Chapter 9

• X-s are normally distributed or n is large enough, σ is known. The interval

$$\left[\bar{X} - z_{\alpha/2}\frac{\sigma}{\sqrt{n}}, \bar{X} + z_{\alpha/2}\frac{\sigma}{\sqrt{n}}\right]$$

is a $(1-\alpha)$ confidence interval for μ.

One-sided confidence intervals:

$$\left[\bar{X} - z_{\alpha}\frac{\sigma}{\sqrt{n}}, \infty\right), \quad \left(-\infty, \bar{X} + z_{\alpha}\frac{\sigma}{\sqrt{n}}\right]$$

• X-s are normally distributed, σ is unknown. $(1-\alpha)$ confidence interval for μ is

$$\left[\bar{X} - t_{\alpha/2,n-1}\frac{S}{\sqrt{n}}, \bar{X} + t_{\alpha/2,n-1}\frac{S}{\sqrt{n}}\right].$$

It can be also used when X-s are not normally distributed but n is large.

• $100(1-\alpha)\%$ prediction interval of a future observation. Normal sample or large sample, μ is unknown.

If σ is known, then

$$\left[\bar{X} - z_{\alpha/2}\sigma\sqrt{1+\frac{1}{n}}, \bar{X} + z_{\alpha/2}\sigma\sqrt{1+\frac{1}{n}}\right].$$

If σ is unknown, then

$$\left[\bar{X} - t_{\frac{\alpha}{2},n-1}S\sqrt{1+\frac{1}{n}}, \bar{X} + t_{\frac{\alpha}{2},n-1}S\sqrt{1+\frac{1}{n}}\right].$$

• Two samples (of sizes n_1 and n_2 which are large enough for the normal approximation) with expectations μ_1, μ_2 and variances σ_1^2, σ_2^2. $(1-\alpha)$ confidence interval for $\mu_1 - \mu_2$.

If σ_1^2, σ_2^2 are known, then

$$\left[\bar{X} - \bar{Y} - z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}, \bar{X} - \bar{Y} + z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}\right].$$