Postal Regulatory Commission
Submitted 7/2/2020 12:35:53 PM
Filing ID: 113843
Accepted 7/2/2020

BEFORE THE
POSTAL REGULATORY COMMISSION
WASHINGTON, D.C. 20268–0001

PERIODIC REPORTING (PROPOSAL TEN)	Docket No. RM2020-2

RESPONSES OF THE UNITED STATES POSTAL SERVICE TO QUESTIONS 1-2 OF CHAIRMAN'S INFORMATION REQUEST NO. 4
(July 2, 2020)

The United States Postal Service hereby provides its response to the above listed questions of Chairman's Information Request No. 4, issued June 26, 2020. The questions are stated verbatim and followed by the response.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

By its attorney:

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July 2, 2020

RESPONSE OF THE UNITED STATES POSTAL SERVICE TO CHAIRMAN'S INFORMATION REQUEST NO. 4

1. Please refer to the Response to Chairman's Information Request No. 3, question 1.b and the example involving the EAS grade pair "EAS-20 and EAS-21," which describes the computation of variability when including both the lower (EAS-20) and higher (EAS-21) EAS grades.[1]

a. Please confirm that the variability computation described in the Response to CHIR No. 3, question 1.b. (when both the higher and the lower pay grades are included) is equivalent to applying the methodology proposed in Proposal Ten and using the following two-step process:

i. Using the same percentage increase in the Workshare Service Credits (WSCs) to separately compute the variability for EAS grades EAS-20 and EAS-21, and then

ii. Computing the average of the two variability results, weighted by the ratios of the EAS-20 grade baseline cost and the EAS-21 grade baseline cost in the total baseline cost for the EAS-20 and EAS-21 grade pair.

b. If question 1.a. is not confirmed, please provide a detailed and mathematical description of the method used to compute the variability when both the higher (EAS-21) and lower (EAS-20) EAS grades of an EAS grade pair are included in the computation, and indicate the growth rates of the WSCs used in the computation.

c. Please provide a table similar to Table 1 of the Response to CHIR No. 3, question 1.b., displaying the calculated variability when both the higher (EAS-21) and lower (EAS-20) EAS grades of an EAS grade pair are included in the computation, and using historic growth rates of the WSCs (instead of the growth rates applied in the sensitivity analysis).[2]

d. Please explain how the computation of the variability, when both the higher (EAS-21) and lower (EAS-20) EAS grades of an EAS grade pair are included, accounts for a decrease (and not an increase) in the WSCs pertaining to Postmasters in the EAS-21 grade.

e. Please confirm whether the computation of the variability, when both the higher (EAS-21) and lower (EAS-20) EAS grades of an EAS grade pair are included, accounts for the different proportions of Postmasters in the EAS-20 grade and EAS-21 grade within the total population of Postmasters in the EAS grade pair.

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[1] Responses of the United States Postal Service to Question 1-5 of Chairman's Information Request No. 3, March 18, 2020, question 1.b. (Response to CHIR No. 3); *see also* Chairman's Information Request No. 3, March 5, 2020 (CHIR No. 3).

[2] *See generally* Bradley Study.

f. If question 1.e. is confirmed, please explain how the computation of the variability, when both the higher (EAS-21) and lower (EAS-20) EAS grades of an EAS grade pair are included, accounts for the different proportions of Postmasters in the EAS-20 grade and EAS-21 grade within the total population of Postmasters in the EAS grade pair.

RESPONSE:

1.a. The answer to this question depends upon what is meant by the phrase "compute the variability for EAS grades EAS-20 and EAS-21." In the established methodology and in Proposal Ten, the variability for EAS-20 offices is the percentage increase in cost associated with a given percentage increase in WSCs that causes offices to move from grade EAS-20 to EAS-21. Similarly, the variability for EAS-21 offices is the percentage increase in cost associated with a given percentage increase in WSCs as that causes offices to move from grade EAS-21 to EAS-22. Using this definition of variabilities, the answer is not confirmed.

However, as explained in the response to question 1.b in ChIR No. 3, the logit model reclassifies a small number of offices based upon their WSCs:

> When EAS-21 offices are included in the variability calculation, some of the EAS-21 offices are classified as EAS-20 offices by the model. This classification occurs because these offices have sufficiently small WSCs so that they are either in, or at, the lower Zone of Tolerance for EAS-21. According to their WSCs, they could be EAS-20 offices, and that is how the logit model designates them.

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When the designated increase in WSCs is applied to EAS-20 offices, as identified by the logit model, some of the reclassified EAS-21 offices move from EAS-20 to EAS-21. There are also a small number of EAS-20 offices reclassified as EAS-21 offices by the logit model, according to their WSCs. Note that these reclassifications are natural, as there can be EAS-21 offices in the Zone of Tolerance that have a lower level of WSCs than EAS-20 offices that are also in that zone. To make the analysis more concrete, Table 1 presents the logit model classifications of EAS-20 and EAS-21 offices.

Table 1

Logit Model Classifications of EAS-20 and EAS-21 Offices

EAS Grade	Total	Classified as EAS-20	Classified as EAS-21
EAS-20	2613	2593	20
EAS-21	1168	31	1137

When both EAS-20 and EAS-21 offices are included in the calculation of the variability for EAS-20 offices, 29 of the 31 reclassified EAS-21 offices move up a grade after the increase in WSCs, along with 194 of the original EAS-20 offices.[3] The percentage change in cost caused by the increase in WSC is found by multiplying the number of offices that move up a grade by the salary differential between EAS-21 and EAS-20

[3] This result makes sense as these offices have WSC levels that put them in, or close to, the Zone of Tolerance.

offices, divided by the pre-WSC-increase level of costs for all offices classified as EAS-20.[4] The formula for the percentage change in cost is given by:

$$\%\Delta \mathrm{C} = \frac{194 * (S_{21} - S_{20}) + 29(S_{21} - S_{20})}{(2593 + 31) * S_{20} + (20 + 1137) * S_{21}}.$$

This formula can be used to demonstrate that the "two-step" process described in the question is actually just a more complicated version of the original formula, and thus must provide the same variability. The first step in that demonstration is to divide the simple formula into two parts:

$$\%\Delta \mathrm{C} = \frac{194 * (S_{21} - S_{20})}{(2593 + 31) * S_{20} + (20 + 1137) * S_{21}} + \frac{29(S_{21} - S_{20})}{(2593 + 31) * S_{20} + (20 + 1137) * S_{21}}$$

Next, multiply each of the two parts by different versions of one:

$$\%\Delta \mathrm{C} = \frac{194 * (S_{21} - S_{20})}{(2593 + 31) * S_{20} + (20 + 1137) * S_{21}} \left(\frac{(2593 + 31) * S_{20}}{(2593 + 31) * S_{20}}\right) + \frac{29(S_{21} - S_{20})}{(2593 + 31) * S_{20} + (20 + 1137) * S_{21}} \left(\frac{(20 + 1137) * S_{21}}{(20 + 1137) * S_{21}}\right)$$

[4] The variability for EAS-20 offices is the percentage change in cost divided by the percentage change in WSCs. In all versions of the variability formula, the denominator is always the same -- the percentage change in WSCs. Thus, for algebraic convenience, the denominator is suppressed in all versions of the formula presented in this response. This has no impact on the analysis

Finally, rearrange the two parts of the formula to provide what is described as the two-step process:

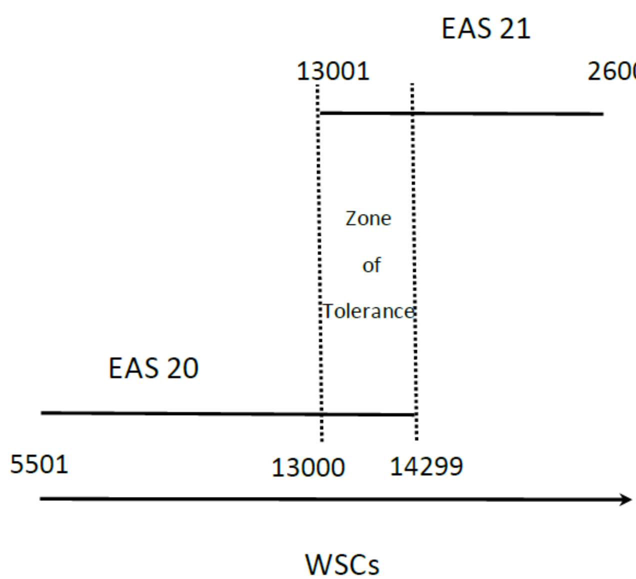
$$\%\Delta C = \frac{194*(S_{21}-S_{20})}{(2593+31)*S_{20}}\left(\frac{(2593+31)*S_{20}}{(2593+31)*S_{20}+(20+1137)*S_{21}}\right) + \frac{29(S_{21}-S_{20})}{(20+1137)*S_{21}}\left(\frac{(20+1137)*S_{21}}{(2593+31)*S_{20}+(20+1137)*S_{21}}\right).$$

1.b. Although a detailed and mathematical description of the method used to compute the variability when both the higher (EAS-21) and lower (EAS-20) EAS grades of an EAS grade pair are included in the computation may not be formally required, it appears that previous descriptions of the method may not have as clear as they could have been. To remedy this potential deficiency, this response details the calculation of the variability for Postmasters moving from EAS grade 20 to EAS grade 21, as a result of an increase in WCSs.[5] For the purposes of this description, EAS-20 offices are called the "lower" offices and EAS-21 offices are called the "higher" offices.

The variability calculation being described is based upon the pool of offices in the EAS-20 and EAS-21 grades. For a large range of WSC values, an office would be well within the values for the EAS 20 grade. But as WSCs increase, a post office would eventually enter the "Zone of Tolerance" range, in which an office could switch from one grade to

[5] The same algorithm applies to all EAS pairs.

the other. In that range, an office may be either an EAS-20 grade or an EAS-21 grade, with the same or overlapping WSC values. Eventually, there is a high enough range of WSC values that ensure that all offices in that range are in the EAS-21 grade. This pattern is illustrated in the figure below.



The first step in the calculation of the variability is the estimation of the logit model for EAS-20 and EAS-21 offices. This model replicates the pattern illustrated in the above figure and thus can be used to classify offices by EAS grade. The estimation process produces two key parameters, α and β, which are used in the variability calculation. For each office in the pool of EAS-20 and EAS-21 offices, the logit model produces the probability of that office being in the EAS-21 grade. The probability of an office being in the "higher" grade in the base period is defined by the following formula:

$$\pi_{HBi} = \frac{e^{\alpha+\beta\, WSC_i}}{(1 + e^{\alpha+\beta\, WSC_i})}.$$

Offices with very low WSCs (for example, say 6,000 to 7,000), will have π_{HBi} values very close to zero, because there is virtually no chance that they will become an EAS-21 office. In contrast, offices with very high WSCs (for example, say 24,000 to 25,000) will have π_{HBi} values very close to one, because it is a virtual certainty that they will be an EAS-21 office. An individual post office in this pool of post offices is necessarily either an EAS-20 grade office or EAS-21 grade office, so we can define the probability of being in the "lower" group as just one minus the probability of being in the higher group:

$$\pi_{LBi} = 1 - \frac{e^{\alpha+\beta\, WSC_i}}{(1 + e^{\alpha+\beta\, WSC_i})}.$$

The calculated probability for each office determines how the model classifies that office, as either being in the higher group (y_{HBi}) or the lower group (y_{LBi}), according to the following rules:

$$y_{HBi} = 1,\ if\ \ \pi_{HBi} \geq\ \ 0.50.$$

$$y_{LBi} =\ \ 1, if\ \ \pi_{LBi} >\ \ 0.50.$$

For an individual office, the base cost is just the minimum salary for its identified group, either high, S_H, or low, S_L. The total base cost for all offices is then the number of lower group offices (n) times the lower group minimum salary, plus the number of higher group offices (m) times the higher group minimum salary.

$$C_B = \sum_{i=1}^{n} y_{HBi}\, S_H + \sum_{i=1}^{n} y_{LBi}\, S_L$$

The variability being calculated measures the percentage change in total cost associated with a given percentage change in WSCs. The next step in the algorithm thus is the determination of the percentage growth in WSCs that will be used to calculate the variability. Mathematically, one defines the increase in WSCs (θ) to be applied as one plus the chosen percentage increase in WSCs. For example, a 10 percent increase in WSCs would imply a θ value equal to 1.1. Once θ is defined, the post office probabilities associated with the higher WSC levels can be calculated. In other words, the probability of each office being in the higher (EAS-21) group is recalculated at the higher level of WSCs. For offices at the ends of the WSC distribution, there will be no material effect. An office at 6,000 WSCs has virtually no chance of becoming an EAS-21 office, and the same is true for that same office even after a 10 percent increase in WSCs. In contrast, a post office in or near the Zone of Tolerance has a reasonable chance of changing grades.

The probability of an office being in the higher grade after a WSC increase is also calculated from the estimated logistic model. That formula is given by:

$$\pi_{HSi} = \frac{e^{\alpha+\beta\, WSC_i\theta}}{(1+e^{\alpha+\beta\, WSC_i\theta})}.$$

Similarly, the probability of being in the lower group is given by:

$$\pi_{LSi} = 1 - \frac{e^{\alpha+\beta\, WSC_i\theta}}{(1+e^{\alpha+\beta\, WSC_i\theta})}.$$

The post-WSC-increase probabilities can then be used to reclassify offices into the higher and lower groups:

$$y_{HSi} = 1 \ if \ \pi_{HSi} \geq \ 0.50.$$

$$y_{LSi} = \ 1\, if \ \pi_{LSi} > \ 0.50.$$

The new cost for each office is equal to the minimum salary for its new identified group, either higher, S_H, or lower, S_L. The total post-WSC-increase cost is the new number of lower group offices (k) times the lower group salary, plus the new number of higher group offices (q) times the higher group salary:

$$C_S = \sum_{i=1}^{k} y_{HSi}\, S_H + \sum_{i=1}^{q} y_{LSi}\, S_L$$

The percentage change in cost due to the increase in WSCs is the percentage difference between the post-WSC-increase total cost and the base total cost:

$$\%\, \Delta C = \frac{C_S - C_B}{C_B}.$$

The resulting variability is the percentage change in cost caused by the given percentage change in WSCs:

$$\varepsilon = \frac{\%\,\Delta C}{\theta - 1}$$

1.c. The requested table is presented below. The variabilities for the method including the lower grade are taken from Table 2, presented in response to question 2.a. in ChIR No. 3. The SAS programs, logs, and listings that produce the variabilities for the method including both grades are being submitted in USPS-RM2020-2-3.

Table 2

Calculated Variabilities Under Two Methods Using Historical Growth Rates

EAS Grades	**Including Lower Grade**	**Including Both Grades**
18-18B	8.40%	4.70%
18B-20	5.30%	5.08%
20-21	3.00%	4.00%
21-22	2.40%	2.19%
22-24	4.90%	5.62%
24-26	0.00%	3.75%

1.d. A variability measures the percentage response in one variable (y) to a given percentage change in another variable (x). The general formula for a variability is given by:

$$\varepsilon_{y,x} = \frac{\partial y}{\partial x}\frac{\bar{x}}{y(\bar{x})}.$$

Note that calculating the variability requires specifying a change in the "x" variable. It is not clear how the question can contemplate this specified change being, simultaneously, an increase and a decrease. Please note that when EAS-21 offices are reclassified as EAS-20 offices by the logit model, it is because of the relatively low level of their WSCs, not because of a decrease in their WSCs.

1.e. Confirmed.

1.f. The variability being calculated is the percentage change in Postmaster cost for EAS grades 20 and 21 that occurs in response to a given percentage change in WSCs. The numerator of that variability is the percentage change in cost. The percentage change in cost is found by dividing the change in cost induced by the WSC change by the base cost that was in place before the WSC change. Mathematically, that percentage change is given by the following equation.

$$\%\ \Delta C = \frac{C_S - C_B}{C_B}.$$

The base cost is calculated by multiplying the number of offices in grade EAS-20 times the salary for that grade, multiplying the number of offices in grade EAS-21 times the salary for that grade, and then summing the two numbers. It may not be obvious in this formulation how the proportions of offices come into play, so please consider a mathematically identical formulation. Let us define the number of offices in grade EAS-

20 as N_{20}, the salary for grade EAS-20 as S_{20}, the number of offices in grade EAS-21 as N_{21}, the salary for grade EAS-21 as S_{21} and the total population of offices in grades EAS-20 and EAS-21 as N. With this notation, the base costs can be written as:

$$C_B = \left\{\left(\frac{N_{20}}{N}\right)S_{20} + \left(\frac{N_{21}}{N}\right)S_{21}\right\} N.$$

This formulation shows explicitly how the variability formula accounts for the different proportions of Postmasters in the EAS-20 grade and EAS-21 grade within the total population of Postmasters in the EAS grade pair.

2. Please refer to the Response to CHIR No. 3, question 3, related to the computation of the elasticity of the estimated logistic-form probability.

a. Please confirm that, in the elasticity formula derived in the Response to CHIR No. 3, question 3.b., the probability should not be indexed by the term "i" because elasticity does not depend on any particular Postmaster's WSCs.

b. If question 2.a. is not confirmed, please explain.

c. Please confirm that the elasticity formula used in the Response to CHIR No. 3, question 3.b., can be simplified into the following formula:

$$\varepsilon_{\pi,\overline{WSC}} = \frac{\beta\overline{WSC}}{1 + e^{\alpha+\beta\overline{WSC}}} = (1-\pi)\beta\overline{WSC}$$

where "π" is the estimated logistic-form probability computed for $WSC = \overline{WSC}$.

d. If not confirmed, please explain.

e. If question 2.c. is confirmed, please also confirm that, using the following values ($\overline{WSC} = 11{,}391.39, \alpha = -45.5707, \beta = 0.00349$), the point elasticity of the estimated logistic-form probability is:

$$\varepsilon_{\pi,\overline{WSC}} = (1-\pi)\beta\overline{WSC} = (1-0.002974)(0.00349)(11{,}391.39) = 39.6377\%$$

f. If question 2.e. is confirmed, please also confirm that the computed point elasticity, 39.6377, is already in a percentage format and does not need to be further multiplied by 100.

g. If question 2.f. is not confirmed, please explain.

h. Please confirm that the above elasticity in question 2.e., $\varepsilon_{\pi,\overline{WSC}}$, is only the elasticity of the estimated probability with respect to WSC, computed as $WSC = \overline{WSC}$, and differs from the elasticity of the average cost defined in the Response to CHIR No. 3, question 3.a.

i. If question 2.h. is not confirmed, please explain.

RESPONSE:

2.a . Not Confirmed

2.b. The elasticity is the product of the marginal effect and the ratio of the mean WSC to the probability calculated at the mean WSC. As explained in the Bradley Report, the marginal effect is dependent upon the level of WSC at which it is calculated, and the "i" index is appropriate:[6]

> A more direct way of understanding the meanings of the estimated coefficients is through calculating the marginal effects, which measure the impact of changes in WSC on the probability of moving up an EAS grade. Marginal effects describe how responsive EAS grade changes are to WSC changes and are found by taking the derivative of the probability function (provided above) with respect to WSC:
>
> $$\frac{\partial \pi_i}{\partial\, WSC_i} = \frac{\partial \left(\frac{e^{\alpha + \beta\, WSC_i}}{(1 + e^{\alpha + \beta\, WSC_i})} \right)}{\partial\, WSC_i} = \frac{\beta\, \pi_i}{1 + e^{\alpha + \beta\, WSC_i}}.$$
>
> Because WSC appears in the denominator of the formula, the marginal effect is going to depend upon the level of WSC at which it is calculated.

2.c. In the special case outlined in this question, which sets WSC_i equal to $\overline{WSC}$, the presented version of the formula is equivalent to the one presented in the Response to

[6] *See*, Investigating The Variability of Postmaster Costs, Nov. 29,2019 at 30.

ChIR No. 3, question 3b. In fact, this special case reinforces why the "i" subscript is required in the general formula, as a particular value (the mean) for WSC_i was chosen to evaluate the elasticity.

2.d. Not Applicable.

2.e Not Confirmed. The calculated value is 39.6377, not 0.396377. The "39" part of 39.6377 is a whole number, not a decimal or percentage. If the calculated value were 0.396377, then it would equal 39.6377 percent, but the calculated value is greater than 1.0, so the associated percent is over 100. For example, if the calculated value was 1.5, then the variability would be 150 percent.

2.f. Not applicable

2.g. Consider the proposed calculation. First subtract 0.002974 from 1. That yields a value of 0.997026, which is very close to 1.0. Now multiply 0.00349 by 11,391.39, which yields 39.75595. Finally, multiplying 0.997026, which is close to 1.0, by 39.75595 will necessarily yield a number close to 39, not 0.39. In fact, it produces the value of 39.6377.

To understand why that elasticity is so large, consider the interpretations of the numbers used in the formula. The number 11,391.39 is the mean WSC value for EAS-20 and EAS-21 offices. The values of -45.5707 and 0.00349 are the parameters from the logistic model for EAS-20 and EAS-21. Those parameters and the mean WSC value can be entered into the probability formula in order to calculate the probability that an office with mean WSC in is grade EAS-21. The resulting probability is 0.002974. The probability of being an EAS-21 office at mean WSC is so small because a WSC level of 11,391,39 is so far below the Zone of Tolerance value of 13,001. At that relatively low level of WSCs, an office has virtually no chance of becoming an EAS-21 office. However, the requested elasticity is the <u>percentage</u> response in the probability of moving up an EAS grade in response to, say, a 10 percent increase in WSCs. With a base probability that is so small, even a very small absolute change in probability will lead to a large <u>percentage</u> change. If the probability goes up by just 0.003, then the percentage change in probability would be over 100 percent.

For example, suppose an office at the mean WSC level experiences an increase in WSCs of 10, moving from the mean value of 11,391.39 to a value of 11,401.39. This is a percentage increase in WSCs of 0.00088, or 0.088 percent. Recalculating the probability of being an EAS-21 office at the higher WSC level shows that the additional 10 WSCs raise the probability of the office being an EAS-21 office from 0.002974 to 0.00308, a change of only 0.000106. In terms of the likelihood of the office becoming an EAS-21 office, this absolute change is very small, as expected. But, the percentage change in the likelihood is calculated by dividing that small absolute change by the original small probability of 0.002974, leading to a 3.564 percent increase in the likelihood. Yet, the percentage change in WSCs that keyed this increase in probability was much smaller, just 10 over 11,391.39 or 0.088 percent.

The elasticity is the ratio of percentage change in probability (3.564 percent) over the percentage change in WSC (0.088 percent), yielding a calculated value of 40.50, which is quite close to the requested point elasticity of 39.6377.

2.h. There is no elasticity of average cost defined in the Response to ChIR No. 3, question 3.a., so no such comparison can be made. Moreover, it is not clear what the elasticity of average cost is, or should be. Typically, the cost elasticity used to calculate attributable cost is the elasticity of the cost pool's total cost with respect to changes in the cost pool's cost driver.

2.i. Because of the nature of cost incurrence for Postmasters, the traditional point elasticity approach for calculating the cost elasticity is not applicable, and a different approach must be taken. This was explained in the response to question 3.b. in ChIR No. 3:

> In other postal functions, increases in the cost driver generate associated increases in cost, whether they are additional hours worked or additional transportation capacity purchased. But for Postmasters, most increases in WSCs have no effect on cost. A cost change only occurs when there is a sufficient change in WSCs to move a postmaster up a grade. The outcome of changing a grade depends not only upon the size of the WSC increase, but also upon the post office's level of WSCs before the WSC increase. As a result, the changes in cost are discrete -- a Postmaster is paid either one minimum salary or another, and the cost surface is a step function. To capture this discrete cost surface, a different type of econometric model was required; a logistic model which, based upon an office's WSC level, identifies the EAS level in which the office belongs. Because the underlying model for Postmasters is different (discrete rather than continuous) than the model appropriate for other

postal functions, a different method of calculating a variability is also required.

For a traditional conditional cost surface, the variability is found by multiplying the change in cost caused by a change in the cost driver, and multiplying that change by the ratio of the cost driver to cost, producing a percentage change. But the logistic model does not directly measure the change in cost associated with a change in WSC. It measures the change in probability that an office will move up an EAS grade as a result of an increase in WSC. But as explained above, only certain WSC increases will cause a cost response, so calculation of the cost variability must include identification of which WSC increases cause a cost increase, and which do not. To do that, the size of the WSC increase must be specified, and a discrete method must be used to calculate the variability.