to stabilize the crude oil price, stock index and exchange rate in the country, according to these recommendations. High-ranking business, policy, and decision-makers in the country, as well as investors, will benefit greatly from the study because they will be able to predict and comprehend how these variables fluctuate in the economy. EVIEWS 9th edition is the statistical software that was used in this study.

Kiani (2008) talked about the effect of higher oil costs on Pakistan's economy from 1990 to 2008. Pakistan is an oil importer rather than a country that produces oil. Inflation, an increase in the budget deficit, and downward pressure on the exchange rate are all consequences of an increase in the price of oil. All developing economies are concerned about the rising cost of oil, and Pakistan is no exception. Household consumption habits have been severely impacted by the rising cost of oil. This study looks at how a change in the real price of crude oil affects the real GDP positively and a variety of other factors in different ways. For instance, Pakistan's real output would rise with lower government spending, a higher real stock price, and a lower interest rate.

3. Data and Methodology

The primary goal of this study was to investigate how oil price and exchange rate effect the economic growth of Pakistan from 1992 to 2021. Secondary data is used in this study. The data is consists of different variables. We constructed the following econometric model to investigate the Impact of Oil Price and Exchange Rate on Economic Growth of Pakistan. First we take following econometric model. The model of the study can be estimated by the following equation:

$GDP = f (ER, OP, LF, DI, CPI)$ …….. (1)

The econometric model of the study can be estimated by the following equation:

$GDP_t = \beta_0 + \beta_1 ER_t + \beta_2 OP_t + \beta_3 LF_t + \beta_4 DI_t + \beta_5 CPI_t + \epsilon_t$ …….. (2)

Table 1: Summaries of Variables

Sr. #	Variable	Description	Type	Source
1	GDP	Gross Domestic Investment	Dependent Variable	World Bank
2	OP	Oil Price	Independent Variable	Index Mundi
3	ER	Exchange Rate	Independent Variable	World Bank
4	CPI	Consumer Price Index	Independent Variable	World Bank
5	DI	Domestic Investment	Independent Variable	World Bank
6	LF	Labor Force	Independent Variable	World Bank

Source: World Bank & Index Mundi

3.1. Data Type and Sources

This research is conducted to find the relationship between variables by utilizing Annual Time Series data based on one country for the period of (1992-2021). Secondary data is used in this study. We consider variables i.e GDP, Oil Price, Exchange Rate, Consumer Price Index, Direct Investment and Labor Force. The data is composed of different sources like World Development Indicators (WDI) and Index Mundi.

3.2. Measurement of Variables

There are numerous number of variables which put effect on economic growth of Pakistan in various ways. Different variables have been taken to find out the relationship between those variables and economic growth. The summary of variables which are used in present study, their abbreviation and their measurement unit are given below in table.

4. Data Analysis and Results Interpretation

4.1. Descriptive Statistics

Table gives the detailed statistic of all the variables i.e, GDP, oil prices, exchange rate, labor force, domestic investment and consumer price index of Pakistan.

Table 2

	GDP	CRUDEOIL	DI	CPI	LF
Mean	166689.1	50.55167	24737.68	8.330028	53.84689
Median	160269.2	50.675	25695.25	8.32212	52.75
Maximum	312570.1	105.48	46336.94	20.28612	75
Minimum	51478.3	10.41	8773.133	2.529328	33
Std. Dev.	96790.4	29.16657	13292.97	4.027216	13.90326
Skewness	0.232028	0.401552	0.231047	0.654494	0.090495
Kurtosis	1.465354	2.026925	1.583439	3.705986	1.665667
Jarque-Bera	3.213108	1.989812	2.775222	2.764832	2.266503
Probability	0.200578	0.369758	0.249671	0.250971	0.321985
Sum	5000673	1516.55	742130.4	249.9008	1615.407
Sum Sq. Dev.	2.72	24669.98	5.12E+09	470.3355	5605.719
Observations	30	30	30	30	30

Mean of GDP shows that its central tendency is higher than other variables. Among all variables, the maximum and minimum values have less difference, which show stability during the sample period. Standard deviation of GDP has the highest volatility. The mean value of GDP is 166689.1, the mean value of crudeoil is 50.55167, the mean value of domestic investment is 24737.68, the mean value of CPI is 8.330028 and the mean value of labor force is 53.84689.The maximum value of GDP is 312570.1, the maximum value of crude oil is 105.48, maximum value of domestic investment is 46336.94, maximum value of CPI is 20.28612, and maximum value of labor force is 75. The minimum value of GDP is 51478.3, minimum value of crude oil is 10.41, minimum value of DI is 8773.133, minimum value of CPI is 8773.133, minimum value of 33.

4.2. Correlation Test

The correlation shows the relationship between the variables.

Table 3

	GDP	CRUDEOIL	DI	CPI	LF
GDP	1				
CRUDEOIL	0.619335	1			
DI	0.196812	0.01124	1		
CPI	-0.51276	-0.52652	0.284278	1	
LF	0.51172	0.809271	-0.25483	-0.70106	1

Note: significant at 10% level

The table above indicates the results of Pair – Wise Correlation Matrix. It illustrates that high values shows the High correlation among variables. Overall results demonstrate that, There is no value grater then .9 in this table there is no multicolarity in the variables.

4.3. Variance Inflation Factor

The Variance Inflation Factor score of independent variable represents how well the variable is explained by independent variables. The results of Variance Inflation Factor are given in the table below:

Table 4

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
CRUDEOIL	10046.01	7.077592	1.723053
DI	0.273941	44.72462	9.759681
CPI	532996.9	9.456808	1.742886
LF	31116579	17251.97	9.71224

Note: significant at 10% level

The results indicate that, the probability values of LM test is insignificant (0.3449), this shows that the problem of Autocorrelation does not exist in the data set.

4.4. Serial Correlation LM Test

A statistical representation of the relationship between a given variable and a lagged version of itself over various time intervals. The problem of autocorrelation is checked by sequential correlation LM Test. The after results of Breusch – Godfrey Sequential Connection LM Test are given in the table below:

Table 5

F-statistic	10.61638	Prob. F(2,23)	0.0005
Obs*R-squared	14.4007	Prob. Chi-Square(2)	0.0007

The probability value f-statistic isless than 5%, so there is autocorrelation in the data.

4.5. Heteroskedasticity Test

The Breusch-Godfrey test is used to evaluate the heteroskedasticity problem. The solution of this problem is by taking the lag of the dependent variable. The table below shows the results of Breusch-Godfrey test:

Table 6

F-statistic	2.168776	Prob. F(4,25)	0.1019
Obs*R-squared	7.728353	Prob. Chi-Square(4)	0.1021
Scaled explained SS	6.263921	Prob. Chi-Square(4)	0.1803

The table shows the probability value is greater than 5% so there is no heteroskedasticity.

4.6. Unit Root Test

To explore the stationarity of data we use unit root test, which is identified through ADF test. The augmented dickey fuller test given by dickey and fuller (1979, 1981) is applied to established the statistical properties of the series involved in model. The test explain that if variables are stationary at level 1st difference or at 2nd difference. When the probability value is less than 0.05 then the variables are stationary at 5% level. When probability value is less than 0.01 then variables are stationary at 1% level.

Table 7

	Augmented Dickey Fuller (ADF) Unit Root Test			
Variables	t-stat.	Stationarity	t-stat.	Stationarity
GDP	-1.90741	I(0)	-4.04894	I(1)
	(0.6249)		(0.0185)	
CRUDEOIL	-2.35599	I(0)	-6.25306	I(1)
	(0.3931)		(0.0001)	
DI	-3.66624	I(1)	-3.66624	I(1)
	(0.0433)		(0.0433)	
CPI	-2.40664	1(0)	-6.26485	I(1)
	(0.3687)		(0.0001)	
LF	-2.81886	1(0)	-5.94585	I(1)
	(0.2022)		(0.0002)	

The test results indicates that variables GDP, crudeoil, CPI, LF have a unit root in their levels and are stationary in their first difference. In conclusion I (0) shows variables are stationary at level and I (1) indicates variables is stationary at first difference. We conclude that our model has the variables which have mixed order of cointegration.

4.7. Bound Test

Bound testing as an extension of Autoregressive Distributed Lag (ARDL) modelling uses F and t-statistic to test the significance of the lagged levels of the variables.

Table 8

Test Statistic	Value	K
F-statistic	8.466576	4
	Critical Value Bounds	
Significance	I_0 Bound	I_1 Bound
10%	1.9	3.01
5%	2.26	3.48
2.50%	2.62	3.9
1%	3.07	4.44

Note: no value is greater than 4

The bound test result is reported in table 8 which indicate the existence of long run relationship. The F-State value is 8.466576 which lie above upper bound critical value at 4% level of Signicant. The value of upper bound and lower bound is not greater than 4 at any level.

4.8. Short Run Coefficients

The table below shows the results of Short Run Coefficients.

Table 9

Variables	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(CRUDEOIL)	0.063547	0.024047	2.642556	0.0143
DLOG(DI)	0.420431	0.084437	4.979254	0
DLOG(CPI)	-0.03486	0.017676	-1.9722	0.0602
DLOG(LFPR)	0.263525	4. 843578	4.392028	0.0002
CointEq(-1)	-0.45278	0.0757	-5.98125	0

There is short run positive relationship of crude oil with economic growth. There is positive relationship of DI with economic growth. There is negative relationship of CPI with economic growth. There is positive relationship of LF with economic growth.

4.9. Long Run Coefficients

The table below shows the results of Long Run Coefficients.

Table 10

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CRUDEOIL)	0.140346	0.057012	2.461715	0.0214
LOG(DI)	0.928549	0.064186	14.46649	0
LOG(CPI)	-0.07699	0.038032	-2.02448	0.0542
LOG(LFPR)	0.582011	0.126685	4.594141	0.000

There is Long Run positive relationship of crude oil with economic Growth. There is positive relationship of DI with economic Growth. There is negative relationship of CPI with economic Growth. There is positive relationship of LF with economic Growth.

4.10. Coefficient Std. Error t. Statistic

The table below shows the results of Long Run Coefficients.

Table 11

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LOG(GDP(-1))	0.547217	0.0757	7.228721	0
LOG(CRUDEOIL)	0.063547	0.024047	2.642556	0.0143
LOG(DI)	0.420431	0.084437	4.979254	0
LOG(CPI)	-0.03486	0.017676	-1.9722	0.0602
LOG(LFPR)	0.263525	0.060001	4.392028	0.0002
R-squared			0.995299	
Adjusted R-squared			0.994515	
Durbin-Watson stat			2.145083	

1 percent change in CRUDEOIL will make .6 percent change in GDP, R square value is 99% indicate that 99% variation in GDP explain by independent variables change in oil price. Change in DI, CPI, LF

5. Conclusion and Policy Recommendations

The main objective of this study is to investigate the effects of oil price and exchange rate on economic growth of Pakistan. The study uses annual Time series data from 1992 to 2021. Then the present study applied different econometric techniques. Firstly, the study presents the results of descriptive statistic. Descriptive statistic shows the mean, median, maximum, minimum, Skewness and kurtosis values. Secondly, to check the problem of multico-linearity among variables, the present study analysis pair wise correlation results, the results indicate that there is no Multicolinearity problem in the data. In the next step, the study checks out the problem of autocorrelation by applying Serial Correlation LM Test. The result of serial correlation LM test shows there is autocorrelation in the data. In the next step the study also check out the problem of heteroskedasticity by applying Breusch – Pagan –Godfrey test. The result of Breusch – Pagan –Godfrey test shows there is no heteroskedasticity in the data set. When probability value is less than 0.01 then variables are stationary at 1% level. The test results indicate that variables GDP, crudeoil, CPI, LF have a unit root in their levels and are stationary in their first difference. In conclusion I (0) shows variables are stationary at level and I (1) indicates variables is stationary at first difference. We conclude that our model has the variables which have mixed order of cointegration. In the next step we use bound testing as an extension of ARDL modeling. The bound test result is indicate the existence of long run relationship. Furthermore, we conduct F statistic which shows the impact of aggregate effect of all independent variables on the dependent variables. The f statistical probability was 0 and less than 0.5 except CPI indicate that there is positive effect of crudeoil, domestic investment and labor force on GDP. And CPI have negative impact on GDP. This study adds some understanding of the Pakistan economic situation. The countries like Pakistan who are oil importers should purchase crude oil on less prices.

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