

## Task 6.1.1 Review of the Roles of Cross-Sectional and Temporal Models

### Discussion

The current WTSM car ownership model is a cross-sectional model estimated on a single household interview survey data set. Such models have been widely used, and are effective in reflecting the variation within the data in terms of variables such as income, household structure and location.

General experience is that while the cross-sectional models retain the ability over time to reflect the **distribution** of car ownership (and specifically the variation between zones and household types), they are not usually successful in representing changes in the **level** of car ownership. Put another way, the cross-sectional model is unable to allow for trend effects which are unrelated to the above-mentioned cross-sectional variables, and it is therefore necessary to import some corrective trends.

Ideally, this would be done using a cross-sectional data set which contained data for different years, possibly of a panel form, but more likely as a “repeated cross-section”. For example, in the UK, where the Family Expenditure Survey [FES] is carried out on a continuous basis, it is possible to estimate car ownership models using cross-sectional data over a period of nearly 30 years. Analysis of this kind has been able better to determine the sort of trends which are required in addition to the purely cross-sectional relationships.

In the case of Wellington, some information along these lines might be obtained by pooling the data from the 1988 and 2001 household surveys. However, clearly a reasonable number of points are necessary to establish a convincing trend. In addition, the UK FES has the advantage of consistent definitions over time: experience shows that even with the best of intentions, surveys repeated at long intervals tend to have problems in this respect.

In the absence of suitable repeated cross-section data, it is necessary to apply more coarse trends on the basis of aggregate time series data relating to the growth of car ownership.

Clearly, these “trends” may be partly modellable. For example, we can expect an effect from car price movements (see below), and from the level of driving licence holding. There is a preference towards reflecting such variables explicitly, as far as possible, not least because this can improve the ability to model policy. It must be recognised, however, that the data may not be adequate for this.

The main point to stress is that it is not reasonable to expect a cross-sectional model to forecast correctly without adjustment.

#### Car prices

Since car prices, either by policy or because of macro-economic conditions, may move differently from the general experience of the past, it is certainly useful if the car ownership model can respond explicitly to this variable.

For obvious reasons, there is no possibility of estimating the effect of car prices from cross-sectional data. Moreover, it has proved quite difficult to estimate the effect from time-series data, given the correlation with other variables. However, some successful studies have been

carried out, and there are also methods relating to vehicle type which can make use of the greater variability of prices relating to different kinds of vehicle.

Given a credible elasticity, the best approach is to incorporate the price term in the model in a suitable form, and calibrate a coefficient which delivers the accepted elasticity. This has been done in the UK, using a modelling structure essentially similar to that in the current WRC model.

As implied earlier, it is preferable to allocate as many of the temporal effects as possible to explicit factors (such as car prices). The residual change over time can then be represented by an unexplained trend.

#### Licence-Holding

An additional effect of increased licence-holding on the trend in car ownership growth has been specifically incorporated in some model systems. Explicitly or implicitly these models represent how licence holding is expected to increase through a population cohort effect: the current generation of younger people is far more likely to have licences than previous generations, and will retain these licences as they age, thus increasing licence holding rates in older population cohorts in the future.

This effect may be most marked for the retired household segments which are to be specifically modelled, and may influence the future rate of car ownership growth.

#### Car Ownership Trend Forecasts and Model

A respectable review of car ownership trends in New Zealand and the development of a temporal forecasting model was done by Booz Allen & Hamilton for Transit NZ in 1997. This model also included a car price term. For efficiency, before we consider anything more ambitious, this model will be reviewed against international practice and the most recent trends (which have also been affected by car price changes). It may be a suitable basis for temporal controls on the car ownership forecasts, perhaps with some minor updating.

### **Decision**

As a result of these considerations, the decision was taken to develop a cross-sectional model of household car ownership from the household survey data, and to constrain this to the forecasts of an updated model of the temporal trends in car ownership.