**Time Series**

**Homework #3**

Answer Sheet Summary

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Q1. Intercept = **10.8873** Interpretation: Intercept indicates the log value of sales when value of month is 0 or further months are not considered for calculation, i.e. only for Dec 2002.

Slope = **0.03742** Interpretation: The trend represents the change in log sales value with unit change in time, i.e. month.

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Q2. Statistic1: R-square = **~0.83** Interpretation: The R-square represents the proportion of variation of the data explained by the model. In this case, it’s ~83% which signifies a good model.

Statistic2: Root Mean Squared Error (RMSE) = **0.33415** Interpretation: RMSE signifies the average deviation of the predicted value from actual value, i.e. the average error.

Q3. Test of L: **No** as residuals don’t have a constant level across time, seem to be non-linear in nature as per Ram Sey Test.

Test of H: **Yes** as the squared values of residuals remain constant across time, verifying homoscedasticity with Spec based test.

Test of I: **No** as per Durbin Watson test, P<DW=<0.001 : reject negative autocorrelation, P>DW = 1 : don’t reject positive autocorrelation, thus residuals are not independent

Test of N: **Yes** as all the four tests fail to reject the null hypothesis, and thus residuals follow a normal distribution.

Q4. Change in SS (Sum of squares) = 39.85-38.32 = **1.53** (new-previous)

Numerator of Wald statistic = 1.53/11 = **~0.14** (Change in SS/DF)

Denominator of Wald statistic = 0.10634

Value of Wald statistic = 1.30712

Critical point for Wald test = 1.96

Decision: Wald statistic < critical point, thus can’t reject null hypothesis about M1-M11.

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Q5. Change in SS (Sum of squares) = **1.59**

Numerator of Wald statistic = 1.59/12 = **0.13**

Denominator of Wald statistic = **0.06673**

Value of Wald statistic = **1.98**

Critical point for Wald test = **1.96**

Decision: Wald statistic slightly greater than critical point, thus can reject null hypothesis.

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Q6. (a) Equation: **log\_sales = 0.30824\*lag\_log\_sales1 + 0.30290\* lag\_log\_sales12 + 0.00688\*trend + 4.71716**

(b) Increase in SS = 14.37 – 13.29 = **1.08**

(c) Proportion = 1.08/1.587 = **68.11%**

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Q6.5 Equation: **log\_sales = 0.36300 \*lag\_log\_sales1 + 0.40401\* lag\_log\_sales12 + 3.10113**

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Q7. R-square = (4 digits) **0.8050**

Q8. Number of predictors =  **2** with predictors: lag\_log\_sales1, lag\_log\_sales12

Q9.

1. RESET

|  |  |  |  |
| --- | --- | --- | --- |
| Power | Statistic | p-value | p < 0.05? (Yes/No) |
| 2 | 0.0051 | 0.9432 | No |
| 3 | 0.0029 | 0.9971 | No |
| 4 | 0.6280 | 0.6003 | No |

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(b) White

|  |  |  |  |
| --- | --- | --- | --- |
| d.f. | Statistic | p-value | p < 0.05? (Yes/No) |
| 5 | 8.67 | 0.1231 | No |

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(c) Durbin-Watson

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Order | DW | Pr < DW | p-value < 0.05? (Yes/No) | Pr > DW | p-value < 0.05? (Yes/No) |
| 1 | 2.1164 | 0.6118 | No | 0.3882 | No |

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(d) Shapiro-Wilk

|  |  |  |  |
| --- | --- | --- | --- |
| Test | Statistic | p-value | p < 0.05? (Yes/No) |
| Shapiro-Wilk | 0.9675 | 0.1295 | No |

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10. Forecast = log\_sales = 0.36300 \*lag\_log\_sales1 + 0.40401\* lag\_log\_sales12 + 3.10113

= 0.36300\*13.184 + 0.40401\*13.1397+ 3.10113 = 13.195

Thus sales = exp(13.195) = **537669.85**