MANOVA

Multivariate Measures: In most of the statistical programs used to calculate MANOVAs there are four multivariate measures: Wilks lambda, Pillai's trace, Hotelling-Lawley trace and Roys largest root. The difference between the four measures is the way in which they combine the dependent variables in order examine the amount of variance in the data.

MANOVA

Wilks lambda demonstrates the amount of variance accounted for in the dependent variable by the independent variable; the smaller the value, the larger the difference between the groups being analyzed. 1 minus Wilks lambda indicates the amount of variance in the dependent variables accounted for by the independent variables.

MANOVA

Pillai's trace is considered the most reliable of the multivariate measures and offers the greatest protection against Type I errors with small sample sizes.

MANOVA

Pillai's trace is the sum of the variance which can be explained by the calculation of discriminant variables. It calculates the amount of variance in the dependent variable which is accounted for by the greatest separation of the independent variables. The Hotelling-Lawley trace is generally converted to the Hotellings T-square.

MANOVA

Hotellings T is used when the independent variable forms two groups and represents the most significant linear combination of the dependent variables. Roys largest root, also known as Roys largest eigenvalue, is calculated in a similar fashion to Pillai's trace except it only considers the largest eigenvalue (i.e. the largest loading onto a vector). As the sample sizes increase the values produced by Pillais trace, Hotelling-Lawley trace and Roys largest root become similar. As you may be able to tell from these very broad explanations, the Wilks lambda is the easiest to understand and therefore the most frequently used measure.

MANOVA

Multivariate F value: This is similar to the univariate F value in that it is representative of the degree of difference in the dependent variable created by the independent variable. However, as well as being based on the sum of squares (as in ANOVA) the calculation for F used in MANOVAs also takes into account the covariance of the variables.

MANOVA

Wilks' lambda is a test statistic used in multivariate analysis of variance (MANOVA) to test whether there are differences between the means of identified groups of subjects on a combination of dependent variables.

MANOVA

- For example, in the paper above, the authors test whether the mean score of two groups, graduates and diplomates, is the same across eight constructs simultaneously.
- Thus, they are considering eight dependent variables and comparing the mean of this combination for two groups.

MANOVA

Wilks' lambda performs, in the multivariate setting, with a combination of dependent variables, the same role as the F-test performs in one-way analysis of variance. Wilks' lambda is a direct measure of the proportion of variance in the combination of dependent variables that is unaccounted for by the independent variable (the grouping variable or factor).

MANOVA

If a large proportion of the variance is accounted for by the independent variable then it suggests that there is an effect from the grouping variable and that the groups (in this case the graduates and diplomates) have different mean values.

MANOVA

Wilks' lambda statistic can be transformed (mathematically adjusted) to a statistic which has approximately an F distribution. This makes it easier to calculate the P-value. Often authors will present the F-value and degrees of freedom, as in the above paper, rather than giving the actual value of Wilks' lambda.

MANOVA

There are a number of alternative statistics that can be calculated to perform a similar task to that of Wilks' lambda, such as Pillai's trace criterion and Roy's gcr criterion; however, Wilks' lambda is the most widely used. Everitt & Dunn (1991) and Polit (1996) provide more detail about the use and interpretation of Wilks' lambdaWilks' lambda is a test statistic used in multivariate analysis of variance (MANOVA) to test whether there are differences between the means of identified groups of subjects on a combination of dependent variables.

MANOVA

For example, in the paper above, the authors test whether the mean score of two groups, graduates and diplomates, is the same across eight constructs simultaneously. Thus, they are considering eight dependent variables and comparing the mean of this combination for two groups.

MANOVA

Wilks' lambda performs, in the multivariate setting, with a combination of dependent variables, the same role as the F-test performs in one-way analysis of variance. Wilks' lambda is a direct measure of the proportion of variance in the combination of dependent variables that is unaccounted for by the independent variable (the grouping variable or factor). If a large proportion of the variance is accounted for by the independent variable then it suggests that there is an effect from the grouping variable and that the groups (in this case the graduates and diplomates) have different mean values.

MANOVA

Wilks' lambda statistic can be transformed (mathematically adjusted) to a statistic which has approximately an F distribution. This makes it easier to calculate the P-value. Often authors will present the F-value and degrees of freedom, as in the above paper, rather than giving the actual value of Wilks' lambda.

MANOVA

There are a number of alternative statistics that can be calculated to perform a similar task to that of Wilks' lambda, such as Pillai's trace criterion and Roy's gcr criterion; however, Wilks' lambda is the most widely used. Everitt & Dunn (1991) and Polit (1996) provide more detail about the use and interpretation of Wilks' lambda