Homework 1: Quiz format for True/False and Multiple Choice

Started: May 25 at 8:50pm

Quiz Instructions

Due: May 29 at 11:59 p.m. Eastern

Attention: You only have **ONE** attempt to answer the True/False and Multiple Choice questions.

Question 1 — 1.5 pts

[1.2 Estimation Method] The estimated simple linear regression coefficient, $\hat{\beta}_0$, measures the strength of a linear relationship between the predicting and response variables.

- ◯ True
- ◯ False

Question 2 — 1.5 pts

[1.2 Estimation Method] In simple linear regression models, we lose three degrees of freedom when estimating the variance of the error terms because of the estimation of the three model parameters $\beta_0,\ \beta_1, \sigma^2$.

- ◯ True
- ◯ False

Question 3 — 1.5 pts

[1.2 Estimation Method] In simple linear regression, the sampling distribution for the variance estimator is χ^2 (chi-squared) regardless of whether the assumptions of the model hold or not.

- ◯ True
- ◯ False

Question 4

1.5 pts

[1.2 Estimation Method] In simple linear regression, a negative value of β_1 is consistent with an inverse relationship between the predicting variable and the response variable.

- ◯ True
- ◯ False

Question 5

1.5 pts

[1.4 Statistical Inference] In simple linear regression, $\hat{\beta}_1$ is an unbiased estimator for β_0.

- ◯ True
- ◯ False

Question 6

1.5 pts

[1.4 Statistical Inference] If the assumptions of a simple linear regression model hold, then the estimator for the variance of the error terms, $\hat{\sigma}^2$, is a random variable.

- ◯ True
- ◯ False

Question 7

1.5 pts

[1.4 Statistical Inference] Under the normality assumption, the estimated simple linear regression coefficient, $\hat{\beta}_1$, is a linear combination of normally distributed random variables.

- ◯ True
- ◯ False

Question 8

1.5 pts

[1.5 Statistical Inference Data Example] The p-value of a hypothesis test is interpreted as the probability of rejecting the null hypothesis.

- ◯ True
- ◯ False

Question 9

1.5 pts

[1.7 Regression Line: Estimation & Prediction Examples] In simple linear regression, the prediction interval of one member of the population will always be wider than the

corresponding confidence interval of the mean response for all members of the population when using the same predicting value.

- ◯ True
- ◯ False

Question 10 1.5 pts

[1.8 Diagnostics] In simple linear regression, the normality assumption states that the response variable is normally distributed.

- ◯ True
- ◯ False

Question 11 1.5 pts

[1.8 Diagnostics] With the Box-Cox transformation, we do not transform the response variable when $\lambda = 0$.

- ◯ True
- ◯ False

Question 12 1.5 pts

[1.10 Diagnostics and Model Evaluation Examples] In simple linear regression, we assess the constant variance assumption by plotting the response variable against fitted values.

- ◯ True
- ◯ False

Question 13 — 1.5 pts

[2.2 Estimation Method] An ANOVA model with a qualitative predicting variable containing k groups will have $k + 1$ parameters to estimate.

- ◯ True
- ◯ False

Question 14 — 1.5 pts

[2.2. Estimation Method] In ANOVA, the linearity assumption is assessed using a QQ-plot of the residuals.

- ◯ True
- ◯ False

Question 15 — 1.5 pts

[2.4 Test for Equal Means] In ANOVA, the mean sum of squared errors (MSE) measures variability within groups.

- ◯ True
- ◯ False

Question 16 1.5 pts

[2.6. Model Fit Assessment] The quantile-quantile normal plot of the residuals is the only tool available for assessing the normality assumption in ANOVA.

- ◯ True
- ◯ False

Question 17 1.5 pts

[2.8 Data Example] In ANOVA, if the constant variance assumption does not hold, the statistical inference on the equality of the means will not be reliable.

- ◯ True
- ◯ False

Question 18 1.5 pts

[2.8 Data Example] In ANOVA, if the pairwise comparison interval between groups does not include zero, we conclude that the two means are plausibly equal.

- ◯ True
- ◯ False

Multiple Choice

Question 19

1.5 pts

[1.4 Statistical Inference] In simple linear regression, given that the variance of the error terms (σ^2) is unknown, the sampling distribution of $\hat{\beta}_0$ is a

- ◯ chi-squared distribution
- ◯ t-distribution
- ◯ normal distribution
- ◯ None of the above

Question 20

2 pts

[1.4 Statistical Inference] To test if a regression coefficient is less than a critical value, c, we conduct a one-sided test on the _____ tail of a _____ distribution.

- ◯ left, t
- ◯ left, Chi-squared
- ◯ right, normal
- ◯ right, t
- ◯ None of the above

Question 21

1.5 pts

[1.9 Outliers and Model Evaluation] A data point far from the mean of both the x's and y's is always:

- ◯ an influential point and an outlier

- ◯ a leverage point and an influential point
- ◯ an outlier and a leverage point
- ◯ None of the above

Question 22

2 pts

[2.4 Test for Equal Means] In ANOVA, when testing for equal means across groups, the alternative hypothesis can be stated as,

- ◯ the means of all pairs of groups are different
- ◯ the means of all groups are equal
- ◯ the means of at least one pair of groups is different
- ◯ None of the above

Question 23

2 pts

[2.4 Test for Equal Means] The F-test for equal means is a _____ tailed test with _____ and _____ degrees of freedom, where k is the number of groups and N is the total sample size.

- ◯ one, k-1, N-k
- ◯ one, k, N-k
- ◯ two, k-1, N-k
- ◯ two, k, N-1
- ◯ None of the above

The following output was captured from the summary output of a simple linear regression model that relates the duration of an eruption with the waiting time since the previous eruption.

```
Coefficients:
             Estimate   Std. Error t value  Pr(>|t|)
(Intercept) -1.374016       A        -1.70  0.045141 *
waiting      0.043714     0.011098    B     0.000052 ***
---
Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.4965 on 270 degrees of freedom
Multiple R-squared: 0.8115, Adjusted R-squared: 0.8108
F-statistic: 1162 on 1 and 270 DF, p-value: < 2.2e-16
```

Question 24

2 pts

[1.4 Statistical Inference] Using the table above, what is the standard error of the intercept, labeled **A**, and rounded to three decimal places?

- ◯ 2.336
- ◯ 0.808
- ◯ 0.806
- ◯ -0.806
- ◯ None of the above

Question 25

2 pts

[1.4 Statistical Inference] Using the table above, what is the t-value of the coefficient for *waiting*, labeled **B**, and rounded to three decimal places?

- ◯ 3.939

- ◯ 3.931
- ◯ 3.935
- ◯ None of the above

Not saved Submit Quiz