The effects of travellers’ attitudes and perceptions on the demand for high speed rail in Norway

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A large-scale study was recently conducted in Norway to evaluate the feasibility of high speed rail (HSR) (Jernbaneverket, 2012). While the study indicated that building HSR in Norway is far from economically feasible, the vast data collected in this context provides excellent possibilities for in depth analyses of the heterogeneity of travellers and the importance of latent variables that influence mode choice.

Discrete choice modelling is the conventional method for estimating the mode choice probabilities in these types of analyses. Historically, the covariates taken into account in such modelling framework are attribute values for each alternative as well as socio-economic attributes describing the travellers. However, conditional on these variables there is often a high degree of unobserved individual heterogeneity, which contributes to a low explanatory power of the models describing the choice. This is an important problem that has been addressed in the literature, but not as much in practice, especially in the context of forecasting.

During the last decades, much research has been done to better capture such heterogeneity among consumers. One approach to address the heterogeneity is “hybrid choice modelling” (see Walker, 2001; Ben-Akiva et al., 2002). The method focuses on estimation of the decision making process behind modal choice by including personality traits as latent variables in the utility functions, and identification of different latent segments of travellers using latent classes. In this paper, this method is utilized to describe the mode choice between all available modes and HSR in two corridors in Norway, Oslo-Bergen and Oslo-Trondheim, for business travellers.

These personality traits are mainly revealed through indicator variables in the form of questions regarding attitudes and behaviours in daily life. This can for instance be information regarding recycling behaviour to reflect environmental consciousness, or information regarding safety attitude and behaviour in traffic to reflect the preference for safety. The obvious advantage of such indicators is that the information that is not inferable from market behaviour can be included in the decision-making process. If these latent variables are able to capture underlying personality traits, this may account for some of the unobserved heterogeneity and hence make forecasting more reliable.

In addition to capturing individual heterogeneity, the model framework makes it possible to understand how different individual specific characteristics affect the personality traits. This allows for predicting different personality traits for different segments of individuals, and hence one should be able to predict the distribution of personality traits over the whole population. This is of particular interest in the context of forecasting.
By including latent variables in mode choice models, the personality traits “comfort” and “global environmental consciousness” can be taken into account in the decision-making process. In addition, including four latent classes identifies discrete segments of travellers and class specific preferences affecting their choices. This contributes in explaining the choice between presently available modes and HSR in Norway in the two corridors of interest.

The modelling framework, a latent class and latent variable model, is applied to data collected on travellers using different modes, car, bus, conventional train and air, in the two corridors. In addition to socio-economic and psychometric data, a stated preference experiment between travellers observed mode and HSR was used (see Halse, 2012). In this paper, we will present the modelling framework and briefly describe the data used in this study.

We conclude that the two latent variables described earlier are significant and increase the explanatory power of the models. Moreover, they affect the choice probability for HSR positively and seem to do a better job in explaining mode choice than the available observable individual specific characteristics. We also identify four latent classes of travellers that in combination with the latent variables outperforms a multinomial logit model.

The study sheds light on important aspects regarding heterogeneity in mode choice studies that are often ignored in conventional analyses.

References:


