Rail in National Transport Modelling

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Outline

- passenger transport, not freight
- regional models as well as national
- want rail improvements but avoid deterioration for other modes

Three points of discussion:

- general challenge of multi-modal modelling for rail
- some difficulties in principle in current model
- Significance identify 3 specific problems:
  - low cost elasticity
  - overestimation of short-distance rail traffic
  - overestimation of use of main stations

  second and (probably linked) third issue have been alleviated but not totally satisfactorily and cost elasticity still too low

It’s difficult to model rail accurately in a multimodal setting

- ‘minor mode’, so not much data in general surveys
  - and not much attention, sometimes
- low market share means that elasticity model can be acceptable for looking at pure rail policy
  - because there is not much impact on other modes
- and the record of multi-mode models is not good for rail
  - this also has to do with the limited quality of those models
- **but it’s important to model all modes together for national policy**
- there are specific issues in multimodal modelling with rail
  - multi-level choices mean lots of inclusive-value connections
  - logsum connections implied by utility framework are not always right
- in particular when obtaining cost from assignment

Logsum is not always the right linkage between sub-models

- sometimes choice is determined by the system, not the traveller
  - choice of station (partially?) determined by home location
  - choice of train (partially?) determined by timetable
  - generally, when relevant attributes relate to alternatives, not traveller so in principle it's a 0/1 choice, i.e. an assignment
  - then we should use the average
- often the logsum is right
  - when variation in unmeasured preferences is important
  - choice probabilities lie between 0 and 1
- using the best alternative is dubious in forecasting
  - means that policy changes to other alternatives have no impact
  - while changes to the best alternative have overstated impact (unless it stops being best, perhaps)

The present model has a number of *ad hoc* adaptations

- which fix up specific issues but which may give unintended problems
  - introduction of 1/distance variable for train
    (does this undermine the estimation of IVT or cost coefficients?)
    (are the IVT coefficients for train and BTM appropriately related?)
  - what does the 'backing out' do to train utility?
    (it seems the overestimation of train should be corrected by the ASC)
    (maybe the utility of large stations is important)
  - how can the 'connections' variables be justified?
    (it's not clear what the behavioural justification is)
- these may be reasonable but their effects are not easy to see

We all know what elasticities should be

☺ though we don't necessarily agree what they are

selected kilometrage elasticities for rail (or pt):

with respect to	Fare	Time (IVT)	Income
UK West Midlands (pt)	-0.49	-0.81	
UK train (new research)	-0.52	-1.19	+0.51
UK long distance (approx)	-0.8	-0.5	+0.7
UK Government (WebTAG)	-0.2 to -0.9	no advice	no advice
Sydney	-0.45	-0.65	
Sweden	-0.6 to -0.7		

expect higher fare elasticities where fares are higher, i.e. in UK
but these cost elasticity values are generally lower than the Audit

Wardman's new meta-analysis should give good comparisons, but it's not simple to extract overall averages

Is cost more important than time?

- simple equation, follows from the definition of elasticity:

$$\frac{\eta_{cost}}{\eta_{time}} \cong \frac{average\ cost}{VOT * average\ time}$$

- this is quite rough, because cost, time and VOT all vary
- but it gives an indication

- the Audit says the ratio ought to be 1 to 2, though it seems the low end might be more reasonable
- but the ‘current version’ gives 1/6 to 1/7 and the ‘NS data’ version is only slightly higher

How does rail cost actually work in LMS?

- through los from train choice model (best train only)
- through station choice logsum
  - is there a logsum coefficient (or 2) that dilutes the impact of cost?
  - should also appear in other mode cost nesting
- through ToD averaging
- what is the MDToD cost function?
  - UK experience suggests that log cost improves fit to data but gives too low elasticity
  - ‘mixed’ log and linear can give better results on balance
  - model need not be based entirely on one set of data, but take account of other information
  - elasticity and value of time are also data, yielding information about behaviour

Recommendations

- review the model structure to ensure all the linkages are optimal
  - e.g. the use of the single best train
- review special adaptations to consider whether these might be having unexpected impact
- check that the logsum coefficients are operating correctly
- look at the cost function to see whether the use of log cost might be depressing the cost elasticity excessively
- check VOT and estimation accuracy of cost coefficients
- check the elasticity targets to ensure these are reasonable


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