Australian Government
Department of Infrastructure and Transport
Bureau of Infrastructure, Transport and Regional Economics

Patronage Forecasting Symposium: Summary of Outcomes

Symposium participants took part in workshops focussing on two themes: modelling methodology, and incentives.

Modelling methodology

Participants in this workshop discussed problems and solutions relating to: modelling; data; assumptions; and presentation.

Models

Workshop participants identified a number of modelling problems relating to traffic forecasting. In particular, it was suggested that:

- Large city-wide strategic models are inappropriate for toll roads, which are highly local in nature. As suggested by Dr Bain, the volatility of model inputs and traffic are higher at a more localised level. There is much within-zone variation that is thrown out as zones are aggregated.
- There is a degree of inaccuracy in modelling transport network links that are close to or at full capacity.
- There can be inadequate checking through calibration (testing against the base year), validation (testing the predictive power of the model) and sensitivity testing.
- There is often inadequate modelling of commercial vehicle traffic, which is more volatile than passenger traffic, and about which there is less public data
- The winning consortium with the highest forecasts sometimes assumes the largest catchment area.
- No account is taken of interactions between toll roads where road users travel on multiple toll roads as part of the same journey.
- Models do not take into account behaviours such as people using a toll road three days a week or only on return journeys.
- Demand elasticities can differ between peak and off-peak periods and in recessions and following fuel price rises.
- Toll road users may be buying reliability improvements rather than time savings. Reliability should be considered for all roads, not only the toll road.

- Ports, freight terminals, and airports are not well modelled.

Workshop participants suggested a number of possible ways forecasting problems could be addressed. For example, it was suggested that:

- The main outcomes of the large city-wide strategic models could be cross-checked by using simple spreadsheet models (which focus on key drivers to the forecast traffic).
- The outputs of strategic models could be used as inputs to a wider judgement-based process. Cross-referencing and other checks could help improve the final forecasts.
- There is a need to find an improved way to adapt the governments' large strategic models for use in forecasting localised toll road traffic.
- There is a need to better understand the performance of highly congested transport network links.
- Best practice guidelines for calibration, validation, and sensitivity testing could be developed. These could include, for example, guidelines on how to calibrate against a larger set of criteria.
- More use of backcasting would be desirable: a model's forecasting accuracy can be tested by using it to 'backcast' past years, and compare the results to known traffic levels.

Data

Workshop participants identified data limitations, in terms of both quality and quantity, as a significant problem. Specifically, it was suggested that:

- Data is old. Part of the problem is the time required to recalibrate four-step models. However, more up-to-date data would be useful. For example, Census data, collected every five years, can take up to two years to be processed, which can necessitate using 2001 data in 2008.
- Data is not sufficiently localised.
- The level of service data (for example, on reliability, speed and service quality) is insufficient.
- Some data, such as that on value of time, is insufficiently segmented to describe travel behaviour. This has made it difficult to capture phenomena observed on some roads such as willingness to pay tolls being higher for journeys from work than for journeys to work.
- Origin-destination commercial freight data would be useful (although this can be commercially sensitive).
- More data from existing roads for benchmarking would allow modellers to be better informed as to whether their assumptions are reasonable.
- More data on changing employment patterns (such as increases in casualisation and four-day working weeks), which can spread or decrease commuter traffic, would be useful.
- More data on travel at different times of the day and week.

Workshop participants suggested that greater sharing, and more timely publicising of information by government agencies, toll road companies and third parties would reduce data problems. It was suggested that if the data is sensitive, such as commercial freight data, a clearinghouse could de-identify the data somewhat. Procurement models could be changed to encourage public release of data collected during the bidding process.

As data lags are difficult to avoid for the Census, more up-to-date localised data could be collected to supplement it.

Assumptions

Workshop participants identified a number of problems relating to assumptions, including the following:

- Projections of population and employment, which have a strong influence on toll road performance, are often undertaken by third parties, and can be somewhat arbitrary.
- The expansion factors used to convert estimates from peak hour numbers (produced by commuting models) to daily or annual numbers are critical.
- It was agreed that incorrect assumptions about the ramp-up period were not as critical as the traffic never approaching the full forecast level.
- Assumptions about changes to the network in the future are based on government plans, but these may not be realised.
- Assumptions about speed flow curves, especially when the road link is highly congested.. This is one of the main causes for inaccuracies in modelling roads close to or at capacity.
- Assumptions about land use changes might not be so important because they are long term. If the toll road survives the first five years financially (too short for land use changes to have much impact), it is likely to survive longer.

A number of potential solutions were identified, including:

- Improve population and employment projection methodology. However, this is often beyond transport modellers' capability as they tend to rely on official figures.
- More modelling (peak and non-peak) should be undertaken to produce more accurate weekly traffic volumes instead of simply relying on peak-hour modelling.

Presentation of forecasts

Workshop participants agreed with points made by Dr Robert Bain, that forecasts should be presented with an appropriate range rather than as single numbers, and that realistic expectations of forecasting accuracy should be encouraged. It was suggested, for example, that forecasts could be produced with different levels of confidence, as is often done with construction cost estimates.

It was also suggested that unclear presentation of assumptions is often a problem. A possible solution would be for a standard template to be used for presenting assumptions (possibly one already in use could be used more broadly).

Incentives

Problems

Some workshop participants identified a the potential for incentive-related problems in traffic forecasting, stemming from the different incentives faced by parties involved at different stages of toll-road's lifetime, and with potentially perverse incentives of the procurement/bidding process.

Non-alignment of incentives

It was suggested that those involved at the bidding stage of a toll-road project often face different incentives to those with long-term equity in the project. In particular, financiers and constructors

(who are often project proponents) have a strong interest in design and construction functions associated with a successful bid. Longer term equity, which is more dependent on traffic growth, is often less involved at the bidding stage.

The bidding process

It was suggested that even if forecasting methods were correct on average, the bidding process itself might introduce a bias (so that those used in winning bids are likely to be biased upwards).

- Following the decision to invest, and the CBA and EIS processes, the government's interest is in minimising short-run costs to taxpayers, by seeking the lowest government subsidy (as opposed to maximising social welfare). This will tend to favour bids with the highest traffic forecasts.
- Well informed bidders may be discouraged from bidding, if there is a perception that realistic traffic forecasts will not win bids.

Possible solutions

Workshop participants suggested a number of ways government could influence incentives with the aim of reducing problems relating to patronage forecasting.

Governments taking on more risk

While it was acknowledged that the private sector has some appetite for patronage risk, it was suggested that the primary benefits of private sector involvement in road projects are through design, construction and operations, rather than through taking on the demand risk. Some models were suggested in which the government could also bear more of the risk, including:

- A "cap and collar" approach, in which governments would issue traffic forecasts, and provide payments one way or another if traffic growth is different to that forecast. This approach was reported to have been used for toll roads in Ireland, Canada and Korea.
- The model used in some US cases, in which the government provides a secondary loan and invests directly in the project (in the case of the US, this is in line with the Transport Infrastructure Finance and Innovation Act, 1998). While traffic risk remains with the private sector, this gives the government an interest in ensuring revenue forecasts are realistic.
- Use of availability payments to underwrite some of the underlying traffic and revenue risk associated with a toll facility.

It was also suggested that there could be some process of quality-assuring models by government, and that the forecasting team be independent of the project team (who may have an interest in the project going ahead).

Government being more wary of forecasting risk during the bidding process.

- When assessing bids, governments could focus more on maximising overall community welfare rather than purely minimising the short-term cost to government. This would incentivise bids with realistic revenue forecasts, and could reduce the risks of large losses and damage to investor confidence.
- When assessing bids, governments could use a common set of assumptions to rule out any potential over-optimistic model inputs.

- It was suggested by some participants that governments could give more weight to bids in which long-term equity is involved. This could potentially reduce the problems relating to the difference in incentives between those involved at the bid stage and those taking on the revenue risk.

Will the market learn?

There were suggestions that governments should avoid inappropriately reacting to problems which the market may address itself to some extent. Specifically, it was suggested that more due-diligence may be being carried out now than before the global financial crisis. However, it was acknowledged that for toll roads such a market correction could be slow.

Longer term: alternatives to PPPs?

It was acknowledged that there are enduring benefits to the PPP model, but it was also suggested that in some cases government may need to consider alternative models:

- Some participants raised questions about whether PPPs would necessarily be the best funding model for some specific projects. For example where a new project has a large effect on other links on the network or form part of an existing corridor.
- A model where the government directly procures a road, then sells it to the private sector after the ramp-up period, when traffic is more certain, was also suggested. It should be noted that this would put the initial ramp-up and construction risk in the government's hands.
- In the longer term, broader road pricing may change the role of the private sector in road provision.

A non-forecasting issue

While not related to forecasting errors, a supplementary problem was identified that relates to attracting private investment in toll roads. There are learning processes in financial markets. They take time to understand new structures. Different financial intermediaries have different appetites for risk, for example, pension funds are interested in long term investments with lower risk and returns, which hedge funds want short-term higher risk investments. Construction companies might be willing to bear part of the construction risk.

To spread risk most efficiently, financial intermediaries need to be matched with the risks they are willing to bear at the least cost. The risks change over time. After construction, all construction risk has disappeared. Then there are high levels of uncertainty about patronage just after opening and during the ramp up period. Once the traffic levels have stabilised, there is a much lower level of risk. The project can be onsold to different parties at different stages of its life. If the project performs below expectations during one stage of its lifecycle, it will be sold at a capital loss to the owners. Conversely, if it performs above expectations, the owners will reap a capital gain.

Governments can facilitate opportunities of different financial intermediaries to buy into projects and onsell at any time. They can have financial experts (especially those who have been involved in toll roads before) to prepare documents in the language of financial intermediaries explaining the opportunities and the risks. They, and/or their financial advisers, can engage with firms in the financial and investment markets to help them think through the issues involved in investing in toll roads, in a context where forecasting methodologies improve.