Introduction to Social Statistics
Summary of Estimation and Hypothesis Testing

1. Point and Interval Estimation

Parameter	Point Estimates	Estimated Standard Error	100(1-a)% C.I. (Large Sample)
Mean μ	$\overline{Y}$	$\hat{s}_{\overline{Y}} = \frac{s}{\sqrt{n}}$	$\overline{Y} \pm z_{a/2}\hat{s}_{\overline{Y}}$
Proportion π	p = X/n	$\hat{s}_p = \hat{s}_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$	$p \pm z_{a/2}\hat{s}_p$
Difference of Means ($\mu_2 - \mu_1$)	$\overline{Y}_2 - \overline{Y}_1$	$\hat{s}_{\overline{Y}_2 - \overline{Y}_1} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$	not covered yet
Difference of Proportions ($\pi_2 - \pi_1$)	$p_2 - p_1$	$\hat{s}_{p_2 - p_1} = \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$	not covered yet

2. Hypothesis Testing

A. Univariate Tests for Large Samples

Steps	Mean	Proportion
1. Assumptions	Random Sample, Interval Variable, Large Sample	Random Sample, Categorical Variable, Large Sample
2. Hypotheses	H_0: $\mu = a$ H_a: $\mu \neq a$ or H_a: $\mu < a$ or H_a: $\mu > a$	H_0: $\pi = a$ H_a: $\pi \neq a$ or H_a: $\pi < a$ or H_a: $\pi > a$
3. Test Statistic	$z = \frac{\overline{Y} - a}{\hat{s}_{\overline{Y}}}$	$z = \frac{p - a}{\hat{s}_p}$
4. p-value	Use Table A: If H_a is a two sided test give area in both tails; if H_a is one-sided, give area from one-tail.	
5. Conclusion	Reject H_0 (accept H_a), if p-value is below some "conventional" level of significance (usually .05 in the social sciences).	

B. Bivariate Tests for Large Samples

Steps	Difference of Means	Difference of Proportions
1. Assumptions	Two Interval Variables, Large Independent Samples	Two Categorical Variables, Large Independent Samples
2. Hypotheses	H_0: $\mu_1 = \mu_2$ H_a: $\mu_1 \neq \mu_2$ or H_a: $\mu_1 < \mu_2$ or H_a: $\mu_1 > \mu_2$	H_0: $\pi_1 = \pi_2$ H_a: $\pi_1 \neq \pi_2$ or H_a: $\pi_1 < \pi_2$ or H_a: $\pi_1 > \pi_2$
3. Test Statistic	$z = \frac{\overline{Y_2} - \overline{Y_1}}{\hat{s}_{\overline{Y_2} - \overline{Y_1}}}$	$z = \frac{p_2 - p_1}{\hat{s}_{p_2 - p_1}}$
4. p-value	Use Table A: If H_a is a two sided test give area in both tails; if H_a is one-sided, give area from one-tail.	
5. Conclusion	Reject H_0 (accept H_a), if p-value is below some "conventional" level of significance (usually .05 in the social sciences).	