

**Econometrics Project**

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**Dataset**

We used a dataset containing a business's sales, advertising budget and seasonal index for this assignment. The data is a daily data in the form of 730x4.A table with numbers and text

Description automatically generated

Bk.1- First 10 row of data.

The libraries we used in project.

A screen shot of a computer

Description automatically generated

**Codes and Analysis**

A screenshot of a computer screen

Description automatically generated

In the graph the first part(blue) shows daily sales values. Sales are with mean approximately 60. We cannot observe any trend. The second part(green) shows daily advertising budget over time. Advertising budget value center around 200. Again we cannot observe any trend. The last part(yellow) shows seasonal index over time. We see seasonal cycles around fourth quarter.

A screenshot of a computer program

Description automatically generated

The first model is lin-lin model. We observe R square 0.724 and the other variables statisticly significant. The model performs good but we try to find better model. The condition number is large, 2.98e+03. This might indicate that there are strong multicollinearity or other numerical problems.

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Description automatically generated

The second one is log-log model. We observe R square value 0.726 and again both variable statisticly significant. This model is better then the first model. We can understand that from AIC(Akaike) and BIC(bayesian) criterias. No multicollinearity observed.

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Description automatically generated

The last model is log-lin model. We observe R square 0.724 same as lin-lin model. So from this we already can understand it is less preferable.

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T-Test

H-0 : The coefficient of the variable is zero (no effect).

H-1 : The coefficient of the variable is not zero (has an effect).

Both predictors are highly statistically significant. It shows with p-values being lower than 0.05. So H-0 is rejected. The predictors has an effect.

**F Test**

A computer code with numbers and letters

Description automatically generated

H-0 : All coefficients are zero (model has no explanatory power).

H-1 : At least one coefficient is non-zero (the model explains variance).

The F value is is huge(953.129) and bigger than the table value. That conclude H-0 is rejected. The model is statistically significant overall.

**MacKinnon, White, Davidson(MWD) Test**

**A computer screen shot of a program

Description automatically generated**

H-0 : The model is correctly specified.

H-1 : The model is not correctly specified.

The p-value is 0.974 which is biggr than 0.05. so we expect the null hypothesis.The model is correctly specified.

**Unit Root Test (ADF)**

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Description automatically generated

H-0: The series has a unit root (non-stationary).

H-1: The series does not have a unit root (stationary).

When we look at the values, we observed the data is stationary. So null hypothesis is rejected.(H-0 reject)

**Multicollinearity TestA screen shot of a computer

Description automatically generated**

If VIF values bigger than 10 it indicates multicollinearity. If its lower, its more preferable. Values for predictors are low which indicates no multicollinearity.

**Wald Test**

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Description automatically generated

H-0 : The coefficients of all predictors are jointly equal to zero

H-1 : At least one of the coefficients is not zero

Reject H-0 At least one predictor significantly contributes to the model.

**Chow Test**

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Description automatically generated

H-0: No structural break.

H-1 : Structural break exists.

We fail to reject the null hypothesis because of p-value being bigger 0.05.(H-0 not reject)

**Park Test**

**A screenshot of a computer

Description automatically generated**

H\_0 : Homoscedasticity .

H\_1 : Heteroscedasticity .

H-0 not reject. Residual variance is constant. The log-log model satisfy homoscedasticity.

**Goldfeld Test**

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Description automatically generated

H-0 : Homoscedasticity (constant variance).

H-1 : Heteroscedasticity (variance is not constant).

We again tested the variance state of the data. So we guaranteed that data is homoscedastic.

**Durbin Watson Test**

**A screen shot of a computer code

Description automatically generated**

H-0 : No autocorrelation in residuals.

H-1 : Autocorrelation exists in residuals.

The statistic range is 1.5 to 2.5. Our value is 1.90, which falls into the accept range. So no autocorrelation indicated. H-0 is not rejected.