A Case Study On The Surging Gasoline And Gas Oil Prices In Thirteen Indian Cities.

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Abstract
This study aims to examine rising gasoline and gas oil prices in several Indian cities using predictive modeling and relationship analysis. Fuel is defined as a material that burns and is converted into energy. Fuel can include coal, gasoline, diesel, or any other compound that combines with another substance to create power that can be utilized for work. This study aims to analyse the cost of gasoline and diesel in fifteen Indian cities. Analysis of variance, Predictive modeling analysis, and Relationship analysis are the statistical techniques used to interpret the data. Additionally, there are scatter diagrams, tabular columns, and graphical representations.
Keywords: Analysis of variance (ANOVA), Relationship Analysis, Predictive Modeling

I. INTRODUCTION

Gasoline and gas oil are among the most significant non-renewable energy sources in our world. In today's context, it is difficult to imagine life without them. Global events in recent years have driven the demand for these energy sources to unprecedented levels. Over the past three decades, technological advancements have transformed transportation, leading to a surge in personal vehicle ownership.

The number of vehicles on the road is increasing at an extraordinary rate, significantly driving up the demand for petrol and diesel. This demand, coupled with rising crude oil prices in the global market, has led to higher fuel costs. In a densely populated country like India, where transportation plays a vital role in the lives of the working population, the need for petrol and diesel remains high. However, the escalating prices have become a major concern for the public.

One of the main reasons behind the steep rise in fuel prices is the reduced availability of crude oil from producing nations. Additionally, increased taxes on these fuels have contributed to record-high costs in India. Beyond these factors, the Covid-19 pandemic has been a significant driver of soaring oil prices in global markets.

Effects of the increase in petrol and diesel prices.

Those who own personal vehicles are the ones who are most affected by the rise in gasoline and diesel costs. Their monthly budgets are generally higher than before. The country's automotive sector would be impacted by rising fuel prices, which will have a cascade effect on corporate divisions.

GOALS:
a. To analyze the patterns of rising petrol and diesel prices across various cities in India.
b. To examine if there is a correlation between fuel prices in two consecutive years.
c. To apply regression analysis and Analysis of variance to interpret the relationships in the collected data.

II. Methodology

Relationship Analysis

Relationship analysis also called dependence, describes the statistical relationship between two random variables or bivariate data, indicating the extent of their linear association. Regression analysis is a statistical method used to analyze and interpret the relationships between two or more variables. Among the various types of regression analysis, linear regression is the most commonly applied. The correlation coefficient ranges from -1 to +1.A value of +1 indicates a perfect positive correlation, while -1 signifies a perfect negative correlation. Two widely used correlation coefficients are Karl Pearson's correlation coefficient and Spearman's rank

correlation coefficient. The Pearson correlation coefficient, also called the Pearson product-moment correlation coefficient (PPMCC), measures the linear relationship between two datasets. It is calculated as the ratio of the covariance of two variables to the product of their standard deviations, with values ranging between -1 and +1. Spearman's rank correlation coefficient, or Rho, is a nonparametric measure of rank correlation. Correlations can be categorized into three types: positive correlation, where two variables change in the same direction; negative correlation, where two variables move in opposite directions; and no correlation, indicating no relationship between the variables.

Predictive Modeling

Regression uncovers the nature of the relationship between the variables. Regression is a process or technique that involves returning to a previous state, condition, or form, or the relationship between variables used to predict or explain outcomes.

Analysis of variance

Analysis of variance is a technique used to test the equality of means when two or more populations are being considered.

Petrol Price
Statistical Interpretation of Data

Table 1: Petrol Prices in Different Cities of India

S.no	City	25th March 2022- Petrol price (Rs/litre)	25th March 2023- Petrol price (Rs/litre)
1	New Delhi	97.81	96.72
2	Kolkata	107.18	106.03
3	Mumbai	112.51	106.31
4	Chennai	103.67	102.63
5	Bangalore	103.11	101.94
6	Hyderabad	110.91	109.66
7	Jaipur	109.73	102.63
8	Lucknow	97.67	96.57
9	Patna	108.37	107.24
10	Trivandrum	108.77	107.71
11	Noida	95.48	96.57
12	Guru gram	95.7	97.18
13	Chandigarh	94.23	96.2

Bar Graph
Petrol Price (Rs/litre)
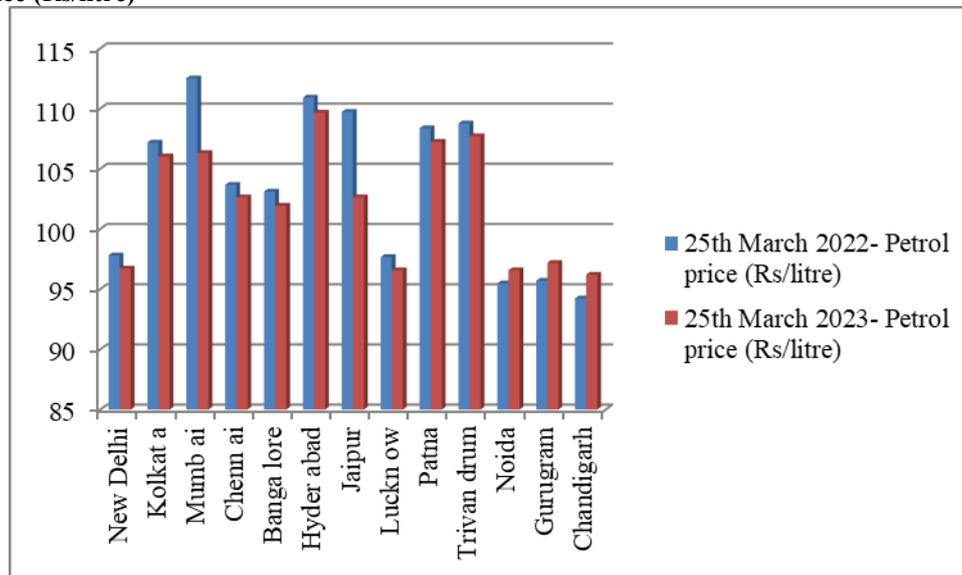

Fig 1: **Bar graph showing Petrol price.**

Relationship Analysis

Table 2: Relationship Analysis of the above Data

	25th March 2022-Petrol price (Rs/litre)	25th March 2023-Petrol price (Rs/litre)
25th March 2022-Petrol price (Rs/litre)	1	
25th March 2023-Petrol price (Rs/litre)	0.933949	1

Interpretation

We utilized the concept of correlation to reach our conclusion. From the table, the correlation coefficient is found to be   0.93395, indicating a positive correlation between petrol rates in the two years.

Predictive Modeling Analysis

Table 3: Predictive Modeling Analysis of the above data

Regression Statistics	
Multiple R	0.933949
R Square	0.872262
Adjusted R Square	0.860649
Standard Error	1.860017
Observations	13

Interpretation:

R square equal to 0.872262 indicates that about 60% of the variation in the petrol price on 25th march 2023 is   explained by the same on 25th march 2022.

Analysis of Variance

Let null hypothesis H_0 = Price of petrol in 2022 is not associated with the price of petrol in 2023
Let Alternative Hypothesis H_1 = Price of petrol in 2022 is associated with price of petrol in 2023.

Table 4: Summary of the above data

Summary				
Groups	**Count**	**Sum**	**Average**	**Variance**
25th March 2022-Petrol price (Rs/litre)	13	1345.14	103.4723	43.13022
25th March 2023-Petrol price (Rs/litre)	13	1327.39	102.1069	24.82697

Table 5: Analysis of Variance Summary of the above data

Source of Variation	Between Groups	Within Groups	Total
SS	12.11779	815.4863	827.6041
df	1	24	25
MS	12.11779	33.9786	
F	0.35663		
P-value	0.555977		
F crit	4.259677		

Interpretation

From the above table the calculated F value is 0.35663 and the critical value of F is 4.259677. Calculated value of F is found to be less than the critical value, so we accept the null hypothesis. That is the Price of petrol in 2022 is not associated with the price of petrol in 2023

Diesel Price
Statistical Interpretation of Data

Table 6: Diesel Prices in Different Cities of India

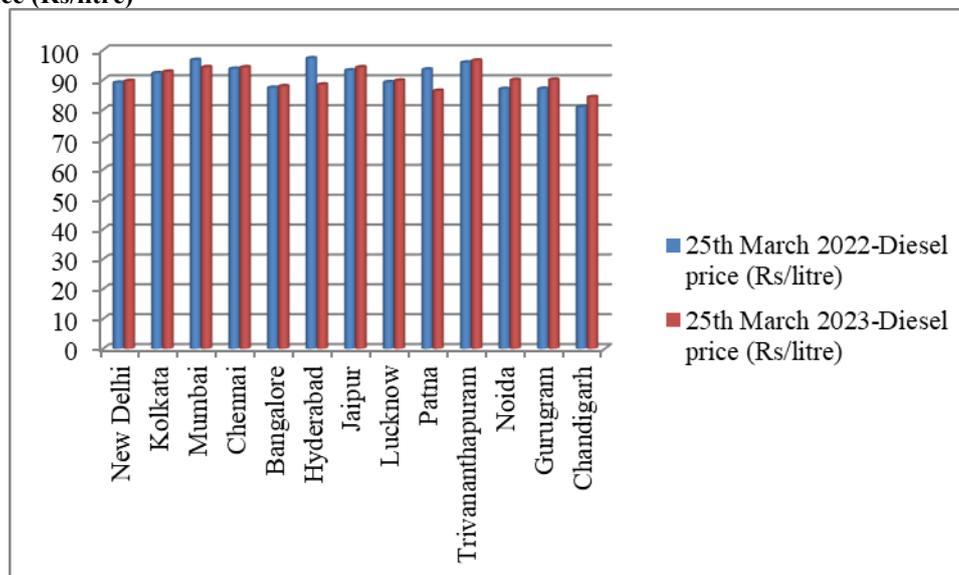| S.no	City	25th March 2022-Diesel price(Rs/litre)	25th March 2023-Diesel price(Rs/litre)
1	New Delhi	89.07	89.62
2	Kolkata	92.22	92.76
3	Mumbai	96.7	94.27
4	Chennai	93.71	94.24
5	Bangalore	87.37	87.89
6	Hyderabad	97.24	88.45
7	Jaipur	93.2	94.24
8	Lucknow	89.22	89.76
9	Patna	93.49	86.35
10	Trivananthapuram	95.81	96.48
11	Noida	86.98	89.96
12	Guru gram	87.02	90.05
13	Chandigarh	80.9	84.26

Bar Graph
Diesel Price (Rs/litre)

Fig 2: Bar graph showing diesel price.

Relationship Analysis

Table7: Relationship Analysis of the above Data

	25th March 2022-Diesel price (Rs/litre)	25th March 2024-Diesel price (Rs/litre)
25th March 2022-Diesel price (Rs/litre)	1	
25th March 2023-Diesel price (Rs/litre)	0.632701	1

Interpretation

We utilized the concept of correlation to reach our conclusion. From the table, the correlation coefficient is found to be 0.632701, indicating a positive correlation between petrol rates in the two years.

Predictive Modeling Analysis

Table 8: Predictive Modeling Analysis of the above data

Regression Statistics	
Multiple R	0.632701
R Square	0.40031
Adjusted R Square	0.345793
Standard Error	2.876654
Observations	13

Interpretation:

R square equal to 0.40031 indicates that about 60% of the variation in the diesel price on 25th march 2023 is explained by the same on 25th march 2022.

Analysis of Variance

Let null hypothesis H_0 = Price of diesel in 2022 is not associated with the price of diesel in 2023
Let Alternative Hypothesis, H_1 = Price of diesel in 2022 is associated with price of diesel in 2023.

Table9: Summary of the above data

Summary				
Groups	**Count**	**Sum**	**Average**	**Variance**
25th March 2023-Diesel price (Rs/litre)	13	1182.93	90.99462	22.37641
25th March 2023-Diesel price (Rs/litre)	13	1178.33	90.64077	12.64911

Table10: Analysis of Variance Summary of the above data

Source of Variation	**Between Groups**	**Within Groups**	**Total**
SS	0.813846	420.3062	421.1201
df	1	24	25
MS	0.813846	17.51276	
F	0.046472		
P-value	0.831142		
F crit	4.259677		

Interpretation

From the above table the calculated F value is 0.046472and the critical value of F is 4.259677. Calculated value of F is found to be less than the critical value, so we accept the null hypothesis. That is the Price of diesel in 2022 is not associated with the price of diesel in 2023.

Declaration

I, [P.Anandhi], hereby declare that the research work presented in this paper titled **"[A Case Study on the Surging   Gasoline and Gas Oil Prices in Thirteen Indian Cities.]"** is my original work and has not been submitted previously, in part or whole, for any degree or certification at any institution or university. I have duly acknowledged all sources of information,   ideas, and references used in this research paper. Any instances of plagiarism, if found, are purely un intentional, and I take   full responsibility for the content of this work.

References

[1]. Akansha Sanjay Jain, N. S. (2015, April-June). Crude Oil Prices And Its Impact On Indian Economy. International Journal Of Social Science And Humanities Research, 3*(2), 562-572.
[2]. Akhil M. Nair, Sidharth S. Prasad, Sreelatha K. S. (2019). Case Study –How To Bridge The Gap Between Present Education System And Employability In Kerala State. *Journal Of Physics: Conference Series,1362*.
[3]. Ibrahim, S. (2022). Discrete Least Square Method For Solving Differential Equations. *Advances And Applications In Discrete Mathematics, 30*, 87-102.
[4]. K. Soundarapandiyan, M. G. (2017). An Analytical View Of Crude Oil Prices And Its Impact On Indian Economy. IOSR Journal Of Business And Management*, 23-28.
[5]. Lakshmi Suresh, Malavika V. R., Sarika S. G., Usha Kumari V.(2020, November 18). A Case Study On COVID-19 In Two Districts Of Kerala State Viz. Kannur And Thiruvananthapuram.
[6]. Malavika V. R., Lasitha A. (2022). The Impact Of Examination Malpractices Among Higher Secondary Students In Kerala - A Case Study.
[7]. Ponnu Soman, Nayana Madhu, Sathidevi C. (2022). Impact Of COVID- 19 Pandemic On Education In Schools Of Kerala State.
[8]. Sathidevi C. (2018). The Reasons For Dropouts Of Adult Learners From Adult Education Centres In Kerala – A Case Study. International Journal Of Advance Research In Science And Engineering, 7*(3),791-802.