

UNIVERSITY OF THE PHILIPPINES
STATISTICAL CENTER
DILIMAN

INFERENCE ON THE PARAMETERS OF A TWO-ERROR COMPONENTS
MODEL USING INCOMPLETE PANEL DATA

A DISSERTATION PRESENTED TO
THE FACULTY OF THE U.P. STATISTICAL CENTER
U.P. DILIMAN, QUEZON CITY

IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN STATISTICS

BY

EVELYN M. DEMOGENA

FEBRUARY, 1996

ABSTRACT

An inference procedure which addresses the problem of missing observations due to a rotating sampling scheme is proposed, based on Hsiao's (1986) single equation error components model defined by

$$y_{it} = \beta'x_{it} + v_{it}$$

where β and x_{it} are $k \times 1$ vectors of parameters and explanatory variables, respectively, and

$$v_{it} = \alpha_i + u_{it}$$

in which the error terms α_i and u_{it} are assumed to be independent of each other, are normally independently distributed with zero means and constant variances, σ_α^2 and σ_u^2 , respectively, and are uncorrelated with x_{it} .

Conditions for the proposed estimated generalized least squares estimator, $\hat{\beta}_{EGLS}$, to be asymptotically unbiased, consistent, asymptotically efficient, and asymptotically equivalent to the maximum likelihood estimator, $\hat{\beta}_{MLE}$, are given. Estimators of the variance components σ_u^2 and σ_α^2 proposed in this paper are also shown to be unbiased, consistent, and asymptotically efficient under certain conditions. The paper also discusses the efficiencies of the proposed estimators relative to the maximum likelihood estimators.

A test specifying whether a variance components model is more appropriate for panel data than an analysis of covariance model is also proposed in this paper. The test statistic is distributed, asymptotically, as chi-squared with k degrees of freedom. The power of the test is given.

As revealed by the results of the simulation experiments, the efficiencies of the proposed parameter estimators improve as either the sample size N increases for fixed T or the number of observation periods T increases for fixed N . These efficiencies, however, deteriorate as the drop-out rate, m/N , increases.

The sensitivity analysis showed that the proposed estimators are fairly resistant to outliers and bimodality.

The simulation results further showed that the power of the proposed specification test increases as either N or T is increased. The tail probability of the proposed test closely approximates the tail probability of the χ^2 distribution when $N \geq 30$ and $T \geq 9$. Again, the drop-out rate, however, causes the power of the test to deteriorate as the drop-out rate is increased. The test also suffers some degree of insensitivity when the α_i 's exhibit chaotic behavior.