Docket No. RM2011-3

Technical Conference

Report on Research Progress

August 7, 2013

Please Note: All numbers in the presentation should be treated as preliminary.

Introduction

- The Commission has requested updates on work related to four areas of costing:
  - City carrier street time
  - Purchased highway transportation
  - Postmaster costs
  - Window service time

- The Postal Service has made progress on the first two areas, city carrier street time and purchased highway transportation.

- Today's presentation will discuss the progress made in these two areas.

City Carrier Street Time Cost Progress

- At the last technical conference, we reviewed operational databases with the goal of indentifying their usefulness in updating the city carrier street time model.

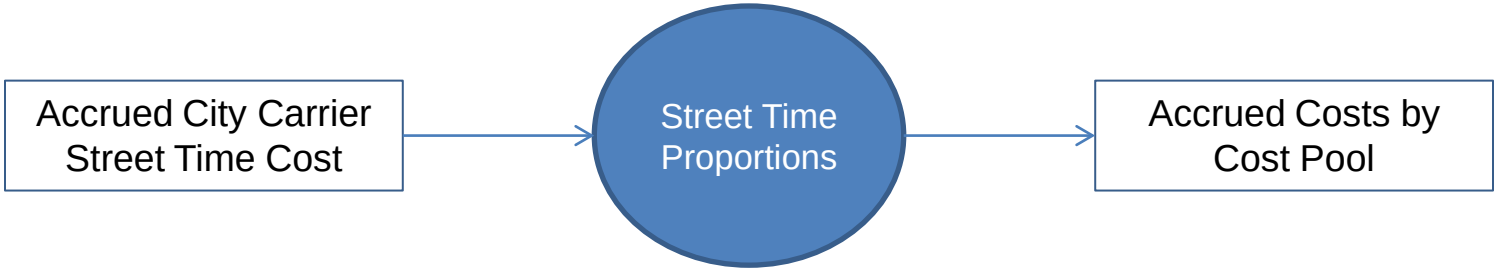
- We determined that Form 3999 data are useful for cost pool formation and DOIS data, along with Form 3999 data, are useful for updating street time variabilities.

- In this technical conference, we will describe the steps we have taken to update city carrier street time costs.

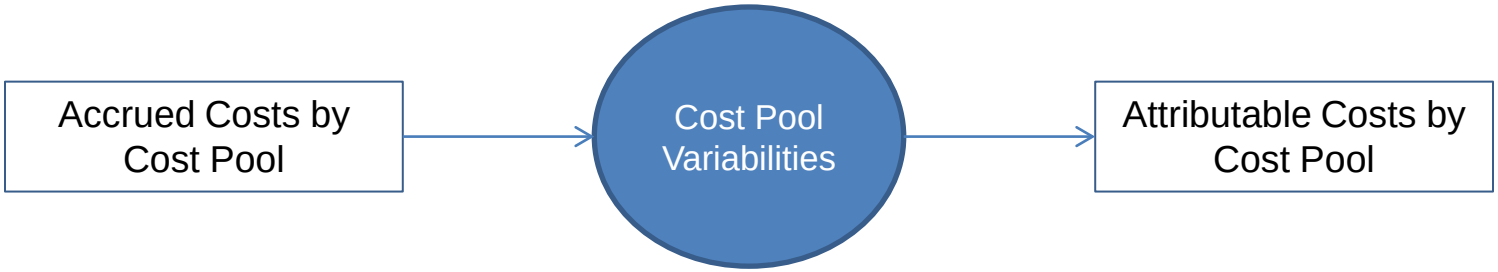
Before discussing the updates it is useful to briefly review the methodology for calculating attributable street time costs.

Calculating Attributable Street Time Costs Has Three Steps

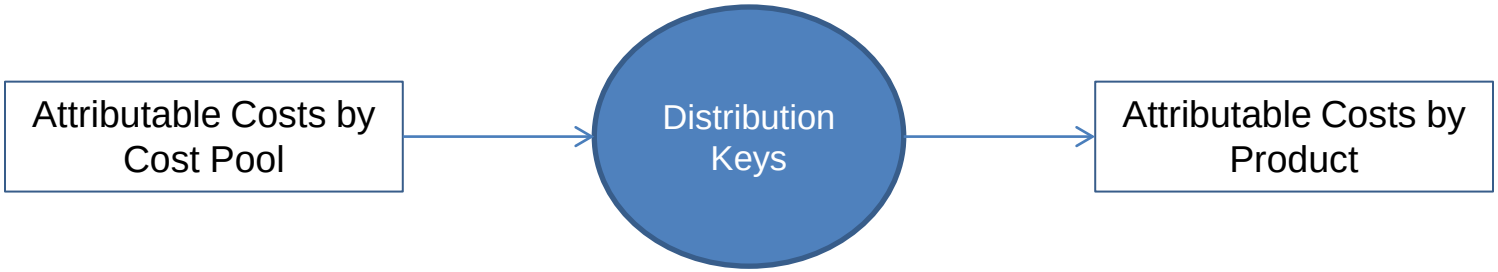
Step1: Assign accrued street time costs to cost pools.



Step 2: Calculate attributable costs by cost pool.



Step 3: Distribute attributable costs to products.



Updating Step 1: Forming Cost Pools

Form 3999 data can be used to update the street time proportions.

We used Form 3999 data from mid-2013 so it matches the DOIS and collection volume data used to update regular delivery variabilities.

- This table shows the current street time proportions that are used to form the associated cost pools.
- Note that a cost pool's variability is applied to all parts of the cost pool.

STREET TIME PROPORTIONS	Cost Pools
DELIVERY ON ROUTE SECTIONS	Regular Delivery Time
PARCEL/ACCOUNTABLE DELIVERY	P/A Delivery Time
DEVIATION DELIVERY TRAVEL	
GENERAL COLLECTIONS	General Collections
EXPRESS COLLECTIONS	EM Collections
NETWORK TRAVEL	Network Travel
TRAVEL TO/FROM ROUTE	Street Support
RELAY	

Form 3999 Data Come From Route Evaluations

Form 3999 data set covers virtually all regular city carrier routes in the country. The raw dataset has 140,457 observations.

Over 50,000 route evaluations were done in the first half of 2013.

Year	# of Routes Captured	Proportion
Pre 2009	82	0.05%
2009	864	0.62%
2010	5,344	3.81%
2011	20,772	14.79%
2012	62,658	44.61%
2013	50,737	36.12%

81% of routes had their data captured in 2012 or the 1st half of 2013. 96% of routes had their data captured in the last 2 ½ years.

We dropped the pre-2009 routes and did a small amount of ‘house cleaning” (e.g. drop routes with Sunday evaluations). We ended up with 139,867 observations.

The operations “view” of street time defines gross street hours as total street hours minus lunch.

Form 3999 Street Time

	Hours	Proportion
Regular Delivery Time	4.47	72.7%
Allied Time	1.67	27.3%
Gross Street Hours	6.14	100.0%

It is split between regular delivery time and allied time.

The CRA "view" of carrier street time has three main parts.

Directly Attributable	Street Support	Office Time
Regular Delivery Relay Travel To/From Network Travel P/A Delivery Collections from SLB	Deadhead Personal Customer Contact Gas Vehicle Break Non Recurring	Vehicle Load Vehicle Unload

The items in the first box are directly attributed and form the cost pools for which we need to estimate variabilities. The items in the second box are indirectly attributed and do not need an individual variability.

Although the Form 3999 breakout of street activities and the CRA cost pools are generally consistent, they do not match exactly. A mapping from the Form 3999 activities to the CRA cost pools is thus required.

This table presents the current CRA break out of the carrier's day using Form 3999 data.

	Hours	Proportion
Directly Attributable Street Hours	5.37	87.4%
Indirectly Attributable Street Hours	0.46	7.5%
Vehicle Load/Unload	0.31	5.1%
Gross Street Hours	6.14	100.0%

To estimate attributable costs, we need to form cost pools for the directly attributable street hours. Thus, we will take the 5.37 hours and break it out into its time proportions.

The Form 3999 data can be used to estimate time proportions required for forming the CRA cost pools.

Street Time Proportions Based upon Form 3999 Data

	2012-2013 Route Evaluations	All Route Evaluations
Regular Delivery	83.38%	83.20%
Parcel/Accountable Delivery	4.63%	4.59%
Collections From SLB	0.20%	0.19%
Travel To/From Route	5.03%	5.03%
Network Travel	2.93%	3.01%
Relay	3.82%	3.94%
Number of Observations	112,972	139,867

The primary activity on the street is regular delivery. This activity includes inserting mail in the receptacle, moving between delivery points within a delivery section, and collecting mail.

There are sufficient data to use the most recent evaluations to form the street time proportions.

The Street Time Proportions Are Stable Through Time

- Total street time has increased an average of 24 minutes per route.
- As expected, the parcel / accountable delivery time proportion has been increasing.
- The network travel time proportion has been decreasing.

	2009	2010	2011	2012	2013	2013 -2009 Change
Regular Delivery	82.82%	82.97%	82.50%	83.14%	83.68%	0.87%
Parcel/Accountable Delivery	3.69%	4.06%	4.56%	4.45%	4.85%	1.16%
Relay	4.24%	4.34%	4.47%	4.10%	3.48%	-0.77%
Travel To/From Route	5.36%	4.98%	5.04%	5.00%	5.08%	-0.28%
Network Travel	3.74%	3.51%	3.29%	3.10%	2.71%	-1.04%
Collections From SLB	0.15%	0.14%	0.15%	0.20%	0.20%	0.06%
Number of Observations	860	5,326	20,709	62,424	50,548	

Updating Step 2:
Estimating Regular Delivery Time Variabilities

- Regular delivery time is determined by:
  - Volume cost drivers
  - Network characteristic variables

- Volume cost drivers include volumes delivered and collected from customers (not street letter boxes).

- Volume is delivered in "bundles." The current bundles used by city carriers are DPS, cased mail (including cased letters, flats and parcels), FSS and sequenced mail. Measures of these volumes are included in DOIS.

- DOIS does not include a measure of volumes collected. To obtain these data a field study was required.

The Postal Service thus undertook a collection volume study.

Collection Volume Study

- Study Goal: Measure the volumes collected from customers on every route in a sample of approximately 300 ZIP Codes over a two week period.
- The measured collection volumes can be matched with DOIS delivery volumes in the same ZIP Codes, on the same days, to produce a complete cost driver dataset.

- The collection volume study was carried out with the following steps.

1. Develop the sample
2. Design study process
3. Run a beta test
4. Refine study process
5. Launch data collection effort
6. Review collected data
7. Combine with DOIS delivery data

1. Developing the Sample

- A sample size of 300 ZIP Codes was determined to be the largest sample consistent with budgetary and management resources. This is approximately double the sample sizes in previous studies.

Stratum	Definition	# of ZIPs	Stratum Proportion of Time
Small Driving	Driving ZIP x < 6 routes	1,209	2%
Small Walking	Walking ZIP x < 6 routes	2,087	4%
Medium Driving	Driving ZIP 5 < x < 21 routes	2,254	20%
Medium Walking	Driving ZIP 5 < x < 21 routes	2,787	24%
Large Driving	Driving ZIP x > 20 routes	882	18%
Large Walking	Walking ZIP x > 20 routes	1,501	32%

- The collection volume study utilized a stratified systematic sample from a frame of 10,720 ZIP Codes that contain city carrier routes.

Two variables, which are highly correlated with a Zip Code's street time, are the number of routes in the ZIP Code and its overall delivery mode ("Driving" and "Walking").

These two variables were used to stratify the data into six subdivisions

2. Designing the Study Process

- The study was designed to have city carriers record collection volumes, by source and shape, for twelve consecutive delivery days.

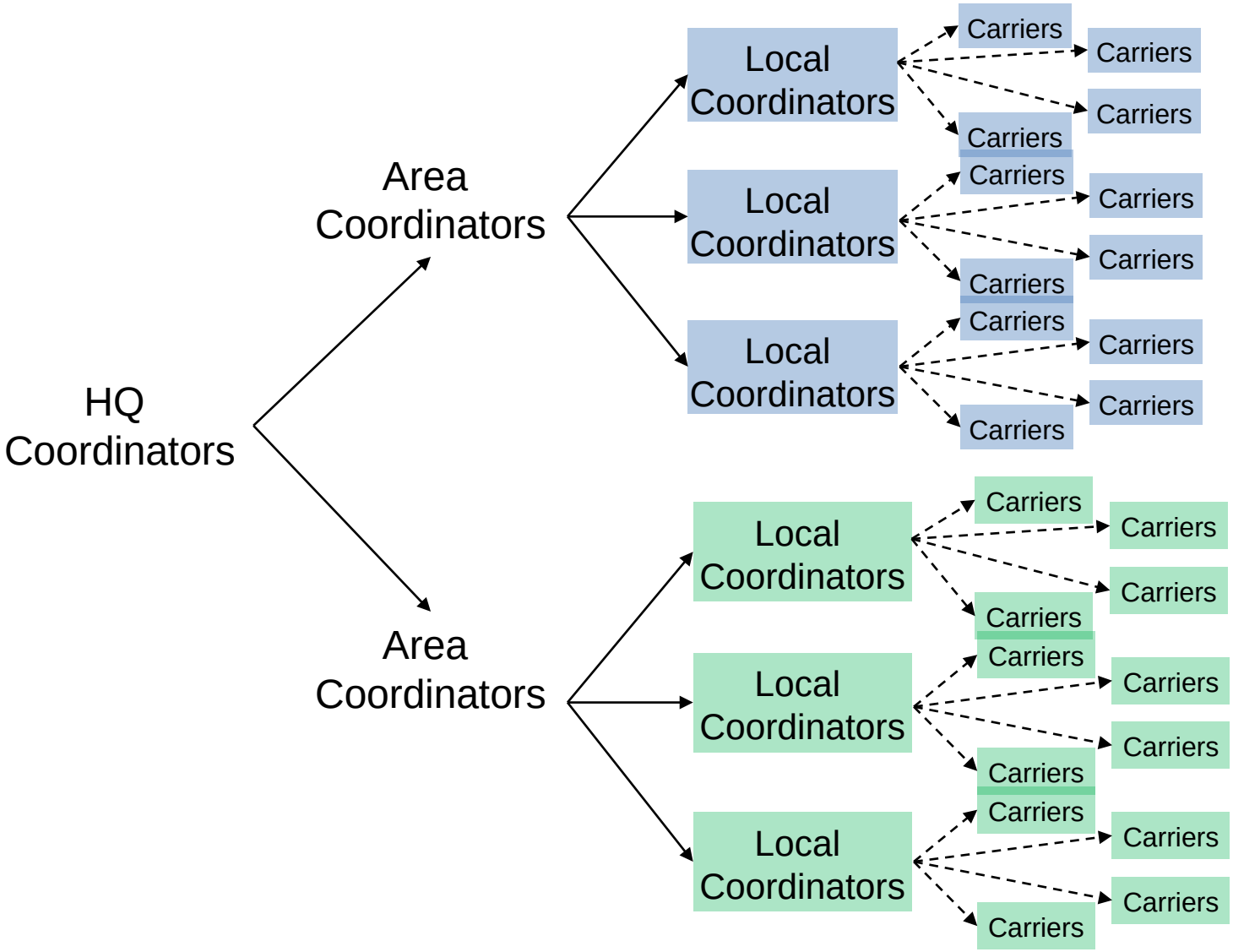
- Operations experts were integrated into the study process both in terms of designing and implementing the study. This greatly increased field participation.

- The possible sources of collection mail volume are:
  1) mail received directly from customer receptacles,
  2) mail received in collection points (like mail chutes), and
  3) containerized mail received from businesses.

- Collection mail volume for letters and flats was to be recorded in linear measurements, using quarter inch increments, and piece counts were to be used for parcels.

Because of the large number of ZIP Codes included in the study, a decentralized study team structure was employed.

Study Team Structure



Training

- Training was conducted prior to implementation to ensure consistent and accurate data collection.
- The study measurements were relatively simple -- measuring mail volumes. This simplified the training requirements.

Prior to beginning the study, headquarters coordinators trained both the area and local coordinators.

Local coordinators then trained individual carriers.

Example of Training Materials

UNITED STATES POSTAL SERVICE®

City Carrier Route Collected Mail Daily Log

Route Collected Mail Daily Log – Collections Returned To Office

Route Number:	
Zip Code:	

Week 1	Carrier	1 Mail Collected From Customers (Excluding Carrier Pickups)			Mail From Collection Points			Containerized Mail (Excluding Carrier Pickups)	
		Letters (Inches)	Flats (Inches)	Parcels (Pieces)	Letters (Inches)	Flats (Inches)	Parcels (Pieces)	Letter Trays (Inches)	Flat Tubs (Inches)

1 **Mail Collected from Customers**:

- All mail picked up from a customer's mail box, whether curb or door delivery is recorded under this heading. Mail picked up from a business delivery is also recorded here
- Mail collected from customers during the day is to be isolated, taken to the carrier case and measured
- Many carriers use a white flat tray and place all of their mail collected from customers in it. Mail from this tray is to be separated first by shape at the carrier case and then measured. Each case has a strip that can measure letter and flat volume
- Mail should routinely be compressed during measurement

3. Running a Beta Test

A beta test of the collection volume study was held for one week in March at five different ZIP Codes.

We instituted the beta test to evaluate our data forms, instructions, and procedures, in order to refine them for the actual collection volume study. In addition, examination of the data from the beta test served as a “proof of concept” before launching the full study.

There were a total of 116 routes in the beta study and that volume was measured for 6 days on each route This means there was a potential data set of 696 route days.

We were able to collect data for 695 of the 696 route days, missing only one route day.

One way we checked for consistency was to compare the beta test results with City CCS collection volumes for 2012.

4. Refine Study Process

Lessons Learned from Beta Test

1) Training and instructions were generally understandable.
2) Study was not overly burdensome to the field.
3) Emailing data from sites to HQ would be difficult to manage for many ZIP Codes.
4) Volumes from the beta test could be used to automatically identify unusual observations during main study.
5) Collection volumes could be matched to DOIS data.
6) No evidence suggesting study should not go forward.

Changes Made Due to Beta Test

1) Revised input forms and study process to improve accuracy of the data

2) Constructed a web tool that provided for centralized data submission

Web Tool Snapshot

Input Office - Windows Internet Explorer

http://hqcsopps/delivery/collections/input_route.cfm?area=230402&func=&do=21228C006

File Edit View Favorites Tools Help

Page Tools

Report Page

Route Selection: 21228C006 | Web Tool Instructions | Carrier Instructions |

Date Collected	Route Nbr	No Volume	Drop Off Location	Mail Collected From Customers (Excluding Carrier Pick-Ups)			Mail Collection Points			Containerized Mial (Exluding Carrier Pick-Ups)	
				Letters (0.25 Inches)	Flats (0.25 Inches)	Parcels (Pieces)	Letters (0.25 Inches)	Flats (0.25 Inches)	Parcels (Pieces)	Letters (0.25 Inches)	Flats (0.25 Inches)
04/16/2013	21228C006	☐	Office								

Submit

Routes input for Date Collected

Date Collected	Route Nbr	No Volume	Drop Off Location or Time	Mail Collected From Customers (Excluding Carrier Pick-Ups)			Mail Collection Points			Containerized Mail (Excluding Carrier Pick-Ups)	
				Letters (0.25 Inches)	Flats (0.25 Inches)	Parcels (Pieces)	Letters (0.25 Inches)	Flats (0.25 Inches)	Parcels (Pieces)	Letters (0.25 Inches)	Flats (0.25 Inches)

Done Local intranet 100%

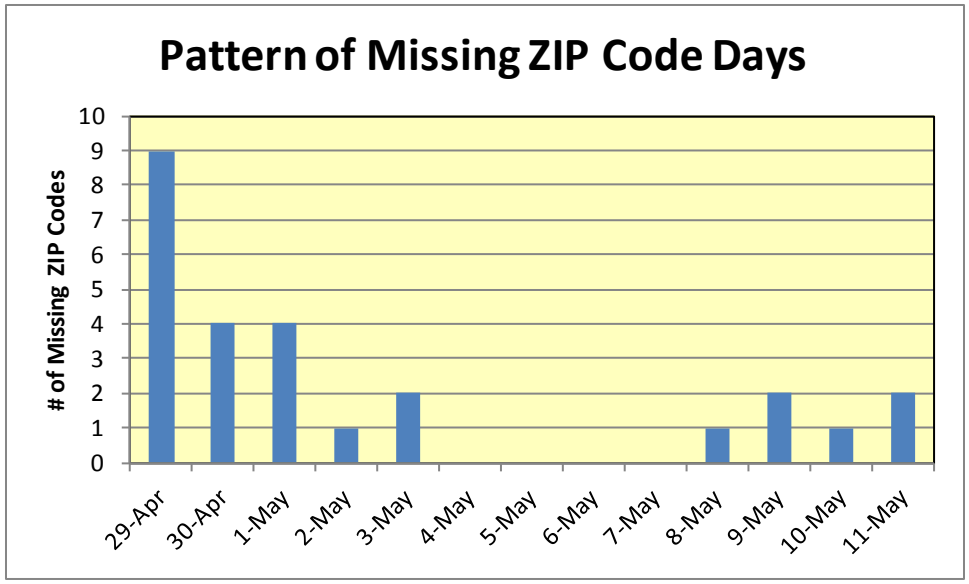
5. Launching the Data Collection Effort

- 297 ZIP Codes participated in the study and reported data.
- Those ZIP Codes contained over 6,000 routes that reported data for 12 delivery days from Monday, April 29 through Saturday, May 11.
- The web tool facilitated ongoing data checking:
  - The tool was pre-populated with each ZIP Code's routes.
  - Each day it facilitated producing a report listing any ZIP Codes that did not submit data.
  - Unusual value checks were used to identify possible data entry errors.
- HQ and area coordinators supported the data collection process and ensured full participation.

6. Review Collected Data

- There are 73,195 possible route days of data. The study captured data for 72,178 of those days. This means that it captured data for **98.6%** of the possible route days.

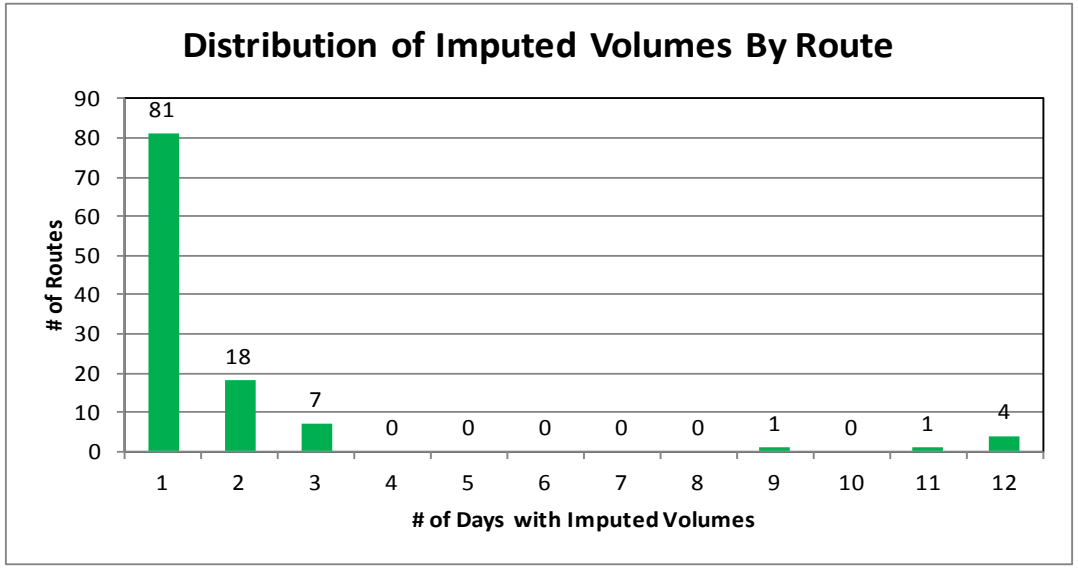
- A large portion of the missing route days occurred because a few ZIP Codes started the data collection process a day or two late.



Attrition was very low at the end of the study. (Missing 6 out of 1,188 possible ZIP Code days)

Imputing volume for missing route days

- There were some (412) missing route days that occurred in ZIP Codes that reported data for other routes.
- It is possible to impute volumes for the missing days. Imputation allows construction of complete ZIP Code days.
- We imputed volumes only on route days for which a ZIP Code reported volume for at least 80 percent of its routes on that day.
- The imputed volume for a route was its mean value over the days for which the route reported volume.
- This decision rule leads us to impute volume for 206 route days.



All the imputed values are zero for the six routes with multiple occurrences. They are "vacant" routes.

Investigating Unusual Observations

- Although the average collection volumes per route-day were low, there were a small number of routes that reported extraordinarily high collection volumes.
- These volumes were generally verified during the data collection process, but because of their unusual nature they deserved another examination as potential outliers.
- To that end, we looked at the highest volume route-days, both in terms of total collection volume and by shape.

There are 30 route-days with more than 4,000 pieces of collection mail. Those route days occur on 19 different routes in 15 ZIP Codes.

These individual routes were investigated and verified. A number of interesting points arise.

Most high collection volume routes are business or mixed routes. None of them are foot routes.

High collection volume days tend to occur on the same routes throughout the sample period.

High collection volumes are typically created by a small number of business delivery points:

- A route in Indiana reporting over 1,900 letters a day is a business route with a few high volume businesses.
- A route in Kentucky with high daily parcel counts includes a lawn parts service business that regularly sends out large numbers of parcels.
- A route in North Carolina with high dally flats counts includes a custom fabric and gift wrap business that regularly sends a high number of flats to customers.

Because they are valid, these high-volume observations are retained in the data set.

To evaluate volumes collected by carriers from customers we can look at daily per-route sample statistics:

Sample Statistics for Collection Volume Measures

	Mean	Median	C.V.
Customer Letter	138.4	75.7	1.67
Customer Flat	12.6	0	3.11
Customer Parcel	2.9	0	4.35
Collection Point Letter	11.9	0	8.61
Collection Point Flat	1.1	0	14.53
Collection Point Parcel	0.4	0	18.48
Container Letter	5.7	0	12.23
Container Flat	0.6	0	19.27
All Letters	156.0	75.7	1.75
All Flats	14.3	0	3.36
All Parcel	3.3	0	4.34
Total Volume	173.6	94.6	1.72

FY2012 City CCS

Total Volume	181.4	95.0	2.45

Carrier collection is primarily a letter-shaped activity.

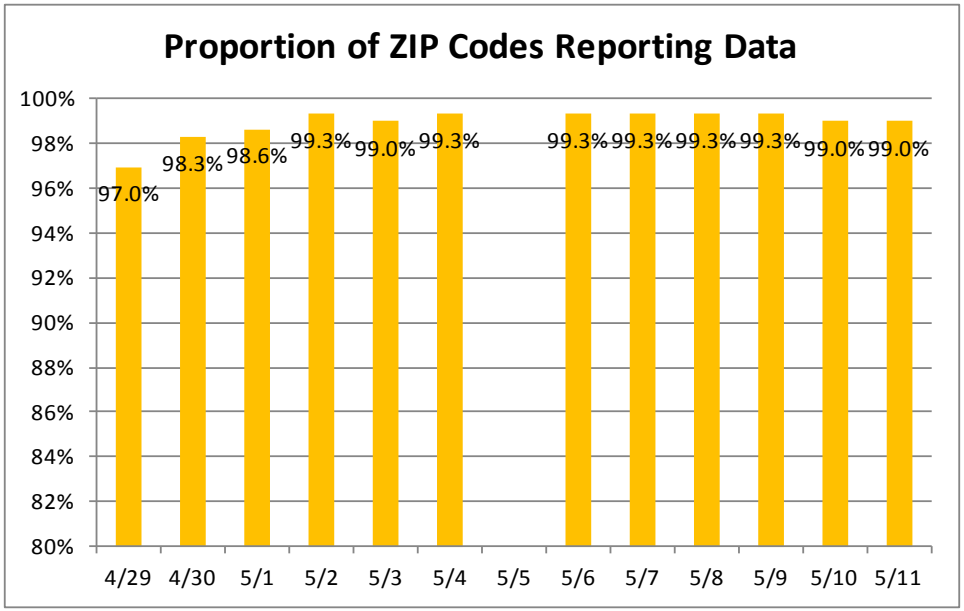
Nearly all carrier collection volume comes from customer receptacles.

Constructing the ZIP Code Day Data Set

The variability analysis takes place at the ZIP Code day level. This requires the collection volume data set to be similarly constructed.

The collection volume study produced about 3,500 ZIP Code days of data.

Attention to data reporting allowed us to construct ZIP Code days that include <u>all</u> of the routes in the ZIP Code. The precludes having to deal with partial ZIP Code days in the econometric analysis.



Not only do we have a high proportion of possible ZIP Code days, but each ZIP Code day is complete.

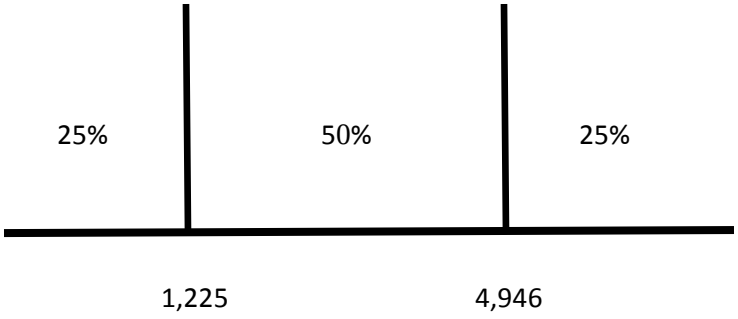
There is a Wide Range of Collection Volumes by ZIP Code

The sample reflects the wide variation in collection activity across the network.

Variation across ZIP Codes comes from both differences in the number of routes and differences in collection volume per route.

Daily ZIP Code Collection Volume

Quantile	Estimate
100% Max	21,547.4
99%	14,801.3
95%	10,093.0
90%	7,784.5
75% Q3	4,945.8
50% Median	2,602.9
25% Q1	1,255.0
10%	379.1
5%	208.6
1%	43.5
0% Min	0.0



To get a sense of the distribution, we can look at the inter-quartile range, which captures the middle 50 percent of the distribution.

7. Combine Collection Volumes with DOIS Data

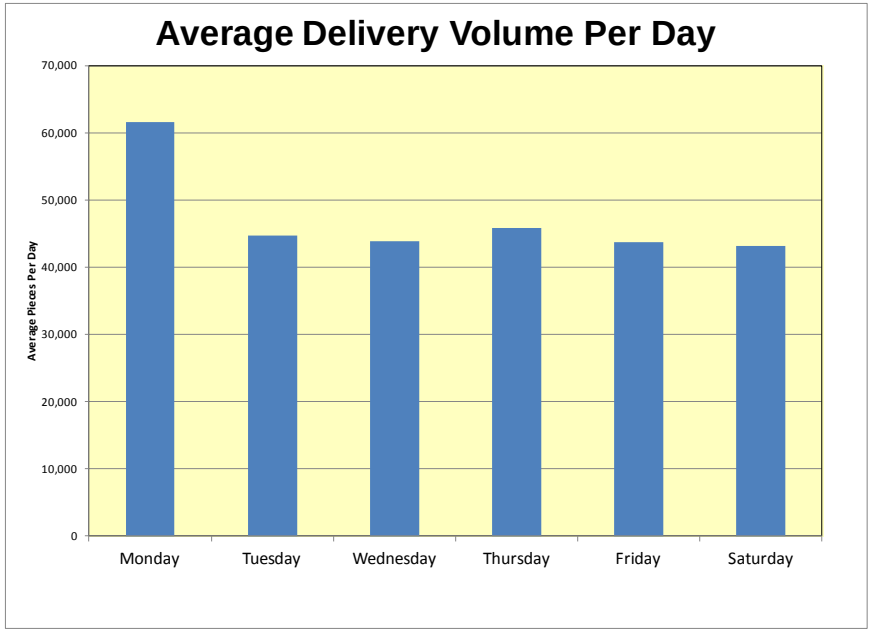
Because of good route number hygiene, we can match the collection volumes with their associated DOIS delivery volumes for all of the route days included in the study.

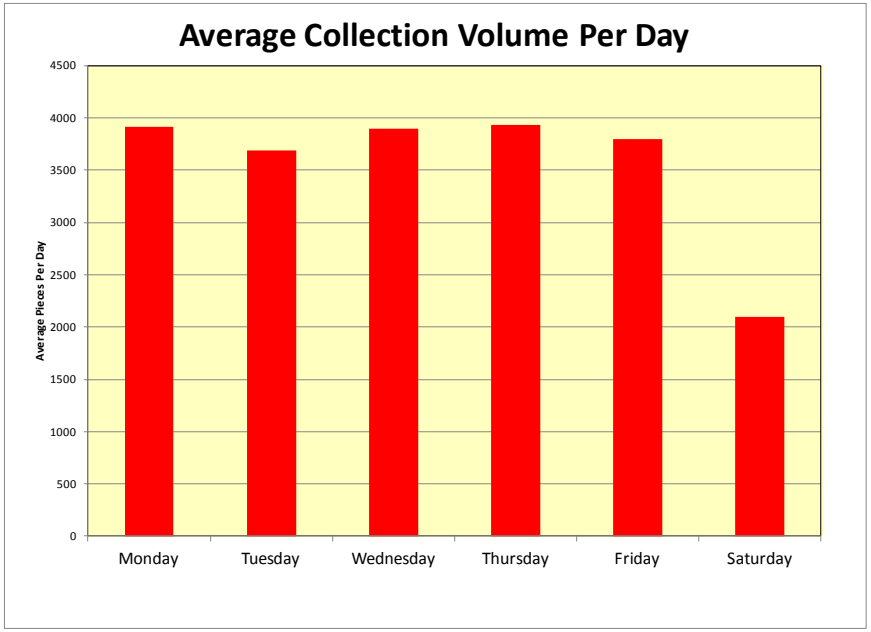
This allow us to construct a complete cost driver data set for approximately 3,500 ZIP Code days

Sample Statistics for ZIP Code Volumes		
	Mean	**Median**
Collected Letters	3,193.5	2,340.9
Collected Flats	293.4	162.9
Collected Parcels	67.4	38.0
Collected Volume	3,554.3	2,602.9
Cased Letters	2,180.2	1,656.0
Cased Flats	7,276.0	5,631.0
Parcels	423.2	318.0
DPS	30,636.9	27,717.0
FSS	2,121.4	0.0
Sequenced	4,923.6	122.0

Average daily delivery volume is more than 10 times average daily collection volume.

The Day of Week Patterns in Delivery and Collection Volumes are Different





Monday is the peak day for delivery (21.8%) but Thursday is the peak day for collection (18.4%).

Saturday collection volume is about half of the volume for the other days of the week.

Next Steps for Regular Delivery Estimation

Step 1: Undertake a field study to measure the volume of mail collected from customers in 300 ZIP Codes for each day over a two-week period.

Step 2: Combine the collection volume data with DOIS data for DPS mail, cased mail, FSS mail and sequenced mail for the same 300 ZIP Codes over the same two weeks.

Step 3: Calculate the delivery time for each ZIP Code day using DOIS street times and Form 3999 allied times.

Step 4: Specify and construct the relevant characteristic variables like miles per delivery point and delivery mode of the ZIP Code.

Step 5: Specify the form of the equation to be estimated, taking into account the roles of FSS mail and sequenced mail.

Step 6: Choose the appropriate econometric techniques given the characteristics of the data and the model to be estimated.

Step 7: Use the constructed data set to estimate the regular delivery equation at the ZIP Code level and calculate the relevant variabilities.

Parcel/Accountable Variability

The time for delivery of parcels and accountables is a separate cost pool that has its own variabilities.

We investigated the possibility of using Form 3999 data for estimating parcel and accountable variabilities but rejected that approach for two reasons:

- Form 3999 data does not include a measure of accountable volumes.
- The definition of a parcel can vary. We are not confident the Form 3999 data includes all parcels.

A field study is necessary to update parcel and accountable variabilities. We have begun planning for such a study and hope to launch it in spring of 2014.

Purchased Highway Transportation Progress

The variability of purchased highway transportation costs with respect to volume has two parts: the variability of cost with respect to moving capacity and the variability of moving capacity with respect to volume.

$$\varepsilon_{\text{Cost, Volume}} = \varepsilon_{\text{Cost, Capacity}} * \varepsilon_{\text{Capacity, Volume}}$$

The elasticity of cost with respect to capacity was last estimated in Docket No. R2000-1, using data collected in 1998.

The elasticity of capacity with respect to volume has always been assumed to equal 100 percent.

The Postal Service has started the process of updating the variability of cost with respect to capacity and testing the assumption of proportionality between capacity and volume.

We will next discuss the progress made in these two efforts

Updating the Variability of Cost with Respect to Capacity

- This variability is estimated through a series of equations, one for each highway account, that relate annual contract cost to annual contract cubic foot-miles.
- In the past, this required producing an extract from the Postal Service's highway transportation contract database called HCSS (Highway Contract Support System).
- HCSS no longer exists and has been replaced with a new system called TCSS (Transportation Contract Support System).

The Transportation Contract Support System (TCSS) is an automated procurement contracting system for administering over 17,500 Postal Service highway, rail, air, and ocean mail transportation contracts.

- The TCSS contains data on annual costs, truck capacities, frequencies, and miles for all contract cost segments. These are exactly the variables required for updating the approved highway transportation equations.

Changes in the Purchased Highway Transportation Network Since 1998

First expansion and then contraction in the amount of transportation purchased due to rising and then falling volume.

Reduction in contract lengths.

Reduction in the number of contracts.

Number of Contract Cost Segments by Account

Account Description	Account Number	Number in 2013	Number in 1998	% Change by Transportation Type
REGULAR INTRA DISTRICT	53605	1603	4866	-69.0%
EMERGENCY INTRA DISTRICT	53607	8	336	
REGULAR INTRA P&DC	53601	5125	7500	-35.7%
EMERGENCY INTRA P&DC	53603	115	654	
REGULAR INTER P&DC	53609	279	427	-42.4%
EMERGENCY INTER P&DC	53612	9	73	
REGULAR INTER CLUSTER	53614	349	464	-32.2%
EMERGENCY INTER CLUSTER	53616	9	64	
REGULAR INTER AREA	53618	581	577	-24.9%
EMERGENCY INTER AREA	53621	59	275	
REGULAR INTRA NDC	53127	301	389	-22.3%
EMERGENCY INTRA NDC	53129	12	14	
REGULAR INTER NDC	53131	110	186	-34.9%
EMERGENCY INTER NDC	53133	13	3	
TOTAL		**8573**	**15828**	**-45.8%**

We have extracted the 2013 data from TCSS and constructed the analysis variables:

Comparison of Key Variables

		Contract Cost Segments	Average Annual Cost	Average CFM	Average Route Length	Cost Per CFM
INTER P&DC - Van	2013	166	$146,377	79,875,374	63.6	$0.0018
	1998	294	$113,126	72,949,484	79.7	$0.0016
INTER P&DC - Tractor Trailer	2013	122	$601,873	812,042,620	99.5	$0.0007
	1998	143	$373,106	578,623,766	116.3	$0.0006
INTER CLUSTER - Van	2013	144	$179,670	87,261,746	76.5	$0.0021
	1998	216	$119,225	81,152,300	87.8	$0.0015
INTER CLUSTER - Tractor Trailer	2013	214	$732,366	1,052,249,640	166.5	$0.0007
	1998	230	$434,935	713,381,012	166.1	$0.0006
INTER AREA - Van	2013	139	$159,788	84,149,573	84.9	$0.0019
	1998	250	$125,318	85,368,369	102.9	$0.0015
INTER AREA - Tractor Trailer	2013	501	$1,150,762	1,977,799,795	478.0	$0.0006
	1998	425	$569,949	1,062,250,402	366.8	$0.0005
INTRA NDC	2013	139	$954,731	1,479,959,837	167.0	$0.0006
	1998	370	$806,250	1,332,704,452	174.8	$0.0006
INTER NDC	2013	144	$3,228,349	5,675,405,995	832.1	$0.0006
	1998	179	$1,863,265	3,432,890,995	820.2	$0.0005

(Note that 1998 dollars are inflated to be comparable with 2013 dollars.)

The next step is to begin the estimation of the econometric equations.

Investigation the Variability of Capacity with Respect to Volume

- The transportation cost model operates on the assumption that highway capacity varies in proportion to volume.

- The Postal Service investigated the use of TIMES data and Surface Visibility (SV) data to test this assumption. It used these data to investigate the behavior of utilization in the purchased highway transportation network.

- It then analyzed that data for feasibility in estimating an econometric equation for estimating a capacity-to-volume elasticity.

- Preliminary results suggested that capacity is not perfectly proportional to volume but the analysis indicated that TIMES/SV data are not sufficiently accurate and complete to meet Commission standards at this time.

The Postal Service is now investigating an alternative approach, first suggested by the Commission, that uses quarterly TRACS data by day of the week to relate capacity to volume