Date: May 4th, 2015
To: Governor Charlie Baker
From: Allison Crerand and Stephen Cheung, Budget Analysts, Office of the Governor
Re: Recommendation for Increasing Revenue in MBTA Subway and Bus Services

Summary:

In light of the MBTA's (the Authority's) fiscal challenges, we propose increasing revenue with the introduction of distance-based pricing and peak load pricing among several of the modes of transit services offered by the Authority. Specifically, we recommend the use of distance-based pricing and peak load pricing in the subway systems operated by the Authority, and the use of peak load pricing in our bus services. We further recommend a system giving different fare cards to low-income individuals in order to ease the impact of this change. To address any shift to cars, which would increase road congestion and reduce revenue, we additionally propose a modest peak pricing system for all existing toll roads into the city, with the additional revenue dedicated to the MBTA. In addition to raising substantial new revenue for the agency, this proposal would more efficiently price transit services to reflect social costs imposed by congested rush hour use; would put the burden of fare increases solely on transit users; and would put the costs of this action on those with the greatest ability to pay.

Background:

In the Authority's budget department's recommendation for the FY2015 budget, the department noted that the FY2015 is one of the first years in recent memory the Authority will present a balanced budget. However, this is not due to any significant change in MBTA revenue policy. Rather, in 2010, in an attempt to shore up the Authority's finances, the Legislature agreed to appropriate an additional $160 million dollars in contract assistance to the Authority—an amount renewed since but subject to annual appropriation by the Legislature.[1] Since this assistance was not enough to cover a persistent budget deficit, in FY2014, the Commonwealth agreed to additional contract assistance in the amount of $135.1 million for FY2015.[2] These new revenue streams come on top of the dedicated sales tax revenue allocated to the Authority—amounting to the greater of 1% of statewide sales, excluding the meals tax, or an inflation adjusted base revenue amount. It also comes on top of the special assessments on the 175 cities and towns in the Authority's special district, which receive transit services and benefits.[3]

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[1] FY2015 Operating Budget, April 2, 2014, MBTA, <http://www.mbta.com/uploadedfiles/About_the_T/Financials/fy2015.pdf>

[2] Ibid

[3] Financial Statements, Required Supplementary Information and Supplementary Information, MBTA (A Component Unit of the Massachusetts Department of Transportation), June 30, 2014 and 2013, pg. 11, <http://www.mbta.com/uploadedfiles/About_the_T/Financials/MBTA%20Financial%20Statements%202014.pdf>

As a result, own-source revenue makes up a declining share of total revenue. The situation makes the Authority more vulnerable to drops in non-own-source revenue—if, for example, the Legislature's new contract assistance fails to keep up with the cost of operating transit services. This is not a new worry. In FY2000, the Legislature restructured the Authority's finances, codifying the above-mentioned dedicated assessments while also shifting $3.3 billion in the Commonwealth's debt to the Authority.[4] The dedicated sales tax revenue was thought to solve the Authority's financial problems permanently. Indeed, in the decade before the new assessment was codified into law, sales tax revenue averaged 6.5% growth per year. It was assumed to grow 3% after the enactment of the new restructuring legislation. Instead, in the decade since, sales tax revenue has grown by only about 1% a year between FY2001 and FY2009.[5] Expenses have significantly outpaced revenues, and the Authority has employed strategies like selling off property, exhausting rainy day funds, and refinancing and restructuring debt to make up the difference.[6]

While the Commonwealth's appropriated assistance—particularly its agreement in the most recent transportation legislation to put money in the Authority's Capital Investment Program, which currently has no dedicated funding stream—goes a long way toward reducing the need for further borrowing to fund capital improvements, it falls short of solving the MBTA's financial problems.[7] In particular, the Authority's reliance on non-own-source revenue leaves it vulnerable to reductions or revenue freezes from the state. Indeed, the fare recovery ratio—fares relative to total operating expenses, which do not include debt service expenses—is a projected 39.6% for FY2015.[8] And as for specific transit modes, the MBTA's fare recovery ratio in 2009 for heavy rail was 53.8%--lower than San Francisco's ratio of 65.6%, Washington DC's 62.9%, and New York City's 67.8% for heavy rail. The Authority's fare recovery ratio in 2009 for bus operations was 21.1%, lower than New York's 31.6%, Atlanta's 25.0%, and Seattle's 25.2%.[9]

Given the difficulty of shifting MBTA debt to the Commonwealth, which would simply shift the burden of transportation debt from riders to taxpayers, one option is to look at improving operating efficiency. Our analysis of cost data, however, indicates that this would not

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[4] Kane, Brian, "Born Broke: How the MBTA found itself with too much debt, the corrosive effects of this debt, and a comparison of the T's deficit to its peers," MBTA Advisory Board, April 2009.
[5] Ibid.
[6] Ibid.
[7] FY2015 Operating Budget, April 2, 2014, MBTA, <http://www.mbta.com/uploadedfiles/About_the_T/Financials/fy2015.pdf>
[8] Ibid.
[9] "Statistics Presentation," Board of Directors, MBTA, (citing primary 2009 NTD Database), 2011.

be easy; the low-hanging fruit has already been taken. For heavy rail transit, the MBTA spent approximately $0.93 in net operating cost for every passenger who used heavy rail compared to Washington DC's $1.01, Chicago's $1.14, and Atlanta's $1.40 per passenger.[10] New York spent significantly less--$0.45—but this is probably due to the sheer number of passengers served. For light rail, Boston spent the least per passenger in 2009: $0.93 per passenger. For bus service, Boston was in the middle of the pack for cost per passenger in 2009 at $2.62.[11] While some efficiency savings might exist, they won't be a panacea.

Proposal

In our view, the MBTA needs to increase own-source revenue. While one way would be to increase the flat rate fare across the board, we argue that a better, fairer way to increase fare revenue would be to implement a distance-based pricing scheme with peak load pricing at the busiest commuting times and a separate low income fare pricing system for demonstrated low-income individuals. We ground our analysis on the San Francisco and the Washington, DC heavy rail experiences. Both systems serve large metropolitan area, with similar ridership numbers. Both systems use distance-based pricing and having average fares of $2.77 and $1.71 per passenger, respectively, compared to an average fare of $1.08 per passenger for the MBTA.[12]

We believe this proposal to be the fairest and most efficient way to increase fare revenue. By targeting more affluent riders, who tend to ride during peak hours and who tend to be more price insensitive, while holding harmless low-income, captive riders, the introduction of this pricing scheme would satisfy the ability-to-pay principle of fairness.

Implications

Fulfills the Benefit Principle

Through invoking the benefit principle in our proposal, we are ensuring that those using the service are the same people who are supporting the finances of the service. Those who are using the MBTA in Boston are currently paying for it through flat fares for the various modes of transportation (with the exception of the Authority's commuter rail system). However, the MBTA is running large deficits and is unable to address necessary infrastructure repairs or replacements. According to the benefit principle, the most logical way to raise revenues would be through fare increases – since according to Ronald Fisher, "one function of user charges is to make consumers face the true cost of their consumption decisions and create an incentive for efficient choice." [13] That is, a fare should reflect the marginal cost for the individual on the

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[10] Ibid.
[11] Ibid.
[12] Ibid.
[13] Fisher, Ronald C., "Chapter 8: Pricing of Government Goods – User Charges," *State and Local Public Finance,* pg. 175, Thomson South-Western: United States

MBTA. Previous flat fare increases have not made enough of an impact to fundamentally change the revenue stream of the MBTA.

Increases Revenue

Distance based fares with peak load pricing, if designed well, have the potential to increase revenue. Revenue impacts can come from two different directions: potential decreases in revenue due to lower ticket prices during off peak and short distance trips for price sensitive customers, and increased revenue by maintaining high ridership during peak hours for price insensitive customers. Below, we offer some general suggestions for maintaining or increasing revenue through our proposal.

While a detailed differential pricing study would need to be done before the Authority considers implementing this proposal, the literature offers some broadly applicable findings. One finding is that price elasticity, the change in demand given an upward or downward change is price is "higher on the very short and the very long trips. Walking and cycling are alternatives to the short distance trips while the car is an alternative on longer trips."[14] This has implications for our proposal. First, this means there is potential for decreased revenue from lower fares for short or off peak trips. A study by Pham and Linsalata (1991) found that in large metropolitan areas (greater than 1 million people), of which the Boston Metropolitan area is one, elasticities during off peak hours were relatively high, at -0.39.[15] This means that a fare increase of 10% is associated with a 3.9% decrease in ridership, but also means that a fare decrease of 10% is associated with a 3.9% increase in ridership. Heavy discounting for short trips during off peak times should induce greater ridership—by incentivizing people to take transit when they would otherwise have walked—without the need to add greater capacity, since there is excess capacity during non peak times. If the goal is to maintain existing revenue levels, the Authority would certainly need to find an optimal balance between decreasing trip prices and finding the offsetting ridership gain level.

The main revenue generating potential of this proposal is raising prices during peak travel times and raising prices on price insensitive commuters who take long trips. Pham and Linsalata (1991) also find that elasticities during peak hours in large cities are a much lower -0.18, meaning that a 10% increase in fares is associated with only a 1.8% decrease in ridership.[16] Price

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[14] Fearnley, Nils. "Inventive Pricing of Urban Public Transport," European Transport Conference Paper. Institute of Urban Transport Economics, Oslo Norway, 2004.

[15] Pham, L. & Linsalata, J., "Effects of fare changes on bus ridership. Washington D.C." American Public Transportation Association, 1991

[16] Ibid.

elasticities are lower during peak hours because on average, peak riders' "freedom to choose trip timing is limited by school and work requirements." Implementing peak load pricing, therefore, targets commuters, who have the greatest willingness to pay and have a greater capacity to bear price increases. According to a survey by MetroTransit, the transit authority for Minneapolis/St. Paul, one of the reasons for the price insensitivity of commuters is that "peak riders are more likely to use transit because their employer subsidizes their ride" further reinforcing the justification to target revenue increases on commuters.[17]

We found that one particular concern that could potentially accompany any changes made to the Authority's fares could be ridership shifts from public transit to car commuting. We acknowledge that with increased fares for public transportation, riders may be incentivized to switch over to driving in or out of the city to avoid the higher fares. We therefore propose that the Authority balance out the potential shift to more highway congestion by also using peak load pricing for highway tolls. Not only would this proposal dis-incentivize potential MBTA riders from switching their mode of transportation, it will also be an additional means of raising more revenue for the Authority. The additional revenue raised from the increased tolls during peak hours potentially be applied to the Authority to assist in maintenance of the entire transit system—perhaps by dedicating the difference between non peak toll prices and peak toll prices to the MBTA.

Promotes Efficiency

Scenarios	Description	Fare ($)	Headway (h)	Profit ($/day)	H_{max} (h)
S1	Flat fare, fixed headway	5.90	0.209	45,934.31	0.319
S2	Off-peak fare, headway	5.88	0.251	46,066.52	1.446
	Peak fare, headway	5.94	0.177		0.317
S3	One-zone fare, fixed headway	5.90	0.209	45,985.38	0.321
	Two-zone fare, fixed headway	5.94	0.209		0.321
S4	Off-peak, one-zone fare, headway	5.88	0.251	46,107.14	1.464
	Off-peak, two-zone fare, headway	5.95	0.251		1.464
	Peak, one-zone fare, headway	5.94	0.177		0.319
	Peak, two-zone fare, headway	5.98	0.177		0.319

S1, flat fare over space and time; S2, temporal flat fare and headway; S3, differential zone fare; S4, temporal headway and differential fare.

[17] Smith, Matthew Justin, "Public Transit and the Time Based Fare Structure: Examining the Merits of Peak Pricing for Transit," The Urban Transportation Center, Chicago, Illinois, 2009

Finally, our proposal increases operating efficiency through the use of peak load pricing. The chart above illustrates the fact that the combination of peak load pricing and differential fare (Scenario 4) generates the highest profit per day of the four options. In the study on the transit system in Newark, NJ, from which the previous chart was taken, the authors found that a differential time- and zone-based fare system achieved the highest profit and was, therefore, the more efficient option.[18] Using peak and off-peak pricing is a way to allocate the costs of high use, and would reallocate ridership toward non-peak times, putting excess capacity to use and thus increasing efficiency. Congestion costs are the idea that during a particular time of day high use of the transit system will cost consumers time, comfort and space. Applying higher costs at these times will encourage consumers to redistribute their use of the system to other times of day, all while potentially raising more revenue.[19]

Protecting Captive Riders: Low Income Differential Pricing Option

We are not unmindful that distance-based, peak load pricing, taken by itself, may have a negative effect on low-income, captive riders of the transit system who travel long distances, or have jobs that require them to travel across the city or travel during peak hours. From a technology standpoint, this differentiation would be easy; the Authority already offers seniors and the disabled discounted smart fare cards that work on the same technological system. A few other transit systems have implemented a separate pricing scheme for low-income transit users. The most recent, high profile effort is in Seattle. In March 2015, Seattle began offering discounted pricing for people in households making less than 200% of the federal poverty level. The program allows Sound Transit, Seattle's transit system, to charge discounts of more than 50% off the peak prices to qualified low-income riders. [20] If one meets the income qualifications, one can get a free discounted fare card that works just like a regular smart fare card.

The major challenge of this differential pricing option is administrative—it would cost money, time, and resources to implement this option—mostly to screen low-income riders to make sure they qualify. But there are several ways to define eligibility broadly enough to both increase enrollment and to decrease administrative headaches. The Authority could, for example, define current SNAP recipients, Medicaid (Masshealth) beneficiaries, WIC recipients, Section 8 housing beneficiaries, and riders who live in public housing as categorically eligible for the low-income discount. The Authority could then partner with administrators from these programs to

[18] Steven I.-J. Y. Chien & Chuck F. M. Tsai (2007) Optimization of Fare Structure and Service Frequency for Maximum Profitability of Transit Systems, Transportation Planning and Technology, 30:5, 477-500, DOI: 10.1080/03081060701599961, 498

[19] Fisher, Ronald C., "Chapter 8: Pricing of Government Goods – User Charges," *State and Local Public Finance,* pg. 178, Thomson South-Western: United States

[20] Johnson, Kirk, "Targeting Inequality, This Time on Public Transit," *The New York Times,* February 28, 2015.

distribute discounted fare cards—through caseworkers, housing managers, and health clinics, to name a few. This categorical eligibility system could also be put in place alongside standard income screening through the Authority's customer service offices.

Implementation Costs

One particular issue the Authority may encounter in implementing distance-based, peak load pricing is the cost of the changes in technology that may be required. The peak load pricing aspect of our proposal will be of little to no cost for the Authority to implement by itself given the fact that fares can be changed as necessary – the Authority currently uses differential pricing for senior citizens and this technology could be easily altered to change prices during particular times of the day. The bulk of the cost will come from a change over to distance-based pricing. The Authority's current gates only require users to use their fare cards at the origin of the trip – upon exiting there is no mechanism that could read a fare card. Because distance-based pricing will require some kind of initiation of the trip through the fare card and then a final payment once the rider reaches his or her destination in order to measure the distance of the trip (and thereby determine the price), some change will be required in the technology. Either altering the current machines or installing new ones will be a fairly sizable cost for the Authority. However, given the revenue-raising capacity of our proposal, this could simply act as an upfront cost that will eventually pay for itself.

Conclusion

Based on the need of the Authority for increased revenue, in addition to the evidence provided by comparable cities, and despite the potential implementation costs, we conclude that a combination of distance-based pricing and peak load pricing would be sufficient to allow the Authority to reach a target fare replacement ratio of 60% for heavy rail services and 30% for buses. Along with these changes, we acknowledge that low-income, captive riders would bear some of the burden, and the potential impact would need to be addressed. Therefore, we additionally propose that low-income individuals be eligible for discounted ridership. Finally, we address any potential increase in car use, and therefore congestion costs, by proposing a new dedicated revenue stream through the implementation of peak pricing for highway tolls leading in and out of the city. This would capture any revenue losses from potential decreased ridership in response to our proposal. Overall, our plan will raise revenues for the Authority from those using the services all the while acknowledging the potential adverse effects on those that may not be able to afford the change. This will inevitably be a significant change for the City of Boston and its surrounding areas; however, given the current financial state of the Authority it is also a necessary consideration.