

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_0 : is equal to 22km/litre

Top speed H_0 : is equal to 140km/hr

For Marengo32:

Mileage H_0 : is equal to 15km/litre

Top speed H_0 : is equal to 210km/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 : is not equal to 22km/litre

Top speed H_1 : is not equal to 140km/hr

For Marengo32:

Mileage H_1 : is not equal to 15km/litre

Top speed H_1 : is not equal to 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 = 0.373

Conclusion

For Rocinante36:

The Mileage p-value (0.0822) Is more than α (0.05) hence we fail to reject the Null Hypothesis. Also the Top Speed p-value (0.4316) which is greater than α (0.05) hence we fail to reject the Null Hypothesis.
Hence we fail to reject the null hypothesis.

For Marengo32:

The Mileage p-value (0.1342) Is more than α (0.05) hence we fail to reject the Null Hypothesis. Also the Top Speed p-value (0.373) which is greater than α (0.05) hence we fail to reject the Null Hypothesis.
Hence we fail to reject the null hypothesis.

Hence It can be concluded that the H_0 is rejected which means that the cars are not performing as per the desired specifications. Thus the engineer needs to check the performance and either revise the specification investment more in the design to improve their performance.

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:

Type 2 Error : Fail to Reject the H_0 (null hypothesis) when H_0 is False

Reason:

The predictions on the Milage and top-speed are false but we fail to reject i.e., they would be deviating from the specifications.

In this case the customers would want an refund and it would incur in loss for the company. Apart of the loss in financial this would effect the brand name as well

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

Price: -0.795026441

Mileage: 8.306331092

Top speed: -0.018572564 (not significant as p value is more than 0.05)

Equation:

Sales = Inercept + b1*Price + b2*Mileage + b3*Top speed

**Sales = 50.7231271792463 -0.795026440875324* Price +
8.30633109237939 *Mileage**

Predicted Sales(in units): 227.8972261 (in 1000 units)

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

Regression coefficients

Price: -0.186728172

Mileage: 0.041301187 (not significant as p value is more than 0.05)

Top speed: 0.220801682

Equation:

Sales = Inercept + b1*Price + b2*Mileage + b3*Top speed

**Sales = -13.4476488883451 -0.186728172116573* Price + 0.22080168203862
*Top Speed**

Predicted Sales(in units): 25.26484928(in 1000 units)

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

Overall predicted profit

Rocinante36 Model: ₹ 2278.972261 Crores

Marengo32 Model: ₹ 2021.187943 Crores

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 more profits hence investing in Rocinante36 is a better option.

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 will have an increase in prices with the overall projected profits increasing to Rs.4557.944523 Crores. This could be due to this model being known for their value for money and good mileage. This is economical and people would still prefer this car until they want a luxurious car.

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?

For Rocinante :

adjusted R-squared value for old regression model is 0.995356039

adjusted R-squared value for new regression model is 0.995447556

For Marengo :

adjusted R-squared value for old regression model is 0.84787522

adjusted R-squared value for new regression model is 0.853091209

There is a increase in the Adjusted R square value in the new regression model this can be due to the dropping of the insignificant variables.