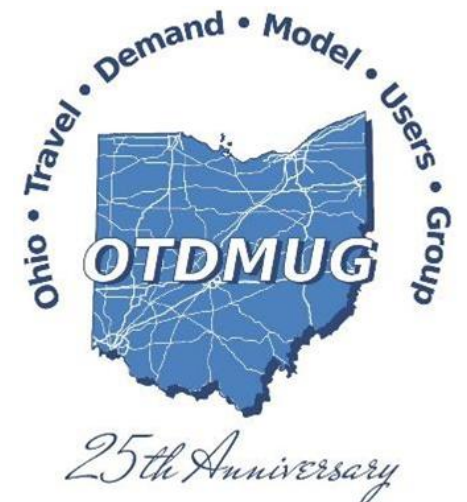# Forecasting Accuracy
We've Been Doing This Long Enough to See Our Mistakes, What Are We Doing About It?

The 25th Anniversary of the Ohio Travel Demand Model Users Group

December 6th, 2024

What is Accuracy?

- No standardized definition!

- Some agencies don't have a definition!

- If there is a definition, it usually depends on context:
  - "Passes the reasonableness test"
  - "Doesn't affect design" (capacity-based)
  - "Within 10%-20%" (demand- or revenue-based)

- A possible, general definition:
  - The difference of the forecast and actual values is not large enough to change the decision…
  - …and there's been no 'game-changer' event between when the forecast was made and the corresponding actual value occurred.

What Have We Found To Date?

- NCHRP 934: Traffic Forecasting Accuracy Assessment Research
  - On average, the actual traffic volume is about 6% lower than forecast
  - On average, the actual traffic is about 17% different from forecast
  - Some 95% of forecasts reviewed are "accurate to within half of a lane"
- FTA's Predicted vs. Actual Analysis
  - Forecasts getting accurate over time due to, in part:
    - Sharper focus on current/opening year forecasts
    - Plausibility tests on transit service plans
    - Reference-class forecasting methods
    - Routine market-specific QC procedures
    - Documentation of uncertainties
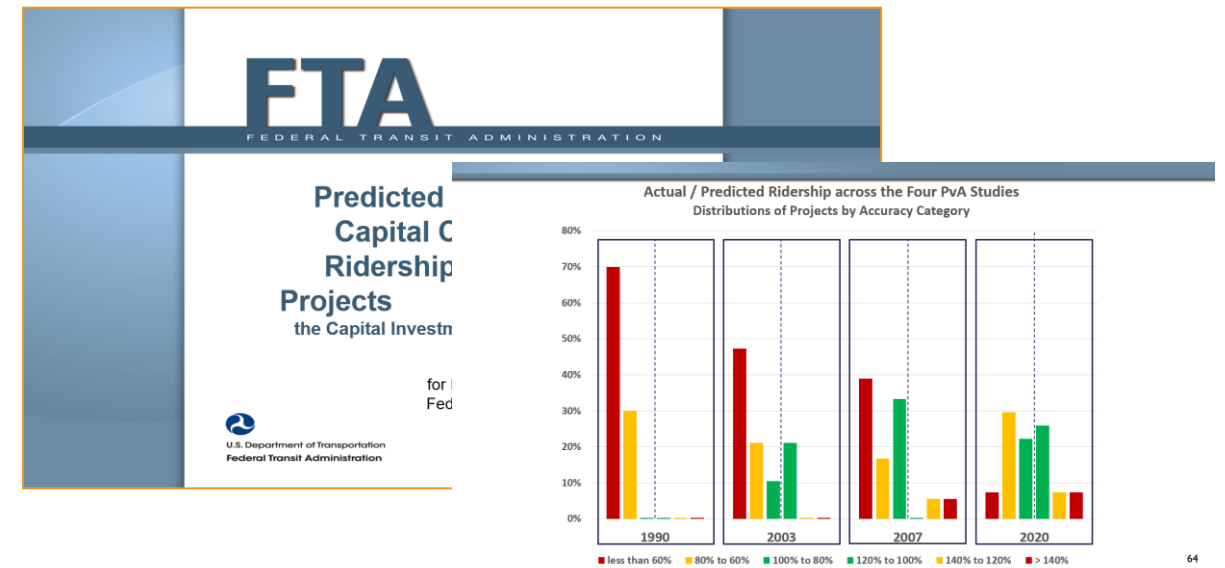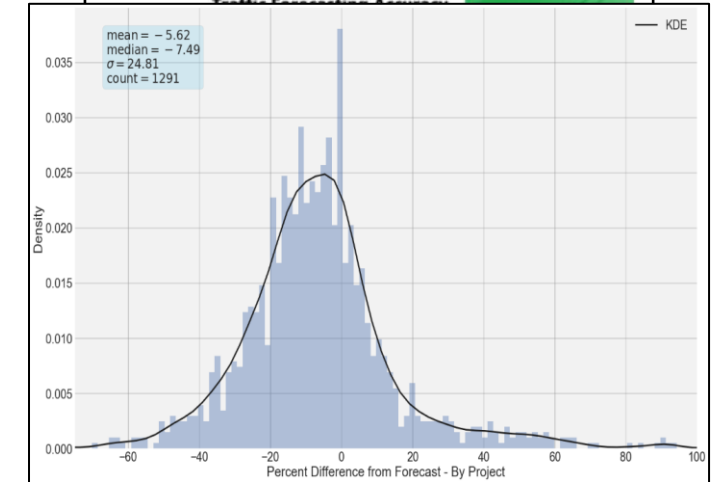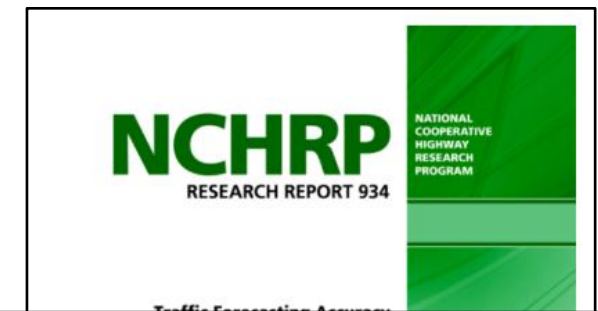
What Have We Learned? (Part 1 of 4)

- **Factors we don't usually measure really matter**

- The Changing Accuracy of Traffic Forecasts". *Transportation, 49*(2), 445-466.
  - Economic conditions (downturns)
  - National VMT trends

- "Are public transit investments based on accurate forecasts? An analysis of the improving trend of transit ridership forecasts in the United States". *Transportation Research Part A: Policy and Practice*, 186, 104142.
  - Gas prices
  - Unemployment rate (economic conditions)
  - National ridership trends

What Have We Learned? (Part 2 of 4)

Traffic Forecast Management System (TFMS)
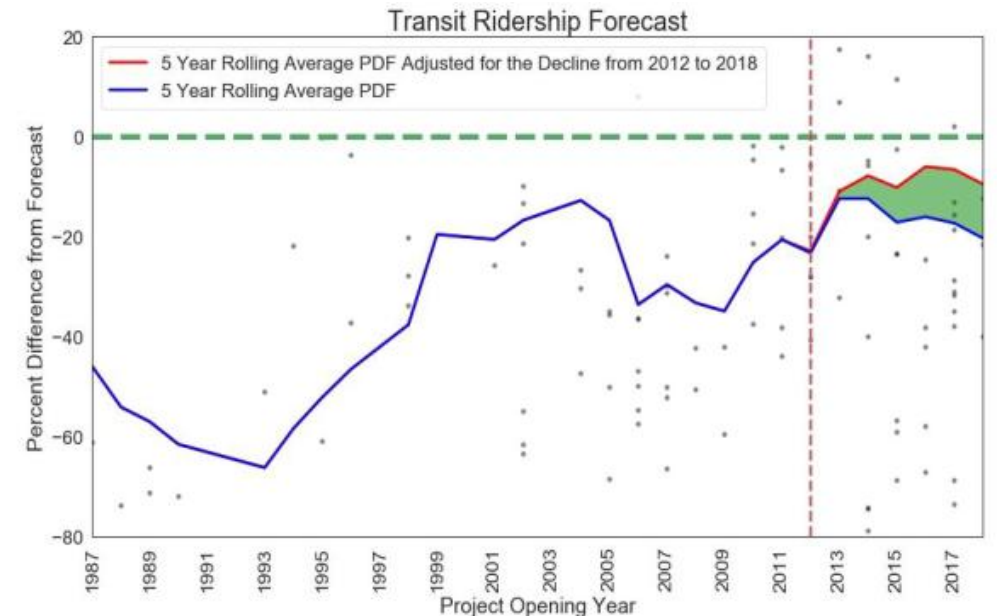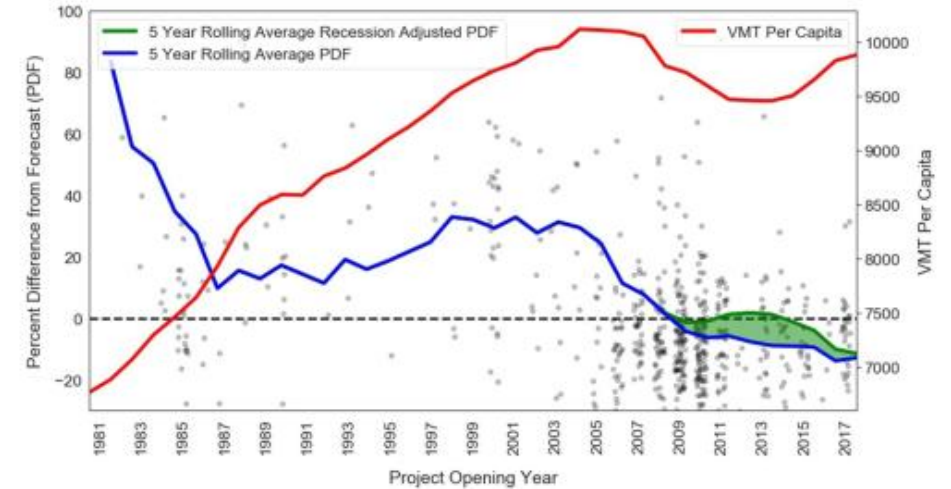
- **"Use the right tool for the right job"**
  - Tactical, analytical tools focused on what you need to know, and minimize what you don't need to know
  - Tool is tailored to the analysis rather than "one model for everything"
- Example #1: ODOT's trend forecasting tool & MnDOT's MnESAL Traffic Forecasting Tool
  - Used for low-risk traffic forecasts
  - Current traffic count & time-series trend is best predictor of forecast
- Example #2: Federal Transit Administration's STOPS Model
  - Roadway components are kept constant → faster to run
  - Higher spatial details than regional models → more precision
- Benefits
  - Allows more analysis in less time
  - Can focus on the variables that really "drive" the forecast to assess robustness & key factors
  - Easier to maintain & operator
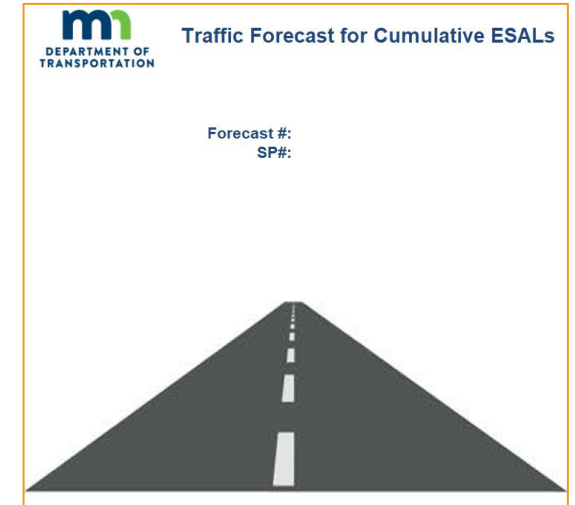
What Have We Learned? (Part 3 of 4)

- **Understand the Key Drivers**
  - Focus on what you need to know, & really understand the impacts
- Project-level sensitivity testing on key variables
  - Alternate project options/designs
  - Socio-economic data impacts
  - Travel time benefit assumptions
  - Estimated travel patterns
  - How is the project forecast different? Why?

Run #	Project Mode	Population / Employment Levels Reflect…	Auto Travel Times Reflect Conditions From…	Transit Service Reflects Assumptions Reflect…	Project Forecast	% of Maximum Forecast	Change from Previous Test
1	**As Light Rail**	**Future**	**Future**	**Future**	8,100	100%	100%
2	**As Light Rail**	**Future**	**Future**	Existing	7,950	98%	-2%
3	**As Light Rail**	**Future**	Existing	Existing	7,650	94%	-4%
4	**As Light Rail**	Existing	Existing	Existing	6,200	77%	-19%
5	As Local Bus	Existing	Existing	Existing	3,600	44%	-42%

Insight
Transportation Consulting

What Have We Learned? (Part 4 of 4)

- **Archive, archive, archive**
  - Models
  - Forecasts
  - Documentation
- We don't learn anything without archiving
- Staff turnover → institutional loss

- NCHRP 934 offers Gold, Silver & Bronze archiving processes & procedures

APPENDIX B

Forecast Archive Annotated Outline (Silver Standard)

1 Introduction

This report, written in <month-year>, documents the traffic forecasts and supporting assumptions for the <project name>. The information in this report will be the primary source of information used to record the accuracy of the traffic forecast(s) and determine whether the assumptions used as a basis for the forecast also were generally accurate.

Section 2 describes the project. Section 3 summarizes the project traffic forecasts. Section 4 describes the forecasting method used to develop the traffic forecasts in Section 3. Section 5 enumerates the common and project-specific assumptions. Section 6 describes the data collection plan that will be executed prior to the post-construction forecast analysis. Section 7 provides a list of data sources and references used to develop the forecast.

2 Project Description

<Name of the project> is a <type of project [capacity addition, reconstruction, etc.]> located in <city, state>. Traffic forecasts for the project were prepared in <YYYY> for the <YYYY>, <YYYY>, and <YYYY> forecast year(s) for <agency name>. The project is currently planned to open in <YYYY>. The internal agency tracking number(s) for planning, design and construction phases is <NNNNNNNNNN>.

<Include a 1–2 sentence description of the purpose of the project and the need for the traffic forecast>.

The study area boundaries are <here>, <here>, <here>, and <here>. A summary of the project scope goes here.

Describe any unique characteristics of the project. Some examples include: first project of its type in the region, first project of its type in decades, and exceptional project length, construction period and/or cost.

Describe the travel markets that are expected to comprise the majority of demand on the project. Travel markets are significant quantities of trips that traverse from one geographic area to another. They are typically further characterized by common trip purposes, time periods, line-haul or circulation/distribution movements, or socioeconomic variables. Examples of travel markets include: suburb-to-CBD work trips, external-external trips, game day traffic, and local shopping trips.

<Include a map.>

III-B-1

Insight
Transportation Consulting

What Do We Still Need To Do?

- **Communicating uncertainty in a clear way…**
  - Weather forecasters do this…how can we?
  - Ranges are helpful, but success has been limited
  - NCHRP 934 suggests using quantile regression

- **…and all that uncertainty means**
 - Accepting bad news and the criticism that comes with it
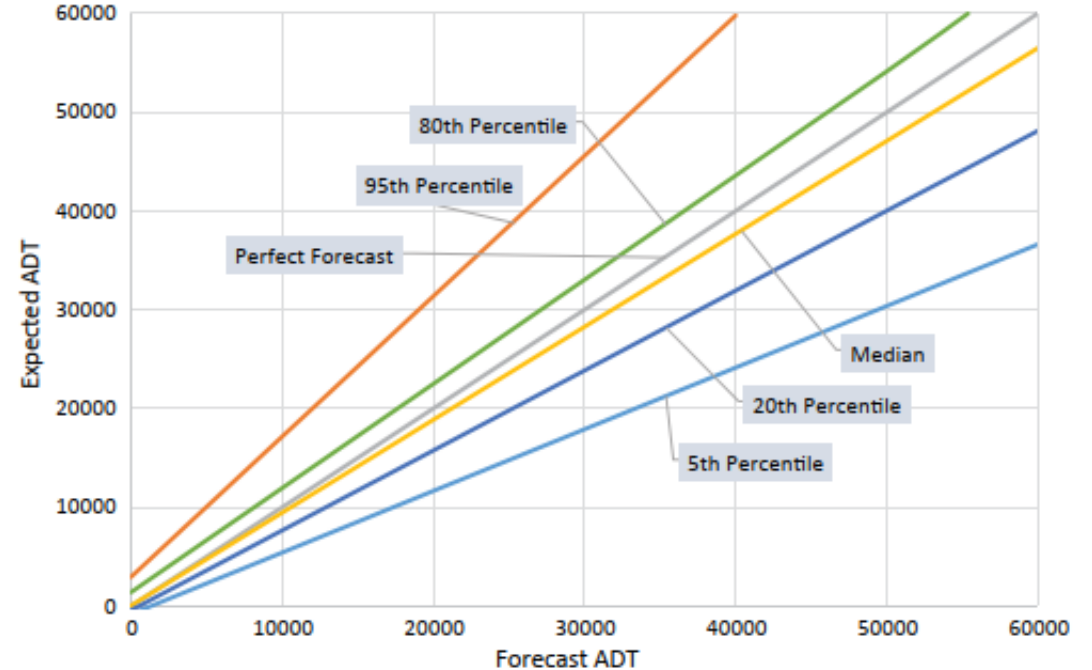
Results: Uncertainty Analysis of the Project Forecast

1. Based on **279** records, 90% of all projects had actual AADT between **38,380** and **58,369** and 60% of all projects had actual AADT between **43,094** and **52,710**, when the forecasted AADT was 50,000.
2. Based on **279** records, 79.9% of all projects had actual AADT between the 120% and 80% of the forecasted AADT.

What Do We Still Need To Do? (2)

- **Focus on why "misses" happened, not on the "scoreboard"….**
  - Scoreboard checks are helpful to identify best methodology based on project types, but they don't provide much help on improving a methodology
  - Scoreboard = 30,000 predicted vs. 26,000 observed forecast missed by 13%
  - But <u>why</u> was it off by 13%?
    - Deep dives (see NCHRP 934)
    - Verify assumptions
    - Assess model parameters & components
- **…And incorporate lessons learned from previous "missed" forecasts**
  - Example in transit forecasting: Current year forecast Base year forecasts
  - Assess macro & economic trends and report their potential impacts to forecast

Bipartisan Infrastructure Law, passed November 2021
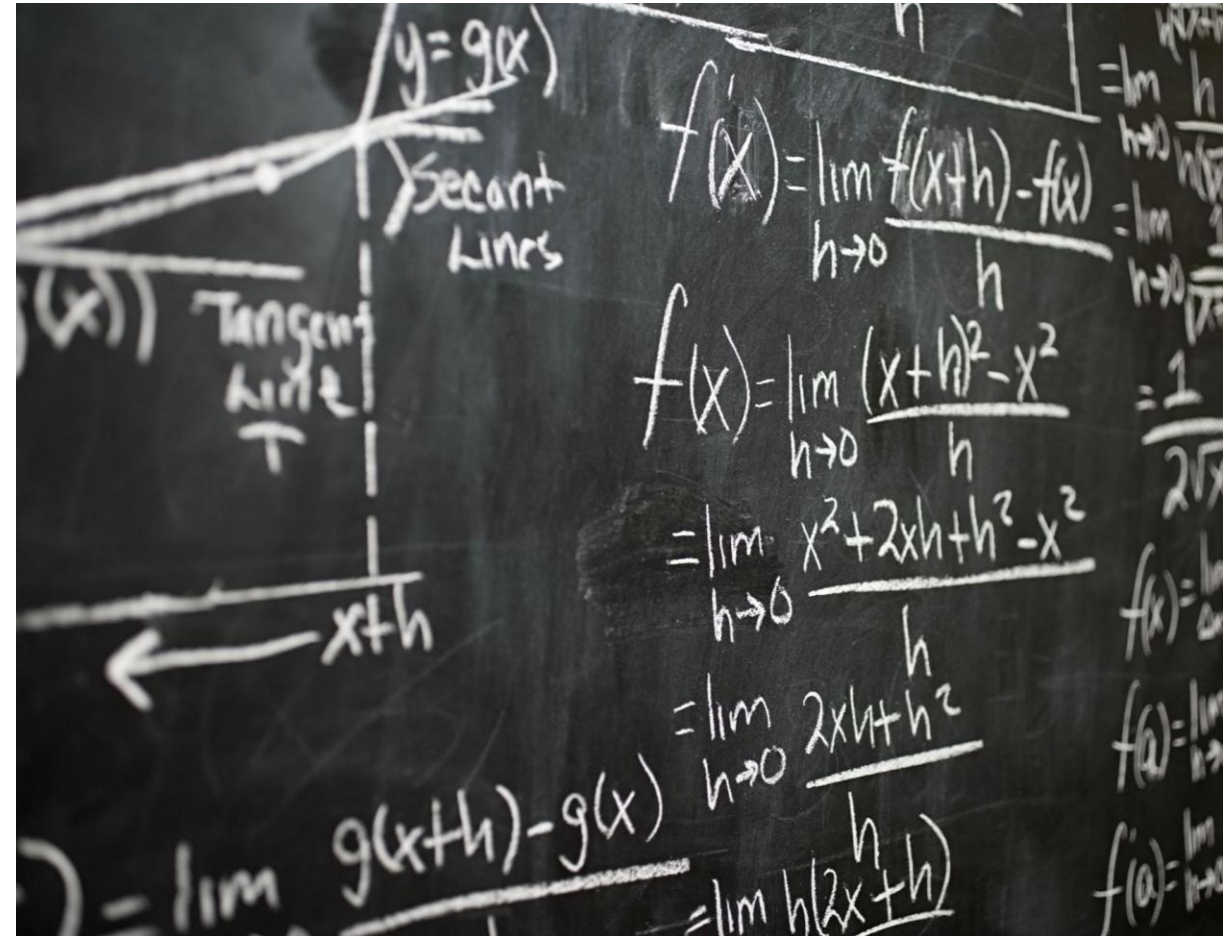
Public Law 117–58
117th Congress

An Act

To authorize funds for Federal-aid highways, highway safety programs, and transit programs, and for other purposes.

Nov. 15, 2021
[H.R. 3684]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Infrastructure Investment and Jobs Act.

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Infrastructure Investment and Jobs Act".

23 USC 101 note.

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

Sec. 1. Short title; table of contents.
Sec. 2. References.

DIVISION A—SURFACE TRANSPORTATION

SEC. 11205. TRAVEL DEMAND DATA AND MODELING

23 USC 134 note.

(a) DEFINITION OF METROPOLITAN PLANNING ORGANIZATION.—In this section, the term "metropolitan planning organization" has the meaning given the term in section 134(b) of title 23, United States Code.

(b) STUDY.—

(1) IN GENERAL.—Not later than 2 years after the date of enactment of this Act, and not less frequently than once every 5 years thereafter, the Secretary shall carry out a study that—

Deadline.
Time period.

(A) gathers travel data and travel demand forecasts from a representative sample of States and metropolitan planning organizations;

(B) uses the data and forecasts gathered under subparagraph (A) to compare travel demand forecasts with the observed data, including—

(i) traffic counts;
(ii) travel mode share and public transit ridership; and
(iii) vehicle occupancy measures; and

(C) uses the information described in subparagraphs (A) and (B)—

(i) to develop best practices or guidance for States and metropolitan planning organizations to use in forecasting travel demand for future investments in transportation improvements;

(ii) to evaluate the impact of transportation investments, including new roadway capacity, on travel

Evaluation.

behavior and travel demand, including public transportation ridership, induced highway travel, and conges-

(iii) to support more accurate travel demand forecasting by States and metropolitan planning organizations; and

(iv) to enhance the capacity of States and metropolitan planning organizations—

(I) to forecast travel demand; and

(II) to track observed travel behavior responses, including induced travel, to changes in transportation capacity, pricing, and land use patterns.

Insight
Transportation Consulting

Looking Ahead
Where I Think Accuracy Assessments Are Headed

Accuracy research thus far has focused on project forecasts...what about Long Range Transportation Plan-related forecast accuracy?

Standardized "scoreboard" accuracy assessments

For traffic: predicted vs. actual traffic volumes
For transit: predicted vs. actual ridership

Update/re-validate travel models more frequently...perhaps annually

For transit: FTA's STOPS allows this easily
For other modes: looking to "big data" to streamline model updates

Insight
Transportation Consulting

Happy Anniversary, OTDMUG!