

# Transit Deficits: A Projection for New York State

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This paper summarizes recent work at the New York State Department of Transportation on the future of transit operating deficits in the state. Transit cost projections are made for three inflation levels for each of 13 transit properties, which serve 95 percent of New York State riders. Based on 1964-1973 data, aggregate demand models relating ridership to fare and service levels are calibrated for each operation and are used to forecast ridership and revenues to 1980 under a series of fare and service assumptions. The analysis shows that (a) transit costs will about double during the 1974-1980 period, (b) fare elasticities for transit ridership are about -0.25 for large operations and -0.55 for smaller operations, (c) ridership will stabilize at about 2.0 billion riders annually if current fares and services are maintained, and (d) transit deficits (operating costs minus revenues) will rise from \$248 million in 1973 to \$1324 million by 1980.

In 1974 New York State established a \$200 million transit operating assistance (TOA) program for state communities. Under this program five large metropolitan areas (Figure 1) receive direct grants, and other transit operators are allocated funds by a formula based on passengers, vehicle-kilometers, and residents served. The state and communities share equally in the program (in the large metropolitan areas participation is mandated). In 1975, the program was continued at a slightly higher (\$206 million) funding level. This operating assistance, combined with federal and other state and local funds, enabled transit operations in New York to hold fares and service at their January 1974 levels, except for recent (September 1975) increases in the New York City area.

The New York State Department of Transportation is responsible for undertaking an annual study of this TOA program to review program effectiveness, fairness of funds distribution, transit productivity, and prospects for the future. The results of these analyses (1, 2) have been submitted to the governor and the legislature to aid in developing an effective long-range approach to financing transit systems and evaluating the services pro-

vided by each system. As part of its study, the New York State DOT has developed and evaluated several options for operating assistance by using available statistics on transit companies and forecasts of ridership, revenues, operating costs, and deficits for various fare and service assumptions. This paper describes the state DOT's modeling and forecasting efforts in regard to (a) transit cost models; (b) ridership and revenue models for each operation in the state; and (c) projections of transit ridership, revenue, costs, and deficits under various fare and service assumptions.

## DATA SOURCES

Data compilation and modeling covered more than 95 percent of the bus, subway, and commuter rail transit ridership in the state. Basic information was compiled for each of 13 major transit operations in New York State. In the New York City area, the transit operations included

1. Private bus companies,
2. Manhattan and Bronx Surface Transit Operating Authority (MABSTOA),
3. Other public bus systems,
4. Subway system, and
5. Commuter rail operations.

Other operations in the state included those in

6. Westchester County,
7. Nassau County,
8. Buffalo,
9. Rochester,
10. Syracuse,
11. Albany-Schenectady-Troy,
12. Binghamton, and
13. Utica-Rome.

Information was obtained from company records and other sources on the number of annual riders, annual bus-kilometers, fare, area employment, population, and other statistics (such as the consumer price index) for the period 1964-1973.

## COSTS OF PUBLIC TRANSPORTATION

In this analysis transit deficits are computed as the difference between the costs of transit operations (excluding capital investments) and revenues obtained from transit riders, plus revenues from other sources such as advertising. The costs of bus and subway transit operations in New York State have risen from \$436 million in 1964 to \$922 million in 1973, paralleling national trends. Commuter rail operating costs in 1973 were \$250 million (Figure 2). Of particular importance in these trends are rapidly rising costs in fuel and power, wages, and retirement benefits.

The cumulative effect of these trends has resulted in a rapidly rising index of transit costs during the 1964-1973 period (Figure 3). The rate of rise is faster than that of the economy in general, because (a) wages, retirement, and other fringe benefits were generally low in the transit industry before the public takeovers, which occurred in this period, and (b) fuel and power costs have increased rapidly in recent years.

Transit costs were modeled in a straightforward manner. First, the transit cost index based on three inflationary trends was projected into the future (Figure 3). For a given transit system, then, the 1973 average cost per vehicle-kilometer was multiplied by the transit cost index to obtain estimates of costs per vehicle-kilometer for future years. Finally, for a given future year the number of vehicle-kilometers planned under a particular service policy was multiplied by estimated cost per vehicle-kilometer for that year to obtain total operating cost. The simple formulation

$$\text{Future cost}_t = (\text{1973 cost per vehicle-kilometer}) \times (\text{inflation factor}_t) \\ \times (\text{vehicle-kilometers planned}_t)$$

is well-suited for forecasting costs under an array of service policy options.

## RIDERSHIP AND REVENUES

While costs rose, New York State transit ridership (bus, subway, and commuter rail) fell during the 1964-1973 period (Figure 2) to about 2.09 billion annual riders. As ridership declined, fares were raised to increase revenues, an action which further encouraged ridership reduction. Through successive fare increases, revenues have kept up with costs (Figure 2) but only at the expense of declining ridership. Generally, fares have increased faster than the cost of living.

Forecasts of the revenue side of transit operations were based on investigation of different aggregate models relating ridership per resident to urban area and transit system characteristics. Results indicated that fare and service-level variables were the best estimators of transit ridership, for most cities. Linear models generally worked better than product forms. The following simple two-variable model was found to adequately describe ridership declines over a 10-year period.

$$\frac{\text{Annual ridership}}{\text{Population}} = a + b (\text{base fare}) + c \left( \frac{\text{annual vehicle-kilometers}}{\text{population}} \right)$$

Base or nominal fare was found to be a much better predictor than deflated fare, which also was observed to be unreasonable in forecasting. These models were calibrated by least squares regression (3).

Table 1 gives the ridership models. Of particular interest is the finding that fare-increase elasticities for large operations (New York City and Buffalo) are all about -0.25 and for smaller metropolitan areas (except

for Binghamton) are about -0.55. These findings generally parallel those of other researchers (4) and indicate that transit ridership in large cities is not so sensitive to fare increases as is the ridership in smaller cities. No such patterns appear in the service elasticities, however.

For each system, for each forecast year (1974-1980) total ridership and revenue were estimated for each of 12 fare-service policies (50 percent less, current, and 50 percent more service versus 0, 15-cent, current, and 60-cent fare). These relationships are given in Table 2 for revenue passengers. If the 1973 fares and service (current) levels are maintained through 1980, transit ridership is expected to rise only slightly (to 2.12 billion annual riders) during the period. If bus and subway fares on the average were raised to 60 cents for bus and subway and \$2.10 for commuter rail (from \$1.41 in 1973), transit usage statewide would fall about 28 percent to 1.513 billion riders by 1980. However, as discussed below, the resulting transit deficits at that time would not be much less than those projected with the current fare because potential revenue increases would be reduced by lost ridership and costs would continue to rise.

On the other hand, a substantial fare decrease (to 15 cents for bus and subway and 70 cents for commuter rail) would increase ridership by about 25 percent during the same period based on the assumption that the riders lost by fare increases would return as a result of similar fare decreases. This is a tenuous assumption according to Donnelly in a paper in this Record. If such reverse diversion is not so sensitive to fare decreases, ridership projections for reduced fares will be high and deficit projections low.

Similarly, if levels of transit service (defined as vehicle-kilometers) were cut 50 percent during the next 5 years, ridership would fall 37 percent to 1.334 billion annually by 1980. If service levels were increased 50 percent, about a 37 percent increase in ridership would occur in the same period.

In summary, the ridership has been declining but is expected to stabilize at about 2.12 billion annual riders if 1973 fares and service levels are maintained. Hence, without fare increases or service cutbacks, revenues are likely to remain relatively constant during the 1975-1980 period.

## TRANSIT OPERATING DEFICITS

Because of increasing costs and declining revenues, transit operating deficits (costs minus revenues) have increased greatly since 1970. In 1973, total state deficits for transit were about \$263 million; they rose to about \$398 million in 1974. Data given in Table 3 show that, if 1973 fares and service are maintained, the gross operating deficit of all New York State transit operations is projected at \$642 million for 1975 and \$1324 million by 1980. Given 1974 as a base, 1975 deficits will be 61 percent higher and 1980 deficits 233 percent higher.

Increases in fare apparently do not materially affect the long-term financial status of transit operations. An average fare of 60 cents for bus and subway and \$2.10 for commuter rail would result in a total state 1980 deficit of \$1214 million, about \$110 million less than projected with the current fare, but ridership would fall 28 percent. On the other hand, a significant fare decrease (to 15 cents) would generate 538 million more riders, but at a deficit \$387 million greater than with the current fare. (Increases in operating cost to handle increased ridership are not included.)

The conclusion is that significantly lower fares would increase ridership on the order of 25 percent, but this would only decrease net revenue and increase deficits. On the other hand, increases in fare would further reduce



ridership below the current levels (by about 28 percent for a 60-cent fare), and resulting deficits would continue to increase because the revenue gained would not offset increases in the cost of transit operations.

However, decreases in service would significantly reduce the deficits. With 50 percent less service, the 1980 projected deficit would be about \$467 million, but ridership would fall 37 percent. A 50 percent increase in service would increase the deficit to \$2182 million but generate 37 percent more ridership. Thus, decreases in service level would reduce deficits, but the impact on New York residents would be great.

## CONCLUSIONS

The analysis suggests that there is no simple solution to the problem of rapidly rising transit operating deficits in New York State.

1. Transit operating costs are rising faster than the general cost of living; they are projected to double during the next 5 years.

2. Although most costs are wage related, no single cost item accounts for these increases. Large transit systems appear to be more expensive to operate on a kilometer basis primarily because of slower operating speeds caused by big city traffic congestion

Table 2. New York State transit ridership in thousands.

Operation	Current Fare and Service				1980 Ridership Projections <sup>a</sup>			
	1973 <sup>b</sup>	1974 <sup>a</sup>	1975 <sup>a</sup>	1980 <sup>a</sup>	Current Service		Current Fare	
					60-Cent Fare	15-Cent Fare	50% Less Service	50% More Service
New York City								
Private bus	90 896	92 432	92 400	92 245	83 439	119 462	59 859	124 630
MABSTOA	292 851	307 361	307 235	306 618	216 956	378 348	207 827	405 410
Other public bus	384 804	383 260	383 448	384 363	268 951	476 692	111 252	657 474
Subway	1 122 456	1 122 886	1 122 383	1 119 920	824 437	1 356 307	777 654	1 462 187
Commuter rail	93 897	98 538	99 770	103 998	46 823 <sup>c</sup>	161 172 <sup>d</sup>	101 580	106 417
Subtotal	1 985 004	2 004 477	2 005 236	2 007 144	1 440 606	2 491 981	1 258 172	2 756 118
Westchester County	18 111	17 866	17 982	18 638	14 137	26 051	18 638	18 638
Nassau County	19 066	18 963	18 963	18 959	14 176	29 548	9 389	28 528
Buffalo <sup>e</sup>	27 576	30 188	30 246	30 546	24 451	38 162	23 648	37 441
Rochester	17 656	17 597	17 579	17 493	9 012	28 095	7 929	27 058
Syracuse	10 599	10 146	10 166	10 266	2 844	16 204	6 342	14 190
Albany-Schenectady-Troy	11 025	11 323	11 342	11 458	5 347	16 346	7 250	15 666
Binghamton	1 671	1 592	1 597	1 621	295 <sup>f</sup>	3 154	1 367	1 876
Utica-Rome	2 032	2 018	2 016	2 007	2 007	2 007	783	3 231
Subtotal	107 736	109 693	127 057	110 988	72 269	159 567	75 346	146 628
Total	2 092 740	2 114 170	2 132 293	2 118 132	1 512 875	2 651 548	1 333 518	2 902 746
Percentage change over 1974				+0.2	-28.4	25.4	-36.9	+37.3

<sup>a</sup>New York State DOT projections.

<sup>b</sup>70-cent fare assumed.

<sup>c</sup>Reported by operators.

<sup>d</sup>Fare changed from 45 cents in 1973 to 40 cents in 1974.

<sup>e</sup>\$2.10 fare assumed.

<sup>f</sup>Unreliable forecast.

Table 3. New York State transit deficits (profits) in thousands.

Operation	Current Fare and Service				1980 Deficit Projections <sup>a</sup>			
	1973 <sup>b</sup>	1974 <sup>a</sup>	1975	1980 <sup>a</sup>	Current Service		Current Fare	
					60-Cent Fare	15-Cent Fare	50% Less Service	50% More Service
New York City								
Private bus	(9 837)	(4 975)	1 771 <sup>a</sup>	28 686	23 823	55 967	3 708	53 664
MABSTOA	4 139	13 458		112 098	89 241	162 662	26 968	197 228
Other public bus	25 876	43 038	470 000 <sup>c</sup>	171 857	143 671	238 031	114 987	228 727
Subway	147 169	224 106		661 214	558 524	849 740	250 402	1 072 026
Commuter rail	84 127	112 742	157 706 <sup>c</sup>	306 400	353 762 <sup>d</sup>	339 240 <sup>e</sup>	59 362	553 426
Subtotal deficit only	261 311	393 344	629 477	1 280 255	1 169 021	1 645 640	455 427	2 105 071
Westchester County	(1 728)	(578)	558 <sup>a</sup>	5 005	4 537	9 111	(2 192)	12 202
Nassau County	(1 327)	32	1 640 <sup>a</sup>	8 052	8 267	12 340	2 698	13 405
Buffalo <sup>e</sup>	(1 544)	421	3 345 <sup>c</sup>	10 527	7 830	17 671	1 073	19 983
Rochester	101	1 359	2 704 <sup>c</sup>	7 265	8 775	9 908	3 761	10 768
Syracuse	342	866	1 549 <sup>c</sup>	4 612	6 688	5 891	1 509	7 716
Albany-Schenectady-Troy	585	1 060	1 995 <sup>c</sup>	5 595	6 477	7 309	1 634	9 556
Binghamton	197	340	243 <sup>c</sup>	975	1 569 <sup>f</sup>	1 064	274	1 675
Utica-Rome	200	462	490 <sup>c</sup>	1 420	577	1 661	626	2 214
Subtotal deficit only	1 425	4 540	12 524	43 451	44 720	64 955	11 575	77 519
Total deficit only	262 736	297 884	642 001	1 323 700	1 213 741	1 710 595	467 002	2 182 590
Percentage change over 1974			61.35	232.68	205.05	392.92	17.37	448.55
Net Total	248 300	392 331	642 001	1 323 700	1 213 741	1 710 595	464 810	2 182 590

<sup>a</sup>New York State DOT projections.

<sup>b</sup>70-cent fare was assumed.

<sup>c</sup>Reported operating costs minus operating revenues.

<sup>d</sup>Fare changed from 45 cents in 1973 to 40 cents in 1974.

<sup>e</sup>Estimated by operators.

<sup>f</sup>Unreliable forecast.

<sup>g</sup>\$2.10 fare was assumed.

and somewhat higher labor costs.

3. On the revenue side, ridership has been declining and is projected to stabilize, under the assumption that no additional fare increases or service cutbacks will be implemented. Hence, revenues will be relatively constant over the foreseeable future.

4. Increases in fares appear to be generally counterproductive in that they simply drive away more riders and necessitate further service cutbacks to make up for lost revenues.

5. Thus, transit deficits are likely to continue rising if present trends continue. The gap between costs and revenues for commuter rail, bus, and subway operations is forecast at about \$1324 million by 1980, based on 1973 fares and service and declining inflation rates.

#### REFERENCES

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