Lecture 5 Friday PP: 20 + 21 January 20

10 MT Lecture notes 10 MH Show answers to other problems Explain solution to Problem 4

## 20

## Application of Rules to Find $E(ar{X})$ & Var $(ar{X})$

Suppose that  $X_1, X_2, \dots, X_n$  are a random sample from a distribution with

mean  $\mu$  and standard deviation  $\sigma$ . Then

$$E(\bar{X}) = E\left(\frac{\Sigma X_{i}}{\pi}\right) = E\left(\frac{\Sigma}{\pi}\right) \times_{i=1}^{n} X_{i} = \sum_{i=1}^{n} \frac{1}{n} E(X_{i})$$

$$= \sum_{i=1}^{n} (\frac{1}{n} \mu_{i}) = n \cdot (\frac{1}{n} \mu_{i}) = \mu_{i} \cdot \sum_{i=1}^{n} \frac{1}{n} E(X_{i})$$

$$= \sum_{i=1}^{n} (\frac{1}{n} \sigma^{2}) = n \cdot (\frac{1}{n} \mu_{i}) = \mu_{i} \cdot \sum_{i=1}^{n} \frac{1}{n} E(V_{i})$$

$$= \sum_{i=1}^{n} (\frac{1}{n} \sigma^{2}) = n \cdot (\frac{1}{n} \pi^{2}) = \frac{1}{n} \sum_{i=1}^{n} \frac{1}{n} E(V_{i})$$

$$= \sum_{i=1}^{n} (\frac{1}{n} \sigma^{2}) = n \cdot (\frac{1}{n} \pi^{2}) = \frac{1}{n} \sum_{i=1}^{n} \frac{1}{n} E(V_{i})$$

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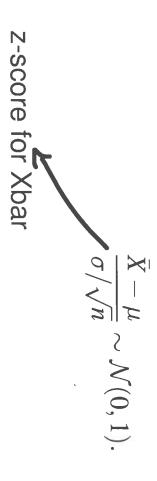
$$= \sum_{i=1}^{n} (\frac{1}{n} \pi^{2}) = n \cdot (\frac{1}{n} \pi^{2}) = \frac{1}{n} \sum_{i=1}^{n} \frac{1}{n} E(X_{i})$$

expected value  $\mu$  and standard deviation  $\sigma$ Suppose we draw a random sample of size n from a population with

Let  $\overline{X}$  be the mean of the sample. Then:

showed on previous page

- The mean of the distribution of  $\bar{X}$  is equal to  $\mu$ .
- The standard deviation of the distribution of  $\bar{X}$  is equal to  $\sigma/\sqrt{n}$ .
- If n is large, then the distribution of  $\bar{X}$  is approximately normal (Central distribution of X is exactly normal for any sample size nIn either case, we use the following as if it were exactly true: Limit Theorem), and if the distribution of the X's is normal, the



variable, so it has a probability distribution; we call it the "sampling distribution" of Xbar. Concept. The statistic Xbar, before drawing the sample, is a random

That that both Scenarios (i) of (ii) involve the event you get at least 60% /feals in a squence of tosses of a fair coin, with (i) n=100 tosses or (ii) n=1000.

Connider (i). Let Xi = {\intermediate} its toss is Head

Connider (ii). than the proposition of Heads is 100 2 1 T T T T How?

and E(T) = .5, Van(T) = \frac{1}{100} = \frac{5}{100} \text{Too} = \frac{5}{100} \text{Vino}

Then asked the CLT to get the approx. pure. that T > .66 Mich mext. Start of a solution involving CLT: use wither the central first shorem or the face of averages in your solution (but not the exact hinomial distribution). HWOI Problem # 4 (Students-who missed this guestion and guestion and HWOI may rework this question and re-submit it w/ HWOI, for full credit toward thuoI