

B: Estimations

1. Comment on Durbin-Watson statistic, and what this implies for OLS assumptions. (2 points)

Explanation: The Durbin-Watson statistic value is $1.321 < 2$. This value suggests the presence of positive autocorrelation in the residuals, as a value close to 2 would indicate no autocorrelation. Autocorrelation in the residuals violates the OLS assumption of independent errors, which can affect the efficiency of the OLS estimates.

Answer: The Durbin-Watson statistic of 1.321 indicates potential positive autocorrelation in the residuals, violating the OLS assumption of independent errors.

2. Comment on Jarque-Bera statistic, and what this implies for the OLS assumptions. (2 points)

Explanation: The Jarque-Bera (JB) statistic is extremely high (159948.347) with a p -value of approximately 0, indicating that the residuals are not normally distributed. This violates the OLS assumption of normally distributed errors, which is particularly relevant for small samples. In large samples, this violation may have less impact due to the Central Limit Theorem.

Answer: The very high Jarque-Bera statistic suggests that the residuals are not normally distributed, violating the OLS assumption of normality in the error terms.

3. What coefficients are significant at 5% level of significance? List variable names. (3 points)

Explanation: To determine the significant coefficients at the 5% level, we look at the p -values. Variables with p -values less than 0.05 are considered statistically significant:

- Nonoperatingmarginin (p -value = 0.000)
- Agriculture Forestry And Fishing (p -value = 0.065, not significant at 5%)
- Construction (p -value = 0.000)
- Insurance And Real Estate (p -value = 0.166, not significant at 5%)
- Retail Trade (p -value = 0.000)
- Services (p -value = 0.002)
- Transportation Communications Electric Gas And Sanitary Service (p -value = 0.027)

Answer: The significant coefficients at the 5% level are Nonoperatingmarginin, Construction, Retail Trade, Services, and Transportation Communications Electric Gas And Sanitary Service.

4. What does the p -value of F -statistic imply? (2 points)

Explanation: The p -value is effectively 0, indicating strong evidence against the null hypothesis that all coefficients are jointly equal to zero. This means the model as a whole is statistically significant and that at least some of the independent variables explain the variability in the dependent variable.

Answer: A large F -statistic with a near-zero p -value indicates that the regression model is effective in explaining the variation in the dependent variable, suggesting that the independent variables are jointly significant.

5. Why is adjusted R -square lower than R -square? (3 points)

Explanation: The former adjusts the latter to account for the number of predictors in the model, penalizing the addition of variables that do not significantly improve the model. This is called the penalty factor. When additional variables are included that don't improve the model fit, the adjusted R -square will be lower than the R -square, as it corrects for the possible inflation of R -square from adding irrelevant predictors.

Answer: Adjusted R -square is lower than R -square because it penalizes the inclusion of additional predictors that do not significantly improve the model, providing a more accurate measure of model fit by adjusting for the number of predictors.