STAT 200 Review Sheet

FACTORS INFLUENCING CONFIDENCE INTERVALS

Confidence Interval for the Mean	$\bar{x} \pm z_{\alpha/2} \frac{s}{\sqrt{n}}$ $\quad \bar{x} \pm t_{\alpha/2,\, n-1 d.f.} \frac{s}{\sqrt{n}}$
Confidence Interval for a Proportion	$\hat{p} \pm z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}}$

FACTOR	FACTOR	WHEN FACTOR GETS SMALLER	REASON	EXAMPLE
n	sample size	C.I. gets larger	Smaller sample size means a larger standard error and less certainty	$25/\sqrt{50} = 3.54$ $25/\sqrt{500} = 1.12$
α	Type I error	C.I. gets larger	If you accept smaller Type I error, i.e., the probability that a C.I. will not contain the mean, you have to allow for a larger C.I. to be that sure	$Z_{.05/2} = 1.96$ $Z_{.01/2} = 2.575$
1-α	% C.I.	C.I. get smaller	A smaller % C.I. means you are willing to accept more Type I error, so we can have a tighter C.I.	95% C.I. uses $Z_{.05/2} = 1.96$ 99% C.I. uses $Z_{.01/2} = 2.575$
σ or s	Std Dev of Population; Std Dev of sample	C.I. gets smaller	If the population has less variability the sampling distribution will also have less variability	$25/\sqrt{50} = 3.54$ $5/\sqrt{50} = .71$

FACTORS INFLUENCING A HYPOTHESIS TEST

Test Statistic for a Mean	$z^* = \frac{(\bar{x} - \mu_o)}{(s/\sqrt{n})}$ or $t^* = \frac{(\bar{x} - \mu_o)}{(s/\sqrt{n})}$
Test Statistic for a Proportion Note: P_o comes from the Null Hypothesis	$z^* = \frac{(\hat{p} - p_o)}{\sqrt{\frac{p_o q_o}{n}}}$

FACTOR	FACTOR	WHEN FACTOR GETS SMALLER	REASON	EXAMPLE
n	Sample size	Test Statistic gets smaller	Smaller sample size means larger standard error. Tthe denominator of the test statistic will be larger, and z* or t* will be smaller	$25/\sqrt{50} = 3.54$ $25/\sqrt{500} = 1.12$
α	Type I error	Test Statistic unchanged Rejection region z gets larger	The rejection region gets larger making it more difficult to reject H_o	$Z_{.05/2} = 1.96$ $Z_{.01/2} = 2.575$
One or 2-Tailed Test	Nature of Alternative Hypothesis	Test Statistic unchanged Rejection region z gets smaller with 1-tailed test	With a one-tailed test, all of α is put into the one tail	Two-Tailed $Z_{.05/2} = 1.96$ One Tailed $Z_{.05} = 1.645$
σ or s	Std Dev of Population; Std Dev of sample	Test Statistic gets larger	If the population has less variability, the sampling distribution has less variability, and denominator of the T.S. is smaller	$25/\sqrt{50} = 3.54$ $5/\sqrt{50} = .71$

DIFFERENCE OF MEANS FORMULAS

Standard Error estimate for Large Sample Difference of Means	$\hat{\sigma}_{(\bar{x}_1-\bar{x}_2)} = \sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}$
Confidence Interval for Large Sample Difference of Means	$(\bar{x}_1-\bar{x}_2) \pm z_{\alpha/2}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}$
Test Statistic for Large Sample Difference of Means Note: D_o comes from the Null Hypothesis	$z^* = \frac{(\bar{x}_1-\bar{x}_2)-D_o}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$
Standard Error estimate for Small Sample Difference of Means **Assumes:** Independent random samples approximate normal distribution $\sigma_1 = \sigma_2$ so we pool our estimate	$s_p^2 = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}$ $\hat{\sigma}_{(\bar{x}_1-\bar{x}_2)} = \sqrt{s_p^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}$
Confidence Interval for Small Sample Difference of Means	$(\bar{x}_1-\bar{x}_2) \pm t_{\alpha/2,\, n_1+n_2-2\, d.f.}\sqrt{s_p^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}$
Test Statistic for Small Sample Difference of Means Note: D_o comes from the Null Hypothesis	$t^* = \frac{(\bar{x}_1-\bar{x}_2)-D_o}{\sqrt{s_p^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$

DIFFERENCE OF PROPORTIONS FORMULAS

Standard Error estimate for Large Sample Difference of Proportions for Hypothesis Test If we have a null hypothesis where the two proportions are equal: We pool the estimate of p_p because under the null hypothesis we assume that $p_1 = p_2$ Pool estimate of p, where x_1 and x_2 are the number of successes for each sample	$p_p = \frac{(x_1+x_2)}{(n_1+n_2)}$ $\hat{\sigma}_{(p_1-p_2)} = \sqrt{p_p q_p\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}$
Test Statistic for Large Sample Difference of Proportions Note: D_o comes from the Null Hypothesis	$z^* = \frac{(p_1-p_2)-D_o}{\sqrt{p_p q_p\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$
Confidence Interval for Large Sample Difference of Proportions	$(p_1-p_2) \pm z_{\alpha/2}\sqrt{\frac{p_1q_1}{n_1}+\frac{p_2q_2}{n_2}}$