

USPS-T-9

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

POSTAL RATE AND FEE CHANGES, 2001

Docket No. R2001-1

DIRECT TESTIMONY  
OF  
GERALD L. MUSGRAVE  
ON BEHALF OF  
THE UNITED STATES POSTAL SERVICE

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DIRECT TESTIMONY  
OF  
GERALD L. MUSGRAVE

AUTOBIOGRAPHICAL SKETCH

1 My name is Gerald L. Musgrave. I am an economist and the president of  
2 Economics America, Incorporated, a consulting company in Ann Arbor, Michigan. My  
3 primary responsibilities are to develop econometric models and economic analyses. I  
4 am the Book Review Editor and a general associate editor of *Business Economics*, The  
5 Journal of the National Association for Business Economics.

6 I have a B.A. in economics from California State University, and an M.A. and  
7 Ph.D. in economics from Michigan State University. My dissertation was in applied  
8 econometrics.

9 I began my professional career in 1968, teaching senior military officers (Navy  
10 captains and Marine full colonels) at the United States Naval Postgraduate School.  
11 From 1968 to 1976, I was assistant professor of economics, academic associate,  
12 associate professor of administrative sciences and associate professor of economics.  
13 My teaching was in the graduate programs in economics, business administration,  
14 computer science, and operations research.

15 During the summers of 1974 and 1975, I was a visiting professor of  
16 economics at Michigan State University. In 1976, I accepted an appointment at  
17 Stanford University. My research was in the general area of economic models,  
18 applied econometrics and computational statistics. I designed and supervised the  
19 installation of the computer facility at the Hoover Institution, and was an economic

1 advisor to the "Age of Uncertainty" television series on National Public Television.  
2 In 1979, I accepted an appointment at the University of Michigan. I was a senior  
3 research associate in the Highway Safety Research Institute where I developed  
4 quantitative economic analyses of the motor vehicle system. I also taught graduate  
5 courses in the Department of Economics, Graduate School of Business, and the  
6 Institute of Public Policy Studies.

7 Since 1983, my full-time occupation has been the president of Economics  
8 America, Inc. Our work has generally been in the area of econometric models and  
9 analysis of the health care sector.

10 I have authored, or coauthored over 80 publications in the area of economic  
11 analysis. These include articles, monographs, reports and books. One is APL-Stat,  
12 A Guide to Computational Statistics with Professor James Ramsey, the former  
13 department chairman of NYU. I am on the Board of Academic Advisors, of The  
14 National Center for Policy Analysis and the Heartland Institute. I have held several  
15 offices in the National Association for Business Economics including chairman of the  
16 Health Economics Roundtable of the NABE. I have received awards from the  
17 National Association for Business Economics including a 1995 Abramson Award for  
18 a publication and in 1992, I was awarded the designation of Fellow, the  
19 organization's highest honor.

20 I am an economic advisor to the American Dental Association. I serve as  
21 consultant on econometric methods and economic models in work on postal prices,  
22 competition and demand markets of mail streams for the Postal Service. I testified

- 1 on behalf of the Postal Service as a rebuttal witness in Docket No. R87-1, and
- 2 presented direct testimony concerning volume forecasts for Priority Mail and Express
- 3 Mail in Docket Nos. R90-1, R94-1, R97-1, and R2000-1.

## PURPOSE AND SCOPE OF TESTIMONY

1           One purpose of this testimony is to present forecasts of volumes for Express Mail  
2 service at the current and the new rates proposed by the United States Postal Service.

3 In addition, my testimony includes similar volume forecasts for Priority Mail. For both  
4 Priority Mail and Express Mail two sets of forecasts are presented:

5           a)     mail volumes that will occur in the Test Year if the current Postal Service  
6                 rate and classification schedules remain in effect, referred to as the  
7                 "before-rates" forecast;

8           and

9           b)     mail volumes that will occur in the Test Year if the rates and classifications  
10                proposed by the Postal Service in this proceeding are adopted, referred to  
11                as the "after-rates" forecast.

12 The method used in forecasting mail volumes is to project changes in mail volumes  
13 between a Base Year and the Test Year. The Base Year used in the forecasts began on  
14 May 20, 2000 and the Test Year begins on October 1, 2002.

15           In the testimony, recent volume experience is reviewed. Factors determining  
16 Express Mail and Priority Mail volumes, which are taken into account in making the  
17 forecasts, are discussed. Detailed explanations of the econometric analyses and related  
18 studies used in making the volume forecasts are provided in the Technical Appendices  
19 accompanying this testimony. A guide to the testimony and documentation is provided  
20 following the summary.

## SUMMARY

1           The first part of my testimony presents the Test Year volume forecasts for Priority  
2 Mail. The second part of the testimony presents the Test Year volume forecasts for  
3 Express Mail. In the before-rates forecast the existing postal rate schedules for Express  
4 Mail and Priority Mail are projected to continue to prevail during the Test Year, whereas,  
5 in the after-rates forecast the new rates and classifications proposed by the Postal  
6 Service in this proceeding are projected to prevail during the Test Year.

7           The Base Year for these forecasts consists of four postal quarters starting at the  
8 beginning of the fourth postal quarter of the 2000 Postal Year (May 20, 2000). The Test  
9 Year coincides with Government Fiscal Year 2003 which begins on October 1, 2002 and  
10 ends on September 30, 2003. Thus, the Test Year begins approximately twenty-eight  
11 months after the beginning of the Base Year. After-rates Test-Year volumes are  
12 projected assuming that proposed rates and classifications become effective October 1,  
13 2002, the same time as the beginning of the Test Year. Table 1 summarizes the  
14 projections of mail volumes for 2001 through quarter one of 2004, assuming first, that  
15 Priority Mail and Express Mail nominal rates remain unchanged (before-rates), and  
16 second, that Priority Mail rates increase by 13.89 percent. The proposed Express Mail  
17 rates increase by approximately 9.65 percent in the after-rates forecast. The Base-Year  
18 Period volume for Priority Mail was 1,177 (1,177.068) million pieces and the Base-Year  
19 Period volume for Express Mail was 71 (70.565) million pieces.



TABLE 1  
VOLUME PROJECTIONS  
(MILLION PIECES)

BASE YEAR: Postal Quarter 2000:4 - 2001:3

Priority Mail 1177.068

Express Mail 70.565

Before-Rates

Postal Qtr	Priority	Express	Postal Year	Priority	Express
2001:1	274.694	15.901	2001	1165.920	70.769
2001:2	303.383	16.488	2002	1178.436	72.120
2001:3	264.587	16.952	2003	1248.193	76.671
2001:4	323.256	21.428			
2002:1	261.733	15.475			
2002:2	299.153	17.053			
2002:3	276.093	17.321			
2002:4	341.458	22.271			
2003:1	277.206	16.339			
2003:2	317.801	18.158	GFY	Priority	Express
2003:3	291.962	18.448	2001	1162.477	70.656
2003:4	361.224	23.726	2002	1186.878	72.605
2004:1	292.496	17.393	2003	1257.064	77.239

After-Rates

Postal Qtr	Priority	Express	Postal Year	Priority	Express
2001:1	274.694	15.901	2001	1165.920	70.769
2001:2	303.383	16.488	2002	1178.436	72.120
2001:3	264.587	16.952	2003	1177.149	70.006
2001:4	323.256	21.428			
2002:1	261.733	15.475			
2002:2	299.153	17.053			
2002:3	276.093	17.321			
2002:4	341.458	22.271			
2003:1	272.684	15.779			
2003:2	303.234	16.822	GFY	Priority	Express
2003:3	270.082	16.593	2001	1162.477	70.656
2003:4	331.149	20.812	2002	1186.878	72.605
2004:1	268.031	15.159	2003	1178.757	69.911

1           The forecasts are based on projections of changes in factors affecting mail  
2 volumes between the Base Year and the Test Year. The first factor considered in  
3 projecting mail volumes is the price paid by the mailer. The effect of price on volume is  
4 estimated as a response to price in real terms, i.e., nominal postal price deflated by an  
5 index of the general level of prices. Rather than occurring immediately, response to price  
6 occurs over a period of time. A change in deflated price is estimated to lead to a volume  
7 response in the quarter in which the price change occurs and the three following quarters.  
8 The volume responses to price are expressed as price elasticities (the price elasticity can  
9 be interpreted as the percent change in volume that would result from a one percent  
10 change in real price). Effects of real price changes on the Test-Year volume forecast are  
11 obtained by applying estimated price elasticities to percentage changes in real prices  
12 between the Base Year and the Test Year.

13           The Postal Service proposes changes in prices of Priority Mail and Express Mail.  
14 The proposals for Priority Mail are explained in detail by Postal Service witness Scherer  
15 (USPS-T-30). The proposals for Express Mail are explained in detail by Postal Service  
16 witness Mayo (USPS-T-35). The net impact of the proposals is to increase rates from  
17 what they would otherwise be in the Test Year.

18           A second factor considered is the growth in real income per adult. The effect of  
19 real income growth on Priority Mail volumes is projected by combining the long-run  
20 income elasticity (the percentage increase in volume that would result from a one percent  
21 increase in real long-run income per adult) for Priority Mail with the projected percentage  
22 increase in real income. Both long-run and short-run income measures were used. In the

1 case of Express Mail, the real (per adult) durable plus nondurable personal consumption  
2 expenditures component of Gross Domestic Product was used as our measure of long-run  
3 macro economic activity. Both long-run and short-run measures of macroeconomic  
4 activity were used.

5 Adult population is the third factor considered. The projected percentage increase  
6 in adult population is estimated to increase Express Mail and Priority Mail volumes by  
7 approximately two percent (0.0230), between the Base Year and Test Year.

8 Additional specific factors, such as the prices of substitute services, also affect  
9 demand for Express Mail, as well as Priority Mail. For those factors that are quantifiable,  
10 and for which predicted values are available, an elasticity is estimated and used in  
11 connection with the projected percentage change for that factor. All of the variables,  
12 except those noted in the testimony, are in natural logarithms.

13 The text of this testimony presents a discussion of factors that affect the demand  
14 for Express Mail, and Priority Mail. It also presents the resulting volume projections.  
15 Technical Appendices are provided giving a detailed description of the methods used and  
16 the Choice Trail.

17 In the case of Priority Mail, Table 1 shows that volume is projected to increase from  
18 1,177 million (1,177.068) pieces in the Base-Year period to 1,257 million (1,257.064)  
19 pieces in the before-rates environment in the Test Year. The increase is approximately  
20 seven percent (0.0680) for Priority Mail in the 28 month period, corresponding to an  
21 average annual compound growth rate of 2.9 percent (0.02858). The projection for Priority  
22 Mail volume in the after-rates environment is 1,179 million (1,178.757) pieces, which

1 totals a 6.2 percent (-0.0623) decrease or a reduction of 78 million (-78.307) pieces from  
2 what it otherwise would have been.

3 Table 1 shows that Express Mail volume is projected to increase from 71 million  
4 (70.565) pieces in the Base Year period to 77 million (77.239) pieces in the before-rates  
5 environment in the Test Year. The increase is approximately 9.5 percent (0.0946) for  
6 Express Mail over the 28 month period, corresponding to an average annual growth rate  
7 of 3.9 percent (0.0395). The projection for Express Mail volume in the after-rates  
8 environment is 70 million (69.911) pieces. Express Mail volume would be 77.239 million  
9 pieces in the before-rates environment and to 69.911 million pieces in the after-rates Test  
10 Year environment, a decrease of approximately 7.3 million pieces (-7.328), or about a 9.5  
11 percent (-0.0949) decrease from what it would otherwise have been.

## GUIDE TO THE TESTIMONY AND DOCUMENTATION

1           Testimony:

2           The testimony presents forecasts of the volume for both Priority Mail and Express  
3 Mail. For each class of mail, two forecasts are presented. The first forecast is under the  
4 conditions that the current rates remain in effect and the second one is under the  
5 conditions that the new rates proposed by the Postal Service are adopted. Five technical  
6 appendices are included with the testimony. Technical Appendix A contains the  
7 explanation of how the UPS person days lost to strikes elasticity is calculated. Technical  
8 Appendix B explains how the seasonal variables are computed. Technical Appendix C  
9 explains how the logistic growth variable is computed. Technical Appendix D contains the  
10 choice trail explaining the development of the current model from the R2000-1 version.  
11 Technical Appendix E contains forecast error analyses and net trends.

12

13           Fixed-Weight Price Indices:

14           As in the other classes of mail, fixed-weight price indices (FWPIs) are used to  
15 measure the aggregate level and changes in rates. Library Reference J-26 Section A  
16 contains the derivation of these indices in the before-rates environment for Express Mail,  
17 Priority Mail and UPS Ground Service. Library Reference J-26 Section B contains the  
18 derivation of these indices in the after-rates environment for Express Mail and Priority  
19 Mail. The FWPI for Priority Mail is based on the 2000 billing determinants and the  
20 Express Mail FWPI is based on the latest available billing determinants, 1999:3 to 2000:2  
21 inclusive. Library Reference J-26 Sections A and B contain both printed values and  
22 spreadsheets developing the indices.

1 Regression Materials:

2 Multiple regression analysis is used to estimate the elasticities. We use a well-  
3 known econometrics statistical program called Regression Analysis of Time Series  
4 (RATS). As in the other classes of mail, the elasticities are combined with explanatory  
5 variables to form multipliers. These multipliers are used to compute the volume forecasts.  
6 The methodology for computing multipliers is contained in witness Tolley's (USPS-T-7)  
7 Technical Appendix.

8 The details of the multiple regression results for Priority Mail, in printed form, are  
9 presented in Library Reference J-27, Section A . For Express Mail, the details of the  
10 multiple regression results, in printed form, are presented in Library Reference J-27,  
11 Section B. The data are presented in Section C.

12

13 Computer instructions for econometrics software:

14 Library Reference J-27, Section D contains the computer files with the data and  
15 input files, for both Priority and Express Mail. The files in this section can be use as direct  
16 input to the econometrics software to produce the estimates in the testimony. The files  
17 contain the instructions, in text file form, that are directly useable by the econometrics  
18 software. In addition, there are files containing the output directly from the econometrics  
19 software, for both Priority Mail and Express Mail.

20

21 Multipliers and Forecasts:

22 The details of the multipliers for Priority Mail, in printed form, are presented in

1 Library Reference J-28, Section A. The details of the multipliers for Express Mail, in  
2 printed form, are presented in Library Reference J-28, Section B. The volume forecasts  
3 for Priority Mail are calculated, using the multipliers, in the spreadsheets in Library  
4 Reference J-28, Section C. The volume forecasts for Express Mail are calculated, using  
5 the multipliers, in the spreadsheets in Library Reference J-28, Section D.

6 Priority Mail Presort Discount Experiment:

7 MC2001-1 authorized an experiment for limited discounted rates for presorted  
8 Priority Mail. In that proceeding, witness Scherer (USPS-T-1) presented estimates of the  
9 volume of Priority Mail in the experiment, see T-1ATCH.XLS. His method is presented in  
10 Library Reference J-28, page 1, files FPMBR01.XLS and FPMAR01.XLS, in tab I. The  
11 total amount of presorted Priority Mail volume in the experiment, in the test year is  
12 computed to be 19.123 million pieces or about 1.5 percent (0.0152) of Priority Mail volume  
13 in the before rates situation, in the test year (See LR-28, section C-I, page 12). In the  
14 after rates situation, the volume is computed to be 17.901 million pieces, also about 1.5  
15 percent of test year volume (See LR-28, section C-II, page 15).

16 Current Technical Appendices and Library References Compared to R2000-1:

17 Current Technical Appendices A-E contain the corresponding material as in my  
18 Technical Appendices A-E in R2000-1. Current Library References J-26, J-27 and J-28  
19 contain corresponding material as in my Library References I-111, I-112, and I-113 in  
20 R2000-1.

## PRIORITY MAIL

### 1 A. Characteristics

2 Priority Mail is an expedited service for mail weighing 70 pounds or less. Under  
3 current regulations, all First-Class Mail over 13 ounces must travel as Priority Mail. At the  
4 option of the mailer, First-Class matter weighing less than 13 ounces may travel as  
5 Priority Mail as well. The structure of the rates for Priority Mail is a combination of  
6 unzoned and zoned rates. Pieces weighing over 13 ounces to one pound have a single  
7 unzoned rate. Pieces weighing over one pound to two pounds have a single unzoned  
8 rate, as does the flat-rate envelope. A flat-rate envelope was approved in the R90-1  
9 general rate case. It is priced at the two-pound rate and comprises approximately 10  
10 (0.0998) percent of Priority Mail total volume. Under the current rate structure, rates for  
11 pieces in excess of two pounds increase for each additional pound up to five pounds and  
12 are unzoned. Pieces exceeding five pounds are zoned, with the rates for zones 1, 2 and  
13 3 combined, and rates increase for each additional pound up to the maximum of 70  
14 pounds. Witness Scherer (USPS-T-30) presents the Postal Service's proposed changes  
15 to the zoning and rates.

### 16 B. Volume Since 1970

17 The Base Period Year, is postal quarters 2000:4 to 2001:3, and is called  
18 BPY2001. For comparison, the annual volumes in Table 2 are presented in Base Period  
19 Years. For example, BPY 1970 is postal quarters 1969:4, 1970:1, 1970:2 and 1970:3.



TABLE 2

PRIORITY MAIL  
Volume\*

Postal Qtrs	Volume (Millions)	Pieces per Adult
69:4 - 70:3	184.179	1.537
74:4 - 75:3	207.650	1.584
79:4 - 80:3	246.893	1.700
84:4 - 85:3	302.329	1.906
89:4 - 90:3	474.324	2.799
94:4 - 95:3	839.646	4.677
95:4 - 96:3	889.444	4.904
96:4 - 97:3	1017.885	5.559
97:4 - 98:3	1170.118	6.338
98:4 - 99:3	1194.895	6.419
99:4 - 00:3	1207.542	6.429
00:4 - 01:3	1177.068	6.211

Growth Rates

BY Period	Volume	Pieces per Adult
1970 - 1975	12.7%	3.1%
1975 - 1980	18.9%	7.3%
1980 - 1985	22.5%	12.1%
1985 - 1990	56.9%	46.9%
1990 - 1995	77.0%	67.1%
1995 - 2000	43.8%	37.5%
1970 - 2000	555.6%	318.3%
1980 - 2000	389.1%	278.3%
1990 - 2000	154.6%	129.7%
1996 - 2001	32.3%	26.6%
1998 - 2001	0.6%	-2.0%
2000 - 2001	-2.5%	-3.4%

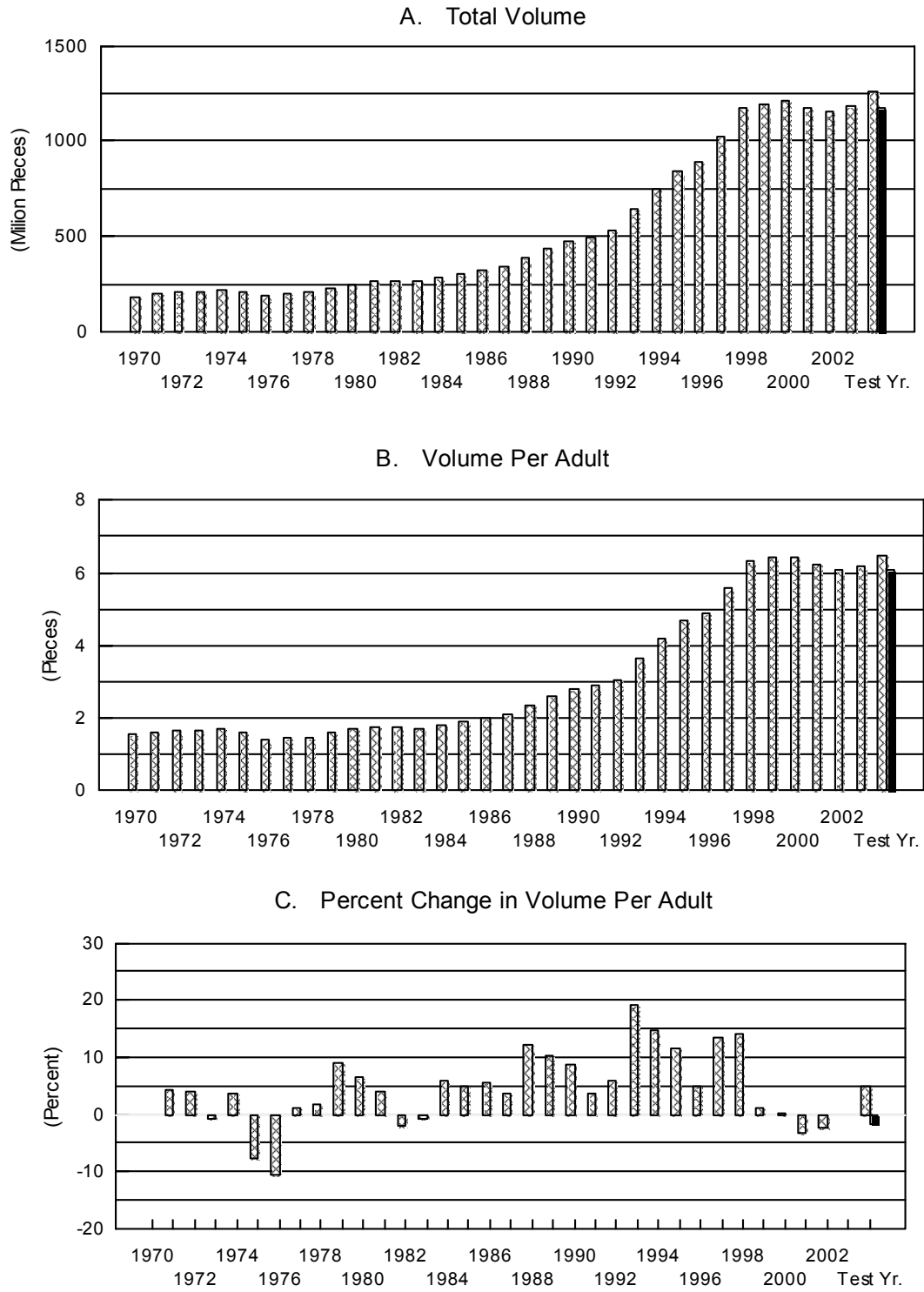
\* Agency and Franked Mail Distributed from 1993:1 onwards.

1 Table 2 displays Priority Mail volumes for Base Period Years from BPY1970 to BPY2001  
2 in five year increments, and annually. Volume increased by about thirteen percent  
3 (0.127) from BPY 1970 to BPY1975. From BPY1975 to BPY1980 it increased by about  
4 nineteen percent (0.189), and it increased almost twenty-three percent (0.225) over the  
5 following five years. From BPY1985 to BPY1990 volume increased by fifty-seven  
6 percent (0.569) and from BPY1990 to BPY1995 it increased by seventy-seven percent  
7 (0.770). Over the period from BPY1970 to BPY2000 the total volume of Priority Mail  
8 increased by about 556 percent (555.6%). On a pieces-per-adult basis, the percent  
9 increase over the BPY1970-BPY2000 period was 318 percent (318.3%).

10 Over the last five years, from BPY1996 to BPY2001, volume increased by thirty-  
11 two percent (0.323), and over the last three years, BPY1998 to BYP2001, it increased by  
12 about one percent (0.006). Figure 1 illustrates these and other historical volume  
13 changes. The figure also displays the before and after rates test year volumes.

14 An econometrics model to determine factors affecting Priority Mail volume was  
15 estimated using quarterly data for volume, on a pieces-per-adult, per postal accounting  
16 period basis. Unless noted in the testimony, all variables are measured in natural  
17 logarithms. The econometrics results are presented in Table 3, and the complete data  
18 set is presented in Library Reference J-27, Section C. Regression results are contained  
19 in Library Reference J-27, Sections A and B. Volume forecast multipliers are contained  
20 in J-28, Sections A and B, with the forecasts in Section C. (For a general discussion of  
21 volume multipliers see witness Tolley, USPS-T-7, Technical Appendix.)

FIGURE 1. HISTORICAL AND FORECAST PRIORITY MAIL VOLUME



Before Rates
  After Rates

Test Year: GFY 2003

TABLE 3  
**PRIORITY MAIL**  
Econometric Results

Dependent Variable VOL8PA - Estimation by Restricted Regression  
Quarterly Data From 1970:03 To 2001:03

Usable Observations	125	Degrees of Freedom	90
Centered R**2	0.994534	R Bar **2	0.99247
Uncentered R**2	0.999494	T x R**2	124.937
Mean of Dependent Variable			-1.633267843
Std Error of Dependent Variable			0.523512161
Standard Error of Estimate			0.045429131
Sum of Squared Residuals			0.1857425319
Durbin-Watson Statistic			2.018072
Q(31-0)			29.361839
Significance Level of Q			0.55039441

Variable	Coeff	Std Error	T-Stat	Signif
Constant	-4.885	0.747	-6.53779	0
PX8	-0.224	0.143	-1.5652	0.12104596
PX8{1}	-0.281	0.149	-1.88787	0.06226562
PX8{2}	-0.237	0.136	-1.74385	0.08459924
PX8{3}	-1.242e-002	0.125	-0.09913	0.92125412
PX8{4}	-2.776e-017	1.573e-009	-1.76412e-008	1
YPERM96	0.935	0.192	4.86528	4.84000E-06
VOLWT	-0.615	0.159	-3.8702	0.00020558
UPSMDLS	2.213e-002	7.040e-003	3.14411	0.00225707
UPSOTM	-0.33	3.694e-002	-8.94151	0
JS_PNS	0.13	3.214e-002	4.04737	0.00010938
PX25FW I00	6.161e-002	4.653e-002	1.3241	0.18882343
PX25FW I00{1}	2.813e-002	2.588e-002	1.0868	0.28002651
PX25FW I00{2}	6.190e-003	2.710e-002	0.22842	0.81983728
PX25FW I00{3}	2.898e-006	2.387e-002	1.21442e-004	0.99990337
PX25FW I00{4}	3.469e-018	0	0	0
UPSCP	0.181	0.113	1.60168	0.11273072
UPSCP{1}	7.597e-002	6.046e-002	1.25665	0.21213213
UPSCP{2}	1.944e-002	6.667e-002	0.29163	0.77124374
UPSCP{3}	2.198e-005	6.283e-002	3.49791e-004	0.99972168
UPSCP{4}	-2.776e-017	1.705e-009	-1.62823e-008	1
DUPS	-1.318	0.298	-4.41902	0.00002759
D_UPSL0	0.303	0.236	1.28569	0.20184801
D_UPSL1	0.35	0.116	3.0196	0.00329331
D_UPSL2	0.388	0.124	3.13016	0.00235586
D_UPSL3	0.282	0.119	2.38011	0.01941775
D_UPSL4	-2.220e-016	0	0	0
DNOGOV	-4.678e-002	4.398e-002	-1.06373	0.29029703
DUPSSTK	0.102	4.796e-002	2.12826	0.03604849
DUPSSTK{1}	5.117e-002	4.975e-002	1.02868	0.30638767
DUPSSTK{2}	2.502e-002	5.118e-002	0.48892	0.62608817
DUPSSTK{3}	9.530e-003	4.986e-002	0.19114	0.8488475
DUPSSTK{4}	-3.469e-018	0	0	0
FL	6.584e-002	2.144e-002	3.07099	0.00282128
WT	7.639e-002	1.559e-002	4.90061	4.20000E-06
SP	8.879e-002	1.203e-002	7.38269	0
DEC1_23	0.277	9.784e-002	2.82755	0.00578044
DEC24_JAN1	-0.667	0.216	-3.08737	0.00268458
DDEC1_23	0.345	0.141	2.44146	0.01658429
TREND	-6.034e-004	2.282e-004	-2.64394	0.00966738

TABLE 3 (Continued)  
**PRIORITY MAIL**  
 Econometric Results

SHILLER SMOOTHNESS PRIORS

Own Price	K = 0.005
Parcel Post cross price	K = 1.640
UPS Ground Service cross price lags 0 through 4	K = 0.155
UPS cross price lags 0 through 4 interacted with DUPS	K = 0.051
UPS strike of 1997:4	K = 0.000

Data Legend

VOL8PA	Priority Mail quarterly volume per accounting period per adult.
Constant	Constant term.
PX8	Priority Mail price index deflated by personal consumption expenditures price deflator (chained).
YPERM96	Real permanent disposable income per adult.
VOLWT	Minimum weight requirement to classify a piece of mail as Priority Mail.
UPSMDLS	United Parcel Service's mandays lost due to strike.
UPSPOTM	United Parcel Service's potential market.
JS_PNS	Standard and Poor's Index of 500 common stock prices.
PX25FWI00	Parcel Post price index deflated by personal consumption expenditures price deflator (chained).
UPSCP	United Parcel Service's Ground price index deflated by personal consumption expenditures price deflator (chained).
DUPS	Binary shift variable 0 up to and including 91:2 when R90-1 rate rate increase took effect, 1 thereafter.
D_UPSLx	Interaction-slope variable, where UPS price is multiplied by DUPS, where x represents the lag.
DNOGOV	Binary variable for PM volume excluding Agency and Franked Mail equals 1 up to 1993:4 and 0 from 1994:1 onwards.
DUPSSTK	Binary variable for UPS strike in 1997:4.
FL	Binary variable for Fall.
WT	Binary variable for Winter.
SP	Binary variable for Spring.
DEC1_23	Proportion of business days in a quarter between December 1 and December23 inclusive.
DEC24_JAN1	Proportion of business days in a quarter between December 24 and January 1 inclusive.
DDEC1_23	Proportion of business days in a quarter between December 1 and December23 inclusive beginning 1997:1
TREND	Trend variable beginning in 2000:3.

1 C. Changes to the Model

2 1. Minor Changes

3 There were minor changes to the Priority Mail model as presented in the R2000-1  
4 general rate case. The changes which were made were generally in the areas of  
5 improving the measurement of the influence of seasons and we added a measure of the  
6 impact of recent trends.

7 a. Seasonal Patterns

8 A pattern of moving seasonal fluctuations in Priority Mail was found to exist in  
9 both R97-1 and R2000-1. As in R2000-1, we accounted for the moving seasons with  
10 binary variables and Christmas seasonal variables in our econometric software that we  
11 use to estimate the model itself.

12 Christmas is an important season for Priority Mail. In 1981 and earlier calendar  
13 years, Christmas Day fell in the first postal quarter. In calendar 1982, Christmas Day  
14 became the first day of postal quarter two of postal fiscal 1983. Since then, the number  
15 of days prior to Christmas, in postal quarter two, has increased. The second quarter of  
16 postal fiscal year 1999 began on December 5, 1998 and thus included 15.5 pre-  
17 Christmas days (Sundays are not counted and Saturdays are counted as half days).  
18 Due to the migration of Christmas Day from postal quarter one to quarter two, the  
19 amount of Christmas Priority Mail has moved from postal quarter one to quarter two. As  
20 explained in Technical Appendix B, we defined the pre-Christmas period to be December  
21 1 through December 23 and the post-Christmas period to be December 24 through  
22 January first. In addition, recent volume growth in quarter two, over quarter one, has

1 increased. The added Christmas variable begins in 1997, the first year where twenty  
2 percent of the business days in quarter two were pre-Christmas days. These coefficients  
3 had the expected signs indicating more mail in the pre and less mail in the post-  
4 Christmas season. These variables are combined with the postal quarter variables to  
5 obtain the moving season impact index (see Technical Appendix B). The index is used  
6 to account for the effect of the moving seasonal pattern (see section D.4.d below).

7           b.       Competitive Conditions

8           UPS continues to be an important competitor. As in R2000-1, we continue to use  
9 United Parcel Service Ground Service prices. Both the current period and four lagged  
10 quarters are incorporated into the model. This is same formulation we used in R97-1  
11 and R2000-1 that continues to be used to measure the competitive nature of the  
12 industry. The variables are discussed in Section D.3.b.

13           c.       UPS Strike

14           From August 4, 1997 to August 19, 1997, United Parcel Service Teamsters  
15 employees were on strike. According to the Department of Labor, 185,000 UPS  
16 employees were on strike. It was a major strike influencing all of the U.S. package  
17 shipping industry. Because the strike was considerably larger than other UPS strikes we  
18 decided to model it as a separate economic event. The influence of added volume due  
19 to this strike was captured in the Priority Mail model by using a binary variable with a  
20 value of unity for 1997.4, instead of the person-days lost due to strikes variable. In  
21 addition, it was assumed that there could be increases in volume for the three  
22 subsequent quarters generally decreasing over the four quarters following the strike.

1 The results indicate that the strike impact followed this pattern with only small additional  
2 volume in the third quarter following the strike (see Section D.4.b below).

3 d. Recent Trends

4 As explained in the Choice Trail, when additional quarters were added,  
5 autocorrelation appeared. To fix this econometric problem, an econometric time trend  
6 was added. The variable begins in 2000:3. The variable could be measuring the  
7 impacts of increased competition, electronic alternatives, special current economic  
8 conditions and or other factors.

9

10 D. Factors Affecting Volume

11 1. Own Price

12 Priority Mail's own price is an important influence on volume. The own-price  
13 elasticity can be interpreted as the percentage change in volume that would result from a  
14 one percent change in price. Own-price elasticity is estimated to be equal to -0.75  
15 (-0.754), and is statistically significant with an estimated  $t = -5.17$ . As indicated in the  
16 Choice Trail, the decrease in absolute value from -0.819 in R2000-1 results primarily  
17 from changing the minimum weight limit from 11 to 13 ounces for Priority Mail in R2000-  
18 1. The remaining Priority Mail pieces are less price sensitive and have a lower elasticity.  
19 From BPY1996 to BPY2001 the real price of Priority Mail decreased (on a weighted  
20 average basis) by 1.1 percent (-0.0109) and is estimated to have increased per adult  
21 annual volume by approximately one percent (0.0082). The 2.6 percent (0.0255)  
22 increase in real price over the last three years, from BPY1998 to BPY2001 resulted in a



1 two percent (-0.0193) decrease in volume, holding all of the other factors constant. The  
2 change in real (or inflation adjusted) price is not the only factor affecting volume.

3

#### 4 2. Income

5 As in R97-1 and R2000-1, the long-run income elasticity is estimated using  
6 “Mixed Estimation”, a well-known econometric technique.<sup>1</sup> Long-run income measured  
7 by our permanent income variable, has an estimated elasticity equal to 0.94. It is  
8 statistically significant with a t-value of 4.87. For every one percent increase in (inflation  
9 adjusted) permanent income, Priority Mail volume is estimated to increase by 0.935  
10 percent. From BPY1996 to BPY2001 per adult permanent income increased by about  
11 10.2 percent (0.1020), and we estimate that per adult Priority Mail increased by 9.5  
12 percent (0.0954) due to this factor alone. Over the most recent three years, the  
13 BPY1998 to BPY2001 period, real long-run income increased by 7.0 percent (0.0699)  
14 and resulted in, an increase of approximately 6.5 percent ( $0.935 \times 0.0699 = 0.0654$ ) in  
15 Priority Mail volume.

16 As in R94-1, R97-1 and R2000-1, expected short-run or transitory income is  
17 measured by the Standard and Poor's Index of stock prices, and is an independent  
18 factor influencing Priority Mail. It has an estimated elasticity of 0.13 (0.1301). From  
19 BPY1996 to BPY2001 this index increased by 126 percent (1.2628), and the resulting  
20 increase in per adult volume is estimated to be approximately 16 percent (0.1642). For

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<sup>1</sup> See Jan Kmenta, Elements of Econometrics, Second Edition, University of Michigan Press 1997, Pp.497-500.

1 BPY1998 to BPY2001, the increase was 39 percent (0.3933) resulting in a 5 percent  
2 (0.0512) volume increase. These three factors, price plus long and short-run income  
3 changes amount to about a twenty-nine percent (0.2857) increase and a ten percent  
4 (0.0983) increase in volume over the last five and three years, respectively.

5

### 6 3. Prices of Alternative Services

#### 7 a. Parcel Post

8 Mailers may choose to send some items via Parcel Post. The cross-price  
9 elasticity is estimated to be 0.096. A one percent increase in Parcel Post rates would  
10 lead to a 0.1 percent increase in Priority Mail volume. From BPY1996 to BPY2001 the  
11 weighted average Parcel Post rates increase in real terms was 1.5 percent (0.0145), and  
12 we estimate that Priority Mail increased about 0.1 percent (0.0014) due to this cross-  
13 price effect, holding all other factors constant. Over the most recent three years, from  
14 BPY1998 to BPY2001, the real rate increase was 4.1 percent (0.0406) resulting in a 0.39  
15 (0.0039) percent increase in volume.

#### 16 b. United Parcel Service

17 Shippers may choose to send some items via UPS ground service. The cross-  
18 price elasticity is estimated to be 0.276. A one percent increase in UPS ground prices is  
19 estimated to increase Priority Mail volume by 0.28 percent. From BPY1996 to BPY2001  
20 the weighted average, inflation adjusted, price of UPS ground service increased by 12.9  
21 percent (0.1287) resulting in an estimated volume increase of 3.6 percent (0.0355) in  
22 Priority Mail. In the last three years the price increase was 8.6 percent (0.0855),

1 resulting in a 2.4 percent (0.0236) volume increase.

2           In addition, the expedited delivery market continues to be highly competitive. One  
3 can expect shippers to continue to be sensitive to the price of competing services. As in  
4 the R94-1, R97-1 and R2000-1 cases, we measure the impact of that highly competitive  
5 environment by constructing a binary shift variable having the value zero up to and  
6 including the quarter when the R90-1 Priority Mail rate increase took effect (1991:2). In  
7 the subsequent quarters (1991:3+) the value is one. At the same time, we also  
8 constructed an interaction-slope variable where UPS prices current and lagged one  
9 through four quarters are multiplied by the binary variable.<sup>2</sup> The estimated coefficient of  
10 the shift variable is -1.318, and the sum of the four slope coefficients is 1.32 (1.3231).  
11 Both the shift and slope variables are statistically significant. These two variables  
12 combined are estimated to have resulted in an increase in Priority Mail volume of twenty-  
13 one percent (0.2118) over the last five years (BPY1996 to BPY2001) and fourteen  
14 (0.1394) percent over the last three years (BPY1998 to BPY2001).

15           4.     Additional Factors

16                   a.     Minimum Weight

17           As discussed in the Characteristics Section, the classification separation between  
18 First-Class and Priority Mail occurs at the minimum weight point. The weight minimum  
19 has varied over time, and is currently thirteen ounces. A weight variable was used in the  
20 econometrics analysis to account for these changes in minimum weight. As in R94-1,

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<sup>2</sup> This is a standard econometrics technique. See Jan Kmenta, Elements of Econometrics, Second Edition, University of Michigan Press 1997, Pp. 461-73.

1 R97-1 and R2000-1, the variable was constructed by dividing the minimum weight by  
2 twelve. Thus, in 1997 when the minimum weight of a piece of mail required to be  
3 classified as Priority Mail was eleven ounces, our variable was equal to 0.917 (11/12).  
4 The current minimum weight is thirteen ounces, and our variable VOLWT is 1.08 (13/12).  
5 Its estimated elasticity is -0.615. One would expect this inverse result. That is, an  
6 increase in the minimum weight would cause a reclassification of what would otherwise  
7 be Priority Mail into First-Class Mail. Thus, we would have less mail classified as Priority  
8 Mail. From a value of 0.917 in BPY1998 to a weighted average value of 1.0833 in  
9 BPY2001, the variable increased approximately 18 percent (0.1818), and based on the  
10 -0.615 elasticity, it is estimated to have resulted in a decrease in Priority Mail of  
11 approximately eleven percent (-0.1119). No change in the current volume-weight  
12 variable is proposed.

13           b.     UPS Strikes

14           In addition to the traditional demand variables of price and income, there are  
15 additional variables associated with competition that are related to Priority Mail volume.  
16 The first variable is person days lost due to strikes at United Parcel Service. This firm  
17 provides services which compete with those provided by the Postal Service. When  
18 strikes occur, it is plausible that the volume in Priority Mail would increase. That is, if  
19 UPS service were not available or if strike activity increased the risk of delay in a UPS  
20 shipment, some customers would shift to Priority Mail.

21           Our results are consistent with this hypothesis, and the estimated parameter is  
22 statistically significant and positive. Since there are quarters in the sample with zero

1 days lost due to strikes, and the logarithm of zero is undefined in those cases, we used  
2 the level of the variable rather than its logarithm. One implication of our formulation is  
3 that the coefficient is not the elasticity. The elasticity can be computed in a  
4 straightforward manner. The method to perform these calculations and the results are  
5 presented in Technical Appendix A. One result is that the elasticity is not a constant.  
6 This result is similar to the linear demand case where the slope or price coefficient is  
7 constant, but the elasticity varies along the demand curve.

8 Our model estimates that the almost 57.8 thousand person days lost in quarter  
9 four of 1970 resulted in an increase in Priority Mail volume of approximately 0.654 million  
10 pieces. Until 1997, the largest strike quarter was quarter one of 1977 where  
11 approximately 630 thousand person days were lost. In this quarter Priority Mail volume  
12 is estimated to have increased by 6.584 million pieces, holding all other factors constant.  
13 Other than the 1997 strike, there had been only one work stoppage since 1983. It  
14 occurred on February 7, 1994, and was a partial one-day labor dispute concerning the  
15 increase in the UPS maximum weight limit from 70 to 150 pounds. It amounted to 40  
16 thousand person days lost and resulted in an increased volume of 1.615 million pieces  
17 of Priority Mail, or one percent (0.0095) of that quarter's volume.

18 However, in 1997 according to the Department of Labor approximately 185,000  
19 UPS workers were on strike from August 4 to August 19, 1997. Our model indicates that  
20 the added volume due to the 1997 strike was approximately 55.9 (55.898) million pieces.  
21 Our forecasts assume that no strikes will take place in the Test Year. Therefore, Priority  
22 Mail volume would not be increased by UPS strikes in the Test Year.

1                   c.       UPS Market Potential

2                   This variable measures the market penetration of United Parcel Service. Our  
3 sample period began in 1970, and at that time it was estimated that UPS had penetrated,  
4 or had a potential to serve, about 50 percent (0.5) of the national market. That is, its  
5 services were available to about half of the U.S. households. That potential grew to 100  
6 percent in 1981.

7                   One would expect the sign of this variable to be negative in our model. That is, as  
8 UPS was able to serve a larger proportion of the national market they became a more  
9 effective competitor. The estimated elasticity is statistically significant, and equal to  
10 -0.330.

11                  Over the sample period the measure of market penetration, or national market  
12 potential increased by 97.6 percent. The net result is that Priority Mail decreased by  
13 approximately 32 percent (-0.3225) due to the increased competition from United Parcel  
14 Service. Since the potential grew to 100 percent in 1981, it had no additional impact  
15 thereafter. In our forecast we assume that UPS will continue to have a 100 percent  
16 market service potential.

17                   d.       Seasonal Patterns

18                  As explained above, the Pre and Post-Christmas variables are combined with the  
19 postal quarter variables to obtain the moving season impact index (see Technical  
20 Appendix B). Table 4 of partial autocorrelations shows the residual pattern after the  
21 moving season process is completed. Based on that table, the Durbin-Watson statistic,  
22 and the autoregression diagnostic regressions in Library Reference J-27, Section A.

1 pages 21-23, indicate that no adjustments at this stage such as those for autocorrelation  
2 were necessary. Table 5 and the Durbin-Watson statistic in Table 3 confirm that no  
3 further autocorrelation adjustments were necessary. The impacts of the moving seasons  
4 adjustments are converted to seasonal factors in the forecasts. The method of  
5 computing these factors is shown in Technical Appendix B and is the same as that used  
6 in Express Mail. While the index values are much the same from year to year, over a  
7 longer period the changes are larger. For example in PFY1988 the seasonal values  
8 were Fall = 1.0734, Winter = 0.9747, Spring = 1.0294, and Summer = 0.9419 and by  
9 PFY2000 the values are Fall = 1.0102, Winter = 1.0942, Spring = 1.0040, and Summer =  
10 0.9187. When the quarterly values are weighted by the number of accounting periods  
11 in the quarter (3/13, 3/13, 3/13 and 4/13), the values sum to one indicating that the index  
12 allocates the moving season impact within the postal fiscal year. See Technical  
13 Appendix B.

TABLE 4  
**Priority Mail**  
 Prior to estimation subject to lag structure restrictions

PARTIAL AUTOCORRELATIONS AND 95 % CI AROUND ZERO

LAG	LOWER BOUND	PAC*	UPPER BOUND	SIGNIFICANT
0	0.0000	1.0000	0.0000	0
1	-0.1796	-0.0978	0.1796	0
2	-0.1803	0.0086	0.1803	0
3	-0.1811	-0.0559	0.1811	0
4	-0.1818	0.1016	0.1818	0
5	-0.1826	-0.1175	0.1826	0
6	-0.1833	-0.0709	0.1833	0
7	-0.1841	-0.0115	0.1841	0
8	-0.1849	-0.1758	0.1849	0
9	-0.1857	0.0235	0.1857	0
10	-0.1865	0.0773	0.1865	0
11	-0.1873	-0.0433	0.1873	0
12	-0.1881	-0.1394	0.1881	0
13	-0.1890	0.1172	0.1890	0
14	-0.1898	-0.0866	0.1898	0
15	-0.1907	-0.0981	0.1907	0
16	-0.1916	-0.0477	0.1916	0
17	-0.1925	-0.0733	0.1925	0
18	-0.1933	-0.0838	0.1933	0
19	-0.1943	-0.1229	0.1943	0

\*Partial Autocorrelation Coefficient



TABLE 5  
**Priority Mail**  
 Final Estimates

PARTIAL AUTOCORRELATIONS AND 95 % CI AROUND ZERO

LAG	LOWER BOUND	PAC*	UPPER BOUND	SIGNIFICANT
0	0.0000	1.0000	0.0000	0
1	-0.1796	-0.0126	0.1796	0
2	-0.1803	-0.0124	0.1803	0
3	-0.1811	-0.0509	0.1811	0
4	-0.1818	0.1712	0.1818	0
5	-0.1826	-0.1666	0.1826	0
6	-0.1833	-0.0125	0.1833	0
7	-0.1841	-0.0504	0.1841	0
8	-0.1849	-0.1740	0.1849	0
9	-0.1857	0.0047	0.1857	0
10	-0.1865	0.0525	0.1865	0
11	-0.1873	-0.0331	0.1873	0
12	-0.1881	-0.0820	0.1881	0
13	-0.1890	-0.0530	0.1890	0
14	-0.1898	-0.1277	0.1898	0
15	-0.1907	-0.0407	0.1907	0
16	-0.1916	-0.0241	0.1916	0
17	-0.1925	-0.0437	0.1925	0
18	-0.1933	-0.0801	0.1933	0
19	-0.1943	-0.1595	0.1943	0

\*Partial Autocorrelation Coefficient

1 e. Population

2 The dependent variable is quarterly Priority Mail per postal accounting period  
3 divided by the adult population 22 years of age and older. From BPY1996 to  
4 BPY2001 the increase in Priority Mail due to population growth was approximately 4.5  
5 percent (0.0450), and from BPY1998 to BPY2001 it was about 2.6 percent (0.0264).

6 f. Government Volume

7 Prior to the R97-1 rate case, the models were based on volume data that did not  
8 include government volume. Beginning with the R97-1 case, only “with government”  
9 volume data would be available. So that future projections would include forecasts of the  
10 “with government” volume data, the two data sets were combined. Data including  
11 government volume begins in postal quarter one 1993. To account for the fact that the  
12 early data did not include government volumes, a binary variable was added with its  
13 value set equal to one from the beginning of the sample up to and including postal  
14 quarter four 1992. Beginning in quarter one of fiscal 1993, the value is set to zero, to the  
15 end of the estimation period. The coefficient’s estimated value is -0.047 indicating that  
16 the previous data “without government” volume was lower. The variable continues to  
17 remain at zero through the Test Year and does not alter the forecast.

18 g. Econometric Trend

19 The econometric trend variable began in 2000 quarter three and has an estimated  
20 coefficient of -0.0006 with a t-statistic of -2.64. Because of the small size of the  
21 coefficient, it has a relatively small impact on the forecast, with the test year volume in  
22 2003 being reduced by about one half of one percent (-0.0055), holding all other

1 variables constant.

## 2 E. Volume Forecasts

### 3 1. R97-1 and R2000-1 Forecast Accuracy

4 In the response to an interrogatory (UPS/USPS-T8-2) in R97-1, we replied that  
5 the forecasts of Priority Mail volume were expected be in the range of plus or minus 11  
6 percent of the actual value. The forecast for PFY1998 was 1,123.852 million pieces and  
7 the actual volume was 1,167.999 million pieces, an error of 3.8 (0.0378) percent. When  
8 the actual values for the right-hand side variables are used, the forecast would be  
9 1,168.078, an error of 0.007 (0.00007) percent. In R2000-1, the forecast for PFY2000  
10 was 1,205.872 and the actual volume was 1,215.581, an error of 0.8 percent (0.008).  
11 When the actual values for the right-hand side variables are used, the forecast would be  
12 1,213.791, an error of 0.1 percent (0.00147). These extraordinarily close forecasts do  
13 not alter our view that future forecasts generally should be in the plus or minus 11  
14 percent range.

### 15 2. Test Year Forecasts

16 Projecting the combined influences of prices, incomes, and population gives a  
17 projection of 1,257 million (1,257.064) pieces of Priority Mail for the Test Year beginning  
18 October 1, 2002, if present postal rates are continued (before-rates forecast). If the  
19 rates proposed by the Postal Service are recommended, the forecast is 1,179 million  
20 (1,178.757) pieces (after-rates forecast).

21

22

## EXPRESS MAIL

### 1 A. Characteristics

#### 2 1. Introduction

3 Express Mail is an unzoned service offered for shipment of all mailable matter of  
4 70 pounds or less. It is an expedited service guaranteeing same day, next day or  
5 second day delivery, depending on the service purchased and the location of the  
6 addressee. Beginning in 1970, as a pilot program with the Federal National Mortgage  
7 Association and six of its regional offices, it gradually grew through phases of test  
8 marketing in the early and mid 1970's, to an official class of mail in late 1977. In  
9 February of 1978 it served 1,016 offices. Today delivery is available virtually throughout  
10 the nation, on a next-day or second-day basis.

11 There are preparation requirements similar to other classes. In the case of  
12 Express Mail, the piece must be large enough to hold the required labels and indicia on  
13 a single side, and at the other extreme be not more than 108 inches in length plus girth.  
14 There are five basic domestic service offerings. They include Express Mail: Same Day  
15 Airport Service (formerly called Airport to Airport), Custom Designed Service, Next Day  
16 Service, Second Day Service, and Military Service. Second Day service, rather than  
17 being a reduced service standard, is service to addresses not served by the Next Day  
18 network. Express Mail Second Day was a new service addition approved in the 1987

1 general rate case. The current rate structure is divided into four categories: Same Day  
2 Airport, Custom Designed, Next Day and Second Day PO to Addressee, and Next Day  
3 and Second Day PO to PO. In 1998, ninety-nine percent (0.9860) of domestic Express  
4 Mail Service was Next Day and Second Day PO to Addressee. The relative distribution  
5 of the other categories was of approximately: no Same Day Airport (the service is  
6 currently suspended), seven-tenths of one percent (0.0074) Custom Designed, and  
7 seven-tenths of one percent (0.0066) Next Day and Second Day PO to PO. For all of  
8 these groups the rate begins at pieces weighing less than or equal to one-half of one  
9 pound, then over one-half pound to two pounds, and then increases in one pound  
10 increments to 70 pounds. A flat-rate envelope was approved in the R90-1 general rate  
11 case. It is priced at the two-pound rate, regardless of actual weight, and comprises  
12 about one one-hundredth of one percent (0.00014) of Express Mail total volume. Under  
13 the proposal all of the services would remain. Witness Mayo (USPS-T-35) presents the  
14 Postal Service's proposed rates.

## 15 2. Dynamic Nature of the Service

16 Through the decade of the 1980's, the expedited delivery industry saw explosive  
17 growth and rapid change in technology. It continues to be a fiercely competitive  
18 industry. The real or inflation-adjusted price has fallen, and the service has expanded as  
19 well as improved through the period we observed. The industry has grown from one  
20 providing an elite service to a few for critical or emergency situations, to one where some  
21 mailers almost routinely send "important" items "Express". Now it is not unusual to see  
22 mail-order catalogs and others offering the service as a routine extra-charge option.

1 Because of these rapid changes, both the industry as a whole, and Express Mail as one  
2 of the competitors, are not the same today as when the Express Mail service began in  
3 the late 1970's. One can reasonably expect the industry to change in the future as well.  
4 It will probably change in unexpected ways that will depend on the innovation and the  
5 creativity of the competitors. The spectacular growth in facsimile (FAX), the Internet,  
6 and other electronic communications media could also be factors in the future of this  
7 industry.

8 We were not able to include all of these influences in our model. Our work is the  
9 fifth presentation of econometrically estimated elasticities. One consequence of this is  
10 the tentative nature of our results. Even though we have tried to be as comprehensive  
11 as possible in modeling this service, changes have occurred and are likely to continue to  
12 occur very rapidly. Those changes could significantly alter the results of future research.

13 Regression files for the Express Mail models are contained in Library Reference  
14 J-27, Section D. Volume forecast multipliers for Express Mail are in J-28, Section B, and  
15 the forecasts are in Section C. (For a general discussion of volume multipliers see  
16 testimony of witness Tolley, USPS-T-7, Technical Appendix.)

#### 17 B. Volume Changes to Date

18 Table 6 shows the annual data for Express Mail volume<sup>3</sup>. Over the period,  
19 BPY1980 to BPY2000, volume increased by 342 percent (342.2), and the per adult  
20 increase was 242 percent (242.2). Over the last five years, BPY1996 to BPY2001,

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<sup>3</sup> As in the case of Priority Mail, BPY stands for the Base Period Year comparison period. For example, BFY1999 would mean the four postal quarters 98:4-99:3.

- 1 Express Mail volume increased by twenty-five percent (0.247), and on a per adult basis
- 2 volume increased by nineteen percent (0.194). Express Mail also experienced volume
- 3 growth over the last three years of six percent (0.057) from BPY1998 to BPY2001.

TABLE 6

EXPRESS MAIL  
Volume\*

Postal Qtrs	Volume (Millions)	Pieces per Adult
79:4 - 80:3	15.791	0.109
84:4 - 85:3	44.995	0.284
89:4 - 90:3	56.731	0.335
94:4 - 95:3	57.086	0.318
95:4 - 96:3	56.570	0.312
96:4 - 97:3	59.623	0.326
97:4 - 98:3	66.758	0.362
98:4 - 99:3	67.876	0.365
99:4 - 00:3	69.821	0.372
00:4 - 01:3	70.565	0.372

Growth Rates

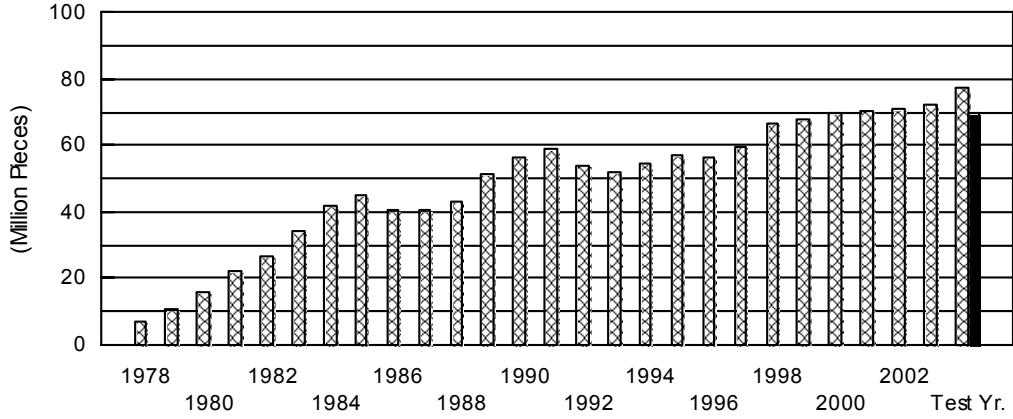
BY Period	Volume	Pieces per Adult
1980 - 1985	184.9%	160.9%
1985 - 1990	26.1%	18.1%
1990 - 1995	0.6%	-5.0%
1995 - 2000	22.3%	16.9%
1980 - 2000	342.2%	242.0%
1990 - 2000	23.1%	11.0%
1996 - 2001	24.7%	19.4%
1998 - 2001	5.7%	3.0%
2000 - 2001	1.1%	0.2%

\* Agency and Franked Mail Distributed except for the period 1986:1 - 1987:4.

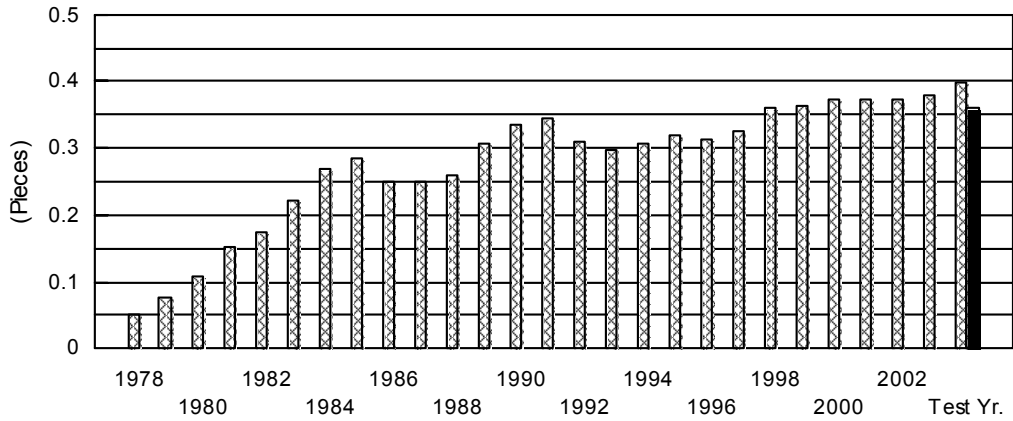


FIGURE 2. HISTORICAL AND FORECAST EXPRESS MAIL VOLUME

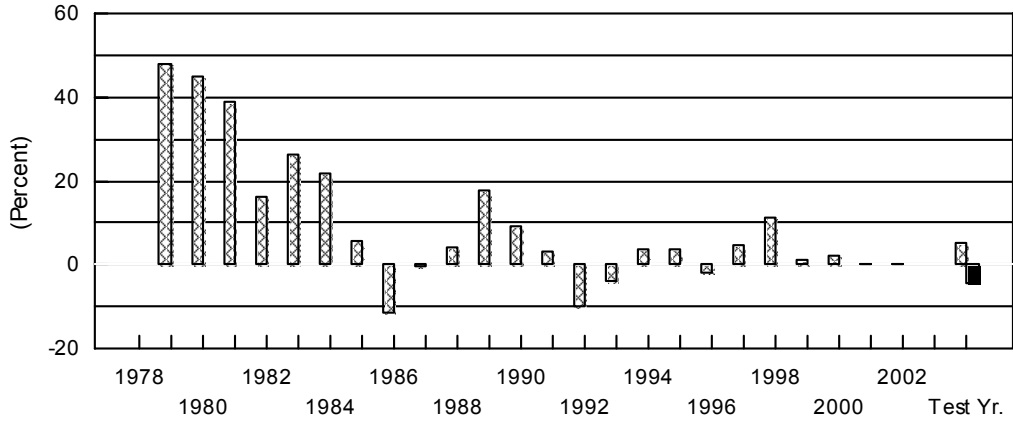
A. Total Volume



B. Volume Per Adult



C. Percent Change in Volume Per Adult



 Before Rates 
  After Rates

Test Year: GFY 2003

1 On a per adult basis, the growth was 3.0 percent (0.03),  $(0.3723567/0.3615719=0.0298)$   
2 from BPY1998 to BPY2001. However, as Table 6 displays, there was a period of volume  
3 decline. These results are indicative of the volatility of this market. Additional historical  
4 volume changes of Express Mail are also illustrated in Figure 2 along with the Test Year  
5 before and after rates volumes.

## 6 C. Changes to the Model

### 7 1. Model Changes

8 The changes which were made were generally in the areas of improving the  
9 measurement of the influence of seasons and improving the measurement of the impacts  
10 of the economic variables due to the revisions in the Department of Commerce data.

#### 11 a. Seasonal Patterns

12 As in the case of Priority Mail, a pattern of moving seasonal fluctuations in  
13 Express Mail volumes was found to exist in the previous general rate cases, R97-1 and  
14 R2000-1. As in R2000-1, we decided to account for the moving seasons with binary  
15 variables and Christmas seasonal variables in the econometric software we use to  
16 estimate the model itself.

17 Christmas is an important season for Express Mail. In 1981 and earlier calendar  
18 years, Christmas Day fell in the first postal quarter. In calendar 1982, Christmas Day  
19 became the first day of postal quarter two of postal fiscal 1983. Since then, the number  
20 of days prior to Christmas, in postal quarter two, has increased. The second quarter of  
21 postal fiscal year 1999 began on December 5, 1998 and thus included 15.5 pre-  
22 Christmas days (Sundays are not counted and Saturdays are counted as half days).

1 Due to the migration of Christmas Day from postal quarter one to quarter two, the  
2 amount of Christmas Express Mail has moved from postal quarter one to quarter two. As  
3 explained in Technical Appendix B, we defined the pre-Christmas period to be December  
4 1 through December 23 and the post-Christmas period to be December 24 through  
5 January first. Both variables had the expected signs indicating more mail in the pre and  
6 less mail in the post-Christmas season. These variables are combined with the postal  
7 quarter variables to obtain the moving season impact index (see Technical Appendix B).  
8 The index is used to account for the effect of the moving seasonal pattern (see section  
9 D.5 below).

10           b.       UPS Strike

11           From August 4, 1997 to August 19, 1997, United Parcel Service Teamsters  
12 employees were on strike. According to the Department of Labor, 185,000 UPS  
13 employees were on strike. It was a major strike influencing all of the U.S. package  
14 shipping industry. Because the strike was considerably larger than other UPS strikes we  
15 decided to model it as a separate economic event. The influence of added volume due  
16 to this strike was captured in the Express Mail model by using a binary variable with a  
17 value of unity for 1997.4. In addition, it was assumed that there could be increases in  
18 volume for the three subsequent quarters generally decreasing over the four quarters  
19 following the strike. The results indicate that the strike impact followed this pattern with  
20 smaller additional volume in the second and third quarters following the strike (see  
21 Section D.6).

22           c.       Logistic Growth Variable

1           The rapid growth in the industry in the early years, and the possibility of slower  
2 growth in the future suggested the logistic growth approach. The Z-variable method is  
3 used in the model now and was also used in the in the R94-, R97-1, and R2000-1  
4 models (see Technical Appendix C and section D.8).

5           d.       Priority Mail Price

6           As explained in the Choice Trail, when the revised economic data were used and  
7 the model was extended to 2001 quarter two, the statistical significance of Priority Mail  
8 fell. The variable was dropped from the model because it was not statistically significant.

9           e.       Federal Express Average Revenue

10          The average revenue of Federal Express' domestic service (called package yield)  
11 was also added to the model in R94-1 and also used in the R97-1 and R2000-1 rate  
12 cases. The Federal Express estimated cross-price elasticity is statistically significant.  
13 The result is that Federal Express appears to continue to offer services that are  
14 competitive with Express Mail services (see section D.4).

15          f.       Long-run and Short-run Economic Activity

16          In 1999 the Department of Commerce made changes in the definition and base  
17 period it uses to measure the level of national economic activity. Several of those  
18 changes resulted in revisions to the government' s historical data. The new series we  
19 use is based on the revised Department of Commerce data on personal consumption  
20 expenditures on durables and nondurables to compute the value for long-run or  
21 permanent income. We use the Federal Reserve Board's Industrial Production Index  
22 for office and computing machines as our measure of short-run economic activity.

1 D. Factors Affecting Volume

2 1. Price

3 The real or inflation-adjusted weighted price index for Express Mail has declined  
4 from about fifteen dollars (\$14.958) in Postal Fiscal Year 1980 to fourteen dollars  
5 (\$14.058) in PFY1988 and then to thirteen dollars (\$13.079) in BPY2001. The index is  
6 based on constant 1996 dollars. The decrease in the inflation adjusted price of Express  
7 Mail is about 13 percent (-0.1256) from 1980 to 2001. This decrease in the real price of  
8 the service represents an important reason why the volume expanded in the 1980 to  
9 2001 period.

10 The econometric model includes the current period and three periods of lags for  
11 inflation adjusted price changes. The estimated elasticity of the own-price variable has  
12 the expected negative sign, and is statistically significant with an estimated  $t = -31.803$ .

13 The results, which are presented in Table 7, estimate that the long-run own-price  
14 elasticity for Express Mail is approximately equal to  $-1.49$  ( $-1.4924$ ).<sup>4</sup> This means that  
15 one would expect about a one percent ( $-0.0101$ ) decrease in volume from BPY1996 to  
16 the 2001 base period, as the result of the 0.7 percent ( $0.0068$ ) increase in real price,  
17 holding all the other factors constant. A six percent ( $-0.0603$ ) decrease in volume from  
18 BPY1998 to BPY2001 would be due to the four percent ( $0.0404$ ) increase in real price  
19 over the last three years, holding all of the other influences constant. Factors other than  
20 price are important.

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<sup>4</sup> Our results, as in R94-1, R97-1 and R2000-1, continue to be consistent with Professor Kahn's testimony in Docket No. RM88-2. Using his terminology, our long-run own-price elasticity would be called "Brand" elasticity. (See Direct Testimony of A.E. Kahn on behalf of USPS, USPS-T-2, Page 21.)

TABLE 7  
**EXPRESS MAIL**  
Econometric Results

Dependent Variable DVOLEM\_Z - Estimation by Restricted Regression  
Quarterly Data From 1981:01 To 2001:03

Usable Observations	83	Degrees of Freedom	63
Centered R**2	0.984605	R Bar **2	0.979962
Uncentered R**2	0.999991	T x R**2	82.999
Mean of Dependent Variable			-4.901693669
Std Error of Dependent Variable			0.121338037
Standard Error of Estimate			0.017176082
Sum of Squared Residuals			0.0185861201
Durbin-Watson Statistic			1.876308
Q(20-0)			18.42114
Significance Level of Q			0.55968688

Variable	Coeff	Std Error	T-Stat	Signif
DUNT	-1.79212367	0.356578301	-5.02589	4.41000E-06
DPX9FWIH	-0.51374066	0.062903882	-8.16707	0
DPX9FWIH{1}	-0.42883802	0.057981376	-7.39613	0
DPX9FWIH{2}	-0.28216499	0.052061293	-5.41986	1.00000E-06
DPX9FWIH{3}	-0.26762209	0.050538994	-5.29536	1.61000E-06
DPX9FWIH{4}	0	0	0	0
DFEDQAR	0.141470009	0.077481265	1.82586	0.07261105
DFEDQAR{1}	0.088134092	0.045174262	1.95098	0.05551001
DFEDQAR{2}	0.087383152	0.052019541	1.67981	0.09794645
DFEDQAR{3}	0.058301839	0.053687439	1.08595	0.2816392
DFEDQAR{4}	0	0	0	0
DYPCG96	0.197130958	0.110743457	1.78007	0.07988711
DJQIND357	0.102747985	0.011927652	8.61427	0
DDUPSSTK	0.081168554	0.017551969	4.62447	0.00001916
DDUPSSTK{1}	0.027284767	0.015746172	1.73279	0.08802636
DDUPSSTK{2}	0.01288581	0.015739909	0.81867	0.41606006
DDUPSSTK{3}	0.012877015	0.013412681	0.96006	0.34069389
DDUPSSTK{4}	0	0	0	0
DFL	-0.03779953	0.007978156	-4.73788	0.00001272
DWT	0.004285607	0.024540291	0.17464	0.86192604
DSP	0.051935059	0.005894715	8.81044	0
DDEC1_23	0.177390273	0.032519492	5.45489	8.80000E-07
DDEC24_JAN1	-0.00356747	0.314581498	-0.01134	0.99098773

TABLE 7 (Continued)  
**EXPRESS MAIL**  
 Econometric Results

SHILLER SMOOTHNESS PRIORS

Own Price	K = 0.006
Federal Express cross price	K = 0.017
UPS strike of 1997:4	K = 0.315

Data Legend

DVOLEM_Z	Express Mail quarterly volume per accounting period per adult less the Z-variable.
DUNT	Constant term.
DPX9FWIH	Express Mail price index deflated by personal consumption expenditures price deflator (chained).
DYPCG96	Real permanent income per adult based on personal consumption expenditures on durable and nondurable goods.
DJQIND357	Industrial production index - Office and computing machines.
DFEDQAR	Federal Express Corporation's average revenue deflated by personal consumption expenditures price deflator (chained).
DUPSSTK	Binary variable for UPS strike in 1997:4.
DFL	Binary variable for Fall.
DWT	Binary variable for Winter.
DSP	Binary variable for Spring.
DDEC1_23	Proportion of business days in a quarter between December 1 and December 23 inclusive.
DDEC24_JAN1	Proportion of business days in a quarter between December 24 and January 1 inclusive.

The prefix "D" indicates variables have been transformed for autocorrelation correction.

1           2. Long-run Income based on durables and nondurables

2           As explained in the Choice Trail, the definition and base period for the economic  
3 variables was changed by the Department of Commerce. As a result of these revisions,  
4 we expanded our measure of long-run economic activity to include durable and  
5 nondurable goods. One would expect the estimated coefficient of this variable to have a  
6 positive sign. Our estimated permanent income elasticity for Express Mail service is  
7 positive with a value of 0.2 (0.1971), and is statistically significant at the 7.99 percent  
8 level. From BPY1996 to BPY2001 per adult (inflation adjusted) permanent income,  
9 based on personal consumption expenditures on durables and nondurables, increased  
10 24.6 percent (0.2462), and from BPY1998 to BPY2001 it increased by about eighteen  
11 percent (0.1778). Over the three year period, the increase in Express Mail volume  
12 totaled approximately 3.5 percent (0.0351) in BPY 2001 compared to BPY1998 and over  
13 the longer five year period it was 4.9 percent (0.0485) higher in 2001 than in 1996, due  
14 to the growth in long-run income, holding all the other influences constant.

15           3. Short-run Economic Activity

16           We use the Federal Reserve Board's Industrial Production Index for office and  
17 computing machines as our measure of short run economic activity. It has an estimated  
18 elasticity of 0.1 (0.01027) and is statistically significant.

19           Over the five-year period, from BPY1996 to BPY2001 the index increased by 485  
20 (485.3) percent. That increase resulted in an increase in Express Mail volume of about  
21 50 percent (0.4986). Over the three years, from BPY1998 to BPY2001, the index of  
22 short-run economic activity increased by 196 (196.4) percent , resulting in a 20.2 percent



1 (0.2018) increase in Express Mail volume, holding all other influences constant.

#### 2 4. Federal Express Average Revenue

3 A leading provider of substitute services for Express Mail is The Federal Express  
4 Corporation. We use data on the firm's total domestic express operating results. The  
5 data we use are called yield per package, and can be thought of as average revenue per  
6 piece. We include the current and three lags of this variable as a measure of the  
7 competitor's price.

8 The estimated cross-price elasticity is 0.375, and is statistically significant. Over  
9 the period from BPY1996 to BPY2001 the change in the weighted average inflation  
10 adjusted Federal Express price was approximately zero (0.0003). With a cross-price  
11 elasticity of 0.375, the resulting change in Express Mail is also approximately  
12 zero(0.0001). Over the three year BPY1998 to BPFY2001 period, the weighted average  
13 Federal Express real price increased one percent (0.0105), and accounted for an  
14 increase in Express Mail volume of approximately 0.4 percent (0.0039), holding all the  
15 other factors constant.

#### 16 5. Seasonal Patterns

17 As explained above, the Pre and Post-Christmas variables are combined with the  
18 postal quarter variables to obtain the moving season impact index (see Technical  
19 Appendix B). Table 8 of partial autocorrelations shows the residual pattern after the  
20 moving seasons process is completed. Based on that table, the Durbin-Watson statistic  
21 and the autoregression diagnostic regressions in Library Reference J-27, Section B  
22 pages 58-60, an autocorrelation correction was necessary. AR(1) and AR(5) were

1 used. Table 9 and the Durbin-Watson statistic in Table 7 indicate that no further  
2 autocorrelation adjustments are necessary. The impacts of the moving seasons  
3 adjustments are converted to seasonal factors in the forecasts. The method of  
4 computing these factors is shown in Technical Appendix B and is the same as that used  
5 in Priority Mail. While the index values are much the same from year to year, over a  
6 longer period the changes are larger. For example in PFY1988 the seasonal values  
7 were Fall = 0.9876, Winter = 0.9975, Spring = 1.0364, and Summer = 0.9839 and by  
8 PFY2002 the values are Fall = 0.9479, Winter = 1.0360, Spring = 1.0369, and Summer =  
9 0.9844. When the quarterly values are weighted by the number of accounting periods  
10 in the quarter (3/13, 3/13, 3/13 and 4/13), the values sum to one indicating that the index  
11 allocates the moving season impact within the postal fiscal year. See Technical  
12 Appendix B.

## 13 6. UPS Strikes

14 When strikes occur in the parcel delivery industry, it is plausible that the volume  
15 in Express Mail would increase. That is, if UPS service were not available or if strike  
16 activity increased the risk of delay in UPS shipments, some customers would shift to  
17 Express Mail.

18 In 1997, according to the Department of Labor, approximately 185,000 UPS  
19 workers were on strike from August 4 to August 19, 1997. The large strike resulted in  
20 increased Express Mail volume. Our model indicates that the added volume due to the  
21 strike was approximately 2.4 (2.351) million pieces. Our forecasts assume that no strikes  
22 will take place in the Test Year.

TABLE 8  
**Express Mail**  
 Prior to estimation subject to lag structure restrictions

PARTIAL AUTOCORRELATIONS AND 95 % CI AROUND ZERO

LAG	LOWER BOUND	PAC*	UPPER BOUND	SIGNIFICANT
0	0.0000	1.0000	0.0000	0
1	-0.2144	0.3336	0.2144	1
2	-0.2157	0.0491	0.2157	0
3	-0.2169	-0.1937	0.2169	0
4	-0.2182	-0.0884	0.2182	0
5	-0.2195	-0.2452	0.2195	1
6	-0.2209	0.1484	0.2209	0
7	-0.2222	-0.0834	0.2222	0
8	-0.2236	-0.1144	0.2236	0
9	-0.2250	-0.1034	0.2250	0
10	-0.2265	-0.2414	0.2265	1
11	-0.2279	-0.0479	0.2279	0
12	-0.2294	-0.1616	0.2294	0
13	-0.2309	0.0002	0.2309	0
14	-0.2325	-0.0757	0.2325	0
15	-0.2341	0.0441	0.2341	0
16	-0.2357	-0.0524	0.2357	0
17	-0.2374	-0.0152	0.2374	0
18	-0.2390	-0.0132	0.2390	0
19	-0.2408	-0.1449	0.2408	0

\*Partial Autocorrelation Coefficient

TABLE 9  
**Express Mail**  
 Final Estimates

PARTIAL AUTOCORRELATIONS AND 95 % CI AROUND ZERO

LAG	LOWER BOUND	PAC*	UPPER BOUND	SIGNIFICANT
0	0.0000	1.0000	0.0000	0
1	-0.2209	0.0518	0.2209	0
2	-0.2222	0.1127	0.2222	0
3	-0.2236	-0.1047	0.2236	0
4	-0.2250	0.0169	0.2250	0
5	-0.2265	-0.1696	0.2265	0
6	-0.2279	-0.0309	0.2279	0
7	-0.2294	-0.0622	0.2294	0
8	-0.2309	-0.0144	0.2309	0
9	-0.2325	-0.1405	0.2325	0
10	-0.2341	-0.1474	0.2341	0
11	-0.2357	-0.1063	0.2357	0
12	-0.2374	-0.1917	0.2374	0
13	-0.2390	0.0023	0.2390	0
14	-0.2408	-0.0788	0.2408	0
15	-0.2425	0.0317	0.2425	0
16	-0.2443	-0.0858	0.2443	0
17	-0.2462	-0.0452	0.2462	0
18	-0.2481	0.0912	0.2481	0
19	-0.2500	-0.0677	0.2500	0

\*Partial Autocorrelation Coefficient

1           Therefore, Express Mail volume would not be increased by UPS strikes in the  
2 Test Year.

3           7. Adult Population

4           In the five-year period BPY1996 to BPY2001, the adult population (males and  
5 females 22 years of age and over) grew by 4.5 percent (0.0450). From BPY1998 to  
6 BPY2001 the increase was 2.6 percent (0.0264). Our dependent variable, quarterly per  
7 accounting period Express Mail volume, is divided by the adult population. To compute  
8 the total volume from per adult volume, one simply multiplies per adult volume by the  
9 adult population. Population growth translates to an approximately 4.5 percent (0.0450)  
10 increase in Express Mail volume through the BPY1996 to BYP2001, and an  
11 approximately three (0.0264) percent increase from BPY1998 to the base period  
12 BPY2001.

13           8. Logistic Growth Variable

14           Rapid growth in Express Mail volume during much of the sample period  
15 suggested that a logistic term should be used. The term would allow for market  
16 penetration as well as market maturation. The Z variable method we used is the same  
17 approach as first used in R87-1, and also in R90-1, R94-1, R97-1, and R2000-1. The  
18 approach is implemented in the same two-step process as in my previous testimony.  
19 (For a discussion of the Z variable approach see witness Thress (USPS-T-8), Section  
20 III.) The implementation of the variable is in my Library Reference J-27, Section B,  
21 pages 52-54.

22           As in R97-1 and R2000-1, the Z variable has a small impact on forecasted

1 Express Mail volume. From BPY1996 to BPY2001 it increases volume by about two  
2 one-millionths of one percent (0.00000002). From BPY1998 to BPY2001 the variable  
3 has the impact of increasing volume by 0.0000002 percent (0.000000002).

4 E. Volume Forecasts

5 1. R97-1 and R2000-1 Forecast Accuracy

6 In the response to an interrogatory (UPS/USPS-T8-4) in R97-1, we replied that  
7 the forecasts of Express Mail volume were expected to be in the range of plus or minus 7  
8 percent of the actual value. The forecast for PFY1998 was 64.228 million pieces and the  
9 actual volume was 66.128 million pieces, an error of 2.9 (0.0287) percent. When the  
10 actual values for the right-hand side variables are used, the forecast would be 64.625,  
11 an error of 2.3 (0.0227) percent. In R2000-1, the forecast for PFY 2000 was 69.477 and  
12 the actual value was 70.377, an error of 1.28 percent (0.0128). When actual values for  
13 the right-hand side variables are used, the forecast would be 69.492, an error of 1.26  
14 percent (0.0126). These very close forecasts do not alter our view that future forecasts  
15 generally should be in the plus or minus 7 percent range.

16 2. Test Year Forecasts

17 Projecting the influences of own price, cross prices, economic activity and  
18 population, results in a projection of 77 million (77.239) pieces of Express Mail for the  
19 Test Year beginning October 1, 2002, if present postal rates are continued (before-rates  
20 forecast). If the rates recommended by the Postal Service are adopted, the forecast  
21 is 70 million (69.911) pieces of Express Mail (after-rates forecast).