```
> fruit = read.table("grapefruit1.data",header=T)
> attach(fruit)
> sales = cbind(sales1,sales2,sales3)
> salesd = cbind(sales1-sales2,sales2-sales3)
> summary(manova(lm(salesd ~ 1)),test="Wilks",intercept=T)
            Df   Wilks approx F num Df den Df   Pr(>F)
(Intercept)  1  0.0919  29.6609      2      6 0.000775 ***
Residuals    7
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
> # Hotelling's T-squared for H0: L mu = h
> HTest = function(datta,L,h=0)
+       {
+       HTest = numeric(5)
+       names(HTest) = c("T-squared","F","df1","df2","p-value")
+       xbar = apply(datta,2,mean)
+       n = dim(datta)[1]; k = dim(datta)[2]; r = dim(L)[1]
+       if(dim(L)[2] != k) stop("L and data matrix incompatible sizes")
+       T2 = n * t(L%*%xbar-h) %*% solve(L%*%var(datta)%*%t(L)) %*% (L%*%xbar-h)
+       T2 = as.numeric(T2); F = (n-r)/(r*(n-1)) * T2
+       pval = 1-pf(F,r,n-r)
+       HTest = c(T2,F,r,n-r,pval)
+       names(HTest) = c("T-squared","F","df1","df2","p-value")
+       round(HTest,5)
+       } # End function HTest
>
> LL = rbind(c(1,-1,0),
+            c(0,1,-1))
> HTest(sales,LL)
T-squared         F       df1       df2   p-value
 69.20887  29.66094   2.00000   6.00000   0.00077
> fruit3 = read.table("grapefruit3.data",header=T); fruit
  Store sales1 sales2 sales3
1     1   62.1   61.3   60.8
2     2   58.2   57.9   55.1
3     3   51.6   49.2   46.2
4     4   53.7   51.5   48.3
5     5   61.4   58.7   56.6
6     6   58.5   57.2   54.3
7     7   46.8   43.2   41.5
8     8   51.2   49.8   47.9
> attach(fruit3)


> salesd = cbind(sales1-sales2,sales2-sales3)
> salesave = (sales1+sales2+sales3)/3
> anova(lm(salesave~Size)) # Main effect for size
Analysis of Variance Table

Response: salesave
          Df  Sum Sq Mean Sq F value Pr(>F)
Size       1  11.520  11.520  0.2918 0.6085
Residuals  6 236.875  39.479
> # Now main effect for price, and interaction
> summary(manova(lm(salesd ~ Size)),test="Wilks",intercept=T)
            Df   Wilks approx F num Df den Df   Pr(>F)
(Intercept)  1  0.0908  25.0481      2      5 0.002481 **
Size         1  0.8088   0.5909      2      5 0.588334
Residuals    6
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```