Abridgment

Financial Analysis Methodology for Regional Rapid Transit System Development

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In planning large-scale transportation improvement projects, local, state, and federal governments all insist that a major consideration be the establishment of the financial workability of the proposed project. The financial commitments involved in such projects extend over long periods of time and can potentially impose untenable financial burdens on a community. It is therefore imperative that the financial requirements be identified early in the planning process. This requires an analysis over time of capital costs, operating and maintenance costs, revenues, and funds from local, state, and federal sources. Through such an analysis, the financial impact of various design parameters and policies, such as fare structures and levels, can be identified and evaluated.

The computerized financial model described in this paper was developed for the metropolitan Dade County transportation improvement program--stage 1: rapid transit system. The costs presented here are for stage 1 (alternative), a 34.5-km (21.5-mile) conventional rail system. The financial model is being used in planning for the Dade County combined bus-rail transit system.

This financial (or cash-flow) model was developed and is being used to assist in the financial analysis of various design parameters and alternatives and in the evaluation of policy decisions. The model provides a yearly analysis of capital-cost and operating-cost expenditures, capital-funding and operating-funding sources, operating revenues, and other funding sources. It also calculates the annual net cash flow and determines the extent of additional funding required.

MODEL LOGIC

As currently implemented, the cash-flow (or financial-planning) model can be conveniently conceived as divided into six component parts:

1. Capital cost,
2. Operating cost,
3. Capital funding,
4. Operating revenue (especially fare-box revenue),
5. Operating funding, and
6. General funding.

First, consider the interrelationships among these component parts. Capital costs must be input to capital-funding computations because many capital funds are computed as a percentage of capital costs. Similarly, both operating costs and operating revenues should be input to operating-funding computations because, in particular, funds available under section 5 of the Urban Mass Transportation Administration (UMTA) Act of 1964 cannot exceed half the operating deficit. Finally, capital-funding computations and operating-funding computations must be input to general-funding computations. There, general funds (not specifically designated for capital or operating costs) are applied toward any remaining capital costs not met by capital funding plus any remaining operating costs not met by operating funding. These interrelationships are indicated in the flow chart of Figure 1.

Next, consider the sequence of actions within the capital-cost component. Data for the rail construction and procurement activities are input. For each activity, a class code, the duration of the activity, the escalation rate, and the base cost are input. The class code denotes the activity as belonging to one of several main classes that are output by the cash-flow model: right-of-way, rail fixed facilities, rail vehicles, or engineering and management costs.

The base cost of a rail activity is spread uniformly over its duration (in months) and escalated on a monthly basis. The monthly activity costs are then accumulated into yearly activity costs that are in turn accumulated into yearly costs for the output classes.

Data for bus capital costs are also input. These data include an initial schedule of purchases of new buses, a schedule of replacement purchases for existing buses, a growth rate for the bus fleet after the initial schedule, and the base cost of an individual bus. Additional data are the schedule of bus-garage construction costs in base-year dollars and escalation factors for bus costs. It is assumed that buses bought during the analysis time period will be replaced after 12 years. With this information, the base-year-dollar costs of buses can be computed and escalated on a yearly basis.

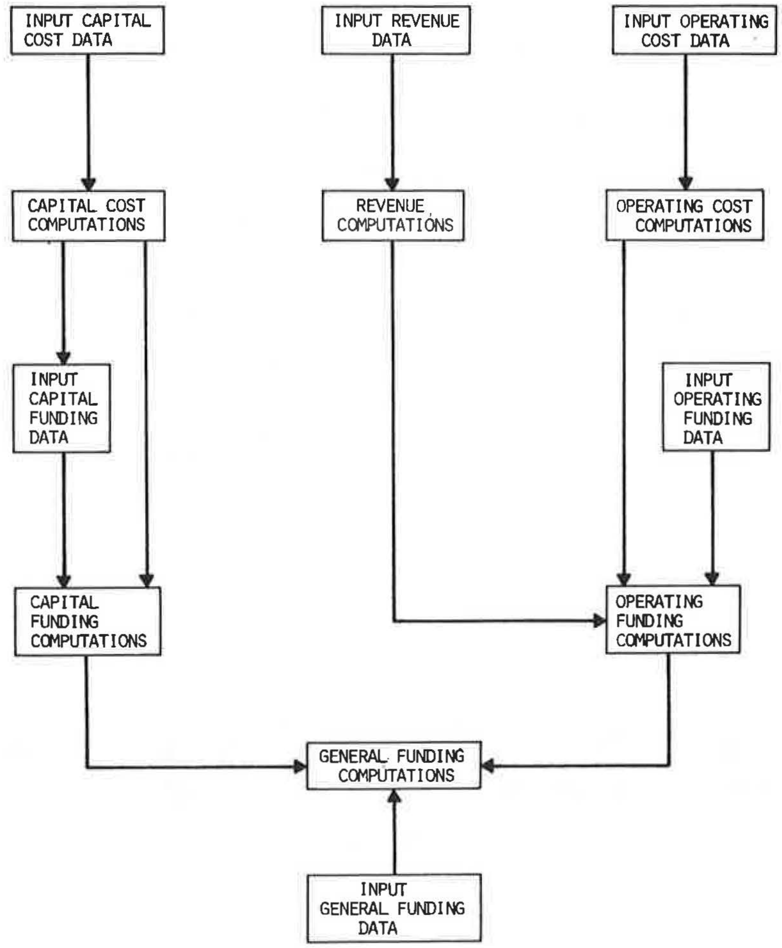
The rail and bus capital costs, as computed above, and the county expenses (a schedule of which is input) are output in a capital-cost table.

The operating-cost component is next considered. Initial schedules of base-year-dollar operating costs are input for both bus and rail systems. By using growth rates for the operating costs after the initial schedule, the schedule over the entire analysis time period can be completed. Appropriate factors are input to divide the total operating costs for bus and rail into the components of (a) transportation operations, (b) power, (c) maintenance, and (d) general and administration. These operating-cost components can then be escalated at possibly different rates.

Next, consider the capital-funding component. The total capital cost, bus capital costs, and any costs that are assumed will receive highway funds are introduced from the capital-cost computations. If there are highway-fundable costs, these will be met 70 percent from federal highway funds and 30 percent from state highway funds. The funds available under section 3 of the UMTA act are then computed as 80 percent of the total capital cost minus the highway-fundable costs. The state will contribute 10 percent of the amount of the total capital cost minus the highway-fundable costs. An attempt will be made to meet the remaining capital costs not covered by the federal and local contribution by the sale of general obligation bonds. If the remaining bond capacity is exceeded, the excess is labeled additional capital funding needed.

Next, consider the operating-revenue component.

Figure 1. Financial planning model.



The inputs for this component include (a) nonstudent revenue patronage for the years 1977 and 1985, (b) initial student patronage and a growth factor for the time period after the initial schedule, (c) a revenue-distance schedule interpolated between 1977 and 1985 and projected by a growth factor thereafter, (d) a schedule of average regular fares (not reduced), (e) a schedule of perceived automobile cost per unit distance, (f) a schedule of elderly-fare riders as a percentage of total ridership, and (g) the Dade County population growth by year.

The 1985 revenue patronage is first factored to the same basis of fare and automobile cost as the 1977 patronage and then has the population growth from 1977 to 1985 factored out. A passenger-per-unit-distance factor to be applied between 1977 and 1985 is derived from the 1977 patronage, the twice-factored 1985 patronage, and the 1977 and 1985 revenue distances. An unadjusted patronage schedule is then projected from the revenue-distance schedule, the 1977-to-85 passenger-per-unit-distance factor, and a post-1985 passenger-per-unit-distance factor. This unadjusted patronage schedule is multiplied by appropriate yearly factors to adjust for fare, automobile cost, and population growth. The next step in the fare-box-revenue computation sequence is to compute the number of elderly-fare passengers as a percentage of the nonstudent passengers. The fare-box revenue is computed by using half-fare for students and elderly passengers and full average regular fare for the remaining passengers. The information from these computations is output in a fare-box-revenue table. Other operating revenues (e.g., station parking, value capture, and advertising) are introduced to be output in the operating-revenue table (a subtable of operating funding).

Now, attention is focused on the operating-funding component. A schedule of UMTA section 5 funds is input, and the total operating cost and operating revenues are introduced from the previous computations. Available section 5 funds are section 5 funds allocated for a given year plus any that were not used in the previous year. Used section 5 funds for the year are the smaller of the available section 5 funds and 50 percent of the operating deficit. The additional operating funding needed is then the part of the operating deficit not covered by used section 5 funds.

Finally, consider the last component, general funding. Here, schedules of transit-designated revenues, particularly taxes, that are not restricted either to capital or to operating costs are input. From the capital-funding computations, additional capital-funding requirements are introduced. From the operating-funding computations, additional operating-funding requirements are likewise introduced. The annual net cash flow is then computed for a given year as the total of the general revenues minus the additional capital-funding requirements. The actual financial situation for the year is obtained by adding to the annual net cash flow any cash remaining from the previous year and the interest accrued.

MODEL OUTPUT

The output format of the computer model consists of six tables corresponding to the six component parts discussed above. For each year of the time span chosen, the cash flows corresponding to the column headings in each table are given.

USE OF RESULTS OF CASH-FLOW MODEL

The results of the cash-flow analyses are being used in the short-, intermediate-, and long-range budgeting processes of the Dade County Metropolitan Transit Agency (the present bus operator) and the Dade County Office of Transportation Administration. The operator is working interactively in the fiscal planning process and the development of the short-range operating budget. The transportation overview function in Dade County (the Office of Transportation Administration) is using the results in financial planning and programming and in the development of the county strategy for securing legislative support for bus and rail transit development. Based on these analyses, a number of fiscal programming strategies have been considered and rejected and a course of action for the Dade County Board of Commissioners relative to deficit management has been and continues to be explored. The fiscal impact of delay and other construction staging decisions have been explored by using this planning tool.

ACKNOWLEDGMENT

This paper is based on work accomplished for the Office of Transportation Administration, Dade County, Florida, in part through a grant from the U.S. Department of Transportation, Urban Mass Transportation Administration.

Publication of this paper sponsored by Committee on Transportation Programming, Planning, and Evaluation.

Abridgment

Maryland's Primary Highway System: Criteria, Policies, and Financial Considerations

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The state highway system in Maryland, like that in most states, has evolved over the years. Additions to the system are continually being proposed, but no specific criteria for additions or deletions have been developed.

In 1972, the state legislature required the designation of a state primary highway system and, in July 1972, the Maryland Department of Transportation (MDOT) adopted such a system, in accordance with this state law. However, the legislation does not define a primary highway and provides no substantive guidance.

In mid-1976, in preparing a statewide transportation plan, MDOT initiated an analysis of the primary highway system to develop departmental criteria and policies for system designation and development. This analysis included a review of the adopted primary system; the development of objective, consistent system guidelines; and a strategy for system development recognizing limited resources. This paper describes this analysis and its results to date.

ANALYSIS OF PRIMARY HIGHWAY CORRIDORS AND DEVELOPMENT OF CRITERIA FOR SYSTEM DESIGNATION

System Objectives

From the beginning, the study found that the objectives of the state primary highway system are similar to those of the national Interstate system. They were defined as

1. The provision of direct routes for major interstate and interregional traffic flows;
2. The connection of major urban areas and traffic generators;
3. The concentration of long-distance, high-volume travel on a limited high-level-of-service system;
4. The support of statewide developmental objectives; and
5. The concentration of funds on needed major highway facilities that serve interregional travel flows.

These objectives established the framework by which roadways and corridors of primary statewide importance could be identified.

Corridor Analysis

Based on these objectives, the primary highway corridor service to centers of economic activity, land use, population, and other major trip generators were analyzed. This resulted in overlays of areas that had population centers of more than 10 000 persons, employment centers of more than 2000 persons, major recreational centers, major transportation terminals, military installations, and national and state parks on maps showing the existing primary system. The series of overlays was an effective illustration of the number of times the links in the system connected activity centers of statewide interest. There were links that appeared to be nonessential and others that were identified as possible additions.

A similar analysis was conducted by using traffic-service information and developed overlays of average daily traffic, percentage of truck traffic, level of service, and access control. The traffic-service information was then used to identify those corridors serving high-volume, long-distance travel. This analysis led to the conclusion that several of the routes in the previously adopted primary highway system were lower volume routes (less than 5000 average daily traffic) and candidates for deletion from the system.