## Chapter 9

- $X_1, ..., X_n$ are normally distributed. $(1-\alpha)$ confidence interval for $\sigma^2$

$$\left[\frac{(n-1)S^2}{\chi^2_{\alpha/2}}, \frac{(n-1)S^2}{\chi^2_{1-\alpha/2}}\right].$$

- Two samples. Confidence interval for the ratio of two variances $\sigma_1^2/\sigma_2^2$

$$\left[\frac{S_1^2}{S_2^2}\frac{1}{f_{\frac{\alpha}{2},n_1-1,n_2-1}}, \frac{S_1^2}{S_2^2}f_{\frac{\alpha}{2},n_2-1,n_1-1}.\right]$$

- Maximum likelihood estimator

$$\hat{\theta}: \quad L(X_1, ..., X_n) \to \max$$

where $L$ is the likelihood function.

## Chapter 10

- A statistical hypothesis is an assertion or conjecture concerning one or more populations.

It is formulated as one assertion against another assertion, that is there are a null hypothesis $H_0$ and an alternative hypothesis $H_1$.

Decisions: a) $H_0$ is rejected, b) $H_0$ is not rejected.

- A test: the test statistic (a function of the data) and the critical region. If the test statistic belongs to the critival region, $H_0$ is rejected.

| | $H_0$ is true | $H_0$ is false |
|---|---|---|
| $H_0$ is rejected | Type I error | Correct decision |
| $H_0$ is not rejected | Correct decision | Type II error |

The level of significance is $\alpha = P(\text{Type I error})$. The power is $1-\beta$ where $\beta = P(\text{Type II error})$.