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Statistical Analysis of Comparison between sell of Petrol Cars and Diesel Cars

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Abstract:

Transportation had been all time necessary for human being. Before time it is carried out by legs i.e. they had to walk for miles. As time goes things also been changing and new models come to introduce. After scientists had given attention towards innovations revolutions occurred time to time. First industrial revolution occurred nearly 1760 decade and a new feeling arises to fast mode of transport. New modes of varied types were made. One of them was petrol and diesel engine motor cars. This engines work on fossil fuels with combustion. Having much power they could transport easily much goods in short period of time. Now-a-days, trending in market as they give much profit and yield, too, and are easy to handle. Both the petrol and diesel cars have slight drawbacks but nevertheless, two of them contribute equally in usage.

Keywords: *petrol cars, diesel cars, Statistical Analysis.*

Introduction:

Petrol and diesel Vitality is the lifeblood of economy of a nation. How the overall role Petrol and diesel Vitality can play in the economy of a nation and how it serves as the mainspring of financial growth do not need explanation. Though India is the world's 4th largest energy user, its per capita consumption is among the lowest in the world. Continuous output of Petrol and diesel Vitality has increased external dependence for its sourcing and as a result Petrol and diesel Vitality

constitutes the major item in India's import bill. Petrol and diesel prices and volatility has negative implications for the Indian economy and the ambition of putting the economy on a higher growth trajectory. In view of the criticality of energy usage for economic growth, it is imperative for India to formulate appropriate strategies and policies that reduce dependence on crude and product imports and review pricing strategies of regulated products, especially diesel. Lack of information on spectral demand of diesel and petrol not only poses a competition for taking policy decisions by the Government, but also creates a decreeing trend when it comes to demand prediction of these products. This necessitates prediction and analysis of diesel and petrol consumption trends in different sectors of the economy.

The other implicit purpose of this paper is to bring to the fore the actual facts pertaining to the recent trend of dieselization and patronization of private motor transport. Historically, petrol has always been more costly than diesel because of higher incidence of taxes on petrol. Since the government has always been wary of increasing diesel prices for its perceived adverse impact on escalation, the price gap between diesel and petrol has been widening. This had led to priority for diesel vehicles vis-à-vis petrol vehicles, leading to dieselization and Petrolization all the sector in motor transport.

The accretion of car traffic in the last decades has been arising very serious environmental concerns over the increase of gas emissions, urban air pollution and dependence on dwindling fossil fuel reserves. The petrol and diesel crises of the seventies, along with the concerns over the increase of petrol and diesel prices [1][2].Most of the national and international policies have been put forth in order to place even more stringent limits on petrol and diesel consumption CO2 emissions of vehicles [3].

Objectives:

1. To test whether type of Vehicle is independent of market prices.
2. To test whether age of owner is independent of sales of vehicle.
3. To check the proportion between two types of cars.

Methodology:

This paper is based on secondary data. Firstly, we make some research on vehicles of no. of company's and made a questionnaire. Which consist of many questions like mileage, maintenance, type of raw material, technology introduced etc. The data is collected from many sites on internet that consists of Tata, Maruti Suzuki and Hyundai. We filled up the questionnaire. We get data of sell in India by three companies.

Test for proportion:

The null hypothesis,

$H_0: P_1=P_2$ ($H_0: P_1 - P_2 = 0$)

Alternative Hypothesis,

$H_1: P_1 \neq P_2$

Let P_1 and P_2 be the proportions of unit's of possessing the given attribute in two populations. we take randomly selected sample of size n_1 taken from the population of proportion P_1 in which the no. of unit that posses attribute is x_1. Let a randomly selected sample of size n_2 taken from population with proportion P_2 in which no. of units posses the given attribute is x_2.

The sample proportion for first sample is -

$p_1 = x_1/n_1$ Similarly, $p_2 = x_2/n_2$

Here, x_1 & x_2 follows binomial distribution with parameter (n_1, P_1) and (n_2, P_2) respectively. For large n_1 and n_2.

That is, $X_1 \sim N(n_1P_1, n1P1Q1)$ and $X_2 \sim N(n_2P_2, n_2P_2Q_2)$.

Therefore, sample proportions are as follows,

p_1 follows Normal distribution with parameter ($P_1, P_1Q_1/n_1$)

And p_2 follows normal distribution with parameter ($P_2, P_2Q_2/n_2$)

The test statistics Z under null hypothesis is,

$$Z=\frac{(p1-p2)}{\sqrt{\frac{P1Q1+P2Q2}{n1+n2}}} \sim N(0,1)$$

Conclusion:

If $Z^2_{Cal} > Z^2_{tab}$.

Then we reject the H_0 otherwise accept H_0.

Test for independence of attributes

Let there are two attributes A and B. These attributes are divided into two classes A_1, A_2 & B_1, B_2. The 2×2 contingency table for two attributes is given by -

B / A	B_1	B_2	T
A_1	A	B	a + b
A_2	C	D	c + d
T	a + c	b + d	N

Where a, b, c, d are cell frequencies. N is total frequency.

H_0: The attributes A and B are independently distributed

H_1: The attributes A and B are not independently distributed

Under the null hypothesis we use given test statistics

$$\chi^2 cal = \frac{N(ad-bc)}{(a+b)(a+c)(c+d)(b+d)} \sim \chi^2_{(2-1)(2-1)d.f}$$

Conclusion:

If $\chi^2_{Cal} > \chi^2_{tab}$

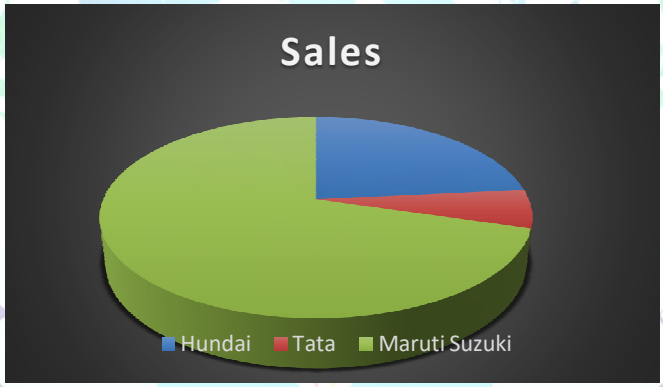
Then we reject Ho otherwise accept H_0.

Data Analysis-

Graphical representation:

i) Distribution of proportion for Total sales of cars for year 2019-20

No.	Company of Cars	Total Sales	Percent (%)
01	Hyundai	3,51,392	23.42%
02	Tata	92,543	6.16%
03	Maruti Suzuki	10,56,306	70.40%



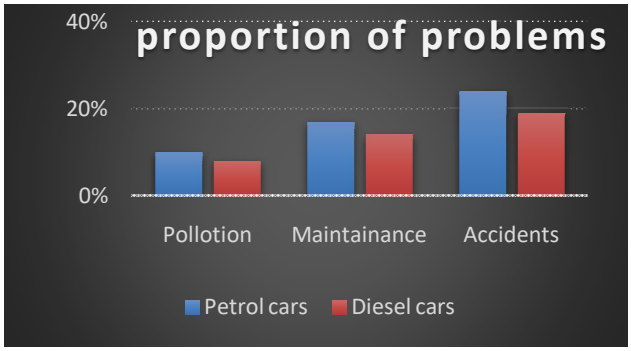
Conclusion:

From above graph it is seen that the sales percentage of cars is 23.42%, 6.16%& 70.40% for Hyundai, TATA, and Maruti Suzuki Respectively.

ii) Proportion of problems in users of petrol cars& diesel cars-

Observation Table-

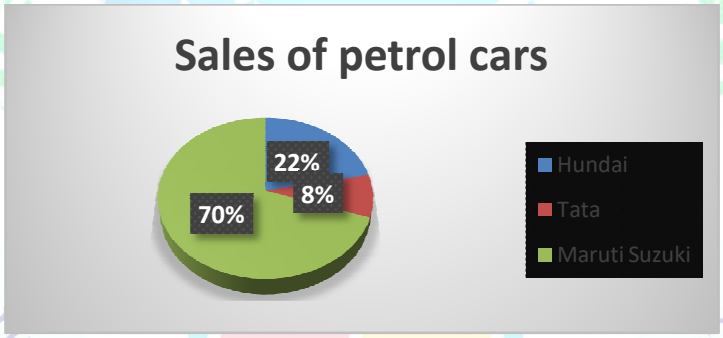
Sr. No.	Car problems	Percent (Petrol)	Percent (Diesel)
1.	Pollution	10%	8%
2.	maintainance	17%	14%
3.	Accidents	24%	19%



Conclusion: From above table and pie chart it seems that there is more problems seen in patrol cars as compare to diesel cars.

iii)Percentageof sales of Petrol cars in two years –

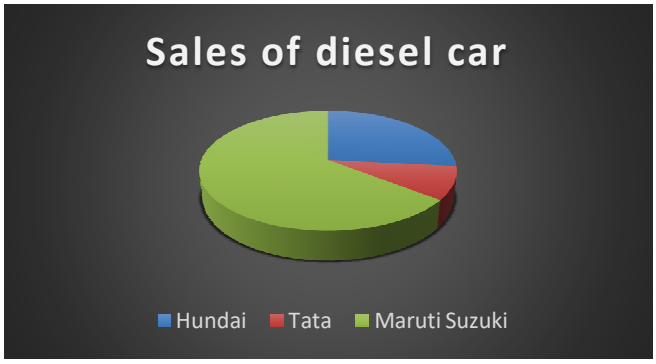
Sr. No.	Company of Cars	Frequency	Percent
1	Hundai	690240	21.83%
2	TATA	269657	8.52%
3	Maruti Suzuki	2201935	69.64%



Conclusion : From above table and pie chart it is seen that only 78.32% of petrol cars sold in two years.

iv) Percentage of sales of diesel cars in two years –

Sr. No.	Company of cars	Frequency	Percent
1	Hyundai	233040	26.68%
2	Tata	78024	8.91%
3	Maruti Suzuki	563921	64.44%



Conclusion: From above table and pie chart it is seen that 21.67%.of diesel cars sold in two years.

Testing the hypothesis:

1) Test for proportion: Aim: To test the hypothesis that proportion of petrol cars & diesel cars is equal.

Test Procedure: in this test we have test null hypothesis, H0:P1 =P_2 against Alternative Hypothesis H_1: $P_1 \neq P_2$

Where, p_1= proportion of sales of petrol cars. p_2=proportion of sales of diesel cars.

The test statistics is, $|Z|=\frac{(p1-p2)-(P1-P2)}{\sqrt{pq\left(\frac{1}{n1}+\frac{1}{n2}\right)}}$

Where, $p=\frac{X1+X2}{n1+n2}$;q = 1- p ;

Where, X_1=No. of Sales of petrol cars.

X_2=No. of Sales of diesel cars

Thus, we reject H_0 at 5% L.O.S. if$|Z_0| > Z_{tab}$.

- **Calculation:**

Given that: n_1=n2= 40, 36,817; x_1= 31, 61,832; X2=874985;

$p_1=\frac{3161832}{4036817}$ =0.7832; $p_2=\frac{874985}{4036817}$ =0.2167; $p=\frac{X1+X2}{n1+n2}=\frac{3161832+874985}{4036817+4036817}$ = 0.5

q = 1 –p q =1 –0.5 q =0.5

Under the null hypothesis test statistics is, $|\mathbf{Z_0}|=\frac{0.567}{\sqrt{(0.25)(0.00000004)}}$

$|\mathbf{Z_0}|$= 5.67 $\mathbf{Z_{tab}=Z_{(0.05)}=7.815}$ Here, $|Z_0| < Z_{tab}$

Results: $|Z_0| < Z_{tab}$. Hence, we accept Ho at 5% L.O.S.

Conclusion: Proportion of sales of petrol cars and diesel cars is equal i.e. H_0: $P_1=P_2$.

2) Test for independence of attributes: Aim : To test whether sales of cars is independent of prices.

To test the null hypothesis H_0- H_0: Attributes types of cars& prices are independent.

H_1: Attributes types of cars& prices are not independent.

Observation Table 1:

Type ofCars / Prices	Petrol cars	Diesel cars	Total
Expensive	874823 (A_1,B_1)	312227 (A_1,B_2)	A_1=1187050
Not Expensive	2287009 (A_2,B_1)	562758 (A_2,B_2)	A_2=2849767
Total	B_1=3161832	B_2=874985	N=4036817

- **Calculations:**

Expected frequencies :- $(A_1,B_1)_e = \frac{(A1)(B1)}{N} = \frac{(1187050)(3161832)}{4036817} = 672508.57$

$(A_1,B_2)_e = \frac{(A1)(B2)}{N} = \frac{(1187050)(874985)}{4036817} = 257294.532$ $(A_2,B_1)_e = \frac{(A2)(B1)}{N} = \frac{(2849767)(3161832)}{4036817}$

$= 2232076.53$

$(A_2,B_2)_e = \frac{(A2)(B2)}{N} = \frac{(2849767)(874985)}{4036817} = 617690.46$

Observation Table 2:

(A_i, B_j)	$(A_i,B_j)_e$	$\frac{\{(Ai,Bj)-(Ai,Bj)e\}2}{(Ai,Bj)e}$
874823	672508.57	0.6017
312227	257294.532	0.4270
2287009	2232076.53	0.0492
562758	6177690.46	-0.1778

Test statistic is:- $\chi^2_{cal} = \sum \frac{[(Ai,Bj)-(Ai,Bj)e]2}{(Ai,Bj)e} = 0.9001$ $\chi^2_{tab} = 9.488$ $\chi^2_{cal} < \chi^2_{tab}$

Hence, we accept H_0. **Result**: $\chi^2_{cal} < \chi^2_{tab}$ Hence, we accept H_0 at 5% L.O.S.

Conclusion: Type of car is independent of prices.

3) Test for independence of attributes: Aim: To test whether sales of cars is independent of age of owners**.**

To test the null hypothesis. H_0: Attributes sales of cars and age of owner are independent.

H_1: Attributes sales of car and age of owner are not independent.

Observation Table 1:

Type ofcars / Age of owners	Petrol cars	Diesel cars	Total
Below 30th	1284033 (A_1,B_1)	536932 (A_1,B_2)	A_1=1820965
Above 30th	1877799 (A_2,B_1)	338053 (A_2,B_2)	A_2=2215852
Total	B_1=3161832	B_2=874985	N=4036817

Calculations: Expected frequencies :-

$(A_1,B_1)_e = \frac{(A1)(B1)}{N} = \frac{(1820965)(3161832)}{4036817} = 1426268.62$ $(A_1,B_2)_e = \frac{(A1)(B2)}{N} = \frac{(1820965)(874985)}{4036817} = 394696.38$

$(A_2,B_1)_e = \frac{(A2)(B1)}{N} = \frac{(2215852)(3161832)}{4036817} = 1735563.38$ $(A_2,B_2)_e = \frac{(A2)(B2)}{N} = \frac{(2215852)(874985)}{4036817} = 480288.62$

Observation Table 2:

(A_i, B_j)	$(A_i,B_j)_e$	$\frac{\{(Ai,Bj)-(Ai,Bj)e\}2}{(Ai,Bj)e}$
1284033	1426268.62	-0.01994
536932	394696.38	0.7207
1877799	1735563.38	0.1639
338053	480288.62	-0.5922

Test statistic is:- $\chi^2_{cal} = \sum \frac{[(Ai,Bj)-(Ai,Bj)e]2}{(Ai,Bj)e} = 0.093$ $\chi^2_{tab} = 9.488$ $\chi^2_{cal} < \chi^2_{tab}$

Hence, we accept H_0. **Result**: $\chi^2_{cal} < \chi^2_{tab}$ Hence, we accept H_0 at 5% L.O.S.

Conclusion: Sales of cars is independent of Age of owners.

Concluding Remarks

1. The usage percentage of Petrol car is 78.32% and Diesel car is 21.67%.
2. Percentage of problems: Petrol cars owners face the mainly three most problems.

3. Pollution: 10%which is more than diesel cars having 8%.
4. Maintainance: 17% which is more than diesel cars having 14%.
5. Accidents: 24% which is more than diesel cars having 19%.
6. Type of cars is independent on prices.
7. Sales of cars is independent of age of owners.

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