Session WS 1.1 : Behavior under uncertainty

Thursday, August, 17, 9:20-16:00

Resource paper

John Polak: Modelling Travel Behaviour in Risky and Uncertain Situations

Papers

A. Michea and J. Polak: Modelling risky choice behaviour: evaluating alternatives to expected utility theory

R. Chen and H. Mahmassani: Learning and risk attitudes in route choice dynamics

Agenda

1. Round table: Presentation, expectations, research questions
2. Presentation of the resource paper and questions
3. General discussion
4. Presentation (afternoon) of the two papers
5. Synthesis

List of participants (21) and topic on interest

1. Mogens Fosgerau: Danish Transport Research, discrete choice, risk
2. Caspar Chorus: Delf University of Technology, how travellers deal with travel information
3. John Polak: characterize attitudes to risk, learning
4. Emma Frejinger, EPFL, Get familiar with uncertainty
5. Karst Geurs, Netherlands Environmental Assessment Agency, NL: evaluation of risk, risk premium
6. Enide Bogers, Delft University of Technology, NL, PhD in travel information, how people learn, deal with risk
7. Piet Bovy, Delft University of Technology, NL, Uncertainty and risk: other dimensions than travel variability, seats, better specification of what uncertainty is, unpredictable uncertainties, uncertainty in design aspects (road pricing,…)
8. Sunitiyoso Yor, PhD, Centre for Transport & Society, UWE, UK, modelling intertemporal behaviour
9. Ozbay Kaan, Rutgers University, New Jersey, USA, Associate professor, route choice, road pricing, VOT, learning
10. Goulias Kostas, UCSB, Santa Barbara, context
11. Kriste Henson, LANL, USA, Population mobility, evacuation models
12. Erel Avineri, changing travel behaviour, dynamics of travel behaviour, haw can be influenced
13. Nathalie Picard, Paris, France: microeconometrics, utility elicitation, risk attitudes, risk sharing
14. André de Palma, uncertainty and risk, theoretical, route choice, statc and dynamic, learning, rational learning, elicitation of utility functions, survey, websites (potentially integrated with courses), risk sharing within couples, laboratory analysis
15. Gerd Sammer, Boku, Austria: Information status, uncertainty, different points of view
16. Hani Mahmassani, University of Maryland, USA
17. Ryuichi Kitamura, Kyoto University, Japan
18. Shoichiro Nakayama, Kanazawa University, Japan
19. Joan Walker, Boston University
20. Moshe Ben-Akiva, MIT
21. Roger Chen, University of Maryland, USA

Introduction of the topic

There is a **growing literature** in many disciplines on the study of risks and their impacts.

The study of risk provides a **common theme** that can be used in different applications in transportation such as:
- Travel behaviour (route and departure time choice, mode choice, parking choice and driver behaviour,
- Safety,
- Residential location,
- Activity pattern, etc…

We are (should be) interested not only in better predictive models, but also in understanding travel models in order to be able to influence performances through **soft methods**: psychological and sociological measures can influence travel demand (as opposed to hard methods such as change in transport infrastructure).

The **sources of risk** are driven by the variability in system performance, by the environment, by incomplete or erroneous knowledge of the system, and possibly by the uncertainty inherent to the human interactions (lack of knowledge of other people's beliefs, intentions and behaviour).

The study of risk incorporates **4 dimensions** (supply and demand driven):
- The actual probability distribution of stochastic events
- The individual perception of this distribution
- The importance of consequences of events
- The individual risk tolerance

Along these lines, **D. Mc Fadden** (1999) suggested "3 dimensions along which risky choice theory must absorb psychological insights:
  - Treatment of perceptions
  - Conception of preferences
  - Processes of choice"

Objectives of the workshop

1. Identify the **literature** dealing with risk in economics (theoretical and experimental), psychology, mathematics and finance, which can be selectively used in transportation,
2. Exchange of **current research** and identify future **cross-fertilization** (within transportation and across disciplines),
3. Identify key research questions for coming years.

Discussions related to the 3 papers presented:

John Polak (Resource paper): Modelling Travel Behaviour in Risky and Uncertain Situations

A. Michea and J. Polak: Modelling risky choice behaviour: evaluating alternatives to expected utility theory

R. Chen and H. Mahmassani: Learning and risk attitudes in route choice dynamics

- Need to make a **glossary**, beginning with the risk/uncertainty distinction: first attempt in the resource paper

- The standard deterministic model is **Expected Utility Theory (EUT)**.
  EUT was more presented as a **normative** theory than as a positive theory, but there was no consensus about that in the workshop.
  Several possible deviations of standard EUT (**NEUT**) were identified in laboratory experiments (controlled experiences):
  1. Introduction of (more) **non-linearities** in EUT framework
  2. Non Expected Utility Theory such as **Cumulative Prospect Theory** or Rank Dependent Expected Utility Theory, …
  3. **Use of RUM with (N)EUT** for the measured utility, with an effort to integrating the 2 approaches
  4. Exploration of **more drastic deviations** involves adding uncertainty (e.g. ambiguity, vagueness, imprecision) in EUT or NEUT.

However, in usual RP or RP data, it is generally difficult (impossible?) to disentangle value (=utility) components and perception components.

New types of data collection, including those in cognitive science (**neuro science**) may be studied in the coming years. Other competing models were mentioned but disregarded in the workshop: fuzzy set theory, Choquet probabilities, etc…

In relation with SP and RP data (surveys and experimentation), but also in real life, we stressed the need to take into account the following aspects, which are well documented in the risk and uncertainty literature:
  1. **Bias in the perception** of probabilities (optimism or pessimism),
  2. **Context-dependent** perception,
  3. **Reference point**, regret and loss aversion
  4. **Framing effects**

Research topics

- Develop models to describe temporal and spatial **learning** (using Baysian and non Baysian approaches).
- **Integration (N)EUT and RUM**
- **Multi dimensional** aspect of attitude towards risk
- **Bias in perception**, framing, reference point
- Statistics of rare events
- **Transferability** of the results on attitudes towards risk for the same individual in different contexts / between individuals (in the same context)
- **Interpretation of error term in RUM**: lack of knowledge from modeller, from individual, intrinsic stochastic component
- **Monetarization** of risk and value of information
- Psychologists discovered **new phenomena** (mentioned above), which can be captured in a NEU framework: more can be done to understand the implications of those mechanisms **for safety analysis**, inter alia.

Announcements: Websites and conference

http://www.RiskAttitude.eu
http://www.RiskDynaMetrics.com
http://www.ExtremRisk.com

International and interdisciplinary conference on risk perception and attitudes (Summer 2008, France)