Feature

New Passenger Railway Fares

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Introduction

Charges for public utilities in Japan are causing public debate in recent years and railway fares are no exception. Prompted a call from some railway companies for introduction of a price-capping system, the Ministry of Transport (MOT, now Ministry of Land, Infrastructure and Transport) decided to perform an overall review of passenger railway fares.

In January 1995, the Ministry set up the Study Group on Passenger Fares Problems to discuss methods for setting passenger fares. The Study Group undertook extensive examination of all transport including railways, airplanes, buses, taxis, passenger ships, etc. In August 1995, the Ministry created the Passenger Railway Fare Working Group composed of transport professionals and including the railway operators to hold concrete and practical discussions based on actual data. The Working Group submitted its final report in February 1996 and included opinions of the Administrative Reform Committee Report published in December 1995. The final report concluded that the current aggregate cost method was the best method of setting fares because the price-cap system (ceiling price system) had several remaining problems and needed more discussions with due consideration given to probable future changes in railway business.

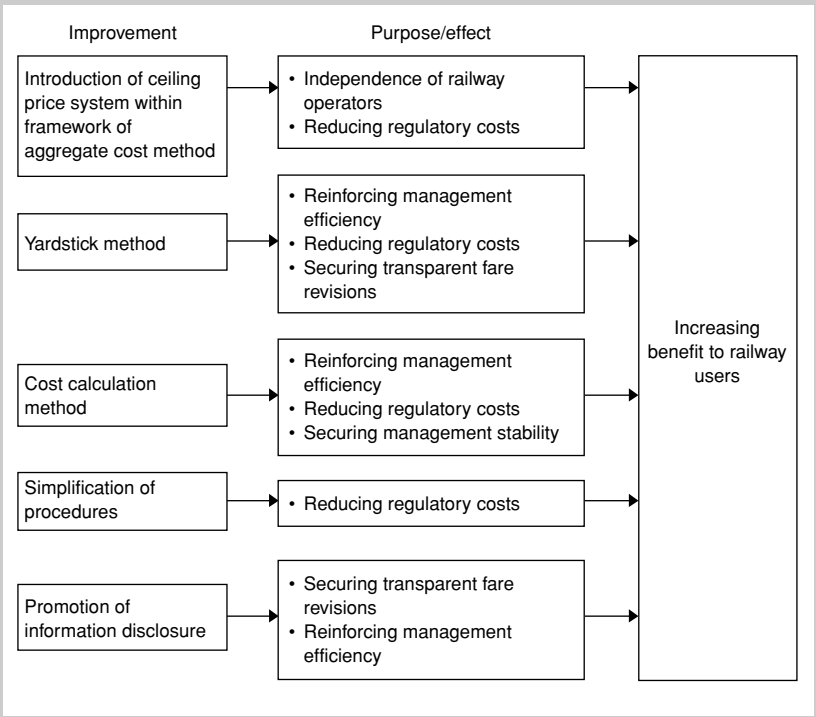
However, the Working Group also noted that if the aggregate cost method continued to be used, there were five improvements that could be made to increase the benefit to railway users, enhance the efficiency of railway management, secure the independency of railway operators, improve the transparency of fare revisions, and reduce the regulatory costs. The improvements were:

- Introduction of ceiling price system within framework of aggregate cost method
- Improvement of yardstick method (base comparison method)
- Improvement of cost calculation method
- Simplification, etc., of various procedures
- Promotion of information disclosure

The relationships between these five improvements and their purposes/effects are shown in Figure 1. The improvements are not in one-to-one correspondence with their purposes/effects, but are interrelated and ultimately aim to increase the benefit to railway users.

The Deregulation Promotion Plan decided by the Cabinet in March 1996 stated that the regulations on fares/charges related to the passenger railway business should be 'imposed in accordance with the conclusions of the Passenger Railway Fare Working Group.' Consequently, the conclusions of the Working Group became official government policy. Therefore, the MOT proceeded with discussions and came up with new passenger railway fare arrangements.

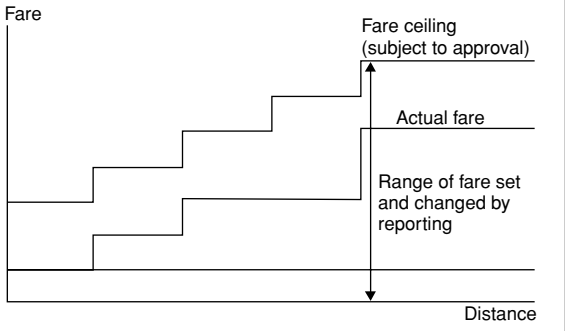
Figure 1 Improvements to New Fare Arrangements



Ceiling Price System under Aggregate Cost Method

In the ceiling price system under the aggregate cost method, the government approves fare ceilings based on the aggregate cost method and the operator is allowed to set and change fares simply by reporting changes to the government as long as they fall within the approved ceilings. Naturally, actual fares do not exactly match approved ceilings (Fig. 2). This is a different system from the price-cap system (so-called ceiling price system) in that the ceilings are set based not on the CPI and other deflators, but on the aggregate cost incurred by the railway operator. However, like the price-cap

Figure 2 Fares and Fare Ceilings



JR East's *'Midori no madoguchi'* reservation ticket office (JR East)

system, this new system helps to increase the independence of railway operators and reduce regulatory costs.

Introducing this system permits a railway operator to set many different fares for each route or section, season, day of the week, hour of the day, etc., simply by reporting them to the government. In theory, this should increase the benefit to railway users.

At present, the railway operator is required to specify definite fares when applying for government approval. Fare increases or cuts are subject to government approval, with the exception of coupon ticket discounts, card premiums, and sales discounts. In other words, a railway operator may change the coupon ticket discount and card premium by up to 20% and the sales discount by up to 50% simply by reporting to the government. This exception gives railway companies some leeway in setting fares.

Many special tickets issued to commemorate special events or occasions are not widely advertised so it is necessary to give railway operators the leeway to set more elastic regular fares meeting users' needs.

There are two reasons why the government has approved defined fares so far. First, from the standpoint of protecting railway users, railway operators should not be allowed to raise fares arbitrarily. Second, from the standpoint of maintaining sound development of railway business, railway operators should not be allowed to cut fares arbitrarily. As an extreme example, the latter reason is based on the concept that a railway company with a free hand might lower the fares for no good reason, thereby jeopardizing its existence. However, such fears are unfounded in view of the business ability of today's operators. Now that the concept of self-responsibility has become widespread, it is an anachronism to restrain railway operators in order to ensure sound development of their business. It is more reasonable to think that sound development of the railway business should be achieved by paying due regard to the independence of the railway companies.

On the other hand, the railway business is still a highly monopolistic, despite some competition in some sectors. This is a good argument for maintaining regulation of fares to protect railway users. However, from the standpoint of ensuring sound business development, it is probably better to allow the companies to charge reasonable fares rather than forcing them to set fares.

This explains why the ceiling fare system was adopted.

Setting fare ceilings

As described earlier, the concept underpinning the ceiling fare system is equilibrium between revenue and expenditure. In other words, since ceiling fares 'that cover reasonable costs under efficient management and which include reasonable profit' (Railway Business Law) are set, ceiling fares are approved when total revenue from the ceiling fares does not exceed the total cost. This means that the total revenue from ceiling fares may not necessarily be sufficient to cover total cost. In the past, some publicly owned subway operators and small and medium private railway companies with loss-making fares still continued setting their fare revisions at only 50% to 60% of the total cost because higher fares would not meet the requirement of the Railway Business Law that 'fares shall be such that they do not make it difficult for passengers or consignors to utilize this business.' In this respect, the conventional concept remains unchanged.

In conceptual terms, fares that were approved formerly in terms of definite amounts have been shifted directly to ceiling fares. Normal and season ticket fares are subject to ceiling prices.

Setting fare lower limits

The zone fare system used by airlines is similar to the fare ceiling system used by railways—the standard cost per air passenger calculated according to distance is set as the fare ceiling. However, a lower airfare is set at 25% below the fare ceiling for reasons of avoidable costs. As a rule, lower fare limits are not set by the fare ceiling system

used by railways but there is some limit on fare differentials. For example, when a railway company is planning to change fares within the ceilings for different routes or sections, it may simply report the change to the government when the fare differential is within 20%. However, to maintain impartiality for users, fare changes are subject to government approval when the differential is more than 20%. Although this limit is not imposed on fare surcharges or local-line fares, it is imposed on special fares set on specific sections with many rival companies for the purpose of being competitive, etc. In the JR group of companies, more than 80% of these special fares are within the difference of 20%. Even so, there are special fares exceeding the 20% fare differential and the method for calculating them needs future review.

Although there are some competing services, most urban railway companies usually have high levels of monopoly so some companies might set very low fares on routes or sections where there are competing services while securing adequate revenues from fares from monopoly services. Setting fares on the basis of excessive internal subsidy poses the problem of partiality between users of monopoly routes with high fares and users of competing routes with extremely low fares. It is also problematic from the standpoint of maintaining fair competition between companies. Clearly, it is necessary to prevent these unfair practices and the above-described 20% fare differential was set to prevent railway companies offering very much lower fares only for some routes. If a company does so, the rules force it to lower all fares since the problem of partiality between users and unfair competition between companies will not occur if all fares, including those in monopolized areas, are lowered. This explains why lower limit fares are unnecessary. However, since ceiling fares are at set at levels to cover total cost, few fares are set far below the ceiling fares.

Various discounts

As a rule, the various discount systems, such as sales discounts, coupon-ticket discounts, public discounts for disabled passengers, etc., remain unchanged even after introduction of the ceiling price system.

Since discounts for through connections and some other discounts can be set as part of normal fares within the ceilings, fares can be set more flexibly than in the past as described later in this article.

Strengthened Yardstick Method

The yardstick method, or base comparison method, is an incentive that is used to regulate public-utility charges to improve management efficiency through indirect competition between companies. It has been introduced recently in the electricity and gas industries, but was introduced by major private railway companies for fare revisions some 20 years ago.

Although railways were the first to introduce this method in Japan, the conventional yardstick method does not fully match the climate and characteristics of the railway business, which differs markedly from other businesses. In fact, the method was heavily criticized and has since been completely overhauled to answer its critics.

Expanding application scope

Formerly, the yardstick method was applied only to the 15 major private railway companies and the Teito Rapid Transit Authority (TRTA) subways, but it has been expanded to include the six JR passenger companies and nine other publicly owned subways. As a result, the yardstick method is now applied to railways carrying about 95% of all passengers in Japan.

For comparison, the 31 corporations are divided according to business characteristics in Table 1.

The yardstick method application scope will probably be expanded in the future.

More accurate comparison

Next, the harshly criticized comparison method was improved to more properly reflect differences in business content and climate and make yardstick comparison more accurate. In the conventional method, common base values for all companies in the electricity, gas, bus, taxi, railway, etc., industries, were obtained by averaging only personnel and other expenses. However, since the business contents and climate are markedly different between such diverse companies, the method was inherently unsuitable for accurate comparison.

With the change, the sum of personnel and other expenses is divided into five items: track costs; catenary costs; rolling stock costs; train operations costs, and station operating costs. Base costs calculated by the following procedure

Table 1 Companies Subject to Yardstick Method

Major non-JR private railways (15)	Tobu, Seibu, Keisei, Keio, Odakyu, Tokyu, Keikyu, Sotetsu, Meitetsu, Kintetsu, Nankai, Keihan, Hankyu, Hanshin, Nishitetsu
JR Passenger Companies (6)	JR Hokkaido, JR East, JR Central, JR West, JR Shikoku, JR Kyushu
Subways (10)	Sapporo City, Sendai City, Tokyo Metropolitan Government (TMG), Yokohama City, Nagoya City, Kyoto City, Osaka City, Kobe City, Fukuoka City, TRTA

Table 2 Indexes for Calculating Base Costs

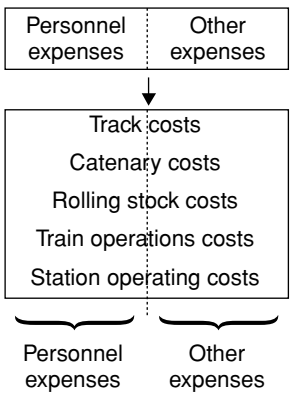
Cost	Facilities	Explanatory variables
Track	Track length (km)	Rolling stock-km per track-km
Catenary	Catenary length (km)	EMU-km per catenary-km
Rolling stock	Number of rolling stock	Rolling stock-km per rolling stock
Train operations	Route-km	Train-km per route-km
Stations	Number of stations	Number of passengers per station

using facility costs and indexes shown in Table 2 for each company are used as the yardstick evaluation criteria (Fig. 3).

- Divide each cost item by appropriate number of facilities to obtain unit cost.
- Use theoretical values obtained by regression analysis of unit costs against appropriate indices indicating differences in business contents and climate as base unit costs.
- Assume base cost to be product of unit cost and base unit cost.

The base cost calculation flowchart is shown in Figure 4. This new method is unique in regulation of public utility charges and adoption of such a precise method of cost calculation has widened the application scope to include passenger companies in the JR group and subways.

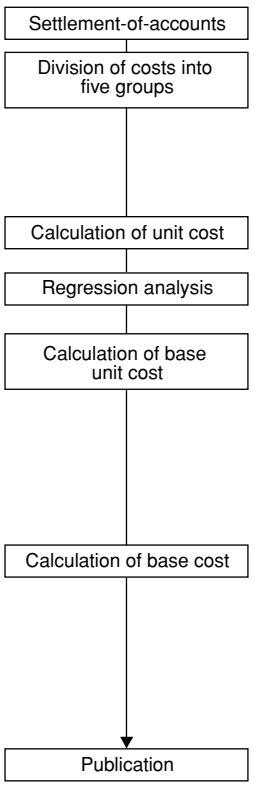
Figure 3 Cost Breakdown using Yardstick Method



Improved application of yardstick method

The method of reflecting the yardstick evaluation in the assessment was changed as well. Formerly, the yardstick evaluation was a relative evaluation the results of which were replaced with a revision rate ranging from 0% to 6% to determine an assessment rate. In other words, since only two cost items (personnel expenses and other expenses) were used previously, even when great improvement in efficiency yielded the best cost items, the company was only rewarded with 'no assessment.' Similarly, when both cost items were bad due to minimum efficiency improvements, the company was only assessed at around 12% of the revision rate. Such a system invites dissatisfaction from companies that have appreciably improved management efficiency, because even if they continue making painstaking efforts to improve, they are only rewarded with no assessment. On the other hand, it spoils companies that have failed to improve management efficiency significantly because they may well think that they will

Figure 4 Base Cost Calculation Flowchart



Examples of calculation of base unit costs (¥1000)

	(1)	(2)	(3)	(4)	(5)
Company A	13,712	1,060	6,941	38,319	113,048
Company B	20,931	3,320	6,612	67,269	157,438
Company C	19,739	2,037	7,119	61,425	117,048
Company D	29,602	3,170	6,687	89,778	188,346

Examples of calculation of base costs (¥ million)

	Base cost	Actual cost
Company A	68,306	69,318
Company B	44,764	41,032
Company C	22,348	23,848
Company D	34,552	33,080

not suffer harsher assessment even if they continue making minimum effort.

Therefore, to further promote management efficiency, it was decided to set a reasonable cost (cost approved as total cost at fare revision) for each company based on its base cost calculated by a new yardstick method shown in Figure 5. Consequently, since the base cost already contains the results of relative evaluation through regression analysis of the appropriate group, the base cost is used for the absolute evaluation. This is characteristic of the new yardstick method. As a result, companies that have not improved their efficiency significantly must cover the portion exceeding the base cost by making more effort. If they continue to make a poor effort, the assessment amount increases without limit, and they cannot continue to remain idle. In companies that have improved efficiency appreciably, although 50% of the difference between the base cost and the actual cost has not actually been incurred, it is added to the total cost as a reward for improved efficiency. This serves as an incentive because the reward for effort increases as actual cost is reduced below base cost. Some researchers in public economics have presented opinions that companies with appreciably improved efficiency should receive some price incentive and Japanese railways are probably the first to introduce such incentives in the aggregate cost method.

This change to the assessment system clearly has far-reaching effects so it has been decided to provide relief measures for the first fare revision in order to facilitate introduction of the new system.

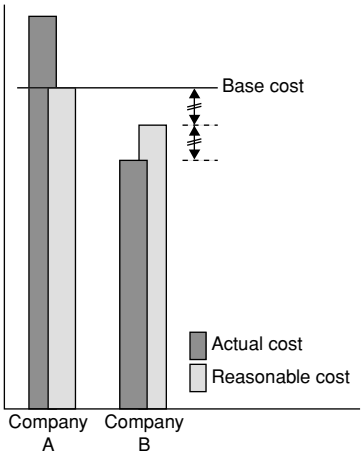
Efficiency improvement using change over time

Any evaluation using base cost simply reflects the results of relative evaluation of companies in the same group. Since the cost structure of a railway business cannot be changed quickly, even when an inefficient company strives to improve, it takes considerable time to produce some tangible result. Therefore, a company that finds that its effort does not soon lead to an improvement in its status might question the validity of the system, while another company that has appreciably improved efficiency might be satisfied with its current position and not make further efforts.

To promote further effort to improve efficiency, it has been decided to evaluate efficiency improvements of individual companies from the standpoint of change in efficiency over time and reflect the evaluation results on the reasonable cost of the company.

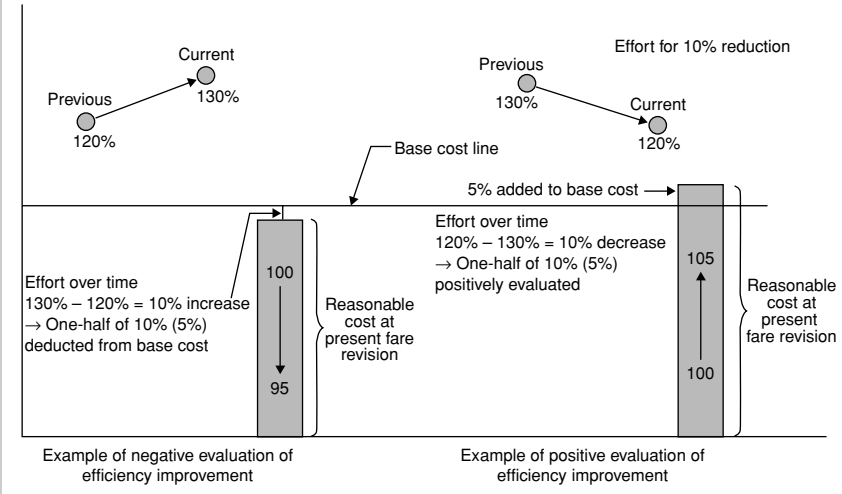
In concrete terms, the degree of divergence of actual cost from base cost is calculated for both the year of the previous fare revision and the year of the current fare revision. Then the change in the effort over time is calculated from the two degrees of divergence and 50% of the effort rate is added to or deducted from the base cost (Fig. 6).

Figure 5 Reasonable Cost Calculation



- Company A (actual cost > base cost) → base cost = reasonable cost
- Company B (actual cost < base cost) → (base cost + actual cost)/2 = reasonable cost

Figure 6 Calculation of Change in Effort over Time



○ = Degree of divergence (actual cost/base cost)
Effort over time = Present degree of divergence – Previous degree of divergence

Figure 7 shows the two above-described process flows.

Calculation of base cost using published data

Even when the assessment method is improved as described, increases in regulatory costs act to oppose deregulation. To reduce regulatory costs and improve the transparency of fare revisions, it has been decided to use only published data to calculate base costs. The data include route-km, passenger numbers, train-km, rolling stock-km, etc., published in the settlement-of-accounts and railway statistics.

Improved transparency

To improve the transparency of fare revisions and promote the efficiency through monitoring by railway users, the base cost calculation method, results, etc., are provided to all companies annually. The disclosed contents are listed below:

- For each group subject to new yardstick method: Recurrence formula used to calculate base cost; base cost calculated by formula; actual cost
- Base unit cost, etc., for track costs, catenary costs, rolling stock costs, operations costs, station operating costs
- Company data required to calculate base costs

For reference, some FY1996 base costs are shown on pp. 14–15.

Improvement of Cost Calculation Method

Use of multiple normal years

Formerly, a 1-year period (normal year without fare revision) was used for calculating costs in the revenue and expenditure forecast at a fare revision. Using this method, it is possible to make a fairly accurate forecast of revenue and expenditure. On the other hand, when a fare revision is made in a year, the revenue and expenditure drops below 100% in the year after next, making it necessary to revise fares frequently. Moreover, it is evident that a railway cannot be managed on a stable basis under a revenue and expenditure structure requiring frequent fare revisions in a short period of time. Consequently, it was believed that the uncertainties in revenue and expenditure forecasting were an impediment to improving management efficiency. As a result, many private railway companies hoped to achieve at least 1 normal year for use as the basis of the cost calculation. Under such conditions, in order to reinforce the incentive to improve efficiency, reduce regulatory costs, secure stable management by prolonging the time intervals between fare revisions, and maintain high-accuracy forecasts, it was decided to extend the cost calculation period from 1 to 3 normal years starting from the fare-revision year. In concrete terms, cost and revenue are calculated for

Figure 7 Reasonable Cost Calculation Flowchart

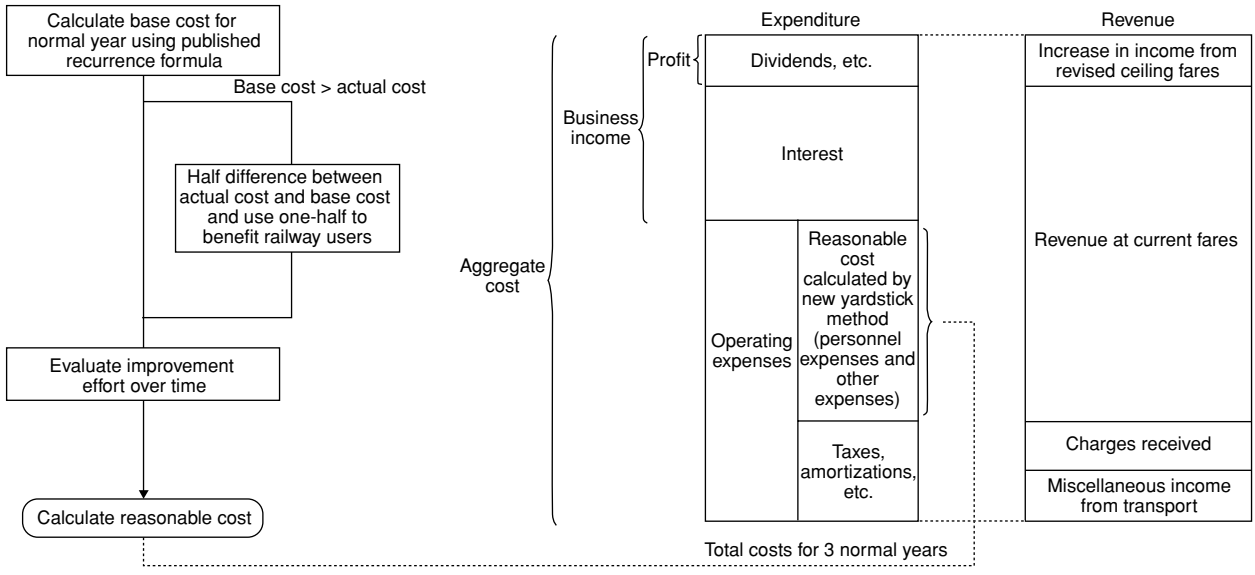


Table 3 Balance of Revenue and Expenditure

Current: 1 normal year

Actual year	Forecast year	Normal year	(Actual year)	(Forecast year)

↑ Revision

Multiple normal years (3 years)

Actual year	Forecast year	Normal year	Normal year	Normal year

↑ Revision

Example of cost calculation in multiple normal years (3 years)

	Actual year	Forecast year	Normal year (1)	Normal year (2)	Normal year (3)	Total for normal 3 years
Revenue	100.0	-	111.4	111.4	111.4	334.1
Cost	105.0	-	109.2	111.4	113.6	334.1
Difference	-5.0	-	2.2	0.0	-2.2	0.0
Revenue/cost	95%	-	102%	100%	98%	100%

each of the 3 normal years and total costs and total revenues for the 3 years are used to balance the revenue and expenditure (Table 3). Deflators prepared by the Economic Planning Agency for public utility charges are still used, but since announced deflators are only annual, they are used for the second and third normal years too.

Improvement of business revenue calculation method

The aggregate cost method used by railways to calculate capital costs can be divided into two types: the rate base method used by the major non-JR private railway companies, TRTA, and the three JR passenger companies on Honshu (JR East, JR Central, JR West), and the add-on method used by other companies. The latter method uses actual results for assessment and causes no special problems. The former method focuses on the assets that the company uses for theoretical guarantee of procurement of its funds, leaving room for different interpretations. In fact, looking at other public utilities, it can be seen that different companies use different calculations.

Obviously, the railway business must offer safe, quality public services meeting social obligations on a stable and consistent basis and must make necessary investment in plant and equipment. In view of these characteristics, it was decided to improve the conventional method of calculating business revenue in order to secure a sound financial base and ensure that changes in interest rate and other economic conditions, and in the actual conditions of general private companies are properly reflected in the business revenue of each individual railway company. It should be noted that the present improvements apply only to railway companies using the rate base method for fare revisions, meaning only the 15 major non-JR private railway companies, TRTA, and the three JR companies on Honshu.

The improvements are listed below:

- Ratio of net worth to total capital
  Previously, the actual average ratio of the company was used as the net worth to total capital ratio but this is replaced with the industry average of 30%.
- Ratio of net worth to revenue
  Previously, the simple average of two indices—yield to bond subscriber and dividend rate—was used as the net worth to revenue ratio. In order to reflect the general economic conditions, return on equity (ROE) is added to the indices. In addition, the previous data-sampling period (past 3 to 4 years) is increased to the average of the past 5 years.
- Ratio of borrowed capital to revenue
  The actual average rate of loans, etc., is still used for the borrowed capital to revenue ratio. Since the average is taken of the same group as the group subject to the new yardstick method, any company procuring funds at a higher interest rate than the group average cannot recover the cost, whereas a company procuring funds at a lower interest rate should be able to secure profits. This is an expected effect of the new yardstick method. It should be noted that the previous data-sampling period (past 3 to 4 years) is changed to the average of the past 5 years.

Adjustment for pending plant and equipment investment

In the rate base method, when plant and equipment investment is planned during a normal year and assets increase accordingly, the additional portion is included in the assets to guarantee the business revenue for the plant and equipment investment. However, not all planned plant and equipment investments are made. If a company does not carry out its plan, the company registers more business revenue than actual revenue. Investment in plant and equipment is a major reason for fare revision. If a company revises fares based on planned plant and equipment investment but does not execute the plan, it will provoke antipathy. To ensure that companies execute planned plant and equipment investment, if the actual investment does not reach the total planned at the fare revision, the amount of revenue corresponding to the pending investment is deducted from the business revenue.

Thus, the business revenue can be calculated as:
Business revenue = Working business assets x Business revenue ratio – A
where, business revenue ratio = 30% x (yield to bond subscriber + ROE + dividend)/3 + 70% x actual average rate of loans, and A = Amount of revenue corresponding to planned pending plant and equipment investment at fare revision.

Simplification of Procedures

Regulatory costs continue increasing as regulations become more stringent, increasing the burden on companies and complicating administrative work. As a result, regulations should be minimized so the following measures were implemented from the standpoint of cost effectiveness.

Introducing ceiling price system

The ceiling price system permits railway companies to set and change fares within the ceiling fares just by reporting to the government, simplifying procedures and reducing regulations.

Introducing new yardstick method

The new yardstick method permits calculation of reasonable revised fares by applying published formulas to individual cost items, including track costs. This simplifies cost estimation for normal years and substantially reduces the number of submitted documents at fare revision (only when ceilings changed), as well as streamlines the examination procedure and cuts costs.

Reviewing existing procedures

In line with introduction of a ceiling price system, it was decided to review the use of existing systems and simplify procedures as much as possible. Some changes of opposed items to reported items are outlined below:

JR East's Series E257 *Chuo Liner* express at Tokyo Station (JR East)

- Surcharges (reduction/abolition)
  A different ceiling price system than the ordinary system was introduced for surcharges. Under the revised system, a railway company is allowed to arbitrarily reduce/abolish surcharges as long as they are within the previously approved maximum. This is different from the ordinary system in that a once-lowered surcharge cannot be increased again. In addition, the 20% limit of the ordinary ceiling system does not apply.
- Fares and charges for newly-opened sections
  It is not regarded as setting a new fare when a new section is opened and the fare system of adjacent sections is applied. As a result, the company only has to report the fact.
- Setting and abolishing fare calculation when shorter route (lower fare) used in section with more than one route
  As a rule, fares are calculated based on the covered section(s). However, since a shorter route benefits users by offering a lower fare, such matters no longer require approval. As a result, the railway company is allowed to arbitrarily set or abolish fares for shorter routes.
- Expanding setting scope for connection fares
  At present, connection fares are subject to government approval. When the ceiling system is introduced, the company is allowed to arbitrarily set or change connection fares as long as they are within the ceilings. Since setting connection fares falls within the category of fare setting by section, it should be subject to the 20% limit of the ceiling price system, but it was decided to exempt connection fares from the limit. This should permit railway companies to set more flexible connection fares.
  However, since the existing system remains in use as well, there are two different methods for setting connection fares.
- Setting and changing rules for stopovers and ticket validities
  Stopovers are governed solely by ticket validity. Consequently, rules for stopovers and ticket validities were removed from the approval procedure.

Table 4 Information Disclosure Guidelines

Information supplied at fare revision

Information supplied by railway company (at fare revision application)	
1. Application contents	(1) Reason (2) Outline of application (3) List of revision rates/revenue increase rates (4) Comparison table of current and new fares
2. Actual and estimated revenues and expenditures	In base and normal years
3. Breakdown of fares/charges received	
4. Demand forecast	For normal years
5. Actual and planned investments in plant and equipment	(1) In plant and equipment (for past 3 normal years) (2) Contents of main projects (purposes/effects, railway sections affected, construction costs, scheduled completion dates, etc.)
6. Present rationalization of railway management and future activities	
7. Details of diversified fares/charges	Newly installed systems, sales discounts, etc. (includes description of existing systems)
8. Measures to improve customer services, etc.	(Items 5 and 7 may be restated here)
9. Means of access to information	Address for enquiries about fares/charges
Information supplied by Ministry	
1. Information supplementing content of approval for fares	(1) Background to revision (2) Outline of assessment (3) Assessed revenue and expenditure (4) List of revision rates/revenue increase rates (5) List of discount rates for season-ticket fares (6) Comparison of applied, current, and revised fares (7) Comparison between current and revised fares for main sections (8) Contents of management rationalization (9) Measures to improve customer services (10) Report, etc.
2. Procedure for calculating revenue/cost	

Information supplied periodically or as required

Information supplied by railway company	
1. Outline of business plan	
2. Settlement-of-accounts	
3. Comparison/analysis of current settlement-of-accounts vs. results of previous year	
4. Actual and planned investments in plant and equipment	Investment results until previous year/investment plan for current year
5. Present condition of management rationalization	
6. Contents of diversified fares/charges	List of fares/charges
7. Measures to improve customer services	(Items 4 and 6 may be restated here)
8. Means of access to information	Address for enquiries about fares/charges, train schedules, etc.
9. Activities for environmental protection and technology development	
10. Opinions of customers	Requests from customers and responses/improvements by railway company
Information supplied by Ministry	
Various data related to new yardstick method/base costs	

Abolition of attached documents

It was decided to abolish the need to attach a 'document showing that total revenues will not decrease' when reporting a sales discount. Formerly, sales discounts that did not affect total revenue were only subject to reporting but documents showing the connection between the discount and total revenue were required. In preparing the documents, each railway company performed tens of hours of work, excluding extensive time for discussions. In 1995, there were a total of 862 attached documents. However, since application of the ceiling price system to railway fares, each railway company is free to set specific fares within approved ceilings. In addition, securing total revenue is up to the independent management of each company. A review of business discounts

JR East's Sendai Station ticket gates (JR East)

based on this concept showed that the formerly required documents were unnecessary. It was also decided to abolish the document requirement from the standpoint of reducing the burden on companies.

Transfer of authority

The private railway companies and JR passenger companies were formerly regulated by different authorities regarding setting and changing reserved seat charges, special rolling stock charges, sleeper charges, etc.

It was decided to streamline the system by putting them all under the control of the directors of District Transport Bureaus.

Promoting Information Disclosure

Against a background of growing public interest in railway fares and to improve the transparency of fare revisions and enhance the efficiency of railway management through monitoring by users, the Ministry is promoting information disclosure by supplying the public with necessary and required information on proposed fare revisions.

The Ministry formulated the following new guidelines and rules on information disclosure:

- Information disclosed at fare revision process
  Contents of application for revision, revenue and expenditure of railway, plant and equipment investment plan, improvements to customer services, etc.
- Information disclosed periodically or when requested
  Settlement-of-accounts, condition of rationalization of railway management, particulars of diversified fares and charges, measures to improve customer services, results of plant and equipment investment plan, etc.

The recently announced guidelines are shown in Table 4.

Publication of new yardstick base costs

In order to improve the transparency of fare revisions and enhance the efficiency of railway management through the monitoring by railway users, the Ministry annually discloses the method of calculation of base costs, calculation results, etc., to all relevant railway companies as follows:

- Recurrence formula for calculating base cost
- Base unit costs (track, catenary, rolling stock, etc.)
- Facilities (track length, number of rolling stock, number of stations, etc.)
- Base cost and actual cost

Method of information disclosure

The railway companies and Ministry must take a proactive stance in supplying useful information to as many people as possible. Typical methods used by railway companies may be through pamphlets, train advertisements, PR magazines, TV, newspapers, other mass media, Internet web pages, customer service windows at stations, etc. Similarly, the Ministry may use TV, newspapers, other mass media, Internet web pages, official gazettes, public documents at District Transport Bureaus, etc.

Implementing the New Fare System

Following the necessary revisions of the relevant ministerial ordinances and the necessary corrections to the relevant circular notices completed during December 1996, the new fare arrangements were put into effect on 1 January 1997. In the future, the Ministry will review the new system as required and keep it up-to-date to meet the needs of the times. ■

Acknowledgment

This article was published in Japanese in *Subway*, Japan Subway Association, 1997. The fare policy system has remained unchanged since that time.

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References

Base Unit Costs, Base Costs, etc., of 10 Subway Operators

Base Unit Costs, Base Costs, Actual Costs, etc.

The base unit costs calculated using the basic FY1995 data, the number of facilities, the totals of base costs, each obtained by multiplying base cost by number of facilities, and the totals of actual costs are calculated as shown below.

The base costs are the five cost items (yardstick costs) that can be compared between all 10 subway operators. They are track costs, catenary costs, rolling stock costs, train operations costs, and station operating costs. They have no direct bearing on the quality of transportation services and the evaluation of overall efficiency of railway operations.

The ratio of the yardstick costs to the railway operating expenses is 56% (average of 10 subway operators).

Since 1997, when any subway operator applies for a fare revision, the base unit cost is calculated as:

Base unit cost $y = ax_1 (+bx_2) +c$

Five Base Cost Items

(1) Track costs
- y = Base unit cost per track-km
- a = 20,260.565
- c = -89,135.148
- x_1 = Rolling stock density (logarithm)
- (Track costs are expenditure on maintenance of tracks and track beds and on management of maintenance of work.)

(2) Catenary costs
- y = Base unit cost per catenary-km
- a = 10.161
- b = 244.203
- c = -3366.322
- x_1 = EMU Density
- x_2 = Trolley wire ratio
- (Catenary costs are expenditure on maintenance of trolley wires, signalling equipment, etc., and on management of maintenance work.)

(3) Rolling stock costs
- y = Base unit cost per rolling stock unit
- a = 11.161
- c = 395.054
- x_1 = Number of passengers per rolling stock unit
- (Rolling stock costs are expenditure on maintenance of rolling stock and on management of maintenance work.)

(4) Train operations costs
- y = Base unit cost per train-km
- a = -377.497
- b = 140,660.806
- c = -572,116.898
- x_1 = One-man train operation ratio per route-km
- x_2 = Train density (logarithm)
- (Train operations costs are expenditure on train operations and work management, excluding the cost of motive power.)

(5) Station operating costs
- y = Base unit cost per station
- a = 148,496.056
- c = -1,051,599.511
- x_1 = Number of passengers per station (logarithm)
- (Station operating costs are expenditure on maintenance of stations, issuing tickets, etc.) ■

(1) Basic data

	Track costs	Catenary costs		Rolling stock costs	Train operations costs		Station operating costs
	x_1	x_1	x_2	x_1	x_1	x_2	x_1
TRTA	6.486	437.026	21.621	887.223	3.943	5.151	9.556
Sapporo	5.913	301.625	34.668	576.088	0.000	4.803	8.493
Sendai	5.438	160.806	23.923	726.310	100.000	4.741	8.186
TMG	6.184	324.115	19.730	862.669	5.580	4.914	9.009
Yokohama	5.723	268.325	14.608	628.403	0.000	4.632	8.373
Nagoya	6.052	344.818	23.681	571.709	19.477	5.018	8.629
Kyoto	5.776	232.264	21.916	740.843	0.000	4.709	8.668
Osaka	6.118	370.682	28.956	904.493	0.000	4.937	9.203
Kobe	5.794	227.790	14.835	624.798	0.000	4.698	8.789
Fukuoka	5.779	243.295	20.677	876.106	100.000	4.784	8.714

(2) Base unit costs

Base unit cost is obtained by substituting the basic data shown in (1) in the formula for calculating base unit cost.

(¥1000)

	Track costs	Catenary costs	Rolling stock costs	Train operations costs	Station operating costs
TRTA	42,275	6,354	10,297	150,938	367,429
Sapporo	30,666	8,165	6,825	103,477	209,577
Sendai	21,042	4,110	8,501	57,006	163,989
TMG	36,156	4,745	10,358	116,984	286,201
Yokohama	26,816	2,927	7,409	79,424	191,758
Nagoya	33,482	5,920	6,776	126,367	229,773
Kyoto	27,890	4,346	8,664	90,255	235,564
Osaka	34,819	7,471	10,490	122,326	315,010
Kobe	28,255	2,571	7,368	88,708	253,532
Fukuoka	27,951	4,155	10,173	63,055	242,395

(3) Number of facilities

	Track-km	Catenary-km	Rolling stock	Route-km	Stations
TRTA	352.2	2,444.4	2,356	162.3	148
Sapporo	90.4	319.6	398	45.2	47
Sendai	29.5	176.4	84	14.8	17
TMG	138.6	1,050.7	632	68.1	69
Yokohama	66.5	518.9	186	33.0	27
Nagoya	158.5	824.7	724	76.5	74
Kyoto	22.9	145.1	102	11.1	13
Osaka	214.4	906.9	1,086	105.8	99
Kobe	45.5	442.2	168	22.7	16
Fukuoka	39.5	253.9	132	17.8	19

(4) Total of base and actual costs

(¥ million)

	Base cost	Actual cost
TRTA	133,557	119,916
Sapporo	22,625	22,053
Sendai	5,691	5,396
TMG	44,258	48,565
Yokohama	12,479	12,030
Nagoya	41,765	39,575
Kyoto	6,217	5,969
Osaka	69,761	88,872
Kobe	9,731	8,996
Fukuoka	9,230	8,060

Note: Total of base costs is the sum of base costs obtained by multiplying base unit cost (2) of each of track costs, catenary costs, rolling stock costs, train operations costs, and station operating costs by the appropriate number of facilities (3). Total of actual costs is the actual expenditure corresponding to the total of base costs.