

Evaluation of Transit and Highway Revenue Forecasting Template (THRIFT) Software

PAUL ZORN

Transit and Highway Revenue Forecasting Template (THRIFT) software was developed by the Government Finance Officers Association under contract with the U.S. Department of Transportation as a sketch-planning tool. THRIFT allows users to forecast available financial resources for highway and transit financing, evaluate capital projects, and examine the effects of changes in selected financial variables on transportation system funding. Tests of the software at four highway and transit sites in the United States indicate that the software is a useful tool for examining financial scenarios in a sketch-planning context. The key drawback with the software is the level of effort required to collect the historical data needed to conduct the forecasts. Overall, THRIFT was judged to provide a useful framework for examining transportation improvements within the context of current and future financial resources.

The U.S. Department of Transportation (DOT) statement of national transportation policy calls for the federal government to provide technical assistance to state and local governments in the use of alternative or innovative approaches to financing transportation operations and improvements. In order for state and local governments to make informed decisions regarding their financial capacity for constructing and operating capital expansions and improvements, transportation planners must have accurate detailed information about future financial resources, capital costs, and the relative benefits received from capital projects.

Because of the complexity of this information, and the complexity of the underlying calculations, planners have turned to computer software to perform the calculations, store, sort, and display the results of their financial analyses. One such computer package is the Transit and Highway Revenue and Improvement Forecasting Template (THRIFT). THRIFT is a sketch-planning tool that allows users to

- Forecast available financial resources over a 10-year period,
- Determine the adequacy of resources needed to operate, maintain, and construct capital projects for highway and mass transit transportation systems,
- Assign priorities to capital projects using benefit-cost analysis,
- Examine the effects of changes in financial variables (such as tax rates, fares, labor costs, etc.) on a jurisdiction's financial capacity to operate, maintain, and improve its transportation

system, and

- Examine the impact of new sources of revenue for financing the transportation system.

THRIFT was developed for DOT with monies from both FHWA and the Urban Mass Transportation Administration (UMTA) (now FTA), and is distributed through FHWA's Office of Planning.

DESCRIPTION OF THRIFT

For more than a decade, state and local governments have assumed a greater share of the responsibility for financing their transportation systems. Because of this increasing responsibility, state and local governments have found it a challenge to manage their resources more efficiently and to find alternative sources of revenue. However, identifying these sources and predicting their potential for generating additional funds is not easy. Furthermore, developing a framework for evaluating alternative financial options in the context of the benefits and costs of highway and transit projects complicates the problem even more.

As early as 1982 FHWA recognized the need to improve the integration of financial planning with transportation planning. In 1985, FHWA began an effort to develop user-friendly computer software to assist state and local governments in forecasting their revenues and expenditures and to integrate this information with the transportation planning process. As one of the products of these efforts FHWA contracted with the Government Finance Research Center, the research arm of the Government Finance Officers Association, to design and construct personal-computer based software for financial forecasting and analysis of capital improvements.

The resulting software, THRIFT, is intended to be used as a tool in the "sketch-planning" process. As shown in Figure 1, sketch-planning is the ongoing process of evaluating (at a summary level) the current state of the transportation network, anticipating the network improvements and expansions required to meet future demand, evaluating the current and future financial condition of the transportation system, and taking the financial and operational steps necessary to implement the plan.

THRIFT can be used to assist in the core financial elements of this process. Although THRIFT does not provide assistance in identifying transportation system needs, once the jurisdic-

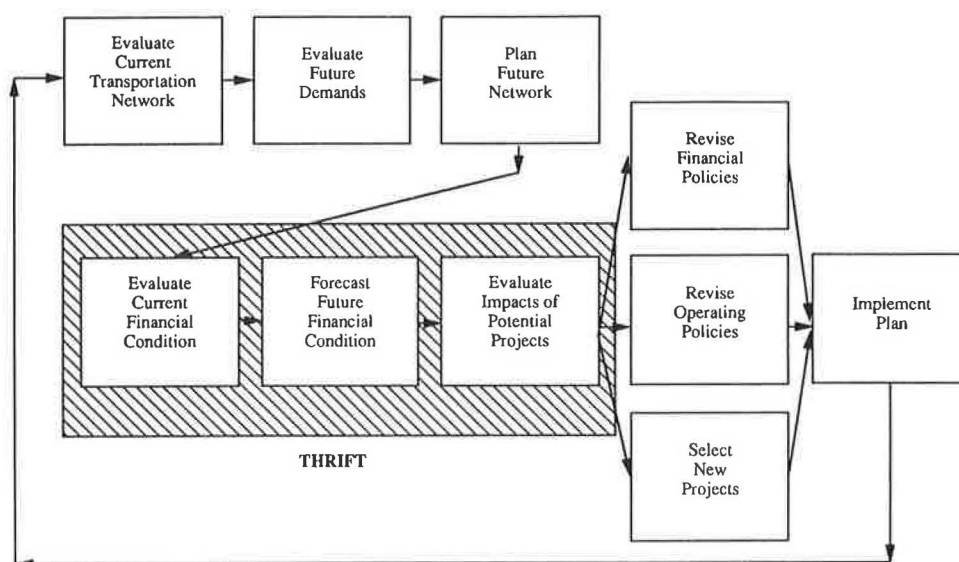


FIGURE 1 Relationship of THRIFT to sketch-planning process.

tion or transportation agency has determined the current status of the network and identified the projects necessary to improve it, THRIFT can be used to test the financial feasibility of the potential transportation improvements. This is done by

- Evaluating the agency or jurisdiction's current and historical revenues and expenditures,
- Forecasting future financial condition based on historical information, using trend analysis and expert judgment,
- Evaluating the financial impact of potential capital projects (including benefit-cost ratios), and
- Evaluating the impact of additional sources of revenues to finance the projects.

The output of THRIFT's analysis is a series of reports that show the net financial impact of highway and transit improvements and expansions on the transportation system. If the analysis shows that resources are unavailable to completely cover costs, THRIFT allows user to examine the impact of

- Revising financial policies by adding new sources of revenue or increasing rates,
- Revising operating policies by cutting back on service, and
- Revising the capital improvement program by changing the ranking of projects based on their benefit-cost ratios.

THRIFT also allows users to conduct sensitivity analyses by examining the impact on the forecasts of changes in the economic and policy variables that underlie the forecasts. In doing so, users have the option of changing any of the underlying demographic and economic assumptions, such as population, income, prices, interest rates, and the like.

REVENUE AND EXPENDITURE FORECASTING USING THRIFT

When examining the current and future financial condition of the jurisdiction or transportation agency, THRIFT is able

to forecast a wide variety of revenues and expenditures. On the revenue side, THRIFT allows users to project the potential of a diverse group of revenue sources, including:

- Real and personal property taxes,
- Retail and wholesale sales taxes,
- Income, wage, and payroll taxes,
- Excise taxes on cigarettes and alcohol,
- Utility taxes,
- Motor fuel taxes,
- Driver's license and vehicle registration fees,
- Highway tolls,
- Transit fares,
- Bus charter revenues, and
- Other taxes or fees (e.g., parking, severance taxes, etc.).

On the expenditure side, THRIFT allows users to forecast system operating and maintenance costs, including:

- Labor costs for system administration, operations, maintenance, security, and other workers,
- Non-labor costs for contracted services, utilities, rental property, maintenance materials, and other non-labor costs, and
- Debt service with provisions for user specified interest rates on borrowing.

THRIFT allows users to forecast revenues and expenditures using a number of forecasting techniques, including linear and exponential trend forecasts, disaggregated trend forecasts, and time-series forecasts.

The linear and exponential trend methods use historical trends in the revenues or expenditures as the basis for the forecast, and project these trends using simple linear or exponential rates of change. Disaggregated trend forecasts break the revenues and expenditures down into their economic and policy components and then forecast the economic components using linear or exponential rates. For example, THRIFT

disaggregates property tax revenues into the following components:

- Market value of taxable property,
- Assessment ratio,
- Property tax rate,
- Percent of property tax collected, and
- Percent distributed for transportation purposes.

The disaggregated trend method uses linear or exponential trends in the number of households, household income, and housing prices to forecast future market values of taxable property. Property tax revenues are then obtained by applying the policy variables (tax rate, assessment ratios, etc.) to the market value of taxable property. This allows the user to examine the effect that changes in the policy variables will have on available revenues.

The time-series forecasting method uses regression equations to calculate the relationship between the underlying variables and the economic base variable. It is similar to the disaggregated trend analysis, except that the equations linking number of households, household income, and housing prices are calculated using a regression formula, with adjustments for autocorrelation.

Since expert judgment is an essential component of any forecast, THRIFT also allows the forecasts to be modified based on outside econometric analysis or expert judgment.

EVALUATING CAPITAL PROJECTS

In addition to forecasting revenues and expenditures for system operation and maintenance, THRIFT also allows the user to evaluate capital improvements and expansions. To do so, the user enters information about each capital project, including

- Capital costs (including planning, engineering, equipment, vehicles, land and right of way, and construction costs),
- Financing sources (including current (general) revenues, project-generated revenues, grant receipts, and bond proceeds),
- Project operation and maintenance (including labor, utilities, repairs), and
- Benefit-cost variables (including travel time, travel costs, and accident costs with and without the project).

THRIFT then calculates debt service associated with each improvement for the portion of the capital cost financed through bonds, based on a user-entered interest rates and bond maturity.

Benefit-cost ratios are calculated using a procedure similar to that presented in the *AASHTO Manual on User Benefit Analysis of Highway and Bus Transit Improvements (1)*, with modifications suggested by the procedures described in the FHWA report *Regional Economic Impact Model for Highway Systems (2)*. For highways, the benefit-cost variables include daily vehicle-miles of travel, vehicle running speeds with and without improvement, accident reduction factors, travel time values, vehicle operating costs, and accident costs. For transit, the benefit-cost variables include number of person-trips, in-

vehicle travel time, waiting time, value of travel time, and average fare.

The user can select the projects to be included in the transportation improvement program. These are then added to the financial forecast for operating and maintenance, showing the impact of financing the projects on net resources over a 10-year period. If current resources are not sufficient to finance the improvements, new revenue sources can be explored and/or capital projects may be postponed. THRIFT allows the user to model the effects of these decisions before any action is taken.

USER EVALUATIONS

As part of the development process, THRIFT was beta-tested by four highway and transit systems in the United States: Lane Council of Governments, Oregon; Minnesota Department of Transportation; North Central Texas Council of Governments; and City of Sioux Falls, South Dakota. The systems were selected to represent large and small transportation systems, in rural and urban settings, involving different mixes of highways and mass transit facilities.

In general, the systems found the software to be a useful tool in the sketch-planning process. Once the data was entered, the systems had no trouble carrying out the forecasts, conducting sensitivity analysis, or examining new projects. THRIFT's results were also found to be consistent with the "bottom-line" results of in-house models (3).

Using THRIFT, the systems identified periods of potential financial trouble in future years and examined the effects of applying different sources of revenue to relieve the potential deficit. THRIFT was judged to be very useful for conducting sensitivity analyses and developing alternative financial scenarios in a sketch-planning context.

The key drawback to THRIFT was the level of effort required to collect and analyze the historical data required to conduct the forecasts. For THRIFT to make projections based on historical data, the data had to be collected and entered into the program. Testers found that the initial effort to obtain the data and ensure its consistency was time-consuming, and that a high level of expertise was necessary to assess this information. It should be noted, however, that this is a problem inherent in any forecast that requires historical data. Once the data was initially entered, the testers noted that considerably less time was needed to update the data during the next forecast cycle.

CONCLUSION

The THRIFT forecasting software provides a useful tool to assist in the sketch-planning process, and helps transportation planners

- Evaluate the current financial performance of the transportation system,
- Estimate the financial resources required and available to meet needed transportation improvements, and
- Examine alternative means for meeting future transportation needs (either through additional revenues, reduced services, or postponed capital projects).

Perhaps most important, THRIFT provides a framework for examining transportation improvements within the context of current and future financial resources.

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