Outlook for Better Regional and National Forecasts of Highway Traffic and Finance

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This paper evaluates briefly procedures in current use in economic forecasting and discusses certain key factors which show promise of improving the techniques of economic forecasting, especially those associated with the prediction of traffic volumes and highway user revenue.

● THE ART of forecasting traffic requirements for specific facilities has reached a high degree of development, as compared with relatively crude techniques still customarily used for regional and national estimates. This is attributable to the differences in the inherent nature of the two situations. In the case of specific facilities, a competent observer normally can isolate and measure the impact of primary traffic generators at reasonable cost. In contrast, regional and national forecasts involve the measurement of the net impact of a complex and interrelated set of traffic generators scattered over wide areas. Those generators are extremely difficult to isolate and measure in a direct fashion. Consequently, the customary solution is based on general relationships with broad economic indicators, such as Gross National Product.

There is much to be said in favor of continuing this practice. Such national forecasts can be made quickly and at nominal cost. Almost all of the essential statistical information is already available in published reports. Economists and business analysts are continuously forecasting the trends of industrial production or Gross National Product, so that the highway expert merely needs to choose among conflicting outlooks. The mechanical relationships can be handled by a statistical clerk, using simple data inputs, a few charts, and a desk calculator. This method is considerably more difficult and less useful for regional forecasts because adequate statistics and independent forecasts of economic activity are not generally available on an area basis.

But there is a real danger in this correlation technique. Changes in relationships can and often do arise without becoming apparent until long after the event. For example, the "flight" of families from densely populated sections of cities to outlying suburbs can be measured long before its effect on automobile use can be detected by statistical correlations with general economic indexes. New construction on vacant suburban lots will increase the density of population in these areas, and may lead to new public transportation service and car-clubbing, which in turn may modify the long-run relationships. The inability to detect or anticipate changes in relationships may lead to serious errors in long-term forecasts based on correlation with general economic indexes.

A method is needed which will avoid that danger, and the author believes the prospects for an effective method are promising. Electronic computers make it feasible to work with masses of data and to use complex statistical procedures. A rich supply of input data will become available shortly from the current cycle of censuses—especially the population and housing censuses. Factors can be developed from analyses of results of the motor vehicle surveys already undertaken by approximately one-half of the states, and by metropolitan area studies, origin-and-destination studies, and other special reports. In some instances, primary reliance may need to be placed on expert judgment for factors that have not been adequately measured by available surveys.

SUGGESTED SOLUTION

To sharpen the comments, the following discussion is pointed toward the forecasting of three related elements: (a) number of automobiles in operation, (b) vehicle-miles operated, and (c) gasoline taxes paid. The suggested method is based on a fundamental assumption (yet to be proved) that the key traffic generating force is the family unit or household, and that automobile ownership and use is significantly related to household characteristics—composition, location, economic and occupational status and other demographic factors that can be objectively measured. A detailed and reliable "profile" of traffic generators (households) can be obtained from the 1960 Census of Population and Housing. Starting with those "profiles," computer programs can be created for estimating automobile ownership, vehicle-miles, gasoline consumption, and taxes paid, by region and for the nation as a whole. This would be done by the application of factors derived largely from analyses of available (or new) automobile use and operation studies, tempered by expert judgment. The computer programs would be sufficiently flexible to estimate the probable net impact not only of existing relationships but also of anticipated changes in any one or more elements in the basic demographic profiles or vehicle use factors.

The suggested solution is described in somewhat greater detail by the following:

1. Private automobile ownership and use tends to be a family (or household) affair, even when two or more vehicles are involved. Households having similar composition, economic and occupational status, home-to-work, and other location factors, probably tend to be similar in automobile ownership and operation.

The 1960 Census returns will support initial measurement of relationships between detailed classes of households with regard to composition and location factors, automobile ownership and method for traveling from home-to-work. Some supplemental information may be inferred from the automobile ownership and financing inquiries collected as a supplement to the 1959 Current Population Survey. Additional information may also be derived from the small-scale automobile use survey that is now being done by the Bureau of the Census for the Bureau of Public Roads, and from other source materials.

Following the initial detailed measurement of relationships, the results of those analyses can be used as factors for the computer programs. In practice, the household characteristics probably can be grouped into a limited number of classes that are closely related to automobile ownership and use factors as well as being significant for estimating demographic trends.

2. The forecasting problem then involves two general problems: (a) anticipating trends in household composition and location, and (b) changes in automobile ownership factors. Demographers are continuously engaged in analyzing and forecasting trends in family composition, mobility, location, and other aspects. Consequently, the highway analyst probably can look to the demographer for advice on population questions. The remaining problem involves changes (if any) to be expected in the automobile ownership factors by families, in which the composition and locational factors remain unchanged. The testing of trends in ownership factors can be done effectively by small-scale surveys from time to time.

3. Having arrived at an estimate of the number of automobiles owned, the problem then turns to the estimation of vehicle mileage. It is believed that a close relationship will be found between the characteristics of the family (composition, income, location, etc.), number of automobiles owned, and annual vehicle-miles. Furthermore, when the demographic and ownership factors are held statistically constant, there is a good chance that the annual vehicle-miles will be found to be relatively stable. In that event, factors can be developed from small-scale surveys which may then be applied to the estimated total number of vehicles in the preceding step.

4. Having developed a forecast of vehicle-miles in the preceding step, an estimate of gasoline consumption and tax receipts could be made by applying factors for miles-per-gallon of gasoline and anticipated tax revenues per gallon. Past experience indicates that it is difficult to collect reliable facts on gasoline consumption from a probability sample of drivers.

The engineering approach should be used for this phase of the problem. Average miles-per-gallon of gasoline tend to be related to three classes of factors: (a) the vehicle itself (weight, transmission, etc.), (b) the general road and traffic situation (city streets, open highways, etc.), and (c) the individual driver.

Measurements of miles-per-gallon of gasoline can be made readily for selected classes of vehicles under controlled road and traffic situations. An average could be made by giving appropriate weights to the results for each class of vehicle under the various types of road and traffic situations. An allowance for differences caused by the fact that the test drivers were not "average" drivers could be based on judgment.

5. The first four items previously discussed were related to private automobiles (including company cars normally garaged at home). Two other major classes of automobile ownership need to be recognized: (a) cars owned by business organizations (other than vehicles assigned to individual employees and garaged at their homes) and (b) automobiles owned by vehicle rental agencies.

With respect to the latter, data on ownership, vehicle mileage, and gasoline consumption probably can be obtained directly from the company's monthly or annual operating records. If not, the factors could be developed readily from reports maintained by the owners for a systematic sample of vehicles. The essential data for other business automobiles would be a bit more difficult to obtain, primarily because there are no readily available lists from which to draw either a sample of automobiles or names of businesses that own and operate them. However, there are various ways in which samples could be obtained, and the essential factors derived, without imposing a substantial reporting problem on anyone.

SUMMARY

To summarize, forecasting regional and national highway traffic trends customarily have been based on correlations with general economic factors. For some purposes, this simple basis is excellent, despite its potential danger. But a more reliable basis is essential for long-term planning.

The outlook for better forecasts is excellent. Some improvement doubtless will come from more detailed, scientifically designed automobile use surveys and an intensive development of computer programs. There is no conflict between the two approaches; there should be a combination of them in the not too distant future, with the computer taking the important role.