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Oil Prices and Balance of Payments: A Quarterly Data Analysis of Pakistan

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ABSTRACT

Aim of the Study: The import of oil is a major component of the trade balance. Therefore, an increase in crude oil prices deteriorates the current account balance. The objective of this study is to analyze the impact of oil price on balance of payment in case of Pakistan.

Methodology: Secondary data on quarterly basis is collected covering the period from 2000Q1-2021Q4. The balance of payment is taken as the dependent variable, while explanatory variable is oil prices controlling with gross domestic product, inflation, and exchange rate. Autoregressive distributive lag model (ARDL) model is applied for empirical examination.

Findings: The empirical evidence provided the negative and significant relationship between oil prices and balance of payment in Pakistan. The study investigated that a rise in crude oil prices is responsible for deterioration in the balance of payment due to the high dependency on the imports of oil, which increases the import bill and negatively affects the trade balance.

Conclusion: Increasing oil prices deteriorates the balance of payments in short run as well as in the long run in Pakistan. To minimize import dependency, it is essential to strengthen the balance of payment components through value-added exports and import substitution industries. The valuable insights for policymakers are suggested on managing the economic implications of oil prices on the balance of payment of Pakistan.

Keywords: Balance of Payment, Oil Prices, ARDL, Current Account Balance, Quarterly Data.

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1. INTRODUCTION

The global oil price variation always has important implications for the oil importing countries, specifically for the countries having high dependency on energy (Malik, 2010; Finance and Byrne, 2016). Oil prices and current account balance are of significant importance where a country fits either among major importers, or exporters of oil. The current account balance is the difference between a country's exports of goods and services, direct investments, income from abroad etc. and its imports into newer currencies also all net transfers when switched to money form. The discovery of oil radically changed the

economic and political geography of the Middle East (Zuoqian et al, 2022). Oil not only serves as a fuel for the industry but also as a raw material for various products. Almost all means of transport use crude oil. The drastic global demand for oil has raised its price. As the uses of petroleum are manifold hence the demand is inelastic (Cashin *et al.* 2014).

Pakistan, with its growing energy needs and limited domestic oil production, is heavily reliant on imported oil to fuel its economic activities. This reliance makes the country vulnerable to the volatility of international oil markets (Yasmeen et al. 2019). The impact of these oil price changes is prominently reflected in the balance of payments, which records all economic transactions between residents of Pakistan and the rest of the world. Understanding the dynamics between oil prices and the balance of payments is crucial for policymakers to devise strategies that mitigate adverse economic effects and ensure sustainable economic growth.

Oil crises of the 1970s and the economic recession that followed, a sharp hike occurs in the oil price in 2001 and a sudden decline in 2008 that was again followed by economic crises established the fact that oil prices are vital (Painter, 2014). Although the United States of America is the world producer of oil followed by Saudi Arabia and Russia, it is the largest consumer and 2nd largest importer of oil followed by China (Bromley, 2005; Elsayed & Yarovaya, 2019). Moreover, oil prices in developing countries are more complex because of the international and domestic considerations that influence prices paid to consumers (Wagner, 2009). Oil prices around the world are determined by supply and demand, geopolitical events like wars or sanctions in oil-producing nations such as those within OPEC member states is due to production from major fractions of fuel trade (Henriques & Sadorsky, 2008; Cologni, & Manera, 2009).

Conversely, increase in oil prices for importing countries may push pressure on imports bills which contribute to a greater current account deficit. This may put pressure on forex reserves, devalue the currency and force inflation higher. High oil prices in the long run would make these countries either reduce imports of other items or seek alternative sources of energy which can slow down their overall economic growth. When oil price falls, the countries can benefit by lower cost of imports leading to improvement in their current account balance.

The objective of the current study is to examine the oil price impact on the balance of payments for Pakistan over the period from 2000Q1 to 2022Q4. This research is organized in five sections. Section one presents an introduction while section two comprised on literature review. Methodology is explained in section three then Results and conclusion are provided in section four and five. Three discusses the related theories. Chapter four discussed the data and methodology.

2. LITERATURE REVIEW

The balance of payments, often known as the balance of foreign payments, is crucial macroeconomic statistics. (Oladipupo, 2011; Broni-Bediako et al. 2018) stated that the recording of all economic transactions between citizens of a country and the rest of the globe over a specific period of time is the balance of payments. It summarizes an economy's interactions with other nations. State bank of Pakistan (2020) gives a statistical statement for a specific time period that detailed economic transactions between citizens of the reporting economy and non-citizens are referred to as a balance of payment (Hyder, 2005). Real resources are given away or received in these transactions and claims obligations to the rest of the world are altered. Because no country is self-sufficient, there is an interdependence in the necessity for economies to trade commodities and services. This international trade between economies is only feasible through the purchasing and selling of a country's currency, which is why there is a need for exchange rates (Rehman *et. al*. 2006; Ahmed *et. al.* 2014; Batool *et. al.* 2015). The exchange rate illustrates how valuable one currency is in comparison to another. Kenton, (2017) and Kouri, (2019) explained that a country's foreign trade of goods, services, capital and transfer payments (foreign aid and remittances) are all included in the balance of payments account.

An importer economy may experience negative effects on the real sector, balance of payments, and general prices if its currency is appreciated by its monetary authority (Thirlwall, 2003; Oladipupo, 2011; Olanipekun and Ogunsola 2017). The findings of these studies were similar to the Kouri, 2019 and Olanipekun, 2017). Afolabi (2019) investigated the balance of payments and variations in crude oil prices in Nigeria. The link between explanatory variables and the balance of payments exists in the long term. According to short-term projections, both the price of oil and the currency rate have a negative significant impact on the balance of payments, while over the long term, both factors have a negative substantial impact. Sakanko *et al.,* (2019) analyze quarterly data from 1980 to 2017 and examine Nigeria's balance of payments and oil price volatility. The evidence reveals that oil exports have a positive and significant impact in the long run.

Eke and Obafemi (2015) investigated the impact of exchange rates on Nigeria's balance of payments and their implications for policy. considering annual time series that were analyzed in a cointegration and vector error correction model, determine the effect of the exchange rate on the balance of trade in Nigeria from 1970 to 2012. According to the calculations, the exchange rate significantly and negatively affects the balance of trade. While the causality result demonstrated an independent association between the exchange rate and balance of payments in Nigeria.

The findings of (Mavi and Sharma, 2002; Eke and Obafemi 2015; Jayasooriya 2020) were coincide. Jayasooriya (2020) considers panel data covering all south Asian countries from 1980 to 2015 The current account balance vs exchange rate movement is one of the most contentious topics in macroeconomics today. Increased current account deficits are one of the most critical issues facing many emerging nations, particularly in South Asia, because it may lead to economic and financial crises. Sujianto (2020) investigated that how Indonesia's balance of payments is affected by macroeconomic factors such as interest rates, inflation, national income, and exchange rates. The macroeconomic indicators can be influenced by fluctuations in the prices of oil . This outcome highlights the importance of oil as the nation's main source of foreign income (Broni-Bediako et al., (2018; Daddikar and Rajgopal, 2016).

India is ranked as the fourth-largest consumer of crude oil in the world by importing 100 million tons of crude oil annually, or 37% of total imports, crude plays a crucial role in containing inflation and sustaining rapid economic growth. Crude is one of several commodities that determines prices since changes in its price directly affect other commodities' prices as well as society at large. Even a dollar drop in crude oil prices has a threefold effect on the economy, saving the nation roughly 40 billion rupees. The fact that oil prices have fallen by approximately 55% since June 2014 confirms that there is an oversupply from OPEC and the US as well as weak demand for use globally (Soundarapandiyan and Ganesh, 2017).

Net oil exports are contributing factor which explains current account surpluses whereas, net oil imports do not impact the current account deficits. The only exception among all importers is for relatively wealthy nations, where higher oil imports seem to be a factor in higher current account deficits. Oil exporters and oil importers may consider oil income gain and loss as transitory income sources which affect their saving habits as one explanation for these trends (Huntington, 2015).

After reviewing previous literature and research reports, it is evident that most of the researchers examined the significant relationship between oil prices and economic growth, with several studies focusing on gross domestic product as a dependent variable in Pakistan (Kiani, 2011; Muhammad, 2012; Jawad, 2013; Nazir and Qayum, 2014; Arshad et al., 2016). However, limited studies have been conducted specifically on oil prices and its impact on the balance of payments in case of Pakistan. Few researchers examined the effect of oil price volatility on the balance of payments (Sakanko, 2019; Afolabi, 2019; Ramadhan, 2000), but these studies primarily focused on oil-exporting countries like Nigeria.

This study aims to explore the relationship between oil prices and the balance of payments in Pakistan using quarterly data, marking the detailed examination of this kind. Crude oil import is major component of the current account balance. Therefore, it is expected that rising oil prices negatively affect the balance

of payments. This research seeks to fill the existing gap and demonstrate how changes in oil prices influence the balance of payments in Pakistan. It will contribute to the literature by establishing the relationship between five independent variables oil price, inflation, gross domestic product, and exchange rate and their effects on Pakistan's balance of payments using quarterly data.

2.1 Model

In the literature review, a sufficient number of studies were conducted to examine oil price volatility (Muhammad, 2012; Jawad, 2013; Yasmeen et al., 2019), but there is no evidence of empirical study which could investigate that how oil prices affect the balance of payment in Pakistan. The empirical model constructed to examine the impact of oil prices and balance of payment is as follows,

$$\mathrm{BOP}_t = \beta_0 + \beta_1 \mathrm{OP}_t + \beta_2 \mathrm{GDP}_t + \beta_3 \mathrm{ER}_t + \beta_4 \mathrm{INF}_t + \varepsilon_t \quad (1)$$

The empirical model of the study is constructed and represented by equation- (1) where dependent variable is balance of payment (BOP) and explanatory variable is oil prices (OP). The control variables are gross domestic product (GDP), inflation (INF) and exchange rate (ER).

εt is the error term in the model and subscripts t represents time period. In equation (1) subscript t is the time subscript that represents the time period in the model. The details of variables and sources of data are given in table- A1 in appendix- A.

In order to estimate the model represented by equation (1), the secondary data of all the variables is collected from the Hand book of Statistic, State Bank of Pakistan, Govt. of Pakistan, International Financial Statistics and World Development Indicators covering the period 2000-2021 on quarterly bases.

3. METHODOLOGY

The empirical estimation to examine the link between oil prices and balance of payment requires initial investigation of data, so the results of summary statistics and correlation, are given in Table- B1 and Table- B2 in Appendix-B1 respectively.

The quarterly time series data is collected for this research and the presence of unit root may be the significant implications for the estimation and findings. To detect the unit root problem in the data series, the Augmented Dickey-Fuller (ADF) and Phillip- Perron (PP) test are applied in order to check whether the data series are stationary or non-stationary. The findings of unit root tests are provided in table (1). These results revealed that all the data series are integrated of mixed order, at level (I (0)) and at first difference (I (1)).

3.1 Autoregressive Distributed Lag Model (ARDL)

On the basis of the unit root test results, the appropriate estimation technique is Autoregressive Distributed Lag Model (ARDL) (Pesaran and Shin, 1999; Pesaran *et al*., 2001). In time series framework ARDL has dynamic advantage to capture the short run as well as the long run relationship among the selected variables in the model. Autoregressive distributed lag model incorporates lag values of both dependent and independent variables. By incorporating lag values autoregressive distributed lag model acknowledge the presence of endogeneity, serial correlation and other complications in time series data (Nkoro and Uko 2016). The ARDL model is presented in the form of the following equation:

$$\Delta Yt = \beta_o + \sum_{i=1}^{\rho} \beta_i \Delta Y_{t-i} + \sum_{i=0}^{\rho} \delta_i \Delta X_{t-i} + \theta_1 y_{t-1} + \theta_2 x_{t-1} + \varepsilon_t \quad (2)$$

In the equation (2) ΔYt represents dependent variables at the time period (t), ΔY_{t-i} represent lag values of dependent variables at time period up to (ρ). X_{t-i} describe lags of independent variables. β_o is the intercept term, while β_i and δ_i are short run coefficients and θ_1, θ_2 are the long run coefficients. ε_t is the disturbance term of the model.

$$y_t = \beta_0 + \beta_1 x_t + \mu_t \quad (3)$$

$$z_{t-1} = y_{t-1} - b_0 x_t - b_1 x_{t-1} \quad (4)$$

In equation the long run terms $\theta_1 y_{t-1} + \theta_2 x_{t-1}$ is denoted by its residuals (z_{t-1}) therefore, the ARDL reverts to the Error Correction Model (ECM). The ECM term is represented by equation (5):

$$\Delta Yt = \beta_o + \sum_{i=1}^{\rho} \beta_i \Delta Y_{t-i} + \sum_{i=0}^{\rho} \delta_i \Delta X_{t-i} + \theta Z_{t-1} + \varepsilon_t \quad (5)$$

In above equation (5), θ represents error correction term (ECT) shows the speed of adjustment revert to restore the equilibrium in the dynamic model. Moreover, if the coefficient of ECT is significant and less than zero then this shows the model is convergent to the equilibrium level. In opposite case, the model will be explosive and considered unstable.

Autoregressive distributed lag model has several advantages, it handles the mix order variables (I (0), I(1)), small sample size, it captures long run and short run dynamics. The ARDL model, when incorporated into methodology, can offer a thorough framework for examining the connections between different variables and can reveal details about both their dynamics of equilibrium (Kripfganz and Schneider 2018).

4. RESULTS AND DISCUSSION

Before estimation of study model, the preliminary analysis of the data is pre-requisite, so data summary, correlation and unit root tests are conducted. The findings of data summary and correlation coefficients are given in Appendix- (B): table- (B1) and table- (B2) respectively.

4.1 Unit Root Tests

In order to detect whether the data series of the model is stationary or non-stationary in other words series has a unit root problem or not, the frequently used test is Augmented Dickey-Fuller (ADF) test. The null hypothesis states that the time series have a unit root, which suggests non-stationarity. The ADF test takes into consideration lagged differences and the potential for a drift term to identify any potential serial correlation in the data. Second test to detect the unit root is the Phillps Perron unit root test (PP). This test handles probable autocorrelation and heteroskedasticity in the data, the Phillps Perron (PP) test is a variant of the Augmented Dickey-Fuller (ADF) test. The Augmented Dickey-Fuller (ADF) test is used in a similar manner, but it takes these problems into account by using a different t-statistic computation. The Unit Root tests results are shown in Table- (1).

Table 1: *Unit Root Test*

Variables	Augmented Dickey Fuller (ADF)		Phillips Perron (PP)		Order of integration
	Level	First Difference	Level	First Difference	
BOP	-3.05	-3.39***	-1.93	-3.68***	I(1)
OP	-2.54	-3.51***	-1.79	-3.58***	I(1)
GDP	-3.21***	-3.06***	-2.54	-3.79***	I(0)
ER	-0.61	-3.77***	-2.12	-4.12***	I(1)
INF	-2.39	-2.81**	-3.81***	-3.86***	I(1)

Note; P-values are shown in parentheses under respective statistics. *, **,*** shows rejection of null hypothesis of "unit-root" at 10%, 5% and 1% significance.

4.2 Optimal Lag Selection

Some commonly used criteria are; Akaike information criterion (AIC), Bayesian information criterion (BIC) and, Hannan-Quinn information criterion (HQIC). In table-2 to be the optimal choice according to the following criteria. An essential phase in time series investigation is choosing the proper lag for a

model. LogL: Not the highest, but relatively close to the highest value. FPE: Lowest value, AIC: Lowest value SC: Lowest value. HQ: Lowest value. Overall, lag 6 provides the best fit, the most accurate forecasts, and the least model complexity according to the criteria used in this analysis.

Table 2: *Lag selection criterion*

C	LogL	LR	FPE	AIC	SC	HQ
0	-1409.078	NA	60186027	34.94021	35.11757	35.01137
1	-558.2229	1554.649	0.110322	14.82032	16.06189	15.31845
2	-366.0135	322.7220	0.002365	10.96330	13.26906*	11.88840
3	-353.3522	19.38269	0.004364	11.53956	14.90953	12.89164
4	-336.3789	23.46929	0.007498	12.00936	16.44352	13.78840
5	-228.7840	132.8332	0.001445	10.24158	15.73995	12.44760
6	-116.4874	122.0014*	0.000266*	8.357712*	14.92028	10.99070*
7	-96.11471	19.11507	0.000522	8.743573	16.37034	11.80353
8	-65.98426	23.80678	0.000924	8.888500	17.57946	12.37543

Source: Calculated by Authors using E-views 10

4.3 Cointegration Approach

ARDL bouns test results are provided in table-3. F-Statistic value provides information about the presence of cointegration among the variables. As the F-statistic value is greater than the upper bound and lower bound values which states that there exists cointegration among the study variables. This finding about the presence of cointegration among variables is the evidence to decide that the long run estimation of the ARDL is appropriate for the analysis.

Table 3: *ARDL bounds test Results*

Statistics	value	K
F-statistic	10.7	4
Critical bounds value		
Significance	**I (0) bound**	**I (1) bound**
10 %	2.08	3.1
5 %	2.39	3.7
2.5%	2.7	3.7

K = the number of regressors

4.4 Long Run Results

The long run findings of ARDL model are presented in table (2), which is referred to understand the long-term relationship between the dependent variable (balance of payment) and various independent variables such as oil price, Gross Domestic Product (GDP), Inflation, and exchange Rate. The model is presented in six different columns, each representing a different specification. Here is the interpretation of the results for each column, in Column 1 the coefficient of oil price is 0.18, significant at the 1% level (***), indicating a positive long-term effect on the oil prices. R-squared: 0.64, indicating that 64% of the variation in the regressand is explained by the model. Durbin-Watson statistic: 2.06, suggesting no significant autocorrelation in the residuals. In column 2 oil price coefficient is 0.54 which is statistically significant. Gross Domestic Product coefficient is 0.20, not statistically significant. Column 3 describes that oil price coefficient is 0.20, which is insignificant at the 5% (**), indicating that there is no evidence of long-term effect. The coefficient of inflation -0.13, significant at the 5% level (**), indicating a negative long-term effect. R-squared: 0.69, indicating that 69% of the variation is explained by this model. Durbin-Watson statistic: 2.00, suggesting no significant autocorrelation in the residuals. In column 2 the coefficient of oil price is 0.54, which is significant and negative.

Table 4: *Long Run Results*

Dependent Variable:	**Balance of Payment (BOP)**				
Variables	**1**	**2**	**3**	**4**	**5**
Oil Price	-0.18***	-0.54**	-0.2	-0.20**	-0.11**
	(0.10)	(0.74)	(1.69)	(0.11)	(0.06)
Gross Domestic		-0.20**			0.05
Product		(0.11)			(0.04)
Inflation			-0.13**		0.711**
			(0.03)		(0.37)
Exchange Rate				0.15	0.70
				(0.10)	(0.21)
R-Squared	0.64	0.69	0.65	0.65	0.80
Durbin-Watson Statistic	2.06	2.00	2.06	2.09	2.01

Note: standard errors are shown in parentheses under respective statistics. *, **,*** shows the level of significance at 10%, 5% and 1% .

The column 3 describe oil price coefficient is 0.20 significant at the 5% level (**), indicating a negative long-term effect. Inflation coefficient is -0.13, significant at the 5% level (**), indicating a negative long-term effect. R-squared 0.65 described that 65% of the variation is explained by this model. Durbin-Watson statistic: 2.06, suggesting no significant autocorrelation in the residuals. Column 4 represent oil price coefficient is 0.20, statistically significant. Exchange rate coefficient is not statistically significant. Interest Rate, R-squared: 0.80, indicating that 80% of the variation is explained by this model. Durbin-Watson statistic: 2.01, described no auto-correlation in the residuals.

In column 5 oil prices are negative and significant, while in case of oil importing country like Pakistan. Although oil price volatility may have serious economic repercussions in the short term, it may not be highly important in the long term due to adjustments and measures taken by economies, for instance, hedging and policy adjustments. The immediate impact of oil price rise dealt with short-term responses, while the long-term importance is often overshadowed by sustained price changes for oil. Gross Domestic Product coefficient is 0.05, not statistically significant. Inflation is positive and significant in long run. R-squared: 0.84, indicating that 84% of the variation is explained by this model, which is the highest among all columns. Durbin-Watson statistic: 2.01, suggesting no significant autocorrelation in the residuals.

4.5 Short Run Results

The dependent variable in table (3) is balance of payment. The table shows the results for several independent variables that may affect balance of payment. These include oil prices, GDP, inflation, and exchange rate. Table-3 shows oil prices and balance of payment have negative and significant relationship in short run at 1% significance level. One percent increase in the prices of oil brings 0.03 percent deterioration in the balance of payment.

In column 2. Oil price and gross domestic product both are independent variables, co- efficient of oil price is significant and negative. Increase in gross domestic product described higher income and more consumption and investment. Better standards of domestic product are one way to drive global preferences in imports, which can lead there be a thirst for imported goods and services, especially if the home economy cannot counter its production economically. This could then be a factor in worsening trade balance (another element within the current account), and by extension, leading to a deficit on the current account.

Column 3 oil prices are negative and significant while coefficient of inflation is positive and significant.

One percent increase in the prices will bring 0.10 percent increase the balance of payment. In general, higher inflation means lower purchasing power for a given sum of money, which in turn increases domestic prices relative to those abroad. This usually results in higher demand for imports because both consumers and businesses turn to cheaper foreign related. So, increased inflation, effect on the trade balance wider current account deficit. For new exports, inflation positively affects the trade balance deteriorating as dependent variable. In column 4 oil prices and exchange rate are independent variables, oil price is significant and negative after taking lag described that one percent increase in the prices of oil brings 0.09 percent decrease in the balance of payment. Interest rate is not significant in the short run. In column 5 oil price is significant and negative. Gross domestic product is also significant and negative, while inflation is also significant after taking one lag. Error correction terms in all columns are significant and negative which is the evidence of the speed of adjustment towards long run.

Table 5: *Short Run Results*

Dependent Variable:	**Balance of Payment (BOP)**				
Variables	**1**	**2**	**3**	**4**	**5**
Oil Price	-0.03***	-0.38***	-0.41***	-0.33***	-0.09***
	(-0.01)	(-0.1)	(-0.1)	(-0.1)	(-0.02)
Δ oil Price	-0.55***	-0.05**	-0.20**	-0.21**	-0.08***
	(-0.1)	(-0.02)	(-0.1)	(-0.11)	(-0.01)
Gross Domestic		0.001			0.002
Product		(-0.02)			(-0.007)
Δ Gross Domestic		-0.02**			0.02***
Product		(-0.01)			(-0.01)
Inflation			0.10**		0.001
			(-0.04)		(-0.14)
Δ Inflation			-0.02**		0.04
			(-0.01)		(-0.10)
Exchange Rate				-0.09	0.099**
				(-0.13)	(-0.05)
Δ Exchange Rate				-0.07	-0.08
				(-0.02)	(-0.03)
Constant	0.76***	0.42***	1.11***	1.22**	-0.45***
ECT	-0.17	-0.10***	-0.21***	-0.18***	-0.03***
p-value	(-0.03)	(-0.02)	(-0.03)	(-0.03)	(-0.01)

Note: standard errors are shown in parentheses under respective statistics. *, **,*** shows the level of significance at 10%, 5% and 1%

4.6 Diagnostic Checks

To check the serial correlation in the data set, BG LM test has been applied. The null hypothesis states that there is no autocorrelation as probability of chi-square is 0.2 which is greater at 5% significance level. So, we do not reject the null hypothesis and conclude that there is no evidence of serial correlation. The results are presented in table-B3 in Appendix-B.

In addition, two graphs are represented in figure 1, one for CUSUM statistic and other for CUSUM of Squares statistics which have been plotted against time (long-run graph). These statistics help assess the stability or otherwise of a model's parameters especially in regression analysis. CUSUM (Cumulative Sum) this graph keeps tabs on the accumulated sum of the residuals. If the CUSUM line is fairly flat and it stays inside predetermined critical bounds (usually dotted lines) over time, it suggests that no significant shifts have occurred in the intercept or mean of independent variable(s) of the model. A persistent upward or downward trend in CUSUM line indicates a possible change in intercept or mean

hence suggesting that relationship described by the model may not hold throughout whole data period. CUSUM of Squares this graph captures always increasing total squared deviations between observed values and fitted curves

resulting from some regression under consideration. A flat CUSUM of Squares line implies no significant changes in the variance of the error term or the slope coefficients of your model.

A sudden upward or downward shift of the CUSUM of squares line indicates a potential change in the model's variance or slope, which means that strength of relationship between variables may have been fluctuating. The CUSUM and the CUSUM of squares lines were relatively flat during the entire analysis period, remaining within the critical limits thus indicating stability for that model.

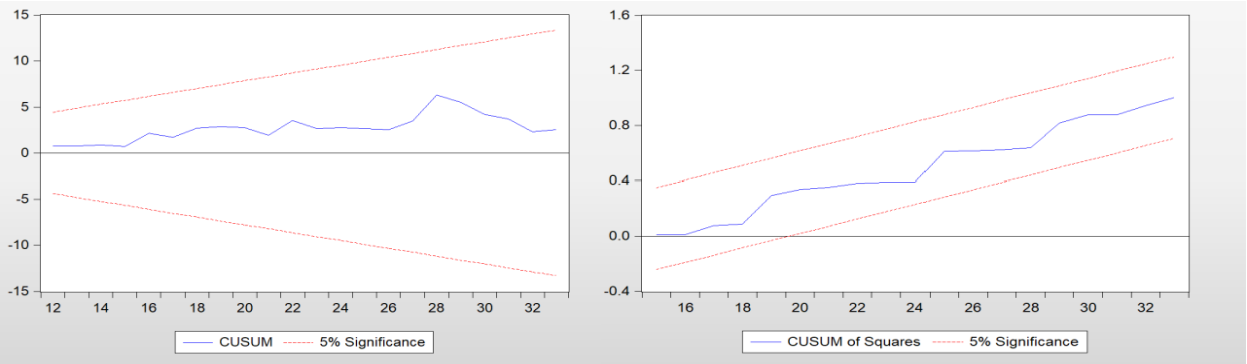

Figure 1: *Long Run Graphs of CUSUM and CUSUM of Squares*

5. CONCLUSION AND RECOMMENDATIONS

This analysis intends to find out how crude oil prices affect Pakistan's balance of payments by analyzing quarterly data covering the period 2000 to 2021. The ARDL bound test technique is applied to find out the relationship between oil prices and balance of payment in the long and short run in Pakistan. The findings of the long-run ARDL model shows that BOP has variable-context dependent effect on oil price which results in both positive and negative significant across various other model specifications. This implies that the relationship between balance of payment and oil prices is complex, shaped by a web of interrelated factors all across diverse economic conditions. Inflation on all times has shown up as playing significant role in determining such price levels but the exchange rate is significantly and positively influenced in one specification, illustrating exchange rates may significantly impact major economic variables over an extended time period. In the same way, fluctuations in balance of payments affected due to crude oil prices thereby emphasizing short term relevance. On a limited and specific context, GDP and its variations are less important in determining the relationship in the short run. The cost of barrels has a variety of short-term impacts and with regard to that one thing we know about inflation is that its results are mixed meaning they can be either good or bad but any change in it always leads to negative outcomes for long-term trends. There is a consistently negative Error Correction Term (ECT) in all models since there exists an intense tendency to revert crude prices back in equilibrium after some deviations have occurred at any particular time frame.

To enhance export performance and minimize import dependency, it is essential to strengthen the balance of payment components through value-added exports and import substitution industries. There is a need for reforms aimed at boosting productivity, improving human capital, and fostering innovation to maintain sustained growth in GDP. Furthermore, effective coordination should be established among the State Bank of Pakistan, the Ministry of Finance, and other agencies. A forecasted unpredictable economic policy is also required to manage market expectations as well as to mitigate speculative activities. In addition, the adoption of these measures can stabilize oil prices which in turn stabilize the economy against shocks.

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Conflict of Interest

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REFERENCES

Afolabi, R. B. (2019). Crude oil price fluctuations and Nigerian balance of payments 1987- 2017. *LapaiJournal of Economics*, *3*(1), 46-58. https://doi.org/10.2022/lje.v3i1.24

Ahmad, N., Ahmed, R., Khoso, I., Palwishah, R., & Raza, U. (2014). Impact of exchange rate on balance of payment: An investigation from Pakistan. *Research Journal of Finance and Accounting*, *5*(13), 2222-1697.

Arshad, A., Zakaria, M., & Junyang, X. (2016). Energy prices and economic growth in Pakistan: A macro-econometric analysis. *Renewable and Sustainable Energy Reviews*, *55*, 25-33. https://doi.org/10.1016/j.rser.2015.10.051

Batool, S. A., Memood, T., & Jadoon, A. K. (2015). What determines balance of payments: A case of Pakistan. *Sukkur IBA Journal of Management and Business*, *2*(1), 47-70. DOI:10.30537/sijmb.v2i1.88

Bromley, S. (2005). The United States and the control of world oil. *Government and Opposition*, *40*(2), 225-255.

Broni-Bediako, E., Onyije, I. J., & Unwene, K. K. (2018). Economic effects of oil price volatility on developing countries: A case study of an oil exporting country. *International Journal of Economic and Management Sciences*, *7*(2), 1-5. https://doi.org/10.4172/2162-6359.1000509

Cashin, P., Mohaddes, K., Raissi, M., & Raissi, M. (2014). The differential effects of oil demand and supply shocks on the global economy. *Energy Economics*, *44*, 113-134.

Cologni, A., & Manera, M. (2009). The asymmetric effects of oil shocks on output growth: A Markov–Switching analysis for the G-7 countries. *Economic Modelling*, *26*(1), 1-29. https://doi.org/10.1016/j.econmod.2008.05.006

Daddikar, P.V., & Rajgopal, M. (2016). Symmetric and asymmetric Volatility Modelling for Crude Oil Prices in India. Elk Asia Pacific *Journal of Finance and Risk Management, 7*(3), E4:E15 https://doi.org/10.19030/jabr.v27i3.4214

Eke, I. C., Eke, F. A., & Obafemi, F. N. (2015). Exchange rate behaviour and trade balances in Nigeria: An empirical investigation. *International Journal of Humanities and Social Science*, *5*(8), 1.

Elsayed, A. H., & Yarovaya, L. (2019). Financial stress dynamics in the MENA region: Evidence from the Arab Spring. *Journal of International Financial Markets, Institutions and Money*, *62*, 20-34. https://doi.org/10.1016/j.intfin.2019.05.004

Finance, B. N. E., & Byrne, J. (2016). Global trends in renewable energy investment 2016. Available at https://www.fs-unep-centre.org/wp-content/uploads/2019/11/Global_Trends_Report _2016.pdf

Henriques, I., & Sadorsky, P. (2008). Oil prices and the stock prices of alternative energy companies. *Energy Economics*, *30*(3), 998-1010. https://doi.org/10.1016/j.eneco.2007.11.001

Huntington, H. G. (2015). Crude oil trade and current account deficits. *Energy Economics*, *50*, 70-79. https://doi.org/10.1016/j.eneco.2015.03.030

Hyder, R. (2005). State Bank of Pakistan.

Jawad, M. (2013). Oil price volatility and its impact on economic growth in Pakistan. *Journal of Finance and Economics, 1*(4), 62-68. https://doi.org/10.12691/jfe-1-4-2

Jayasooriya, S. (2020). Movement of exchange rate on balance-of-payments constrained growth in South Asia: Panel ARDL.

Kiani, A. (2011). Impact of high oil prices on Pakistan's economic growth. *International Journal of Business and Social Science, 2*(17). DOI:10.4172/2151-6219.1000182

Kouri, P. J. (2019). The exchange rate and the balance of payments in the short run and in the long run: A monetary approach. In *Flexible Exchange Rates/h* (pp. 148-172). Routledge.

Malik, A. (2010). Oil prices and economic activity in Pakistan. *South Asia Economic Journal, 11*(2), 223-244. https://doi.org/10.1177/139156141001100204

Mavi, A. K., & Sharma, N. (2002). Macro-economic determinants of balance of payment in India. *Economic Survey (various years), 72*(03), 1991-92.

Muhammad, S. D. (2012). The impact of oil prices volatility on export earning in Pakistan. *Available at SSRN 2164275*.

Nazir, S., & Qayyum, A. (2014). Impact of oil price and shocks on economic growth of Pakistan: Multivariate Analysis. *Business and Economics Journal, 6*(4). DOI:10.4172/2151-6219.1000182

Oladipupo, A. O. (2011). Impact of exchange rate on balance of payment in Nigeria. African *Research Review, 5*(4), 104-118. https://doi.org/10.52589/AJESD-SDEWBA5E

Olanipekun, D. B. & Ogunsola, A. J. (2017). Balance of payment crises in Nigeria: The role of the exchange rate. *International Journal of Economics, Commerce and Management, 5*(5), 119-140.

Painter, D. S. (2014). Oil and geopolitics: the oil crises of the 1970s and the Cold War. *Historical Social Research/Historische Sozialforschung*, 186-208.

Rammadhan, M. A. (2000). The effects of the fluctuations in oil prices on the balance of payments of the GCC countries.

Sakanko, M. A., Obilikwu, J., & David, J. (2019). Oil Price Volatility and Balance of Payments (BOP): Evidence of Nigeria. *Bingham Journal of Economics and Allied Studies (BJEAS)*, *2*(3), 69-82.

Soundarapandiyan, K. & Ganesh, M. (2017). An Analytical View of Crude Oil Prices and Its Impact on Indian Economy. IOSR *Journal of Business and Management* (IOSR- JBM), 23-28

Sujianto, A. E. (2020). Macroeconomic factors and balance of payment: Evidence from Indonesia. *Industrial Engineering and Management Systems, 19*(1), 266-272. DOI:10.7232/iems.2020.19.1.266

Thirlwall, A. P. (2003). Trade, the balance of payments and exchange rate policy in developing countries. Books.

ur Rehman, H., & Rashid, H. A. (2006). The balance of payment problem in developing countries, especially in Pakistan. *The Journal of Commerce, 1*(1), 31.

Wagner, H. L. (2009). *The Organization of the Petroleum Exporting Countries*. Infobase Publishing.

Yasmeen, H., Wang, Y., Zameer, H., & Solangi, Y. A. (2019). Does oil price volatility influence real sector growth? Empirical evidence from Pakistan. *Energy Reports, 5*, 688-703. https://doi.org/10.1016/j.egyr.2019.06.006

Zuoqian, W. A. N. G., Zifei, F. A. N., Zhang, X., Baolei, L. I. U., & Xi, C. H. E. N. (2022). Status, trends and enlightenment of global oil and gas development in 2021. *Petroleum Exploration and Development*, *49*(5), 1210-1228. https://doi.org/10.1016/S1876-3804(22)60344-6

Appendix - A

Table- A1: *Variable Details and Data Sources*

Variable	Symbol	Description	Data Source	Reference
Oil Prices	OP	annual crude oil prices in US dollar per barrel	BP statistical review of world energy 2021, international financial statistics	(Malik 2010; Kashif 2017)
Balance of payment	BOP	Current account balance	State bank of Pakistan annual reports, hand book of state bank of Pakistan 2020	(Ahmad et al., 2014)
Gross domestic product	GDP	Quarterly gross domestic product based on current prices	SBP Working Paper Series (2013)	(Hanif et al., 2013)
Exchange rate	ER	Nominal exchange rate	Monthly data from State Bank of Pakistan (SBP) and average of a quarter will be taken as a measure of quarterly exchange rate.	(Badar et al., 2013)
Inflation	INF	consumer prices annual percentage	state bank of Pakistan, International Financial Statistics	(Badar et al., 2013)

Source: Author

Appendix - B

Table-B1: *Descriptive Statisticss*

Description	BOP	OP	GDP	INF	ER
Mean	-1.87	64.27	4.12	7.92	5.01
Median	-1.7	63.50	4.39	7.75	5.54
Maximum	4.82	111.63	7.54	20.28	7.60
Minimum	-9.2	24.45	-1.27	2.52	2.16
Std. Dev.	2.89	26.09	1.73	3.95	1.57
Skewness	0.22	0.27	-0.43	0.77	-0.16
Kurtosis	3.31	2.20	3.17	3.35	1.71
Observations	89	89	89	89	89

Calculated by Author using E-views 10

Table-B2: *Correlation Coefficients*

Variables	OP	ER	INF	GDP	BOP
OP	1				
ER	-0.2	1			
INF	-0.14	0.08	1		
GDP	0.31	-0.25	0.28	1	
BOP	-0.45	-0.08	0.25	-0.54	1

Source: Author using E-views 10

Table-B3: *Breusch-Godfrey Serial Correlation LM Test*

F-statistic	2.231102	Prob. F(10,20)	0.0808
Obs*R-squared	16.34661	Prob. Chi-Square(10)	0.0901
Scaled explained SS	8.107142	Prob. Chi-Square(10)	0.6184

Source: Author using E-views 10