

## Measuring the Power of a Hypothesis Test

It is quite important to know how well a hypothesis test is working. The measure of how well the test is working, is called the *power of the test*.

In hypothesis testing  $\alpha$  and  $\beta$  (the probabilities of type I and type II errors) should both be small. Type I error occurs when we reject a null hypothesis that is true and  $\alpha$  (the significance level of the test) is the probability of making a type I error. Once a significance level is decided nothing can be done about  $\alpha$ . Type II error occurs when we accept a null hypothesis that is false, the probability of type II error is  $\beta$ . The smaller the  $\beta$ , the better it is. Alternatively  $(1-\beta)$ , *i.e.*, the probability of rejecting a null hypothesis when it is false, should be as large as possible.

Since rejecting a null hypothesis when it is false is exactly what a good test ought to do, a high value of  $1 - \beta$  (something near 1) means the test is working quite well. (it is rejecting the null hypothesis when it is false). A low value of  $1 - \beta$  (something near 0) means that the test is working very poorly (it is not rejecting the null hypothesis when it is false).  $(1 - \beta)$  is the measure of how well the test is working and is called power of the test. If we plot the values of  $(1 - \beta)$  for each value of  $\mu$  for which the alternative hypothesis is true, the resulting curve is known as a *power curve*.