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Computation of Operating and Revenue Statistics Using Taximeter Totalizer Readings

Methodology

We download taximeter statistics AFTER the taximeter rate increase and DURING the 9 months of scheduled annual taxicab safety inspections. At each scheduled taxicab safety inspection/taximeter test the taxicab inspector downloads the totalizer readings from the taximeter and enters them into our Access database for inspection data. To understand totalizer readings think of a car odometer. The odometer starts at 000000 and adds total (= totalizer) miles until it rolls over after 99,999 or 999,999 (depending upon whether there are 5 or 6 digits). There are several counters like this in the statistical functions of a taximeter (see discussion on p. 2 of *Seattle Taxicab Industry Revenue and Operating Statistics [Using Taximeter Totalizer Readings] 2009-2010* - August 31, 2010): total revenue (paid) trips, total revenue miles, total fare revenue. To that data we add total odometer miles. After all 929 Seattle and King County taxicabs have been inspected (approx. 9 months), I print out a 30-page Access query showing the totalizer and odometer data as well as the taxicab name and number, VIN, and taximeter serial number (see attached sample showing printouts for 2009 and 2010 with data for Farwest 107). I have reproduced an extract below as an example:

Cab_Name	Cab_#	Year	VIN	mileage	meter make	Serial Numb	Trips	Miles	Fares	Date
FARWEST	107	2005	119616	129796	CENTRO	25342	22589	228736	361405	6/9/2010

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Cab_Name	Cab_#	Year	VIN	odo mileage	meter make	Serial Numb	Paid Trips	Paid Miles	Paid Fares	Date
FARWEST	107	2005	119616	93718	CENTRO	25342	20787	216677	323570	11/20/2009
FARWEST	107	2002	130403	313245	CENTRO	25342	16362	88502	247781	2/17/2009

The process of obtaining the operating and revenue statistics for Farwest 107 for a 1-year period from mid-2009 to mid-2010 (the typical taxicab inspection cycle) is as follows:

(1) Verify that totalizer readings are for the same taxicab in both 2009 and 2010 (compare 1st and 2nd columns: "Cab Name" and Cab #").
(2) Verify that the taxicab vehicle hasn't been changed because it corrupts the totalizer data when the taximeter is reinstalled in a new vehicle (compare 3rd and 4th columns: "Year" and "VIN"). In this case we can't use the bottom reading in 2009 because the VIN (130403) is different from the VIN (119616) in the only total reading in 2010 – so we use the top reading.
(3) Verify that the taximeter hasn't been changed (compare 6th and 7th columns: "Meter Makie" and "Serial Numbers").

Now that we have verified that we are comparing "apples and apples" we can start doing the math. Generally, the totalizer numbers increase (unless the totalizer "rolled over") so the process is to subtract the smaller numbers (2009) from the larger numbers (2010). If the totalizer has rolled over, we must add 99,999 or 999,999 (depending upon whether there are 5 or 6 digits) before subtracting. Usually the printouts should be arranged (as shown above) with the larger numbers on the top to facilitate subtraction and avoid confusion.

(4) Annual Time Interval. In order for any of the totalizer differences from our subtraction to be comparable or additive, they must have a common denominator. So we need to calculate the time difference in days between the dates of the 2009 and 2010 totalizer readings in the 11th column then divide all totalizer differences the number of days to "annualize" the data. For example, 6/9/2010 – 11/20/2009 = 10 (Nov) + 31 (Dec) + 31 (Jan) + 28 (Feb) + 31 (Mar) + 30 (Apr) + 31 (May) + 9 (Jun) = 201 days between totalizer readings.

(5) Annual Paid trips. Subtract the 8th column totalizer reading for 2009 (bottom) from the totalizer reading for 2010 (top): 22589 trips – 20787 trips = 1,802 trips during the 201 days between 11/20/2009 and 6/9/2010. In order to "annualize" this data, we first find the daily rate then multiply by 365 days as follows: (1,802 paid trips/201 days) X 365 days per year = 3,272 paid trips per year. This is essentially the process of extrapolating from a partial year to a full year and assumes that the daily rate will not change.

(6) Annual Paid Miles. Subtract the 9th column totalizer reading for 2009 (bottom) from the totalizer reading for 2010 (top): 228736 miles - 216677 miles = 12,059 miles during the 201 days between 11/20/2009 and 6/9/2010. In order to "annualize" this data, we first find the daily rate then multiply by 365 days as follows: (12,059 paid miles/201 days) X 365 days per year = 21,898 paid miles per year. This is essentially the process of extrapolating from a partial year to a full year and assumes that the daily rate will not change.

(7) Annual Paid Fares. Subtract the 10th column totalizer reading for 2009 (bottom) from the totalizer reading for 2010 (top): $361,405 - $323,570 = $37,835 during the 201 days between 11/20/2009 and 6/9/2010. In order to "annualize" this data, we first find the daily rate then multiply by 365 days as follows: ($37,835/201 days) X 365 days per year = $68,705 fare revenue per year. This is essentially the process of extrapolating from a partial year to a full year and assumes that the daily rate will not change.

(8) Annual Total (Odometer) Miles. Subtract the 5th column totalizer reading for 2009 (bottom) from the totalizer reading for 2010 (top): 129,796 miles – 93,718 miles = 36,078 miles during the 201 days between 11/20/2009 and 6/9/2010. In order to "annualize" this data, we first find the daily rate then multiply by 365 days as follows: (36,078 total miles/201 days) X 365 days per year = 65,515 total miles per year. This is essentially the process of extrapolating from a partial year to a full year and assumes that the daily rate will not change.

(9) Quick Check. It is important to perform a quick check on whether the monetized components of the taximeter fare sum to the annual paid fare and leave a reasonable amount of "time charges". In other words, I convert the total paid trips to a total drop charge then add total paid miles converted to total distance charge and the combination must not exceed the total paid fares because: taximeter fare = drop charge + distance charge + time charge. For example, total drop charge($2.50 drop charge X 3,272 paid trips per year) + total distance charge (21,898 paid miles per year X $2.50 per mile) + total time charge = total fare revenue. Or, $8,180 total drop charges + $54,745 total distance charges + total time charge = $68,705 total fare revenue. So, $62,925 + total time charge =$68,705 fare revenue per year. That means that the total time charge must be $5,780 and the time charge per trip is $5,780/3,272 paid trips per year = $1.77 time charge per paid trip or 3.5 minutes with the taximeter running on "time" (less than the 12 mph "crossover speed"). This quick check is helpful because experience shows that the

time charge per trip is very similar in all taxicabs. The quick check confirms that the data hasn't been corrupted, recorded in error, etc.

(10) Analysis. It is likely, based upon the relatively low number of paid trips per year (3,272 paid trips) and the somewhat longer average trip (21,898 paid miles/3,272 paid trips = 6.7 miles per trip) that this taxicab operates chiefly in King County even though it is dual-licensed (allowed to pick up passenger in either Seattle and King County). It is also likely, based upon the relatively low number of odometer miles (65,515 total miles per year) and the somewhat low total fare revenue ($68,705) that this taxicab is mostly driven just a single shift each day. Most King County taxicabs operate just one shift per day. The "average" Seattle taxicab is double-shifted (driven two 12-hour shifts) and the operating and revenue statistics are significantly higher. Compare the data in the following table:

Operating and Revenue Statistics	Farwest 107 2009-2010	Average Seattle-licensed taxicab 2009-2010
Annual Paid Trips	3,272	7,422
Annual Paid Miles	21,898	32,378
Annual Paid Fares	$68,705	$109,868
Annual Total Miles	65,515	80,615

(11) Report. The last published report is attached. Typically, the sample of usable data from the taximeter statistical function downloads is over 40% (about 370 taxicabs) which is a very large sample. It is considered very reliable, despite known sources of error (e.g., see discussion on p. 3 of *Seattle Taxicab Industry Revenue and Operating Statistics [Using Taximeter Totalizer Readings] 2009-2010* -August 31, 2010), when used in conjunction with other data – e.g., monthly computer dispatch reports from taxicab associations, monthly outbound trip counts at Sea-Tac Airport by the Port of Seattle, etc. The paid miles are typically 40% of total (odometer) miles which indicates that nearly every revenue trip by taxicabs involves a deadhead (nonrevenue) return trip to reposition the taxicab. The other 20% is private use (e.g., 80,615 X .20 = 16,123 miles private use per year). In order to compile industry-wide statistics, the statistics for the taxicabs in each taxicab association are extrapolated to represent the total number of affiliated taxicabs in each taxicab association. Then, the final data is compared year-to-year. Average trip and total odometer miles are nearly constant. The change in fare revenue and change in paid trips data is used to compute the price elasticity of demand in order to predict the impact of a specific taximeter rate hike (like the one pending in the City Council presently). There is a thorough discussion of price elasticity of demand on p.6 of *Seattle Taxicab Industry Revenue and Operating Statistics [Using Taximeter Totalizer Readings] 2009-2010* (August 31, 2010) and p.3 of the work sheet, *Proposed Taximeter Rate Changes and Taxicab Lease Cap Changes* (Version #4, June 1, 2012).

From the above, you can see that collecting data, performing computations and then analyzing the results is an enormous task. It should be computerized. No other city does this sort of analysis. A paper on use of statistics for policymaking presented at an annual conference of the International Association of Transportation Regulators (www.iatr.org) hosted by Seattle in 2006 provides general guidance on the use of statistics for regulation of the taxicab industry, *Collection and Use of Information for Effective Regulation of the Taxicab Industry* (September 19, 2006).