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Economics 422

Quiz 1

1. (10 points) An estimator $\widehat{\mu}_Y$ of the population mean μ_Y is unbiased if

   a. $\overline{Y}$ has the smallest variance of all estimators.

   b. $\widehat{\mu}_Y \xrightarrow{p} \mu_Y$.

   c. $E\left[\widehat{\mu}_Y\right] = \mu_Y$.

   d. $\widehat{\mu}_Y = 0$.

2. (10 points) Suppose that $Y_1, Y_2, ..., Y_n$ denotes an *i.i.d.* sample from a population with mean μ_Y and variance σ_Y^2, and let $\overline{Y} = \frac{1}{n}\sum_{i=1}^{n} Y_i$ be the sample mean. Then, each of the following is true except

   a. $E\left[\overline{Y}\right] = \mu_Y$.

   b. $E\left[\overline{Y}\right] > E\left[Y_1\right]$.

   c. $\overline{Y}$ is efficient among linear, unbiased estimators.

   d. $\overline{Y}$ is a random variable.

3. (10 points) The expected value of a discrete random variable

   a. is the outcome that is most likely to occur.

   b. always equals $\frac{1}{n}\sum_{i=1}^{n} Y_i$

   c. is computed as a weighted average of the possible outcomes of that random variable, where the weights are the probabilities associated with the individual outcomes.

   d. equals the population median.

4. (10 points) Let X and Y be two random variables with covariance denoted by σ_{xy} and standard deviations denoted by σ_x and σ_y, respectively. Which of the cases listed below does not necessarily imply that X and Y are uncorrelated

a. $E[Y|X] = 0$.

b. $|\sigma_{xy}| \leq \sigma_x \sigma_y$.

c. X and Y are independent.

d. X and Y have zero covariance.

5. (10 points) An estimator $\widehat{\mu}_Y$ of the population mean μ_Y is more efficient when compared to another estimator $\widetilde{\mu}_Y$ if

a. $E[\widehat{\mu}_Y] < E[\widetilde{\mu}_Y]$.

b. $var(\widetilde{\mu}_Y) = 0$.

c. the probability distribution of $\widetilde{\mu}_Y$ is more concentrated around μ_Y than that of $\widehat{\mu}_Y$.

d. both estimators are unbiased, and $var(\widehat{\mu}_Y) < var(\widetilde{\mu}_Y)$.

6. (10 points) Suppose that $Y_1, Y_2, ..., Y_n$ denotes an $i.i.d.$ sample from a population with mean μ_Y and variance σ_Y^2, and let $\overline{Y} = \frac{1}{n}\sum_{i=1}^{n} Y_i$ be the sample mean. Then, the standard deviation of $\overline{Y}$ is given by

a. $\sigma_Y/\sqrt{n}$.

b. $\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(Y_i - \overline{Y}\right)^2}$.

c. σ_Y^2/n.

d. $\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(Y_i - \overline{Y}\right)^2}$.

7. (10 points) Two random variables X and Y are independently distributed if all of the following conditions hold, with the exception of

a. $\Pr(Y = y|X = x) = \Pr(Y = y)$.

b. knowing the value of one of the variables provides no information about the other.

c. if the conditional distribution of Y given X equals the marginal distribution of Y.

d. $E(Y) = E[E(Y|X)]$.

8. (10 points) A type I error is

a. always 5%.

b. the error you make in failing to reject the null hypothesis when it is in fact false.

c. has probability smaller than that of type II error.

d. the error you make when rejecting the null hypothesis when it is true.