**Note for testing gene-environment interaction.**



Where is a measurement of environment of the -th individuals.







Let 

, ,



where  and .

 (8)

and its variance is

. (9)

where

.

**Test Statistics**

An essential problem in genetic interaction studies of the quantitative trait is to test the interaction between two genomic regions (or genes). Formally, we investigate the problem of testing the following hypothesis:

,

which is equivalent to testing the hypothesis:

,

Let be the matrix corresponding to the parameter of the variance matrix Var (in equation (9). Define the test statistic for testing the interaction between gene and environment as

. (10)

Then, under the null hypothesis, is asymptotically distributed as a centraldistribution if components are taken in the expansion equation (6).