

On the Economic Value of Snowstorm Forecasts in Winter Road-Maintenance Decisions in Sweden

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Abstract

This paper describes the results of a case study of the economic value of short-range forecasts of snowstorms in winter road-maintenance decisions in the Jönköping district of south-central Sweden. A decision-analytic model of basic road-maintenance decisions was formulated. When this model is depicted in the form a decision tree, each branch of the tree represents a sequence of maintenance decisions and snowstorm events terminating in a specific outcome. To use this decision-tree model to assess the value of snowstorm forecasts, it was necessary (1) to estimate the overall cost associated with the terminal outcomes and (2) to specify the probabilities of occurrence of various snowstorm events given different types of information. Estimates of the terminal costs included costs due to vehicular accidents, traffic delays, maintenance activities, and environmental impacts. Probabilities of snowstorm events were specified on the basis of forecasts of current quality as well as on the basis of climatological information and perfect information (the latter represent lower and upper bounds on forecast quality and forecast value). Forecast-value estimates for the Jönköping district - as well as scaled-up estimates for Sweden as a whole - indicate that the economic benefits of state-of -the-art snowstorm forecasts in winter road-maintenance decisions are substantial and that these forecasts capture about 35% of the potential benefits of perfect information. Consideration of hypothetical improvements in the quality of snowstorm forecast reveals that the relationship between forecast quality and forecast value is decidedly non-linear.