Commercial Vehicle Forecasting Model Specification

Overview

The simplest, least expensive approach would be to establish how the proportion of vehicles varies by road type and function, and to use these proportions to estimate future commercial vehicle numbers from the forecasts of car traffic. The presumption that the proportion of commercial vehicles will remain stable in future could be tested against the available historic evidence. This was judged to be inadequate for WSTM, given the importance of commercial vehicle movements raised in the Statement of Requirements.

For greater modelling refinement, the most common approaches to commercial vehicle matrix development involve deriving a prior matrix and applying a matrix estimation process to tune the often very rough prior matrix to reproduce commercial vehicle screenline counts. The key issue in this approach is the derivation of the prior matrix. Depending on resources, it may be based on intercept survey data, a matrix available from earlier modelling studies or a synthetic matrix derived from whatever information can be assembled cost-effectively. This might include the experience of other NZ or international models, registration number surveys, premises trip rate surveys and land use data. This is our preferred approach and is discussed further below.

The most sophisticated research methods rely on premises surveys (which historically have proved both expensive and ineffective) and the relationship between travel and commodity flows in the local economy. Such complex methods could not be accommodated within our constrained budgets and the required data bases were not available (input/output tables, commodity data etc).

Issues to be considered regarding our preferred approach were:

- the segmentation of commercial vehicle flows;
- the collection of classified counts on cordons and screenlines for matrix estimation and validation;
- the assembly of trip rate data through counts or registration numbers for special generators (eg ports and airports) but also if feasible for other self-contained major commercial vehicle generating areas;
- means of establishing a prior matrix: two appear open to us: (i) to use that from the current model or (ii) to construct such a matrix empirically from the aforementioned data sources and local/international evidence on the appropriate distribution model specification;
- the prior matrix would then be fitted to the count data using matrix estimation techniques;
- using historic count data (if available) to obtain some idea on expected growth trends and relate this to changes in employment and other land use parameters and economic indicators.

With the objective of establishing a basic commercial vehicle model cost-effectively, our preferred approach was as follows:

- a commercial vehicle model would be developed comprising current year matrix, growth factors and a multi-user assignment procedure option for specific studies in which commercial vehicle paths could be differentiated;

- the choice of vehicle types (eg lights, mediums and heavies) remains to be resolved;

- the base matrix will be devised using a combination of surveyed or otherwise obtained trip rate data for special generators (such as ports, industrial areas and airports), sample surveys of commercial vehicle usage and a 'prior' trip matrix (the current WSTM CV matrix); this matrix will be scaled using matrix estimation techniques (perhaps on restricted O/D pairs) to match classified vehicle counts;

- growth trends will be related to employment distributions and historic trends (such as are available).

Vehicle Types

Decisions on vehicle types to be modelled and on the specification of the commercial vehicle model were made in the preliminary studies of Task 2.

Key findings of our analysis of commercial travel were, as expected:

- there are very few trucks possessed by households (1.4% of the vehicles), while vans/utes account for 9% of the vehicles;
- 5% of BU (business) trips are by truck, and most (63%) are for pick-up/delivery of goods;
- 13%of BU trips are by company cars, of which 23% are pick-up/delivery of goods;
- 24% of BU trips are by vans/utes, of which 28% are pick-up/delivery of goods;
- 48% of BU trips are by private cars, of which 8% are pick-up/delivery of goods.

The major points were that truck trips did not feature in the household survey, and were mainly used for the carriage of goods, whereas van/utilities played a major part in business travel, and the majority of trips were not involved in the carriage of goods.

This analysis confirmed the importance of commercial vans/utes and we decided to distinguish the following vehicle types:

- cars,
- vans/utes (light commercial vehicles),
- trucks (medium and heavy commercial vehicles).

Light Commercial Vehicle Model (see figure)

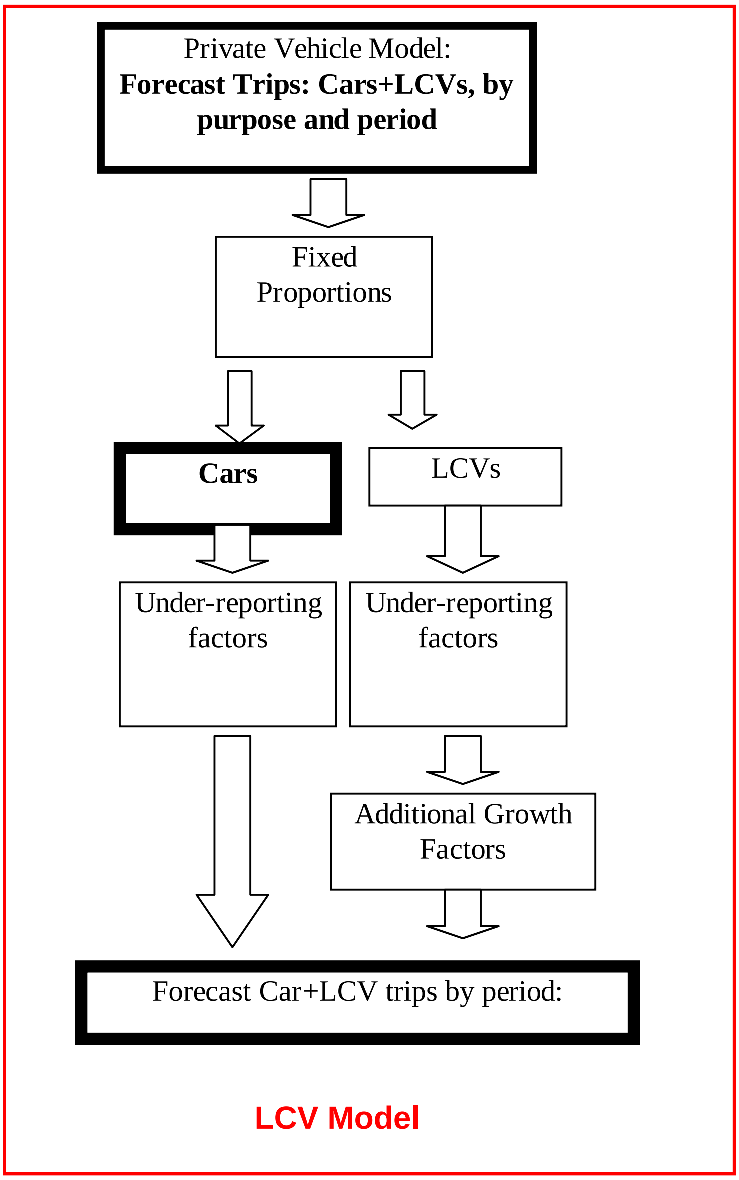
Apart from the classified counts, the only information which we have available on light CVs is what is in the household survey. This is too sparse to consider developing a separate light CV matrix.

Therefore, in the first place, we shall develop personal travel models from the household survey in which cars and light CVs are combined. Subsequently, we shall use simple matrix factors to split light CVs from cars.

We shall use matrix estimation on the light CV matrix to improve its representation of traffic flows. Our main concern is that we are likely to have under-sampled light CVs in the household survey and the matrix estimation should enable trip shortfalls to be rectified.

We also expect light commercial vehicle growth rates to be more closely related to economic growth than household business travel, and will therefore devise an additional growth factor to account for this.

Having thus adjusted the light CV matrix, it will be re-combined with the car business travel matrix.



Other Commercial Vehicle Model (see figure)

The approach will be based on applying growth factors to a current year CV matrix.

The 2001 CV matrix (for medium and heavy CVs) will be developed from a number of data sources using matrix estimation techniques:

- the matrix from the present model,
- classified counts for 1996 and a sample for 2002,
- additional classified counts at major CV generators.

Growth factors will be developed from a trip end model consistent with a number of studies, replacing the present trip end model which is less than convincing. Such models reflect changes in the distribution of population and employment but not the wider economic and logistics trends. At present it is unclear what evidence can be found for these trends, but part of the project will be to seek such information. We have information on the national vehicle stock as a starter, but we need to establish historic trends, if not for Wellington then for other interurban and urban contexts in NZ.