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Periodic Reporting **Docket No. RM2016-12**
(Proposal Four)

PR REV & REDACTED REPLY COMMENTS
(Redacted in Black)

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I. Executive Summary

A. Public Representative Reply Comments

The Public Representative's ("PR") Comments[1] identified serious flaws in the Postal Service's proposed model, ("Proposed Model") which estimated the variability of vehicle capacity with respect to mail volume.[2] The PR recommended "the Commission reject the proposed model and open an inquiry into the appropriate data, operational factors, and types of models which would produce unbiased long term variability estimates of overall transportation variability." *PR Comments at 4*.

Specifically, the PR found that:

- minor corrections to the Proposed Model (such as including zero mail volume observations and properly specifying the day-of-the-week dummy (DOW) variables, lowered estimated variabilities by contract type from 8 percent to over 25 percent, making them suspiciously low.[3] *Id. at 14.*
- data structure differences between the TCSS and TRACS biased overall transportation variabilities. *Id. at 17-19.*
- inconsistencies due to different definitions and collection protocols associated with regression variables between the TCCS and TRACS biased overall transportation variabilities. *Id. at 21.*
- omitted variability bias due to the endogeneity of the independent variable "capacity" in the cost to capacity model the Commission accepted in Docket No. RM2014-6, Order No. 2180, (September 9, 2014) biased overall transportation variabilities. *Id. at 22.*
- operational features of contracting for new vehicle capacity were not incorporated into the Proposed Model, which resulted in model misspecification. *Id. at 4.*

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[1] *Docket No. RM2016-12, Public Representative Comments, submitted October 17, 2016* ("PR Comments").

[2] The Proposed Model refers to *USPS-RM2016-12, Proposal 4; Research on Estimating the Variability of Purchased Highway Transportation Capacity with Respect to Volume, submitted August 22, 2016*. Also note: "vehicle capacity" and "mail volume" are short-hand terms for vehicle capacity trips, and cubic mail volume trips when they refer to the Proposed Model. Otherwise, vehicle capacity refers to the volume of the vehicle, and mail volume refers to the volume of the vehicle used when sampled.

[3] The author of the Proposed Model, Dr. Bradley ("Bradley") justified dropping zero volume observations because including them "could cause the data to understate the true relationship between the number of trips and volume." *Proposed Model, at 18*. Bradley also stated he did not attempt to use the proper definition of the DOW dummy variables, because he feared that doing so would "increase the likelihood of creating a singular or near-singular matrix." *Docket No. RM2016-12, Responses Of The United States Postal Service To Questions 1-9 Of Chairman's Information Request No. 1 (September 13, 2016), Response to Question 2b.* The PR found no evidence to support Bradley's concern. *See, PR Comments at 12, and RM2016-12-PR-LR-1-Files.*

B. UPS's Comments

The United Parcel Service ("UPS") opposes adopting the Proposed Model for reasons similar to the PR. In support of its opposition, UPS submitted a report which analyzed the weaknesses of the Proposed Model. *See, Report of Dr. Kevin Neels and Dr. Nicholas Powers To Accompany UPS Comments In Docket No. RM2016-12,* submitted October 17, 2016. ("UPS Report"). The UPS Report identified, and then empirically supported, five major criticisms of the Postal Service's approach:

- TRACS is not data source appropriate for estimating transported mail volume. *Id. at 10-21.*
- Non-sampling error renders TRACS data an unreliable data source to estimate the variability of vehicle capacity with respect to mail volume. *Id. at 24.*
- The Proposed Model is misspecified for several reasons, the result of which yields downwardly biased variability estimates. Chief among those reasons is the model's failure to incorporate operational decisions and constraints into its specification. *Id. at 26.*
- The Proposed Model produces downwardly biased variability estimates because it is misspecified and relies upon imprecise and error-prone data. Id. at 36-39.

The opposition of the PR and UPS to the Proposed Model is based upon similar concerns, but UPS performed a variety of original and illuminating tests which lend empirical support for opposing the Proposed Model. The PR considers UPS's effort to be a significant contribution to econometric practice provided to the Commission. Consequently, its Reply Comments will discuss the significance of UPS's quantitative tests.

II. UPS's Comments Provide Empirical Support For Its Opposition To The Proposed Model

A. Diagnostic Tests Illustrate Flaws in Variable Measurement Which May Bias Variability Estimates In The Proposed Model

1. Introduction

The UPS Report states that "there is a great deal of evidence indicating that the TRACS sample is simply too small and too variable to produce reliable estimates of system wide capacity and mail volume, or of capacity-to-volume variabilities." This doesn't mean that TRACS may not have an inappropriate amount of error for the purpose *Id at 10*. The Public Representative does not fully agree with this statement. The Public Representative believes the purpose of TRACS is to estimate system wide

transported mail volume in order to develop keys to distribute types of attributable transportation costs to products. *See, e.g., Docket No. ACR2015, USPS-FY15-NP24*. Moreover, the sample coefficients of variation have long been accepted by the Commission.

However, the Public Representative agrees that TRACS was not designed to estimate capacity to volume variabilities, which the UPS Report later shows, would require focusing the sample observations on a smaller subset of observations which captures the conditions under which managers make decisions about altering vehicle capacity in response to changes in mail volume. *UPS Report at 27.* Since the Proposed Model does not adjust TRACS data for this purpose, it is safe to conclude that TRACS, as used by the Proposed Model, is not an appropriate source of data to use to estimate capacity-to-volume variabilities. The UPS Report goes on to demonstrate a variety of flaws in variable measurement which may bias the Proposed Model's variability estimates.

2. Comparing the Postal Service's TRACS-based measure of mail volume to an RPW-based measure, provides more realistic seasonal and annual variations in mail volume

The primary dependent variable in the Proposed Model is cubic mail volume multiplied by trips.[4] This variable is meant to represent the volume of mail being transported through the Postal Service's highway transportation network. The UPS Report derived a measure of mail volume to test the accuracy of TRACS to capture cubic mail volume over time. To do so, it developed an RPW-based measure of volume, which was linked to TRACS through the TRACS product, distribution key. It first calculated a weight for each product equal to the FY 2015 CRA transportation cost for the product divided by FY2015 RPW volumes for each contract type and postal quarter.[5] It then calculated a measure of product cost by multiplying the FY2015 cost per unit weight of a product against volume of the product in the previous years. This

[4] The Proposed Model refers to this measure as "moving capacity." *See, Proposed Model at 21.*

[5] The transportation cost per product is developed using CRA transportation costs, which utilize the TRACS distribution key for each product. The weight is a combination of fairly accurate CRA cost data which uses TRACS keys to distribute attributable costs to individual products. Because the weight yields the TRACS-based distribution of the modified measure to products, it reasonably represents the transportation of mail volume transported through the Postal Service's network, and provides a measure of mail volume which could be compared to the TRACS-based measure of cubic mail volume. *Id at 11*.

weighted volume variable for each product was summed to get the total indexed volume for each contract type, quarter and year. Finally, the UPS Report adjusted this modified measure of mail volume by multiplying it by the share of regular TRACS Costs to TRACS Costs which also included Christmas Routes. The UPS Report then transformed this measure, as well as the measure of TRACS mail capacity volume used by the Postal Service, into index numbers so that it could make meaningful, comparisons of the two measures. The modified measure of mail volume has more appropriate annual and seasonal and annual variations than does the Proposed Model's measure of mail volume. *Id at 14 (Figure 1).*

3. Decisions to alter vehicle capacity appear to be based on capacity utilization approaching peak capacity[6]

UPS explains that the difficulty using TRACS to determine the variability of vehicle capacity with respect to mail volume is because TRACS randomly samples stops which may be located at any point along each route. Vehicles may be carrying mail ranging capacity utilization from zero to 100 percent. Managers base their decisions to modify both short and long term vehicle capacity miles based upon a consideration of the appropriateness of vehicle capacity along the entire route, not based upon consideration of a particular stop. The primary dependent variable, mail volume trips in the Proposed Model, is not constructed to reflect peak load on a route. Mismeasurement of the primary dependent variable results in a misspecificed model, and produces unreliable measures of the variability of vehicle capacity to mail volume. *Id. at 27-28.*

The UPS Report illustrates this by comparing variabilities obtained when using all of the data from the Proposed Model, to variabilities obtained by limiting observations to those where vehicle capacity utilization went as low as 10 percent and as high as only 50 percent. Even where capacity utilization could be as low as 10 percent, variabilities were approximately 10 percentage points higher than those obtained by the Proposed Model. Where capacity utilization was not allowed to fall below 50 percent, variabilities by contract type were between 96 and 97 percent.

[6] The PR has included this discussion in the sampling error section of its Reply Comments because this is where it was discussed in the UPS Report. The PR believes this error is most importantly a model specification error, but included it in this section to conform to the UPS Report's presentation.

One might think that a manager would choose to reduce vehicle capacity when its utilization was low. If cubic mail volume were falling, a manager might choose to reduce vehicle capacity, thus producing positive, but perhaps low, variability estimates. However, as shown in Figure 1, mail volume capacity has been relatively stable between FY2011 and FY2015. The obvious conclusion is that an operationally appropriate model of the variability of vehicle capacity with respect to mail volume capacity should be based on data which reflected at least 50 percent vehicle capacity utilization.

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B. Mail Volume Capacity Tests Show Non-Sample Error Is Sufficiently Large To Nullify The Econometric Validity Of The Proposed Model

The PR's Comments stated that the measurement of vehicle capacity "taken through thousands of sampled measurements are not likely to be done in exactly the same manner, which may introduce non-sampling bias into the capacity variable." *PR Comments at 21*. The UPS Report shows that nearly every observation of mail volume

capacity suffers from non-sample error. It shows that the measurement of mail volume capacity at each stop is basically a guess made by each data collector. Data collectors can measure whether a vehicle is full or empty to obtain accurate measurements.[7] Measurement is not needed when the vehicle is 100 percent full or 0 percent full. However, accurately determining mail volume capacity greater than zero but less than 100 percent seems to be done by a rule of thumb, where the data collector guestimates the percentage with which mail occupies vehicle volume in increments of 5 percent. The UPS Report finds that 52.7 percent of total mail capacity estimates use this rule of thumb. *UPS Report at 25*. If one takes out the 100 percent and zero percent cases, slightly more than 81 percent of non-full or empty estimates rely upon the 5 percent increment rule of thumb.[8]

C. The Proposed Model Is Misspecified

1. The DOW variable is misspecified when aggregated

Aggregating TRACS data by day-of-week (DOW) increases the noise of the sample, because the underlying sample is not stratified this way. Consequently, "the number of TRACS tests underlying each observation varies significantly." *Id.* at 22. This leads to numerous, unrealistic, year-over-year changes in mail volume and vehicle capacity. For example, a 7 percent decline in mail volume in 2014 occurs at the same time there is a 27 percent increase in vehicle capacity. *Id.* at 23, Table 6. The prevalence of this mismatch provides empirical evidence that the aggregating DOW produces measurement error, which makes the Proposed Model inappropriate for estimating the variability relationship between vehicle volume and mail capacity. *Id. at 26.*

2. Failing to account for interdependence among days of the week results in a misspecification of the DOW variable

The second misspecification occurs by treating DOW observations as being separable from each other. Separability means that the mail volume transported on a

[7] The degree of vehicle utilization is Mail Volume Capacity divided by Vehicle Capacity. Since vehicle capacity is known and fixed, inaccurate measurement of mail volume capacity will produce inaccurate measurements of capacity utilization. Conversely, inaccurate measurements of capacity utilization reflect inaccurate measurement of cubic mail volume with a vehicle.

[8] Approximately 65 percent of trucks are neither empty nor full. Rebasing to 65 percent, the percentage using the "rule of thumb" for trucks with mail is 52.7/65, or 81 percent.

given day is based solely on the mail volume that day, and does not influence the volume of mail transported on other days. *Id.* at 29. The Public Representative agrees with UPS that the capacity of mail transported on a route on one day will influence the capacity of mail transported on a subsequent day. *Id*. It is true that the Proposed Model tested for autocorrelation, but only among variables, not among observations within a variable – in this case the DOW variable.[9]

3. A regional variable should be considered to control for geographic differences.

The Proposed Model does not have a variable which can control for the varying effects of geography on variability by contract type. The closest the TRACS sample used by the Proposed Model comes to a location variable is the first-stage sampling strata, facility type. This is not a location variable.[10] The UPS Report deduced 21 regional variables from TRACS data. The method it used to obtain these regional variables seems reasonable, but the PR is unable to verify the accuracy of its results.[11] It then regressed the natural log of the volume against a time trend variable and quarterly dummy variables. It found 8 of the 21 regressions showed region was significantly correlated with time trend. *Id.* at 35. The results suggest a regional variable should at least be tested in the future.[12]

4. A shape variable should be considered

Just as the UPS Report suggests the model should control for region, the PR finds substantial differences in the rate of mail volume change, by contract type and

[9] The DOW dummy in the proposed model was treated as a continuous variable.

[10] See, USPS-FY15-NP24, Transportation Cost System (TRACS) Documentation. Neither do other sampling stages reflect geography.

[11] *See,* United Parcel Service, Inc.'s Supplement To Its Initial Comments With Informal Responses To Postal Service Questions, (November 4, 2016), as well as Id. at 35.

[12] The PR interprets the results as indicative, rather than definitive.

mail shape. This is illustrated in Figure 2, below.

Figure 2
Percent Change In Cubic Mail Volume
Between FY2011 and FY2015 By Shape & Contract Type

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5. The Proposed Model Does Not Consider Operational Conditions

The PR has already discussed this issue in Section II.A.3 above. It herein incorporates that discussion. It does so, because the Proposed Model not only measures mail capacity incorrectly, it measures it in a manner which does not reflect the conditions under which managers make decisions to alter vehicle capacity. Consequently, this measurement error is also a model specification error, which is very serious flaw, and casts substantial doubt upon whether the Proposed Model's variability estimates reflect operational decision-making.

III. Recommendations

A. The Commission Should Reject The Proposed Model

The Public Representative and UPS have, in different ways, shown that the Proposed Model is replete with non-sampling error, several cases of sampling error, and a substantial amount of measurement error. Both parties have shown that the model is misspecified and not appropriate for estimating transportation cost to volume

variabilities. UPS has provided a substantial amount of empirical support for the conceptual flaws it and the PR and UPS identified in their comments. Although the UPS Report's regression tests do not always produce estimates of key parameters which are significantly different from zero, the evidence it has accumulated against accepting the Proposed Model is so substantial and varied, there should be no doubt it should be rejected

B. The Commission Should Initiate Informal Working Groups

The Public Representative believes it would be valuable for the Commission to open an informal set of working group meetings to develop new model(s) of transportation variability, once the current highway route restructuring is complete, and if and once the dynamic routing of highway contract tests become implemented throughout the country.[13] The Public Representative recommends that parties have access to confidential data during this process,

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[13] *See*, USPS OIG, Management and Oversight of Highway Contract Routes. Report Number NL-AR-16-006, September 13, 2016.

is competitive, but because it will also allow parties other than the Postal Service to develop models for consideration by the working group.

IV. CONCLUSION

The Public Representative respectfully submits the foregoing Comments for the Commission's consideration.

Respectfully submitted,

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