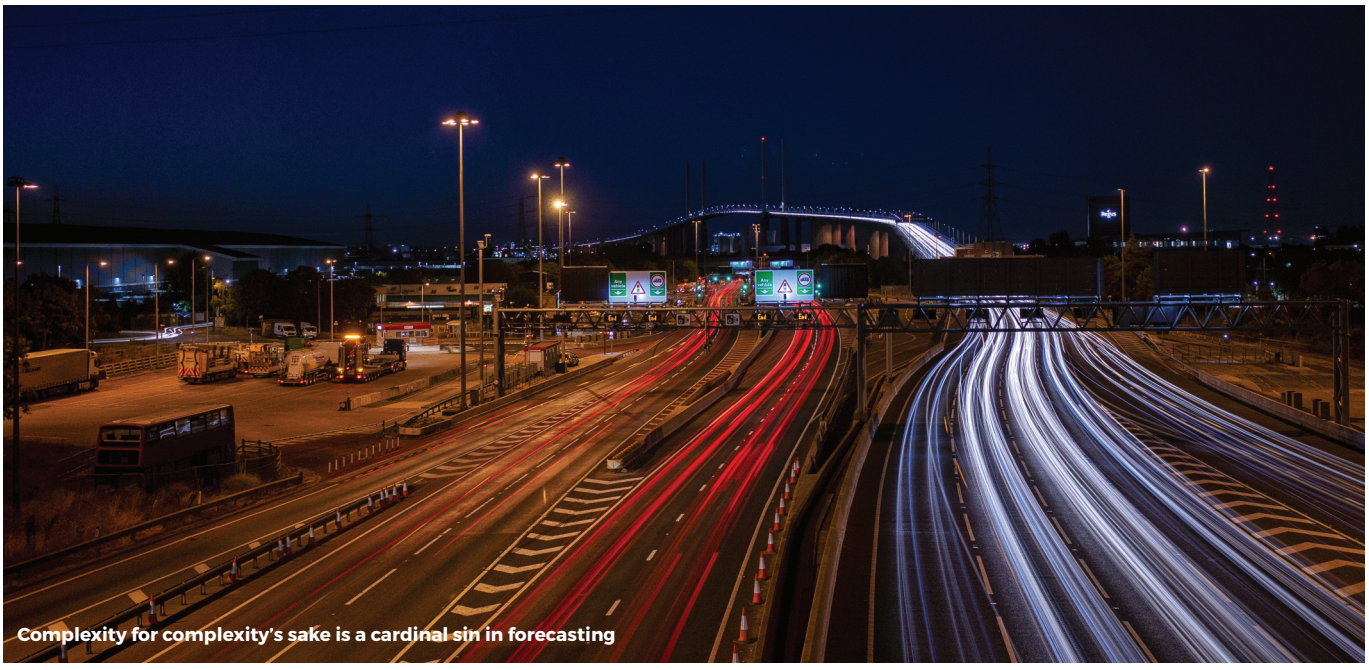

Complexity for complexity's sake is a cardinal sin in forecasting

CALL YOURSELF A FORECASTER?

Robert Bain examines how transport forecasting departs from modelling, and the implications for our profession. Better forecasting practice may not guarantee predictive accuracy, he concedes, but it would help to inform our understanding of what future states of the world could look like. Experience in this regard has been poor to date. Time to raise our game?

In business there is a common assumption that people who are good at their job can be promoted - effortlessly - into management positions; despite the fact that the attributes of good leaders (delegation, motivation, responsibility, feedback and so forth) may be far removed from the on-the-job skills garnered over the years. The result can be uncomfortable and unsatisfactory for all.

My experience from reviewing transportation projections for investors suggests that, unfortunately, the same is true for a number of demand forecasters. They've developed strong modelling skills over the years and can be relied upon to produce reasonably well-calibrated base-year models in most circumstances. This is their comfort zone; building on foundations put in place at university and/or on modelling courses, and fine-tuned through practical experience. Base-year modelling (simulation) is, for many, an enjoyable mathematical challenge with a satisfying end product. There's a right answer and goodness-of-fit statistics to demonstrate just how right you are.

Switch the model from simulation to forecasting mode, however, and comfort – and, my reviews suggest, interest – dissipates rapidly. Forecasting is way more difficult. It involves stepping-out into the unknown with no roadmap to guide you. There is no 'right'. The modeller is no longer the go-to expert. Other people may have different views, and statistics alone can't prove them wrong. Evidence-based approaches compete with arguments of assertion allowing for objective-based or agenda-driven behaviour to contaminate, if not dominate, the forecasting process. Traditional teaching and academic texts focus on the mechanics of what to do

> Good modellers don't necessarily make good forecasters

(update your network, grow then re-assign your demand matrices) with little guidance – in the specific context of growth – about *how* to do it. This results in often poorly-estimated regression equations[i] employing a couple of explanatory variables from staggeringly short time-series being applied at the trip-end or matrix total level; albeit with some disaggregation (for example by vehicle class).

Compared to the science of base-year model calibration, the art of forecasting is horribly crude. Forecasting is the classic 'poor relation'; a rather frivolous pursuit somehow deemed less-deserving of serious scientific attention. Just look at the reams of papers in academic journals and conference proceedings devoted to modelling alone. Yet the paradox is that much (if not most) applied transportation modelling is undertaken for the very purposes of forecasting!

Don't misunderstand me. I'm a strong advocate of straightforward, transparent modelling and rail against over-sophistication when circumstances simply don't support it. Complexity for complexity's sake, beloved of some, is a cardinal sin in forecasting, although some clients still get sucked-in by fancy mathematical footwork (*"reassuringly difficult to comprehend"!*). But surely there's some middle ground where a little more research, insight and intelligence should and could be applied to demand forecasting?

Many of problems appear to stem from the fact that modellers often fail to *understand* what they're actually modelling[ii]: the product or service under investigation, its markets and their characteristics. Model development is highly quantitative with a strong, get-the-numbers-right emphasis. In other spheres, a mathematical preoccupation

Modellers often fail to understand what they're actually modelling

with getting – or forcing – a model to reflect 'observed' data is accompanied by warnings about over-fitting (and its potential to compromise predictive performance). Not so in applied transportation modelling. It's all about the goodness-of-fit of the model, an objective that can be achieved simply by bending the numbers into shape. Understanding, *per se*, needn't trouble the practitioner who has to calibrate a base-year model by the end of the week. Yet it is precisely this lack of understanding that shines so brightly when you turn to the forecasting write-up.

Stepping back, there seems to be three related factors in-play:

1. Survey results (and other data sources) are commonly used as feedstock for the model with more effort being focused on data manipulation and preparation than analysis and comprehension[iii].

2. Ninety per cent of the modelling effort is concentrated on getting the base-year model to accurately reflect today's observations. This involves tweaking the model and its parameters; a numbers exercise that can be completed in the absence of any particular empathy for or understanding of the data.

3. This leaves ten percent for the forecasts, which appear almost as an afterthought.

A recent review of a toll road traffic and revenue study illustrated the problem well. Construction of the toll road would significantly improve access to a major port from land-locked copper (and cobalt) mining areas. This, in turn, held the potential to shift the economics in favour of local extraction, impact on global competitiveness and move commodity prices. The forecasting story was all about copper, yet the traffic consultants made no effort to understand the demand for or dynamics of copper production. Late in the day a completely arbitrary growth rate of 3 % per year was suggested for forecasting purpose. No support or justification provided. Demand forecasting at its worst!

Was the forecasting challenge difficult? For sure: but that's no reason to avoid it. Let's go back to basics. We're not in the business of pure mathematics. We're travel demand forecasters and on Day 1 we're taught that travel is a derived demand. So it's beholden upon us to understand the underlying factors at work. Sorry, modellers, it goes with the territory.

I occasionally come across serious efforts to understand travel markets. In the case of a toll road heavily dependent on trucks, road-freight experts were appointed to canvas the views of local truckers and industry representatives. This helped to understand behaviours, preferences and sensitivities; all of which were carried forward to the forecasts. Another effort surveyed cargo types in considerable detail to understand the investor's exposure to key commodity prices and flows, and assess concentration risk. And it's not uncommon for economics consultants to be retained separately to provide detailed input on the macro-variables at work and their likely trajectories. The key issue is that, done properly, modelling and forecasting are different tasks requiring different skillsets.

At its worst, the situation today results in technically-competent modelling professionals treating demand forecasting as an end-of-process inconvenience; the remaining and somewhat rushed to-do before the final invoice can be submitted. Wrong! Forecasting is all about understanding, and communicating that understanding to clients in ways that enable better-informed decisions to be made.

From the transportation studies I review on an almost weekly basis, it's very clear that good modellers don't necessarily make good forecasters. ■

Notes:

i For more information see: Bain R (2018), *Beware Fake Econometrics,* Infrastructure Investor, Issue 96, 42-44, September 2018, PEI Media Ltd, London (available at: http://www.robbain.com/articlesandpapers.htm).

ii Equally, if not more, important is the fact that modellers often fail to understand what they're not modelling.

iii Related issues include a failure to properly critique the data (from various sources) being used to inform a model build.

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