Introduction

The allocation of U.S. federal government funds to states for developing their road transportation system is based on highway performance data collected by the states.

For comparability of such data, the Federal Highway Administration (FHWA) requires every state Department of Transportation (DOT) to have in place a Traffic Monitoring Program (TMP) whose procedures are consistent with recommendations made in FHWA’s Traffic Monitoring Guide.

One key performance measure that informs funding decisions is the Annual Average Daily Traffic (AADT), which is estimated from traffic volume counts made over an entire year on each section of roadway.

Ideally, obtaining AADT for all road sections would require the placement of expensive count equipment on every road section. Given the large scale of any state’s roadway system, this would be expensive and impractical.

Sampling is used to address this concern. It results in two components of a TMP Program:

1. Permanent Traffic Count (PTC) Program
   - Only a relatively small number of road sections are selected under this program for continuous counts all year round. These are called PTC stations, and a

2. Short Period Traffic Count (SPTC) Program
   - Covers the remaining numerous road sections at which counts are made for only a short period of time, typically, one to seven days.
   - Data from the PTC program are used to compute Annual Average Daily Traffic (AADT), and seasonal/temporal variation factors that are used to adjust the short period counts into AADT estimates.

Literature Review/State of Practice

Focus – how final seasonal factors used to adjust coverage counts into AADT estimates are determined

Findings

- FHWA recommends that final seasonal adjustment factors be computed from the most recent data set available.
- Among selected states, the number of years used for developing SFs varied
- For states that used a multiple number of years, the simple average approach was adopted

Table 1: Number of Years of PTC data Used by Selected States for Computing Final SFs

<table>
<thead>
<tr>
<th>State</th>
<th>Number of Years Used For Computing Final SFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>Single Average of 2 years</td>
</tr>
<tr>
<td>Florida</td>
<td>Single year (Most recent calendar year’s data)</td>
</tr>
<tr>
<td>Kentucky</td>
<td>Single year (Most recent calendar year’s data)</td>
</tr>
<tr>
<td>Maryland</td>
<td>Single year (Most recent calendar year’s data)</td>
</tr>
<tr>
<td>New York</td>
<td>Simple Average of 3 years</td>
</tr>
<tr>
<td>Ohio</td>
<td>Simple Average of 3 years</td>
</tr>
<tr>
<td>Virginia</td>
<td>Single year (Most recent calendar year’s data)</td>
</tr>
<tr>
<td>Washington</td>
<td>Single year (Most recent calendar year’s data)</td>
</tr>
<tr>
<td>Tennessee</td>
<td>Simple Average of 5 years</td>
</tr>
</tbody>
</table>

Gaps Identified

- Assumption underlying the simple average approach – equal reliability of SFs across multiple calendar years.
- Not supported by PTC data collected in a year for each ATR group.
- No research in the open literature that examined alternative ways of combining multiple years of PTC data to generate final seasonal factors used in adjusting short term counts.

Data and Input Values for SF Computation

Data

- Sources of data: Tennessee (TN) and Maryland (MD)
- Data Required: Minimum of five years of PTC data

Computation of AADT

- The AASHO method (average of averages) was used:
  \[
  \text{AADT} = \frac{1}{2} \left( \frac{1}{2} \left[ \frac{1}{12} \sum_{i=1}^{12} \sum_{j=1}^{5} V_{ij} \right] + \frac{1}{12} \sum_{i=1}^{12} \sum_{j=6}^{10} V_{ij} \right)
  \]
  
  Where \( V_m \) is the volume for the \( m \)-th day of the year (e.g., \( m = 1 \) for the first occurrence of that day type in a given month, \( m = 2 \) for the second occurrence of that day type in a given month, \( m = 1 \) for the first occurrence of that day type in a given week, and \( m = 2 \) for the second occurrence of that day type in a given week).

- Computational of Seasonal Factors
  - Index AADT to 84 monthly average day-type volumes to yield 84 SFs for each year for each ATR group.

Methodology – SF Estimation Methods

- FHWA’s Method
  - Determine SFs for each station within a selected ATR group
  - Determine the average of SFs for all stations in the ATR group
  - Repeat the procedure for all ATR groups

- TDOT’s method
  - Determine SFs for each station within a selected ATR group
  - Determine the average of SFs for all stations in the ATR group
  - Repeat the procedure for all ATR groups
  - For each ATR group, average SFs obtained with 4 years’ SFs

Results and Discussion

- Comparison of Analysis for three datasets
  - Group MAPE by Method for Predicted AADT: All Rural Interstate Groups
  - Group MAPE by Method for Predicted AADT: All Urban Interstate Groups
  - Group MAPE by Method for Predicted AADT: All Urban Non- Interstate (TN)/Rural Other (MD) Groups

Conclusions/Contributions to Research

- Conclusion 1: An alternative method for determining final seasonal factors that accounts for within ATR-group variance has been successfully developed for combining PTC data spanning a five – year period. It is known as the Weighted Average method.
- Conclusion 2: The use of five years of PTC data to develop seasonal factors is better than the use of only a single year of PTC data in AADT prediction. Also, results of the empirical test of the three SF estimation methods show that an explicit consideration of calendar year seasonal factors yields superior AADT estimates at coverage count stations.

Future Studies

- Investigate alternative grouping of ATR stations into more specific sub-divisions of roadway functional classifications such as principal arterials, minor arterials, collectors and local roads prior to estimation of seasonal factors
- Investigate the number of calendar years of seasonal factors that result in AADT estimates at coverage count stations that give the lowest error.

References

- Traffic Monitoring procedures/guidelines of the selected states

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