

A Review of Travel Forecasts

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● **LOOKING AHEAD** for the purpose of estimating future conditions and events is a commonplace and necessary thing to do. Although most forecasting is short range and often handled informally, long-range forecasts serve an important role in planning large scale public works.

One of the factors which can add materially to the cost of public improvements is premature obsolescence. Where the use of public facilities can be expected to increase in future years, it is in the public interest to appraise that future use as accurately as possible in order to conserve the public wealth.

In the field of highways, during the past ten years increased attention has been given by highway administrators to evaluating the extent of future motor vehicle travel on roads and streets under their jurisdiction. They have learned that highways built to exacting structural standards can become obsolete years before their anticipated life is reached if the volume and character of traffic exceeds expectations. This has led to the practice of preparing forecasts of travel to aid in determining the traffic volumes and parking demands which can reasonably be expected in the future.

Forecasts of travel are sometimes used to estimate future maintenance requirements and the need for future road construction and reconstruction. In some states, such information is used in preparation of budgets. Estimating future road user revenues cannot be done realistically without some knowledge of road use in future years. These forecasts are also fundamental in the preparation of long-range plans for highway development.

SOURCE OF DATA AND METHOD OF ANALYSIS

The information on which this report is based was taken from published reports on long-range highway needs prepared by 28 states. The data pertain to each state as a whole rather than to a particular system of roads or streets within the state.

No attempt was made to analyze the methods by which the forecasts were made. Forecasts can be developed in whatever amount of detail may be desired. Methods have been developed in forecasting population of a single city which are so complex as to require solution by high speed electronic computing machines. Forecasts may also be as simple as free-hand line drawn on a piece of paper. However, since data on methodology were not available and since the purpose of this study was to determine how successful the forecasts were (particularly in the light of what transpired after the forecast was made), methodology was not analyzed.

In every instance, the forecast of travel included study of several related elements which have a direct and controlling effect. Not all of the states included the same elements in their published reports, and none attempted to include directly an evaluation of future economic forces although each forecast certainly included some consideration of these matters. Generally an analysis and forecast of several items were made and then related to the forecast of travel. Included in the reports are the following: population; motor vehicle registration; motor vehicle ownership; total motor vehicle travel, or total highway use of motor fuel; and travel per motor vehicle, or highway use of motor fuel per vehicle.

Although none of the state reports included a forecast of future economic conditions, some reports indicated their forecasts were valid only if certain conditions prevailed during the forecast period. Generally, these included such items as continued prosperity, absence of a full-scale war, and other matters pertaining to economic conditions.

FORECASTS COMPARED

The forecasts were all made in the years since 1945. Actual data for the year 1955 were then obtained to permit comparing at least a portion of the forecast with a record

TABLE 1
RATIO OF FORECASTED CHANGES TO ACTUAL CHANGES SINCE FORECAST WAS MADE^a
Population, Motor Vehicle Registration, Ownership, Travel per Vehicle and Total Travel

Region and State	Period Covered by Forecast	Start of Forecast Period to 1955 (years)	Population	Motor Vehicle Registration	Motor Vehicle Ownership	Travel per Motor Vehicle, or Highway Use of Motor Fuel per Vehicle	Total Travel or Total Highway Use of Motor Fuel
New England							
Maine	1947-70	8	1 5	3.3	4 8		3.8
New Hampshire	1947-60	8		14 0	24 8	3 2	12.5
Middle Atlantic							
New York	1948-65	7	2.1	2.6	2.5		2 5
Pennsylvania	1950-61	5	3 5	3.4	4 9	0 0	2 5
East North Central							
Ohio	1949-70	6	5.0	8.2	9 6	2 3	5.6
Indiana	1947-70	8	2.3	2.6			2 8
Illinois	1947-60	8	4.0	5 7	6 7	0.1	3 9
Michigan	1946-70	9	2 8	5.2	7 4	Forecast an increase— actually declined	4.1
Michigan	1954-75	1		3 2	9.3		2.3
South Atlantic							
Delaware	1954-70	1	4 3	1.4			2.0
Maryland	1951-65	4					
Virginia	1950-70	5	1 5	2.8	3 8	2.6	2.7
Virginia	1952-65	3	1.2	2 0	2.7		Forecast not reported
West Virginia	1953-75	2	3.5	1 9	2.2	4 6	2.0
N Carolina	1953-75	2	1.2	2.6	3.9	Forecast an increase— actually declined	2 3
Florida	1951-72	4	2.0	3.5	6 0	1.4	2.4
East South Central							
Kentucky	1954-75	1	0 8	3.7	6 6	Forecast an increase— actually declined	
Tennessee	1954-75	1	1 5	1 8	2.3	3.0	
Mississippi	1948-70	7	0 3	5 7	11 9	Forecast decline ex- ceeded by 1 3 times	5 4
West South Central							
Louisiana	1953-75	2	2.1	3.7	7.0	Forecast an increase— actually declined	2 2
Texas	1955-75	0	Forecast too recent for comparison				
West North Central							
Minnesota	1953-75	2	4 1	3 0	3 3	5.7	3.0
Iowa	1947-60	8	Forecast not reported				2.9
N Dakota	1951-70	4	3.3	2.0	2.6	12.7	2 6
Nebraska	1947-70	8	2.8	3.4	0.9	17.2	10 2
Kansas	1947-70	8	6 5	8.6	-	1 9	5.3
Mountain							
Idaho	1953-65	2		1.6	4.3	Forecast an increase— actually declined	1 3
Colorado	1949-69	6	3.7	2.7		6.0	3.4
Arizona	1953-64	2	Forecast not reported				1 4
Pacific							
Washington	1947-70	8	1.7	3 5	8.6	2.0	2 6
Washington	1953-65	2		1.8	7.2	Forecast no change— actually declined	1.8
Oregon	1947-70	8	1.2	1 6	7 2	Forecast no change— actually declined	1.7
California	1945-60	10	2 1	2 9	3.6	Forecast no change— actually declined	2 9
California	1951-70	4	1.3	1 3	2.9	0 5	1.2

^aRatio. Actual average annual rate of change from year when forecast was made through 1955. Divided by forecasted average annual rate of change.

of actual change for periods up to a maximum of 10 years.

Actually the forecasts for each state were compared in two ways. They were compared with conditions which developed subsequent to the forecast, and then they were compared to the trend of the 20 years preceding the forecast.

As yet there is nothing standard about the length of forecast period used by the various states. Some were only 10 years. One covered 24 years. Because of the varying time periods and in order to have a standard unit for comparison, the increases (or decreases) in the five items studied were converted to show the annual rate of change. For example, a forecast showing an expected increase in motor travel of 6 billion vehicle-miles in a 20-year period would be expressed as an average increase of 300 million vehicle-miles per year for 20 years. If during the 5 years following the forecast,

travel increased two billion vehicle-miles, this would be expressed as an increase of 400 million vehicle-miles per year (for the 5 years).

This averaging of forecasts to a yearly rate creates a bias. Where the forecast was other than a straight line, the average rate does not reflect the correct position of the travel trend during intermediate years. However, in the majority of the state reports, figures for intermediate years were not available. A substantial number of forecasts differed so greatly from the actual trend that the differences between a straight and curved line were decidedly secondary.

Since the purpose of this study was to compare forecasts with actual data, the ratio of the two annual rates was computed. This was done for total travel and the components of travel as reported by each state. The resulting ratios are shown in Table 1. Ratios were computed so that a value less than one means that the rate of increase actually experienced was less than had been forecast. Correspondingly, a ratio greater than one means events following the forecast were greater than had been expected. The ratio itself gives the extent of the divergence. For example, a ratio of 0.5 means that the rate of actual increase was only half as great as had been forecast. A ratio of 1.0 indicates the rate of change actually experienced was the same as expected. A ratio of 3.5 shows the rate of change which occurred exceeded that which had been projected by 3½ times.

Table 1 gives the period covered by the forecasts and the number of years included in the comparison period for each state. For convenience, states are grouped according to the arrangement used by the U. S. Bureau of Census in its population reports. In this way, states having similar characteristics can be readily compared.

THE GENERAL TENDENCY

Many of the ratios exceed 1.0, indicating that the rates of increase actually experienced are greater than had been forecast. To show this more clearly, Table 2 was prepared. Here the data are grouped according to size of ratio. This arrangement makes it clear that very few forecasters were too optimistic. In only a few instances was there a ratio less than 1.0 (actual rates of increase smaller than forecast).

Population

For example, in 25 of 27 forecasts of population the actual rate of population increase was greater than expected. It is particularly significant that in 60 percent of the forecasts the actual rate of increase exceeded the forecast by more than two times.

TABLE 2
RATIO OF FORECASTED CHANGES TO ACTUAL CHANGES SINCE FORECAST WAS MADE^a
Population, Motor Vehicle Registration, Ownership, Travel per Vehicle and Total Travel
States Grouped According to Size Ratio

Range in Ratios		Population	Motor Vehicle Registration	Motor Vehicle Ownership (vehicles per 100 persons)	Travel per Motor Vehicle or Highway Use of Motor Fuel per Vehicle	Total Travel or Total Highway Use of Motor Fuel	Range in Ratios	
From	To						From	To
0.0	1.0	2	0	1	3	0	0.0	1.0
1.1	2.0	9	10	0	3	6	1.1	2.0
2.1	5.0	14	15	13	5	18	2.1	5.0
5.1	Above 5.1	2	6	12	5	5	5.1	Above 5.1
Decreased instead of increasing as forecast		0	0	0	8	0	Decreased instead of increasing as forecast	
Rate of decline forecasted was exceeded		0	0	0	2	0	Rate of decline forecasted was exceeded	
Number of forecasts		27	31	26	26	29	Number of forecasts	
Number of states		25	27	22	23	26	Number of states	

^a Ratio: Actual average annual rate of change divided by forecasted rate.

When the trends for the 20 years preceding the forecast were studied, it was found that nearly one-half were smaller and about one-half were greater than the forecasted rates.

Registration

In all cases, forecasted rates of increase in motor vehicle registration were below the increases actually experienced subsequent to the date of the forecast. In more than two-thirds of the states the actual rate of increase was more than double the rate forecast.

In one out of five cases the actual increase was more than five times greater than had been anticipated. There was an even division when the forecast was compared to the rates during the 20 years preceding the forecast—about one-half were smaller, the remainder were greater.

Ownership

The rate of change in motor vehicle ownership is, mathematically speaking, a second differential. As such, it appears to be the one which gives forecasters the greatest difficulty. Only in one case was the actual rate of increase in ownership less than forecast. In 96 percent of the states actual increases were at a rate at least twice that which had been forecast. In nearly half the instances, actual increases were at a rate more than five times greater than expected.

Travel per Vehicle

This is the only item studied in which there were decreases. A reduction in travel per vehicle is, of course, not entirely unexpected where ownership is rising. Because of the tendency for travel per vehicle in some cases to decrease or at least increase slowly, it made possible a better showing for the forecasters. Even here, however, in one-half of the states the actual increases were at a rate greater than forecast. In one out of ten cases the actual increase was at a rate less than forecast. In nearly one-third of the instances there was an actual decline in travel per vehicle rather than an increase as forecast. There were also two states where a decline had been forecast and subsequently the rate of decline was substantially exceeded.

Total Travel

The travel trend is, in a sense, a composite of the other components. This is evident in the distribution shown in Table 2. In no case was the actual rate of increase in total travel (or total highway use of motor fuel) less than forecast. In more than three-fourths of all forecast efforts, it developed that actual increases were at a rate more than twice that expected.

Compared with the previous 20 years, it was again found that about one-half were smaller and one-half greater than forecast.

INTERPRETATION AND SUMMARY

Forecasts of travel and related items made during the past decade have been definitely on the low side. With the exception of travel per vehicle, increases after the forecasts have been at rates greater than forecast. In roughly two-thirds of the cases investigated, actual increases were at rates more than two times greater than had been foreseen.

Motor vehicle travel is one of the factors which has an important bearing upon the nation's economy. However, little work has been done so far to relate a forecast of travel to future economic conditions, but it is important to the reasonableness of travel forecasts that this be done. If the nature of the nation's economy for the decade ahead had been foreseen in 1946, it would have greatly eased the problems of the travel forecaster. Since the extent and duration of economic prosperity in the past 10 years was not adequately anticipated, the accuracy of travel forecasts was correspondingly affected.

It is also possible that part of the reason for low forecasts is that, as a matter of policy, public officials have been unwilling to overstate themselves on the extent of future motor vehicle registrations and fuel consumption. Both of these items have a direct bearing on highway user revenues as well as on the needs of the highway systems.

Until more accurate forecasts can be made, it will be a matter of sound policy to make a periodic review of travel forecasts and related items. Forecasts should be adjusted in the light of current conditions and as new information regarding the future becomes available. As knowledge of the means for guiding the national economy increases, the ability to forecast future travel will improve.