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The Impact of Oil Price Inflation on Economic Growth of Oil Importing Economies: Empirical Evidence from Pakistan

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Abstract

By analyzing the impact of oil prices on economic growth, this study has shown a new insight into the link between oil price inflation and economic growth. The primary goal of this study is to determine if oil prices are pro-growth or anti-growth. To provide empirical proof, the series data for both the core and control variables from 1972 to 2020 was used to justify the association on empirical grounds. To account for the presence of a unit root, the Augmented Dickey-Fuller Test was used, and after making the series compatible for co-integration, the Autoregressive distributed lag model was used to determine the empirical estimate. Additionally, the empirical models were used to diagnose heteroscedasticity and autocorrelation. The reference point model reveals that in developing nations like Pakistan, economic growth is anti-growth with an increase in prices, and it responds negatively to economic growth in the long and short run. As a result, oil price inflation in Pakistan fails to have a significant beneficial impact on economic growth in both the long and short run, but it does raise the general price level in the economy.

Keywords: Oil Prices, Economic Growth, ARDL, Time Series, Pakistan

JEL Classification Code: E00, E31, E60, P28

1. Introduction

Macroeconomic policymakers' primary goal is to achieve a high and stable rate of economic growth. This problem has been a source of serious debate for many years because of its consequences for economic growth, consumption levels, and income inequality. Therefore, it is more suitable to sustain a smoother level of oil (Gasoline) prices over a long period to get a sustainable path of economic growth. Few countries supply oil and gasoline, two types of standard energy, resulting in abrupt price increases and supply shocks (Wolde-Rufael, 2009). Hence, the focus of this research is to give evidence on the elements that contribute to energy inflation, with a particular focus on the influence of oil prices and economic growth. OPEC is responsible for the oil shocks of the 1970s, as well as the decline in oil imports by countries around the world, resulting in a global recession. Many studies are of the view that energy inflation leads to an increase in the general price level. Some literature focused on a significant relationship between energy prices and inflation (Iqbal et al., 2021).

Kraft and Kraft (1978) drew the attention of a number of policymakers who wanted to examine the relationship between energy prices and other economic indicators, particularly the link to economic growth. The impact of oil prices on economic growth was emphasized by Ozturk (2010). Historical studies were also used to form conclusions for the study. Nonetheless, valuing the links between energy resources and economic growth is a key gap in pragmatics.

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These studies have also considered the level of energy assets and endowments. These findings are consistent with a comparison of the economic growth-oil price relationship between industrialized and developing countries (Dinh, 2020).

However, the study's main goal is to determine if the pattern of oil price change in emerging nations, particularly Pakistan, is pro- or anti-growth (Jawad, 2013; Brown & Yücel, 2002) and thus improve the economy's overall performance (Echchabi & Azouzi, 2017; Nguyen & Nguyen, 2020; Okoye et al., 2021), while others believe that growth has slowed due to higher oil prices in developing countries (Echchabi & Azouzi, 2017; Nguyen & Nguyen, 2020; Okoye et al., 2021).

Some economists argue that energy possessions' accessibility has a significant impact on energy inflation, consumption, and economic growth. On the other hand, the level/extent of economic development is determined, especially in the long run, by the abundance or scarcity of basic demands in terms of energy resources (Adekoya, 2021). This argument expresses an opinion and acts as a foundation for the research. Furthermore, this argument is economically comprehensive in that it asserts that countries with abundant energy resources can consume discounted energy products (Johnson, 2021).

Nonetheless, the countries may face a resource deficit, making the impact insignificant for economic growth (Badeeb et al., 2021). Because the international oil price has been falling since 2010, global oil demand has risen rapidly. The available literature has demonstrated that oil shocks can have a variety of negative effects on economic growth. For example, a spike in the price of oil led to an increase in production costs, import bills, and the price of petroleum goods, therefore a drop in productivity owing to rising input costs (oil) resulted in a drop in consumption, investment, and, as a result, economic growth (Loungani, 1986; Sharma & Shrivastava, 2021).

As a result, oil price shocks reduce oil use, resulting in slower economic growth. Energy consumption, on the other hand, is critical to the economy's expansion. Every economic sector, such as transportation, power, and industry, relies heavily on oil consumption. The conclusions of causal relationships relating to the energy-growth model of developed and developing countries, such as Pakistan, differ. The majority of studies on oil prices, consumption, and their impact on economic growth in industrialized countries are available (Ghalayini, 2011).

Inflationary pressures on energy are critical to a country's development. Energy inflation is one of the most pressing issues because it has an impact on a country's economic growth. Taking energy inflation as a delicate debate is a key issue (Bekhet & Yusop, 2009). Energy inflation is a concept that has a relative influence on energy prices, which is inflation and leads to higher energy prices. Extreme volatility is another feature of energy inflation (Chevallier, 2011).

In addition, the energy required for household fuelling cars is in short supply for kitchen alternatives. As a result, energy inflation, which is demand-pull inflation, has an impact on core inflation and is an important indicator of a country's macroeconomic health. Inflation also has an impact on the money supply in any country. As a result, every change in world pricing had an impact on electricity prices. Ben Bernanke researched energy inflation in Pakistan in 2006, and concluded that "high energy costs make enterprises less eager to invest in new capital." From all the discussion, it is concluded that monetary and fiscal authorities of behavior seemed to respond to the energy supply side bottleneck.

Past research on energy inflation has relied solely on oil, ignoring the fact that other energy sources exist. Because all economic operations in Pakistan are dependent on energy, it is regarded as one of the most vital industries. As a result, energy inflation is Pakistan's most pressing concern, and maintaining price stability is a major task for the government. The key determinant of energy inflation is explained and based on this research.

2. Oil Inflation and Economic Growth

Oil inflation is determined by economic demand rather than the Keynesian economist state's money supply. The theory of price is influenced by the inflation theory. It means that the demand and supply of products and services may be investigated at the price level. The movement in cause of price level is represented by the demand and supply curves. The classical theory of money's role states that as the quantity of money supply increases, the price rises.

The aggregate demand in basic and non-monetary elements overlooked the influence of monetary expansion on the price level, according to Keynesian theory. The study's aim is to examine the effects of rising oil prices. Keynesian economics is an economic theory that explains how total spending affects output and inflation in any economy. To analyze the Great Depression, British economist John Maynard Keynes created Keynesian economics in the 1930s.

Figure 1 illustrates the trends in GDP growth, total energy growth, and Pakistan's oil consumption growth rate from 1972 to 2011. Figure 2 describes mostly similar trends in all the presented variables.

Oil is a crucial component of the country's economy, as it is used as a primary raw material in manufacturing. Oil is required for production and specialized in economic model resources. The approach is focused on the long-term survival of commodities, with oil being the most significant of all resources. The increase in demand for oil in developing countries' economic activity, as well as oil inflation, is significant (Figure 3). Prices are rising, and oil inflation is a

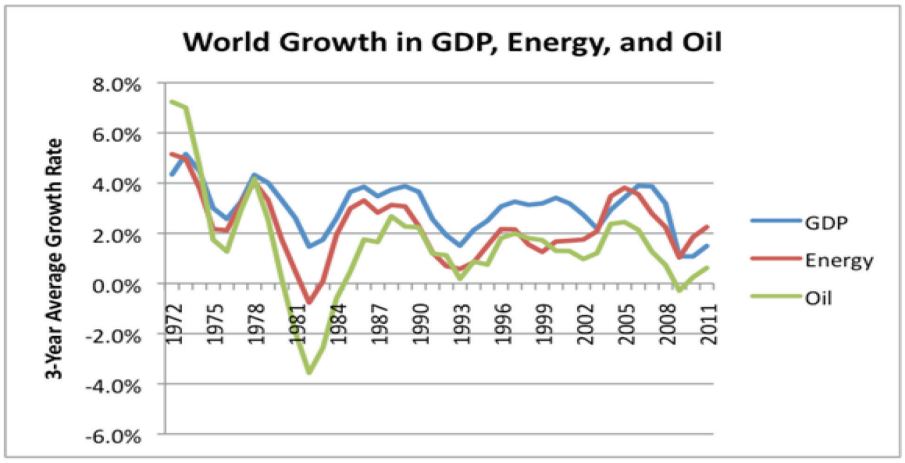

Figure 1: World Growth in GDP, Energy, and Oil Price
Source: Global Energy Review

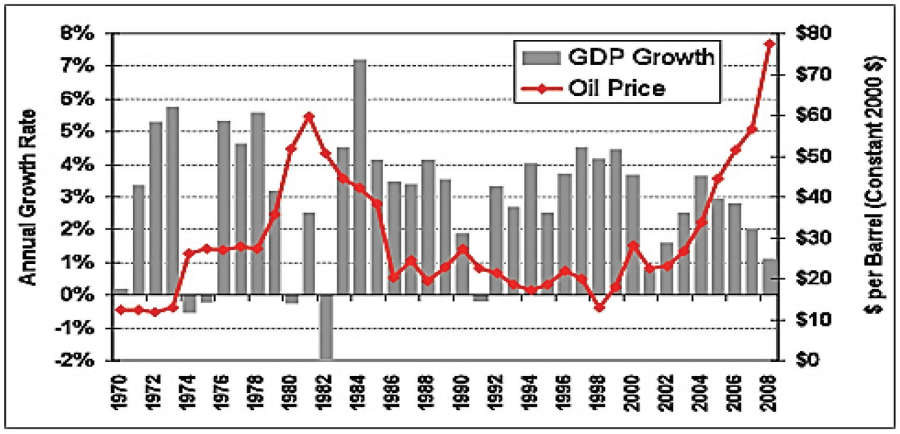

Figure 2: Global Energy Prices and GDP Growth Trends
Source: Global Energy Review

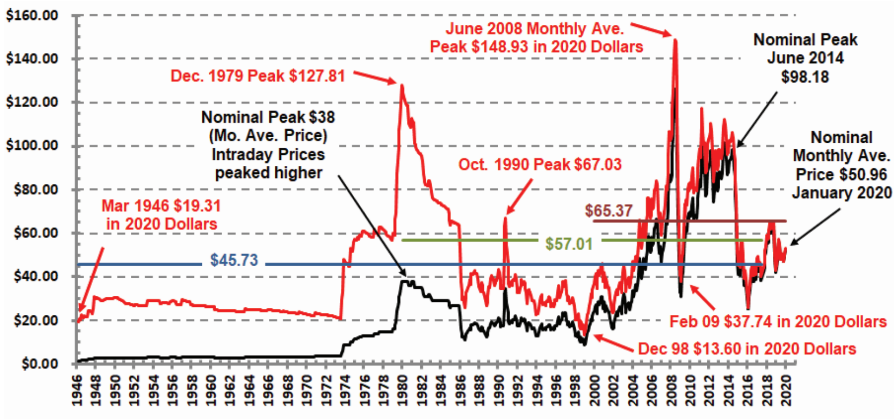

Figure 3: Inflation-Adjusted Monthly Average of Oil Prices

pure source of monetary policy in the long run. During long-term high oil inflation rates, oil is used in different daily life activities, including education, lighting, travel, recycling, food preparation, and entertainment.

Increased output leads to lower unemployment and increased demand for fuel and wages. Oil inflation has had a significant influence on Pakistan's inflation rates. The consumer price index and international oil prices have a close relationship (CPI). The rising price of oil is having a significant impact on the economy, as the country is a net importer of natural commodities.

Oil prices, on the other hand, are increasing, which increases production costs because rising prices reduce output (Figure 4). Oil is a source of energy for electricity generation, although it is not used in Pakistan's transportation sector. As a result, in Pakistan, oil inflation is critical. Oil inflation and power prices are estimated in great detail and based on theory. The oil markets create a divide between producers and consumers. In the future years, Pakistan's oil demand will rise, as will demand in industries with large populations. The capacity of sub-sectors and industries to produce grows as a result of electricity. This has had a significant impact on Pakistan's industry around the world. As a result, estimations of oil inflation and electricity prices are required in Pakistan.

Furthermore, future inflation may be caused by the rise in oil prices. The topic of this study is Pakistani oil inflation. Oil inflation is caused by a number of factors, including oil prices, taxes, GDP, gas, oil imports, money supply, and oil inflation. These are the most important variables in explaining why oil prices are rising. The government has been keeping track of the country's overall well-being, such as a country's positive expectation of oil inflation.

3. Literature Review

Ahmed et al. (2018) studied the determination of recent Inflation in Pakistan. Sing the time series data, they have concluded a long-run relationship among the selected variables, and the output gap of fiscal policy inflation was highly significant. Empirical evidence of higher energy inflation affects energy prices, and energy consumption and prices also strongly impact the economy.

Ciner (2001) examined the dynamic relationships between oil prices and stock market prices. The data for this study was collected between 1979 and 1983. To estimate the economic factors, they employed the vector autoregressive model and the granger casualty test. The price of oil and the stock market have a nonlinear relationship. Oil prices have an impact on GDP in all of the nations studied. The nonlinear association between oil price and the stock market in the 1990s has more significant support throughout this time period. Rehman and Khan (2015) examined how food prices are set in Pakistan. The findings suggest that supply-side factors have a significant impact on food prices and that the market forces are active in the long-run equilibrium.

The oil price and the stock price of alternative energy businesses were studied by Henriques and Sadorsky (2008). The empirical association between energy stock price, technology stock price, oil price, and the interest rate was estimated using a vector autoregressive model. The augmented dickey-fuller was used by the researchers, while Philips' Perron was testing the unit root test. According to the findings, the price of technology stocks has a significant impact on the price of alternative stocks. The investment in the alternative energy industry was high because alternative

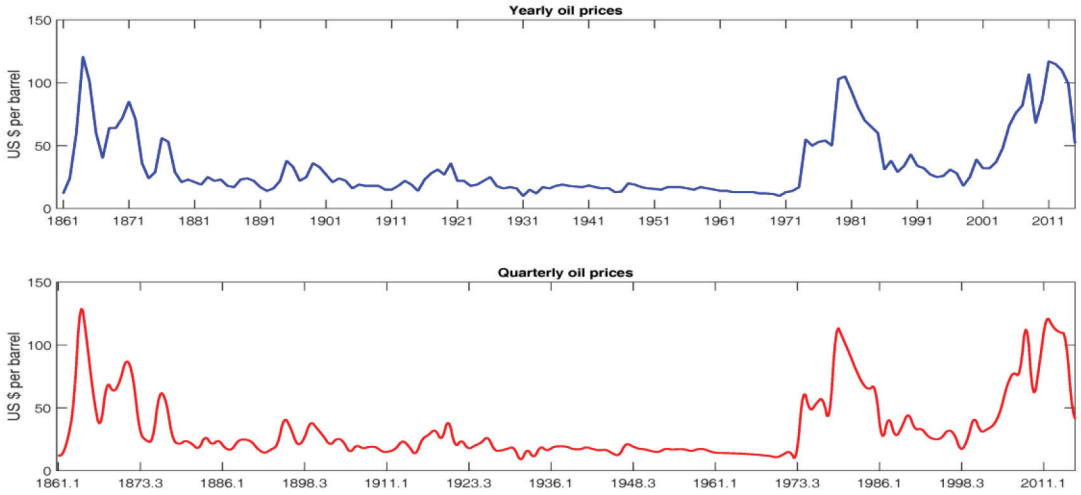

Figure 4: Annual Oil Prices and Quarterly Oil Prices
Source: Global Energy Review

energy companies were seen by investors' potential and technology providers, potential return. The government can assist in the introduction of alternative energy products to the market, as well as subsidize and acquire related products.

In Lao PDR, Saysombath (2014) investigated the causal relationship between budget deficit and inflation. From 1980 to 2010, they used annual time series data. Researchers have also utilized the ARDL co-integration test and vector autoregressive model to show evidence for both long- and short-run relationships between the variables. In Laos, there was no long-run association between budget deficit and inflation, according to this study. Budget deficits, on the other hand, had a negative influence on inflation since they were utilized to support investment projects rather than increase output.

The impact of oil prices on Tanzanian economic development was found by Kasidi and Mwakanemela (2013). In the current study, time-series data was employed for the years 1990 to 2011. The unit root test was checked using the co-integration, dickey fuller, and Philip-perron tests. The findings indicate that oil prices hurt economic development in Tanzania and that there is no long-term association between oil prices and economic progress. Instead, the general price level has risen, but GDP has fallen. As a result, inflation stability was a critical aspect, and policymakers should focus on keeping inflation low.

Baghestani (2014) examined the impact of oil price fluctuations on economic growth. The data was collected between 1987 and 2012. In the current investigation, they employed the ordinary least square method to estimate mean error. Inflation expectations were found to be useful information for crude oil, gasoline, and heating oil prices in this study.

In Nigeria, Bawa et al. (2016) identified the dynamic of energy inflation. The co-integration test and autoregressive distributed lag model were used to check the unit root in the current study, which covered the years 1981 to 2015. The dependent variable was GDP, while the independent variables were money supply, output gap, and oil price. Findings show that past inflation and rainfall appear to be the key determinants of the inflationary process in Nigeria.

Nawaz et al. (2020) investigated Pakistani oil prices and demand. They looked into the impact of oil prices on economic growth. From 1971 to 2019, time-series data was used. To check the unit root, they used augmented dickey-fuller and Philips-perron tests. The study discovered a long-term link between oil price and GDP per capita growth. Pakistan's principal source of energy was oil. According to the findings, coal, gas, and other energy sources will change the relationship between oil consumption and Pakistan's electricity pricing, posing a threat to the country's economic progress.

In Pakistan, Zaman et al. (2015) examined the factors that influence oil price inflation. In the study, data was collected from 1973 to 2013. The cost of energy was a dependent variable, as were the price of oil, the exchange rate, and the government. The independent variable in this study was revenue. To check unit roots, the researchers used the augmented dickey-fuller and Philips Perron tests. The outcome revealed that the government was very desired for the country's overall welfare. In all factors, there was a positive association. The behavior of monetary and fiscal authorities appeared to be a pro-cyclical response to the energy supply side bottleneck.

4. Data and Methodology

4.1. Data

The purpose of this research is to examine the impact of oil prices on Pakistan's economic growth. Statistics on trade openness, oil price, interest rate, and GDP were obtained from the World Development Indicator (WDI), while data on labor force participation and investment were obtained from the Pakistan Economic Survey.

In this study, data is collected for Pakistan from 1980 to 2020. The data is gathered from different sources, including the IFS, PBS, and Economic Survey. The nature of the observed variable is secondary in the research. The independent variables are positive signs.

4.2. Methodology

The following theoretical and empirical methodology will be used in this investigation. Some time-series statistics is estimated using the distributed Lag approach. In this approach, independent factors ultimately have an effect on dependent factors. The ARDL model is a hybrid of autoregressive and distributed lag models. The Autoregressive model consists of the lag terms of the dependent variable, but the distributed lag model consists of the lag terms of the independent variables. The distributed lag model means that the presence of lag of the independent variable in a regression equation.

Short-run Specification of ARDL equation

$$\mathrm{GDP}_t = \gamma_0 + \sum_{i=1}^{p} \omega_{1i} \Delta \mathrm{OILP}_{t-1} + \sum_{i=1}^{p} \omega_{2i} \Delta \mathrm{INT}_{t-1} + \sum_{i=1}^{\rho} \omega_{3i} \Delta \mathrm{TOP}_{t-1} + \sum_{i=1}^{\rho} \omega_{4i} \Delta \mathrm{LFPR}_{t-1} + \sum_{i=1}^{\rho} \omega_{5i} \Delta \mathrm{INVG}_{t-1} + \sum_{i=1}^{\rho} + \mu_{1t}$$

Long run Specification of ARDL equation

$$\Delta GDPGR_t = \gamma_0 + \sum_{i=1}^{\rho} \varnothing_{1i} \Delta OILP_{t-1} + \sum_{i=1}^{\rho} \varnothing_{2i} \Delta INT_{t-1} + \sum_{i=1}^{\rho} \varnothing_{3i} \Delta TOP_t + \sum_{i=1}^{\rho} \varnothing_{4i} \Delta LFPR_{t-1} + \sum_{i=1}^{\rho} \varnothing_{5i} \Delta INVG_{t-1} + \mu_{2t}$$

Where OILP is the Oil prices, INT is the Interest rate, and TOP is the Trade openness, LFPR is the Labor force participation rate, INVG is investment growth, GDP is the Gross domestic product.

5. Empirical Results and Discussion

5.1. Descriptive Statistics

Descriptive statistics offer a quantitative description of a data collection (Table 1), such as the GDP, INVG, IR, LFPR, OILP, and TOP for the years 1976 to 2019. The average indicates the values, standard deviation, Skewness, and Kurtosis of the variables that were not taken into account.

5.2. Correlation Analysis

The degree of association between factors is seen in Table 2. The link between the variables is examined using correlation analysis. The relationship between values is shown by the value of ranges from (–1, +1) and numerical values. They show how these variables are related positively. Table 2 shows whether or not there is a positive correlation between the variables. INVG has a –0.3289 negative correlation with GDP, indicating that both are moving in the opposing direction. The fact that IR has a positive correlation with GDP of 0.1362 indicates that both are moving in the same direction. LFPR has a positive association with economic growth GDP equal to 0.2439, showing that both move in opposite directions. OILP has a negative association with economic growth GDP equal to –0.3289, showing that both move in the opposite direction. TOP has a positive association with economic growth GDP equal to 0.8214, showing that both move in the opposite direction 0.1284.

5.3. Unit Root Analysis

The researcher verifies data stationarity using a panel unit root test based on the data and methodology section (Table 3).

Table 3 shows that GDP growth is stationary at the level and has no unit root, and the *p*-value is more significant than (0.05). The investment growth is non-stationery, and the *p*-value is more significant than (0.05). Oil prices are non-stationery, and the trend intercept *p*-value is more significant than (0.05). And the oil prices are stationary at

Table 1: Descriptive Analysis of the Data

Variables	Description	Mean	Median	Std. Dev.
GDP	The growth rate of gross domestic product	4.930932	4.846451	2.066644
INVG	Growth rate of Physical investment	898430.4	418948.0	984918.9
IR	Interest rate, i.e., the cost of capital	8.736490	7.015000	14.58792
LFPR	Labor force participation rate	82.35264	82.75500	5.509731
OILP	US Gulf coast, i.e., the Gasoline prices	12211683	13690640	5719186.
TOP	Trade openness i.e., the sum of imports plus exports divided by two (average)	0.303957	0.300000	0.028947

Table 2: Correlation Analysis

	GDP	INVG	IR	LFPR	OILP	TOP
GDP	1.0000					
INVG	–0.3289	1.0000				
IR	0.1362	–0.3098	1.0000			
LFPR	0.2439	–0.3306	0.1573	1.0000		
OILP	–0.5247	0.7971	–0.3231	–0.3506	1.0000	
TOP	0.1284	–0.5474	0.0717	–0.0440	–0.2517	1.0000

Table 3: Unit Root Analysis

	Trend and Intercept	Intercept	Decision
GDP at level	–4.684211*** (0.0026)		I(0)
INVG at level	–2.7813 (0.2115)		
INVG at 1st difference		–6.5953** (0.0311)	I(I)
IR at level	–6.03317*** (0.0001)		
IR at 1st difference	–4.8251** (0.0243)		I(I)
LFPR at level		1.370459 (1.435)	
LFPR at 1st difference		–5.0605*** (0.0015)	I(I)
OILP at level		–1.09823 (0.5701)	
OILP at 1st difference		–6.9743*** (0.0000)	I(I)
TOP at level	–1.1317 (0.6701)		
TOP at 1st difference	–6.5843*** (0.0000)		I(I)

Note: *p-value < 0.1; **p-value < 0.05; ***p-value < 0.001. Significant at the 0.05 level.

first difference. TOP is stationary at the first difference and has the unit root, and the p-value is less than (0.05).

5.4. Cointegration Analysis - Bound Test

The bound test is used to assess the long-run relationship between the variables, as shown in Table 4. The F-statistic estimated value is 14.8066, which is higher than the upper bound values. Therefore, the F-statistic has revealed the presence of long-run co-integration in our study.

5.5. Short-Run and Long-Run Analysis Results

Table 5 reveals that variable D (GDP(–1)) has a coefficient of –0.064814 and a probability value of 0.7258, both of which are statistically insignificant, indicating that the independent and dependent variables have a negative connection. D(INVG) has a coefficient of –0.000000 and a probability value of 0.9597, which is statistically insignificant, indicating that the independent and dependent variables have a negative association. D(INVG(–1)) has a coefficient of –0.000001 and a probability value of 0.7538, which is statistically insignificant, indicating that the independent and dependent variables have a negative association.

D(IR) has a coefficient of –0.007583 and a probability value of 0.7090, which is statistically insignificant, indicating that the independent and dependent variables have an adverse correlation. D(IR(–1)) has a coefficient of –0.010381 and a probability value of 0.6076, which is statistically insignificant, indicating that the independent and dependent variables have a negative relationship.

Table 4: Bound Test Results

Test Statistic	Value	K
F-statistic	14.8066***	5
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.36	3.45
5%	2.72	3.69
2.5%	2.92	4.38
1%	3.61	4.98

Note: *p-value < 0.1; **p-value < 0.05; ***p-value < 0.001. Significant at the 0.05 level.

D(LFPR) has a coefficient of 0.006197 and a probability value of 0.9107, which is statistically insignificant, indicating that the independent and dependent variables have a positive association. D(LFPR(–1)) has a coefficient of –0.010762 and a probability value of 0.8435, which is statistically insignificant, indicating that the independent and dependent variables have a negative relationship.

D(OILP) has a coefficient of –0.000001 and a statistically significant probability value of 0.0026, indicating a negative link between the independent and dependent variables. D(OILP(–1)) has a coefficient of –0.000001 and a probability value of 0.0552, which is statistically insignificant, indicating that the independent and dependent variables have a negative relationship.

D(TOP) has a coefficient of –10.189190 and a probability value of 0.6163, which is statistically insignificant,

indicating that the independent and dependent variables have a negative relationship. D(TOP(–1)) has a coefficient of –17.158301 and a probability value of 0.3127, which is statistically insignificant, indicating that the independent and dependent variables have a negative connection. The coefficient of CointEq(–1) is –1.150987, which is negative 0.0004. It demonstrates that in the short term, variables adjust towards long-run equilibrium. In the short term, optimistic in the current and preceding year. The current year's oil price coefficient is 0.008760, which is positive.

INVG has a coefficient of 0.259250, and the probability value is 0.0392, which is statistically significant, indicating a negative association between investment growth and economic growth (Table 6). The interest rate has a coefficient equal to –0.566046, and the probability value is equal to 0.0005. Labour force participation rate, LFPR, has a coefficient of 0.566046 and a probability value of 0.0005, both of which are statistically significant, indicating a positive relationship between labor force participation and economic growth. Oil prices are rising. OILP has a highly statistically significant coefficient of –0.124022 and probability of 0.0006, indicating a positive association between oil prices and economic growth. Finally, trade openness TOP has a coefficient of 25.44899 and a probability value of 0.0070, both of which are statistically significant, indicating a positive association between investment and economic growth.

5.6. Diagnostic Test

The diagnostic test of the model is explained in Tables 7 and 8. The serial correlation test and the Breush test were removed from the model, and *F*-statistics have no significance. As a result, there is no serial correlation in this model, however, heteroscedasticity exists. Hence, the null hypothesis is accepted and the alternative hypothesis is rejected.

Table 6: Long-Run Analysis

Variables	Coefficient	*t*-statistic	Prob.
INVG	0.259250**	2.530436	0.0392
IR	–0.566046***	–6.039364	0.0005
LFPR	0.566046***	6.039364	0.0005
OILP	–0.124022***	–5.940526	0.0006
TOP	25.44899***	3.772627	0.0070
C	3.726990	0.345278	0.7332

Note: **p*-value < 0.1; ***p*-value < 0.05; ****p*-value < 0.001.
Significant at the 0.05 level.

Table 7: Heteroskedasticity Test

F-statistics Value	Probability	Result
0.6307	0.5359	No Heteroskedasticity

5.7. Stability Test

In the autoregressive distributed lag (ARDL) method, the CUSUM and CUSUM Square stability tests estimate model stability. The current model's coefficient is steady because, as shown in the CUSUM (Figure 5) and CUSUM Square (Figure 6) statistic graphs.

Table 8: Breusch-Godfrey Correlation LM Test

F-statistics Value	Probability	Result
0.7914	0.6615	No Autocorrelation

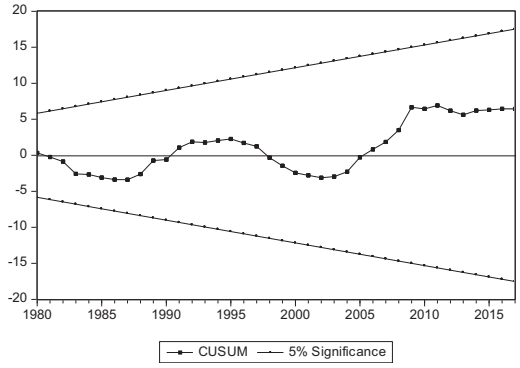

Figure 5: CUSUM

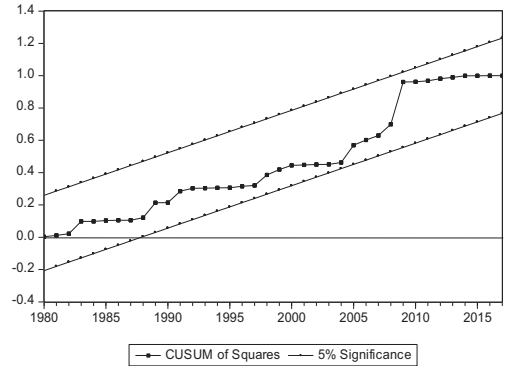

Figure 6: CUSUM Square

6. Conclusion and Policy Recommendations

By considering the impact of oil prices on economic growth, his study has shown a new insight into the link between oil price inflation and economic growth. The research used tie series data on a yearly basis for the core and control variables to empirically justify the association. Oil prices play a critical effect on a country's economic development. The impact of oil prices on economic growth (energy inflation) is the subject of this study. The studies examine the relationship between the factors of Pakistan's GDP and oil prices. The data used in this study spanned from 1976 to 2019. The reference point model reveals that in a developing country like Pakistan, economic growth is anti-growth with an increase in prices, and it responds negatively to economic growth in the long and short run. As a result, oil price inflation in Pakistan fails to have a significant positive impact on economic growth in both the long and short run, but it does raise the general price level in the economy.

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