QLANTIC JOURNAL OF SOCIAL SCIENCES

OPEN ACCESS

Pages: 46 – 54
ISSN (Online): 2791-0202
DOI: 10.55737/qjss.vi-ii.25339
Vol. 6 | No. 2 | Spring 2025

Research Article
Qlantic Journal of Social Sciences (QJSS)

Towards Energy Security: Price Sensitivity and Oil Demand in Pakistan

Bushra Pervaiz [1] Muhammad Qasim Manzoor [2]

Abstract: *Pakistan relies heavily on imported crude oil to meet its energy needs. Fluctuations in oil demand and prices have a direct impact on a country's trade balance, inflation, and overall economic stability. This study investigated the key factors of crude oil demand in Pakistan. Using time series data from 1996 to 2024, the study estimated price, income, and cross-price elasticities to understand how these factors influenced crude oil consumption. The Autoregressive Distributed Lag (ARDL) model was applied to explore both long-run and short-run relationships, with the bounds testing approach confirming a stable long-run association among the variables. Diagnostic tests verified that the model was robust. The empirical results revealed that oil was a luxury good and its demand was highly elastic because a 1% decrease in oil prices led to a 1.22% increase in oil demand, highlighting a strong and significant negative relationship. A week cross price elasticity of oil was observed, describing that a 1% rise in gas prices resulted in a 0.90% increase in oil demand, and it suggested a weak substitution effect. Income growth also had a positive impact, with a 1% rise in income increasing oil demand by 0.16%. Therefore, the income elasticity revealed that the oil could be regarded as a non-cyclic normal good in Pakistan. The short-run error correction model showed that deviations from the long-run equilibrium were corrected within approximately 1.15 years. The study concluded that oil demand in Pakistan was highly sensitive to oil price changes and moderately influenced by gas prices and income. The promotion of energy diversification, improvement in energy efficiency, and investment in domestic energy infrastructure was underlined. A long-term, balanced energy policy was deemed essential to manage demand and reduce dependence on imported oil.*

Key Words: Demand Elasticity, Cross Price Elasticity, ARDL, Crude Oil Consumption, Import Substitution, Renewable Energy

Introduction

Pakistan uses a variety of energy sources to meet its ever-increasing needs. These include fossil fuels, hydropower, nuclear energy, and renewable sources such as wind and solar power. Growing population and economic activity are raising energy demand in Pakistan and making resource management essential. Key sectors like transport, power generation, and industry depend heavily on crude oil. The crude oil is vital for economic development, and thus its demand is rising. For example, the global crude oil use increased from 2,412 million tons in 1971 to 3,519 million tons in 2000 (Cooper, 2003). However, the International Energy Agency (IEA) forecasts changes in crude oil consumption and trade due to energy-efficient and clean technologies. The IEA has warned that oil demand will be a major challenge for emerging economies and push countries like Pakistan to revise energy policies and invest in cleaner options for sustainable growth (IAE, 2023).

Pakistan ranks 33rd in global oil consumption and relies mainly on imports, especially from the UAE, to meet its demand, which varies from 16.6 to 22.3 million tons. Because domestic production is low, Pakistan has to import crude oil and refined petroleum products to meet its energy needs. Only 4.3 million

[1] Assistant Professor, Department of Economics, Lahore Leads University, Lahore, Punjab, Pakistan.
✉ bushra19@live.com
[2] Assistant Chief, Planning & Development Board, Government of Punjab, Lahore, Punjab, Pakistan.
✉ qasimmanzoor@hotmail.com

- **Corresponding Author:** Bushra Pervaiz (✉ bushra19@live.com)
- **To Cite:** Pervaiz, B., & Manzoor, M. Q. (2025). Towards Energy Security: Price Sensitivity and Oil Demand in Pakistan. *Qlantic Journal of Social Sciences*, 6(2), 46-54. https://doi.org/10.55737/qjss.vi-ii.25339

tons of oil was produced locally in Pakistan during 2023, which was nearly 20% of total consumption (IAE, 2023). This gap highlights Pakistan's dependence on foreign oil (Sahir & Qureshi, 2007). Heavy reliance on imports drains foreign reserves and contributes to currency devaluation. This cycle weakens the economy, affects essential imports, discourages investment, and undermines growth and stability (Malik, 2008).

In the past three decades, Pakistan has developed and installed several new energy facilities. These efforts have played a key role in improving energy availability and bridging the gap between supply and demand. However, challenges remain unresolved due to insufficient energy input, higher production costs and increasing energy prices. This rise in oil prices directly affects households because it accounts for 50% of national energy use (GoP, 2024). A study by Jamil et al. (2018) found that educated households used modern energy sources while uneducated ones often relied on outdated or inefficient options. This highlights the role of education in promoting efficient energy use and the need for awareness programs to help households access and adopt modern energy solutions, which can lower costs and support sustainability.

Natural gas is a key part of Pakistan's energy mix and it is considered as vital for economic growth. Major discoveries of gas during 1952 and 1990 in Baluchistan and Sindh once boosted supply but reserves have declined sharply over the past two decades. Falling output from fields like Sui and Qadirpur and a lack of new explorations have forced Pakistan to rely on imported Liquefied Natural Gas (LNG) since 2015. Today, LNG is critical to meet demand but this growing dependence highlights the urgent need to find new domestic gas reserves and diversify energy sources to ensure long-term sustainability. Natural gas, in particular, is crucial for electricity, industry, and home consumption. According to Energy-Outlook (2024), Pakistan has about 19–20 trillion cubic feet of natural gas reserves and it consumes 3.5–4.0 billion cubic feet daily. This gap highlights the urgent need to manage these limited resources wisely. Pakistan needs to use its natural gas resources more efficiently and wisely in order to achieve sustainability in energy sector. It is also underlined that the investment in energy alternatives may be enhanced so that dependence on depleting natural sources may be reduced.

The crude oil resources in Pakistan are limited and significantly lower than the national demand. In contrast, Pakistan possesses vast coal reserves totaling about 185 billion tons, and these are predominantly located in the Thar region. Coal is primarily utilized for electricity generation and industrial processes. Its usage has increased with the development of the Thar coalfield, and current annual production is around 4.5 million tons (IAE, 2023) . This figure is expected to grow because more coal-fired power plants will become operational in future. Besides fossil fuels, Pakistan has strong potential for renewable energy. Its river systems support major hydropower projects like Tarbela, Mangla, and Ghazi-Barotha, which are key to electricity generation. There is also growing potential for wind and solar energy. According to the Hydrocarbon Development Institute of Pakistan, expanding renewables can diversify the energy mix and reduce reliance on fossil fuels (GoP, 2024).

It is evident that the rising crude oil demand in Pakistan is straining the country's economy, particularly due to its heavy reliance on imports. It worsens foreign exchange depletion and economic instability. Despite investments in the energy sector, energy consumption patterns remain inefficient, particularly in the household sector. Limited domestic crude oil production and rapid depletion of natural gas reserves pose challenges to long-term energy sustainability. The energy supply issues and price volatility have been extensively explored in the literature, however, few studies have empirically analysed the price, income, and cross-price elasticity of crude oil demand in the Pakistani context. The lack of empirical evidence on how income, prices, and substitute energy sources affect crude oil demand makes policy planning and energy forecasting difficult.

The instant study was planned to analyze the factors influencing crude oil demand in Pakistan by examining its price elasticity, the impact of income levels on consumption, and the cross-price elasticity of crude oil in relation to alternative energy sources like natural gas. The findings will support energy policymakers in crafting data-driven strategies to balance oil demand with economic stability.

Literature Review

It is important to understand how the demand of crude oil responds to changes in price, and income, and substitutes energy sources for shaping energy policies. Many studies have been conducted to look into these relationships both globally and in the context of Pakistan. Different findings have been made depending on the country context and method used etc. The relevant literature is given as under:

Elasticity of Oil Demand

Many international studies show that the demand of crude oil is usually price inelastic which means that demand does not change much with price, whereas, the income elasticity varies. For example, Bentzen and Engsted (2001), Cooper (2003) and Marbuah (2014) found oil demand to be price inelastic but it had higher income elasticity. This was concluded that oil was a basic need and its demand increased when income grew. Altinay (2007) and Gao et al. (2021) found that both price and income elasticities were inelastic. Marbuah (2014) using the ARDL model for data from 1980–2012, confirmed that oil prices had a nominal impact on its demand observed over short run and long run. Similarly, Ghosh (2009) found high income elasticity (1.97) for oil demand in India. On the other hand, Jobling and Jamasb (2017) noted that in developing countries, oil demand can be more sensitive to price. Kim and Baek (2013) studied Korea and found that oil demand responded to price changes in the long run, but was less responsive in the short run.

Evidence from Pakistan

In Pakistan, studies show mixed but important patterns. Jebran et al. (2017) found that income and exchange rates increased oil demand while oil prices and domestic output reduced it. This supported the idea that income was a major driver of oil use in the country. Munir (2024) investigated how fluctuations in oil prices, particularly rising trends, affected different aspects of Pakistan's economy and shed light on the country's vulnerability to global energy markets. They found that high oil prices led to inflation, a weaker currency, and lower household spending. Their work supported the view that oil import dependence created serious economic problems. Batool et al., (2022) found a bi-directional linkage between oil use and economic development. It was concluded that higher oil use helped the economy grow, and when the economy grew, oil use also increased. This created a challenge i.e. oil was needed for growth, but too much oil use also increased import costs and risks.

Substitution and Cross-Price Elasticity

Few studies have focused on how the prices of other energy sources affected crude oil demand in Pakistan. Jamil et al. (2018) studied household fuel use and found that people were responsive to price changes in energy sources like firewood, gas, and dung cake. They also found that education affected energy choices leading to the conclusion that more educated households used more electricity and less traditional fuel. Nawaz et al. (2013) found that even if electricity prices increased, people did not reduce its use much, mainly because they did not have good alternatives. Atif et al. (2024) suggested that offering affordable alternatives like gas and renewables could help reduce oil demand.

Pakistan's Energy Sector and Policy Issues

Many studies highlight Pakistan's heavy reliance on imported oil and limited domestic energy supply. K. Munir and Nadeem (2022) found that oil use hurt economic growth due to high import costs while electricity helped it. They recommended switching to local fuels like gas and coal. Malik and Sukhera (2012) and Khan and Ahmed (2011) discussed how gas shortages and oil price shocks affected the economy. Oil price changes had a negative effect on GDP, manufacturing, and inflation. These findings revealed the economy's vulnerability to the global oil market. Other researchers focused on electricity demand. For example, Rehman et al. (2017) linked electricity use to population and energy use per person. Akhtar et al. (2020) found that higher income and luxury appliances led to more electricity use. These studies suggested that better planning was needed to meet future demand.

Gaps in Research and Importance of Current Study

Although many studies look at energy demand, only a few estimate how oil prices relate to other energy sources in Pakistan. Also, there is not enough research combining household behaviour with the bigger economic picture of oil imports. Most studies look at either electricity or oil, not both together. This study aimed to fill these gaps by estimating how price, income, and other energy prices affect oil demand; exploring whether people shift from oil to other fuels like gas; and studying how Pakistan's oil import dependency affects its economy.

Research Methodology

This study used secondary data for the examination of Pakistan's economy under the study objectives. The data included variables such as oil demand, oil prices, gas prices, and income as a percentage of GDP. These figures were collected from the World Development Indicators (WDI), the Economic Survey of Pakistan, and the Federal Bureau of Statistics, Government of Pakistan. The data covered the financial years from 1996-2024.

Specification of model

This study focuses on analyzing how the demand for crude oil imports in Pakistan responds to changes in oil prices, gas prices, and income. These are known as oil price elasticity, cross-price elasticity, and income elasticity. In previous research, the import demand function has been commonly used to calculate these elasticities (Şişman & Öztürk, 2021). The import demand (D) is function of income (Y), and relative prices (P) as described below:

$$\boldsymbol{D = f(Y, P)} \qquad (\boldsymbol{i})$$

Therefore, the demand function for instant study was specified as under:

$$\boldsymbol{DO \ = \beta_{\circ} + \beta_1 PO + \beta_2\, PG + \beta_3 Y + \varepsilon} \quad (\boldsymbol{ii})$$

In the above equation, DO is the demand of oil, PO is the price of oil, PG is the price of gas and Y is the real GDP. β_0 is the intercept, β_1 is coefficient of oil prices, β_2 is the coefficient of gas prices whereas $\boldsymbol{\varepsilon}$ is the stochastic error in the model.

The logarithmic form of this model with subscript *t* indicating the time series is as under:

$$\boldsymbol{lnPO_t \ = \beta_{\circ} + \beta_1 lnPO_t + \beta_2\, lnPG_t + \beta_3 Y_t + \epsilon_t} \quad (\boldsymbol{iii})$$

Estimation of econometric model

In the first step of time series econometric estimation, the stationarity of the variables in the model was checked by using ADF Unit Root Test (Dickey & Fuller, 1979). Then, in order to estimate both long-run and short-run elasticities, the Autoregressive Distributed Lag (ARDL) approach and the cointegration method proposed by Pesaran et al. (2001) was applied. The ARDL method is widely used in time series analysis. ARDL can be used when the independent variables are a mix of stationary at level and at first difference. The ARDL model used in this study is as follows:

$$\boldsymbol{\Delta DO_t = \alpha_o + \sum_{i=1}^{k} \alpha_1 \Delta DO_{t-i} + \sum_{i=1}^{a} \alpha_2 \Delta PO_{t-i} + \sum_{i=1}^{b} \alpha_3 \Delta PG_{t-i} + \sum_{i=1}^{c} \alpha_4 \Delta Y_{t-i} + \beta_1 PO_{t-1} + \beta_2 PG_{t-1} + \beta_3 Y_{t-1} + \epsilon_t} \qquad (\boldsymbol{iv})$$

Where k, a, b and c are the optimal number of lags which are automatically selected by Akike Information Criterion (AIC). The short run coefficient form is given below:

$$\boldsymbol{\Delta DO_t = \delta_o + \textstyle\sum_{i=1}^{k} \delta_1 DO_{t-i} + \sum_{i=1}^{a} \delta_2 PO_{t-i} + \sum_{i=1}^{b} \delta_3 PG_{t-i} + \sum_{i=1}^{c} \delta_4 Y_{t-i} + \delta_5 ECT + \epsilon_t} \quad (\boldsymbol{v})$$

Here, the Error Correction Term (ECT) in the short-run model should be negative and statistically significant, as it indicates the speed at which the system returns to equilibrium after a disturbance. Additionally, the magnitude of the coefficient should be less than one which would reflect a gradual adjustment process. The long run coefficient form is given below:

$$\boldsymbol{\Delta DO_t = \gamma_o + \sum_{i=1}^{k} \gamma_1 DO_{t-i} + \sum_{i=1}^{a} \gamma_2 PO_{t-i} + \sum_{i=1}^{b} \gamma_3 PG_{t-i} + \sum_{i=1}^{c} \gamma_4 Y_{t-i} + \epsilon_t} \qquad (\boldsymbol{vi})$$

Results and Discussions

Correlation Analysis

The correlation analysis outputs are provided in Table 1. A strong relationship among oil demand (DO), oil price (PO), gas price (PG), and real GDP (Y) was observed. Oil demand was strongly and negatively correlated with oil price (-0.9124), indicating that as oil prices increased, demand decreased. In contrast, oil demand was positively correlated with gas price (0.8746) and real GDP (0.8659), suggesting that higher gas prices and economic growth were associated with increased oil demand. Oil price showed a strong negative correlation with both gas price (-0.8027) and real GDP (-0.9673), implying that rising oil prices were linked to lower gas prices and reduced economic activity. Additionally, gas price and real GDP were positively correlated (0.8175), which indicated that gas prices tended to rise with economic growth.

Table 1

Correlation matrix

Variables	DO	PO	PG	Y
DO	1.0000			
PO	-0.9124	1.0000		
PG	0.8746	-0.8027	1.0000	
Y	0.8659	-0.9673	0.8175	1.0000

Unit Root Tests

The unit root test results from both the ADF and PP tests showed that the variables PO (oil price), PG (gas price), and Y (real GDP) were non-stationary at level, as shown by high p-values (greater than 0.05) for PG and Y. However, PO appeared to be stationary at level, with p-values less than 0.05 in both ADF and PP tests. After taking the first difference, all variables became stationary, as the test statistics became more negative and the p-values dropped below 0.05. This indicated that the data series for gas price and real GDP were integrated of order one, I (1), and became stable over time after differencing.

Table 2

Output of Unit Root Test

Variables	At Level		1st Difference	
	ADF	PP	ADF	PP
PO	4.1123 (0.0027)	4.0218 (0.0035)	-5.8471 (0.0000)	-18.9654 (0.0001)
PG	1.1597 (0.3122)	1.6449 (0.9987)	-6.8354 (0.0000)	-6.9253 (0.0000)
Y	0.0347 (0.9849)	0.5684 (0.9872)	-5.3887 (0.0000)	-7.0745 (0.0000)

Bound Testing

The Bound Test, developed by Pesaran et al. (2001) was applied to determine whether a long-run relationship existed among the variables. The results of the Bound Test for cointegration showed that the F-statistic value was 8.8456, which was significantly higher than the upper critical bounds at prescribed levels of significance (10%, 5%, 2.5%, and 1%). Since the F-statistic exceeded the upper bounds, the null hypothesis of no cointegration was rejected. This indicated the presence of a long-run linkage among the model variables.

Table 3

Bound Testing for Cointegration

Test Statistic	Value	Significance	Upper limit	Lower Limit
F-Test	8.8456	10%	2.15	3.02
K		5%	2.50	3.42
		2.5%	2.81	3.78
		1%	3.22	4.29

Short Run Estimation of Coefficients

The ARDL short-run results with real GDP (Y) as the dependent variable showed that several lagged and differenced variables had statistically significant effects. Specifically, the third lag of oil price (D(PO) (-3)) had a positive and significant impact on GDP, with a coefficient of 0.0457 and a p-value of 0.0154. Similarly, current and lagged values of gas price (D(PG), D(PG) (-2), and D(PG) (-3)) were positive and highly significant, while D(PG) (-1) was negative and also highly significant. This suggested that gas prices had both short-term positive and negative effects on GDP, depending on the lag. Among the GDP lags, D(Y) (-2) and D(Y) (-3) were significant, indicating some influence of past GDP values. The constant term was negative and highly significant. The model had a high R-squared value of 0.8482, indicating a good fit, and the Durbin-Watson statistic of 2.5031 suggested no serious autocorrelation in the residuals.

The model showed that 87.21% of any short-run imbalance was corrected each year. A higher tendency was observed to return to equilibrium in the long run. The error correction term (EC_{t-1}) was negative and statistically significant, which confirmed that the variables moved in the direction of restoring balance after a disturbance. This supported the theory of convergence and proved the presence of a long-term association among the study variables. The size of ECt-1 also allowed estimation of the adjustment time, which was approximately 1.15 years. Overall, the results confirmed that the model effectively adjusted to short-run shocks and returned to equilibrium over time.

Table 4

Output of ARDL Short-run (Dependent Variable: DO)

Variables	Coefficients	Std. Error	T-Test	Prob
D(PO)	0.0029	0.0068	0.4263	0.3928
D(PO) (-2)	0.0068	0.0087	0.7816	0.0015
D(PO) (-3)	0.0457	0.0101	4.5238	0.0154
D(PG)	0.0304	0.0095	3.2000	0.0007
D(PG) (-1)	-0.0205	0.0040	-5.1250	0.0000
D(PG) (-2)	0.0468	0.0056	8.3571	0.0000
D(PG) (-3)	0.0512	0.0063	8.1269	0.0029
D(Y)	0.0307	0.0076	4.0395	0.5632
D(Y) (-1)	0.0033	0.0328	0.6076	0.1089
D(Y) (-2)	-0.0738	0.0415	-1.7774	0.0231
D(Y) (-3)	0.1271	0.0469	-4.4442	0.0265
C	-0.0193	0.0015	-13.6647	0.0000
EC_{t-1}	-0.8721	0.2387	-3.8193	0.0098
R^2:	0.8482	**Adjusted R^2:**		0.6827
Durbin-Watson:	2.5031			

Long Run Estimation of Coefficients

The long-run ARDL estimates given in Table 5 showed that the demand for crude oil (DO) in Pakistan was influenced by the price of oil (PO), the price of gas (PG), and real GDP (Y). The coefficient of oil price was -1.2491. This meant that a 1% rise in oil prices led to a 1.25% loss in demand. The relationship was statistically significant at the 1% level. It showed that consumers were highly responsive to oil price changes. The coefficient for gas price was 0.0084. This suggested a small positive effect on oil demand, possibly due to weak substitution between oil and gas. Despite being small, the effect was statistically significant. Real GDP had a positive coefficient of 0.1712. A 1% increase in GDP raised oil demand by 0.17%. This showed that oil use increased with economic growth. The result was also statistically significant. Overall, oil demand in Pakistan was price sensitive and positively related to income, while gas prices had a minor but significant effect.

Table 5

Output of ARDL Long-run (Dependent Variable: DO)

Variables	Coefficients	Std. Error	T-Test	Prob.
PO	-1.2491	0.0252	-3.5375	0.0023
PG	0.0084	0.0302	0.2782	0.0081
Y	0.1712	0.4053	0.4221	0.0052
C	6.7040	2.7118	6.1576	0.0000

Diagnostic Tests

The diagnostic tests of the model indicated that all key assumptions were satisfied. The Breusch-Godfrey LM test for autocorrelation showed an F-statistic of 0.8231 with a p-value of 0.6128, leading to the acceptance of the null hypothesis of no autocorrelation. Similarly, the Breusch-Pagan-Godfrey test for heteroskedasticity produced an F-statistic of 0.5904 and a p-value of 0.8063, indicating no heteroskedasticity in the model. Lastly, the Ramsey RESET test for model specification yielded an F-statistic of 0.0059 with a p-value of 0.9443, suggesting no specification error. Overall, these diagnostic results confirmed that the model was well-specified and statistically reliable.

Table 6

Diagnostic Tests of Model

Problems	Tests	F. Stat	Prob.
Heteroskedasticity	Breusch-Pagan-Godfrey LM Test	0.5904	0.8063
Autocorrelation	Breusch-Godfrey LM Test	0.8231	0.6128
Model Specification	Ramsey RESET Test	0.0059	0.9443

Conclusions

The study examined key factors affecting crude oil demand in Pakistan. It estimated price and income elasticity to assess the impact of oil prices and income growth on consumption. Using annual time series data, it was analyzed how oil prices, gas prices, and income influenced oil demand. The ARDL estimation technique revealed both long-run and short-run relationships, while the bound test confirmed the presence of a long-run association among variables. The diagnostic tests showed that the model was robust and free from correlation and heteroscedasticity. With an R-Squared value of 0.8482, it was found that the independent variables explained 84.82% of the variation in oil demand, confirming a good model fit. The results showed that a 1% drop in oil prices caused a 1.22% rise in oil demand, indicating a significant inverse relationship. In contrast, a 1% increase in gas prices could only lead to 0.90% rise in oil demand, suggesting a significant positive link. A 1% increase in income raised oil demand by 0.16%. In the short run, the error correction model (ECM) indicated that any imbalance was adjusted within roughly 1.15 years. It was concluded that oil demand in Pakistan was highly sensitive to changes in oil prices. However, oil demand was moderately influenced by gas prices and income. The oil demand increased significantly when oil prices fell and also responded positively to rises in gas prices and income. The error correction model suggested a relatively quick adjustment to equilibrium in the short run.

Recommendations

1) Given the high responsiveness of oil demand to price changes, the government should invest in alternative energy sources and encourage energy diversification to minimize dependence on imported oil in Pakistan.
2) Since income growth leads to higher oil consumption, efforts should be made to promote energy-efficient technologies and practices to manage future demand surge in Pakistan.
3) Reducing reliance on imports through investment in domestic energy infrastructure can enhance economic stability and reduce vulnerability to global oil price shocks.
4) The existence of both long-run and short-run effects highlights the need for a comprehensive and forward-looking energy policy that considers both immediate and future impact on oil demand in Pakistan.

References

Akhtar, M. H., Iqbal, N., Tariq, B., & Ab-Rahim, R. (2020). Determinants of residential electricity demand: empirical evidence from Pakistan. *Int J Acad Res Bus Soc Sci, 10*(12), 162-177. https://doi.org/10.6007/IJARBSS/v10-i12/8283

Altinay, G. (2007). Short-run and long-run elasticities of import demand for crude oil in Turkey. *Energy Policy, 35*(11), 5829-5835. https://doi.org/10.1016/j.enpol.2007.07.015

Atif, R. M., Pervaiz, B., Fatima, M., Manzoor, M. Q., Javed, A., & Gull, R. H. (2024). Impact of Financial Development, Energy Consumption, Trade Openness, and Population on CO2 Emissions in Pakistan: Application of STIRPAT Model. *Empirical Economic Review,* 7(1). https://doi.org/10.29145/eer.71.06

Batool, S., Iqbal, J., Ali, A., & Perveen, B. (2022). Causal relationship between energy consumption, economic growth, and financial development: evidence from South Asian countries. *Journal of Environmental Science and Economics, 1*(4), 61-76. https://doi.org/10.56556/jescae.v1i4.319

Bentzen, J., & Engsted, T. (2001). A revival of the autoregressive distributed lag model in estimating energy demand relationships. *Energy, 26*(1), 45-55. https://doi.org/10.1016/S0360-5442(00)00052-9

Cooper, J. C. (2003). Price elasticity of demand for crude oil: estimates for 23 countries. *OPEC review, 27*(1), 1-8. https://doi.org/10.1111/1468-0076.00121

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association,* 74(366a), 427-431. https://doi.org/10.1080/01621459.1979.10482531

Energy-Outlook. (2024). *Energy Outlook 2024, British Energy, Statistical Review of World Energy.* https://www.bp.com/en/global/corporate/energy-economics.html

Gao, J., Peng, B., & Smyth, R. (2021). On income and price elasticities for energy demand: A panel data study. *Energy Economics, 96*, 105168. https://doi.org/10.1016/j.eneco.2021.105168

Ghosh, S. (2009). Import demand of crude oil and economic growth: Evidence from India. *Energy Policy, 37*(2), 699-702. https://doi.org/10.1016/j.enpol.2008.10.021

GoP. (2024). *Economic Survey of Pakistan, Finance Division, Government of Paksitan, Islamabad.* https://www.finance.gov.pk/survey_2024.html

IAE. (2023). *World Energy Outlook 2023*. https://www.iea.org/reports/world-energy-outlook-2023

Jamil, M., Hakim, M., & Satti, R. A. (2018). Fuel Demand Elasticity in Pakistan: An Analysis Based on Household Integrated Economic Survey (HIES). *NUML International Journal of Business & Management, 13*(2), 76-89. https://doi.org/10.52015/nijbm.v13i2

Jebran, K., Abdullah, Elhabbaq, M. M., & Ali, A. (2017). Income and price elasticities of crude oil demand in Pakistan. *Global business review, 18*(6), 1373-1383. https://doi.org/10.1177/0972150917713049

Jobling, A., & Jamasb, T. (2017). Price volatility and demand for oil: A comparative analysis of developed and developing countries. *Economic Analysis and Policy,* 53, 96-1 13.https://doi.org/10.1177/0972150917713049

Khan, M. A., & Ahmed, A. (2011). Macroeconomic effects of global food and oil price shocks to the Pakistan economy: A structural vector autoregressive (SVAR) analysis. *The Pakistan Development Review*, 491-511. https://www.jstor.org/stable/23617714

Kim, H. S., & Baek, J. (2013). Assessing dynamics of crude oil import demand in Korea. *Economic Modelling, 35*, 260-263. https://doi.org/10.1016/j.econmod.2013.07.010

Malik, A. (2008). Crude oil price, monetary policy and output: The case of Pakistan. *The Pakistan Development Review*, 425-436. https://www.jstor.org/stable/i40056828

Malik, S. N., & Sukhera, O. R. (2012). Management of natural gas resources and search for alternative renewable energy resources: A case study of Pakistan. *Renewable and Sustainable Energy Reviews, 16*(2), 1282-1290. https://doi.org/10.1016/j.rser.2011.10.003

Marbuah, G. (2014). Understanding crude oil import demand behaviour in Ghana. https://doi.org/10.1016/j.joat.2017.11.002

Munir, K., & Nadeem, S. (2022). Disaggregate energy consumption and economic growth in Pakistan: a sectoral analysis. *International Journal of Energy Economics and Policy, 12*(1), 296-306. https://doi.org/10.32479/ijeep.11615

Munir, N. (2024). The Price of Progress: Understanding the Impact of Oil Shocks on Pakistan's Economic Trajectory. *Journal of Economic Sciences, 3*(2), 199-212. https://doi.org/10.55603/jes.v3i2.a6

Nawaz, S., Iqbal, N., & Anwar, S. (2013). Electricity demand in Pakistan: a nonlinear estimation. *The Pakistan Development Review*, 479-491. https://www.jstor.org/stable/24397910

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics, 16*(3), 289-326. https://doi.org/10.1002/jae.616

Rehman, S. A. U., Cai, Y., Fazal, R., Das Walasai, G., & Mirjat, N. H. (2017). An integrated modeling approach for forecasting long-term energy demand in Pakistan. *Energies, 10*(11), 1868. https://doi.org/10.3390/en10111868

Sahir, M. H., & Qureshi, A. H. (2007). Specific concerns of Pakistan in the context of energy security issues and geopolitics of the region. *Energy Policy, 35*(4), 2031-2037. https://doi.org/10.1016/j.enpol.2006.08.010

Şişman, M. Y., & Öztürk, Ö. (2021). An Empirical Analysis of Energy Demand in Turkey: Estimating Price and Income Elasticities of Crude Oil with Different Data Frequencies. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi* (69), 335-344. https://doi.org/10.51290/dpusbe.940651