

INFO 7374 MACHINE LEARNING IN FINANCE

ASSIGNMENT VI

1. Which of the following phenomenon tell you that there might be multicollinearity in X ?
 - i. None of the regression coefficients are significant.
 - ii. All of the regression coefficients are significant.
 - iii. R^2 is high.
 - iv. R^2 is low.
 - v. Variance of β is large and sensitive to changes in data and outliers.
 - vi. Variance of β is small and insensitive to changes in data and outliers.

A. i, iii and v
B. ii, iv and vi
C. ii, iii and v
D. i, iv and vi
2. When there is multicollinearity in X , which of the following statements about $\hat{\beta}_{OLS}$ is wrong?

A. $\hat{\beta}_{OLS}$ is no longer BLUE estimator.
B. Variance of $\hat{\beta}_{OLS}$ is inflated by the Variance-Inflating Factor (VIF).
C. Multicollinearity could be detected by auxiliary regression.
D. Multicollinearity could be avoided using Principal Component Analysis.
3. When there is heteroskedasticity in X , which of the following statements about $\hat{\beta}$ is wrong?

A. $\hat{\beta}_{OLS}$ is no longer efficient, $\hat{\beta}_{GLS}$ is efficient.
B. $\hat{\beta}_{GLS}$ is the BLUE estimator: consistent and efficient, $var(\hat{\beta}_{GLS}) \leq var(\hat{\beta}_{OLS})$.
C. Assume σ_t is known, confidence intervals based on OLS will be unnecessarily larger. the t and F tests are likely to give us inaccurate results in that $var(\hat{\beta}_2)$ is overly large. A statistically insignificant coefficient may in fact be significant.
D. Assume σ_t is unknown, $\hat{\beta}_{OLS}$ is the BLUE estimator.
4. Which of the following tests could help you test heteroskedasticity except?

A. Spearman's Rank Correlation Test
B. White's General Heteroscedasticity Test
C. Durbin-Watson Test
D. Breusch-Pagan-Godfrey Test

5. When there is autocorrelation in u_t , which of the following statements about $\hat{\beta}$ is wrong?
- $\hat{\beta}_{OLS}$ is not BLUE.
 - $var(\hat{\beta}_{AR})$ are likely to be wider than those based on the GLS procedure.
 - To establish confidence intervals and to test hypotheses, one should use GLS and not OLS even though the estimators derived from the latter are unbiased and consistent.
 - The residual variance $\hat{\sigma}^2 = \sum \hat{u}_t / (T - 2)$ is likely to overestimate the true σ^2 .
6. Which of the following tests could help you test autocorrelation except?
- Graphical Method
 - Goldfeld-Quandt Test
 - The Runs Test (Geary Test)
 - Durbin Watson Test
7. Which of the following Shrinkage Methods (Factor Section) has a closed form-solution of $\hat{\beta}$?
- LASSO
 - Least Angel Regression (LARS)
 - Ridge Regression
 - Elastic Net
8. Which of the following is the objective function of Elastic Net?

$$A. \hat{\beta} = \underset{\beta}{argmin} \left\{ \frac{1}{2} \sum_{t=1}^T \left(Y_t - \beta_0 - \sum_{j=1}^k x_{tj} \beta_j \right)^2 + \lambda \sum_{j=1}^k |\beta_j| \right\}$$

$$B. \hat{\beta} = \underset{\beta}{argmin} \left\{ \sum_{t=1}^T \left(Y_t - \beta_0 - \sum_{j=1}^k x_{tj} \beta_j \right)^2 + \lambda \sum_{j=1}^k \beta_j^2 \right\}$$

$$C. \hat{\beta} = \underset{\beta}{argmin} \left\{ \frac{1}{2} \sum_{t=1}^T \left(Y_t - \beta_0 - \sum_{j=1}^k x_{tj} \beta_j \right)^2 + \lambda \sum_{j=1}^k (\alpha \beta_j^2 + (1 - \alpha) |\beta_j|) \right\}$$

$$D. \hat{\beta} = \underset{\beta}{argmin} \left\{ \sum_{t=1}^T \left(Y_t - \beta_0 - \sum_{j=1}^k x_{tj} \beta_j \right)^2 + \lambda \sum_{j=1}^k \beta_j \right\}$$

9. You Portfolio manager asks you to hedge the fluctuation in Bitcoin using S&P 500 futures, the standard deviation of Bitcoin price change is \$10, the standard deviation of S & P 500 futures change is \$25, the correlation between the two is 0.30. What is the minimum variance hedge ratio?
- A. 0.12
 - B. 0.75
 - C. 0.50
 - D. 0.24
10. Which of the following properties about principal components of X are wrong?
- A. Sum of the variance of the principal components equals to the sum of the variance of X .
 - B. Correlations among principal components are 0.
 - C. The 1st PC explains the largest fraction of the sum of the variances of rates. The 2nd PC explains the next largest fraction.
 - D. PCA was mainly used in empirically based hedges for single positions. Hedging for large portfolios mainly relies on regression-based hedge.