DOCKET SECTION

UNITED STATES OF AMERICA
POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268-0001

Before Commissioners: Edward J. Gleiman, Chairman;
George W. Haley, Vice Chairman;
W.H. "Trey" LeBlanc III; George A. Omas

Postal Rate and Fee Changes Docket No. R97-1

NOTICE OF INQUIRY NO. 4 ON MAIL PROCESSING VARIABILITY

(Issued January 16, 1998)

The "fixed-effects" model of mail processing labor cost variability proposed by Postal Service witness Bradley in USPS-T-14 restricts the slope coefficients of his explanatory variables to be identical across facilities. Witness Bradley, however, did not formulate this restriction as an hypothesis and test it statistically. Evidence provided by OCA witness Smith (OCA-T-600) and UPS witness Neels (UPS-T-1) implies that if this hypothesis were tested statistically, the hypothesis would be rejected. Parties are requested to evaluate whether this restriction can be supported statistically. Responses are due within 21 days of the date of this Notice.

Prior to the filing of the parties' direct cases, several parties and the Commission had asked the Postal Service to elaborate upon the statistical support for the restriction that the fixed-effects model represents. For example, in part "a." of DMA/USPS-T-14-29 (Tr. 11/5287), witness Bradley was asked to refer to equation (5) on page 40 of USPS-T-14, and confirm that

> the fixed-effects estimator of the parameters of this equation restricts the slope coefficients (represented by the vector β) to be identical across facilities, while all of the time-invariant, facility-specific fixed effects operate through a facility-specific intercept shifter (the α_i).

Part "b." of the interrogatory asked

> [d]id you test this restriction against a more general alternative hypothesis that allows some or all of the slopes to vary across facilities? If so, please provide the results of this test. If not, please explain.

Witness Bradley's response confirmed that the fixed-effects estimator restricts the slope coefficients to be identical across facilities. He stated that he did not test this restriction against a more general alternative hypothesis that allows the slopes to vary because "the restriction of estimating a single slope coefficient from each econometric model accomplishes [his] goal" of "construction of a single variability for each cost pool." Tr. 11/5287. UPS/USPS-T-14-42, and Presiding Officer's Information Request No. 7, Question 1, also inquired about the statistical basis of the restriction that the fixed effects model represents.

OCA witness Smith and UPS witness Neels offer both conceptual and empirical grounds for rejecting witness Bradley's fixed effects of mail processing labor costs in favor of other forms of his model. On an empirical level, both argue that witness Bradley's fixed-effects model yields slope coefficients and variabilities that are not consistent with plots of the underlying data. OCA-T-600 at 21, 27; UPS-T-1 at 5, 40-44. Specifically, witness Smith argues that plots of the log of total piece handlings (TPH) and workhours for individual facilities imply that if regression lines were fit through these data, many of the resulting slopes would not be consistent with the fixed effects model that witness Bradley recommends.[1] Witness Smith describes this conclusion as "visually compelling but not precise" because he did not compute actual regressions. OCA-T-600 at 28. Witnesses Smith and Neels do not support their conclusions regarding the inconsistency of the fixed-effects model with the underlying data with a formal statistical test of the equality of these facility-level slopes.

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[1] OCA-T-600 at 27-28. The plots for four illustrative mail processing operations — manual letter cases, manual flat cases, Optical Character Readers, and Letter Sorting Machines appear in Exhibit OCA 603. All of the plots are presented in OCA-LR-9.

Visual inspection of the plots of individual facility data presented in OCA-LR-9 suggests that regression lines fit through them, using the model specification proposed by witness Bradley, would produce slope coefficients that are statistically different. The plots suggest that a test of the null hypothesis that the relationship between hours and TPH at these facilities is represented by regression lines that have common slope coefficients and differ only by a single facility-specific intercept (the fixed-effect) coefficient would be rejected. That is, these plots suggest that the data would reject the hypothesis that in the following generalized model, all of the site-specific vectors β_i are equal to a common vector β,

$$Y_{it} = \alpha_i + X_{it}\beta_i + \varepsilon_{it}$$

where (t = 1, ...T)
(i = 1, ...N)
(the vector X_{it} contains all of the regressors in witness Bradley's model on page 36 of USPS-T-14).

Interested parties are asked to evaluate whether this restriction is statistically supported.[2] They are requested to conduct a statistical test, such as an "F-test," of the stability of the regression slope coefficients across facilities, and to comment on the

[2] In Presiding Officer's Information Request No. 7, Question 1, the Postal Service was asked to run regressions for individual sites using witness Bradley's "fixed effects" model to estimate β_i for individual sites. Witness Bradley did this for only eight sites, asserting that it would take too long to separately review results of regressions for all sites, and arguing that multicollinearity invalidates the results of regressions for individual sites. (Tr. 19-E/9671-9736). This Notice asks interested parties to run regressions for individual facilities and apply an "F-test," or similar test, to the entire set of regression results for a given activity. It is not necessary to separately review regression results for each individual site before performing such a test, nor does the presence of multicollinearity invalidate such a test. *See* Arthur S. Goldberger, A Course in Econometrics, Harvard University Press, 1997 at 245-52. It should be noted that the β_i in the generalized model described here are not the site-specific variabilities that witness Bradley presents in Attachment 2 of his response to Presiding Officer's Information Request No. 7, Question 1. Witness Bradley derives those site-specific variabilities from his "fixed effects" model applied to the whole panel of data for a given activity. To obtain those site-specific variabilities, witness Bradley assumes the validity of his "fixed effects" model, and then evaluates it at various points that he interprets as corresponding to various individual facilities.

results. If they wish to minimize the effort involved, it would be appropriate to provide documentation of test results for only the four cost pools identified in OCA-LR-9.

By the Commission.

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Cyril J. Pittack
Acting Secretary