Random Motors Project Submission

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Q-1a) Formulate the null hypotheses to check whether the new models are performing as per the desired design specifications.

For Rocinante36:

Mileage H_O : The Rocinante36 model mileage meet the desired design specification of 22 km/litre.

Top speed H_O : The Rocinante36 model top speed meet the desired design specification of 140 km/hr .

For Marengo32:

Mileage H_O : The Marengo32 model mileage meet the desired design specification of 15 km/litre.

Top speed H_O : The Marengo32 model top speed meet the desired design specification of 210 km/hr.

Q-1b) Formulate the alternate hypotheses to check whether the new models are performing as per the desired design specifications.

For Rocinante36:

Mileage H_1 : The Rocinante36 model mileage do not meet the desired design specification of 22 km/litre.

Top speed H_1 : The Rocinante36 model Top speed do not meet the desired design specification of 140 km/hr.

For Marengo32:

Mileage H_1 : The Marengo32 model mileage do not meet the desired design specification of 15 km/litre.

Top speed H_1 : The Marengo32 model Top speed do not meet the desired design specification of 210km/hr.

Q-2) In order to comment on whether the design specifications are being matched or not, perform relevant hypothesis tests and calculate the p-value for each. What will you conclude? Assume you are performing the tests at 95% confidence level.

For Rocinante36:

p-value for mileage = 0.0822
p-value for top speed = 0.4316

For Marengo32:

p-value for mileage = 0.1342
p-value for top speed = 0.3730

Conclusion:

For Rocinante36
Mileage: Since 0.0822 > 0.05, we fail to reject the null hypothesis.
Top speed: Since 0.4316 > 0.05, we fail to reject the null hypothesis.

For Marengo32
Mileage: Since 0.1342 > 0.05, we fail to reject the null hypothesis.
Top speed: Since 0.3730 > 0.05, we fail to reject the null hypothesis.

The design specifications are being matched for both models with respect to mileage and top speed. There is no significant deviation from the expected performance metrics..

Q-3) You have learnt about the possible errors that might result from the hypothesis tests. What type of error is more expensive for Random motors based on the hypothesis they are testing? Why? Assume that you need to refund all your customers if your cars deviate from specifications.

The type of error which is more expensive:

For Random Motors, Type I Error (False Positive) is more expensive.

Reason:

•If a Type I error occurs, the company will refund all customers even though the cars meet the specifications. This leads to unnecessary financial losses, which could significantly impact the company's bottom line.

•In contrast, while Type II errors may result in customer dissatisfaction and long-term reputational damage, these consequences may not be as immediately costly as issuing refunds to every customer.

Q-4) Develop a regression equation for each model at 95 percent confidence level. From the regression equation predict the sales of the two models.

Develop the regression equation for the Rocinante models and Predict the number of unit sales of Rocinante36 model?

Regression coefficients: 50.7231
Price: -0.7950
Mileage: 8.3063
Top speed: -0.0186

Equation:
Predicted Sales of Rocinante = 50.7231 - 0.7950 * 7 + 8.3063 * 22 - 0.0186 * 140

Predicted Sales(in units): 225.2927 units

Develop the regression equation for the Marengo models and Predict the number of unit sales of Marengo32 model?

Regression coefficients: -13.4476
Price: -0.1867
Mileage: 0.0413
Top speed: 0.2208

Equation:
Predicted Sales of Marengo= -13.4476 - 0.1867 * 41 + 0.0413 * 15 + 0.2208 * 210

Predicted Sales(in units): 25.8852 units

Q-5) Based on sales prediction, what is the overall predicted profit for Rocinante36 model and Marengo32 model ?

Overall predicted profit:

Rocinante36 Model: 225.29 lakh rupees

Marengo32 Model: 207.04 lakh rupees

Q-6) As a CEO, you wish to invest only in the model which is predicted to be more profitable. Which model among Rocinante36 and Marengo32 will you invest in?

Which model you will invest in?

Rocinante36 has a predicted profit of 225.29 lakh rupees, which is higher than the 207.04 lakh rupees predicted for the Marengo32 model.

Investing in the Rocinante36 model as it is projected to be more profitable. This investment decision is supported by the higher predicted profit, indicating better potential for return on investment.

Q-7) Now you must have derived the regression equation for both models, Rocinante and Marengo. Now if you increase the price of Rocinante36 and Marengo32 by 1 lac rupees each, which car will have a higher impact on the sales due to increase in price? Give proper logic for your answer. You can consider that all other specifications such as mileage and top speed remain the same for both models.

Which car is most affected by a price increase? Why?

Rocinante36 is more affected by a price increase of 1 lakh rupees due to its higher sensitivity to price changes as indicated by the regression coefficient.

Q-8) After developing the regression equation for both models (Rocinante and Marengo), if you analyse the p values for coefficients in the regression results, you will notice that some of the regression variables (top speed, mileage and price) are insignificant. Remove the insignificant regression variables from your selection and rebuild the regression model using only significant variables. Compare the Adjusted R square value for the new and old regression model. Do you notice any change in Adjusted R square value? If yes, explain the reason for the change.

Is there a change on Adjusted R square Value? If so, Why?

In the Rocinante36 model, the adjusted R-squared value decreased , suggesting removing the insignificant variable caused severe model instability, indicating multicollinearity or dependence among variables, and the removed variable may have still added some contextual relevance to the model.

In the Marengo32 model, the adjusted R-squared value increased, indicating that the significant variables were more effective at explaining the variation in the dependent variable without the presence of insignificant variables.¶