

## DM-Spring-2020-Q2-Grade

88.24% (15/17)

- ✓ 1. Select the intercept-only models, if any:
- ☐ A  $y=b_0+b_1*x$
  - ☐ B  $y=b_0+b_1*x_1+b_2*x_2$
  - ☒ C  $\ln(y)=b_0$
  - ☐ D  $y=e^{(b_1*x)}$
  - ☐ E I do not know
- ✗ 2. The interpretation of adjusted  $R^2$  for multiple linear regression is the same as the interpretation of  $R^2$  for simple linear regression.
- ☒ A True
  - ☐ B False
  - ☐ C I do not know
- ✓ 3. Which one is observable ("visible")?
- ☒ A  $e$  (residuals)
  - ☐ B  $\varepsilon$  (regression error)
  - ☐ C neither
  - ☐ D I do not know
- ✓ 4. The estimation of  $\beta$  is distributed as:
- ☐ A  $b \sim N(0, \sigma^2)$
  - ☐ B  $b \sim N(\beta, \sigma^2)$
  - ☒ C  $b \sim N(\beta, \sigma^2(X^T X)^{-1})$
  - ☐ D It does not have distribution
  - ☐ E I do not know

✓ 5. How many parameters are estimated by OLS in the case of simple linear regression?

- ☐ A 1
- ☐ B 2
- ☒ C 3
- ☐ D I do not know

✗ 6. Estimation of  $e$  (residuals) is distributed as:

- ☒ A  $e \sim N(0, \sigma^2)$
- ☐ B  $e \sim N(0, \sigma^2 M)$  ( $M$  is a matrix)
- ☐ C It does not have distribution
- ☐ D I do not know

✓ 7.  $b$  parameters can be computed using only

- ☐ A OLS
- ☐ B ML
- ☒ C Neither
- ☐ D I do not know

✓ 8. In the case of multiple linear regression

- ☒ A  $\text{adj } R^2 < 1$  (always)
- ☐ B  $\text{adj } R^2 \leq 1$  (always)
- ☐ C I do not know

✓ 9.  $b =$

- ☒ A  $(X'X)^{-1}X'Y$
- ☐ B  $(X'X)^{-1}Y'X$
- ☐ C  $(Y'X)^{-1}Y'X$
- ☐ D I do not know

✓ 10. The total sum of squares equals

- ☒ A  $\text{Sum}((y - \text{mean}(y))^2)$
- ☐ B  $\text{Sum}((\hat{y} - \text{mean}(y))^2)$
- ☐ C  $\text{Sum}((y - \hat{y})^2)$
- ☐ D I do not know

- ✓ 11. The regression sum of squares equals
- ☐ A  $\text{Sum}((y - \text{mean}(y))^2)$
  - ☒ B  $\text{Sum}((\hat{y} - \text{mean}(y))^2)$
  - ☐ C  $\text{Sum}((y - \hat{y})^2)$
  - ☐ D I do not know
- ✓ 12. If RSS is the regression sum of squares and ESS is the error sum of squares then
- ☒ A  $R^2 = 1 - \text{ESS}/\text{TSS}$
  - ☐ B  $R^2 = \text{ESS}/\text{TSS}$
  - ☐ C  $R^2 = \text{ESS}/\text{RSS}$
  - ☐ D I do not know
- ✓ 13. Multicollinearity occurs when
- ☒ A  $\text{rank}(X) < m$  ( $m$  is the number of explanatory variables)
  - ☐ B  $\text{var}(\epsilon) = \sigma^2 I$
  - ☐ C  $E(\epsilon) = 0$
  - ☐ D  $\text{cov}(\epsilon_i, \epsilon_j) = \text{const}$
  - ☐ E I do not know
- ✓ 14. In simple linear regression model response variable ( $y$ ) can be
- ☐ A binary
  - ☐ B categorical
  - ☒ C numeric
  - ☐ D ordinal
  - ☐ E I do not know
- ✓ 15. In a simple linear regression model, explanatory variables can be
- ☐ A binary
  - ☐ B categorical
  - ☐ C numeric
  - ☐ D ordinal
  - ☐ E I do not know
  - ☒ F all answers are correct
  - ☐ G Neither

✓ 16. If  $A$  is a matrix,  $X$  is the vector of random variables, then  $\text{var}(AX) =$

- ☒ A  $A'\text{var}(X)A$
- ☐ B  $A^2\text{var}(X)$
- ☐ C  $\text{var}(x)$
- ☐ D Can not be calculated
- ☐ E I do not know

✓ 17. Which of the answers can be used to conclude about the significance of variables (if any)?

- ☒ A t values
- ☐ B Estimated coefficients (only)
- ☐ C SE of estimated coefficients (only)
- ☐ D I do not know