

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

RATE ADJUSTMENT DUE TO EXTRAORDINARY
OR EXCEPTIONAL CIRCUMSTANCES

Docket No. R2010-4R

FURTHER STATEMENT OF
THOMAS E. THRESS
ON BEHALF OF THE
UNITED STATES POSTAL SERVICE

Table of Contents

AUTOBIOGRAPHICAL SKETCH	1
PURPOSE AND SCOPE OF STATEMENT	2
I. Introduction	3
II. Calculation of Sources-of-Change Decomposition Analysis	5
A. General Overview	5
B. Timing of Volume Losses	5
Technical Appendix I: Calculation of Sources-of-Change Decomposition	
Technical Appendix II: Specific Equations used in This Analysis	
<u>Supporting Documentation</u>	
USPS-R2010-4R/10: DECOMPOSITION OF MAIL VOLUME INTO SOURCES OF CHANGE	

1 FURTHER STATEMENT
2 OF
3 THOMAS E. THRESS
4

5 AUTOBIOGRAPHICAL SKETCH

6 My name is Thomas E. Thress. I am a Vice-President at RCF Economic and
7 Financial Consulting, Inc., where I have been employed since 1992. As a Vice
8 President at RCF, I have major responsibilities in RCF's forecasting, econometric, and
9 quantitative analysis activities.

10 I testified to the volume forecasts underlying the Postal Service's case in the last two
11 omnibus rate cases prior to the enactment of the Postal Accountability and
12 Enhancement Act (PAEA): Docket Nos. R2006-1 and R2005-1. Prior to this, I testified
13 regarding the demand equations underlying the volume forecasts for all mail categories
14 except for Priority and Express Mail in Docket Nos. R97-1, R2000-1, and R2001-1. I
15 have also appeared as a rebuttal witness for the Postal Service in Docket No. MC95-1,
16 and submitted written testimony for the Postal Service in Docket No. MC97-2.

17 I have had primary responsibility for the econometric analysis underlying Dr. George
18 Tolley's volume forecasting testimony since Docket No. R94-1. In addition, I was
19 responsible for the development of the share equation methodology used by the Postal
20 Service since MC95-1, as well as the classification shift matrix construction used in Dr.
21 Tolley's volume forecasting testimony in MC95-1 and MC96-2 to shift mail into the new
22 categories proposed under classification reform.

23 I received a Master's Degree in Economics in 1992 from the University of Chicago. I
24 received a B.A. in Economics and a B.S. in Mathematics from Valparaiso University in
25 1990.

1

2

PURPOSE AND SCOPE OF STATEMENT

3

The purpose of this Further Statement is to update and further document the

4

estimate I previously provided in this proceeding of the exigent impact of the “Great

5

Recession” on mail volumes for which the Postal Service is seeking relief.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19**I. Introduction**

Before the exigent rate request was initiated in July 2010, in response to an interrogatory from the Greeting Card Association, directed to Postal Service CFO Joseph Corbett in Docket No. N2010-1, the Postal Service filed a spreadsheet entitled, 'GCA.1.Sources-of-Change.xls'. This spreadsheet presented a decomposition of the factors affecting mail volume for each mail category I forecast through FY 2009. Of particular interest, this spreadsheet provided an estimate of the impact of macro-economic factors on Postal Service mail volumes in FY 2008 and FY 2009. After the Commission put parties on notice of the importance of distinguishing the effects of the Great Recession on mail volume from the effects of other factors on mail volume, the estimates from the Sources-of-Change spreadsheet were incorporated in this proceeding into the Postal Service's Initial Comments on Remand (July 25, 2011). Subsequently, I was asked by the Postal Service to prepare a Statement which documented the Sources-of-Change estimates, and that Statement was filed on November 21, 2011.

For this Further Statement, I have updated this analysis based on the most recent available data, including Postal Service RPW volume and revenue data through 2013PQ3. The final results are presented in Table One.

1

TABLE ONE: Exigent FY 2008 – 2012 Losses Attributable to the Great Recession
(Market-Dominant mail only, all numbers in millions of pieces)

	<u>2008</u>	<u>2008 - 2009</u>	<u>2008 - 2010</u>	<u>2008 - 2011</u>	<u>2008 - 2012</u>
First-Class Mail	(3,926.9)	(10,037.0)	(15,031.7)	(19,044.0)	(22,590.2)
Standard Mail	(6,960.2)	(23,928.6)	(25,989.5)	(27,397.0)	(29,121.5)
Periodicals Mail	(165.3)	(682.4)	(1,161.4)	(1,356.6)	(1,623.0)
Package Services	(8.7)	(94.3)	(133.3)	(166.3)	(193.9)
TOTAL MARKET-DOMINANT	(11,061.1)	(34,759.2)	(42,332.9)	(47,980.9)	(53,545.6)

2

3 The spreadsheet in which these calculations are made is being filed as USPS-

4 R2010-4R/10.

1 **II. Calculation of Sources-of-Change Decomposition Analysis**

2 **A. General Overview**

3 The estimated exigent impact of the “Great Recession” on Postal Service mail
4 volumes comes out of a set of calculations which underlie all of the Postal Service’s
5 demand equation analysis and volume forecasts, called a Sources-of-Change
6 Decomposition Analysis.

7 Sources-of-Change tables of this type were one of the centerpieces of my testimony
8 in Docket Nos. R2005-1 and R2006-1, where they were entitled “Estimated Impact of
9 the Factors Affecting Mail Volume.” These tables presented the percentage change in
10 mail volume from one Fiscal Year to the next attributable to various factors which were
11 identified in my testimonies.

12 The impact of the Great Recession on mail volumes is the sum of the impact of
13 those factors which are judged to be attributable to the Great Recession. This includes
14 macro-economic variables, such as Employment, Investment, and Retail Sales, as well
15 as other factors which began to affect mail volumes over the time period associated with
16 the Great Recession.

17 The numbers presented here are based on econometric demand equations which
18 have been estimated using data through 2013PQ3.

19

20 **B. Timing of Mail Volume Losses**

21 The effect of the Great Recession, as I use the term here, refers to events which
22 affected the U.S. economy which triggered temporary and permanent losses in mail
23 volumes as well as significant downturns in long-run mail volume trends. These factors
24 closely parallel the factors which caused the Great Recession as it affected the overall
25 U.S. economy. Just as the specific impact of these events on the overall U.S. economy
26 was not the same as the effect on mail volumes (GDP did not fall 20 percent in two

1 years like Standard Mail volume), so also, the timing of their effect on mail volume was
2 not necessarily identical to their effect on the economy as a whole.

3 The National Bureau of Economic Research (NBER) sets what are sometimes
4 thought of as the “official” dates of turning points in the U.S. economy. According to the
5 NBER’s dating, the so-called “Great Recession” officially began in December, 2007
6 (2008PQ1), and ended in June, 2009 (2009PQ3). The U.S. macro-economy does not,
7 however, move purely in unison. Weaknesses in one sector may gradually expand to
8 other sectors until they reach enough of the economy to be identifiable as a full-blown
9 recession. Likewise, some sectors of the economy may be quicker to recover from
10 recession than others, so that some sectors of the economy may effectively remain in
11 recession even after the macro-economy in general has moved into recovery.

12 In the case of the Postal Service, mail volumes, and the sectors of the economy that
13 are the heaviest users of mail, both of these things occurred. Mail-intensive sectors of
14 the economy weakened before the date designated by the NBER as the start of the
15 Great Recession. These same sectors – and, most importantly for our purposes here,
16 mail volume – have also been far slower to recover than many other sectors of the
17 macro-economy even as the NBER judged that the economy as a whole began to
18 recover in mid-2009. For example, gross private domestic investment, the primary
19 macro-economic variable in the Postal Service’s demand equations for Standard Mail,
20 peaked in 2006PQ2, seven full quarters before the initial downturn in the U.S. macro-
21 economy, as identified by NBER. Because of this, the exigent factors that are generally
22 explained (here and elsewhere) as being due to the Great Recession began to
23 adversely affect mail volumes already in FY 2007.

24 Even more significant to the Postal Service, the Postal Service’s financial losses due
25 to factors related to and triggered by the Great Recession continue to accrue even now,
26 four years after the general U.S. economy has been in recovery.

1 In previous recessions, mail volume trends were essentially the same after the
2 recession as before. For example, in the two Fiscal Years prior to the 2001 recession
3 (FY 1999, FY 2000), Standard Mail volume grew at an average annual rate of 4.8
4 percent. In the first two Fiscal Years following the end of the 2001 recession (FY 2003,
5 FY 2004), Standard Mail volume grew at an average annual rate of 4.7 percent.

6 Unlike after the 2001 recession, however, where Standard Mail volume returned to
7 pre-recession growth rates, Standard Mail volume has had only one year of meaningful
8 growth since the declared end of the Great Recession (FY 2011, when Standard Mail
9 volume grew 2.6 percent) and Standard Mail volume in FY 2012 was 3.3 percent below
10 its level two years earlier. The story is similar for First-Class Mail. From FY 2004 to FY
11 2006, First-Class Mail volume declined, but at a fairly modest average annual rate of
12 only 0.3 percent. From FY 2010 to FY 2012, while employment grew (albeit somewhat
13 slowly), First-Class Mail volume declined at an average annual rate of 5.8 percent.

14 Table Two decomposes the year-to-year changes in First-Class, Standard, and total
15 Market-Dominant mail volumes from FY 2008 through FY 2012 into the key factors
16 which have been identified as affecting these mail volumes. The estimated cumulative
17 effect of factors relating to the Great Recession on total Market-Dominant mail from FY
18 2008 through FY 2012, as shown in the final row of Table Two, is a loss of Market-
19 Dominant mail volume of 53.5 billion pieces of mail.

20 That is to say, it is my estimate that, if macro-economic conditions had not
21 deteriorated between FY 2007 and FY 2012, and the relationship between mail volume
22 and macro-economic and other factors had remained the same as before the Great
23 Recession, total Market-Dominant mail volume would have been 53.5 billion pieces
24 higher in FY 2012 than actual volumes that year, or 209.8 billion pieces of total mail, as
25 compared to actual FY 2007 volume for these categories of mail of 209.4 billion pieces.

TABLE TWO: Exigent Postal Service Losses, FY 2008 – 2012

	Starting	Pre-Existing Non-Macro-Economic Factors						Macro-Economy & Recession-Induced Factors	Final
	<u>Volume</u>	<u>Population</u>	<u>Diversion</u>	<u>Trends</u>	<u>Nominal Price</u>	<u>Inflation</u>	<u>Other Factors</u>	<u>Volume</u>	
<u>First-Class Mail</u>									
2008	95,347.0	1,059.4	(2,657.2)	744.3	(1,787.4)	973.5	918.4	(3,926.9)	90,671.2
2009	<u>90,671.2</u>	<u>923.6</u>	<u>(2,429.7)</u>	<u>671.5</u>	<u>(747.6)</u>	<u>173.2</u>	<u>(425.1)</u>	(6,110.1)	<u>82,727.0</u>
2008 - 2009	95,347.0	1,983.0	(5,086.9)	1,415.8	(2,535.0)	1,146.8	493.3	(10,037.0)	82,727.0
2010	<u>82,727.0</u>	<u>855.2</u>	<u>(2,224.5)</u>	<u>594.5</u>	<u>(512.2)</u>	<u>257.4</u>	<u>888.8</u>	(4,994.6)	<u>77,591.6</u>
2008 - 2010	95,347.0	2,838.2	(7,311.4)	2,010.3	(3,047.2)	1,404.1	1,382.1	(15,031.7)	77,591.6
2011	<u>77,591.6</u>	<u>819.9</u>	<u>(2,055.2)</u>	<u>543.3</u>	<u>(78.7)</u>	<u>461.1</u>	<u>(747.7)</u>	(4,012.3)	<u>72,521.9</u>
2008 - 2011	95,347.0	3,658.1	(9,366.6)	2,553.6	(3,125.9)	1,865.2	634.4	(19,044.0)	72,521.9
2012	<u>72,521.9</u>	<u>809.4</u>	<u>(1,911.6)</u>	<u>496.2</u>	<u>(463.0)</u>	<u>527.6</u>	<u>239.5</u>	(3,546.2)	<u>68,673.7</u>
2008 - 2012	95,347.0	4,467.5	(11,278.2)	3,049.8	(3,588.9)	2,392.8	873.9	(22,590.2)	68,673.7
<u>Standard Mail</u>									
2008	102,968.6	1,144.7	0.0	1,252.7	(3,195.1)	2,087.0	1,263.6	(6,960.2)	98,561.3
2009	<u>98,561.3</u>	<u>976.7</u>	<u>0.0</u>	<u>1,090.1</u>	<u>(2,772.1)</u>	<u>842.8</u>	<u>183.0</u>	(16,968.4)	<u>81,913.3</u>
2008 - 2009	102,968.6	2,121.4	0.0	2,342.9	(5,967.2)	2,929.8	1,446.6	(23,928.6)	81,913.3
2010	<u>81,913.3</u>	<u>849.8</u>	<u>0.0</u>	<u>943.8</u>	<u>(1,828.1)</u>	<u>367.3</u>	<u>1,760.4</u>	(2,060.9)	<u>81,945.5</u>
2008 - 2010	102,968.6	2,971.1	0.0	3,286.7	(7,795.3)	3,297.0	3,206.9	(25,989.5)	81,945.5
2011	<u>81,945.5</u>	<u>905.3</u>	<u>0.0</u>	<u>1,008.4</u>	<u>(1,047.9)</u>	<u>1,020.8</u>	<u>1,632.0</u>	(1,407.5)	<u>84,056.6</u>
2008 - 2011	102,968.6	3,876.4	0.0	4,295.1	(8,843.3)	4,317.8	4,838.9	(27,397.0)	84,056.6
2012	<u>84,056.6</u>	<u>932.8</u>	<u>0.0</u>	<u>1,002.0</u>	<u>(1,375.8)</u>	<u>1,296.4</u>	<u>(4,610.5)</u>	(1,724.5)	<u>79,577.0</u>
2008 - 2012	102,968.6	4,809.2	0.0	5,297.1	(10,219.1)	5,614.2	228.5	(29,121.5)	79,577.0

1

	Starting	Pre-Existing Non-Macro-Economic Factors						Macro-Economy & Recession-Induced Factors	Final
	Volume	Population	Diversion	Trends	Nominal Price	Inflation	Other Factors	Volume	
<u>Periodicals Mail</u>									
2008	8,795.8	98.9	(230.1)	0.0	17.0	36.6	52.2	(165.3)	8,605.2
<u>2009</u>	<u>8,605.2</u>	<u>88.5</u>	<u>(218.5)</u>	<u>0.0</u>	<u>(26.3)</u>	<u>(1.6)</u>	<u>(29.5)</u>	<u>(517.0)</u>	<u>7,900.9</u>
2008 - 2009	8,795.8	187.4	(448.5)	0.0	(9.2)	35.0	22.8	(682.4)	7,900.9
<u>2010</u>	<u>7,900.9</u>	<u>80.6</u>	<u>(198.0)</u>	<u>0.0</u>	<u>(17.6)</u>	<u>12.2</u>	<u>(29.5)</u>	<u>(479.1)</u>	<u>7,269.5</u>
2008 - 2010	8,795.8	268.0	(646.6)	0.0	(26.8)	47.2	(6.7)	(1,161.4)	7,269.5
<u>2011</u>	<u>7,269.5</u>	<u>78.3</u>	<u>(189.5)</u>	<u>0.0</u>	<u>(5.2)</u>	<u>18.1</u>	<u>100.6</u>	<u>(195.2)</u>	<u>7,076.7</u>
2008 - 2011	8,795.8	346.4	(836.1)	0.0	(32.0)	65.3	93.9	(1,356.6)	7,076.7
<u>2012</u>	<u>7,076.7</u>	<u>79.3</u>	<u>(183.3)</u>	<u>0.0</u>	<u>(18.4)</u>	<u>16.2</u>	<u>37.2</u>	<u>(266.4)</u>	<u>6,741.4</u>
2008 - 2012	8,795.8	425.6	(1,019.3)	0.0	(50.3)	81.6	131.0	(1,623.0)	6,741.4
<u>Package Services</u>									
2008	814.2	9.0	(15.1)	0.0	(60.5)	19.1	(1.3)	(8.7)	756.7
<u>2009</u>	<u>756.7</u>	<u>7.6</u>	<u>(13.4)</u>	<u>0.0</u>	<u>(15.0)</u>	<u>8.6</u>	<u>(9.2)</u>	<u>(85.6)</u>	<u>649.7</u>
2008 - 2009	814.2	16.6	(28.6)	0.0	(75.5)	27.7	(10.5)	(94.3)	649.7
<u>2010</u>	<u>649.7</u>	<u>6.6</u>	<u>(11.8)</u>	<u>0.0</u>	<u>(7.0)</u>	<u>3.0</u>	<u>(6.5)</u>	<u>(39.0)</u>	<u>595.0</u>
2008 - 2010	814.2	23.1	(40.4)	0.0	(82.4)	30.7	(16.9)	(133.3)	595.0
<u>2011</u>	<u>595.0</u>	<u>6.4</u>	<u>(10.6)</u>	<u>0.0</u>	<u>(2.6)</u>	<u>8.0</u>	<u>41.7</u>	<u>(33.0)</u>	<u>604.9</u>
2008 - 2011	814.2	29.6	(51.0)	0.0	(85.0)	38.7	24.8	(166.3)	604.9
<u>2012</u>	<u>604.9</u>	<u>6.7</u>	<u>(9.6)</u>	<u>0.0</u>	<u>(6.6)</u>	<u>11.6</u>	<u>(5.2)</u>	<u>(27.6)</u>	<u>574.2</u>
2008 - 2012	814.2	36.3	(60.6)	0.0	(91.7)	50.2	19.6	(193.9)	574.2

2

1

	Starting		Pre-Existing Non-Macro-Economic Factors					Macro-Economy & Recession-Induced Factors	Final Volume
	Volume	Population	Diversion	Trends	Nominal Price	Inflation	Other Factors		
<u>Total Market-Dominant Mail</u>									
2008	209,401.3	2,328.1	(2,902.4)	1,902.7	(5,037.4)	3,124.9	2,140.2	(11,061.1)	199,896.3
<u>2009</u>	<u>199,896.3</u>	<u>2,007.4</u>	<u>(2,661.6)</u>	<u>1,688.9</u>	<u>(3,564.1)</u>	<u>1,023.4</u>	<u>(564.9)</u>	(23,698.1)	<u>174,127.2</u>
2008 - 2009	209,401.3	4,335.5	(5,564.0)	3,591.5	(8,601.5)	4,148.4	1,575.3	(34,759.2)	174,127.2
<u>2010</u>	<u>174,127.2</u>	<u>1,801.6</u>	<u>(2,434.4)</u>	<u>1,473.1</u>	<u>(2,370.8)</u>	<u>642.9</u>	<u>2,521.6</u>	(7,573.6)	<u>168,187.7</u>
2008 - 2010	209,401.3	6,137.1	(7,998.3)	5,064.6	(10,972.3)	4,791.3	4,096.9	(42,332.9)	168,187.7
<u>2011</u>	<u>168,187.7</u>	<u>1,818.5</u>	<u>(2,255.3)</u>	<u>1,496.6</u>	<u>(1,137.9)</u>	<u>1,511.7</u>	<u>1,050.6</u>	(5,648.0)	<u>165,024.0</u>
2008 - 2011	209,401.3	7,955.7	(10,253.6)	6,561.3	(12,110.2)	6,303.0	5,147.5	(47,980.9)	165,024.0
<u>2012</u>	<u>165,024.0</u>	<u>1,836.6</u>	<u>(2,104.5)</u>	<u>1,447.3</u>	<u>(1,870.8)</u>	<u>1,854.9</u>	<u>(4,342.7)</u>	(5,564.7)	<u>156,280.1</u>
2008 - 2012	209,401.3	9,792.3	(12,358.1)	8,008.6	(13,981.0)	8,157.8	804.8	(53,545.6)	156,280.1

2

3

4

5

6

Note: The numbers presented here are based on the Postal Service's most recent econometric models which are estimated based on data available through 2013PQ3. These numbers differ somewhat from the similar numbers presented in my November, 2011, statement, because the models here have been updated to incorporate all available data. First-Class Mail excludes Parcels and International Mail. Total numbers exclude First-Class Parcels, Alaska Bypass, and all mail that has been reclassified as Competitive as of January, 2013 (e.g., Lightweight Parcel Select, Standard Post, First-Class Commercial and International Parcels).

1 **Technical Appendix I: Calculation of Sources-of-Change Decomposition**

2 The estimated exigent impact of the “Great Recession” on Postal Service mail
3 volumes comes out of a set of calculations which underlie all of the Postal Service’s
4 demand equation analysis and volume forecasts, called a Sources-of-Change
5 Decomposition Analysis.

6 Sources-of-Change tables of this type were one of the centerpieces of my testimony
7 in Docket Nos. R2005-1 and R2006-1, where they were entitled “Estimated Impact of
8 the Factors Affecting Mail Volume.” These tables presented the percentage change in
9 mail volume from one Fiscal Year to the next attributable to various factors which were
10 identified in my testimonies.

11 The general calculation of Sources-of-Change Decomposition Analysis tables of this
12 type are constructed as follows. These calculations were made in the spreadsheet,
13 Sources-of-Change.xls, which is included in Library Reference USPS-R2013-4/8, which
14 has been filed with this statement.

15 The calculation of the estimated impacts on mail volume begins with the calculation
16 of quarterly projection factors of the form, $[x_{it} / x_{i(t-1)}]^{e_i}$, as described in my R2006-1
17 testimony (pp. 333 ff.). The process by which I convert from quarterly percentages to
18 annual percentages is a three-step process. First, the quarterly percentage impact of
19 each factor is converted into a number of pieces. The quarterly impacts, expressed as
20 pieces, are then aggregated to express annual impacts of each factor, expressed as a
21 number of pieces. Finally, the annual impact of each factor is converted from a number
22 of pieces to a percentage. The numbers used in this Exigent Case are expressed in
23 terms of annual pieces, so that the third step – the conversion from pieces back to
24 percentages – is not necessary here.

25 In converting percentages to pieces, order matters – i.e., if I multiply each
26 percentage times the starting volume, I get a different answer than if I multiply each
27 percentage times the ending volume, and in neither of these cases, if I then sum up the

1 pieces, do I get the same answer as if I sum up the percentages¹. In this case, I
2 converted from percentages to pieces sequentially. That is, suppose there are three
3 factors; x, y, and z; contributing to changes in volume. Then,

$$4 \qquad \text{Ending Volume} = \text{Starting Volume} \cdot (1+x) \cdot (1+y) \cdot (1+z)$$

5
6
7 First, x is converted to pieces (P_x) by multiplying Starting Volume times x. Next, y is
8 converted to pieces (P_y) by multiplying [Starting Volume + P_x] times y. Finally, z is
9 converted to pieces (P_z) by multiplying [Starting Volume + P_x + P_y] times z.

10 This leads to the result that

$$11 \qquad \text{Ending Volume} = \text{Starting Volume} + P_x + P_y + P_z$$

12
13 In this case, however, the values for P_x , P_y , and P_z depend on the order in which
14 they are calculated. For consistency, I use a standard order in which explanatory
15 variables are analyzed for all mail categories: population, macroeconomic variables,
16 time trends, Internet variables, input prices, Postal prices (nominal), competitor prices,
17 inflation, other econometric factors (e.g., dummy variables), seasonality, and “other”
18 unexplained factors. As a practical matter, the effect of order on the results is fairly
19 trivial and does not affect the general conclusions of this work.

20 After converting from quarterly percentages to quarterly pieces, then, quarterly
21 pieces are converted into annual pieces. This is done by summing the quarter-by-
22 quarter impacts of moving from Quarters 1 through 4 to Quarters 5 through 8 as follows.

23 The impact of a factor between Quarter 1 and Quarter 5 is equal to the impact from
24 Quarter 1 to Quarter 2 plus the impact from Quarter 2 to Quarter 3 plus the impact from
25 Quarter 3 to Quarter 4 plus the impact from Quarter 4 to Quarter 5. Looking at the
26 impact from Quarters 2 through 4 to Quarters 6 through 8 in the same way yields the
27 following overall formula:

¹ Percentages are multiplicative, not additive. Whenever I use the phrase “sum [or add] up the percentages” I mean, for percentages a, b, and c, calculate $(1+a) \cdot (1+b) \cdot (1+c) - 1$.

1
2 Change from (Quarters 1 through 4) to (Quarters 5 through 8) =
3 Change (Q1 to Q2) + 2·Change (Q2 to Q3) + 3·Change (Q3 to Q4) + 4·Change (Q4 to Q5) +
4 3·Change (Q5 to Q6) + 2·Change (Q6 to Q7) + Change (Q7 to Q8)
5

6 The annual percentage changes that were presented in my earlier testimonies were
7 then backed out from these annual pieces. Again, the order matters to convert these
8 pieces to percentages. The order in which annual pieces are converted to annual
9 percentages parallels the order in which quarterly percentages were converted to
10 quarterly pieces.

1 **Technical Appendix II: Specific Equations used in This Analysis**

2 The numbers presented in Tables One and Two of this document are calculated
3 based on a set of econometric demand equations for mail volumes that were estimated
4 in August, 2013, using data through the third Postal quarter of FY 2013. The general
5 methodology used to estimate these equations is similar to that outlined in the
6 “Narrative Explanation of Econometric Demand Equations for Market Dominant
7 Products as of November, 2012”, which was filed with the Postal Regulatory
8 Commission on July 1, 2013.

9 The specific First-Class Mail and Standard Mail equations used for this exercise and
10 the specific variables which were included in the “Exigent Impact” calculations in Tables
11 One and Two are identified here. For the other classes of mail, the equations used to
12 construct Table Two were generally similar to the equations described in the Narrative
13 Statement noted above, filed with the Commission on July 1, 2013.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

1. First-Class Single-Piece Letters, Cards, and Flats

a. Econometric Specification

The econometric demand equation for First-Class single-piece letters, cards, and flats includes the following explanatory variables.

(1) Macro-Economic Variables: Employment

The relationship between First-Class single-piece mail and the general economy is modeled through the inclusion of Private Employment (EMPLOY) as an explanatory variable in the First-Class single-piece letters and cards equation.

The theoretical rationale for including total employment per adult as a macro-economic variable is that in many cases, mail volume is not affected by the dollar value of economic transactions, so much as by the number of such transactions. For example, the number of credit card bills one receives does not necessarily go up as the total amount charged per card goes up. While variables like GDP or retail sales may be good measures of the total dollar amount of economic activity (e.g., the total amount charged per credit card), employment appears to be a better measure of the number of business transactions (e.g., number of credit card bills received). Employment was chosen as the macro-economic variable to be included in the First-Class single-piece letters equation on the basis of a comparison of econometric results including several candidate macro-economic variables, including retail sales, consumption, and GDP.

Employment is filtered using a Hodrick-Prescott filter. The resulting trend and cyclical components of Employment (EMPLOY_HPT and EMPLOY_HPC, respectively) are treated as separate variables. Only the former of these, the trend component of Employment (EMPLOY_HPT), is included in the demand equation for First-Class single-piece letters, cards, and flats.

(2) Diversion Trends

1 The most critical factor affecting First-Class single-piece mail volume over at least
2
3 the past ten years has been the loss of this volume to electronic alternatives. The
4 diversion of First-Class single-piece mail to the Internet and other electronic alternatives
5 is modeled through the inclusion of linear trends starting at three distinct time periods:
6 1993Q4, 2002Q4, and 2007Q4. The starting dates of these trends are chosen to
7 coincide with periods when the rate of diversion appeared to accelerate for First-Class
8 single-piece mail volume.
9

(3) Postal Prices

10 The First-Class single-piece letters, cards, and flats equation includes a price index
11 measuring the average price of First-Class single-piece letters, cards, and flats
12 (PX01SP_LCF).
13

(4) Other Variables

14 The First-Class single-piece mail equation includes four dummy variables: D_R90,
15 which is equal to one since the introduction of R90-1 rates in 1991Q2, zero prior; MC95,
16 which is equal to one since the introduction of classification reform, MC95-1, zero prior;
17 R2006PHOP, which is equal to -1 in 2006Q1 and +1 in 2006Q2 and is related to the
18 Postal Service's measure of Postage in the Hands of the Public (PHOP) just before and
19 after the implementation of R2005-1 rates in January, 2006; and D_R07, which is equal
20 to one since the introduction of R2006-1 rates².
21

22 Finally, the First-Class single-piece letters and cards equation includes a set of
23 seasonal variables.

² Forever Stamps were also introduced at this time.

1

2

3

b. Exigent Factors associated with the Great Recession

4

The following variables are included in the calculation of Exigent Losses in Tables

5

One and Two of my testimony.

6

- Trend Component of Employment

7

- Diversion Trend starting in 2007Q4

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

2. First-Class Workshared Letters, Cards, and Flats

a. Econometric Specification

The econometric demand equation for First-Class workshared letters, cards, and flats includes the following explanatory variables.

(1) Macro-Economic Variable: Employment

The relationship between First-Class workshared letters, cards, and flats and the general economy is modeled through the inclusion of Private Employment (EMPLOY) as an explanatory variable in the First-Class workshared letters, cards, and flats equation.

The theoretical rationale for including total employment per adult as a macro-economic variable is that in many cases, mail volume is not affected by the dollar value of economic transactions, so much as by the number of such transactions. For example, the number of credit card bills one receives does not necessarily go up as the total amount charged per card goes up. While variables like GDP or retail sales may be good measures of the total dollar amount of economic activity (e.g., the total amount charged per credit card), employment appears to be a better measure of the number of business transactions (e.g., number of credit card bills received).

Employment is filtered using a Hodrick-Prescott filter. Only the resulting Cyclical component of Employment (EMPLOY_HPC) is entered into the First-Class workshared letters, cards, and flats equation as an explanatory variable, as the Trend Component of Employment was not found to have a statistically significant impact on First-Class workshared mail volume.

1 **(2) Logistic Time Trend**

2 The First-Class workshared letters, cards, and flats equation includes a logistic time
3 trend starting in 1992Q1 (@LOG(TREND-84)).

4 **(3) Diversion Trends**

5
6 The negative impact of the Internet and other electronic alternatives on First-Class
7 workshared mail volume in recent years is modeled by including three linear time trends
8 starting in 2002Q3, 2004Q1, and 2008Q1 in the First-Class workshared letters, cards,
9 and flats demand equation.

10 Prior to 2002, there was very little, if any, apparent Internet diversion of First-Class
11 workshared mail (or, to the extent such diversion existed, its presence was offset by
12 other factors). The rate of diversion actually attenuated somewhat starting 2004, but
13 more recently, negative economic conditions have acted as a trigger for increased
14 diversion.

15 **(4) Postal Prices**

16 The First-Class workshared letters, cards, and flats equation includes a single Postal
17 price: the price of First-Class workshared letters, cards, and flats (PX1WS_LCF).

18 **(5) Other Variables**

19 The First-Class workshared letters, cards, and flats equation includes two dummy
20 variables: MC95, which is equal to one since the implementation of MC95-1
21 classification reform in 1996Q4, and D_EL1, which is equal to one in the first Postal
22 quarter of Federal election years, to capture election-generated mail volume such as
23 voter registration cards and candidate literature. The First-Class workshared letters
24 equation also includes a set of seasonal variables.

25

1
2
3
4
5
6

b. Exigent Factors associated with the Great Recession

The following variables are included in the calculation of Exigent Losses in Tables One and Two of my testimony.

- Cyclical Component of Employment
- Diversion Trend starting in 2008Q1

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26

3. Standard Regular Mail

a. Econometric Specification

The econometric demand equation for Standard Regular Mail (excluding parcels) includes the following explanatory variables.

(1) Macro-Economic Variable: Investment

The relationship between Standard Regular mail volume and the economy is modeled through the inclusion of gross private domestic investment (INVR) per adult.

(2) Intervention Variables

The Standard Regular demand equation includes two non-linear Intervention variables which take the following form:

$$\ln(\text{Vol})_t = a + \dots + \omega_0 \cdot P_t + \omega_1 \cdot (P_t + \delta P_{t-1} + \delta^2 P_{t-2} + \delta^3 P_{t-3} + \dots) + \omega_2 \cdot S_t + \dots$$

starting in time T, where P_t is a pulse function and S_t is a step function, so that $P_t = 1$ if $t=T$ and 0 otherwise; $S_t = 1$ if $t > T$ and 0 otherwise.

The first Intervention variable starts in 1999Q3 and reflects a rate crossover associated with the implementation of R97-1 rates which priced Standard Regular automation 5-digit letters below the price of Standard ECR basic letters. This created incentives for ECR mailers to automate their mail and migrate to Regular.

The second Intervention variable is included in recognition of the fact that the most recent recession hit advertising expenditures, and, hence, Standard mail volume, much harder than would have been expected, even given the decline that occurred in private investment. To capture this effect econometrically, an Intervention variable was added to the Standard Regular demand equation that starts in 2008Q2.

(3) Postal Prices

The Standard Regular mail equation includes a price index measuring the average price of non-parcel Standard Regular mail (PX3R_N_NP).

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27

(4) Time Trend

The Standard Regular mail equation includes two linear trend variables. The first of these is a simple linear time trend over its full sample period. This trend is included to capture general increases in the attractiveness of direct-mail advertising as a desirable advertising medium as well as in Standard Regular mail volume specifically relative to other direct-mail alternatives (e.g., Standard ECR mail). The second trend, which starts in 2007Q1, has a negative coefficient which perfectly offsets the positive long-run trend, reflecting a change in direct-mail's role within the advertising marketplace which began with the recent downturn in the overall advertising market.

(5) Other Variables

The Standard Regular mail equation includes several dummy variables to reflect the impact of various one-time events and/or changes to the relative relationship between Standard Regular mail and other mail categories.

(a) D1996Q4

A dummy variable equal to one in 1996Q4, zero otherwise, is included in the Standard Regular mail equation. This variable is included to reflect the initial impact of rule changes implemented at that time in connection with classification reform, MC95-1, that are not fully captured by the Standard Regular price index.

(b) D2002Q2

A dummy variable equal to one in 2002Q2, zero otherwise, is included in the Standard Regular equation. This variable is included to capture the temporary negative impact of bio-terrorist Anthrax attacks in the fall of 2001 (2002Q1) on the level of direct-mail advertising in general and on Standard Regular mail volumes in particular.

(c) D_R01

A dummy variable, D_R01, is set equal to one since the implementation of R2001-1 rates in the summer of 2002.

1 **(d) R2006-1**

2 A dummy variable equal to one starting with the implementation of R2006-1 rates in
3 2007Q3 (D_R07) is included in the Standard Regular equation. Standard ECR
4 automation letter discounts were eliminated at this time, leading this mail to migrate
5 from Standard ECR to Standard Regular.

6 **(e) 2012**

7 A dummy variable, D2012Q1, equal to one in 2012Q1, zero otherwise, is included in
8 the Standard Regular equation. Another dummy variable, D2012Q2ON, which is equal
9 to one from 2012Q2 forward, is also included in the Standard Regular demand
10 equation. These dummies are included to account for significant unexplained declines
11 in Standard Regular mail volume in FY 2012.

12 **(f) Election Dummies**

13 Three dummy variables are included in the Standard Regular demand equation to
14 model the impact of Federal elections on Standard Regular mail volume: D_EL4_PRES,
15 which is equal to one in the fourth Postal quarter of Presidential election years;
16 D_EL1_08, which is equal to one in the first Postal quarter of Federal election years
17 since 2008; and D_EL4_08, which is equal to one in the fourth Postal quarter of Federal
18 election years since 2008.

19 **(g) Seasonal Variables**

20 Finally, the Standard Regular mail equation includes a set of seasonal variables.
21

1
2

3 **b. Exigent Factors associated with the Great Recession**

4 The following variables are included in the calculation of Exigent Losses in Tables
5 One and Two of my testimony.

- 6
- Investment
 - Non-Linear Intervention variable starting in 2008Q2
 - Negative Trend starting in 2007Q1
- 7
8

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26

4. Standard ECR Mail

a. Econometric Specification

The econometric demand equation for Standard ECR Mail includes the following explanatory variables.

(1) Macro-Economic Variable: Investment

The relationship between Standard ECR mail volume and the economy is modeled through the inclusion of gross private domestic investment per adult (INVR).

(2) Time Trends

The Standard ECR demand equation includes a full-sample time trend (TREND), reflecting declining market share for Standard ECR volume within the general advertising market.

(3) Postal Prices

The Standard ECR mail equation contains a price index for the price of Standard ECR mail (PX3R_CR).

(4) Interventions

The Standard ECR mail equation includes two non-linear Intervention variables to reflect the impact of changes to the relative relationship between Standard Regular and ECR prices.

(a) R97-1

With the implementation of R97-1 rates in 1999Q2, Standard ECR basic letter rates were set greater than Standard Regular automation 5-digit letter rates, leading some mail to migrate from Standard ECR to Standard Regular.

A non-linear Intervention starting in 1999Q3 is included in the Standard ECR equation to explain this. This Intervention takes the following form:

$$\text{Ln}(\text{Vol})_t = a + \dots + \omega_0 \cdot P_t + \omega_1 \cdot (P_t + \delta P_{t-1} + \delta^2 P_{t-2} + \delta^3 P_{t-3} + \dots) + \omega_2 \cdot S_t + \dots$$

1 where P_t is a pulse function and S_t is a step function, so that $P_t = 1$ if $t=1999Q3$ and 0
2 otherwise; $S_t = 1$ if $t > 1999Q3$ and 0 otherwise. This variable has an initial value in
3 1999Q3 of ω_0 , which decays toward a long-run value of ω_2 . A separate dummy variable
4 for 1999Q2 (the actual quarter in which R97-1 rates took effect), D_{1999Q2} , is also
5 included in the Standard ECR demand equation.

6 **(b) R2006-1**

7 A second non-linear Intervention starting in 2007Q4 is included in the Standard ECR
8 equation to model the impact of the implementation of R2006-1 rates. Standard ECR
9 automation letter discounts were eliminated at this time, leading this mail to migrate
10 from Standard ECR to Standard Regular.

11 **(5) Other Variables**

12 There are two other sets of variables in the Standard ECR mail equation.

13 **(a) Election Dummies**

14 Political campaigns are a heavy user of Standard mail volume. Because of the
15 general timing of Federal elections in only even-numbered years, the effect of elections
16 on Standard mail volumes is not adequately modeled by simple seasonal variables.

17 Two such variables are included in the Standard ECR mail equation. The variable
18 D_EL1_OFF has a value of one during the first Postal Quarter of off-year Federal
19 election years since 2000, and is equal to zero otherwise. The variable D_EL3_OFF is
20 equal to one in the third quarter of off-year Federal election years.

21 **(b) Seasonal Variables**

22 Finally, the Standard ECR mail equation includes a set of seasonal variables.

23 **b. Exigent Factors associated with the Great Recession**

24 The following variable is included in the calculation of Exigent Losses in Tables One
25 and Two of my testimony.

- 26 • Investment

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27

5. Standard Nonprofit Mail

a. Econometric Specification

The econometric demand equation for Standard Nonprofit Mail includes the following explanatory variables.

(1) Macro-Economic Variable: Investment

The relationship between Standard Nonprofit mail volume and the general economy is modeled through the inclusion of gross private domestic investment per adult (INVR).

Investment is filtered using a Hodrick-Prescott filter. The resulting trend component of Investment (INVR_HPT) is entered into the Standard Nonprofit equation as separate explanatory variables.

(2) Postal Prices

The Standard Nonprofit mail equation contains a price index for the price of Standard Nonprofit mail (PX3N_NCR).

(3) Time Trend

The Standard Nonprofit mail equation includes a full-sample linear time trend, TREND and a second time trend starting in 2011Q2.

(4) Interventions

The Standard Nonprofit mail equation includes a non-linear Intervention variable to model the negative impact of Nonprofit Classification Reform, MC96-1, on Standard Nonprofit mail volume.

With the implementation of Nonprofit Classification Reform (MC96-1) in October of 1996 (1997Q1), Standard Nonprofit ECR basic letter rates were set greater than Standard Nonprofit automation 5-digit letter rates, leading some mail to migrate from Standard Nonprofit ECR to Standard Nonprofit.

A non-linear intervention starting in 1997Q1 is included in the Standard Nonprofit equation to explain this. This Intervention takes the following form:

1 $\ln(\text{Vol})_t = a + \dots + \omega_0 \cdot P_t + \omega_1 \cdot (P_t + \delta P_{t-1} + \delta^2 P_{t-2} + \delta^3 P_{t-3} + \dots) + \omega_2 \cdot S_t + \dots$
2 where P_t is a pulse function and S_t is a step function, so that $P_t = 1$ if $t=1997Q1$ and 0
3 otherwise; $S_t = 1$ if $t > 1997Q1$ and 0 otherwise. This variable has an initial value in
4 1997Q1 of ω_0 , which decays toward a long-run value of ω_2 .

5 A second Intervention variable is included in the Standard Nonprofit equation
6 starting in 2009Q2 to capture the extraordinary impact of the 'Great Recession' on
7 Standard Nonprofit mail volumes. This Intervention variable follows the same
8 specification as the 1997Q1 Intervention variable, except that the long-run step value,
9 ω_2 , is set equal to zero.

10 **(5) Other Variables**

11 There are three other sets of variables in the Standard Nonprofit mail equation.

12 **(a) Election Dummies**

13 Political campaigns are a heavy user of Standard mail volume. Because of the
14 general timing of Federal elections in only even-numbered years, the effect of elections
15 on Standard mail volumes is not adequately modeled by simple seasonal variables.

16 Four such variables are included in the Standard Nonprofit mail equation. The
17 variable D_EL1_OFF has a value of one during Postal Quarter 1 of off-year (i.e., non-
18 Presidential) Federal election years, and is equal to zero otherwise. The variable
19 D_EL1_PRES00 has a value of one during the first Postal Quarter of Presidential
20 election years since 2000 and is equal to zero otherwise. The variable D_EL3_PRES is
21 equal to one in the third quarter of Presidential Federal election years. The variable
22 D_EL4_PRES96 has a value of one during the fourth Postal quarter of Presidential
23 election years since 1996, and is equal to zero otherwise.

24 **(b) R2006-1**

25 A dummy variable equal to one starting with the implementation of R2006-1 rates in
26 2007Q3 (D_R07) is included in the Standard Nonprofit mail equation. Standard

1 Nonprofit ECR automation letter discounts were eliminated at this time, leading this mail
2 to migrate from Standard Nonprofit ECR to Standard Nonprofit.

3 **(c) Seasonal Variables**

4 Finally, the Standard Nonprofit mail equation includes a set of seasonal variables.

5 **b. Exigent Factors associated with the Great Recession**

6 The following variables are included in the calculation of Exigent Losses in Tables
7 One and Two of my testimony.

- 8 • Trend Component of Investment
- 9 • Non-Linear Intervention variable starting in 2009Q2
- 10 • Negative Trend starting in 2011Q2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26

6. Standard Nonprofit ECR Mail

a. Econometric Specification

The econometric demand equation for Standard Nonprofit ECR Mail includes the following explanatory variables.

(1) Macro-Economic Variable: Investment

The relationship between Standard Nonprofit ECR mail volume and the general economy is modeled through the inclusion of gross private domestic investment per adult (INVR).

Investment is filtered using a Hodrick-Prescott filter. Only the resulting Cyclical component of Investment (INVR_HPC) is entered into the Standard Nonprofit ECR equation as an explanatory variable.

(2) Postal Prices

The Standard Nonprofit ECR mail equation contains a price index for the price of Standard Nonprofit ECR mail (PX3N_CR).

(3) Time Trend

The Standard Nonprofit ECR mail equation includes a linear time trend over its full sample period.

(4) Interventions

The Standard Nonprofit ECR mail equation includes a non-linear Intervention variable to model the negative impact of the May, 2007, rate change (R2006-1), which eliminated automation discounts for Standard Nonprofit ECR letters, which made it cheaper for mailers to send this mail at Standard Nonprofit automation letters rates.

A non-linear intervention starting in 2007Q3 is included in the Standard Nonprofit ECR equation to explain this. This Intervention takes the following form:

$$\text{Ln}(\text{Vol})_t = a + \dots + \omega_0 \cdot P_t + \omega_1 \cdot (P_t + \delta P_{t-1} + \delta^2 P_{t-2} + \delta^3 P_{t-3} + \dots) + \omega_2 \cdot S_t + \dots$$

1 where P_t is a pulse function and S_t is a step function, so that $P_t = 1$ if $t=2007Q3$ and
2 0 otherwise; $S_t = 1$ if $t > 2007Q3$ and 0 otherwise. This variable has an initial value in
3 1997Q1 of ω_0 , which decays toward a long-run value of ω_2 .

4 **(5) Other Variables**

5 There are two other sets of variables in the Standard Nonprofit ECR mail equation.

6 **(a) Election Dummies**

7 Political campaigns are a heavy user of Standard mail volume. Because of the
8 general timing of Federal elections in only even-numbered years, the effect of elections
9 on Standard mail volumes is not adequately modeled by simple seasonal variables.

10 Seven such variables are included in the Standard Nonprofit ECR mail equation.
11 The variable D_EL1_OFF has a value of one during the first Postal Quarter of off-year
12 (i.e., non-Presidential) Federal election years, and is equal to zero otherwise. The
13 variable D_EL4 has a value of one during the fourth Postal Quarter of all Federal
14 election years (both off-year and Presidential). The variable D_EL1_PRES has a value
15 of one during the first Postal Quarter of Presidential election years, and is equal to zero
16 otherwise.

17 **(b) Seasonal Variables**

18 In addition, the Standard Nonprofit ECR mail equation includes a set of seasonal
19 variables.

20 **b. Exigent Factors associated with the Great Recession**

21 The following variable is included in the calculation of Exigent Losses in Tables One
22 and Two of my testimony.

- 23 • Cyclical Component of Investment