

Chawanee Suphirat 2009: Efficiency Comparisons of the Four Statistical Tests for Treatment Effects in Analysis of Covariance on Factorial Designs. Master of Science (Statistics), Major Field: Statistics, Department of Statistics. Thesis Advisor: Assistant Professor Boonorm Chomtee, Ph.D. 225 pages.

The objective of the research is to compare the efficiency of the four statistical tests for treatment effects in analysis of covariance on factorial designs : F-test which is parametric statistic, Q-test, MP-test and S-test which are nonparametric statistics by considering the ability of controlling type I error and the power of the tests. The data considered in the study are composed of 21 characteristics when the distributions of error are normal and nonnormal. Each case of data is generated by Monte Carlo simulation technique and repeated 1,000 times which each the distributions of error are both mean and variance equal to 100. The  $2^2$  factorial designs are used to study with the replications of 3,4,...,8 and  $3^2$  factorial designs with the replications of 3,4,5,6. The nominal significance level is 0.05. There are 2 parts of the results as following :

1. For the ability of controlling type I error : when the two-factors factorial designs are considered which each factor has two levels, F-test cannot control type I error when sample size (N) such as 12 and 16 but when N increases F-test tends to increase the ability of controlling type I error. Q-test and MP-test can control type I error similarly, although the sample size is small. For the two-factors factorial designs with each factor has three levels : F-test , Q-test and MP-test can control type I error. However, S-test cannot control type I error for any situations.

2. For power of the test : when the two-factors factorial designs are considered which each factor has two and three levels : F-test gives the highest power of the test. Next in rank is MP-test. Q-test provides the lowest power of the test. However when N increases, the value of power of all tests tends to increase.

In conclusion, although , the study results present that the suitable statistical tests for main effect A , B or interaction AB are different in each design. In overview, F-test which is parametric statistic still gives the high efficiency even though the data does not follow the assumptions of analysis of covariance. For Q-test and MP-test which are nonparametric statistics, these two tests can be used and suitable when the small sample size are 12, 16 or 20.

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Thesis Advisor's signature

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