Decision Theory

- Decisions about population based on sample information are called statistical decisions
- The decision are based on hypotheses
- Hypotheses .... Statistical assumptions made about a population .... True or not true
- True hypotheses are called Null while an hypotheses that is untrue is called alternative hypotheses
- Examples are to be discussed in the classroom
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Test of Hypotheses and significance

- Procedures that are used to enable us decide whether to accept or reject an hypotheses and determine if samples are significantly different from each other statistically ..... Called tests of hypotheses, test of significance or rule of decisions
- Errors in Decision Making
- Type I error
  - Rejecting an hypotheses when it should be accepted
- Type II error
  - Accepting an hypotheses when it should be rejected

  ** A way to minimize error in decision making is the have an enlarged sample size
- Level of Significance
  - THE MAXIMUM PROBABILITY that the experimenter is willing to take in order to risk a Type I error is called the level of significance
  - This must be decided before the commencement of data collection
  - In practice it is usually 0.01 and 0.05 …….. 1% and 5% respectively
  - Alternatively we can call it a confidence level of 99% and 95% respectively

Tests Involving Normal Distribution

- Use a normal distribution curve standardized value deignated by Z
- Decision making
  - Reject test hypotheses when z-score lies outside the range at the significant level on the normal distribution curve
  - Accept the hypotheses lies within the range on the normal distribution curve
- One tailed or Two Tailed Tests
  - Interesrt in one extreme of the distribution currve is known as a one-tailed test
  - When interest is on two extremes we have a two-tailed test
  - eg... when testing if one method is better than the other we have a one-tailed test however, if the test is whether there is a difference betwenn two methods then we are talking of a two tailed test. Since it could be better or worse (two extremes)
- Values of normal distribution z is given in a table to be distributed in Class and used with examples

Small Sampling Theory

- Small samples have sample size N less than 30 …… usually called exact sampling theory
- Distribution used (test ststistics)
  - Student's "t" test using t-test formula
  - Chi-square test using chi-square formula
- Used to test hypotheses
- Using means and differences between means
- Examples and test statistics are as illustrated and discussed in class room

Test involving differences of Means

Examples

1. To test the efficacy of a new process line in the production of garri, experiment were set up using process A and process B. The cyanide contents of samples from the processes were used in comparison. The mean cyanide content of process A was 0.125 mg/mg with a set of 0.021, while that of process B was 0.205 mg/mg with standard deviation of 0.05.
   i. Is there any significant difference between the two processes at 5% and 1% level of significance
   ii. Is the new process better than the old process at 5% level of significance

   The number of samples in process 1 and 2 are 100 and 150 respectively
2. In the second semester examination result showed that 68% passed AGE 304 while 52% passed AGE 308. The number of students offering AGE 304 and 308 are 52 and 60 respectively.

   Determine at 5% significant level if
   i. There is a difference between the performances in both courses
   ii. The candidates preferred AGE 304 and 308

Correlation Theory

- Simple correlation
- Simple regression
- Multiple correlation
- Multiple regression
- Linear correlation
- Least square regression lines
- Coefficient of Correlation

Example

An experimental data set obtained by varying the speed of rotation of an oil shaft at a constant temperature with the output quantity measured as shown in Table1.

a. Find the least square line representing the data set
b. Draw a scatter diagram

Table 1Experimental result obtained from oil expeller at 340oC							
Shaft speed (rpm)	50	70	90	150	210	270	350
Oil Yield (kg)	240.5	290.0	330.5	420.3	510.0	590.0	650.0