

BEFORE THE
POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268-0001

POSTAL RATE AND FEE CHANGES
PURSUANT TO PUBLIC LAW 108-18

Docket No. R2005-1

RESPONSE OF THE UNITED STATES POSTAL SERVICE TO
ITEMS 4-5 AND 7-14 OF
PRESIDING OFFICER'S INFORMATION REQUEST NO. 9
(July 6, 2005)

The United States Postal Service hereby provides the following responses to Presiding Officer's Information Request (POIR) No. 9, issued June 24, 2005. The following witnesses are sponsoring the identified responses in this document. Their responses have been expedited to allow inclusion with the rest of their discovery responses at hearings on July 7:

Witness Bradley: Questions 7, 8, 9, 10, 11, 12, 13, and 14

Witness Stevens: Questions 4 and 5

Each question is stated verbatim and is followed by the response. Responses of other witnesses to other items will be provided subsequently.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

By its attorneys:

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RESPONSE OF POSTAL SERVICE WITNESS STEVENS
TO POIR NO. 9, QUESTION 4

4. Please refer to the file "scan_rules.xls" in LR-K-133.
- a. Please confirm that allocation to time pools of 238 of the 530 listed scan pairs depends on information, or decision rules, separate from the information provided by the scan pair itself. For example, the allocation of the scan pair "Clock Off Other – Start Account Delivery" depends on whether the pair follows a "Leave Office" scan, an "Arrive Deviation Park Point" scan, an "End Section" scan, or an "Activity" scan.
 - b. What percent of total scan pairs were subjected to such decision rules?
 - c. Please provide the total amount of time associated with the scan pairs mentioned in b, immediately above.

RESPONSE:

- a. Confirmed.
- b. The time pool assignments for 18.7% of scan pairs were determined using decision rules.
- c. The total time associated with the scan pairs in subpart b is 54,428 hours.

Note that this time is not weighted.

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TO POIR NO. 9, QUESTION 5

5. Please refer to the file "scan_rules.xls" in LR-K-133.
- a. What percent of scan pairs subjected to a decision rule discussed in question 4, above, involve administrative activities such as other, break, emergency other, or lunch that were allocated to the category "Delivery?"
 - b. Please provide the total amount of time associated with the scan pairs described in subpart a.
 - c. What percent of scan pairs subjected to a decision rule described in subpart a involve administrative activities such as other, break, emergency other, or lunch that were allocated to the category "Activity?"
 - d. Please provide the total amount of time associated with the scan pairs described in subpart c, immediately above.
 - e. What percent of scan pairs discussed in number 4 above were allocated to the category "Delivery?"
 - f. Please provide the total amount of time associated with the scan pairs described in subpart e, immediately above.
 - g. What percent of scan pairs discussed in number 4 above were allocated to the category "Activity?"
 - h. Please provide the total amount of time associated with the scan pairs described in subpart g, immediately above.

RESPONSE:

- a. 14.7% of scan pairs subjected to decision rules were associated with administrative activities and were assigned to Delivery time pools.

Delivery time pools include Loop/Foot, Curblin, Dismount, NDCBU, VIM, and Centralized.
- b. The total time for the scan pairs in subpart a. is 14,728 hours.
- c. 0.1% of scan pairs subjected to decision rules was associated with administrative activities and was assigned to time pools for CCSTS defined carrier activities. Activities include general collections, express collections, relays, parcel delivery, and accountable delivery.
- d. The total time for scan pairs in subpart c. is 59 hours.

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- e. 55.0% of scan pairs subjected to decision rules were assigned to Delivery time pools. The 55.0% includes the scan pairs in subpart a.
- f. The total time for scan pairs in subpart e. is 35,300 hours.
- g. 0.1% of scan pairs subjected to decision rules was assigned to time pools for carrier activities. This includes the scan pairs in subpart c.
- h. The total time for scan pairs in subpart g. is 59 hours.

RESPONSE OF POSTAL SERVICE WITNESS BRADLEY
TO POIR NO. 9, QUESTION 7

7. Please refer to LR-K-81. Please confirm that a least-squares regression fit to a sample with improbably large outliers will be disproportionately influenced by those observations. Please provide the results of a suitable test for outliers for the full quadratic and restricted quadratic models performed with the sample data, along with documentation of these tests.

RESPONSE:

It is possible for one or a few observations to have a disproportionate influence in a least squares regression. This is particularly a problem in cross sectional data sets with few observations. However, as the size of the data set increases, the relative influence of one data point tends to fall.

A suitable test for outliers is the DFFIT statistic. It is computed as the difference between the predicted value for the i th observation and the predicted value from a model estimated with the i th observation removed, scaled by the standard error. (See, Green, William H., Econometric Analysis, Macmillan Publishing Co., New York, 1993 at 288.) An absolute value of the DFFIT statistic in excess of 2.0 is indication of a potential influential observation that deserves further scrutiny. The results of calculating the DFFIT statistics are presented below.¹ There were 3 observations that had a DFFIT greater than 2 for the full quadratic model, no observations that had a DFFIT greater than 2 for the restricted

¹ The SAS program, listing and log for calculating the DFFIT statistics are attached to this response as "Estimating Delivery Equations.Calculating DFFIT.sas", "Estimating Delivery Equations.Calculating DFFIT.lst" and "Estimating Delivery Equations.Calculating DFFIT.log"

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quadratic and one observation that had a DFFIT greater than 2 for the parcel/accountable model.

**Regular Delivery - Full
Quadratic**

Zip	Date	DFFIT
1797270	5/28/2002	-2.76983
3023743	6/11/2002	2.5813
2330822	5/28/2002	-2.27993

**Regular Delivery - Restricted
Quadratic**

Zip	Date	DFFIT
1797270	5/28/2002	-1.45701
3023743	6/11/2002	1.58346

P/A Delivery -Full Quadratic

Zip	Date	DFFIT
8131706	5/20/2002	2.99465

The econometric models were re-estimated with the potentially influence observations removed. Despite the fact that no observations had a DFFIT greater than 2.0, the restricted quadratic was re-estimated with the two observations with the largest DFFIT statistics removed.² The results suggest that the potential outliers are not having a disproportionate impact on the results; the

² The SAS program, listing and log for re-estimating the equations with potential influential observations removed are attached to this response as “Estimating Delivery Equations.Poss Influential Obs Removed.sas”, “Estimating Delivery Equations.Poss Influential Obs Removed.lst” and “Estimating Delivery Equations.Poss Influential Obs Removed.log”

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estimated variabilities are similar with the potentially influential observations removed.

RESPONSE OF POSTAL SERVICE WITNESS BRADLEY
TO POIR NO. 9, QUESTION 8

8. Please refer to LR-K-81. Please confirm that the t-values and other tests for significance witness Bradley has relied upon depend upon the assumption that the equation errors are approximately normal. Please provide the results of a suitable test for normality of residuals for the full and restricted quadratic models, along with documentation of these tests.

RESPONSE:

The variance/covariance matrix for the OLS estimator is given by:

$$V(b) = (X'X)^{-1} X'V(y)X(X'X)^{-1}, \text{ where } V(y)=\sigma^2I.$$

As suggested by the question, the error variance is typically assumed to be normal and constant so that:

$$V(b) = \sigma_{\varepsilon}^2(X'X)^{-1}.$$

This variance is the basis for the t-tests mentioned in the question. However, when these assumptions are violated, an alternative is to estimate robust standard errors, based upon the heteroskedasticity consistent covariance matrix.

The variance underlying the robust standard errors is given by:

$$V(b) = (X'X)^{-1} X'\Phi X(X'X)^{-1},$$

where $\Phi = \text{diag}[e_i^2]$, and the e_i are the OLS residuals. This is the approach that I took in calculating t-statistics for the full and restricted quadratic models presented in my testimony.

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A standard test for the normality of the residuals is the Jacque-Bera statistic,
given by:

$$JB = \frac{N-k}{6} \left(\omega^2 + \frac{(\kappa - 3)^2}{4} \right)$$

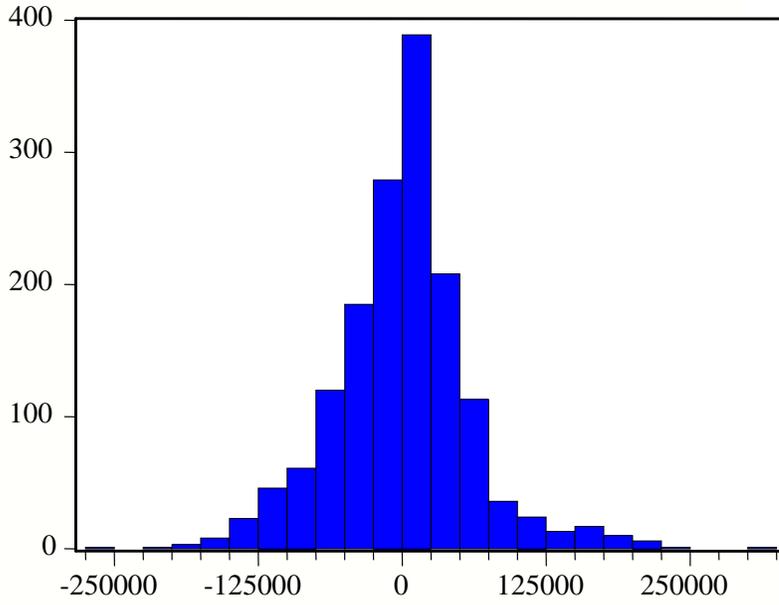
ω is a measure of skewness and κ is a measure of kurtosis. The Jacque-Bera
statistic is calculated below for both models:

	Full Quadratic	Restricted Quadratic
N	1545	1545
k	36	15
ω	0.268279	0.259572
κ	5.082959	5.484132
JB	290.90	410.58

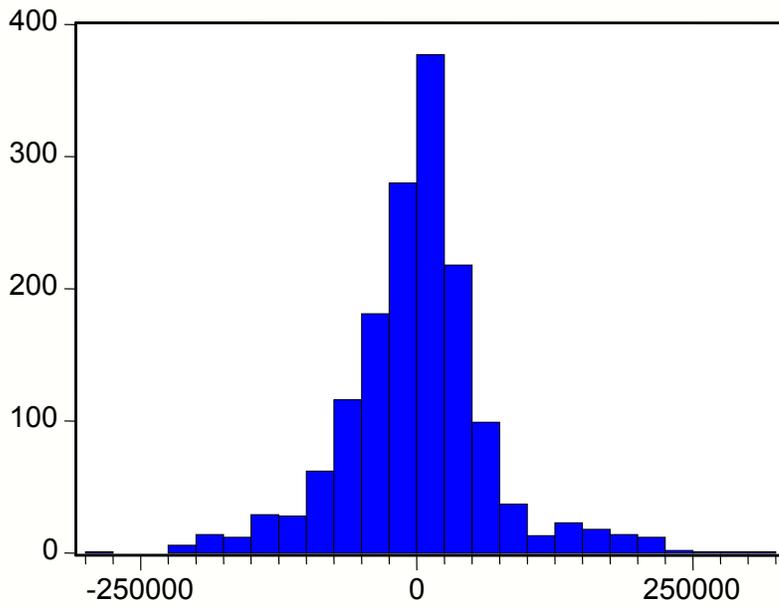
Both test statistics indicate rejection of normality. Analysis of the statistics reveals
that rejection does not occur due to asymmetry but to the fact that the residuals
are leptokurtic. This is demonstrated by the following plots:

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Full Quadratic Residuals:



Restricted Quadratic Residuals:



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TO POIR NO. 9, QUESTION 9

9. Please refer to LR-K-81. Please provide tests or other evidence that the Commission may rely on to confirm that the coefficients of the estimated parameters of witness Bradley's restricted quadratic model are not biased due to the omission of interaction terms. Please perform an appropriate test to determine whether the excluded interaction terms are correlated with the regressors remaining in the restricted quadratic model, along with documentation of this test.

RESPONSE:

In this instance, the Commission has the best possible evidence of the effect of omitting the interaction terms -- the estimation of the model with the terms included. Because both models (with and without the cross product terms) were estimated and presented before the Commission, it can directly assess the effect of omitting the interaction terms by comparing the results of the full quadratic model and the restricted quadratic model. The interactive terms were dropped to deal with the multicollinearity inherent in the full quadratic model. However, as the question points out, this approach raises the possibility of inducing bias. Thus, the selection of the model depends upon weighing the benefit from reducing the effect of multicollinearity with the cost of potentially inducing some bias. If one feels that benefits outweigh the costs, then one would select the restricted quadratic model. If one does not, then one would select the full quadratic model.

Given that the interaction terms are excluded to reduce multicollinearity, (a condition in which the right-hand-side variables are inter-correlated) one would expect the interaction terms to be correlated with remaining regressors. Indeed,

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the interaction terms are simply transformations on the included terms. Below I present the matrix of correlations between the included regressors (on the rows) and the excluded interaction terms (in the columns). Below each correlation coefficient is the p-value for the null hypothesis of no correlation.

	lf	lse	lcv	lspr	ldp	fse	fcv
let	0.85678 <.0001	0.37775 <.0001	0.50269 <.0001	0.78128 <.0001	0.90886 <.0001	0.32424 <.0001	0.46113 <.0001
let2	0.89447 <.0001	0.28365 <.0001	0.42846 <.0001	0.86051 <.0001	0.91252 <.0001	0.23139 <.0001	0.38115 <.0001
cf	0.86695 <.0001	0.29209 <.0001	0.42200 <.0001	0.60662 <.0001	0.67950 <.0001	0.37405 <.0001	0.55249 <.0001
cf2	0.91453 <.0001	0.20098 <.0001	0.37814 <.0001	0.63271 <.0001	0.65883 <.0001	0.28023 <.0001	0.52721 <.0001
seq	0.12284 <.0001	0.88722 <.0001	0.19021 <.0001	0.10605 <.0001	0.17143 <.0001	0.87188 <.0001	0.17768 <.0001
seq2	0.09984 <.0001	0.78055 <.0001	0.15850 <.0001	0.09850 0.0001	0.14221 <.0001	0.75533 <.0001	0.14730 <.0001
cv	0.17430 <.0001	0.18147 <.0001	0.80651 <.0001	0.15918 <.0001	0.16572 <.0001	0.17221 <.0001	0.72481 <.0001
cv2	0.06320 0.0130	0.07834 0.0021	0.61391 <.0001	0.08147 0.0013	0.06611 0.0093	0.05976 0.0188	0.46908 <.0001
spr	0.65389 <.0001	0.27026 <.0001	0.40834 <.0001	0.86214 <.0001	0.71580 <.0001	0.23618 <.0001	0.38471 <.0001
spr2	0.63609 <.0001	0.14048 <.0001	0.27396 <.0001	0.92374 <.0001	0.65193 <.0001	0.11534 <.0001	0.24589 <.0001
dp	0.61420 <.0001	0.34568 <.0001	0.37235 <.0001	0.60983 <.0001	0.84987 <.0001	0.29188 <.0001	0.35430 <.0001

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dp2	0.62973 <.0001	0.31569 <.0001	0.31606 <.0001	0.64053 <.0001	0.89798 <.0001	0.25896 <.0001	0.30416 <.0001
dens	0.00877 0.7305	-0.06177 0.0152	-0.06023 0.0179	-0.01771 0.4867	0.09739 0.0001	-0.06853 0.0070	-0.09437 0.0002
dens2	-0.00814 0.7491	-0.07714 0.0024	-0.05894 0.0205	-0.02404 0.3451	0.05819 0.0222	-0.08007 0.0016	-0.08429 0.0009
	fspr	fdp	scv	sspr	sdp	cspr	cdp
let	0.71967 <.0001	0.81136 <.0001	0.18891 <.0001	0.30325 <.0001	0.30994 <.0001	0.35412 <.0001	0.41448 <.0001
let2	0.74795 <.0001	0.77156 <.0001	0.11367 <.0001	0.21377 <.0001	0.21925 <.0001	0.27194 <.0001	0.31148 <.0001
cf	0.76043 <.0001	0.87638 <.0001	0.16077 <.0001	0.23913 <.0001	0.23743 <.0001	0.30507 <.0001	0.36405 <.0001
cf2	0.81469 <.0001	0.88559 <.0001	0.09219 0.0003	0.15364 <.0001	0.15076 <.0001	0.25553 <.0001	0.30139 <.0001
seq	0.09825 0.0001	0.15932 <.0001	0.69370 <.0001	0.87596 <.0001	0.90532 <.0001	0.15473 <.0001	0.23058 <.0001
seq2	0.08987 0.0004	0.13163 <.0001	0.66621 <.0001	0.82162 <.0001	0.78674 <.0001	0.13790 <.0001	0.19137 <.0001
cv	0.16506 <.0001	0.18282 <.0001	0.55461 <.0001	0.19100 <.0001	0.18223 <.0001	0.74541 <.0001	0.83552 <.0001
cv2	0.06795 0.0075	0.06240 0.0142	0.51876 <.0001	0.08066 0.0015	0.08071 0.0015	0.63543 <.0001	0.65845 <.0001
spr	0.83878 <.0001	0.68869 <.0001	0.18067 <.0001	0.33717 <.0001	0.26093 <.0001	0.46601 <.0001	0.40827 <.0001
spr2	0.87188 <.0001	0.61506 <.0001	0.08079 0.0015	0.18874 <.0001	0.13071 <.0001	0.35949 <.0001	0.25401 <.0001
dp	0.58187 <.0001	0.78335 <.0001	0.20947 <.0001	0.32672 <.0001	0.38317 <.0001	0.31686 <.0001	0.44138 <.0001

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dp2	0.60305 <.0001	0.81149 <.0001	0.17402 <.0001	0.29373 <.0001	0.35092 <.0001	0.26537 <.0001	0.37635 <.0001
dens	-0.03714 0.1446	0.04007 0.1154	-0.06619 0.0093	-0.05400 0.0338	-0.05424 0.0330	-0.08604 0.0007	-0.09355 0.0002
dens2	-0.03764 0.1392	0.01851 0.4673	-0.06483 0.0108	-0.06514 0.0104	-0.07029 0.0057	-0.07627 0.0027	-0.08816 0.0005
	spdp	ldns	fdns	sdns	cdns	spdns	dpdns
let	0.74563 <.0001	0.44526 <.0001	0.37355 <.0001	0.09983 <.0001	0.04385 0.0849	0.34438 <.0001	0.31718 <.0001
let2	0.74105 <.0001	0.42842 <.0001	0.33148 <.0001	0.04144 0.1034	0.04421 0.0824	0.30439 <.0001	0.26802 <.0001
cf	0.60016 <.0001	0.23950 <.0001	0.39163 <.0001	0.06824 0.0073	-0.00465 0.8550	0.23434 <.0001	0.17413 <.0001
cf2	0.59223 <.0001	0.18169 <.0001	0.31685 <.0001	0.01746 0.4927	-0.01887 0.4585	0.17948 <.0001	0.11529 <.0001
seq	0.14813 <.0001	-0.01778 0.4849	-0.01127 0.6582	0.64288 <.0001	0.00394 0.8771	0.02283 0.3698	-0.01718 0.4997
seq2	0.13413 <.0001	-0.00526 0.8364	-0.00058 0.9817	0.46915 <.0001	0.01037 0.6839	0.01796 0.4805	-0.00609 0.8109
cv	0.17760 <.0001	-0.01419 0.5773	-0.03659 0.1505	0.03352 0.1879	0.65026 <.0001	-0.01444 0.5705	-0.06565 0.0098
cv2	0.08203 0.0013	0.00376 0.8827	-0.00330 0.8969	0.03124 0.2197	0.60310 <.0001	0.02230 0.3810	-0.01457 0.5672
spr	0.91603 <.0001	0.16606 <.0001	0.17714 <.0001	0.09353 0.0002	-0.00432 0.8653	0.37568 <.0001	0.16395 <.0001
spr2	0.88971 <.0001	0.11199 <.0001	0.12180 <.0001	0.01473 0.5629	-0.01643 0.5188	0.26480 <.0001	0.09183 0.0003
dp	0.77870 <.0001	0.41075 <.0001	0.37137 <.0001	0.13696 <.0001	-0.02006 0.4308	0.44082 <.0001	0.47676 <.0001

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TO POIR NO. 9, QUESTION 9

dp2	0.81774 <.0001	0.45340 <.0001	0.41249 <.0001	0.09255 0.0003	-0.01023 0.6880	0.49066 <.0001	0.53973 <.0001
dens	0.01535 0.5465	0.69032 <.0001	0.70751 <.0001	0.28107 <.0001	0.28538 <.0001	0.68255 <.0001	0.73278 <.0001
dens2	0.00159 0.9503	0.58061 <.0001	0.62367 <.0001	0.17607 <.0001	0.18381 <.0001	0.55495 <.0001	0.62939 <.0001

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TO POIR NO. 9, QUESTION 10

10. Please refer to LR-K-81. Please perform an F-test of the hypothesis that all of the coefficients of the cross product terms contained in the full quadratic model are simultaneously equal to zero, along with documentation of this test.

RESPONSE:

An F-test of the hypothesis that all the coefficients on the cross product terms contained in the full quadratic model are simultaneously equal to zero is given by the following formula:

$$F_{J,n-K} = \frac{(e'_R e_R - e'e)/J}{e'e/(n-K)},$$

where e_R represents the residuals from the restricted model, e represents the residuals from the unrestricted model, J is the number of restrictions, n is the number of observations and K is the number of parameters in the regression model. This formula has a computationally convenient form:

$$F_{J,n-K} = \frac{(R^2 - R_R^2)/J}{(1 - R^2)(n - K)}.$$

Calculation of this statistic for the full and restricted quadratic model yields a test statistic of 13.34, indicating rejection of the null hypothesis.

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TO POIR NO. 9, QUESTION 11

11. Page 39, lines 1-2 of witness Bradley's testimony (USPS T-14) states that "[d]espite the loss of many right-hand-side variables the fit of the equation is still quite good and most coefficients have their expected signs and magnitudes."
- a. Did you test to determine whether a better outcome was achieved by selectively removing a smaller number of the interaction terms from the full quadratic model? If so, please provide the results.
 - b. If you have not previously done so, please run your full quadratic equation removing only the interaction terms involving small parcels, and provide documentation of the results.
 - c. If this does not achieve a better outcome, please run your full quadratic model dropping interaction terms for both small parcels and letters, and provide documentation of the results.
 - d. If you believe additional improvements could be achieved by dropping additional interaction terms, please do so, and provide documentation of the results.

RESPONSE:

- a. No.
- b. The requested estimation was performed. The SAS program, SAS log and SAS listing for the requested estimation are attached as "Dropping Interactions with Small Parcels.sas", "Dropping Interactions with Small Parcels.lst" and "Dropping Interactions with Small Parcels.log".
- c. This estimation did produce a better outcome relative to the full quadratic model. The Variance Inflation Factors are lower for this estimation than for the full quadratic model, although they are not as low as they are in the restricted quadratic.

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- d. I believe that better results can be obtained by continuing the process and dropping all of the cross product terms. That would lead to the restricted quadratic model presented and documented in my testimony.

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TO POIR NO. 9, QUESTION 12

12. Please refer to LR-K-81. Please provide, if possible, the sample correlations of the matching residuals from the full quadratic and parcel/accountable regressions. Please confirm that if the error terms of these two regression models are correlated, it may be possible to improve the efficiency of the estimated parameters by re-estimating both with feasible generalized least-squares.

RESPONSE:

Because the data sets used to estimate the regular delivery equation and the parcel/accountable delivery equation are not the same, correlation across the residual can only be performed on the subset of the observations common to both equations. The residuals from the full quadratic equation and the parcel/accountable equations were matched by Zip Code and date. This matching produced 1,468 matched residuals. The correlation of the matched residuals is 0.1435.

In theory, there is an efficiency gain from pursuing a FGLS or “Seemingly Unrelated Regressions” approach to estimation. However the efficiency gain is dependent upon the amount of correlation of the disturbances across the equation and the amount of correlation across the right-hand-side variables. The greater the correlation in the disturbances and the less the correlation in the right-hand-side variables, the less the efficiency gain. Given the low estimated correlation of the residual, the fact that delivery points appear in both equations, and the likely correlation across the volume measures in both equations, a

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reasonable inference is that there would be little actual efficiency gain from
FGLS.

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TO POIR NO. 9, QUESTION 13

13. Please refer to LR-K-81.
- a. Please confirm whether, on average, a carrier participating in the study delivered all of the mail shapes given to him/her on any given day, including large parcels, accountables, letters, flats, sequenced mail, small parcels and collection mail.
 - b. Please confirm that your models for regular mail delivery make no use of the corresponding data for parcels/accountables.
 - c. Please confirm that your model for parcels/accountables makes no use of the corresponding data for other kinds of mail.
 - d. If your answers to a. and c. are in the affirmative, please explain why you chose to fit independent models for regular mail and parcels/accountables.

RESPONSE:

- a. The CCSTS data set tracked the mail delivered on routes and the time it took to delivery that mail. When there was only one carrier on a route, then one would expect that carrier to deliver all of the all mail delivered on that route on that day. When there was more than one carrier on a route, one would expect the set of carriers to deliver all of the mail delivered on that route on that day.
- b. Not confirmed. The regular delivery equation makes use of small parcels and collection mail, both of which were collected in the parcel/accountable data set.
- c. Confirmed.
- d. Independent models were fit for two reasons. First, regular delivery and parcel/accountable delivery are separable activities. In other words, the time it

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takes to make a special access to deliver a large parcel or the customer time required for handling an accountable is not a function of the other volumes on the route. Second parcel/accountable delivery time is small compared to regular delivery time and parcel/accountable volumes are small relative to letter and flat volumes. Trying to estimate the effect of large parcels and accountables on parcel/accountable time while it is embedded in the regular delivery equation would be difficult empirically. Given that regular delivery and parcel/accountable delivery are separable activities, there is no need to pursue this difficult estimation approach, and I believe a more accurate estimate of large parcel and accountable variabilities can be obtained from a separate regression.

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TO POIR NO. 9, QUESTION 14

14. Please refer to LR-K-81.
- a. Please confirm that the residuals from both the full quadratic and restricted models show evidence of heteroskedastic errors.
 - b. Please confirm that the sample observations are sums taken over different numbers of routes.
 - c. Is this likely to cause the errors to be heteroskedastic?
 - d. Can the observations in the sample be scaled to eliminate this source of heteroskedasticity?

RESPONSE:

- a. Confirmed.
- b. Confirmed.
- c. It is possible, but it is difficult to ascertain the likelihood that this is the cause of the heteroskedasticity.
- d. The observations can certainly be scaled by the inverse of the number of routes. The results of the exercise are presented in my testimony at pages 52 and 53. Moreover, please note that I follow a general procedure to correct for the presence of heteroskedasticity, regardless of its source.