Abridgment

Commuter Railroad Pricing in the New York Metropolitan Region

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A framework for examining commuter railroad pricing in the New York metropolitan region is presented. The Metropolitan Transportation Authority (MTA) operates two commuter railroads: the Long Island Railroad, which is the country's busiest, and the Metro-North, which consists of the Harlem, Hudson, New Haven, and the Hoboken-Port Jervis lines. It is shown that the distance component of the MTA commuter railroad pricing structure is fair: riders who travel longer distances pay a higher fare in relation to the benefits they receive from the incremental distance they travel; and it is efficient: the charges are related to the additional cost of carrying riders further distances. Peak-period pricing is another efficiency-based strategy that theoretically would move riders who have a choice to the off peak, thereby rationing expensive peak capacity to those who are most willing to pay for it. The current commuter railroad peak pricing policy has not charged the peak-period rider in accordance with efficient resource allocation. Restructuring of the relative prices of the different tickets along with offering a viable off-peak alternative for monthly commuters would go a long way toward pricing the peak riders in relation to the actual costs they impose while offering a workable off-peak alternative. The alternatives that are examined are those that are operationally feasible.

This paper deals with the commuter railroad fare pricing strategy at the Metropolitan Transportation Authority (MTA), which is headquartered in New York City. MTA is responsible for operating one of the largest transportation systems in the world, which encompasses subways, buses, commuter rail lines, tunnels, and bridges. A discussion is presented on pricing issues for two MTA commuter railroads: the Long Island Railroad (LIRR) and the Metro-North Commuter Railroad. These two railroads carried a combined average weekday ridership of 453 000 in September 1982.

PRICING MASS TRANSIT

Discussions of various types of fare structures often revolve around complications due to different pricing principles (e.g., economic efficiency versus social welfare), the market structure, and, finally, the role that subsidies play. Many other studies have detailed the efficiency and equity arguments of transit pricing, so we will only summarize them. Efficient pricing requires that riders pay in proportion to the costs they impose on the system. Theoretically, this would lead to true signals being sent to producers of transit services concerning how much the service is valued.

There are two different types of equity or fairness criteria that are generally considered: benefit equity, which requires that riders pay in relation to the benefits they receive, and ability-to-pay equity, which states that riders should pay according to what they can afford. Although ability-to-pay equity is clearly an important consideration and is always a priority when decisions are made, this paper only marginally deals with this issue. In accordance with established federal, state, and city legislation, MTA has provided discount fares for certain groups such as senior citizens and the handicapped. Studying the effect on various socioeconomic groups of the kinds of fare structure changes under consideration is a complex undertaking beyond the means of this paper. A separate study is being designed to better evaluate these issues.

The revenue implications of different options are clearly important considerations, especially during this time of decreasing federal assistance. In 1981, LIRR covered about 45 percent of its operating expenses through the fare box. The coverage ratio for the Metro-North Harlem-Hudson lines was about 37 percent in 1981, and it was about 56 percent for the New Haven line during the same period. The balance was provided through a variety of federal, state, local, and regional subsidies. Because the level of fares is an extremely sensitive political and economic issue, the utmost care is taken in evaluating the revenue implications of alternative fare structures.

Any modifications in the existing fare structure must be evaluated in terms of the facility and of their implementation. Changes that would make fares much more difficult to collect or place undue hardship on the administrative staff cannot seriously be considered. This includes measures that adversely affect ticket lines, on-board ticket collection, or revenue handling. Also, employees and riders should be able to easily understand the fare structure. These constraints limit the number of available alternatives and, therefore, this paper addresses only feasible alternatives that can be implemented in the short run.

MTA COMMUTER RAILROAD FARE HISTORY

Before 1980 there did not exist an independently determined rationale for pricing commuter railroad tickets. In general, the pricing relations that existed when MTA took control of these railroads, through ownership or contractual agreement, were the ones in effect until July 1980. Indeed, these were most likely inherited from the private managements of the Pennsylvania Railroad, the New York Central Railroad, and the New Haven Railroad. From a historical perspective, it appears that fares were correlated closely with distance--perhaps until around the time of the end of World War II--but that thereafter the flat rate increases in the one-way fares (a nickel, or later a dime, for each and every station on a line) distorted the relations. Discounts for commutation tickets were offered to the railroads' best customers, and deeper discounts were frequently offered to riders who traveled greater distances on the basis of a perception that there existed a rate above which the railroads would lose large numbers of riders and revenues. These notions were, at best, the tried and true rules-of-thumb of experienced railroad managers, although they were not necessarily based on economic theory. Table 1 gives a thumbnail sketch of the post-1970 fare structure changes on the LIRR.

When comparing the fares charged by distance, Commuter Rail Corporation (Conrail) fares had relatively higher monthly ticket prices than the LIRR but lower one-way ticket prices. Recent MTA policy has been to make the two MTA commuter railroad's fare structures more consistent with one another.

Thus, the pre-1980 MTA fare structures were characterized by (a) the one-way fare as the base for determining all fares; (b) a vague, informal relation of fares to distance traveled; (c) an irregular pattern of discounts for monthly commutation tickets

(depending, in some cases, on local political arrangements made a long time ago); and (d) a relatively weak commitment to off-peak pricing as part of the overall fare structure.

MTA COMMUTER RAILROAD PRICING ISSUES

The following sections present some of the MTA commuter railroad pricing issues that merit review. (The arguments presented are our views, and may not necessarily reflect future MTA policy.)

Peak and Off-Peak Pricing

Public transportation in general, and commuter railroads in particular, are services characterized by considerable variability of demand based on both time of day and day of the week. Comparatively more people desire to travel during the peak periods than in the off peak, usually to commute to and from work. This group, which demands peak-period service, places the greatest burden on the system and thus imposes the greatest cost. Therefore, efficient or marginal-cost pricing requires that peak-period users pay for the additional capacity they require in order to allocate expensive peak space to those who value it the most.

Theoretically, higher peak-period charges have the desirable effect of moving some riders who have a choice to the lower-priced off peak, thereby rationing the peak capacity to those who are the most willing to pay for it. This would also make better use of excess capacity during the off peak and, in the long run, decrease operating costs in the peak to the degree they are variable. The magnitude of this shift depends, of course, on the price differential between the peak and off-peak fares. Clearly, a large differential would move more riders than would a small differential. The amount of the shift also depends on the sensitivity of peak riders to fare changes and how broadly the peak time period is defined.

The current MTA commuter rail peak pricing policy has not provided sufficient incentive to induce off-peak travel and has not priced services consistent with efficient resource allocation. Figure 1 portrays the extent of the peaking problems experienced by the railroads.

The main pricing inconsistency is that currently there exists no peak and off-peak fare alternative for monthly ticket holders who represent the vast majority of peak riders (approximately 90 percent of peak riders use some type of commutation ticket). Currently, there is a round-trip off-peak ticket designed to offer an off-peak alternative to the one-way peak ticket rider. The monthly commuter has no such off-peak alternative, since the current off-peak ticket costs more on a per ride basis than the per trip price of monthly commutation ticket holders (see Table 2). This situation grew out of the traditional view of railroad fares, which holds that the basic ticket is the one-way peak, with monthly, weekly, and off-peak ticket prices derived from the one-way ticket by using different formulas. The monthly price for a LIRR monthly commutation ticket, for instance, is discounted from the basic one-way fare times 42 rides/month.

When viewed in the traditional light, monthly tickets are not as economically efficient a manner of payment compared with one-way fares. Efficiency suffers, since monthly ticket holders tend to be peak riders, so discounts for monthly tickets lower the price for those who place the greatest burden on the system. In addition, efficiency is lessened to the extent that ridership is attracted to the peak travel times due to the discounts.

However, the monthly commutation ticket is likely to remain a fact of life, since returning to all one-way tickets would be operationally difficult. Current fare-collection methods on MTA commuter railroads are very labor intensive. There is no automatic fare collection in the offing; every ticket needs to be checked by a trainman. For instance, the LIRR has 140 stations on nine lines from which trips can originate. Under these circumstances, it is clear why a monthly flashticket makes operational sense. Currently, the railroads have no plans for installing a more capital-intensive fare-collection system. Thus, it is practical to assume that a monthly commutation ticket of some type will continue to be offered as long as fare collection remains labor intensive. Therefore, a more rational pricing policy would shift as many of these peak riders as possible, whether monthly or one-way, to periods of excess capacity and charge the ones who continue to ride in the peak a relatively higher price because of the cost they impose.

Two possible alternative methods would help achieve this goal and merit further detailed study of the revenue and operational implications. Both make the necessary assumption that offering a monthly commutation ticket is necessary for the smooth operation of the railroads.

The first option is to veiw monthly commutation ticket riders and one-way ticket riders as completely separate and distinct markets. Therefore, the first method would require that an off-peak commutation ticket be offered as an alternative for monthly commuters, as well as to continue to use an off-peak one-way equivalent. The second option calls for gradually lowering the relative price of the current off-peak ticket until it is below the per ride cost of a monthly commutation ticket. Thus, there is a single off-peak ticket that offers

Table 1. Recent fare structures, MTA commuter railroads (LIRR).

Date	Ticket Types Offered	Fare Changes	No. of Zones or Stations	Cost per Distance of Avg Trip[a] ($)	
				One-Way	Monthly
1/30/70	One-way, round trip, monthly, weekly, school (monthly), police and firemen, and ladies day	Flat fare increase of $0.20, $1.80, and $4.60 for one-way, weekly, and monthly, respectively	139 stations	1.85	47.10
1/29/72	One-way, round trip, monthly, weekly, school (monthly), and police and firemen	Up to a 16.67 percent increase	16 zones	2.00	54.85
9/1/75	One-way, one-way off peak, weekly, school (monthly), senior citizen, and Sunday round trip	23 percent across-the-board	16 zones	2.45	67.45
7/1/80	One-way, monthly, weekly, school, round-trip off peak	20 percent, monthly discount increased	11 zones	3.15	72.50
7/15/81	One-way, monthly, weekly, school, round-trip off peak	25 percent increase	10 zones	4.15	91.00
Proposed		Unknown	Unknown		

[a]This column uses the Bellmore run of 27.1 miles as an example.

Figure 1. Passenger arrivals and departures from Penn Station (LIRR).

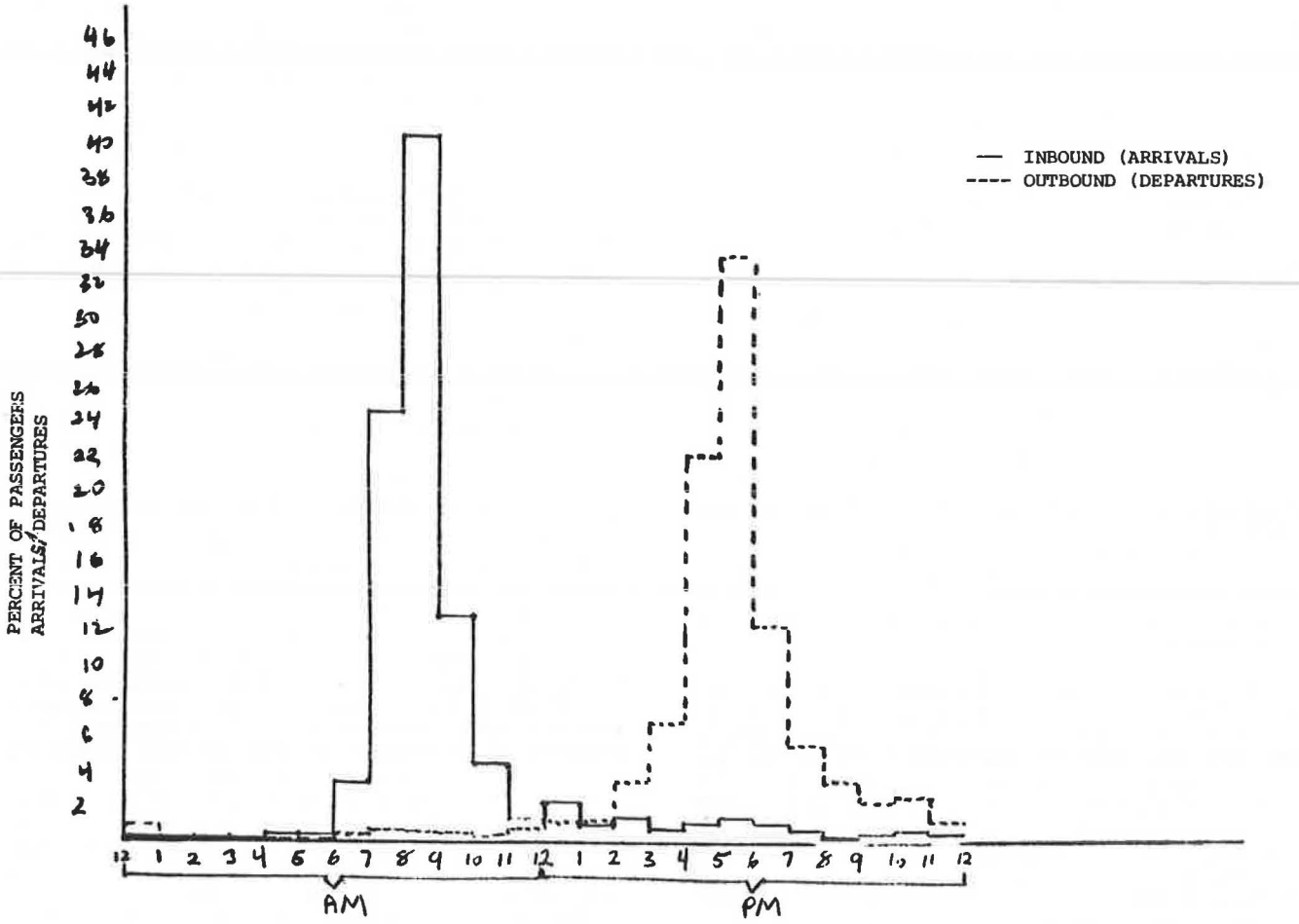


Table 2. Comparison of monthly per ride price and off peak per ride price.

Zone	Monthly Ticket Price ($)	Monthly Price per Ride (42 trips/ month) ($)	Round-Trip Off-Peak Price per Ride ($)
LIRR			
1	61.25	1.46	1.93
2, 3	69.50	1.65	2.30
4	81.25	1.93	2.78
5, 6, 7	91.00	2.17	3.13
8, 9	102.75	2.45	3.75
10	112.50	2.68	4.33
11	120.50	2.86	4.80
12	133.25	3.17	5.40
Metro-North Hudson Line			
A	47.50	1.13	1.48
B	49.00	1.17	1.50
C	51.50	1.23	1.58
D	54.25	1.29	1.78
E	59.50	1.42	2.00
F	62.50	1.49	2.10
G	67.75	1.61	2.23
H	72.50	1.73	2.53
I	78.25	1.86	2.85
J	81.25	1.93	3.00
K	82.75	1.96	3.15
L	87.50	2.08	3.45
M	91.00	2.17	3.60
N	103.50	2.46	3.98
O	110.75	2.64	4.63

a lower-priced alternative for both one-way peak riders and monthly commuters. This latter method would necessarily involve a substantial shrinking of the absolute price difference between the one-way peak ticket and the monthly ticket equivalent. This method has the advantage of offering one less ticket type than the first option. On the negative side, this option would consequently increase the number of tickets to be collected on the trains. However, collecting off-peak tickets would be done during times of less constrained capacity, and it would therefore have a smaller adverse impact on productivity. Bulk coupon booklet sales of off-peak tickets would also make sense under this option.

Both of these options may increase the number of step-ups necessary on peak trains for riders who hold off-peak tickets (riders who upgrade their tickets on the train by paying the difference between the two fares). This could be a potentially serious problem. However, both would offer an off-peak alternative for monthly ticket riders who currently have no such pricing alternative.

Other issues that merit further consideration include the following:

1. Replacing the off-peak round-trip ticket: Whether or not an off-peak monthly alternative is considered, the current off-peak one-way ticket has too many restrictions for it to be a viable alterna-

tive. For instance, the round-trip off-peak ticket needs to be used on the same day for both legs of the trip. If the return trip is made during a peak time or on the next day, a step-up fee is charged to make the total cost equivalent to two one-way peak tickets. Not only does this reduce the trainmen's productivity by forcing them to handle more fares on the trains, it generally fosters a good deal of ill will among passengers who simply do not understand the system. When the one-way off-peak ticket was offered on the Metro-North commuter railroad, 74 percent of the total one-way ticket riders bought the off-peak ticket. After the off-peak ticket became valid only for round trips, this percentage dropped to 28 percent. Returning to a one-way off-peak ticket would seem to be sensible.

2. Redefining outbound morning peak trains as off peak: The demand for seats on outbound trains during the morning peak is small compared with inbound peak demand. However, outbound service is limited in the extent that it can vary with demand. This is because trains need to be run outbound during the morning peak in order to make room for the inbound morning peak trains due to equipment storage constraints at the New York City terminals. This has led to a situation where there exists excessive capacity on these outbound morning peak trains, which can easily accommodate additional ridership. Lowering ticket prices on outbound trains would potentially attract modest increases in passengers who travel during the peak periods.

3. Monthly ticket price and one-way ticket price: The railroads are currently offering an average discount of 40-50 percent for monthly tickets when compared with using a series of one-way tickets for commutation. More analysis needs to be done to determine if this dramatic premium for using a one-way ticket during the peak period is consistent with what price breaks are necessary to discourage purchase of this type of ticket.

The thrust of these policies is to change the ticket prices of one-way peak riders and monthly commuters to reflect the true cost they place on the system while offering a viable off-peak alternative. These are much more rational policies that, if effective, would result in reducing the peak crush factors and make better use of off-peak capacity. In the longer run, they would lessen the need for future equipment purchases to meet the peak demand.

The standard objection to the policies outlined above is that they would produce revenue losses when compared with the current revenue yield. It is argued that offering cheaper tickets and inducing shifts to these cheaper tickets must necessarily lower total passenger revenue. This argument is short-sighted, since, as mentioned earlier, there could be longer-run cost reductions or revenue increases, depending on the latent peak demand. But, more importantly, instituting a peak pricing policy at the same time as a general fare increase would generate the needed revenue while maximizing the total system ridership, since off-peak ridership is more elastic than peak ridership. Stated another way, an across-the-board fare increase would move more riders off the system than would differential peak and off-peak increases. This involves raising peak charges high enough to offset the relatively cheaper off-peak price. This is as it should be under the efficiency criteria, since it rations the expensive peak capacity to those who are most willing to pay for it. Table 3 gives an example of the effects of various differential peak and off-peak fare increases on ridership and revenue, as compared with an across-the-board 25 percent fare increase.

Table 3. Ridership and revenue effects of differential peak and off-peak fare increases.

Fare Increase (%)		Revenue Increase (%)	Ridership Change (%)	Percentage of Ridership	
Peak	Off-Peak			Peak	Off-Peak
25	25	19.14	-4.69	75	25
26	23	19.44	-4.65	75	25
26.5	23	19.73	-4.71	75	25
26.5	22.5	19.66	-4.67	75	25
26	22.5	19.73	-4.61	75	25
26	23	19.38	-4.65	74	26
26.5	23	19.66	-4.71	74	26
26.5	22.5	19.59	-4.67	74	26
26	22.5	19.30	-4.61	74	26
26	23	19.31	-4.65	73	27
26.5	23	19.59	-4.71	73	27
26.5	22.5	19.51	-4.67	73	27
26	22.5	19.24	-4.61	73	27
26	23	19.11	-4.65	70	30
26.5	23	19.38	-4.71	70	30
26.5	22.5	19.30	-4.67	70	30
26	22.5	19.03	-4.61	70	30

Note: The following assumptions are used: Ep peak = -0.15, Ep off-peak = -0.30; and % Δ ridership = % Δ fare • Ep.

The peak and off-peak pricing strategy outlined in this section is not only more efficient but also may be more equitable. Benefit equity is served, since one-way riders in the peaks receive more frequent service than off-peak riders, and they are charged for it. However, benefit equity suffers to the extent that the peaks are more crowded and less comfortable. This may be somewhat eased by the fact that peak crowding may be reduced under a more rational peak pricing policy. On the other hand, there may be latent demand for peak service that would perpetuate the crowding, notwithstanding higher peak fares.

In summary, higher peak-period charges are more efficient than uniform fares, since they are based on cost and make peak space available to those who are most willing to pay for it. The current commuter railroad pricing strategy does not operationalize these concepts particularly well. Modifying the ticket structure in a more rational way would help move toward this end. Peak pricing is also somewhat consistent with the doctrine of benefit equity.

Distance-Based Component

Distance-based fares are the next important component of the MTA commuter rail pricing structure to be considered. Distance fares, which relate the price of a trip to the distance traveled, are more efficient than uniform fares, since they address the increased cost of carrying passengers longer distances.

Both MTA commuter railroad divisions are well suited for distance fares due to the radial commuting patterns and the clearly defined Manhattan central business district (CBD) where most riders terminate. The railroads have a zone fare structure, where the price of a ticket increases with the distance from Manhattan. The smaller and more numerous the zones, the greater is the opportunity to charge each rider the cost he or she actually imposes on the system. However, small zone sizes must be traded off against whatever productivity and operational gains are associated with larger zones, such as handling fewer different ticket types less frequently.

Figure 2. Distance and monthly ticket prices.

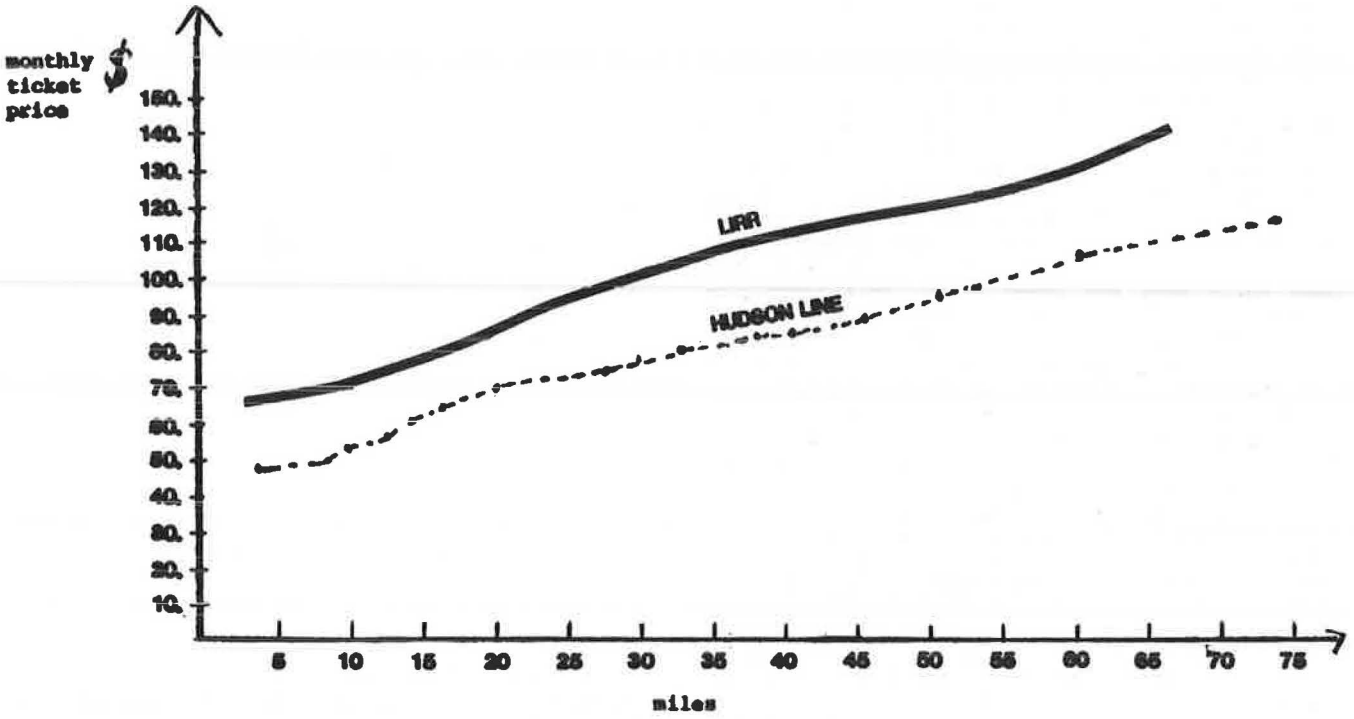
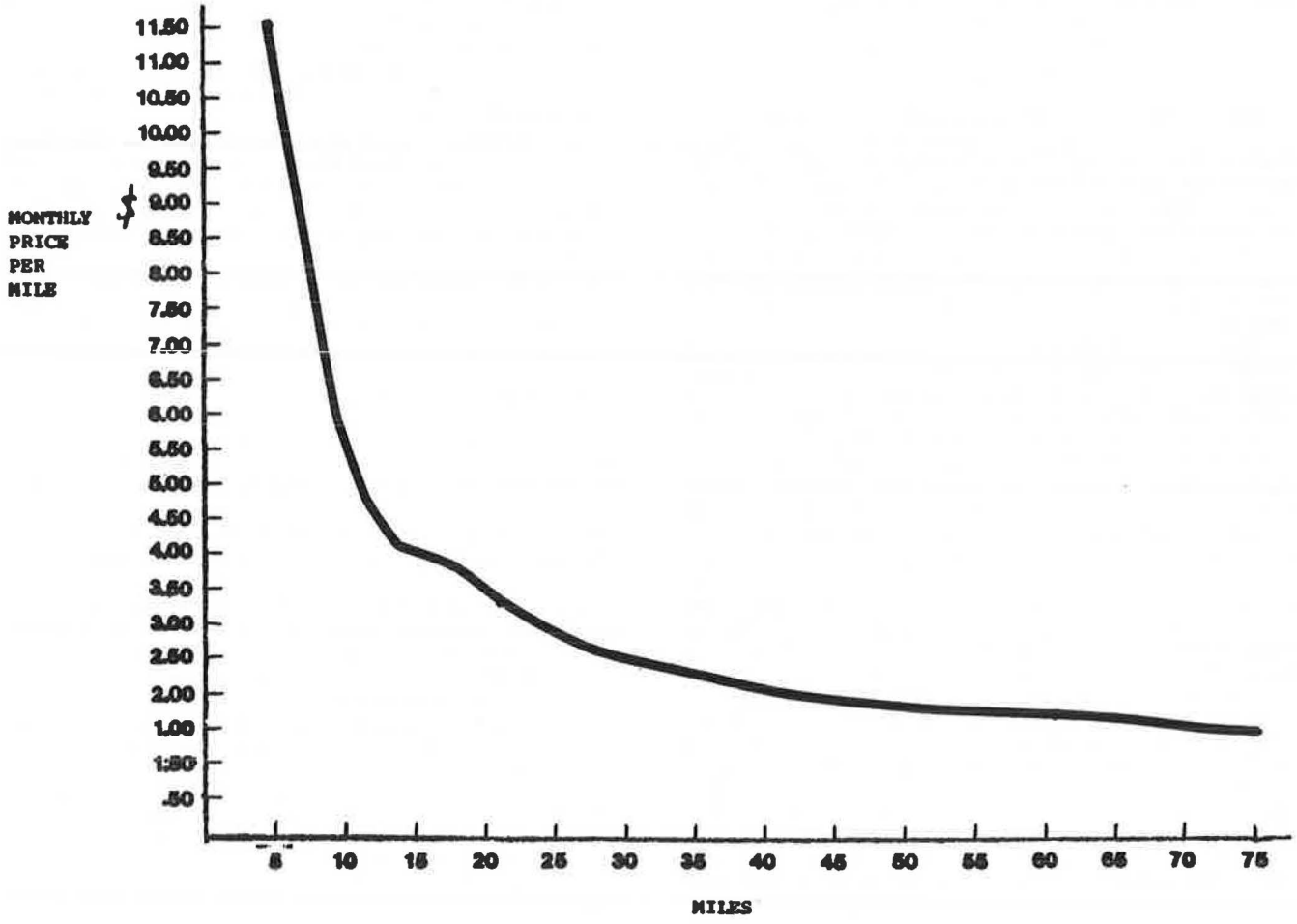


Figure 3. Monthly price per mile, Metro-North Hudson line.



The current one-way charge for each zone is based on a terminal charge plus a mileage charge. Specifically, the one-way fares that went into effect in July 1981 are based on the following formula: $2.25 plus $0.075 per each mile from New York to the center of each zone. The terminal charge theoretically represents a fixed cost applicable to every zone. The mileage charge represents the variable cost of moving trains and people over different distances. Figure 2 shows how monthly fares on the LIRR and on Metro-North's Hudson line increase with distance.

The $0.075 standard mileage charge is based on an average cost, and not a marginal cost in the pure sense. The marginal cost and the average cost are equivalent only to the extent that variable costs are uniform across all distances. For instance, if it costs more to move people in the city zones due, perhaps, to higher power costs, this would not be reflected in the price. Instituting a true marginal-cost distance pricing strategy would further complicate an already complicated pricing structure with apparently only small efficiency gains.

An interesting footnote is that the use of fixed and variable charges tends to cause closer zones to have an overall higher per mile charge than more distant zones, since the fixed cost is a larger proportion of the total (see Figure 3). This is consistent with another MTA policy, which is that the commuter railroads should not be price-competitive with the New York City Transit Authority for intra-New York City trips.

Distance fares are also consistent with benefit equity, since riders who travel longer distances and receive additional benefits when compared with riders who travel shorter distances pay an incremental charge related to the additional benefits they receive. Thus, in this sense, distance fares on the commuter railroads are both efficient and equitable.

Weekly Tickets

In addition to monthly commutation tickets, both MTA commuter railroads currently offer weekly commutation tickets priced at 31 percent of the monthly ticket fare. There are two traditional arguments in favor of offering weekly tickets. First, it is thought that weekly tickets provide an alternative for commuters who cannot afford the capital outlay at the beginning of the month necessary for the purchase of a monthly ticket. In a sense, this provides a public service for these riders. Second, weekly tickets are an alternative for commuters who do not expect to ride the required number of times to make a monthly ticket economical due to vacations, illness, etc. Tradition and the convenience factors mentioned above appear to be the main reasons for continuing to offer this type of ticket.

SUMMARY

Currently, both commuter railroads charge fares that are based on distance traveled and have a peak and off-peak pricing strategy for one-way riders. However, there is no peak pricing strategy for monthly commuters who represent the vast majority of riders. The distance component is fair, to the extent that riders pay in relation to the benefits they receive, and it is efficient, since the charges are related to cost. The current peak pricing policy could be improved by offering an off-peak alternative for monthly commuters and replacing the round-trip off-peak ticket with a more flexible one-way off-peak ticket. This strategy prices all peak tickets to better reflect the actual burden the riders impose while offering a viable off-peak alternative.

Further work in this general area, which is beyond the scope of this study but merits future attention, includes analyzing the burden of alternative fare structures on various socioeconomic groups and geographic locations, examining the benefits and costs of the different taxes collected to subsidize operations, and generating more reliable fixed and variable cost estimates for pricing purposes.

Publication of this paper sponsored by Committee on Taxation, Finance, and Pricing.