POSTAL RATE AND FEE CHANGES, 1997

Docket No. R97–1

RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS BRADLEY TO INTERROGATORIES OF DIRECT MARKETING ASSOCIATION, INC. (DMA/USPS-T14-19-22, 23(a) and (b), AND 24-31)

The United States Postal Service hereby provides responses of witness

Bradley to the following interrogatories of Direct Marketing Association, Inc.:

DMA/USPS-T14-19-22, 23(a) and (b) and 24-31, filed on August 13, 1997.

Interrogatory T14-23(c) was redirected to witness Moden.
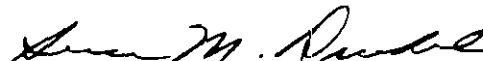
Each interrogatory is stated verbatim and is followed by the response.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

By its attorneys:

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Response of United States Postal Service Witness Bradley
to
Interrogatories of DMA

DMA/USPS-T14-19. Please define the term "piece-handling" as you use it in your testimony, and describe specifically how it is calculated for each direct activity.

DMA/USPS-T14-19 Response:

A piece handling is defined as the sorting of a piece of mail. For each direct activity, a piece handling is defined by the sortation of the relevant shape of mail by the relevant technology. For example, in the LSM activity, a piece handling is the sortation of a letter-shaped piece of mail through the use of mechanized equipment. To calculate the piece handlings for a specific direct activity, I simply sum the recorded piece handlings for all three-digit MODS codes that make up that activity. For a list of the specific MODS codes that make up each direct activity, please see Library Reference H-148 at page H148-5.

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DMA/USPS-T14-20. Please consider the following hypothetical: Suppose a group of N workers at a MODS office clocks into an optical character reader (OCR) sorting activity to sort a quantity Q of unsorted letter mail. They load the Q pieces of mail into the OCR for a primary sort and run the sort.

a. Please confirm that if no other OCR processing is performed in the current AP at this facility, and the sort is completed without errors in one hour, the process generates a value of N for the variable HOCR, and a value of Q for the variable TOCR at this facility in this period. If not confirmed, please explain.

b. Suppose instead that, after running the Q pieces of letter mail through the primary sort described above, the same N workers collect the sorted mail and reload it into the same OCR for a secondary sort.

(i) Please confirm that if no other OCR processing is performed in the current AP at this facility, and both sorts are completed without errors in two hours, the process generates a value of 2N for the variable HOCR, and a value of 2Q for the variable TOCR at this facility in this period. If not confirmed, please explain.

(ii) How would your answer to subpart b. (i) change if, halfway through the secondary sort, the OCR breaks down?

(a.) Would the workers typically clock out of the operation while repairs are made?

(b.) What would the workers typically do during the time the machine is being repaired?

(c.) What is the probable disposition of the mail that is halfway through its secondary sort – would it be set aside until repairs are completed, moved to another OCR, or sorted under a different activity code?

(d.) Regardless of your answers to subparts b. (ii) (a)-(c), how would this breakdown likely affect the values ascribed to HOCR and TOCR for this operation, if at all?

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DMA/USPS-T14-20 Response:

a.   My confirmation depends upon the meaning of the term, "the sort" used in your

hypothetical. If, in your hypothetical, the term "the sort" includes bringing the mail

to the OCR, setting up the sort scheme, running the mail and sweeping the bins,

I can confirm. On the other hand, the hypothetical seems to indicate that the term

"the sort" refers only to the running of the mail through the machine. (Part b, for

example refers to "collecting" the sorted mail. This presumably refers to sweeping

the bins and would have already been accomplished if the term "the sort" was

more broadly defined). In this case, I cannot confirm, because the time required

to complete the sortation includes the time required for things like obtaining the

mail, setting up the operation and sweeping the bins. This amount of time would

exceed N.

b.(i.)   Subject to the caveats outlined in part a. I can confirm this part of your hypotheti-

cal. Please keep in mind that any site with such small about of volume would not

pass the threshold scrubs and would not be included in the econometric analysis.

b.(ii.) (a.)   Employees would remain clocked into the operations during a temporary

equipment breakdown of ten minutes or less.

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b.(ii.)(b.)   During a temporary equipment breakdown, employees would typically continue activities associated with the operation. For example, they may be loading mail to be processed, sweeping mail from bins to containers, or obtaining mail from staging areas.

b.(ii.)(c.)   Being specific is not possible because the disposition of mail depends upon several factors like the duration of the equipment outage, the availability of other similar equipment, and the local processing and dispatch schedules. If the equipment outage were temporary, the mail may remain at that location. If other similar equipment were available, the mail may be moved to the other equipment. If local processing and dispatch schedules would be impacted, the mail may be moved to the most efficient alternative processing method. If the mail were moved to a processing method different from the original, the mail volume and work hours would also be moved to the new operation.

b.(ii.)(d.)   If the breakdown were temporary and the work could be finished on an OCR, HOCR and TOCR would not be affected. If the remaining mail was moved to another operation, HOCR and TOCR would be reduced.

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DMA/USPS-T14-21. Would the responses that you provided to DMA/USPS-T14-20 differ in any material way if the activity had involved:

    a.   A BCS instead of an OCR? Please explain.

    b.   An LSM instead of an OCR? Please explain.

    c.   An FSM instead of an OCR? Please explain.

    d.   A facer-canceler? Please explain.

DMA/USPS-T14-21 Response:

a.- d.   The responses to DMA/USPS-T14-20 would not differ in any material way if the

activity had involved a BCS, LSM, FSM, or facer-canceler.

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DMA/USPS-T14-22. Please refer to page 12 of your direct testimony (USPS-T-14) where you state: "The dependent variable in a cost equation should be a variable that captures the additional cost associated with providing the output being produced. *For mail processing labor cost, the variations in mail processing hours are the variations in cost*" (emphasis added). Please confirm:

  a. that variations in the wage rates paid to clerks and mail handlers can affect the cost associated with processing mail.

  b. that variations in the benefits package provided to clerks and mail handlers can affect the cost associated with processing mail.

  c. that variations in the mix of skills and abilities in the labor force performing mail processing tasks can affect the cost associated with processing mail.

  d. that variations in the capital intensity of mail processing activities can affect the cost associated with processing mail.

DMA/USPS-T14-22 Response:

a. Not confirmed in the context of my testimony. To understand the meaning of the

sentence, it is importance to be aware of its context. Earlier on page 12 in my

testimony, at line 6, I state:

> To find the volume variability of mail processing labor
> costs for these activities, I estimate an econometric cost
> equation for each individual activity.

This sentence makes clear that this page in my testimony is discussing the estimation

of the volume variability of mail processing labor. What this means, as indicated in the

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first sentence of the quotation, is that I am discussing the variations in cost caused by

a variation in volume. When volume changes, however, Postal Service wage rates do

not respond to those changes in volume. Your interrogatory seems to be based upon

a misunderstanding of volume variability. Volume variability measures the change in

cost caused by a change in volume. It does not measure the change in cost

associated with non-volume factors such as wage rates. Within the context of volume

variability estimation, the sentence emphasized in your interrogatory is referring to

variations in cost caused by variations in volume. At the risk of being redundant, one

could modify that sentence without changing its meaning, to say: "For mail

processing labor cost, the variation in mail processing hours are the variations in cost

caused by variations in volume." Because wages do not change in response to

variations in volume, they are not part of the variation in cost associated with variations

in volume. Obviously, variations in wage rates paid to clerks and mail handlers

"affect" the cost of processing mail. However, these wages are accounted for in the

formation of cost pools, not in volume variability estimation.

b.   Not confirmed in the context of my testimony.   Please see my explanation in part a.

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c. Not confirmed in the context of my testimony.   Please see my explanation in part a.

I would also note that the skill level tends to be homogenous with activities because

certain operations are associated with particular crafts. For example, mail handlers

work the platform whereas clerks work automation equipment.

d. Not confirmed in the context of my testimony.   Please see my explanation in part a.

I would note that capital intensity should not vary greatly within an activity although

there may be variations in capital intensity at the level of the facility.

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DMA/USPS-T14-23. Please refer to page 13, lines 12-16, of your direct testimony (USPS-T-14) where you state: "The nature of the labor adjustment process in mail processing facilities is such that current staffing may depend not only upon volume in the current period but also upon volume in the previous period. To allow for this gradual labor force adjustment to changes in piece-handlings, I included a lagged TPH term along with the current TPH term."

    a. Besides the reasoning cited above concerning the time lag in the labor adjustment process in mail processing discussed in your testimony, are there any other reasons to introduce a lagged TPH term in your mail processing labor cost equations?

    b. Did you experiment with additional lag terms (either higher-order lags in TPH or lags in MANR) in the specification of any of your cost equations? If so, what were the results? If not, why not?

    c. Your discussion focused only on the problem of adjusting staffing levels at a facility to mail processing labor requirements within a given activity. Is there also an *overall* constraint operating in mail processing, such that the Postal Service faces short-term rigidities in its ability to match the overall number of clerks and mail handlers it employs at a facility to the total mail processing labor requirements across all MODS activities at that facility?

DMA/USPS-T14-23 Response:

a. Not that I am aware of.

b. In estimating the equations for my testimony, I did not try longer lags. In earlier research, however, I did examine additional lags and found that adding them did not affect the estimated variability.

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c.   This part of the interrogatory was redirected.

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DMA/USPS-T14-24. Please refer to page 13, line 17, of your direct testimony (USPS-T-14) through equations (1) on page 16, where you describe the specification of your segmented autonomous trend variable.

    a. Please confirm that, in general, an autonomous trend variable included in a linear regression will capture the net effect on the dependent variable of *all* time-varying factors not otherwise included in the model. If not confirmed, please explain.

    b. In your judgement, is there anything else besides the introduction of new technologies (which includes not only the introduction of new machines, but also new purposes to which pre-existing activities or machines are put) that a trend variable included in your regressions might pick up? Please explain.

    c. Please explain in greater detail why you chose FY 1993 as the break point for your trend variable. Have you performed any sensitivity analyses to test whether any of your results are sensitive to the presence, or the precise location, of the breakpoint? If so, please provide the results of such analyses.

DMA/USPS-T14-24 Response.

a. *Confirmed.*

b. Yes. It could pick up things like autonomous changes in the quality of the workforce, improved efficiency of the machinery, or more effective integration of the machine into the operating system, if such things are taking place.

c. I chose FY 1993 as the breakpoint because I was informed that there was a potentially material restructuring of mail processing at that time. To allow for the possibility that

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such restructuring could affect the individual activities, I included the segmented trend.

Because the break point was chosen on the basis of exogenous, non-statistical

information, I did not pursue any sensitivity analyses of alternative breaks.

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DMA/USPS-T14-25. Please refer to page 31, lines 2-5, of your direct testimony (USPS-T-14) where you state that "[t]he first scrub requires that a site have at least *thirty-nine continuous* observations in any activity. The time dimension is an important part of the nature of panel data and if possible, it is preferable to have *continuous* data" (emphases added).

    a.   Define "continuous" as you use it in this context.

    b.   Please explain why using "continuous" data is so important to your analysis.

    c.   Please refer to the following SAS code excerpted from Bcs.txt (found in LR-H-149):

```
*************************************************************;
* TO CHECK FOR DATA SUFFICIENCY THE PROGRAM IDENTIFIES   ;
* THE NUMBER OF OBS. PER SITE                            ;
*************************************************************;

PROC MEANS NOPRINT;
     BY IDNUM;
     VAR TPH;
     OUTPUT OUT=OUT1 N=N;

PROC SORT;
     BY IDNUM;

*************************************************************;
* ELIMINATING ANY SITES THAT DO NOT HAVE 39 OBS   ;
*************************************************************;

DATA OPER;
     MERGE OPER OUT1;
     BY IDNUM;

DATA MODSET;
     SET OPER;

DATA OPER SHORT;
     SET MODSET;
     IF N< 39 THEN OUTPUT SHORT;
     IF N > 38 THEN  OUTPUT OPER;
```

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(i)   Please confirm that this scrub eliminates sites that do not have at least 39 observations, continuous or otherwise. If not confirmed, please explain.

(ii)   For each regression, please list how many observations were eliminated as a result of this scrub.

(iii)   For each regression, please list how many observations would have been eliminated if sites having fewer than thirty-nine *continuous* observations in any activity were dropped?

DMA/USPS-T14-25 Response:

a.   Uninterrupted in time or sequence. In particular, continuous data require that a site have a sequence of observations from consecutive accounting periods.

b.   Continuity is important because of the time series dimension of panel data:[1]

> In most cross-section studies the unavailability of observations on the dependent variable makes any information about explanatory variables useless. For example, if we are predicting individual auto purchases on the basis of annual income, data on income for which there are no corresponding automobile expenditures are likely to be of no value. The income observations (without expenditures) are best dropped from the model. In time series analysis, however, missing-dependent-variable observations present a serious problem and necessitate a solution procedure.

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[1]   See, Robert S. Pindyck and Daniel L. Rubinfeld, Econometric Models and Economic Forecasts, 1981, McGraw Hill at page 246.

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In a time series, the observations are ordered in a particular sequence and the estimation of certain parts of the model is dependent upon this sequence. Breaks in the sequence can affect the estimated parameters. For example, consider the estimation of the serial correlation coefficient. Under serial correlation, the value for the stochastic error term in the current period depends upon the value in the previous period. That is:

$$\varepsilon_t = \rho\, \varepsilon_{t-1} + \xi_t$$

Estimation of the model requires accounting for the sequential relationship in the error structure but discontinuous data destroys this structure. In similar fashion, estimation of the coefficient on a lagged term, as in the current model with lagged piece handlings, requires sequential or continuous observations. Also, please keep in mind that the problem is not so simple as the existence of a single break, or missing observation, in a single time period for all sites. The data set instead contains breaks for individual sites that occur in different periods. An individual site, in addition, could have multiple breaks or missing observations for more than one period. Identifying and interpolating or otherwise resolving each of these breaks would be a complex and difficult problem. In sum, requiring continuity is a solution procedure for resolving a menu of econometric problems and issues.

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Finally, in assessing the continuity requirement, it is important to consider its costs as well as its benefits. Requiring continuity implies a reduction in the amount of data available for estimation of the parameters of the model. In technical terms, this is called a loss in efficiency. However, a review of the econometric results reveals that there are still many observations available for the estimation of individual parameters and the loss of data from imposing continuity does not cause a low level of efficiency.

c.(i.) Not confirmed. Only sites with continuous data are read into this program so only sites with continuous data could be deleted.

c.(ii.) Zero. This is a redundant scrub to ensure that scrub program, VVMALLSC.CNTL, did not allow inclusion of any sites with less than 39 continuous observations. As review of any of the programs in Workpaper WP-1 show, it did not.

c.(iii.) Sites with fewer than 39 continuous observations were dropped. For a description of the number of observations lost please see Table H148-1 on page H148-7 in Library Reference H148.

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DMA/USPS-T14-26. Please refer to pages 31-32 of your direct testimony (USPS-T-14), where you suggest that the fact that MODS is "an operational data set" used for management decision making "raises the possibility that, on occasion, the data may be misreported."

a.   Please explain the reasoning underlying this assertion.

b.   In your judgement are some variables more likely than others to be misreported? If so, please list these variables and explain.

DMA/USPS-T14-26 Response:

a.   Because MODS is an operational data set rather than a specific statistical study undertaken for the purposes of estimating volume variable costs, the data collection process may not be held to the exacting standards of rate cases. Therefore, there is the possibility that, on occasion, the data may be misreported.

b.   I had no expectations, a priori. After cleaning the data, however, it would appear as if the parcel and priority activities had more data problems.

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DMA/USPS-T14-27. Please refer to page 32, lines 3-25, of your direct testimony (USPS-T-14) where you describe the four steps of your "one-percent outlier" data scrub.

a.   Did you examine any of the observations eliminated by this scrub to assess whether or not they were the result of obvious mechanical (e.g., keypunch) errors? If so, what conclusions did you draw?

b.   Please provide a complete accounting of how many observations were eliminated by this scrub for each activity, on both an absolute and a percentage basis, and indicate the effect that these deletions had on each of your final variability estimates.

DMA/USPS-T14-27 Response:

a.   The eliminated observations clearly contained some extreme values, in some cases beyond what is considered to be physically possible. In those instances, I would conclude that the recorded observations were subject to some type of data entry error.

b.   Please see Table H148-1 in Library Reference H148 and my response to UPS/USPS-T14-11.

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DMA/USPS-T14-28. Referring to equation (3) on page 38 of your direct testimony (USPS-T-14), please explain why you omitted time-trend interaction terms from your allied activities regressions.

DMA/USPS-T14-28 Response:

Equation 3 on page 38 of my testimony already has 34 right-hand-side variables.

Interacting the time trends with the volume variables would have added another 40 right-

hand-side variables. I felt that the additional flexibility of such a specification was not

worth the reduction in efficiency and the potential multicollinearity associated with the

additional 40 terms.

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DMA/USPS-T14-29. Referring to equation (5) on page 40 of your direct testimony (USPS-T-14),

a.   Please 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).

b.   Did 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.

.DMA/USPS-T14-29 Response:

a.   Confirmed.

b.   No. The goal of my research is to estimate the volume variability for a single national cost pool for each activity. This necessitates the construction of a single variability for that cost pool. The restriction of estimating a single slope coefficient from each econometric model accomplishes this goal. It is true, of course, that separate slope coefficients could be estimated for each site, but those many estimated coefficients would have to be combined in some way. There is no single correct way to combine these coefficients and the estimation of a single slope coefficient directly brings all of the data to bear on the estimation of the system-wide response to changes in volume.

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DMA/USPS-T14-30. Please refer to pages 41-42 of your direct testimony (USPS-T-14), where you discuss the Gauss-Newton Regression (GNR) tests of site-specific effects.

    a.   For each regression model for which you performed a GNR test, please provide a list of the variables that were included in the final specification which you chose to omit from the regression used to generate the residuals used in the GNR test.

    b.   Please explain why you omitted these variables specified in response to sub-part (a) when generating the GNR residuals.

DMA/USPS-T14-30 Response:

    a.   In all cases, the variables that account for facility-specific effects and the time-period specific effects in the final regressions were omitted from the regressions generating the residuals for the GNRs.

    b.   These variables were omitted because the point of the GNR procedure is to test if the variables should be included in the final specification. Including them in the original equation that generates the residuals would seem to subvert this test.

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DMA/USPS-T14-31. Please refer to pages 80-84 of your direct testimony (USPS-T-14), where you discuss the problem of measurement errors in the right-hand-side variables of your cost equations and your errors-in-variables estimator of β.

a.   Please confirm that your model of measurement error in the total piece-handlings variable, embodied in equations (17) and (18) on page 81, assumes a linear error process. If not confirmed, please explain.

b.   Please list all of the assumptions about how measurement errors are distributed (other than the linearity referred to in subpart a) that you relied on to derive the probability limits of the estimated fixed-effects and first-differenced coefficients in equations (19) and (21) on pages 81-82.

c.   Please refer to page 83, lines 1-3, of your direct testimony (USPS-T-14), where you state: "In the mail processing analysis, measurement error is of particular concern for the manual letter and flat operations, in which the mail is weighed to produce volume counts."

(i)   Please confirm that conversion factors based on linear feet, as well as weight, are used to estimate first handling pieces (FHP) in the MOD system when console or meter readings of mechanical equipment, or actual counts from mailers' statements, are unavailable (see MODS Handbook M-32, chapter 4).

(ii)   Please confirm that when FHP estimates in manual letter and flat operations are obtained using conversion factors based on weight, the procedure consists of weighing the quantity of mail to be processed and dividing by an assumed average weight per piece. If not confirmed, please explain.

(iii)   Please confirm that when FHP estimates in manual letter and flat operations are obtained using conversion factors based on linear measurement, the procedure consists of measuring the linear footage of inventoried mail to be processed and multiplying by an assumed average number of pieces per linear foot. If not confirmed, please explain.

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(iv)   Regardless of your answers to subparts c. (I)-(iii), please confirm that subsequent handling pieces (SHP) are always derived from initial FHP, and thus reflect any errors inherent in the latter. Please confirm also that total piece handlings (TPH) in a MODS operation is the sum of FHP and SHP in that operation (see MODS Handbook M-32, *op. cit.*)

(v)   Taking into account your answers to subparts c. (i)-(iv), please confirm that the most likely source of measurement error in manual letter and flat operations is through the use of conversion factors that are either too high or too low. If not confirmed, please explain.

(vi)   If subpart (v) is confirmed, please confirm that subparts c (i)-(v) together imply a non-linear error process with a non-unit mean error, rather than an additive process as you imply. If you disagree, please explain.

DMA/USPS-T14-31 Response:

a.   Not confirmed.   The distribution of the measurement error, ψ, is lognormal, which is a nonlinear distribution.

b.   The measurement errors are assumed to be individually and identically distributed as a lognormal distribution with variance σ_ψ.

c(i.) Confirmed.   Please see at M-32, section 411.b: "Record letters and flat mail by weight, other than machine counts or actual pieces from mailers' statements.

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Linear measurements can be used for inventories or in rare situations when scales are not available."

c(ii.)   Not confirmed. First handling piece volumes for manual letter and flat operations may be recorded by weight. The number of first handling pieces would be obtained by multiplying the net weight of the mail by the appropriate conversion factor for that mail shape and type. Please see M-32, at section 413.1.

c(iii.) Linear measurements may be used to determine the number of first handling pieces in rare situations when scales are not available.   If this situation occurred, the number of first handling pieces would be obtained by multiplying the number of feet of mail by the appropriate conversion factor for that mail shape and type. Please see M-32, at section 411.b.

c(iv.)   Not confirmed. SHP is projected to downstream manual letter and flat operations based upon local mail flow densities. Subsequent handling pieces may be flowed from FHP or TPH. Please see M-32 at section 412.3. The total of the FHP and SHP volumes becomes the TPH volume in manual letter and flat operations. TPH in automated operations and mechanized letter and flat operations is determined

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from mail processing equipment meter readings rather than from projections.
Please see M-32 at section 412.4.

c(v.) Not confirmed. The responses to c(i) through c(iv.) establish that use of conversion factors is a possible source of measurement error, but they in no way establish the magnitude of those errors. It is thus impossible to draw the inference from those answers that the use of conversion factors that are either too high or too low is the most likely source of measurement error.

c(vi.) Not confirmed. Subpart c(v.) is not confirmed. Moreover, the hypothetical generation of measurement errors as described in your questions c(i.) through c(iv.) is consistent with a lognormal measurement error that is additive in the logs. To see this, suppose that the sole source of measurement error is from the use of conversion factors for mail being weighed. Then let the hypothetical true volume (V) be described as:

$$V = \theta z,$$

where V is volume (piece handlings), z is the weight of mail and θ is the true density for that mail in pieces per pound. In this scenario, hypothetical measured volume

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would be:

$$\hat{V} = \bar{\theta} Z,$$

where the bar indicates that the average conversion factor is used. Using the
definition of the hypothetical true piece volume given above, we can rewrite the
measured volume as:

$$\hat{V} = \frac{\bar{\theta}}{\theta} V.$$

From this expression, it is clear that the measurement error is generated by error
in the conversion factor. If the actual conversion factor equaled the average, then
there would be no measurement error. However, when we take logs to estimate the
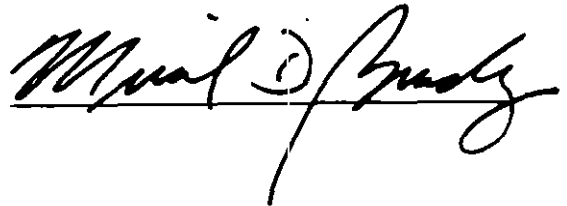equation the log of the measured volume is expressed as:

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$$\ln(\hat{V}) \;=\; \ln V \;+\; \ln\!\left(\frac{\bar{\theta}}{\theta}\right)$$

$$=\; \ln V \;+\; \psi$$

This similar to the form of the measurement error for the model on page 81 of my testimony.
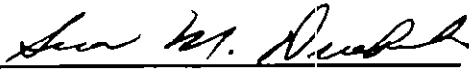
DECLARATION

I, Michael D. Bradley, declare under penalty of perjury that the foregoing

answers are true and correct, to the best of my knowledge, information, and belief.

Dated: _August 27, 1997_

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon all participants of record in this proceeding in accordance with section 12 of the Rules of Practice.

Susan M. Duchek

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August 27, 1997