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VALIDATING T-BEST MODELS WITH 100% AUTOMATED PASSENGER COUNTER (APC) COUNTS

BACKGROUND

The Public Transit Office of the Florida Department of Transportation (FDOT) in recent years has invested heavily in developing a comprehensive transit ridership forecasting model system for short-term service planning. The Transit Boarding Estimation and Simulation Tool (T-BEST) is the third generation version of this system.

T-BEST includes several improvements to the system. It models and forecasts transit boarding at the individual stop level. It separates direct boarding from transfer boarding for both modeling and forecasting. It explicitly treats inter-relationships in a transit network through measures of accessibility to opportunities for potential activity participation. More important, these modeling advances provide a significant level of practical flexibility for transit service planning that has not been available before. T-BEST can be used to assess the boarding impacts of a variety of service changes, including operating strategies, schedule changes, alignment changes, system changes, and fare policy. The current user guide at www.tbest.gov provides detailed information about the modeling and forecasting framework of T-BEST as well as its flexibility for assessing the boarding impacts of service changes.

T-BEST's current boarding equations were estimated with a small sample of boarding data collected through automated passenger counters (APC) in the Jacksonville area of Florida. Consequently, the small sample has greatly reduced the reliability of the current boarding equations in T-BEST. This small sample also has made it difficult to separate the morning and afternoon peaks on weekdays.

OBJECTIVES

The purpose of this research was to re-estimate a set of boarding equations for the next version of T-BEST. Specific objectives in this effort included (1) using more reliable boarding data than were used to estimate the current set of boarding equations and (2) improving the boarding equations.

FINDINGS AND CONCLUSIONS

Both objectives were successfully achieved. In the case of the first objective, researchers used boarding data from a fleet of bus vehicles that had an APC penetration rate around 75 percent at an agency that has had many years of experience in archiving and using APC data.

Researchers also made several improvements to the boarding equations:

- Some improvements are structural: the current weekday peak period has been split into a weekday morning peak and a weekday afternoon peak.

- Some improvements are statistical: except for the afternoon peak period, boarding equations are estimated without the restrictive assumption that the mean and variance of model error terms are equal.

- Some improvements involve adding additional desirable variables: (1) the effect of park-n-ride lots on direct boardings has been taken into account for the weekday morning peak; and (2) the effect of daily service span on both direct and transfer boardings has been added for Saturdays and Sundays.

- Some improvements involve how certain variables enter the questions: (1) the socio-demographic characteristics of population enter the equations as quantity rather than as shares; and (2) daily service span, service frequency, and accessibility to population and employment from boarding at a subject stop enter the equations in a log form.

- Some improvements involve (1) the computation of individual variables, including the radius of stop buffers, (2) the manner in which overlapping stop buffers are split to avoid double-counting, (3) the computation of some of the accessibility measures, and (4) the weighting of impedance components, including the impedance threshold within which accessibility measures are computed and the distance threshold within which people may transfer from one route to another.

The estimated boarding equations perform well in terms of both how well the equations fit the data and how observed and in-sample predictions compare. However, serious over-predictions can still occur at a small number of stops. These instances need to be dealt with individually as part of the validation process in each application of T-BEST.

BENEFITS

The new boarding equations are expected to be implemented into T-BEST 3.0. In addition to providing additional flexibility in evaluating the boarding impact of transit service changes, the new equations are expected to increase the reliability of these boarding evaluations. Transit agencies in Florida and nationally will benefit from the additional flexibility and reliability, not only in developing state-required Transit Development Plans but also in other service planning activities.

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