EVALUATING MENTALLY AVAILABLE RISKS

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Abstract

While it is generally assumed that decisions under risk are to a great extent influenced by heuristics, details are still little known. The present paper studies a prominent heuristic, referred to as mental availability, its general properties and relationship to a competing heuristic called representativeness. In the context of insurance decisions mental availability appears to result in overreaction to recent or vividly described events, while by representativeness, low-probability high-loss events tend to remain underestimated. More than 250 subjects participated in a survey that gives detailed evidence for the effects of mental availability.

Introduction

Decisions under risk in general and concerning insurance in particular do not count among those that are reached most elaborately and reasonably. Rather, many people would say that these decisions are especially demanding and often, they fail to develop an appropriate concept of the situation they are in, and of the measures they have at their disposal.

Several reasons for misjudgement have been analysed in the past. In this context, one specific aspect is the role of heuristics. Heuristics, or "rules of thumb", are often employed because they provide shortcut approaches to quite involved problems, while at the same time, the results are considered satisfying.

However, heuristics are also held responsible for misjudgement, particularly in not everyday decisions, for instance those concerning insurance. Clearly, more and detailed knowledge of the underlying processes would be of major interest for all parties involved in insurance decisions.

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The present paper is intended as a step in this direction. In particular, it deals with the effects of varied kinds of information on risk judgment. To serve this purpose, we conducted an extensive survey, mainly consisting of a risk evaluation task under several conditions modelling different informational input.

The paper is organized as follows: First, we will build on previous work on heuristics, developing a theoretical framework of how they may affect insurance decisions. Next, we describe the concept of a survey related specifically to judgement of a number of hazards and present the results. Interpretations and conclusions make the final part of the paper.

Heuristics In Insurance Decision Making

General

Quite generally, judgement appears to be influenced by several kinds of heuristics. In many instances, these heuristics may be useful, because they provide shortcuts to much more involved processes and because they produce relatively crude, but useful estimates. Despite their widespread use, there are situations in which these heuristics are particularly misleading. Insurance decisions provide a good example, not least because these usually deal with low-probability, high-loss events – rather extreme parameters that leave much room for biased judgement.

We will confine the present treatment to two of three fundamental heuristics, 'representativeness' and 'mental availability'. Some effects of the third one, 'anchoring and adjustment', have already been treated elsewhere (Einhorn / Hogarth 1987) in the context of insurance.

Representativeness

The representativeness heuristic, also denoted 'judgement by prototype', describes the effect that people tend to focus on "typical" characteristics (Tversky / Kahneman 1982b). While there are several widespread examples, two are of particular interest here:

1. The most representative value of a variable defined in a given class: in this case, we can speak of more or less representative values of the income of a certain profession or of waiting time for the train to arrive. The most representative value will most usually be close to the mean, median or mode of the distribution of the relevant variable. Clearly, judgement is much influenced by what the judge knows about the frequency distribution of the relevant variable.

2. The most representative instance of a particular class: Most people would probably agree that a lion is more representative for the class of mammals than a whale. Contrary to the first case, such judgement does not have a basis in frequency. Rather, it reflects the degree to which an instance carries the salient features associated with the relevant class.

Because representativeness is essentially based on judgement by similarity, the given set of information has a considerable effect on the value or the characteristic which is considered representative. Also, if additional information becomes available, previous judgement may be reversed.

It has been shown that decision-makers often neglect base rates and sample sizes. That is, they generalize from a much too small number of cases, often from their personal experience (Anderson and Settle 1996, Busenitz 1999), and rather prefer to rely on their personal notion of "correct" proportions instead of considering information about actual proportions (Tversky and Kahneman 1982c).

What are the implications of these effects for insurance decisions? The properties of the risk in question (kind of loss, loss size, loss probability) and the characteristics of risk transfer by insurance (premium, extent of transfer) are essential for this decision. If we consider the "tendency towards the mean" induced by the representativeness heuristic first, there is indeed much room for biased judgement: People may focus on average probabilities and loss sizes, which drags their attention away from low-probability, high-loss events that insurance is best suited for. Also, they might think of average insurance premiums, misconstruing differences in premium size caused by differences in risk transfer.

Thinking of characteristics that may be considered prototypical for insurance, people may focus on immediate kinds of loss (for instance, damage to property) instead of more distant results (e.g. business interruption), mainly because the former are easier and more often observable. In a similar manner, decision makers may narrow their analysis to particular origins of loss (Tversky / Kahneman 1982e). Insurance often appears to be associated with complete transfer by insurance.

Table 1: Variants of the respresentativeness heuristic and their relevance to insurance decisions

Representativeness type 1 "regression to the mean"	**Representativeness type 2 "prototype"**
Loss probabilities loss sizes insurance premiums	causes of loss kinds of loss extent of risk transfer

Mental availability

Mental availability describes the effect that instances of large classes and co-occurring events are recalled better and faster than less frequent classes (Tversky and Kahneman 1982d). Just as representativeness, this heuristic is used to judge frequency and probability, not in the sense that people attribute numeric values as expressions of probability to specific events, but in that they can discriminate between alternatives, because they believe that they are not equally plausible. In particular a number of reasons may be responsible: for instance, it appears easier to find words with the letter "r" in the first than in the third position of a word, or the estimate of 1*2*3*4*5*6*7*8=? is significantly lower than for 8*7*6*5*4*3*2*1=?, probably due to extrapolation of the first few elements.

While it may be reasonable to assume that mentally available events are indeed more probable in many cases, Combs and Slovic (1979) and others (Anderson and Settle 1996) show that some events are mentally available because of recent and exciting information, for instance when they are reported by the media. For example, aircraft accidents tend to be highly mentally available, while in fact, much fewer people are killed in such disasters than in everyday road traffic. For events like these, judgement by mental availability is misleading.

Another effect is different from its origins, but nevertheless equally deceptive: people tend to rely on the amount of information that is presented to them rather than to question whether there is something missing. A popular example is that they fail to discover that reasons responsible for fifty percent of failures are missing in a fault tree (Slovic, Fischhoff and Lichtenstein 1982). Even experts are prone to this effect.

Greening, Dollinger and Pitz (1996) show that mental availability appears in more than only one dimension. People do not merely remember mentally available events faster, they also can give more details concerning these events.

Because insured losses happen quite infrequently, we may expect them not to be mentally available unless there is some recent evidence. After all, many insurance contracts are concluded after the policyholder or some of his friends have incurred a loss. We may take the fact that insurance is most commonly distributed over channels supported by personal communication as additional evidence that it is important to make losses mentally available in order to sell insurance.

The Study

General

The departure point was that several authors have reported that the amount and details (for instance Combs and Slovic 1979, Russo and Schoemaker 1990) of information concerning loss seemed to influence mental availability and thus judgement of loss. The concept then was to collect judgements for several risks while different amounts of information were available for the subjects. Specifically, we tested a list of 18 hazards that was put together from loss reports by Munich Re. Subjects were asked to indicate three hazards from this list in descending order that they think are most threatening for them. In addition, they were given the possibility to name further hazards. Furthermore they were asked whether they could quantify these three risks by stating loss sizes or loss probabilities.

One group of subjects was given no additional information. This condition is expected to reflect the extent to which the hazards of our list are considered representative. Prior to answering the questions, a second group received a page with some recent loss reports, which were extracted from a detailed publication (Schadenspiegel – losses and loss prevention) by Munich Re. In addition to these texts, group three and four received a picture documenting one of these losses each.

Following prior research on mental availability, our assumption was that subjects would judge hazards differently when certain risks were more mentally available after decision-makers had taken notice of damage reports. In particular, and in accordance with some previous findings, we hypothesized that:

1. risks are ranked higher when their mental availability increases
2. subjects consider the offered list exhaustive
3. subjects give more details (i.e. they estimate loss size and probability) for higher than for lower ranking risks
4. subjects give more details (i.e. they estimate loss size and probability) for risks that are increasingly mentally available

The specific procedures are described in the following sections.

Subjects and methods

264 students participated in the present study. They were recruited and interviewed by ten students who took part in a research seminar. Beforehand, the interviewers were given extensive instructions about how to conduct this survey. They also received information on the background of this study. They were supplied with a number of questionnaires, leaflets informing about several risks and quota plans for the study. Upon

completion, the material was returned together with a report by each interviewer on the details of his work.

Extensive testing was run in order to discover differences between interviewers. Except for two minor differences (two interviewers picked subjects slightly younger than the average), no significant differences depending on interviewer were observed. Therefore, the sample appears to be quite homogenous.

Essentially, the four different conditions in this study come to four different subject populations, further subdivided according to gender and age. As an appropriate instrument, we will use the *z*-test throughout. Because the critical values are well-known, we restrict our account of statistically significant results to the significance level, thus omitting the *z*-values themselves.

Material and procedures

Material consisted of a questionnaire and – depending on condition – of a leaflet informing about several risks. In the conditions two, three and four, subjects received additional information before they went on answering the questions. In condition two they were given a sheet containing seven short damage reports, extracted from a more detailed publication by Munich Re. Three reports were on fires, one each was on vandalism, faulty repairs, hailstorms and avalanches. In conditions three and four, they received a picture of a kitchen that burnt out and of a car heavily damaged by hailstones, respectively, in addition to the damage reports as in condition two.

Subjects were then asked to read a list consisting of the following 18 hazards, consisting of several natural perils (lightning, fire, flood, storm, hail, avalanches, falling rocks, earthquakes), kinds of crime (fraud, robbery, burglary, physical injury, vandalism), accidents in household, sports, traffic, defective products and poor services.

Then, they were asked to name three of those risks in descending order that present the highest threat to them in person. Clearly, our list of hazards was not exhaustive at all, so we offered the possibility to add hazards, if subjects felt that their most threatening risk was not on the list.

Next, subjects were asked whether they can quantify their three most important risks by estimating loss sizes or loss probabilities. Finally, subjects gave their age and gender, because these characteristics appeared to play a role in judgement of risk and in recollection in earlier studies (for instance, Mitchell and Vassos 1997, Sivak et al. 1989, Larsson, Lövdén and Nilsson 2003).

Results

In total, the interviewers returned 264 completed questionnaires together with a written report concerning subject recruitment, duration of interviews and whether subjects were able to understand the questions. Interviewers did not report particular difficulties: The questions seemed sufficiently clear to those interviewed, who also took adequate time to complete the survey.

About half of the subjects were female. The average age of respondents was 23 years. Considering these characteristics, the sample was representative for the university's student population. These proportions also hold across conditions.

Subjects were asked to name three out of 18 perils, which they feel most menacing to them. In condition one, they did so without having received any additional information. The following table summarizes the number of times a specific hazard has been mentioned, and the ranks thus assigned.

Table 2: Ranking of listed hazards in reference scenario

Hazard	#	Rank
Traffic accident	35	1
Fire	29	2
Physical injury	22	3
Burglary	15	4
Robbery	14	5
Earthquake	13	6
Sports accident	12	7
Avalanche	10	8
Household accident	8	9
Fraud	7	10
Flood	6	11
Vandalism	6	11
Defective products	5	13
Poor services	5	13
Lightning	3	15
Storm	1	16
Hailstorm	1	16
Falling rock	0	18

For this given set of hazards, this ranking reflects the representativeness (type two) of a particular risk for the class of risks threatening the decision-maker himself. The overall picture is dominated by quite few hazards: The first two account for one third of total

nominations, the first four for more than fifty percent. The ranking certainly does not reflect actual risk: for instance, traffic accidents and household accidents are about equally probable (Slovic / Fischhoff / Lichtenstein 1982). Also, the ranking should not be taken as an absolute standard of worry or concern towards these particular risks. Representativeness is always to be seen in context with, in the present case, the list of 18 hazards. Judgement of these risks is likely to change if items are added to or dropped from that list.

A similar picture can be drawn for additional risks mentioned by the interviewed. Little more than 25% of subjects took up the offer to specify hazards that they fear most but have not been included in the list. Overall, 29 additional perils were mentioned, 19 of which in only one case, 4 on two occasions and another two by three subjects. The four most important hazards are listed in the following table:

Table 3: Additional hazards: type and count

Hazard	#
Disease	14
Terorism	11
War	9
Rape	6

Overall, there was little consent about missing threats: The by far biggest part of the 29 additional risks has been proposed by only a single subject. An overwhelming portion of those interviewed stuck to the list of 18 hazards without making additions. This behaviour may be interpreted as an effect of non-availability: For the vast majority, the list seemed exhaustive and there was no need to complete it.

It should be noted that the number of times in which additional risks have been mentioned should not be compared to the number of times that risks have been picked from the list. First, the populations are different: For additional risks, the answers come from all participants. For the ranking of risks from the list, the results are from the subjects in the first condition, roughly about 25% of total subjects. Secondly, the same argument as above applies, namely that judgement of representativeness depends on the items to be judged. If, for instance, disease and terrorism were included in the original list, the ranking most probably would have been different as well as the number and nature of hazards added by the participants of this study.

Overall, there is some support for the hypothesis that not immediately available aspects are neglected. In other words, the information presented is likely to be regarded as complete. The proverb "out of sight, out of mind" describes best what happens to the rest. As a counter-argument, one might put forward that still one out of four subjects wishes to

add a more important risk. While this is true, one should keep in mind that interviews are always influenced by the very personal experiences of those interviewed. Only in a borderline case, the experimenter can construct a situation that is free from this effect. The fact that the majority of additional risks is mentioned only once lends support to our view.

In condition two, when damage reports were provided prior to selecting risks from the presented list, the results change only little. The ranking of risks is identical to that of the reference group until position five. While there are a few changes concerning the lower-ranking risks, there is hardly any support for the hypothesis that enhanced mental availability changes attitudes towards risk. In fact, only vandalism is ranked slightly higher (position ten instead of eleven). Other risks included in the text obtain the same or an even lower ranking than in the reference condition.

There is a noticeable, however not significant, reduction in additional perils mentioned under condition two. The kinds of risks subjects wish to add remain the same as in the reference case. Therefore, and because the effect is missing under conditions three and four, this reduction is likely to be unsystematic.

When the picture of a burnt-out kitchen is added to the damage reports in condition three, however, hazards are rated much differently than under condition one. Most importantly, fire is quoted more frequently than before, so that it replaces traffic accidents as the number one hazard. This effect is twofold: not only does the number of times that fire is mentioned increase, at the same time, traffic accidents are more rarely quoted. Virtually all other risks change in ranking simultaneously.

This may be taken as a good example for judgement by similarity: When a single element changes, judgement of the whole group of elements is likely to be reassessed.
At the same time, we may explain this clear difference in judgement by mental availability which is enhanced by the textual and pictorial information offered. The difference is statistically significant ($p<0.05$). Our assumption is also bolstered by the fact that the described effect vanishes under condition four.

Under condition four, that is, when the text is completed by a picture of car damaged by hailstones, we can observe similar effects. That is, many of the ranks of perils change. Hailstorm also rises in importance. Unlike fire, this effect is not tested for statistical significance due to the small number of relevant cases. The results can be explained in much the same way as before: First, by the overall changes in judgement, we may observe an effect typical for judgement by similarity. Secondly, mental availability of the hailstorm peril, enhanced by a corresponding photo, seems to result in a different ranking of this hazard.

Altogether, the results concerning the hypothesis that risks are ranked higher when their mental availability increases are mixed. We did not observe a corresponding effect when we tried to increase mental availability by giving textual information for several risks. However, when pictures showing damage from fire or hailstorm, respectively, were offered, judgement changed in the predicted direction.

Similar to earlier studies (for instance, Mitchell and Vassos 1997), we find several differences in risk ranking depending on gender. For instance, significantly more women rank earthquakes on the first place ($p<0.01$). Whether earthquake risk is considered at all (that is, it appears on any of the three ranks), however, does not depend on gender. Another pattern – when a particular risk is always ranked higher by male subjects – can be found for sports accidents ($p<0.01$). For fire and hailstorms, we do not find any differences depending on gender.

Similar to gender and also in line with some previous findings (for instance, Sivak et al. 1989) there are differences in risk-ranking depending on age. For example, robbery ($p<0.05$) and physical injury ($p<0.01$) are considered primarily by younger people. Fire and hailstorms do not differ in ranking depending on age.

In addition to this ranking task, subjects were asked to provide frequency and severity estimates for the risks they picked from the list. The concept was that subjects would rather give estimates when risks were mentally available. Also, we hypothesized that there would be more estimates for higher ranking than for lower ranking risks, that is, that estimates would vary depending on degree of representativeness. In the present context, we are not interested in whether the estimates are well calibrated compared to actual values.

Concerning estimates of loss severity, the results show moderate support ($p<0.05$) for the hypothesis that there are more estimates for risks ranked on first place than on second or third. On the other hand, risk ranking does not seem to have an influence on whether subjects estimate loss probability.

The degree of mental availability, represented by the four different conditions of the study, does not seem to influence subjects' propensity to give frequency or severity estimates. This result also holds when we control for gender, that is, there are no differences between male and female subjects concerning closer description of risks. In a similar manner, there is no evidence that age has an influence.

Altogether, we did find some support for the hypothesis that subject give more estimates about more representative risks, while we did not observe a similar effect when mental availability increased.

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Summary and Conclusions

In the present study, we were interested in additional insight concerning the relationship between representativeness, mental availability and judgement of risk. Specifically, we intended to vary the degree of mental availability for several risks by introducing textual and pictorial information and to study the effects on judgement of completeness, ranking and estimates.

From a list derived from actual damage reports, subjects had to choose the risks most relevant to them, thus reflecting the representativeness of specific hazards for the category "risk". The vast majority of subjects considered the list exhaustive and did not wish to add (in their view) more relevant risks. This finding is in accordance with several previous results, all indicating that immediately available information obscures complete and well-balanced perception.

The results concerning the impact of mental availability on risk judgement are somewhat mixed. Although we find a positive effect when subjects are offered textual and pictorial information, in which case the relevant risk rises in importance, this result is missing when subjects are offered text-only information. There are several possible explanations for this effect: First, we may have to distinguish between several different levels of mental availability. At first glance, this may sound plausible, but since previous work did not consider this particular problem, further investigation of this matter appears necessary. A second explanation might rest in the fact that while the pictures in conditions three and four were related to only one risk, there were several risks described in words in conditions two, three and four. Therefore, the pictorial stimulus was more exclusive, which may cause a stronger effect.

At any rate, future research should concentrate on further analysis of the described findings. A quite obvious extension would be to offer not only text and pictures, but also short movies related to risk.

As with several other work, the present study did find some results depending on age and gender. In particular, there were some risks that received higher rankings from either women or men or from subjects of a certain age group, suggesting that there may be various risk preferences. Because this study does not focus particularly on age and gender differences, this result has its merits from a methodical viewpoint, that more unbalanced subject groups are likely to produce different outcomes.

Finally, we found that subjects give more severity estimates, if risks appear more representative, while changing mental availability does not seem to have an influence. Previous studies have found that concerning recent and spectacular – and therefore highly

mentally available – events, people were able to give a number of details. In the present survey, we asked for numerical probability and severity estimates, which might be a more difficult task for the subjects. Together with well-known difficulties concerning calibration, the present results lend support to the view that insurance decision makers generally do not have a clear picture of the risk to be insured.

Overall, the present study opens up a wide area to future research and applications. The aspects of judgement of risk that the paper deals with are not entirely new. However, the present treatment extends previous work to the context of insurance and it develops a more detailed analysis of the underlying processes. On many occasions, the described effects have been successfully exploited in the past, for instance in insurance marketing. On many other occasions, we have seen failures, for instance concerning the selling of insurance over the internet (Theil 2002). In providing an analytical and explanatory framework, the present approach goes beyond these mixed practical experiences.

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