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A Step towards enhancement of Macroeconomic Performance of Pakistan: Do Oil Price, Public Expenditures and Financial Development Matter?

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ARTICLE DETAILS	ABSTRACT
History: Accepted 22 Feb 2021 Available Online March 2021	<p><i>Oil price fluctuations have vital importance in macroeconomic performance. Our study demonstrates the impact of oil price fluctuations on the trade balance and economic growth in Pakistan. We employ a linear autoregressive distributed lag model (ARDL) for the period 1970-2018. The results showed that oil price negatively affected the total trade balance in Pakistan other control variables like the real effective exchange rate, real GDP (Home country) and financial development also negatively affected. While real GDP (Foreign country) influenced trade balance positively. In the second model, the results showed that oil price negatively affected economic growth in Pakistan and other control variables like government expenditure, financial development and gross capital formation are positively affected. The study results are useful for policymakers and government officials for making the policies regarding long-run economic growth as well as trade balance improvement.</i></p>
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1. Introduction

Oil is the major input in the production process and its trade massively affects the economy. Although the intensity of oil used in overall energy usage has decreased over the last few years, it is still the second main source of energy used after ordinary gas, which accounts for 40 percent of the total energy use. The 2014 oil price shock has revived academic and political advantage by indulging the connection between oil prices and macroeconomic performance. A large body of literature that

already exists that focuses on how the volatility of oil prices affected macroeconomic variables in developed and developing countries (Kilian et al., 2009; Ozlale and Pekkurnsz, 2010; Le and Chang, 2013; Nazir and Qayyum, 2014; Rafiq et al., 2016; Raheem, 2017; Nasir et al., 2018; Jo et.al., 2019; Baek et al., 2019; Nasir et.al., 2019; Faheem et al., 2020; Ahad and Anwer, 2020; Faheem et al., 2020; Chaudhry et al., 2020; Faheem et al., 2021). The previous literature concluded mixed findings regarding oil price and macroeconomic variables that is not sufficient for the specific policy formulation purpose of a specific country.

The sudden changes in oil price impacted the economic growth and trade balance of both countries (oil-rich and oil-importing). It is proved that oil price increase is favourable for oil-rich economies and the reverse case is with oil-importing countries. This heterogeneous impact of oil price raises the attention of researchers and policymakers to explore the real impact of oil price fluctuations on importing countries. The severe oil price changes affect the economic activities of Pakistan that heavily depend on imported oil. This study contributed to the existing literature in several ways: Firstly, this study applied a time-series methodology that has several advantages on panel analysis. Secondly, this study is helpful for policymakers and government official for the formulation of policies regarding trade balance and economic growth. Finally, this study provides the guidelines for other oil-importing developing countries like Pakistan to overcome the effect of oil price shocks.

The remaining parts of the papers are the following: the second segment is about literature review and the third section is demonstrates data and methodology. The fourth part is related to results and discussion. Finally, the last part is about concluding remarks.

2. Literature Review

Le and Chang (2013) examined the link of oil price with the trade balance in three Asian economies; Malaysia, exporter of oil products; Singapore, as an oil refinery and Japan, as an oil importer. Time-series data was used over the time period 1999 to 2011 and results showed a significant effect of oil price on the trade balance. Similarly, Baek et al. (2019) investigated the effect of oil price on the trade balance in the OPEC member countries for the period of 2007 to 2011. The result of the nonlinear ARDL model showed that the change of oil price affects all four selected countries trade balance. Nasir et.al (2019) demonstrated the effect of oil price fluctuations in the GCC member economies over the time period from 1980 to 2016. Structural vector autoregressive model was used to analyze the impact of oil price shocks and results showed heterogeneous response of oil shocks in these economies. Rafiq et al. (2016) explored the effect of oil price on the trade balance of oil in the exporting and importing countries. Findings showed oil price positively affect the trade balance of oil-rich economies and the reverse case is with oil-importing economies. Raheem (2017) conducted the asymmetric effect of oil price on trade balance over the monthly data from 1992 to 2016. The result showed that in the long run high trading economies existing asymmetric effect of oil price on export components. Kalian et al. (2009) described an association between oil price and external balance over the period of 1970 to 2005. The results showed that oil price shocks affect the current accounts which depend on the nature of oil shocks. Ozlale and Pekkurnsz (2010) used time-series data to estimate the structural analysis of oil price and Turkish current account from 1999 to 2008. Result demonstrated that oil price shocks affect the current account in starting time period increased and after 3 months decreased.

Nazir and et al. (2014) tries to find the link of oil price with the economic growth of Pakistan.

This paper used annual time series data from 1972 to 2011 and found the significant association of oil price with economic growth. Boheman and Manen (2015) inquire about the pursuance of oil price shocks on the economic growth of the OPEC and non-OPEC nations. The study used a time-series data period from 1980 to 2008 by employing VAR (vector autoregressive) model. The results demonstrated that oil price shocks significantly affect the economic growth of OPEC and non-OPEC economies. Mahboub and Ahmed (2017) applied the vector autoregressive (VAR) method to determine the effects of price of oil shocks on the manufacturing sector in Saudi Arabia and found no evidence of co-integration between oil price and the manufacturing sector. Jo et.al (2018) explored the oil price fluctuations effect on the industry sector of Japan over 1972-2017 and found a significant association.

3. Data And Methodology

Data is taken from World Development Indicator (WDI) and BP data Statistics. Data range over the period from 1970 to 2018. The study uses two models at a time for macroeconomic performance. In the first model, the trade balance is the dependent variable and oil price, real GDP (Home country, real GDP (Foreign Country), real effective exchange rate and financial development are independent variables. In the second model economic growth is used as a dependent variable and oil price, government expenditures, gross capital formation and financial development are used as independent variables. Our study employed Autoregressive Distributed Lag Model that can be utilized under certain condition of stationarity test like variables are stationary either I(0) or I(1) as well as for a mix of I (0) and I(1) variables (Pesaran and Shin 1998; Duasa, 2007). In contrast with traditional co-integration tests, taking different lags for each variable make it more flexible (Pesaran et.al 2001). ARDL is easy to apply and yields consistent estimates of long-run coefficients even in the case of a small sample size.

3.1 Model Specification

To check the effect of oil price on macroeconomic performance, our study depends on two models trade balance and economic growth. The specification of these two models is given as follows:

$$TB = f(OP, GDP, YW, RER, FD) \quad (1)$$

In the following

TB= Trade balance.

OP= Oil price.

GDP= Gross domestic product.

YW= GDP (rest of the world).

RER= Real effective exchange rate.

FD= Financial development.

Following is the model specification based on the previous studies,

$$TB_t = \beta_1 + \beta_2 OP_t + \beta_3 GDP_t + \beta_4 YW_t + \beta_5 RER_t + \beta_6 FD_t + \mu_t \quad (2)$$

Standard theory assumes that in the above model, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 > 0$, $\beta_5 > 0$ and $\beta_6 > 0$. And the error term is assumed to be normally distributed. The coefficients β_2 , β_3 , β_4 , β_5 and β_6 are the elasticity's of trade balance with respect to the oil price, real GDP (Home Country), real GDP

(Foreign Country), real effective exchange rate and financial development. The specification of the ARDL model is as follows:

$$\Delta TB_t = \alpha_0 + \sum_{i=1}^l a_{1i} \Delta TB_{t-i} + \sum_{i=0}^p \alpha_{2i} \Delta OP_{t-i} + \sum_{i=0}^q \alpha_{3i} \Delta GDP_{t-i} + \sum_{i=0}^r \alpha_{4i} \Delta YW_{t-i} + \sum_{i=0}^s \alpha_{5i} \Delta RER_{t-i} + \sum_{i=0}^t \alpha_{6i} \Delta FD_{t-i} + \beta_1 TB_{t-1} + \beta_2 OP_{t-1} + \beta_3 GDP_{t-1} + \beta_4 YW_{t-1} + \beta_5 RER_{t-1} + \beta_6 FD_{t-1} + \mu_t \quad (3)$$

The ECM estimated as follows:

$$\Delta TB_t = \alpha_0 + \sum_{i=1}^l a_{1i} \Delta TB_{t-i} + \sum_{i=0}^p \alpha_{2i} \Delta OP_{t-i} + \sum_{i=0}^q \alpha_{3i} \Delta GDP_{t-i} + \sum_{i=0}^r \alpha_{4i} \Delta YW_{t-i} + \sum_{i=0}^s \alpha_{5i} \Delta RER_{t-i} + \sum_{i=0}^t \alpha_{6i} \Delta FD_{t-i} + \lambda ECT - 1 + vt_t \quad (4)$$

In the second model our model specification is as follows:

$$GDP = f(OP, GEXP, GCF, FD) \quad (5)$$

Where

GDP= Gross domestic product.

OP= Oil price.

GEXP= Government expenditures.

GCF= Gross capital formation.

FD= Financial development.

Following is the model specification based on the previous studies,

$$GDP_t = \beta_1 + \beta_2 OP_t + \beta_3 GEXP_t + \beta_4 GCF_t + \beta_5 FD_t + \mu_t \quad (6)$$

Standard theory assumes that in the above model, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 > 0$ and $\beta_5 > 0$. And the error term is assumed to be normally distributed. The coefficients β_2 , β_3 , β_4 and β_5 are the elasticity's of economic growth with respect to the oil price, government expenditures, gross capital formation and financial development. The specification of the ARDL model is as follows:

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^l a_{1i} \Delta GDP_{t-i} + \sum_{i=0}^p \alpha_{2i} \Delta OP_{t-i} + \sum_{i=0}^q \alpha_{3i} \Delta GEXP_{t-i} + \sum_{i=0}^r \alpha_{4i} \Delta GCF_{t-i} + \sum_{i=0}^s \alpha_{5i} \Delta FD_{t-i} + \beta_1 GDP_{t-1} + \beta_2 OP_{t-1} + \beta_3 GEXP_{t-1} + \beta_4 GCF_{t-1} + \beta_5 FD_{t-1} + \mu_t \quad (7)$$

The ECM estimated as follows:

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^l \alpha_{1i} \Delta GDP_{t-i} + \sum_{i=0}^p \alpha_{2i} \Delta OP_{t-i} + \sum_{i=0}^q \alpha_{3i} \Delta GEXP_{t-i} + \sum_{i=0}^r \alpha_{4i} \Delta GCF_{t-i} + \sum_{i=0}^s \alpha_{5i} \Delta FD_{t-i} + \lambda ECT - 1 + vt_t \quad (8)$$

4. Results and Discussion

4.1 Descriptive Statistics and Correlation Matrix

It gives statistical properties of the variables and added it is measured as the base of research. The result of descriptive statistics in the following table 1 shows the mean value of trade balance, oil price, real GDP rest of the world, real effective exchange rate, gross domestic product and financial development are 0.643158, 57.31049, 3.24E+13, 149.8562, 1.04E+11 and 23.18654 respectively. The maximum value of trade balance 1.009499, oil price 124.1984, real GDP (rest of the world) 5.14E+13, real effective exchange rate 367.7707, gross domestic product 2.41E+11 and financial development 29.78608 respectively. The minimum value of trade balance 0.373515, oil price 11.63429, real GDP (rest of the world) 1.53E+13, real effective exchange rate 90.84851, gross domestic product 2.75E+10 and financial development 15.30549 respectively. The standard deviation value of trade balance 0.163818, oil price 31.89671, real GDP (rest of the world) 1.11E+13, real effective exchange rate 63.97725, gross domestic product 6.19E+10 and financial development 3.761625, respectively. The correlation matrix shows the association between the variables which are used in the study.

Table 1: Descriptive Statistics and Correlation (Model I)

	TB	OP	YW	RER	GDP	FD
Mean	0.643158	57.31049	3.24E+13	149.8562	1.04E+11	23.18654
Median	0.578381	52.34453	3.12E+13	118.7033	9.37E+10	23.95695
Maximum	1.009499	124.1984	5.14E+13	367.7707	2.41E+11	29.78608
Minimum	0.373515	11.63429	1.53E+13	90.84851	2.75E+10	15.30549
Std. Dev.	0.163818	31.89671	1.11E+13	63.97725	6.19E+10	3.761625
Skewness	0.422245	0.639312	0.098552	1.722304	0.528810	-0.433030
Kurtosis	2.085493	2.309364	1.666114	6.194451	2.152626	2.555982
Jarque-Bera	3.098972	4.223719	3.636201	44.13968	3.673206	1.894425
Probability	0.212357	0.121013	0.162334	0.000000	0.159358	0.387821
Sum	30.87159	2750.903	1.55E+15	7193.097	4.97E+12	1112.954
Sum Sq. Dev.	1.261314	47817.79	5.75E+27	192375.2	1.80E+23	665.0416
TB	1					
OP	-0.6321	1				
YW	-0.0728	0.33781	1			
RER	-0.2301	-0.1543	-0.7653	1		
GDP	-0.1692	0.3629	0.9832	-0.6748	1	
FD	0.4091	-0.3845	-0.3147	0.0079	-0.4079	1

The result of descriptive statistics in the following table 2 shows the mean value of gross domestic product 8.95E+10, oil price 57.59619, government expenditure 1.05E+10, financial development 48.41029 and government capital formation 17.36781 respectively. The maximum value of gross domestic product 3.13E+11, oil price 124.1984, government expenditure 2.93E+10, financial development 36.85130 and government capital formation 20.81826 respectively. The minimum value of gross domestic product 6.32E+09, oil price 11.63429, government expenditure 2.39E+09, financial development 36.85130 and government capital formation 12.93048 respectively. The correlation matrix shows the association between the variables which are used in the study.

Table 2: Descriptive Statistics and Correlation (Model II)

	GDP	OP	GEXP	FD	GCF
Mean	8.95E+10	57.59619	1.05E+10	48.41029	17.36781
Median	5.19E+10	53.82295	9.04E+09	49.46387	17.85805
Maximum	3.13E+11	124.1984	2.93E+10	58.27717	20.81826
Minimum	6.32E+09	11.63429	2.39E+09	36.85130	12.93048
Std. Dev.	8.86E+10	31.62600	7.21E+09	5.514574	1.863329
Skewness	1.203777	0.616509	0.937595	-0.510644	-0.494655
Kurtosis	3.180124	2.316466	2.965228	2.655236	2.432063
Jarque-Bera	11.90038	4.057921	7.181654	2.372192	2.656796
Probability	0.002605	0.131472	0.027576	0.305411	0.264901
Sum	4.38E+12	2822.213	5.16E+11	2372.104	851.0225
Sum Sq. Dev.	3.76E+23	48009.78	2.49E+21	1459.705	166.6558
GDP	1				
OP	-0.4459	1			
GEXP	0.9820	0.3662	1		
FD	0.0821	-0.1805	0.1320	1	
GCF	0.3172	-0.058	-0.2206	0.3094	1

The study applies unit root tests such as Augmented Dickey-Fuller test and Phillips Perron test. The results of the unit root tests (Table 3) show all variables are non-stationary at the level except RER and become stationary at first difference, while RER is stationary at both.

Table 3: Unit Root Test Results (Model I)

ADF Test		
Variable	At level	At 1 st Difference
OP	-2.237	-6.375***
TB	-2.035	-6.870***
YW	1.028	-5.382***
GDP	5.168	-4.476***
RER	-3.940***	-6.196***
FD	-1.851	-5.849***
PP Test		
Variable	At level	At 1 st Difference
OP	-2.306	-6.363***
TB	-2.121	-7.139***
YW	0.967	-5.277***
GDP	5.799	-4.489***
RER	-3.997***	-6.171***
FD	-1.851	-5.778***

Note:*** shows significant level at 1%.

The results indicate in table 4 that all variables are non-stationary at level and become stationary at first difference.

Table 4: Unit Root Test Results (Model II)

ADF Test		
Variable	At level	At 1 st Difference
OP	-2.237	-6.375***
GDP	5.168	-4.476***
GCF	-2.088	-6.213***
GEXP	-1.805	-6.213***
FD	-1.851	-5.849***
PP Test		
Variable	At level	At 1 st Difference
OP	-2.306	-6.363***
GDP	5.799	-4.489***
GCF	-2.205	-6.182***
GEXP	-1.886	-6.216***
FD	-1.851	-5.778***

Note:*** shows significant level at 1%.

4.2 Bound Test Results

The F-statistic for long-term co-integration and the estimated value is 4.874 which indicate that the long-run association among variables as calculated F-values is greater than the upper bounds.

Table 5: Bound Test Results (Model I)

Linear Model	ARDL	F-Statistic		Lower bound I(o)	Upper bound I(1)
		4.874	10%	2.26	3.35
			5%	2.62	3.79
			1%	3.41	4.68

The F-statistic for long-term co-integration and estimated value is 4.737 in table 6 which indicate the long run association among variables as calculated F-values is greater than the upper bounds.

Table 6: Bound Test Results (Model II)

Linear Model	ARDL	F-Statistic		Lower bound I(o)	Upper bound I(1)
		4.737	10%	2.45	3.52
			5%	2.86	4.01
			1%	3.74	5.06

4.3 Long Run and Short Run Results (Model 1)

The long-run results in table 7 show that all variables have a significant effect on the trade balance. In particular, the coefficient of oil price is 0.304 which is considerable with negative sign

meaning that one percent rise in oil price will deteriorates 0.304 percent in the trade balance. The coefficient of real GDP (rest of the world) is the significance with a positive sign. The coefficients of the real effective exchange rate, real GDP and financial development are significant with a negative sign.

Table 7: Long Run Results (Model I)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OP	-0.3046***	0.1033	-2.9484	0.0057
RER	-1.1742***	0.1916	-6.1290	0.0000
YW	1.2563*	0.6556	1.9163	0.0638
GDP	-2.6169***	0.7838	-3.3389	0.0020
FD	-0.7224**	0.3318	-2.1771	0.0365
C	-3.6038	12.8722	-0.2799	0.7812

Note: *, **, *** shows significant level at 10%, 5% and 1%.

Similarly, short-run results in table 8 show oil price have a negative effect on trade balance meaning that a one percent increase in oil price will decrease or deteriorates trade balance. The coefficient of the real effective exchange rate, real GDP is significant with a negative sign, while the coefficient of real GDP (rest of the world) is significant positively. The coefficient of financial development is insignificant. However, the value of the ECT term is negative and highly significant that shows insured of long-run adjustment.

Table 8: Co integration Form (Model I)

Variables	Coefficients	Std.Error	t.statistics	Prob.
D(TB(-1))	0.1853	0.1141	1.6247	0.1135
D(TB(-2))	0.2827**	0.1123	2.5185	0.0167
D(OP)	-0.5273***	0.1397	-3.7751	0.0006
D(RER)	-1.1057***	0.2131	-5.1888	0.0000
D(YW)	1.1831*	0.6515	1.8158	0.0782
D(GDP)	-2.4643***	0.8209	-3.0022	0.0050
D(FD)	0.3355	0.4625	0.7254	0.4732
CointEq(-1)	-0.9417***	0.1553	-6.0663	0.0000

Note: *, **, *** shows significant level at 10%, 5% and 1%.

The diagnostic result in table 9, show that the overall model is stable and free from all main issues i.e., heteroscedasticity, normality, autocorrelation and stability.

Table 9: Diagnostic Test Results (Model I)

R	0.8698	D.W= 2.1304
Adj. R	0.8316	F-Value=22.7315
J.B Test	7.7271	(0.0209)
LM Test	0.4282	(0.6553)
Hetero Test	1.4020	(0.2212)
Ramsey Test	1.5370	(0.2238)

Note: the numbers in () are showed p-values.

However, the results of CUSUM and CUSUMQ show that the overall model is stable. Following figures 1 and 2 show the result of CUSUM and CUSUMQ

Figure 1: CUSUM

Figure 2: CUSUMQ

4.4 Long Run and Short Run Results (Model II)

The long-run results in table 10 show that all variables have considerable effects on GDP growth. In particular, the coefficient of oil price is 0.5870 which is significant with a negative sign meaning that one percent increase in oil price will decrease 0.5870 percent in economic growth. The coefficient of real Government expenditure, gross capital formation and financial development are significant with a positive sign in long run.

Table 10: Long Run Results (Model II)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OP	-0.5870***	0.1656	-3.5447	0.0010
GEXP	0.6208***	0.0362	17.16138	0.0000
GCF	1.5950**	0.7314	2.1808	0.0353
FD	1.6389**	0.7381	2.2205	0.0323
C	-3.4831***	1.1344	-3.0704	0.0039

Note: **, *** shows significant level at 5% and 1%.

Similarly, short-run results in table 11 show oil price have a negative effect on economic growth meaning that a one percent increase in oil price will decrease or decrease economic growth by 0.1227. The coefficient of gross capital formation and financial development are significant with a positive sign in the short run.

Table 11: Co-integration Form (Model II)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OP)	-0.1227***	0.0257	-4.7701	0.0000
D(GEXP)	0.0037	0.0648	0.0564	0.9553
D(GEXP(-1))	-0.1728***	0.0572	-3.0179	0.0045
D(GCF)	0.3334***	0.1081	3.0865	0.0037
D(FD)	0.3426***	0.1048	3.2713	0.0022
CointEq(-1)	-0.2091***	0.0663	-3.1542	0.0031

Note: *** shows a significant level at 1%.

The diagnostic results in table 12 show that the overall model is stable and free from all main issues like heteroscedasticity, normality, autocorrelation and stability.

Table 12: Diagnostic test Results (Model II)

R	0.9954	F.Value=1221.88
Adj. R	0.9946	D.W=2.0804
J.B Test	1.7231	(2.4224)
LM Test	0.1569	(0.8553)
Hetero Test	1.9519	(0.0581)
Ramsey Test	0.0328	(0.8571)

Note: the values in () are p values

However, the results of CUSUM and CUSUMQ shows that overall model is stable. Following figures 3 and 4 shows the result of CUSUM and CUSUMQ

Figure 3: CUSUM

Figure 4: CUSUMQ

5. Conclusion and Policy Implications

The key purpose of the analysis is to examine the effect of oil price fluctuations on the trade balance and economic growth in Pakistan. This study used annual data from 1970-2018. This analysis employs the autoregressive distributed lag model (ARDL) to calculate approximately the effect of oil price on the balance of trade in the short time period and the long time period. In the linear ARDL model, this study found oil price negatively affected total trade balance in Pakistan other control variables like the real effective exchange rate, real GDP (Home country) and financial development also negatively affected. While real GDP (Foreign country) influenced trade balance positively. The second objective of the study is to examine the effect of oil price fluctuations on the economic growth in Pakistan. This study used annual data from 1970-2018. The study used the autoregressive distributed lag model (ARDL) to justify the effect of oil price on economic growth in the short run and the long run. In the linear ARDL model, this study found oil price negatively affected economic growth in Pakistan. Other control variables like government expenditures, gross capital formation and financial development positively affected.

On the behalf of our results, the study suggests some policies for Pakistan and other oil-importing countries. An increase in oil price is not in favor of oil-importing countries trade balance that deteriorates the trade balance and economic growth. On the other hand, oil price decrease improves the trade balance as well as economic growth. Secondly, this study results are useful for policymakers and government officials for making the policies regarding long-run economic growth as well as trade balance improvement.

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