Sampling Distributions:(6.4)

- 1) Sampling Distributions of sample Mean \bar{x}
- 2) Sampling Distribution of the sample Proportion \hat{p} :
- 3) Sampling Distribution of the two sample means $\bar{x}_1 \bar{x}_2$
- 4) Sampling Distribution of the two sample Proportions $\hat{p}_1 \hat{p}_2$

(ask <u>about probability of sample statistics</u> \bar{x} , \hat{p} , $\bar{x}_1 - \bar{x}_2$, $\hat{p}_1 - \hat{p}_2$)and give information about population parameters

Steps to answer:

- Compute means $(\mu_{\bar{x}}, \mu_{\bar{x}_1-\bar{x}_2}, \mu_{\hat{p}}, \mu_{\hat{p}_1-\hat{p}_2})$
- Compute variance $(\sigma_{\bar{x}}^2, \sigma_{\bar{x}_1-\bar{x}_2}^2, \sigma_{\hat{p}}^2, \sigma_{\hat{p}_1-\hat{p}_2}^2)$
- Compute standard deviation or "sd" Standard error s.e " $(\sigma_{\bar{x}}, \sigma_{\bar{x}_1-\bar{x}_2}, \sigma_{\hat{p}}, \sigma_{\hat{p}_1-\hat{p}_2})$

• Use $Z = \frac{varac}{standard\ error}$, (<u>Standard\ deviation = Standard\ error</u>)

<u>Symbol</u>

	sample	population
mean	\bar{x}	μ
variance	s ²	σ^2
Standard deviation	S	σ
proportion	\hat{p}	р

Estimate population parameters

- point estimate
- interval estimate

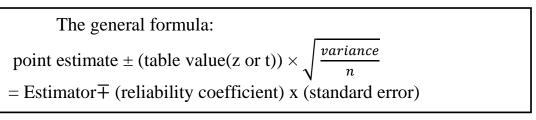
point estimate:

Point estimate for (μ) is \bar{x} Point estimate for (σ) is S Point estimate for (p) is \hat{p} Point estimate for $(\mu_1 - \mu_2)$ is $\bar{x}_1 - \bar{x}_2$ Point estimate for $(p_1 - p_2)$ is $\hat{p}_1 - \hat{p}_2$

Interval estimate(ch6)

- 1) interval for population mean μ
- 2) interval for two population means $\mu_1 \mu_2$ (not related)
- 3) interval for population proportion **p**
- 4) interval for two population proportions p_1 - p_2
- 5) interval for two population means μ_1 - μ_2 (related or paired)(in chapter 7)

(ask about population parameters μ , μ_1 - μ_2 , **p**, p_1 - p_2 and give information about sample statistics)



 $\begin{array}{ll} s_p^2 = & estimate \ pooled \ common \ variance \\ s_p = estimate \ pooled \ common \ Standard \ deviation \\ z_{1,\frac{\alpha}{2}} & , \ t_{1,\frac{\alpha}{2}} = \mbox{reliability coefficient} \ , \ table \ value \\ \bar{p} = \mbox{pooled estimate proportion} \end{array}$

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Test Hypotheses (ch7)

- 1) test for population mean μ
- 2) test for two population means $\mu_1 \mu_2$ (not related) note: degree of freedom for T is $(df = n_1 + n_2 - 2)$ (when use T-test)
- 3) test for population proportion **p**
- 4) test for two population proportions p_1-p_2
- 5) test for two population means $\mu_1 \mu_2$ (related or paired) note: degree of freedom for T is (df = n - 1)

ask about population parameters μ , μ_1 - μ_2 , p, p_1 - p_2 and give information about sample statistics

<u>Steps</u>

- 1) data
- 2) assumptions
- 3) hypotheses
- 4) test statistic
- 5) decision
- 6) conclusion

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Paired Sample

- 1) Confidence interval
- 2) test hypotheses

1)Confidence interval(Paired or related population)

Use
$$\overline{D} \pm t_{1-\frac{\alpha}{2},n-1} \frac{s_D}{\sqrt{n}}$$
 (df=n-1)
And
 $\overline{D} = \frac{\sum_{i=1}^n D_i}{n}$ (mean of difference)
 $s_D^2 = \frac{\sum_{i=1}^n (D_i - \overline{D})^2}{n-1}$ (variance of difference)
 $s_D = \sqrt{s_d^2}$ (standard deviation of difference)

2) Test hypotheses(Paired or related population)

1) data 2)Assumption: normal + paired 3)Hypotheses: we have three cases <u>Case I</u>: H₀: $\mu 1 = \mu 2 \rightarrow \mu_1 - \mu_2 = 0 \rightarrow \mu_d = 0$ $H_{A}: \mu_{1 \neq} \mu_{2} \rightarrow \mu_{1} - \mu_{2 \neq 0} \rightarrow \mu_{d} \neq 0$ e.g. we want to test that the mean for first population is different from second population mean. <u>Case II</u>: H₀: $\mu 1 = \mu 2 \rightarrow \mu_1 - \mu_2 = 0 \rightarrow \mu_d = 0$ $H_{A}: \mu_{1} > \mu_{2} \longrightarrow \mu_{1} - \mu_{2} > 0 \longrightarrow \mu_{d} > 0$ e.g. we want to test that the mean for first

population is greater than second population mean.

 $\begin{array}{rcl} \underline{\text{Case III}}:H_0: & \mu \ 1 = \mu 2 & \rightarrow & \mu_1 - \mu_2 & = \ 0 & \rightarrow & \mu_d = \ 0 \\ H_A: & \mu_1 & < & \mu_2 & \rightarrow & \mu_1 - & \mu_2 & _{<0} \rightarrow & \mu_d < \ 0 \\ \text{e.g. we want to test that the mean for first population is} \\ \text{less than second population} \end{array}$

4)Test:

$$T = \frac{\overline{D}}{\frac{S_d}{\sqrt{n}}}$$

 $\frac{5)\text{Decision}}{\text{Reject }H_0 \text{ if :}}$ Case1:

$$T_c < -T_{1-\frac{\alpha}{2},n-1} \text{ or } T_c > T_{1-\frac{\alpha}{2},n-1}$$

Case2:

$$T_c > T_{1-\alpha,n-1}$$

Case3:

$$T_c < -T_{1-\alpha,n-1}$$