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RATE ADJUSTMENT DUE TO EXTRAORDINARY OR EXCEPTIONAL CIRCUMSTANCES	Docket No. R2013-11

RESPONSES OF THE UNITED STATES POSTAL SERVICE TO QUESTIONS 1-12 OF PRESIDING OFFICER'S INFORMATION REQUEST NO. 9
(November 29, 2013)

The United States Postal Service hereby provides its responses to Questions 1-12 of Presiding Officer's Information Request No. 9, dated November 21, 2013. Each question is stated verbatim and is followed by the response. The responses to Questions 2-12 are sponsored by Thomas Thress; the response to Question 1is an institutional response of the Postal Service.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

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RESPONSE OF THE UNITED STATES POSTAL SERVICE
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

1. On page 2 of the Statement of Altaf Taufique, he states "However, rather than proposing to recover the entire contribution loss through price changes, the Governors have decided to limit the exigent price increase to 4.3 percent over and above the CPI increase (Docket No. R2013-10)." During the November 19, 2013 hearing in this case, Mr. Taufique was unable to demonstrate personal knowledge of this fact. It is important to have confirmation of the Governors' action in this case. *See Newspaper Ass'n of Am. v. Postal Reg. Comm.*, --- F.3d ----, 2013 WL 6037191, *3 (D.C. Cir. Nov. 15, 2013). Please confirm that the Governors decided that the Postal Service would file an "across-the-board" 4.3 percent exigent price increase in this case.

RESPONSE:

Confirmed.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

2. In the Further Statement you estimate the FY 2012 Market Dominant mail volume losses "due to" the factors relating to the Great Recession to be approximately 53.5 billion pieces of mail. Based on the FY 2012 Annual Compliance Determination Report, total Market Dominant mail volume was approximately 157 billion pieces. (Source: PRC-ACR2012-LR1). Please also refer to Library Reference USPS-R2010-4R-10, file "Sources-of-ChangeCalcs", tab "InputData" in answering the following set of questions.

a. Would it be fair to say that you estimate that the 2007-2009 recession caused FY 2012 mail volume to be over 25 percent less than it would have been had there not been a recession? If not, please explain why not.

b. Can you confirm that the real (i.e., inflation-adjusted) Gross Domestic Product (GDP) declined by approximately 4 percent during the Great Recession of 2007-2009? If not, please provide the corrected percent of GDP decline based on the numbers you used for your calculations.

c. Would it be fair to say that the percent of GDP decline during the period of the Great Recession is at least six times less than the percent of the decline in Market Dominant mail volumes "due to" the Great Recession in FY 2012? If not, please explain why not.

d. Would it be fair to say that real (i.e., inflation-adjusted) GDP in FY 2012 was higher than before the recession started? If not, please explain why not.

RESPONSE

a. I estimate that total Market-Dominant mail volume was 25.4 percent lower in FY 2012 than it would have been in the absence of the Great Recession.

b. Real GDP declined by 4.26 percent from its pre-recession peak in 2007Q4 to its recession-low in 2009Q2.

c. 25.4 divided by 4.26 is 5.96.

d. Real GDP surpassed its pre-recession peak in 2011Q2 and has remained above its pre-recession peak every quarter thereafter. However, real GDP per adult was approximately $1,000 lower in FY 2012 than its pre-recession peak, and real GDP remains approximately 5 percent below potential GDP.

Moreover, over many years, including periods of both growth and recession, for specific categories of mail (the level of aggregation at which my models are specified), other economic variables have proven more effective at explaining changes in mail volume than GDP. These include employment and investment, both of which remained below their pre-recession peak in FY 2012.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

In addition to these variables, I have identified several macro-economic variables, most of which have obvious implications for mail volume, which were at, near, or even below their Great Recession low points in 2012 or 2013. These include the following:

- Real median household income declined five straight years from 2008 to 2012 by a total of eight percent
- Real advertising expenditures in 2012 are at the same level as in 1995
- The level of home ownership in the United States peaked in 2004 at 69 percent and has declined every year since and is now at 65 percent
- The rate of household formation slowed down dramatically in the wake of the Great Recession so that the number of adults per household is now at its highest level in at least 40 years
- The number of new credit card accounts was less than the number of closed credit card accounts in 2012 and 2013
- The number of mortgage loan accounts has declined for 20 of the last 21 quarters
- The number of home equity loan accounts has declined for 19 of the last 21 quarters.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

3. Please refer to your response to POIR No. 3, question 1. There you state: "Careful econometric analysis can be extremely useful in identifying when these net diversion trends might have changed and to quantify these trends historically. But to understand why these trends have changed requires moving outside of the econometric models and analyzing the underlying factors that are driving these trends."

a. Do the trends you are referencing in this response include "trends" that you classify as recession-related? If not, please explain why not.

b. If part a is confirmed, please clarify if these recession-related trends are the same ones responsible for 37.5 billion of the 53.5 billion piece FY 2012 impact of the recession?

RESPONSE

a. Yes

b. The 37.5 billion figure cited here appears to be taken from my response to POIR No. 3, question 5, which encompasses more than only "recession-related trends". The 37.5 billion figure in that response is the combined impact of factors which are included in columns V and W of sheet 'Volume' of ExigentImpact.xlsx. As I said in my response to POIR No. 3, question 5, I would characterize this 37.5 billion figure as "unanticipated changes in mail volume in response to the Great Recession". Mathematically, columns V and W present volume losses which are measured in my econometric models via Intervention analysis. As I explained in my response to POIR No. 7, Question 14, "[t]he mathematical difference between column V and column W is that column V includes Intervention variables which attenuate to a constant long-run level, while the variables in column W are on-going trends."

Unanticipated changes in mail volume in response to the Great Recession which attenuated to a constant long-run level (column V) account for 10.4 billion of the 37.5 billion pieces identified in my response to POIR No. 3, question 5. Unanticipated changes in mail volume in response to the Great Recession which take the form of time trends (column W) account for the other 27.1 billion pieces.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

4. Please refer to Library Reference USPS-R2010-4R-10, file "Sources-of-Change.xlsx", tab "ForecastLvl." It contains certain macro-economic variables that could affect volume changes: population, employment, retail sales and others. You use a Hodrick-Prescott Filter (H-P Filter) to decompose trend and cyclical effects on employment, investment, and retail sales. Please explain why you did not apply the H-P Filter to other variables – such as population or foreign trade.

RESPONSE

I would not characterize population as a macro-economic variable but as a demographic variable. The rate of growth in adult population is fairly insensitive to immediate macro-economic conditions. The population aged 22 and over this year is a simple function of the population aged 21 and over last year (which is, of course, independent of current-year macro-economic conditions), the death rate (which, in a developed country such as the United States, will be largely independent of year-to-year deviations in macro-economic conditions), and net immigration. Only this last factor can really be seen to have much of a macro-economic component to it. As such, it would not seem to make sense to me to think about the "cyclical" component of adult population within a macro-economic context.

Some experiments were conducted with filtered exports data several years ago. At that time, it was determined that total un-filtered Exports provided a better econometric fit in explaining the demand for International mail volumes. Hence, filtered exports data were not used in this case.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

5. With respect to your measurement of internet diversion and electronic substitutes for mail:

   a. Would it be fair to say that you justify changing your previous methodology of using Internet usage variables in favor of linear trends for Single-Piece First-Class Mail in this case on the grounds that the traditional measures are slowing down in growth or ceasing to grow whereas diversion of Single-Piece First-Class Mail has not slowed down?

   b. Please explain whether the decline in the prices of e-substitutes has stopped or moved at the same pace as the continued diversion of Single Piece First-Class Mail.

RESPONSE

a. Please see my response to question 7 of this POIR.

b. The marginal price of paying a bill electronically is, and has long been, essentially zero. The costs associated with this instead take the form of the high fixed costs associated with (a) obtaining (computer and) Internet access, and (b) learning how to pay bills online. As Internet usage has neared full saturation, the cost of (a) will approach zero: that is, if everybody has Internet access anyway, then there is no marginal cost to acquiring the Internet access necessary to pay one's bills online. One might also expect learning costs to similarly asymptote toward near-zero as the general population's comfort with the Internet and technology improves over time.

Please see my response to question 7 of this POIR for a further discussion of this topic.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

6. Please explain why you chose private employment rather than total employment in your demand equations. Please explain how you would expect your results to be different if you had used total employment instead of private employment in your demand equations.

RESPONSE

Alternate measures of employment were investigated several years ago, including civilian employment, total employment, private employment, and the unemployment rate. Private employment provided a somewhat stronger statistical fit in the econometric models at that time. All of these measures of employment are extremely highly correlated. For example, from 1983 through the first half of 2013 (the sample period over which I estimate the demand equation for First-Class Single-Piece letters, cards, and flats), the correlation between total civilian employment (age 16 and over) and total private employment is 0.9914; the correlation between total private employment and total non-farm payroll employment is 0.9992. As such, I would not expect my results to have been different had I used a different measure of employment.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

7. Your response to POIR No. 4, question 2, states: "[A]dvances in communications using the Internet … are largely continuations of pre-existing trends in non-mail-based communications. For example, smartphones are a new way to access the Internet, but, measured objectively via 'Internet' variables, trends in usage have actually slowed down in recent years."

a. Have you considered measuring Internet diversion of mail volume through variables capturing increases in computing power, such as increases in processor speeds, increases in storage space, or the shrinking size of computers?

b. Please explain why you would or would not consider measuring Internet diversion of mail volume through increases computing power, such as increases in processor speeds, increases in storage space, or the shrinking size of computers.

c. Have you considered measuring Internet diversion through variables capturing differences or increases in broadband Internet speeds? For example, broadband can mean DSL, fiber (such as FTTX, FiOS, T-1/T-3 lines), 4G wireless, or cable, among other things?

d. Please explain why you would or would not consider measuring Internet diversion through differences or increases in broadband Internet speeds, such as changes in the use of DSL, fiber, 4G wireless, or cable, among other things.

e. Have you explored any alternative sources of data on internet usage that might be appropriate for these new devices, such as average capacity used per second of transmission or per second of reception?

f. If you have explored alternative sources, can you please explain those alternative sources that you have explored?

g. If you have explored alternative sources, can you please provide a copy of such data series and cite your sources?

RESPONSE

a. – g. My experiences in attempting to model Internet diversion of mail through explicit Internet variables has been discussed at length in this case and in earlier submissions to the Postal Regulatory Commission. See, for example, the "Narrative Explanation of Econometric Demand Equations for Market Dominant Products Filed with Postal Regulatory Commission on January 22, 2013", which was filed with the Commission on July 1, 2013, at pages 13 through 16. See also my responses to POIR No. 2, questions 5 and 6; POIR No. 3, questions 1 and 2; POIR No. 4, questions 2, 6, and 7; POIR No. 6, questions 12, 13, and 25; and POIR No. 8, question 1.

In general, it is my belief that the failure of the Internet variables which I have used in the past to continue to explain ongoing Internet diversion is not because of a failure specific to these particular Internet variables, but because of a more general failure of the rate of mail diversion

to the Internet and other electronic alternatives to be amenable to being modeled by a single "Internet" variable. As such, my answers to parts a., c., and e. of this question are all "No".

British researchers Veruete-McKay, Soteri, Nankervis, and Rodriguez, came to a similar conclusion in a 2011 paper which investigated the demand characteristics of mail in the United Kingdom.

> "The effect of technology on the erosion of mail volumes was explored in a number of ways. For example, model specifications including the proportion of households with internet and broadband access yielded broadly similar results to those reported in table 2. However, statistical criteria (for example, diagnostic test statistics, AIC and SBC information criteria and the standard error of regression) preferred models with time trend break terms. This could reflect the fact that changes in technology are dynamic in nature and unlikely to be reflected within the properties of a single variable or group of variables. For example, it could be the case that, potentially, time trend terms may be a better proxy for the combined and evolving impacts of different technologies, which individually can be modelled as being logistic in their effect on the demand for mail, but over time cumulate to yield "corrugated S-shaped" impacts that are better reflected by time trend terms and/or time trend break terms.[24]
>
> [24] The technology variables tested in the econometric modelling included measures of the number of connections and subscribers to the internet in the UK; the index of broadband internet connections in the UK; the proportion of adults with access to electronic banking; and the proportion of UK households with access to the internet."
>
> Veruete-McKay, Leticia; Soteri, Soterios; Nankervis, John C.; and Rodriguez, Frank (2011) "Letter Traffic Demand in the UK: An Analysis by Product and Envelope Content Type," *Review of Network Economics*: Vol. 10: Issue 3, Article 10.

There are several issues associated with attempting to identify or construct a variable for the purpose of "measuring Internet diversion of mail volume".

<u>Relationship between Internet Usage and Mail Diversion</u>

First, it is important to understand that we are not interested in Internet usage, *per se*, but are, instead, interested in the diversion of mail volume to the Internet and other electronic alternatives. When looking, then, for a variable by which to model the diversion of mail, it is not sufficient to merely identify an Internet variable which follows the same time path as the path of Internet diversion of the mail, but it is important to identify a variable which reflects the actual driver of mail diversion to the Internet. In the 1990 and 2000s, the primary drivers of mail diversion to the Internet were simply access to the Internet and, later, shifts from dial-up to Broadband access. It is less obvious that the sorts of variables suggested in this question have a similar relationship to mail diversion. In part, this is because it is not at all clear the extent to

which recent negative trends in First-Class Mail volume are, in fact, due to the diversion of mail to the Internet and other electronic alternatives as opposed to being the result of other negative influences caused by the Great Recession. See, for example, my response to question 2 of this POIR for a list of factors that have negatively affected mail volumes from 2008 through 2012 beyond Internet diversion.

Beyond the simple question of precisely how much Internet diversion is occurring, the issue becomes, to what extent is such diversion being driven by increases in things like Internet speed or capacity? Consider the example of how I have paid my Discover bill over the 20-some years that I have had the card.

When I first got my Discover card in 1989, the only way to pay the bill each month was to write a check and put it in the mail or go to a Sears store and pay it in person. As a college student without a car, the former was far more convenient than the latter, and so I dutifully wrote a check to Discover each month and mailed it to them. Sometime in the early 1990s (1993, I believe), I obtained my first Internet access (via Prodigy). But still, I continued to mail checks to Discover each month. Somewhere along the way, probably in the late 1990s, I became aware that it was possible to pay my Discover bill online at their website. For a few years, I resisted, continuing to mail my checks, partly out of loyalty to the Postal Service (for whom I was a consultant) but partly because it just did not seem worth the effort to switch. Back then, I was accessing the Internet via a dial-up connection, which meant that to pay my bill online required me to dial into the Internet (at a time when the phone line in the house was free), access Discover's website, click through to the right screen – and before I could do that, I had to provide them with information about my bank account. It was quicker to just write a check and put it in the mail.

In the early 2000s, my family got Broadband access (DSL, to be precise). Now, the Internet was always available, and it was much quicker and easier to navigate Discover's website. In addition, my wife and I had been using the Internet for many years by this time; my wife shopped regularly through the Internet; and so we were much more comfortable sharing personal and financial information on secure web sites. So, eventually, at some point in the early-to-mid 2000s, I bit the bullet, gave my banking information to Discover, and began to pay my bill online each month.

For the first several years, this still required me to go onto their website and click a couple of buttons each month to make the payment. But that was still quicker (and, once I had done it a few times, easier) than writing a check and putting it in the mail. How much advantage would there have been at that point to faster Internet access that might shave the bill-paying process

from 30 seconds to 10 seconds? Certainly some, I'd have 20 more free seconds each month, but, really, how much are 20 free seconds a month worth?

A few years later, then, I became aware of a new feature on Discover's website. Now, you could have Discover automatically take money from your account each month. With this feature, the time it takes me to pay my Discover bill each month is literally zero. Of course, this feature did not divert my bill-payment from the mail. It only changed the means by which I paid it electronically.

What would it likely take for every one of Discover's customers to start using this feature? Faster Internet? What's faster than zero? Broader Internet access? Virtually anybody who wants Internet access already has it: and with this feature, you really only even need the Internet access once; once you've set it up, you're done (unless you change bank accounts) – one trip to the public library and it's set up. The barriers to adoption are no longer technological; they're psychological: people need to be aware of these options and become more comfortable with them. That was largely true already by the mid-2000s when Internet usage was becoming ubiquitous; it has already been literally true now probably for years.

To the extent that the trend in average Internet access speed and the trend in Internet bill payments have coincided somewhat in recent years, it seems clear to me that this is not because the former is driving the latter; it is because both trends are examples of broader technological trends within society. But these trends have been ongoing for years.

- The shift from not being able to pay your bill online – because there was no such thing as "online" – to being able to pay your bill online was huge.
- The shift from slow, clunky dial-up service to continuous, faster broadband service was pretty big.
- The shift from pretty fast broadband service to very fast broadband service? Not so much.

Specific technological trends attenuate over time. Which means that, unless or until the rate of diversion of First-Class Mail to the Internet begins to attenuate over time, such variables are going to inadequately model and predict the rate of such diversion.

Conflation of Trends in Econometric Modeling

There is a trap that econometricians – myself included – often fall into, where we start to anthropomorphize our econometric models and view them as having their own "intelligence":

e.g., "the model says this", "the model believes that". One common example of this sort of trap is the belief that if an explanatory variable in a model is tied to a specific thing, that the model has some special ability to isolate the effect of only that one specific thing and exclude all other effects from the coefficient(s) on this variable. This is simply not true, however.

Just because a variable includes the word "Internet" in its name or because it is constructed from a measure of Internet usage for the purpose of isolating the impact of the Internet on mail volume does not mean that the variable will, in fact, fully capture the impact of the Internet on mail volume and nothing else.

On the contrary, the model does not know what the variables it contains are supposed to be measuring; the model only knows what the mathematical values of the variables are at each point in time over which the model is being estimated. If mail volume falls by nearly 40 percent in five years (as First-Class Single-Piece Mail volume did from FY 2007 to FY 2012), the model is simply going to look for the explanatory variable(s) within the model that changed the most over that same time period and assume that those variable(s) are responsible.

If the model is missing one or more key factors which were responsible for part or all of that decline in mail volume, the model has no way to know that and no way to assign part of the decline to "other factors". Instead, the impact of those missing factors is going to be absorbed into the estimated coefficients of the variables that are included in the model. And the variables whose coefficients will be most affected are the variables that correlate most strongly with the omitted variables.

This was true for the Internet usage variables that used to be included in the Postal Service's econometric demand equations. These variables were not simply identifying specific diversion due to the increasing use of Broadband, but would have also picked up more general diversion trends due to general technological advancements which happened to correlate well with the growth of broadband. An example of this is the trend toward the use of automatic debit to pay bills, which grew substantially during the same period in which broadband grew, even though automatic debit payments do not require broadband access.

More recently, we know that First-Class Mail volumes have been significantly negatively affected by the more than 20 percent decline in the total number of credit card accounts in the United States from 2008 to 2012. If one were to construct a model of First-Class Mail volume that did not include a variable to measure this, but did include a variable tied to smartphone usage which grew rapidly over this same time period, the impact of the 20 percent decline in the total number of credit card accounts in the U.S. on First-Class Mail volume would likely be attributed to increasing smartphone usage. This would lead to an over-estimate of the true

impact of smartphone usage on mail volumes over this time period and, depending on future trends in credit cards and smartphones, could lead to extremely unreliable volume forecasts.

I am sympathetic to the notion that the inclusion of simple time trends instead of more targeted variables intended to explain specific events and factors feels less satisfactory compared with more targeted variables intended to explain specific events and factors.

Unfortunately, in the real world of real data, it is not possible to craft the perfect explanatory variable to explain the precise relationship between mail volume and every factor that affects it. Moreover, every factor that is left out of the equation may be picked up by a factor that is being included, with the end result that the econometric estimates associated with both variables – the excluded one and the included one – would be wrong.

In contrast, the Intervention analysis approach that I use in this case provides a flexible tool that allows the data to speak to us and allows the modeler to identify when mail volumes have been affected by factors outside of the model that may not be amenable to direct modeling econometrically and to accurately quantify the impact of these factors. It is then left to the user of the model to take off his econometrician hat and put on his economist hat and step outside of the econometric model to identify and understand the specific factors that are affecting mail volume.

I have done this repeatedly throughout this case. See, for example, my responses to, among other things, POIR No. 1, questions 4 and 9; POIR No. 2, questions 5 and 6; POIR No. 3, questions 1, 2, 7, and 9; POIR No. 4, questions 1 and 2; POIR No. 6, questions 1, 4, 5, 12, 13, 19, 20, and 25; POIR No. 7, questions 5 and 6; and the Transcript from my Hearing at pages 100 and 101 and elsewhere.

<u>Example from the Past: Periodicals Mail vis-à-vis Television</u>

Let me conclude my answer with an example from my previous Postal work. Periodicals Mail volume per adult (the dependent variable in the Postal Service's Periodicals Mail demand equation) has been trending generally downward for decades. Very early in my work for the Postal Service, I attempted to investigate the extent to which Periodicals Mail volume had been adversely affected by television. I found a variable that measured the average amount of time Americans spent watching television and introduced it as an explanatory variable in the Periodicals Mail equation. The amount of time that Americans spent watching television increased significantly in the 1960s and 1970s and, sure enough, this explained a significant part of the declines in Periodicals Mail volumes through the 1970s and into the 1980s.

But, alas, there was a problem. By the 1980s, the average amount of time that Americans were spending watching television had started to level off: there are only so many hours in a

day and you can't spend them all watching television. In fact, since the 1980s, the average amount of time that Americans spend watching television has declined, with those hours being replaced by hours spent playing video games or on the Internet. But as the number of hours of television watching was leveling off, was the trend in Periodicals Mail volume abating? It was not. So, time spent watching television helped to explain declines in Periodicals Mail volumes in the 1970s and early 1980s, but not the late 1980s and early 1990s, and it was no help at all to us in forecasting Periodicals Mail volumes.

So, what to do? Well, people weren't watching more overall television, but what they were doing in the late 1980s was watching more cable television. So we tried adding a second variable to the Periodicals Mail equation, cable television expenditures. Mathematically, it picked up the trend where the time spent watching television left off, so mathematically, the fit was solid. But, of course, cable television penetration attenuated too, and the negative trend in Periodicals Mail volume did not.

If anything, the negative trend in Periodicals Mail volume accelerated as the Internet began to pick up steam. And here the specific story comes back to the general topic at hand.

Did people stop reading magazines, in part, because they started watching more television? Absolutely. Did the advent of cable television accelerate that trend? Possibly. But was it a simple one-to-one tradeoff – an hour more watching television is an hour less reading magazines? No, not at all.

The relationship between Periodicals Mail and television and American society at large was more complicated than could be captured by a direct measure of television usage in the Periodicals Mail equation. Because this relationship was more complicated, it turns out (perhaps somewhat counter-intuitively) that this relationship is best modeled by a more all-encompassing trend variable. A mechanical trend variable of this nature might miss year-to-year deviations in the exact relationship between Periodicals Mail and alternate media, but it provides the model with a place for capturing this relationship, even as the universe of "alternate media" and their relationship with Periodicals Mail change over time.

The same is true of the relationship between the Internet and mail volume. The problem with the use of the Internet variables used in previous years was not a failure to find exactly the right variable, it was that "exactly the right variable" does not, and ultimately, cannot exist.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

8. In your response to POIR No. 2, question 1(c), you state: "[t]he introduction of non-econometric judgment does, however, play an important role in the development of the Postal Service's volume forecast."

a. Please explain the areas where you applied such non-econometric judgment and explain in more detail why such judgment is important.

b. Would it be correct to say that your volume forecasts might have been quite different if you had applied different non-econometric judgments than those you made?

c. Please explain how you arrived at your non-econometric judgment in each particular area where you applied such non-econometric judgment.

RESPONSE

a. Non-econometric judgments enter into the volume forecasts used in this case on sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9. These adjustments take one of three forms. So-called "vol-adjustments", which are level shifts, can be found at row 35 of sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9. Net trends, which introduce non-econometric trends to the forecast, can be found at rows 91 through 95 of sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9. Other adjustments which take the form of neither level-shifts or simple trends can be found at rows 153 through 157 of sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9.

The Postal Service's use of judgment in making volume forecasts is expounded upon in the final section of the document VolumeForecastingMethodology.docx, which was filed as part of the folder 'Public Forecasts' within USPS-R2010-4R/9 filed with this case. Quoting from there,

> "Given a series of forecasted explanatory variables and estimated elasticities, it is possible to make an initial, purely mechanical, volume forecast. The methodology by which this is done was described in some detail above.
>
> However, this purely mechanical application of the historical econometric demand equation to forecast explanatory variables is only the first step in developing the volume forecasts regularly used by the Postal Service. At this point, the forecasts are checked for reasonableness. In particular, additional information is investigated at this time. The types of additional information that should be considered at this point fall into two general categories.
>
> First, historical changes in mail volume that were not fully explained by the demand equations are analyzed with an eye toward understanding the factors underlying these changes. Typically, the sources of such changes are not amenable to direct inclusion in an econometric equation. Even in such a situation, however, it may be possible, and is certainly desirable; to include such factors in making volume forecasts going forward.

> Second, there may be factors which have not (or have only minimally) affected mail volumes historically but which are expected to affect mail volumes in the forecast period. For example, there may be a threat, which is as yet unrealized, that an alternative to a specific type of mail may arise. This was the case for many years with electronic bill presentment and First-Class workshared mail. For years, it was known that e-mail and the Internet represented a potential alternative to First-Class Mail for receiving bills and statements. This potentiality began to become a reality within the past decade. As this happened, it was necessary to augment the strict econometric volume forecast of First-Class workshared letters with additional information regarding the potential impact of electronic bill-presentment on First-Class Mail volumes. By now, these events which have affected First-Class Mail volumes have been operating for a sufficiently long time that they can be represented econometrically through the [trend] variables described above. When influences are newer, however, non-econometric adjustments will still be required.
>
> Only when one has endeavored to understand fully all of the factors which may affect mail volumes in the forecast period, whether these factors are amenable to econometric analysis or not, and incorporated them as best as one can in the volume forecasts, should one have full confidence in the resulting volume forecasts."

b. There are literally an infinite number of possible non-econometric judgments that one could apply to a volume forecast, each of which would produce a different final volume forecast, and some of which might be considered "quite different." On the other hand, in my opinion, it would <u>not</u> be correct to say that the overall forecasts used in this particular case would have been "quite different" if all adjustments based on non-econometric judgments (described below) had simply been omitted.

c. The volume forecasts used by the Postal Service in this case were developed collaboratively and the non-econometric judgments introduced to this forecast were not exclusively my judgments. The following adjustments were made to the public forecasts filed with this case.

- First-Class Retail Parcels

A single econometric demand equation is estimated for all First-Class Parcels, both retail (market-dominant) and commercial (competitive). This equation includes a time trend to reflect strong recent growth in the latter of these (commercial parcels). A negative net trend is added to the forecast for First-Class retail parcels to zero out this econometric trend, because recent parcel growth has been limited to commercial parcels only. This net trend can be found at rows 91 through 95 of sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

- Standard Regular and Nonprofit Mail

Separate net trends are added to the forecasts for Standard Regular and Nonprofit letters vis-à-vis non-letters to reflect differences in the historical growth rates associated with these categories. Letter-shaped mail within these subclasses has been growing relative to non-letter-shaped mail for many years. See, for example, my responses to POIR No. 7, questions 5.c-d. and 10.c. To incorporate this into the Postal Service's volume forecasts, slight positive net trends are added to the forecasts for Standard Regular and Nonprofit letters and slight (offsetting) negative net trends are added to the forecasts for Standard Regular and Nonprofit non-letters. These net trends can be found at rows 91 through 95 of sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9.

- Bound Printed Matter Flats

An adjustment is made to the forecasts of Bound Printed Matter flats that increases these forecasts by 0.7 percent. This adjustment can be found at row 35 of sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9.

- Inbound International Mail

Formal econometric equations are not estimated that model Inbound International mail volumes due to a lack of available historical data. Instead, these volumes are forecasted using only simple net trends, which are calculated based on very recent history. These net trends can be found at rows 91 through 95 of sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9.

In addition, the base volumes for some categories of Delivery and Signature Confirmation and Post Office Boxes were adjusted to account for the shifting of some mail between market dominant and competitive within the base period used for forecasting in this case. These adjustments take the form of vol-adjustments and can be found at row 35 of sheet 'Comp. Mult.' of the forecasting spreadsheets found in USPS-R2010-4R/9.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

9. In your response to POIR No. 6, question 5, you state: "Events which are closely related to the Great Recession which have had a negative impact on mail volume over the past five years" includes "substantial efforts by American consumers, businesses, and governments to reduce costs, including the adoption of cheaper technological alternatives to the mail." Can you please explain why such adoption of cheaper technological alternatives is attributable to the Great Recession? Isn't the adoption of cheaper technological alternatives something that consumers, businesses, and governments do to reduce costs irrespective of whether there is a recession or Great Recession?

RESPONSE

For many (perhaps most) types of mail, the existence of "cheaper technological alternatives to the mail" pre-dates the Great Recession by many years. In response to these "cheaper technological alternatives", there has been a general trend away from the mail and toward these "cheaper technological alternatives" that also pre-dates the Great Recession. This on-going effect is modeled in my work by mail diversion trends which also pre-date the Great Recession. These trends continued to reduce mail volume throughout the past five years and are explicitly excluded from the volume losses which I have attributed to the Great Recession in this case (see, for example, my response to POIR No. 6, question 1).

A consumer's choice among possible substitutes will involve a weighing of the costs and benefits of these alternatives against one another. In the case of "cheaper technological alternatives to the mail," the benefit of lower marginal cost may be weighed against the time necessary to learn to use these "technological alternatives" or against security concerns or other factors. A change in the consumer's macro-economic conditions could well change the relative value of these competing costs. For example, a consumer who is laid off may be more willing to spend the time to convert to electronic bill-payment in order to save the marginal costs of stamps which may now represent somewhat more of a financial burden to the consumer.

In good economic times, it is also often the case that businesses may be inclined to adhere to the philosophy of "if it ain't broke, don't fix it," focusing instead on maintaining and growing the status quo. The Great Recession changed the status quo and caused many businesses to rethink their options. Such rethinking may well have included a re-evaluation of the use of the mail vis-à-vis "cheaper technological alternatives".

Herbert Simon, who won the 1978 Nobel Prize in Economics "for his pioneering research into the decision-making process within economic organizations", described this type of behavior in his seminal 1959 paper, "Theories of Decision-Making in Economics and Behavioral Science" (*The American Economic Review*, Vol. 49, No. 3 (June, 1959), pp. 253-283).

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

"The notion of satiation plays no role in classical economic theory, while it enters rather prominently into the treatment of motivation in psychology….

If we seek to explain business behavior in the terms of this theory, we must expect the firm's goals to be not maximizing profit, but attaining a certain level or rate of profit, holding a certain share of the market or a certain level of sales. Firms would try to 'satisfice' rather than to maximize….

Models of satisficing behavior are richer than models of maximizing behavior, because they treat not only equilibrium but of the method of reaching it as well. Psychological studies of the formation and change of aspiration levels support propositions of the following kinds. (a) ***When performance falls short of the level of aspiration, search behavior (particularly search for new alternatives of action) is induced.***" (pp. 262-263, emphasis added)

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

10. In your response to POIR No. 6, question 12(c), you state with respect to Intervention trends: "The problem with such an approach, however, is that trend variables of this nature will also capture the effect of other trends in mail volumes, including, for example, negative trends caused by the Great Recession that are not necessarily the result of changes in the rate of Internet mail diversion (although, the Internet variables themselves were subject to this same issue). These trends are best thought of, then, not as measuring 'Internet' diversion or 'electronic' diversion but of measuring net mail diversion, the net effect of the various trends affecting mail volumes."

a. Would it be possible to econometrically separate the "other trends in mail volumes" as compared to the "negative trends caused by the Great Recession that are not necessarily the result of changes in the rate of Internet mail diversion?" If so, how would one do this sort of econometric separation?

b. If part a. is not confirmed, please explain what judgment outside the model you use to separate "other trends in mail volumes".

RESPONSE

a. Please see my response to question 7 of this POIR. The issue of attempting to include multiple factors within a model which follow very similar time paths (e.g., time trends starting between 2007 and 2009) is called multicollinearity. I have discussed multicollinearity extensively in past proceedings before the Postal Regulatory Commission. For example, my explanation from my Direct Testimony in Docket No. R2006-1 (USPS-T-7) of multicollinearity and the problems which it can create is particularly applicable to this situation:

> "In order for the OLS estimator, b, to be defined, the value of $(X'X)^{-1}$ must be defined. This requires that the matrix (X'X) must be of rank k if (X'X) is a k-by-k matrix. This will be strictly true as long as there is no independent variable in X which can be expressed as a linear combination of the other variables that make up X. So long as this is the case, perfect multicollinearity will not exist, and [the GLS equation used in my econometric work] will be uniquely solvable.
>
> As a practical matter, if there are variables within X which are near-perfect linear combinations of one another, however, some degree of multicollinearity will exist. In such a case, the OLS estimators will be unbiased, but may have extremely large variances about the estimates (i.e., the estimates will be inefficient).
> Suppose, for example, that the X-matrix of explanatory variables [in the econometric model] were to be divided into two separate matrices, X_1 and X_2, so that
>
> $$y = X_1\beta_1 + X_2\beta_2 + \varepsilon$$
>
> Suppose further that the explanatory variables that make up X_1 (e.g., x_1, x_2, x_3) are highly correlated, so that, for example, $x_1 \approx a_1 \bullet x_2 + a_2 \bullet x_3$, for some constants, a_1 and a_2. The aggregate impact of these variables on the dependent variable ($X_1\beta_1$) will be accurately estimated. The estimated standard errors associated with the coefficients on x_1, x_2, and x_3 will be quite large, however, so that the values of b_1, b_2, and b_3, associated with x_1, x_2, and x_3, respectively, will be poorly estimated.

If one's goal is simply to fit y as well as possible (i.e., to minimize ε), then Ordinary Least Squares should be sufficient. If, however, one's goal is to obtain the best possible estimate for each individual coefficient, β_i, it may be necessary to develop independent estimates of some of the elasticities, in cases where high multicollinearity is known to exist.

The need for additional information in such cases is expounded on quite clearly in The Theory and Practice of Econometrics, 2nd edition, by George G. Judge, et al. (1985):

> "Once detected, the best and obvious solution to [this] problem is to ... incorporate more information. This additional information may be reflected in the form of new data, a priori restrictions based on theoretical relations, prior statistical information in the form of previous statistical estimates of some of the coefficients and/or subjective information." (p. 897)

Multicollinearity will be a problem to at least some degree in any empirical econometric work. In my work, multicollinearity is particularly acute with regard to a high degree of correlation between current and lagged prices of Postal products and a high degree of correlation between the prices of competing Postal products. The techniques by which the demand equation estimation procedure is refined to account for these types of multicollinearity are described below." (R2006-1, USPS-T-7, pp. 313-314)

b. Please see my responses to, among other things, POIR No. 3, questions 1 and 2, question 7 of this POIR, and the Transcript from my Hearing at pages 100 and 101 and elsewhere.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

11. In your response to POIR No. 6, question 25(a), you state that "the baseline assumption underlying the Postal Service's econometric demand equations and volume forecasting methodology – in general, not only in this case – is that the rate of electronic diversion is expected to remain constant in the absence of evidence to the contrary." In discussing your rationale for your response, you explain an "S" curve of technological adoption that includes "early adopters," "take-off," and a plateau.

a. For purposes of "S" curve adoption, do you consider e-readers and/or tablet computers to be a new technology or a continuation of the technological advancement of the Internet? Please provide the rationale for your response.

b. For purposes of "S" curve adoption, do you consider Facebook and other social media communications platforms to constitute a new technology or, rather, a continuation of the technological advancement of the Internet? Please provide the rationale for your response.

c. For purposes of "S" curve adoption, do you consider smartphones to constitute a new technology or, rather, a continuation of the technological advancement of the Internet? Please provide the rationale for your response.

RESPONSE

a. – c. For the purposes of my work for the Postal Service, the technological adoption in which I am interested is the technological adoption of alternatives to the mail. As such, I am not interested in the rate of adoption of e-readers or Facebook or smartphones, *per se*, but am only interested in these specific technologies to the extent that they divert mail. Unlike electronic bill presentment and payment (EBPP) systems, tablets, social media, and smartphones were not designed for the purpose of explicitly diverting mail. To the extent that the way in which such technologies divert mail is by providing consumers with better access to Internet alternatives to the mail, these technologies should properly be viewed as mere continuations along pre-existing s-curves toward the technological adoption of alternatives to mail.

RESPONSE OF THOMAS THRESS
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 9

12. Please refer to your response to POIR No. 3, question 6 where you state that "the provided estimate of the effect of the recession on mail volumes excludes the positive effect of the economic variables in columns D through G in years when these variables have a combined net positive effect on mail volumes". Please also refer to file "POIR.6.Q14.Rev.11.15 ExigentImpacts.xlsx" (tab "Volume") filed with your response to POIR No. 6, question 14.

a. Would it be fair to say that you exclude the positive effect of economic variables because such impact is not "due to" the Great Recession? If not, please explain.

b. Please direct your attention to "First-Class Workshared Letters" on the spreadsheet. Would it be fair to say that negative impact of employment on mail volumes in FY2009-FY2010 (as shown in cells D57:D58) could be partially "due to" other reasons than the Great Recession? If not, please explain.

c. For First-Class Workshared Letters, the impact of employment on mail volumes is positive during three consecutive years - FY 2011, FY 2012 and FY 2013 (cells D59:D61). However, in FY2014 such impact becomes negative again (cell D62). Could you please provide an explanation for this occurrence?

RESPONSE

a. Yes

b. No. One of the most significant, obvious, and generally agreed-upon impacts of the Great Recession was on employment, which remains below pre-recession levels even today.

As 2010 Nobel Laureate and labor economist Dale Mortenson said in 2011 in a panel discussion which I cited to in my response to POIR No. 7, question 12(c), when discussing the Great Recession: "If you look at the data, what happened was unemployment doubled in a year, and it didn't do that for structural reasons. It obviously did that because all of a sudden expectations changed. And expectations, as far as I can see, haven't changed back."

I do not see why one would reasonably seek to distinguish between the negative impacts of the Great Recession and the negative impacts of the dramatic declines in employment in 2009 and 2010, which were not only obviously caused by the Great Recession, but which practically define the Great Recession to many, if not most, people.

c. The First-Class Workshared letters, cards, and flats demand equation includes only the cyclical component of employment. In the macro-economic forecast used in this case, Global Insight projected that the rate of growth in employment would be slower in FY 2014 (1.69 percent) than in the surrounding years (2.23 percent in FY 2012, 2.01 percent in FY 2013, 1.85 percent in FY 2015, and 1.95 percent in FY 2016). Because of this, the projected growth rate in employment in this year is lower than the growth rate of the trend component of employment.

This causes the cyclical component of employment to decline in this year which, in turn, leads to an expected decline in First-Class Workshared Mail volume.