

## An Econometric Analysis of Imported Petroleum Products of Nepal

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### Abstract

**Background:** Petroleum products are materials derived from crude oil as it is processed in oil refineries. It is a naturally occurring yellowish-black liquid found in geological formations beneath the earth's surface that can be refined into fuel. The purpose of this study was to examine the trend analysis of petroleum product imports in Nepal.

**Methods:** The study has been based on secondary data provided by the website of Nepal Oil Corporation (NOC) from April 1987 to February 2018. An analytical time series study has been conducted to analyze the trend of imported petroleum products. For the analysis of data, M.S. excel and SPSS have been used.

**Result:** The result showed that dependence on petroleum product import is increasing every year which caused an increase in the price of petroleum products. As the result also showed that time is increased by one unit then the consumption of petrol is increased by 0.11 units.

**Conclusion:** The finding of the study concluded that the trend and regression analysis to estimate the demand for petroleum products is in increasing order. So alternative sources of petrol and other petroleum product should have to search to avert the fuel crisis.

**Keywords:** Nepal, petrol, fuel crisis, trend, and import

### Background of the study

Petroleum products are materials derived from crude oil as it is processed in oil refineries. Unlike petrochemicals, which are a collection of well-

defined usually pure organic compounds, petroleum products are complex mixtures (Wang, et. al, 2016). Petroleum is perhaps the most important substance consumed in modern society (Speight, 2015). Petroleum product is a naturally occurring yellowish-black liquid found in geological formations beneath the earth's surface that can be refined into fuel. It is used as fuel to power vehicles, heating units, and machines, and can be converted into plastics and other materials. Petroleum is a versatile fossil fuel that can be refined into many different products. Common examples include gasoline, kerosene, fuel oil, and lubricating oil. Gasoline is primarily used to power vehicles such as cars, motorcycles, and other vehicles. Kerosene oils are primarily used for light, such as burning in kerosene lamps, heaters, etc. Petroleum is a versatile fossil fuel that can be refined into many different products. Common examples include gasoline, kerosene, fuel oil, and lubricating oil.

Gasoline is primarily used to power vehicles. It is used in cars, motorcycles, and other vehicles, as well as to power small engines, such as lawnmowers. Kerosene oil is primarily used for light, such as burning in kerosene lamps, as well as for some heaters, and to make rocket fuel and jet fuel. Fuel oil is used in heaters and furnaces to heat interior spaces. Lubricating oil has many uses primarily that of a lubricant, which is meant to reduce friction. Most of our world is powered by petroleum. Without it, the world would look very different and many of our products would not exist. It provides transportation, heat, light, plastics, and an abundance of other uses. As a fossil fuel, it is easy to extract. The process is not difficult

and, therefore, makes the products affordable to many. As a fuel, it is an efficient power source (Pokharel, 2007).

## **Methodology**

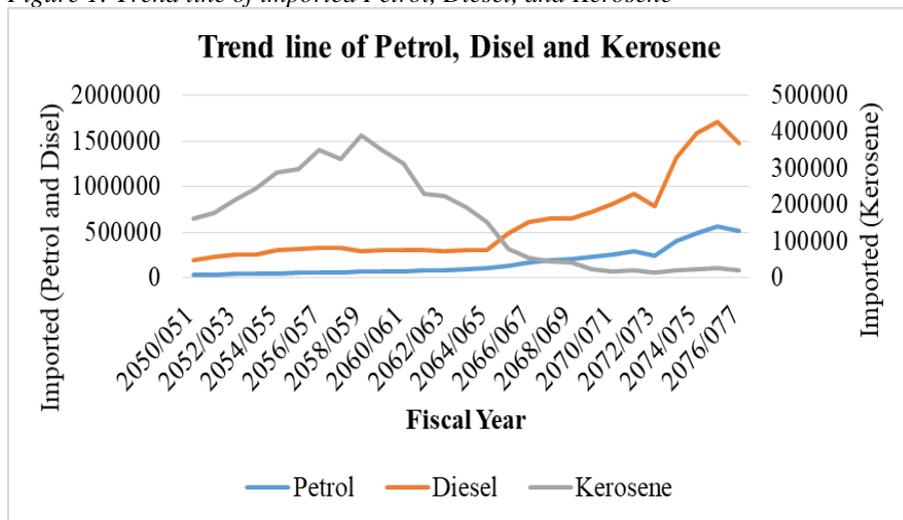
An analytical study was conducted by taking the time series data from Nepal Oil Corporation(NOC) Limited. Data from the Fiscal year 2050/51 to 2076/077 has been downloaded from the official website of Nepal Oil Corporation. Collected data was entered into SPSS-20 and analysis was done accordingly. Data was analyzed by using descriptive and inferential statistical tools. In the descriptive statistics, a trend line was used to show the trend values while in the inferential statistics to find the association of petroleum consumption with time period regression analysis was done. In order to perform the regression analysis, the Consumption of petrol was taken as the dependent variable while the time period was taken as an independent variable. Box plot was used to check the normality of the data graphically while the Shapiro-Wilk test was used as numerically to check the normality of the data. P-value <0.05 was considered as statistically significant.

## **Result**

The trend line shows that there are small changes in petrol imported from the year 2050/051 to 2065/066 But after 2064/065 the import of petrol increases suddenly up to 2070/71. This trend line of diesel has no change in the trend of imported diesel from the year 2050/051 to 2064/065 after the

trend line slowly increases up to 2072 due to the demand for diesel is increasing because the number of vehicles increases and suddenly lines depressed at 2072/2073 show that decrease of demand (Figure 1).

Figure 1: Trend line of imported Petrol, Diesel, and Kerosene



The trend line of aviation turbine fuel is constantly going up due to the import of this fuel increasing from 2050/051 to 2057/058 and suddenly going down at 2059 and after that import of turbine fuel increases slowly up to 2072. The trend line of trend line slowly increased from 2050/051 to 2070/071 but after that trend line depressed at 2072/073. The trend line of the furnace and light diesel in a single graph. From the graph furnace slightly increased from the fiscal year 2051/052 to 2052/053 and after that, the trend line slightly decreased from 2052/053 to 2054/055 showing that demand for furnace decrease may be increasing price (Figure 2).

Figure 2: Trend line of Aviation Turbine Fuel, LPG and Furnace

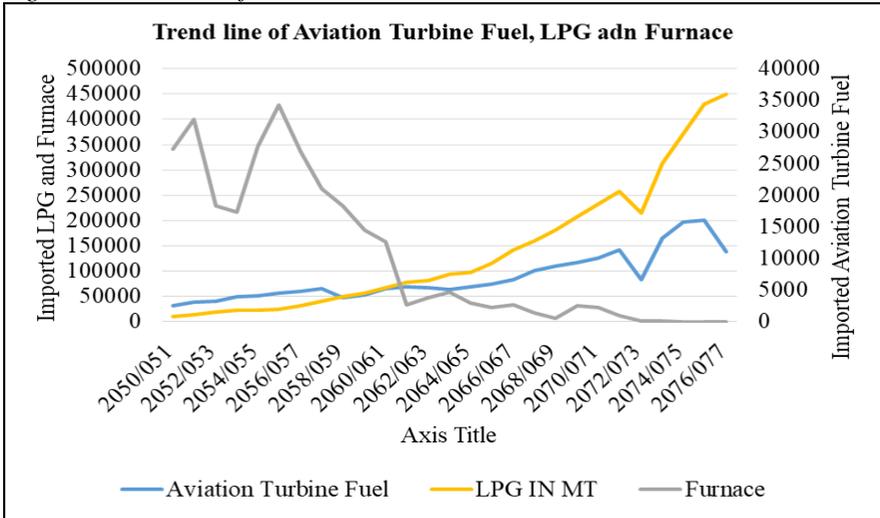
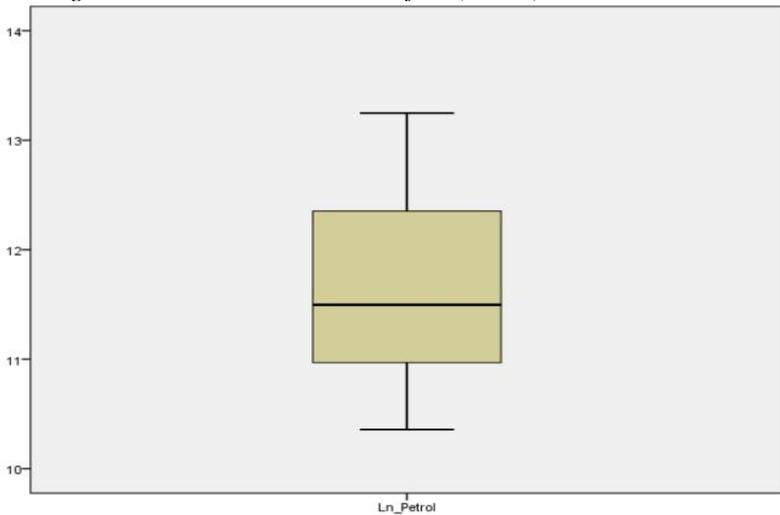


Figure 3: Box and Whisker Plot of Ln (Petrol)



The above Box and Whisker Plot of Ln (Petrol) (figure 3) showed that there are no out lawyers and it follows the normal distribution. In order to check the normality of the dependent variable (Imported petrol). Here Kolmogorov-Smirnov value is more than a 5% level of significance which indicates that the data of petrol follows a normal distribution (p-value>0.05) (table 1).

Table 1: Test of Normality of Ln (Petrol)

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	p-value	Statistic	df	p-value
Ln_Petrol	0.137	27	0.200*	0.938	27	0.108

\*.This is a lower bound of the true significance.

a. Lilliefors Significance Correction

### Regression equation between petrol and time

Regression analysis was carried out by taking consumption of petrol as the dependent variable while time period as the independent variable. The result showed that the Adjusted R square value is 0.9696 i.e which indicates that 96.96 % variation in the dependent variable (imported petrol) is explained by the change in the time period (independent variable) (table 2).

*Table 2: Regression statistics value of petrol and time period*

<b>Regression Statistics</b>	<b>Value</b>
Multiple R	0.985304
R Square	0.970824
Adjusted R Square	0.969657
Standard Error	0.153257
Observations	27

In order to check the regression model ANOVA test was done. ANOVA table of the regression model showed a p-value less than 0.05. Which showed that the model is significant (table 3).

**Table 3: ANOVA table of regression model**

	<b>df</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>p-value</b>
Regression	1	19.53878	19.53878	831.8776	<0.001
Residual	25	0.587189	0.023488		
Total	26	20.12597			

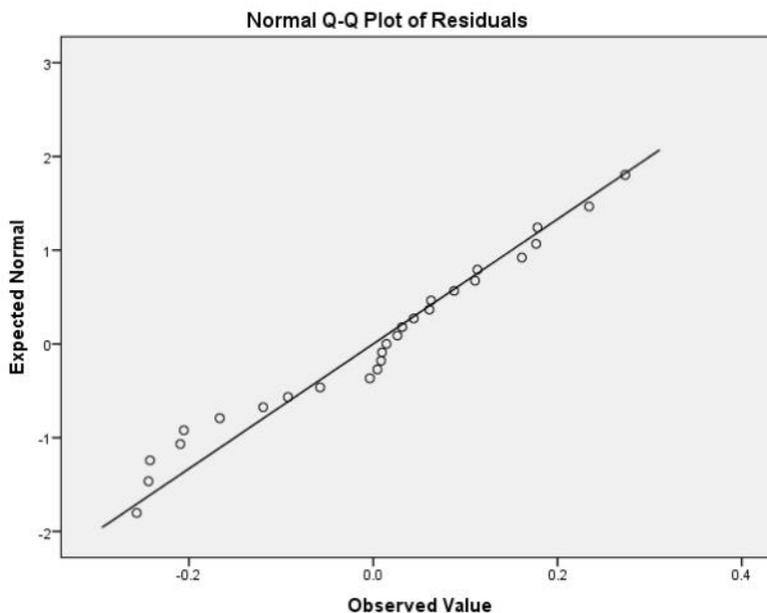
The value of the regression parameter and test of significance of parameters showed that the regression parameters are found to be statistically significant at a 1% level of significance and the regression model is  $\ln(y) = 11.66 + 0.11\ln(x)$ . This regression model showed that, if time is increased by one unit then the consumption of petrol is increased by 0.11 units (table 4).

**Table 4: Value of regression parameter**

	Coefficients	Standard Error	t Stat	P-value
Intercept	11.66	0.03	395.46	<0.001
Time	0.11	0.00	28.84	<0.001

For the regression model to be a significant model its error also should follow the normal distribution. The Q-Q plot showed the plot of the observed and expected value of residuals which shows that data are near to the fitted line, which indicates that data of residuals are normally distributed (figure 4).

*Figure 4: Q-Q plot of Residuals*



The following table shows the normality table of Residuals of the regression model. Here Kolmogorov-Smirnov value is more than a 5% level of significance which indicates that the residuals of the regression model follow a normal distribution (table 5).

*Table 5: Tests of Normality*

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residuals	0.157	27	0.087	0.954	27	0.263

a. Lilliefors Significance Correction

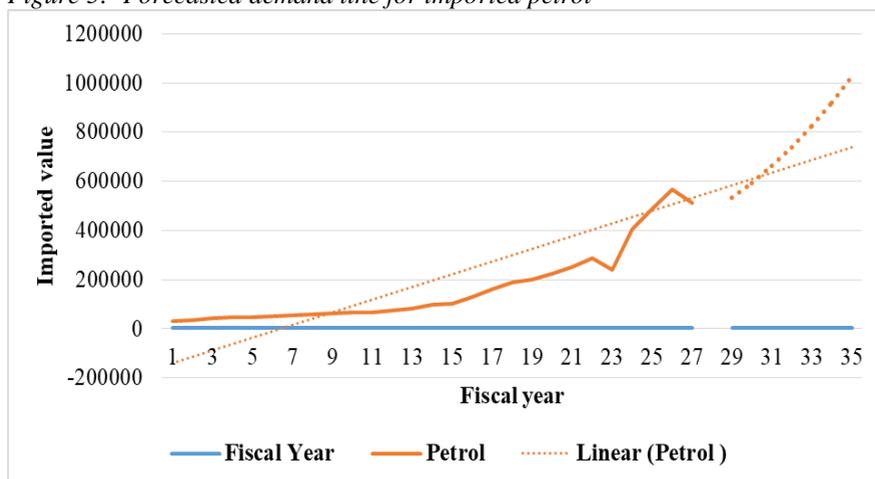
Following table (6) showed that petrol consumption will be 532852.52KL for 2078, 594217.1 KL for 2079, 662648.5 KL for 2080, 738960.7KL for 2081, 824061.1KL for 2082, 824061.1 KL for 2083, and 1024792 KL for 2084. So we can predict that the import of petroleum products will grow every year according to this forecast (Table 6).

*Table 6: Forecasted of Petrol Consumption of the next five year*

Year	Petrol Consumptions
2078	532852.5
2079	594217.1
2080	662648.5
2081	738960.7
2082	824061.1
2083	918962
2084	1024792

Figure 5 showed the observed and fitted value of imported petrol. This showed that the forecasted demand line for imported petrol will go highly increase level (figure 5).

Figure 5: Forecasted demand line for imported petrol



## Discussion

The result of this research showed that the demand for petroleum products is in highly increasing order and significantly associated with time period while the research of Pokharel (2007) also showed a similar result. Raza (2021) conducted a study entitled “oil for Pakistan. They carried out the autoregressive distributive lag method to measure the robustness of price and income elasticities and forecasted crude oil import dependency analysis based on a fitting line from 1986 to 2035. The empirical outcomes of the study are first, the price and income elasticities are consistent with An Econometric Analysis of Imported Petroleum... 76 Rajeshwori Mall-Pradhan

the theoretical prospects, which confirm that income elasticity is significant, while price elasticity is insignificant. Second, the positive growth of income elasticity is 0.21 proposes that imported crude oil in Pakistan is rising income level due to sectorial oil consumption. Zhao and wu (2007) had published a research article on "Determination of China's energy imports: An empirical analysis. This paper investigates the determinants of china's energy import demand by using co-integration and VECM techniques. The findings suggest that, in the long run, the growth of industrial production and expansion of the transport sector affect china's oil imports, while domestic energy output has a substitution effect on imports, its growth is limited due to scarce domestic reserve and high exploration costs. Sa'ad & Isah (2016) had published a research article on "Empirical analysis of transportation demand for oil products in Nigeria: Using error correction approach". This paper analyses the demand for petroleum products (gasoline and diesel) in Nigeria using time series data (1980–2013).

The analyses of the trend in the consumption of products have shown that the consumption initially maintained and increasing trend, later declined considerably with the increase in domestic prices. Bhattacharyya & Blake (2009) had published an article on " Domestic demand for petroleum products in MENA countries". The purpose of this paper is to analyze the domestic demand for petroleum products in the Middle East and North African (MENA) countries employing a recent data series (1982–2005). Understanding the domestic demand of oil-producing countries is An Econometric Analysis of Imported Petroleum...

important due to the existence of subsidized supply, loss of foreign exchange income and the environmental effects of oil use. Asche, Gjøølberg, & Völker. (2003) published an article on "Price relationships in the petroleum market: an analysis of crude oil and refined product prices". In this paper, the relationships between crude oil and refined product prices are investigated in a multivariate framework. This allows us to test several (partly competing) assumptions of earlier studies. In particular, we find that the crude oil price is weakly exogenous and that the spread is constant in some but not all relationships.

## **Conclusion**

The trend of imported petroleum products in Nepal is almost increasing every year according to the above analysis. However, the import of kerosene is decreasing because Nepal used alternative sources instead of kerosene i.e. electricity. But the use of petrol and diesel is increasing day by day. Similarly, we depend on LPG gas for cooking so its demand is also increasing every year. So in the future trend of import increases cause the price of petroleum products to increase and transportation costs will increase so the price of every good increase due to transport costs so an economic crisis in Nepal will happen.

## **Recommendations**

In the conclusion, this research shows that the import of petroleum products from foreign countries will be grown. Alternative sources of

petroleum products should be searched and given more priority to our own resources. For example, Nepal is rich in water so we can use water to increase the production of electricity. And more hydropower will generate and electric vehicles, and electric products can be used, and dependence on petroleum product import will slowly decrease. Control of the use of petroleum products is necessary in order to decrease the import of petroleum products for avoiding an economic crisis. Therefore, the search for an alternative source of petroleum products is crucial.

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