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Understanding the Shape of the Hazard Rate: The Use of Quasi-Stationary Distributions in First-Passage-Time Models
Odd O. Aalen

The shape of the hazard rate as a function of time has great variation. Sometimes it is just increasing, sometimes decreasing, and at other times it is a combination of both these features. For instance, the risk of divorce increases after marriage up to a time and then decreases. From frailty theory it is known that such shapes may have complex explanations, and do not simply reflect a development of risk at the individual level.
To understand these features better it is useful to look at first-passage-time models of survival and 'death'. One assumes an underlying process, described by a Markov process (of diffusion type, or with discrete state space), such that 'death' corresponds to reaching a certain limit. The shape of the hazard rate of the time it takes to reach this limit depends on the quasi-stationary distribution on the transient state space.
It will also be shown that first-passage-time models (like for instance the inverse gaussian distribution) are useful survival models for analyzing data, also when covariates are present. In fact, many of the covariates used in survival analyses are indicators of how far some underlying process has advanced.

Generalized Blockmodeling of 2-Mode Networks
Vladimir Batagelj, Patrick Doreian, and Anuška Ferligoj

In 1991 we proposed the optimization approach to blockmodeling problem of ordinary (1-mode) networks based on criterion functions compatible with structural and regular equivalence. In 1993 we extended this idea to other types of blocks – the generalized blockmodeling. In 1996 we added to the approach the fitting to the pre-specified blockmodel.
In the paper we present an extension of our generalized blockmodeling approach to the analysis of 2-mode networks. The approach will be illustrated with several examples.

Three Experiments in Telephone Surveys
Eva Belak, Katja Rutar, and Metka Zaletel

At the Statistical Office of Slovenia some surveys are conduced exclusively via telephone. Aiming to improve the response rate and the quality of these surveys, some experiments were done at the Statistical Office:

- we tested the respondent selection technique, ”next birthday”and ”last birthday”methods on the sample of 6,000 telephone subscribers in the case of the Quarterly Survey on Travels of Domestic Population;
- we introduced a free call telephone number at the Statistical Office's telephone interviewing facilities along with the one page per survey written guidelines for answering the free call telephone number (which proved to be very efficient and helpful for staff answering the free call telephone);
- we examined the sample non-contacted telephone numbers in the case of the Crime and Victimisation Survey, which was conducted during February and March on the sample of 6,000 telephone subscribers. A sample of approximately 10% of non-contacted telephone numbers was called after we had finished the data collection. We tried to interview persons living on these numbers to examine the characteristics of the households which were not reachable during the Crime and Victimisation Survey period and to be able to estimate the number of ineligible phone numbers more accurately and consequently to calculate response rates more accurately. The results of the experiment would also be helpful to determine the optimal calling strategy.

Internet Surveys: Timeliness of Data Collection and Individual Survey Period Length
Silvia Biffignandi and Monica Pratesi

Data quality in Internet surveys has not yet completely investigated with reference to all the dimensions of quality. The paper focuses on the effect of the solicitation plan on timeliness of data collection. The reaction to the soliciting message is analysed modelling the individual survey period length. The event of interest is the self-interview after the solicitation and the aim is to determine how the occurence and timing of response depend on several covariates. The competing risk model for the effect of the solicitation plan is applied to the response process of a list based Internet survey on firms in four provinces of the Lombardy region in Italy.

Education as an Explanatory and a Disturbing Variable in Survey Research with Questionnaires

Jaak Billiet and Jerry Welkenhuysen-Gybels

In nearly all substantial survey research with questionnaires is an explanatory variable. This is the case for both descriptive and explanatory theoretical driven research. However, both the sampling method and the instrument that is used in this kind of research, are very sensitive for past education obtained by the respondents. The nonresponse rates are largely dependent on the level of education (the lower educated have much lower response probability) and a some method effects (or measurement error) also are related to education. Later waves in panel surveys are particularly effected by this kind of error. In this paper we will focus on the latter. The instrument (questionnaire) is sensitive for the level of education since it presumes reading skills and cognitive sophistication.
In the paper, we will discuss a number of measurement errors that are related to education. These errors are found in the large scale surveys we have organised in the past. Examples are a.o. the acquiescence bias, random error over time (unstability in the measures), and item bias in measurement instruments (differential item functioning according to education). The illustrations deal with concepts as utilitarian individualism, ethnocentrism, political trust...
It is highly doubtful whether some findings about the relation between education and other variables is really substantive. It is possible that the relations are caused by measurement error. What to do with these findings? In order to control for this kind of measurement error, it is proposed always to investigate the measurement equivalence (method and item bias) in the constructs between educational groups before turning to substantial analysis, as is required in cross-cultural research.

Assessing the Quality of Data between Countries and between Items: Methodological Explorations Using ISSP Data

Jörg Blasius and Victor Thiessen

There are several methodological problems concerned with international comparisons such as the understanding of the items and the quality of the data. If one cannot guarantee that the quality of data and the understanding of the questions is high in all countries, the results in international comparison are biased. To assess the quality of data in an international survey, we will focus on a set of Likert-type items within the ISSP.
For assessing the quality of data, we explore the nature of opinionnation in the context of Likert scales. To what extent can responses such as 'can't choose' and 'neither agree nor disagree' represent substantive answers. Part of the answer to

this question depends on whether the complete set of Likert response categories behave in an ordinal manner; that is, the responses are ordered as: strongly agree, agree, neither agree nor disagree/can't decide, disagree, strongly disagree. Determining extent of ordinality is the main purpose of this analysis.
The 1994 ISSP data set focuses on family and gender roles and it is the main data set for our analysis. This data contains a large number of opinion statements in the areas of women and work, marriage, and children using five-point Likert response formats, with a neutral 'neither agree nor disagree'. It also includes a 'can't choose' response as a second possible non-substantive response. Furthermore, the frequency distributions for the items show that the 'neither agree nor disagree' response is used quite frequently-as often as 30 percent of the time. This minimizes a problem that frequently plagues analyses of non-substantive responses, namely the extreme skew of the distributions. A further advantage of ISSP is that many countries participated in this study: Australia, Germany-West, Germany-East, Great Britain, Northern Ireland, United States, Austria, Hungary, Italy, Ireland, Netherlands, Norway, Sweden, Czech Republic, Slovenia, Poland, Bulgaria, Russia, New Zealand, Canada, Philippines, Israel, Japan, and Spain.
With multiple correspondence analysis, nonlinear principal components analysis and the biplot methodology we have several techniques for assessing the quality of data within a set of Likert-type items within 24 countries participating in the ISSP 1994. The analysis shows that the response structure of the gender role items varies substantially by country; in some countries, such as Norway, Germany-West and Australia, a clearly interpretable underlying structure of support for single versus dual household earner emerges. In other countries, including Japan and many of the East European the underlying dimensions are less clear and appear to have high proportions of measurement error. The analysis highlights some of the difficulties in quantitative cross-cultural comparisons.

Detecting Changes in Temporal Density of Events
Andrej Blejec

The responses of olfactory neurons to ever changing environment are action potentials, which they spontaneously fire even in the absence of explicit stimuli. In the presence of odor, the action potential firing rate of individual neuron increases, decreases or remain unchanged when compared to spontaneous firing rate.
Action potentials are time events and occur with changing density in time. A method for detection of event density change was developed and will be described. The method is based on the local change of the cumulative distribution slope. During the spontaneous activity, prior to the odor presentation the local slope of cumulative distribution is fairly constant. The slope increases or decreases in the

case of increased or decreased activity. The local slopes of cumulative distribution are estimated at each event time as the slope of linear regression line in the neighborhood with fixed number of events. The slope estimates after odor application are compared with the limits of expected slopes based on the distribution of slope estimates during the spontaneous activity. Unexpectedly high or low slopes are attributed to increased or decreased activity of neuron respectively.
The method enables rapid analysis of large number of neurons, which is important for understanding of olfactory code.

Experimental Compilation of Industrial Production Index in Slovenia by Double Deflation Method
Lea Bregar and Mojca Bavdaž Kveder

The production volume index is the key short-term indicator. It reflects monthly changes of industrial production volume and as such, it is mainly used as leading indicator of turning points of business cycles in an economy. Prompt availability is its most important advantage. This feature of production volume index is also appreciated in the compilation of quarterly national accounts, since production volume indices are used as proxy measures of production movement in the frame of national accounts.
National accounts represent consistent, coherent and integrated system of economic statistics, firmly based on economic concepts and theories. Under the assumption that double deflation method is used for calculation of production indices, quarterly national accounts measured by production volume indices reflect the movement of real value added.
Contrary to the sound concept of real value added in national accounts, the prevailing practice of production volume indices exhibits diversity of methodologies worldwide in terms of coverage, production indicators, weighting system, formula used, methods of data collection and other methodological characteristics. The implementation of methodologies is thus often far from double deflation method. Application of an industrial production index as a proxy (substitute) indicator of real value added in the system of quarterly national accounts thus urges the question, how reliable indicator of real value added is this indicator.
This issue was a central point of the research, which was carried out for Slovenia this year within the programme Scientific and operational support for the alignment of Slovene statistical methodology with EC requirements. The research was performed in several stages. First, qualitative analysis was implemented focusing on compliance of index of industrial production in Slovenia with the concept of real value added as a central category of production in national accounts. Then methodological practice in Slovenia was compared with seven selected countries,

scrutinizing more than dozen of methodological characteristics. This comprehensive comparison discovered that the most considerable deviation from theoretical assumptions and the prevailing practice in other countries is the fact that in Slovenia the basic production data are measured exclusively in physical units of quantities produced, while majority countries used combination of indicators. Using product as a basic observation unit has some serious implications for the consistency of industrial production statistics with related statistics (employment, investment). It also aggravates the delicate issues of service measurement and quality treatment in index calculation. These deficiencies are even more pronounced in the case of Slovenia because of the structural characteristics of the manufacturing sector and relatively small statistical population.
The findings of qualitative analysis encouraged us to investigate the possibility of compilation industrial production index in Slovenia by double deflation method, which is considered superior to other options in national accounts, but its wider implementation is limited by shortage of the needed data. The experimental calculation of industrial production indices by double deflation based on the individual company accounts for about 1600 industrial enterprises was carried out. The results of comparison of double deflation methods calculations with the calculations based on officially used methodological procedures indicate the measures which are needed for better compliance of industrial production index in Slovenia with national accounts requirements.

Some Practical Aspects on Multidimensional Scaling of Compositional Data – Part II

Matevž Bren and Josep Antoni Martín-Fernández

To visualize the data with Multidimensional Scaling methods we approximate a given dissimilarity matrix – matrix of differences among observations – to obtain a configuration of points in low (two) dimensional real (usually) Euclidean space. The Multidimensional Scaling methods input is a dissimilarity matrix and to construct such a matrix a suitable measure of difference between observations is needed.
In literature different measures of dissimilarity between compositional data have been proposed: Euclidean, Aitchison's distance, compositional Kullback-Leibler divergence... Recent studies show that some of these measures are not suitable for compositional data (Euclidean) and some are coherent with compositional nature (Aitchison, KL-divergence...). Results obtained applying different measures sometimes differ much and sometimes are closely related.
In our work we discuss applications of different dissimilarity measures, relations between them and their (un)suitability in case of compositional data. We present

results of Multidimensional Scaling methods applied to real compositional data sets to visualize all these relations. Visualizations also confirm our theoretical results and show which dissimilarity measures are coherent with the compositional nature of the data.

Insects as Probabilistic Models of Human Behaviour: from the Ehrenfests' Fleas to Kirman's Ants

Maurizio Brizzi, Domenico Costantini, and Ubaldo Garibaldi

Sometimes scientific researchers have devoted their attention to the study of animal behaviour, and have considered it for proposing simple models, in order to represent some aspects of the complex human behaviour, which is so difficult to grasp, as psycologists and sociologists, having to challenge with it every day, may probably confirm. The dog-and-fleas model proposed by the P. and T. Ehrenfest (1907) is an old and well known probability model, developed by many Authors. In such model, according to Pagels' (1982) interpretation, we have two dogs, A and B, and n fleas, jumping independently from a dog to another. The state of the system is the number X_t of fleas lying on the dog A (or B, equivalently) at the time t.
The transition matrix of such model is:

$$p(i,j) = P(X_{t+1} = j \mid X_t = i) = \left\{ \begin{array}{c} \frac{n-i}{n} \quad \text{if} \quad \text{j=i+1} \\ \frac{i}{n} \quad \text{if} \quad \text{j=i-1} \\ 0 \ \text{otherwise} \end{array} \right\} \tag{1}$$

More recently, Kirman (1993) suggested a simple model, able to account for the behaviour observed by the entomologists, that may be summarized saying that in a symmetric situation, ants behave collectively in an asymmetric way. The model suggested by Kirman considers situations in which there are n ants and two sources of food: the "black" and the "white" source. Each ant is feeding at one of the two sources. The state of the system at the time t, say X_t, is defined as the number k of ants feeding at the black source. The $n+1$ possible states are $0, 1, , k, ..., n$. The system evolves as follows: two ants meet at random; the first ant is converted to the second's source with probability $1-\delta$. Each ant may also change source with a small probability ε. The dynamic evolution of the process is described by Kirman, using the following transition matrix:

$$p(h,k) = P(X_{t+1} = k \mid X_t = h) = \left\{ \begin{array}{c} \frac{n-h}{n}\left(\varepsilon + (1-\delta)\frac{h}{n-1}\right) \ \text{if k = h + 1} \\ \frac{h}{n}\left(\varepsilon + (1-\delta)\frac{n-h}{n-1}\right) \ \text{if k = h - 1} \\ 1 - w(h+1,h) - w(h-1,h) \ \text{if k = h} \\ 0 \ \text{otherwise} \end{array} \right\} \tag{2}$$

On the other hand, supposing that exchangeability and invariance hold, it is possible to deduce (see Costantini and Garibaldi, 2000) the probability of the transition from the state $\mathbf{n} = (n_1, n_2, ..., n_d)$ to the state $\mathbf{n_i^k} = (n_1, n_2, ..., n_i - 1, ..., n_k + 1, ..., n_d)$. This transition can be related to a system of n fleas (ants), changing dog (food source). The probability of this transition is the following:

$p(\mathbf{n}, \mathbf{n_i^k}) = \frac{n_i}{n} \frac{\alpha_k + n_k}{\alpha + n - 1}, \quad \alpha = \sum_{k=1}^{d} \alpha_k$ (3)

where α_k is the initial probability for a flea to jump on the k-th dog.

The vector **n** specifies the number of fleas of each dog; here, the jumping flea may change the dog or return on the same dog. We are considering the transition from the i-th to the k-th dog. After this transition the state of the system is $\mathbf{n_i^k}$.

It has been shown (Costantini and Garibaldi 2000) that this Markov chain has an invariant distribution, which is the generalized d-dimensional Polya distribution:

$\mathrm{P}(\mathbf{n}, \alpha) = \frac{n!}{\alpha^{[n]}} \frac{\alpha_1^{[n_1]} \alpha_2^{[n_2]} \ldots \alpha_{\mathrm{d}}^{[\mathrm{n_d}]}}{n_1! n_2! \ldots \mathrm{n_d}!}, \sum_{i=1}^{n} n_i = n$ (4)

In (4) we have used the symbol introduced by Pochammer:

$$\alpha^{[n]} = \alpha(\alpha + 1)(\alpha + n - 1) = \frac{\Gamma(\alpha + n)}{\Gamma(\alpha)}.$$

It is not difficult to see that the Ehrenfest model transition matrix (1), is a particular case of (3). We will show that also the Kirman model matrix (2) can be derived by (3).

The generalized Ehrenfest model (3) has been successfully used for representing the dynamics of a gas of particles (Costantini and Garibaldi, 2000), but it is useful even in human sciences (see Garibaldi and Penco, 2000). Kirman (1993) proposes his ants-and-food model for representing some human mind tendencies in choosing between two apparently equivalent decisions. He thinks about people who decide where to eat, between two similar restaurants, or two investors, deciding which to buy between two different assets. We suggest here another possible situation in which this model may be used: suppose that an Internet user has to choose between two (or more) chat lines or websites related to the same subject. Since nowadays Internet users are almost as numerous as ants, we think that Kirman model may be worthy in this context.

Living Conditions, Interviewer Effects and Perceived Well-Being of the Elderly. A Multiple Correspondence Analysis Approach

Germà Coenders, Ferran Casas, Joan Manuel Batista-Foguet, and Mònica González

This paper reports on a study on quality of life of elderly people carried out in the city of Girona (Spain) in 1999. The study of the quality of life of the elderly

must be based on both objective and subjective indicators along a set of relevant sub-dimensions. Most of the relevant factual and subjective items in quality of life questionnaires are qualitative and call for a multiple correspondence type of analysis. Besides, most of the questions are to some extent sensitive and therefore prone to high non-response and interviewer effects.
In this paper, we apply a variant of multiple correspondence analysis drawing on the work of Escofier (1981) and Zrraga and Goitisolo (1999) that can be implemented with ordinary principal component analysis software and that prevents non-response categories from having too high a contribution on the first dimensions. Subjective well-being questions play the role of active variables and objective well-being questions that of illustrative variables. Next, analysis of variance models are fitted to the axis scores with the interviewer and demographic variables used as predictors. Interviewer effect estimates are used to partial interviewer effects out of the axis scores.
The results show a two-dimensional solution to be appropriate, in which the north-eastern quadrant corresponds to high quality of life respondents and the south-western quadrant low quality of life respondents. The solution is related in the expected way to many of the objective illustrative variables such as neighbourhood, prior occupation, income source, disablement, education, level of activity and housing condition.
The analysis was replicated without accounting for non-response and interviewer effects and the interpretation of the axes got so obscure as to render it virtually useless.

Measurement Error in Web Surveys
Mick P. Couper

One of the major benefits of Web survey is the ability to enhance (or even replace) survey questions with a variety of visual stimuli (pictures, drawings, etc.). In addition, the rich visual medium of the Web permits the survey designer to vary color, design and layout of the survey instrument at will. However, these enhancements may come at a cost in terms of measurement error. This paper will present the results of several experiments examining the effects of visual enhancements on the answers provided in Web surveys and discuss the implications for survey design and measurement error.

Applications of a Functional non-Parametric Model for Scalar Response with Bootstrap Confidence Intervals

Alessandra Durio and Aldo Goia

The purpose of this work is to describe some applications of non-parametric regression models where the dependent variable is a curve and the response is a scalar one.

To characterize these models we consider the random variables X and Y defined on the same probabilized space $(\Omega, \mathcal{A}, P)$, where Y takes values on $\mathbb{R}$ and the random variable X takes values in the semi-normed vector space $(\mathcal{H}, \|.\|)$.

We take as regression model:

$$Y = \mathbb{E}(Y|X) + \varepsilon = \Phi(X) + \varepsilon \tag{1}$$

where Φ is a functional operator defined on $\mathcal{H}$ taking values in $\mathbb{R}$, and where ε is a random variable independent from X with zero mean. It is a multidimensional regression models extension at the case of regressors having functional nature.

Starting from an observed data set $(X_i, Y_i)_{i=1,\ldots,n}$, we will use the non-parametric estimator for $\Phi(x)$:

$$\hat{\Phi}_n(x) = \sum_{i=1}^{n} w_i(x) Y_i \tag{2}$$

with

$$w_i(x) = \frac{K\left(\dfrac{\|X_i - x\|}{h_n(x)}\right)}{\displaystyle\sum_{i=1}^{n} K\left(\dfrac{\|X_i - x\|}{h_n(x)}\right)} \tag{3}$$

where $k(\cdot)$ is a kernel function, $\|.\|$ is a semi-norme measuring the distance between the curves and $h_n(x)$ is a sequence of positive real numbers.

At it may be noticed, it is a generalization in a functional field of the classical Nadarya-Watson regression estimator with local window. Such a model may be used both for independent and identically distributed data and for dependent observations. These methods may be also used for the forecast of longitudinal data where the variable Y is a time series determination and X are portions of the same series.

With the aim to find a local confidence interval of $\Phi(x)$ we will use bootstrap techniques in order to approximate the low of the statistics. In particular, adapting the bootstrap techniques for non parametric regression to the case of functional regression, we will find an approximation of the standard deviation of $\Phi(x)$ bootstrapping the residuals.

After explaining the use of the methods with some simulated examples, we will point out the result for some real economical data set. Through simulation we

will try to evaluate the obtained results and in the case of real data we will use the proposed methods with a portion of data set as forecasting and we will compare our forecast with the data set left.

Scales for Student Satisfaction Measurement in CASI and CATI Surveys
Luigi Fabbris

Experimental assessment of scale validity
The Universities of Paula and Florence experimentally assessed validity criteria for teaching quality scoring through computer assisted systems, on behalf of the Board for the Italian University System Evaluation belonging to the Ministry of Education, University and Research. The following criteria were experimentally evaluated:

1. Self-reporting (CASI - Computer Assisted Self-administered Interviewing) versus telephone interviewing (CATI - Computer Assisted Telephone Interviewing) techniques.

2. Ordinal versus cardinal measurement scales, and ordinal scales with versus without a neutral position between balanced positive and negative positions.

3. An 'efficiency' conceptual models for teaching quality evaluation versus a teaching 'effective-ness' model.

Main results
The experiment on scale measurement held on students enrolled in 2001 at the Faculties of Statistics and Political Science, the University of Paula, highlighted that:

1. Cardinal scales are prone to non response more than ordinal ones. It may depend on the implicit difficulty for giving analytical scores. The 10-point scale is the one which students consider mostly difficult.

2. The 4-point ordinal scale induces less severe judgments than the cardinal (both 7- and 10-point) scales in relation to almost all features of a University course quality and to the overall judgment of a course. Differences are milder on scores assigned to in-class teacher performances.

3. CASI questionnaires, made accessible anonymously through the Internet, have been considered easy to access by students who collaborated to the survey. Nevertheless, just a minority of students spontaneously accessed the electronic questionnaire through the WWW.

4. Students showed a high availability to collaborate to the telephone survey. It was evident that CATI questionnaires are more likely to give complaisant answers than CASI ones. Nevertheless, anonymity of responses is not a real problem for student's assessment of teaching and the even-soft solicitation of informative responses by interviewers helped in collecting qualitative and quantitative evidences for improving the teaching process.

5. Among all the experienced scales, the 10-point cardinal scale shows the steadiest distribution on most variables. In general, this scale is less dependent than other scales to data collection method, conceptual model, and assessed feature of the teaching service.

Length of Input Field and the Responses Provided in a Self-Administrated Survey. A Comparison of a Paper&Pencil and a Web Survey.
Marek Fuchs and Mick Couper

It belongs to the common wisdom of survey methodology that respondents react to the question wording of a particular item when searching a response. In addition, respondents also react to other more formal aspect of the presentation of an item, e.g. question order, response order, numbers and symbols associated with the response categories etc.
In this experiment we tested the length of an input field for numeric information as an independent variable. In a previous experiment in web survey conducted by Couper it was found that longer input fields lead to more instances where the respondent provides ranges or estimates of the correct answer. This lead to the more general hypotheses that longer input fields or lines/boxes for the responses reveal more extensive information. The more space is provided by the designer of the questionnaire the more the respondent assumes that extensive information is expected by the researcher.
In a self-administrated survey on right wing attitudes among Germany high school students (n=5,042) two versions of the same questionnaire were used. The versions were randomly assigned to the respondents. In one version each input field or line/box had twice the size compared to the other version. In addition both versions were administrated on paper as well as on the Internet. The resulting 2x2 design allows a detailed assessment of the effect of long vs. short response boxes or input fields. In Addition, data is available for a comparisons of a paper&pencil and a web questionnaire in terms of that particular effect. During the course of the questionnaire 6 items were included in the experiment. The items differ in the degree of salience of the response (very low to very high).

The results indicate that respondent react to the length of the input field or the line/box when the response is not readily stored in their minds. When respondents need to guess or estimate the response they use different strategies to indicate the week status of their response: (1) they use ranges instead of a single value ('between 10 and 20'), (2) they qualify their response as an estimate (e.g. 'about 10', '˜10'), (3) they provide responses that are easily detected as estimates (bunching/hyping). In addition, respondents provide lots a additional information associated with the response that. E.g., when asked how long it took to answer the questionnaire a respondent might answer '45 minutes, it was an awful long and boring questionnaire'.
From our results we can draw the conclusion that longer input fields induce more ranges, more estimates and more additional information. Furthermore, with longer input fields or lines/boxes we have in decrease in the amount of bunching/hyping.
In summary, the results suggest that respondents use different strategies when dealing with uncertaincy: long input fields and lines/boxes lead to more 'ranges' and 'explicit estimates', short input fields and lines/boxes show more hyping and bunching. This is especially true for items where the respondent needs to guess the correct answer.
The comparison of the paper&pencil and the web questionnaire indicates that this effect shows up differently in a web environment. In a computer assisted situation respondents use far less 'ranges', 'explicit estimates', and provides less 'additional information'. On the other hand bunching/hyping seems to be the same or slightly higher.
From a researchers point of view both approaches (long an short version) have different trade-offs: confronted with long fields and lines/boxes respondents qualify their response as an estimate. As a result more editing is necessary. Short input fields and lines/boxes on the other hand lead to less explicit estimates and show more hyping/bunching. This requires less data editing but leads to a situation where a researcher takes a response for granted were he or she should be more careful.

On Hypergeometric Generalized Negative Binomial Distribution
M.E. Ghitany, S. Al-Awadhi, and S.L. Kalla

It is shown that the hypergeometric generalized negative binomial distribution has moments of all orders, is overdispersed, skewed to the right, leptokurtic, infinitely divisible, and unimodal. Also, a three-term recurrence relation for computing probabilities from the considered distribution is given. Application of the distribution to entomological field data is given and its goodness-of-fit is demonstrated.

Interaction Hierarchies in Generalized Linear Models: Issues and Applications
Jeff Gill

There is substantial confusion in the political science and related literatures about the meaning and interpretation of interaction effects in generalized linear models. I clarify the conditional nature of reported coefficients and their standard errors in dichotomous choice models with interactions, explain the different interpretation of interactions in generalized linear models, introduce hierarchies of interaction effects, and then fill a gap in the literature with regard to estimating uncertainty in these models. There is currently no general method for correctly analytically calculating coefficient standard errors in models with second-order or higher interactions and complex interaction specifications. The methodology is demonstrated with applications to current work in political science. These examples demonstrate the utility of interaction hierarchy specifications in generalized linear models by providing analyses of data from judicial decision-making, voting behavior, and education public policy.

Biplots of Compositional Data
Michael Greenacre

The singular value decomposition and its interpretation as a linear biplot has proved to be a powerful tool for analysing many forms of multivariate data. Here we adapt biplot methodology to the speciffic case of compositional data consisting of positive vectors each of which is constrained to have unit sum. These relative variation biplots have properties relating to special features of compositional data: the study of ratios, subcompositions and models of compositional relationships. The methodology is demonstrated on a data set consisting of six-part colour compositions in 22 abstract paintings, showing how the singular value decomposition can achieve an accurate biplot of the colour ratios and how possible models interrelating the colours can be diagnosed. The full paper is available at http://www.econ.upf.es/cgi-bin/onepaper?557

Social Selectivity in Survey Interviews
Petra Hartmann

Surveys are an efficient tool for serving the information needs in modern societies. Based on large nationwide probability samples they provide huge amounts of data within reasonable time. The survey results derived from a sample usually constitute the base for inferences about the population. This requires that neither sampling nor measurement was biased. A requirement which is rather hard to met in practice.
A considerable amount of methodological research by now exists focussing on biasing effects in either area. Core issue in sampling is the problem of non response. Most surveys are based on a sample which is considerable smaller than intended by the sampling plan. Reports on sample completion show that most losses are not random but caused by systematic factors, especially the refusal of the selected person to participate. If the willingness to take part in a survey relates to the variables under study the results derived from the sample may be seriously misleading with respect to the population.
Survey results may also be biased because of systematic errors in measurement. Although almost any aspect of a survey and especially of the interview situation may affect survey responses most research has focussed on effects related to various attributes of the interviewer (such as gender, race, or age) and on effects due to the presence of other persons during the interview, especially that of the spouse. Both kinds of effects can be linked to the same theoretical concept of social desirability or need for approval. The participants of a survey may act strictly task oriented but responses may also serve motivational principles other than that of truthful responding. Need for approval is the probably most prominent alternative motive which may guide respondents.
Methodological research usually considers issues in sampling and measurement separately. This corresponds to the common perspective of data collection as a process with several stages. Although sampling and measurement may be viewed as distinct stages within this process this does not imply that these stages are unrelated. Rather the contrary as it is rather standard practice in data collection that the field work required in both stages, for sampling as well as for measurement, is done by the same persons, namely the interviewers. The involvement of the interviewer is probably deepest with random route sampling where the interviewers task starts with the selection of the target person according to the sampling rule. But even if the primary sampling of target persons is done in advance (as in register sampling) the interviewer remains involved. It is his or her job to contact the selected persons and to ask for their participation in the survey. After successful recruitment the interview may start.
Both tasks of the interviewer role are important in the process of data collection.

Objectivity of measurement requires that the measurement result, i.e. the response is not influenced by the person who asked the question. This requirement seems to be violated if survey responses show associations with attributes of the interviewers. Such effects of interviewer characteristics or more briefly interviewer effects are usually viewed as the result of response distortions. The visible characteristics of an interviewer may provide the respondent with as a clue to guess which answer will be valued best by the interviewer. Respondents with a need for social approval are likely to distort their response in the direction of this presumably desirable answer.
Although need for approval may distort responses in a way that results in an interviewer effect, the existence of an interviewer effect does not necessarily imply the distortion of responses. Interviewer characteristics may affect responses but they may also affect the recruitment of participants for a survey in a socially selective way. If different types of interviewers recruit participants from different subsets of a population this may also lead to interviewer effects in responses even with perfectly valid measurement which is free of distortions. Thus, the key question with any interviewer effect is whether different interviewers recruited different types of respondents who accordingly gave different but valid responses or whether they recruited the same kind of respondents who provided responses distorted in different directions in order to get approval from different kinds of interviewer. An analogous question can be raised with respect to effects of the presence of other persons during the interview. Socially selective recruitment of survey participants does not imply that the resultant sample is biased.
The distinction between recruitment and response effects requires more detailed information about the interviewer and their work than is usually available. The German General Social Survey 2000, however, provides such data to same extent including information about the process of recruitment. Based on analyses of these data the paper aims to contribute not only to a more sophisticated theoretical understanding of interviewer and third party effects but also to provide some first empirical results concerning their competing causes.

Web Surveys: The Effect of Controlling Survey Access using PIN Numbers
Dirk Heerwegh and Geert Loosveldt

Web surveys generally use some sort of access control in order to prevent uninvited respondents to take part in the survey, as well as to prevent multiple completions by the same (invited) respondent. Restriction of survey access can be accomplished in several technically equivalent ways. However, these methods may not be equivalent from a methodological viewpoint. In this paper, an exploration of possible effects of access control mechanisms is undertaken. Two different modes

of access control were experimentally manipulated. Five hundred invited respondents were assigned to the automatic login condition. Another 500 respondents were assigned to the manual login condition. The respondents in the automatic login condition could sign in to the survey without having to key in their access code (a four digit PIN number), whereas respondents from the manual login condition did have to perform this action. It was expected that the automatic login procedure would generate higher response rates, but a lower degree of data quality. The data show that using a manual login procedure does not decrease response rates, and increases the overall degree of data quality. Respondents who logged in manually tend to complete more questions, and generate more substantive answers to sensitive questions than respondents who logged in automatically.

Test-Retest Stability of Measures of Centrality and Prominence
Valentina Hlebec and Barbara Zemljič

This paper evaluates the test-retest stability of measures of centrality and prominence for social networks of high school students. The authors present and discuss the results from eight experiments. Four types of social support were measured three times within each class with four measurement scales (1) binary, (2) categorical, (3) categorical with labels and (4) line production, as well as two measurement techniques for listing alters (free recall and recognition). Test-retest stability of in- and out- degree, in- and out- closeness, betweeness and flow-betweeness was estimated. Meta-analysis of factors affecting the test-retest stability of measures of centrality and prominence was done by Multiple Classification Analysis. The results show that:

- global centrality indices are more sensitive to measurement errors than local centrality indices,
- in-measures are more stable than out-measures,
- among measures of social support, the emotional support gives the least stable measures of centrality and prominence whereas social companionship gives the most stable results,
- when two network generators are presented within 20 minutes, stability of measures of centrality and prominence is higher than the stability of two network generators presented within a week,
- stability of measures of centrality and prominence is higher when line scale and categorical scale with labels or categorical with labeled extremes are used,

- stability of measures of centrality and prominence is lower when line scale and binary scale are used.

New Sampling Designs and the Quality of Data
Jürgen H.P. Hoffmeyer-Zlotnik

Random Route Sampling has been continuously modified.
At the begin there was a two states procedure: first a controlled walk to provide a listing of N addresses serving as a base for sampling n persons in a second stage. This design has a fixed gross N which has to be fixed in a way that the net n is still large enough, i.e. based on a reasonable sumption about completion rates. First modification of this basic design was that instead of gross sample a size of net sample was fixed: This meant in praxis that interviewer had to continue the Random Walk until a given number of participants (n) was won for participation. This design is a net design. The most recent modification of the last design of Random Route net sampling is with the combination of quota sampling: interviewers have to select the unit of the net sample in the way that the target persons are defined by given attributes. This modification shall guarantee that the empirical distribution is a scaled down mirror of the population (at least with respect to those variables that had used for quotation).
The new generation of interviewers are professionals doing interviews 8 hours per day. They are not willing to do an unpaid walk so each target person is contacted only once. Restricting sampling to those person who are easy available might led to seriously biased samples. The new sampling design restricts the interviewer in his selection of respondents by quotation criteria. This design still composed from those who are easy to contact for win to participation but the group of respondents becomes more heterogeneous with respect to the quotated attributes.
Using data from a methodological study I will demonstrate what happened during the Walk, how quotation affects the pool of target persons from which the sample has to be drawn.
All three sampling designs has been used for empirical practice. Using data from large national German surveys employing the three sampling designs I will investigate how sampling design effects the social demographic composition of the final sample. The composition differ with respect to the variables gender, age, education, employment and size of household. Which is most appropriate to represent the population? Or is nicer appropriate so that we need to look for a new sampling design or for a new type of interviewer?

A Construction of the Unbiased Estimator for the Probability of the Fulfillment of the Meteorological Forecast

A. S. Iskakova

The class of the unbiased estimators for the probability of the fulfillment of the meteorological forecast is defined. For the given class the most suitable estimator possessing the good properties is defined.

Suppose that there is the meteorological forecast $u = \| u_{ij} \|_{m*q}$ of any weather factor for m meteorological stations and q days ahead. We have the data $x = (x_1, \ldots, x_k)$ for last k years, where $x_\beta = \| x_{\beta ij} \|_{m*q}$ is the value of weather factor for m meteorological stations and q days in βs year, $\beta = 1 \ldots k$.

Let, for example, $n = 2$ and the matrices $L_1, \ldots, L_d$ are defined as possible matrices, such that for any $i = 1, \ldots, k$ there exists a vector $r_{vi} = (r_{1vi}, \ldots, r_{dvi})$ with nonnegative integer components and

$$\sum_{\alpha=1}^{d} L_\alpha r_{\alpha vi} = x_i$$

$$\sum_{\alpha=1}^{d} r_{\alpha vi} = n$$

$v_i = 1, \ldots, V_i$, V_i being the positive integer. Let for every $j = 1, \ldots, \mu$, where

$$\mu = \prod_{i=1}^{k} V_i$$

the elements of vectors $z_j = (z_{1j}, \ldots, z_{dj})$, are defined as

$$z_j = \sum_{i=1}^{k} r_{vi}$$

Theorem. The elements of the set $W(u, z) = \{W(u, z_1), \ldots, W(uz_\mu)\}$ are the unbiased estimators for the probability of the fulfillment of the meteorological forecast u, which for $j = 1, \ldots, \mu$, is defined as

$$W(u, z) = \binom{nk}{n}^{-1} \sum_{v_u=1}^{Vu} \prod_{\alpha=1}^{d} \binom{z_{\alpha_j}}{r_{\alpha_{vu}}}$$

where V_u is the number of the partition of u on $L_1, \ldots, L_d$; for every partition $r_{1vu}, \ldots, r_{dvu}$ defines the possible numbers of the balls drawn; $k > 1$ and $z_{\alpha_j} \geq r_{\alpha_{vu}}$ for $\alpha = 1, \ldots, d$, $v_u = 1, \ldots, V_u$.

Definition 1. The solution z_g, based on observations, will be the most suitable from the set $z = z_1, \ldots, z_\mu$, if

$$\prod_{i=1}^{k} W(x_i, z_g) = \max_{j=1\ldots\mu} \prod_{i=1}^{k} W(x_i, z_j)$$

where for $i = 1, \ldots, k$ every element of the set

$$W(x_i, z) = \{W(x_i, z_1), \ldots, W(x_i, z_\mu)\}$$

is the unbiased estimator, defined by (1).

Definition 2. The unbiased estimator $W(u, z_g)$ for the probability of the fulfillment of the meteorological forecast u will be the most suitable from all unbiased estimators $W(u, z)$ defined by (1), if z_g is the most suitable solution, based on observation.

Remark. The most suitable unbiased estimator $W(u, z_g)$ for the probability of the fulfillment of the meteorological forecast u is consistent, asymptotically normal and asymptotically effective.

Statement 1. If c_i is the 'Monte-Carlo' estimator and $W(x_i, z_g)$ is the most suitable unbiased estimator for the probability of the fulfillment of the meteorological forecast u, where x_i is the element of x, then

$$\prod_{i=1}^{k} \mid c_i - W(x_i, z_g) \mid = \min_{j=1\ldots\mu} \prod_{i=1}^{k} \mid c_i - W(x_i, z_j) \mid$$

Statement 2. If c_u is the 'Monte-Carlo' estimator and $W(u, z_g)$ is the most suitable unbiased estimator for the probability of the fulfillment of the meteorological forecast u, then

$$\prod_{u\in\Omega} \mid c_u - W(u, z_g) \mid = \min_{j=1\ldots\mu} \prod_{u\in\Omega} \mid c_u - W(u, z_j) \mid$$

Thus, from the above statements it follows that the most suitable unbiased estimator is better. This approach has been used for defining unbiased estimators for probabilities of the fulfillment of the ideal forecast of the relative air humidity on 31 August and 1 September 2001 year in Almaty and in Astana. Observations during lest 10 years (1990-1999 years) were used. The Department of the weather fore-cast of the Gidro-meteorological center of Regional State enterprise 'Kazgidromet' of Republic of Kazakhstan presented the data. The obtained results show that unbiased estimator for probabilities of the fulfillment of the ideal forecast takes value from 9 to 38.4%.

Composite Sampling in Soil Survey – Advantages And Dissadvantages

Polona Kalan and Katarina Košmelj

Changes in environment are effecting also soil quality that is estimated on the basis of observations and measurements of physical, chemical and biological soil parameters. Because of their preserved morphological structure forest soil are especially convenient to study cause and effects of soil changes. On the selected location in forest, several samples are taken for the further laboratory analysis. Sampling on the field is one of the most critical phases in soil monitoring, since soil samples represent a petty part of the total soil amount at the observed area. Furthermore, high soil variability necessitates large number of samples taken on the field. However, analyzing large number of samples is often an economic impossible because of expensive laboratory measurements. An appealing solution is to blend several field samples into a composite sample. It can be easily applied to many classical sampling designs like two-stage, stratified or random sampling.
The main advantage of composite sampling is to obtain the desired information that would have been obtained from measuring individual samples, but at reduced analytical cost. However, composite sampling has also some limitation, like potential dilution when an individual with high value is combined with low value individuals.
The application of composite sampling on determination of different chemical parameters in forest soil was studied at two research plots in Slovenia. We compared two-stage design and its composite sampling alternative. Obtained results for mean and variance of the mean have shown no statistical significant difference between studied designs. It also turned out that composite sampling is very cost-effective design.
The weakness of composite sampling is identification of local extremes. On the basis of individual samples analysis we detected one location with very high amount of nitrogen, that was covered in composite sample because of the dilution effect.
We also tried to identify limiting values for Cd with composite samples analysis. It turned out that half of composite samples at one plot were expected to contain individuals exceeding limiting value for Cd, what implied further retesting of individual samples to characterize locations with increased Cd content. However, there were no individuals exceeding limiting value for Cd.

Consensus Decision Trees

Branko Kavšek, Nada Lavrač, and Anuška Ferligoj

In data analysis, induction of decision trees serves two main goals: first, induced

decision trees can be used for classification/prediction of new instances, and second, they represent an easy-to-interpret model of the problem domain that can be used for explanation. Standard decision tree learning methodology assumes that the accuracy of the induced classifier is estimated using N-fold cross validation, whereas for explanation purposes a decision tree induced from all the available data is used. Decision tree learning is relatively non-robust: a small change in the training set may significantly change the structure of the induced decision tree. This paper presents a decision tree construction method in which the domain model is constructed by consensus clustering of N decision trees induced in N-fold cross-validation. Experimental results show that consensus decision trees are simpler than C4.5 decision trees, indicating that they may be a more stable approximation of the intended domain model than the decision tree constructed from the entire set of training instances.

Computer Assisted Observational Pretesting of CATI-Questionnaires: A New Device and Process-Based Interpretation of Pretest Results

Martin Kleudgen, Marc Deutschmann, and Frank Faulbaum

Observational or standard pretesting of CATI-Questionnaires is not unproblematic because the recording of observed respondent behavior has to be done during the proper interview. In order to accomplish this task a specific computer assisted pretesting device has been constructed to allow behavior coding of respondents without any disturbance of the proper interview, i.e. without any delay of the ongoing interview. In fact, the respondents are not able to perceive that pretesting is taking place.

The pretest data for each question and each respondent collected by the pretesting device described above can be considered as longitudinal data which can be represented by a graph called IPG (Interview Process Graph). The IPG like an electrocardiogram reveals the problem zones occurring during the complete interview. By this method, it is possible to identify problems with response scales as well as the learning processes initialized by the respondents while going through extensive item batteries. Problems of understanding and weaknesses in question wording manifest themselves in oscillations of the IPG.

The paper presents the pretesting device as well as exemplifications of the IPG by pretesting two questionnaires concerning health and medical information seeking behavior.

Quality of Measurement of Personal Support Subnetworks

Tina Kogovšek and Anuška Ferligoj

Data about personal networks and their characteristics are increasingly used in

social science research, especially in research about the quality of life, social support and similar (e.g., Fischer, 1982; Marsden, 1987; Iglič, 1988a, 1988b; van der Poel, 1993; Hojnik-Zupanc et al., 1996a, 1996b; Schweizer et al., 1998). Since all data about a person's social network are usually obtained from the respondent himself, the quality (reliability and validity) of such measurements is a very important issue.
Among other factors, the type of social support (e.g., Ferligoj and Hlebec, 1998, 1999), can affect quality of social network measurement. Differences in the stability of measurement between the core and extended personal network have also been found (e.g., Marsden, 1990; Morgan et al., 1997). The closer and the more important an alter is, the more likely it is that he or she would named in any measurement (e.g., Hoffmeyer-Zlotnik, 1990; Van Groenou et al., 1990; Morgan et al., 1997). Therefore it can also be expected that the reliability and validity of measurement of the characteristics of core network members would be higher compared to extended network members.
In this paper the results of a recent study on the quality of measurement of tie characteristics in different personal subnetworks are presented. Multitrait-multimethod (MTMM) approach was used for estimating reliability and validity. A meta analysis of reliability and validity estimates was done by hierarchical clustering. The data were collected in the year 2000 by computer assisted face-to-face and telephone interviews on a random sample of 1033 residents of Ljubljana.

Nonresponse in Panel Studies: Relation Between Self-Selection and Topic of the Study?
Dagmar Krebs

The analysis of the extent to which self-selection in panel studies relates to the content of a survey is based on a three wave panel where the third wave consists of 2002 respondents. The analysis focusses on socio-demographic background as well as on attitudinal variables to get information about the characteristics of those respondents dropping out of the panel. The topic of the study is the family a person lives in. The analysis aims to ...

- reveal patterns of attitudes and/or background variables in panel drop-outs
- detect differences in patterns between panel participants and panel drop-outs
- get information about the similarity or dissimilarity of drop-outs between the first and second panel wave on the one hand side as well as between the second and the third panel wave on the other hand side

- clarify if there are certain types of panel drop-outs
- describe whether panel drop-out primarily relates to attitudes connected to the topic of the survey or to the background characteristics of nonrespondents
- demonstrate the degree to which panel drop-out relates to the reachability of respondents
- display the extent to which panel drop-out relates to the method of data collection
- to present a typology of panel nonresponse.

Problems in Capturing New Work Situations with Questions Based on Traditional Concepts of Work and Workplaces
Bettina Langfeldt

The transformation from industrial societies to information societies is characterized by tremendous changes in terms of work life and organizational structures. The introduction of information and communication technologies into the average daily working routine has been followed by new flexibility in working locations (with consequences like the development of telework) and by flexi-time. The increase in womens employment rates and the accompanying problem of compatibility of work and family life introduced new forms and modes of work, such as part-time work, less than part-time work, self-employment as a side line, or temporary work. The proportion of new forms of occupation and the combination of them in a single persons working life steadily increases. Developments of these kinds are taking place at different rates in all European countries, so it seems reasonable to compare national progress in this field. The German Federal Labor Office (Bundesanstalt für Arbeit) recently stated a decrease of the proportion of unlimited full-time workplaces the so-called typical work arrangements compared to all workplaces in the last decade. Analogous to this change atypical work arrangements rose about 2.1 million to 11.2 million in total. In other words, nearly 38% of total employment in Germany is covered by atypical jobs today. The paper sets out to illustrate some difficulties in capturing new work situations with standard demography questions based on traditional concepts of work as used in most National General Social Surveys, the Eurobarometer or the International Social Science Program (ISSP). Most of these surveys try to map profession by asking for employment status with three different answering categories and an open question for specifying the occupation. Some of them survey also the number of working hours in the main job. Whether the respondent has

a second or even third job (which especially in the US often applies) will be left concealed to the researcher. Comparable problems come up in the topic of working location. With traditional demography questions on employment status we will not find out how many alternating teleworkers or people taking a sabbatical the survey sample contains. For many types of research just this subpopulation with modern and highly flexible work arrangements might be very interesting regarding their attitudes towards different social subjects. But even if we do not take specific research interest we have to realize that, insofar as employment status represents a crucial component for measuring social status, we have to invest more care in asking the right questions to find out the 'true' professional biography of the respondents. Otherwise we will face the situation that in the long run less often data on the employment status referring to the main job will fit the data on income of the same respondent since he or she holds in addition a second job or is self-employed as a side line. On the cross-cultural level we already deal with serious difficulties in comparing employment status across countries. The definition of part-time work for example differs tremendously so that data on the number of working hours seems to be essential.
In the paper data and questions from the German Family Survey 2000 and the 1997 ISSP module 'Work Orientations' are used to demonstrate (twice) difficulties and potentials for improvement in asking employment status.

Testing for Heterogeneity on Regression Coefficients in Marginal Estimating Equations
Lara Lusa, Patrizia Rozbowsky, and Dario Gregori

In literature two main different approaches have been proposed to deal with clustered data: a population-averaged approach, using marginal models, and a subject specific approach where the heterogeneity between clusters is taken explicitly into account. The differences that arise in the interpretation of the obtained regression parameters and in the modeling strategy of the correlation structure, make the choice between the two approaches a problem to be faced by any analyst. In certain problems, a population-averaged approach might be preferred, especially when the aim of the investigation is making inference on the population mean. This approach is known to be appropriate when cluster heterogeneity is not dramatically relevant, but it is not clear how to detect such a situation in practical work. As pointed out by Zeger (1992), the subject-specific parameters are generally greater in absolute value than the population averaged ones, and this amount increases with the variance of the random effect. Zeger (1988) shows an approximate relation between marginal mean and regression parameters at cluster level obtained from a subject specific modeling, deriving a quantity a() that relates the

two.
In the population-averaged approach to longitudinal analysis, we focus on the marginal expectation, $\mu_{ij} = E(y_{ij})$. That is, we assume $h(\mu_{ij}) = x\beta$ and var$(y_{ij}) = g(u_{ij})\phi$ for some link function h and variance function g. Here, $E(y)$ describes how the population-averaged response depends on the covariates.
In the the mixed generalized linear model, we assume z_{it} to be a $q \times 1$ vector of covariates (typically a subset of x_{ij} associated with a $q \times 1$ random effect, b_i, and we let $u_{ij} = E(y_{ij}|b_i)$. Under the mixed GLM, the responses for cluster i are assumed to satisfy $h(u_{ij}) = x\beta + z_{ij}b_i$ and var$(y_{ij}|b_i) = g(u_{ij})\phi$ where b_i is an independent observation from a mixture distribution, F.
Adopting the classical logistic Gaussian mixed model, in which is assumed that logit$(u_{ij}) = x_{ij}\beta + z_{ij}b_i$ and var$(y_{ij}|b_i) = u_{ij}(1 - u_{ij})$ and b_i is an independent Gaussian random vector with mean 0 and covariance D, i.e., $b_i \sim G(0, D)$. Notice that, under the mixed GLM, if there is no heterogeneity, i.e., $b_i = 0$ for all i, the population averaged and subject specific models are the same but in general, the link function that transforms u_{ij} into a linear function of x_{ij} does not also do the same for y_{ij}. Therefore, several authors illustrated the dependence of the marginal expectation on the random effects variance in terms of an attenuation of the effect of the covariates, as is well known in the context of errors-in-variables regression. For the logit link, an exact closed-form expression for the marginal mean resulting from omitting the random effect is unavailable. However, using a cumulative Gaussian approximation to the logistic function leads to the expression

$$\text{logit}(\mu_{ij}) = a(D)x\beta$$

where

$$a(D) = \left|c2Dz_{ij}z'_{ij} + I\right|^{-q/2}$$

and

$$c = 16[3/(5\pi)]^{1/2}$$

The subject-specific parameters are in general greater in absolute value than the population averaged ones ($D = 0$), and this amount increases with the variance of the random effect. The random effect variability shrinks the fixed effect parameters toward 0 in the logistic model. This is the main idea behind the use of the quantity $a()$ for detecting an underestimation of the regression coefficients due to the estimation of the population average parameters via a marginal model, when heterogeneity occurs. Thus, if under-estimation occurs, a more complex model based on random coefficients could be used. Estimation of D could be efficiently estimated using indirect inference methods (1999).
the use of the shrinkage factor is shown via simulation and also with respect to a real psychological dataset, where the aim is the identification of the predicting variables of the clinical evidence of burnout

Outliers Detection Methods in Attitude and Evaluation Research
Maria Cristiana Martini

Introduction
Data quality is an important issue in survey research. The development of computer assisted surveys makes it possible to introduce on-line data-quality checks and reconciliation, but the logic of an automatic process requires a general procedure suitable to recognise the suspicious cases in a wide range of different situations. This contribution is aimed at comparing different approaches for automatic quality checks, in order to assess their performances under different experimental and non-experimental conditions, and to establish which method should be more profitably applied in the most common situations for survey research. The attention is specifically directed to attitude and evaluation research, and in particular to categorical ordinal and quantitative discrete measurement scales, which are often used to measure opinions. In this field, in fact, a theoretical framework on outliers detection is missing.
Comparison of different methods
In order to compare the results of different types of quality checks in some common situations for the social surveys, the analysis of a real data set does not allow to determine if the detected cases are really wrong ones, and what rate of wrong values are detected, since unlikely but valid data cannot be distinguished from erroneous ones. Then, we carry out a simulation study to compare the proportion of wrong cases introduced in a regular pattern which are detected with alternative approaches. Data sets with different characteristics are generated and then contaminated by various kinds of erroneous data (for example, random errors, response set or scale reversion errors). The obtained data sets should reproduce some of the most common situations in attitude research, and they vary in the strength of the relationship between the variables, the number of variables which are involved in the considered pattern, the number of points in the measurement scales, the distribution of the considered variables, and so on. Once the simulated data have been generated, we need a target function which describes in a proper way the performances of alternative outliers detection methods. In analogy with medical statistics, where a single laboratory test (or diagnostic marker) is often evaluated in terms of its ability to distinguish between a healthy population and a population of individuals suffering from a specified illness, we can look at outliers detection methods as diagnostic markers, and summarise their performances by means of some transform of the receiver operating characteristic (ROC) curve, often used in biomedical research. The proposed method has been used to compare the results of various outliers detection methods, and their sensitivity to some characteristics

of the data. For example, in large data sets with ordinal or discrete variables the influence measures in general behave worse than the residual-based ones, since it is very unlikely for a single case to have a very large influence on the final estimates. Moreover, because of the low values taken by the diagonal elements of the 'hat' matrix, the standardised residuals are the same as the studentised residuals, since the last are derived from the first, and adjusted by these influence measures. Also the ordinal residuals give the same results as the standardised ones, because they only differ for a scale constant. The random errors are more difficult to detect than response set or scale inversion errors, since they take more frequently 'likely' values, and when the errors are too many, their detection becomes more problematic. Naturally, a low R2 (that could also mean a model misspecification) produces scarce results, and the same is true if the variables are classified in few categories. Finally, when a high R2 is reached with fewer predictors the wrong cases are easier to identify.

Assessing Response Artifacts Resulting from Oppositely Worded Items by Multidimensional Itemcomponent Rasch Models

Herbert Matschinger, J. Rost, C. H. Carstensen, and M. C. Angermeyer

In order to avoid acquiescence it is a common strategy to use oppositely worded items. Unfortunately this procedure may result in undesirable artifacts if the respondents do not recognize the different wording of these items. The sufficient statistic calculated in this case overestimates or underestimates the 'true' value of the respondents on the latent dimension. Mapping 'positively' and 'negatively' worded items separately in two dimensions as frequently done does not solve the problem, since the response artifact still may distort the model parameters of at least one of the dimensions. The goal of this study is to map both the latent dimension and the response artefact simultaneously by a 2-component partial credit Rasch model as developed by Rost & Carstensen (in press). This model is considered an extension of the partial credit Rasch model for ordered categories (Masters 1988, Rost 1988a, 1988b, 1996).
In the Rasch model for ordered categories the probability for a person v to respond to item i with a particular category x is defined:

$$p(X_{vi} = x) = \frac{e^{x\theta_v - \sigma_{ix}}}{\sum_s e^{s\theta_v - \sigma_{is}}}$$

θ_v represents the latent ability of a respondent on one and only one latent continuum (here depression). The existence of one (latent) ability θ_v (independent from the response categories) for all respondents is assumed which is activated by the

respondents each time a threshold to the next response-category has to be passed (Rost, 1988a).
The multicomponent model is defined as:

$$p(X_{vi} = x) = \frac{e^{x \sum_{j=1}^{J} q_{ij}\theta_{vj} - \sigma_{ix}}}{\sum_{s=1}^{m} e^{s \sum_{j=1}^{J} qij\theta_{vj} - \sigma_{is}}}$$

The subscript j indicates that the latent ability θ is measured in j dimensions. The responseprobability is a weighted sum of the log-linear person-dimension-parameter θ_{vj} minus a particular itemparameter. The weights are defined by the designmatrix q_{ij} which holds for all respondents.
Employing the Center for Epidemiological Studies Depression Scale (CES-D) we are confronted with very specific artifacts resulting from the confounding of one aspect of the construct ('well being') with the direction of the item wording. We investigated the structure and applicability of the CES-D by means of a sample of 986 individuals over 75 years of age within the 'Leipzig Longitudinal Study in the Aged'. Results of the 2-component model are compared with the membership probabilities of a 4-class latent-class-model for ordered categories were three classes of the latter were ordered on a latent continuum 'depression', one class comprises those respondents who exhibit response patterns indicating the artifact which results from the wording of the items. It can be shown that depression is overrated at least for these respondents. This artifact can be controlled by the second dimension of the 2-component model.

Simultaneous Latent Association Models for Cross-National Research
Allan L. McCutcheon

This paper presents a new methodology for analyzing association models that include latent scales in multiple groups. These methods are generalizable to a wide range of association models in which at least one of the variables in the analysis of association is latent; they are especially well suited to modeling cross-national differences and similarities in latent structures. The methods employed here derive from the work of Haberman (1974, 1979), Goodman (1974a, 1974b, 1979, 1984), Clogg (1982a, 1982b, 1988), and Hagenaars (1990, 1993), and extend the work of McCutcheon (1996, McCutcheon and Hagenaars 1997, Hagenaars and McCutcheon forthcoming). Following a discussion of the general and restricted model, and a comparison of the formal model to other latent variable models, an example is considered. This example focuses on a comparative analysis of the religious beliefs among the public's of five European Catholic nations (i.e., Austria, Ireland, Italy, Poland and Slovenia). Data from the 1991 International Social

Survey Programme are examined.

A View of Some Centrality and Consensus Functions in Classification Theory and Beyond
Fred R. McMorris

The notions of centrality and distance-based consensus are important concerns in many areas such as social network theory and classification theory. The general set-up consists of a finite metric space X and a subset S of X. For $x \in X$, let $D(x, S)$ be a measure of 'remoteness' of x to S, and let L be the function where $L(S)$ is the set of all points $x \in X$ for which $D(x, S)$ is minimum. L is called the median function on X when $D(x, S)$ is the sum of distances of x to all the points in S, L is called the mean function on X when $D(x, S)$ is the sum of the squared distances, and L is called the center function on X when $D(x, S)$ is the maximum of the distances of x to all the points in S. This talk will review recent results obtained toward characterizing the median, mean and center functions on metric spaces such as certain classes of graphs (symmetric networks) and spaces of various types of classifications on a fixed set of entities.

Some Approaches to Visualization of Social Networks using SVG and Pajek
Andrej Mrvar and Vladimir Batagelj

For most network drawing efforts the target is a static picture on the paper. In the paper we shall discuss the alternative - interactive and dynamic network visualization on the computer screen with special emphasis on possibilities offered by the SVG (Scalable Vector Graphics).
SVG (Scalable Vector Graphics) is a language for describing two-dimensional vector graphics based on XML (eXtensible Markup Language). Three different types of graphic objects are supported: paths consisting of straight lines and curves, images and text. SVG provides all transformations which are usual in standard vector graphics packages. Additionally, animation can be applied to SVG pictures. Pictures in SVG can be examined using Web browsers using a special plug-in. Objects in SVG DOM (Document Object Model) can be accessed using JavaScript language and in this way parts of the picture can be manipulated dynamically from the Web browser.
In the paper some approaches to visualization of social networks implemented in Pajek as options for exporting layouts to SVG will be discussed and illustrated by some typical examples.
Pajek is freely available at:

http://vlado.fmf.uni-lj.si/pub/networks/pajek/
For a free SVG-viewer see:
http://www.adobe.com/svg/viewer/install/

A Statistical Analysis of Teaching Effectiveness from Students Point of View
Laura Pagani and Chiara Seghieri

Introduction
The principal aim of this article is to evaluate the teaching effectiveness of a sample of instructors at the University of Udine. According to a vast literature, teaching is a multidimensional process comprising a number of aspects, i.e. instructor attributes, which sometimes are difficult to evaluate. An instructors overall effectiveness can be measured by a combination of these attributes, such as the clarity in presenting the lectures, the course organisation (including handouts, exercises, etc, but also physical aspects of the classroom or laboratory) and so on. Moreover, the same effectiveness is influenced by a series of other attributes of the instructors (gender, age), by characteristics of the classes they teach (gender, age, preparation of the student, class size.) and by course type and faculty type.
Data
To study the effectiveness of instruction we used data from a questionnaire given to the students at the end of each course. The questionnaire is divided in two parts: the first collects information on the students characteristics (age, gender, type of high school attended and so on); the second consists of 18 general items about teacher characteristics (instructors teaching qualities, materials adopted) and a last global question on the level of course-instructor satisfaction. Response is measured on a five-point scale ranging from 1 (not at all satisfactory) to 5 (very satisfactory). The data set used in this study consists of 9561 questionnaires regarding 416 teachers of the University of Udine covering the academic year 1999-2000. An important concern with regard to the data set is the possible presence of selection bias due to the fact that course attendance is not compulsory and to the fact that questionnaires are distributed during the last days of course so that many students may not participate in the evaluation.
Statistical analysis
The main objective is to use the multilevel analysis to relate a response variable (the instructors overall effectiveness measured by student evaluation) to independent variables related both to the student characteristics and to the teacher-course ones. We used two different kind of response variable and consequently two different multilevel models. In the first multilevel model (model A), an ordinal probit one, the response variable is the last global item of the questionnaire. In the second multilevel model (model B) the response variable is the first component

obtained from a principal component analysis (PCA) performed on the 18 items of the questionnaire. This component accounted for 46 percent of the total variation. Both of the response variable we adopted can be seen as a synthesis of the overall instructors effectiveness. While the first is a measure of effectiveness obtained from only one global item, the second is a weighted sum of the information contained in the 18 original items and so it captures multidimensional view of teaching attributes. The main results for both models are:

- the class size has a negative effect on the instructors effectiveness;
- the Faculties that have a statistically significant effect are 'Letters and Languages', both with a positive influence;
- the significant effect of the mark obtained at the end of the compulsory school (8 years).

The main difference between the two models concerns the statistical significance in model B (but not in model A) of these variables: the Faculty of Engineering, the high school attended and the kind of courses (compulsory or not). Naturally this work is in progress and we are trying to find other significant effects or eventually differences between the two models.

Network Effects for the Dynamics of the Slovenian Ownership Network
Marko Pahor

In the work presented in Pahor, Ferligoj, Prasnikar (2000) we presented the basic structure of the Slovenian corporate network based on equity ownership and supervisory board relation. Continuing this work we extent the data into time, in such a way that now we have longitudinal network data. The data was taken from the archive of the CBCH and represents top 30 owners of a company. Data consists of seven observations of ownership network and starts with 360 companies in January 1998 and ends with 855 companies in may 2001. Following the methodology presented in Snijders (2001) we use continuous time Markov chain stochastic models. The network evolution is modeled as the consequence of the actors (companies) making new connections, or withdrawing existing connections, on the basis of functions, with fixed and random components, that the actors try to maximize. The change in network is than the result of network effects (density reciprocity, popularity, activity...) and individual and dyadic covariates. At this point only the network effects are tested.

Typology of Individuals as Producers of Web Sites

Gregor Petrič

The research in progress develops a twofolded theoretical typology of individuals actions on the World Wide Web regarding intentions and consequences of actions and offers an explanatory theoretical model, which is used to deduce an operational model. Specifically, the research analyses the background and consequences of observable actions of producing a web site and providing web links to other web sites. Functionalist would claim that individuals' actions conform to the function of the system, which in this case reflects the idea of the World Wide Web as a system for faster, efficient and democratic access to information. Intentions of functionalist actions are thus in an unintelligible way oriented toward helping users of Internet and they can be occur when individuals perceive existence of norms regarding desirable actions and possess conformist dispositions. Rationalist on the other hand support the idea that individuals' actions are goal oriented and have clear intentions. Considering the needs we further crystallize the intentions of rationalist action in idealistic self-presentation, self-disclosure, institutional presentation and public support. The explanatory model is proposed and some empirical insights are offered based on a pilot study of a sample of Slovenian individuals 'owning' a web site. In terms of consequences of actions we focus on the notion of 'usability' of web sites and its operational challenges.

Parameterisation of Covariate Effects in Periodic Hazards Models

Ulrich Pötter and Kai Kopperschmidt

Labour market participation, consumer behaviour, and many other phenomena exhibit strong periodic patterns that result from cyclic behaviour, constraints on the timing of events, or seasonal variation. While these periodicities can generally be neglected when dealing with small data sets or coarsely grouped event times, they pose challenges to the analysis of large data sets with precise recordings. It seems natural to require that statistical models used in the analysis of such data sets reproduce any underlying periodicities. In particular, the conditional hazard given covariates should be periodic for all possible values of the covariates. We show that this requirement severely restricts the class of covariate effects models. We define periodicities by points of zero crossings of the derivative of the hazard. We then consider simultaneously transformations of the time scale and transformations by covariate effects that respect the underlying periodic structure. This allows us to characterise feasible classes of covariate effects. We illustrate the results using a large data set on labour market participation.

Respondent Related Correlates of Response Behaviour in Audience Research
Henk Roose and Hans Waege

This paper deals with unit nonresponse in audience research in theatres. Audience research in theatres frequently lacks the methodological rigour due to high nonresponse rates and selective sampling to be able to do scientifically valid statements on the composition, the aesthetical expectations and the evaluations of the members of the theatre audience. This may lead to seriously biased estimates of distributions and parameters. In this paper, we will explore nonresponse bias in audience research. More particularly, the focus will be on the explanation of nonresponse by socio-demographic and attitudinal characteristics of a theatre audience.
The typical features of audience research make an attempt at exploration of the silent minority a challenging endeavour. First of all, people are not contacted in their homes, but in the playhouse itself. This generates a series of specific problems faced by audience researchers and very specific reasons for nonresponse (non-contact/refusal/indirect noncooperation). Secondly, no real sampling frame is available: the population attending each playhouse as such, is unknown. Moreover, this population and the population of visitors to theatres are in no respect representative of the general population. Hence, this opens the opportunity to test the applicability of the seminal theoretical framework offered by Groves and Couper (1998) in a specific surveying context with an equally specific population. Two research questions will be addressed:

1. in what respect(s) do respondents differ from nonrespondents in audience research in a survey on arts participation? Not only potential socio-demographic differences will be examined, but also possibly relevant correlates with regard to topic involvement or issue salience and experience with theatre will be put to the test;

2. can the hypotheses to explain nonresponse by means of respondent characteristics derived from a theory of participation in household surveys within a general population justifiably be used in the study of nonresponse within audience research?

Before addressing these research questions, the specificity of the population and surveying situation are discussed. Cultural participants generally tend to be younger, higher educated and have to a higher SES than non-participants. There are no significant differences with regard to gender. These findings, based on a survey in the Flemish population (APS2000 data), are concurrent with earlier population research on the composition of theatre audiences in Flanders. Pertinent features of

the specific surveying situation that may affect response behaviour, are the severe time restrictions faced by the agencies establishing contact with members of the audience and spacial impediments.
During the months February and March 2001 the University of Ghent carried out an extensive audience research in 3 theatre institutions in Ghent (Belgium): the audience of 24 performances of 10 different plays selected by means of time and place sampling was contacted on site to participate in a survey on arts participation. The research design used for this attempt to model nonresponse consists of a two step procedure. In the first step, every xth member of the audience was handed over a 6-page questionnaire which had to be filled out on site. We opted for as short as possible a questionnaire with only questions on peoples socio-demographic characteristics so as to maximise response in this first step. At the same time every contacted and cooperative member of the audience was given a second 20-page questionnaire - with a pre-stamped envelope which was supposed to be filled out at home and returned by mail.
Within the context of audience research, it is impossible to collect data on nonrespondents in step 1. Therefore, the composition of the audience in the first step is compared to a proxy of a population benchmark based on the weighted APS2000 data. Aggregate socio-demographic differences between the population proxy and sample data are discussed. The validity of this best available method is questioned and discussed.
However, our research design does make it possible to compare respondents with nonrespondents on a microlevel inspired by the three-step procedure used by Hox, de Leeuw and Vorst (1995): ignoring unit nonresponse in step 1, we use logistic regression to map selection in step 2 (response behaviour on the mail questionnaire). The chance of completing and returning a mail questionnaire within this specific population of cultural participants in step 2 has been found to increase with age and educational attainment and vary according to occupational category. Moreover, involvement with survey topic is confirmed as a strong predictor of survey participation. Gender and experience with theatre remain insignificant in predicting response behaviour. These findings are compared with the socio-demographic correlates of response behaviour in general populations (Groves and Couper, 1998). Implications for statistically controlling for nonresponse bias in audience research and suggestions for further research are presented.

On the Parameterization of Graphical Models Describing the Association Structure among Several Variables
Tamas Rudas and Wicher Bergsma

One of the popular methodologies of the behavioral and social sciences to model

effects (causal or not) among variables is the LISREL approach. Advantages of LISREL include intuitively appealing model formulation, readily interpretable graphical representation and the availability of user-friendly software. The major disadvantage of LISREL is that model formulation and therefore, interpretation, is local, in the sense that no attention is paid to properties implied by the assumptions, including the possibilities that the assumptions may have way too strong implications or may be contradicting.

A less well known alternative to the LISREL approach is fitting graphical models. The main advantage of graphical modeling is the sound theoretical background: assumptions always apply to the joint distribution of all variables and issues related to existence and implications are easily handled. The graphs associated with graphical models have straightforward interpretations and are in one-to-one correspondence with the statistical models. A disadvantage of the graphical modeling approach is the lack of standard software to carry out calculations.

This talk aims at alleviating another drawback of graphical models, namely the lack of parameters measuring the strengths of the individual and joint effects. It will be shown that graphical models, in the discrete case, can be parameterized by marginal log-linear parameters. These parameters are readily interpretable in the context of graphical models and can be used to measure the strengths of effects among variables. Using the estimated values of these parameters, the researcher can produce directed graphs with valued arrows describing the association structure among the variables.

Complex Principal Component Analysis for Customer Satisfaction Evaluation

Pasquale Sarnacchiaro and Luigi D'Ambra

A square matrix $H \in L(C^n)$ is called Hermitian when for each couple (k, l) $H_{k,l} = \overline{H}_{l,k}$ where $\overline{H}_{l,k}$ is the conjugate of $H_{k,l}$. This matrix can be written in an unique form $H = A + iB$ where $A, B \in \mathbb{R}^n$, are squares and $A' = A$ (A is symmetric), $B' = -B$ (B is anti-symmetric). The eigenvalues of a Hermitian matrix are real and the eigenvectors form a complete orthogonal base. So its possible to analyse a matrix of complex data by his extension to the Hermitian matrix. In the case of Principal Component Analysis (PCA), starting from the statistical units-variables data matrix $X = G + iP$ ($n \times p$) of complex data, after to have constructed the matrix E, decomplexification of the Hermitian matrix associated to the complex matrix, the problem can be led to the maximisation of the next criterion $\max < Ev >$ with $\mathrm{v} = \begin{bmatrix} \mathrm{c} \\ \mathrm{d} \end{bmatrix}$ with the constraints $\| c \|^2 = 1$ and $\| d \|^2 = 1$

This constrained maximum problem has been solved with the lagrangian method. By computing and setting to zero the derivate functions with respect to the lagrangian multipliers λ and μ , associated to the normalization constraints on the axis c and d and after some substitutions we arrive to the following characteristic solution:

$$\begin{bmatrix} GG' + PP' & GP' - PG' \\ PG' - GP' & GG' + PP' \end{bmatrix} \begin{bmatrix} d \\ c \end{bmatrix} = \lambda \begin{bmatrix} d \\ c \end{bmatrix}$$

In this way we can perform a rap presentation of the variables on the axes d and c, they aren't orthogonal but they are of unitary norm. With this representation we have some interesting information regarding to the intensity and the sign of the matrices P and G, that, normally, are not available with the classical tools of data analysis. By the conceptual scheme of the complex PCA is possible to take, at the same time, some aspects of the SERVQUAL and SERVPERF models. As a matter of fact constructing the matrix $X = G + iP\ (n \times p)$ of complex data, where $G(n \times p)$ is the Gap-matrix and $P(n \times p)$ the perceptions-matrix, is possible to perform the complex PCA as illustrated previously.

On Clustering Techniques for Web Personalization
Gabriella Schoier

Data Mining is one of the hottest topics in information technology. It is important to understand that Data Mining is a discovery oriented data analysis technology and not a singular system. This technology has been successfully applied in science-health, marketing, finance to aid new discoveries and strengthen markets. A natural combination of two active areas of research i.e.: Data Mining and the World Wide Web (WWW) referred to as Web Mining. Web Mining technology appears to be an excellent tool to organize and retrieve this immense variety of material from the WWW. The term Web Mining has been used in two distinct ways: Web Content Mining and Web Usage Mining. In particular the latter is the process of mining the Web access logs on one or more Web server. It includes: custom reporting, usage profiling, banner and targeting, real time recommendations, cross-sale analysis to such customer relationship such as customer attraction, segmentation, retention and web-time value.
Recently Web personalization based on Web Usage Mining has been developed. This type of personalization is applicable to any Web browsing activity. Elements of Web personalization are modelling of Web objects (pages etc.), modelling subjects (users), categorization of objects and subjects, matching between and across objects and/or subjects, determination of the set of actions to be recommended for

personalization
Different Web Usage Mining techniques such as transaction clustering, usage clustering and association rules have been used to extract knowledge, for the purpose of Web personalization. The data we have considered are the extended log file of the form

```
130.93.25.19 - - [20/Dec/2000:10:19:44 +0100]
"GET /mappa/01.jhtml    HTTP/1.0"  200  2472  " -" "Mozilla/4.0"
146.58.31.12 - - [20/Dec/2000:10:19:42+0100]
"GET /picts/index_27.gif  HTTP/1.0"  200  312 " -" "Mozilla/4.0"
235.58.54.78 - - [20/Dec/2000:10:19:41 +0100]
"GET /news/archivio.jhtml HTTP/1.0"   200  115 "-" "Mozilla/4.0"
267.12.83.56 - - [20/Dec/2000:10:19:40+0100]
"GET /news/01/01/01.jhtml HTTP/1.0"  200  793  "-" "Mozilla/4.0"
241.27.83.61 - - [20/Dec/2000:10:19:37+0100]
"GET /favolando/01.jhtml HTTP/1.0" 200  88     "-" "Mozilla/4.0"
341.25.82.14 - - [20/Dec/2000:10:19:37 +0100]
"GET /giochi/01.jhtml HTTP/1.0"  200  656      "-" "Mozilla/4.0"
156.12.35.61 - - [20/Dec/2000:10:19:40+0100]
"GET /picts/index_26.gif HTTP/1.0"  200  415   "-" "Mozilla/4.0"
```

they regards a web site called 'Girotondo'. The required task in usage data preprocessing are: data cleaning, user identification, pageview identification, pageview ID duration, the transaction identification. At this point the transaction file has been further filtered by removing very low or very high support page view references. After this phase of pre-processing we considered clustering techniques for grouping URL references into sets (user transactions), i.e. we want to find out behavioural profiles on the base of grouping similar sessions in terms of viewed pages. It is at the base of the so called user profile useful for developing marketing actions and promotion according to the type of user which is finding out (i.e. targeted e-mail, banners personalization). In our case user transactions are mapped into a multidimensional space as vectors of URL references. Standard clustering algorithms generally partition the space into groups of items that are close to each other based on a measure of similarity or distance. In the case of Web transactions each cluster represents a group of transactions that are similar based on co-occurrence patterns of URLs references. Given the set with all the viewed pages of the site $P = \{p_1, \ldots, p_n\}$ each pageview is uniquely identified by its associated URL. The sample of sessions (i.e. user transactions) is $T = \{t_1, \ldots, t_m\}$; each session t_i is a sub set of P. To facilitate various Data Mining operations such as clustering, each ti is transformed in an n-dimensional vector over the space of page view references URL: $t = \{w(p_1, t), \ldots, w(p_n, t)\}$; where $w(p_i, t)$ is a weight in the transaction t, associated with the pageview represented by p_i belonging to P. We proposed three different analysis that take into consideration different weights. In the first standard binary weight (0,1) (1 if the page has been

viewed 0 otherwise) are considered. In the second the impressions (i.e. the number of times the page that has been viewed) in relation with the number of the viewed pages are applied. In the third the weights are a function of the duration of the associated page viewed in order to capture the users interest in a content page. At last some prediction have been made by using bootstrap methodology.

Non Symmetrical Data Analysis Based on PLS
Biagio Simonetti and Michele Gallo

In the study of modelling relationships between dependent variables and other explanatory variables we find linear combination called latent variables, which been obtained by means of several different methods. The goal is to model the predictive relationships between a response variable set and predicting variable one. The study of predictions could be dealt with several approaches:

1. Constraint Principal Component Analysis (DAmbra, Lauro, 1982; CPCA);

2. Canonical Analysis (Hotelling, 1933).

These approaches consist of determining two subspaces of orthogonal latent variables, for the response and explicative variables, respectively. When there are colinearity problems, these approaches cannot be used. The principal purpose of this paper is to show for qualitative variable how we can use non symmetrical data analysis based on Partial Least Squares. To focalize on qualitative data and show the usefulness of Non Symmetrical Correspondence Analysis (Lauro, DAmbra, 1984; NSCA) based on Partial Least Squares (Wold, 1966).

Simulation-Based Statistical Inference for Evolution of Social Networks
Tom A.B. Snijders

Social networks are structures of relations between individuals. The most common representation of a social network is a directed graph, in which the arcs indicate for each of the ordered pairs of individuals whether the relation in question (e.g., friendship) is present or not.
Repeated measures on social networks represent a complicated data structure, and few probability models and statistical methods have been proposed for such data. Computer simulation offers fruitful possibilities here, because it greatly expands the scope of modeling beyond the models for which likelihood and other functions can be analytically calculated. Continuous-time models are more appropriate for

modeling longitudinal social network data than discrete-time models because of the endogenous feedback processes involved in network evolution.
The probability models for the evolution of social networks proposed here are based on the idea of actor-oriented modeling: the vertices in the network represent actors who change their relations in a process of optimizing their 'utility function'. This function includes a random component to represent unexplained change. The resulting model constitutes a continuous-time Markov chain, and can be simulated in a straightforward manner. It can be applied also when the actor-oriented interpretation is not so obvious. The change in the network is modeled as the stochastic result of network effects (reciprocity, transitivity, etc.) and effects of covariates.
The main parameters of this model are weights in the utility function, representing these various effects. The parameters can be estimated using a stochastic version of the method of moments, implemented by a Robbins-Monro-type algorithm.
An example is given of the evolution of the friendship network in a group of university freshmen students.

Some Aspects of Stochastic Modeling
Pavel Stoynov

The change in the wealth of a market agent (an investor, a company, a bank etc.) in an economy is an interesting topic. In this paper I suppose a general stochastic model describing the wealth process. Some issues connected to the model are developed and some applications are considered.

Correspondence Analysis and Categorical Conjoint Measurement
Anna Torres-Lacomba and Michael Greenacre

We show the equivalence between the use of correspondence analysis (CA) of concatenated tables and the application of a particular version of conjoint analysis called categorical conjoint measurement (CCM). The connection is established using canonical correlation (CC). The second part introduces the interaction effects in all three variants of the analysis and shows how to pass between the results of each analysis.
We start the paper by describing the objective and the results of a CCM analysis followed by a brief introduction of CA and CC. CC is useful as an intermediate stage, since the equivalence between CCM and CC is already shown (Carroll, 1969). The equivalence between CC and CA has been shown for the particular case where there is one attribute being related to preference (see, for example,

Greenacre 1984, chap.4). We will see what happens when two or more attributes are being related to preference and finally we will compare the results obtained from the analysis of the data using CCM, CC and CA. Green and Wind (1972), pointed out as possible future research the introduction of interaction effects in CCM analysis. This idea occupies the second part of our work where we introduce the way to code the data so that CA can treat interaction effects. We will repeat the operation with CC as well as with CCM to demonstrate the equivalence empirically.
The first data set used to corroborate our analytical results is from the paper of Rao (1977). It comes from the situation of an apartment-dweller planning to purchase a house that is already built in a college town. The decision-maker has isolated the attributes of the house considered most important in the decision. The attributes are three: size of house (3 levels), price of house (4 levels) and general condition of the house (3 levels) and the response variable has 4 levels. The second data set is from a study done by an airline company. The objective in this case is to know the trade-off between the different attributes offered as well as possible interaction effects between them. The attributes are: airline company (5 levels), price (5 levels), service (3 levels) and timetable (3 levels). The response variable has 4 levels.

Estimation of Exposure Prevalence Using Case Control Designs
Adhikari Tulsi and Padam Singh

For planning intervention strategies the size of the risk group is required. For example, smoking has been identified as one of the risk factor for lung cancer and for targeting any intervention for the smokers the number of smokers has to be known. Thus for prevention measures, the basic requirement for the health planner is the knowledge of the size of the risk group. In statistical term it amounts to estimation of exposure prevalence. In this paper, an attempt has been made to estimate exposure prevalence using case control design, when the disease prevalence in the population is known. The theory developed has been demonstrated using the real life data of National Family Health Survey, India and empirically constructed population with the help of Monte-Carlo method. When P is small, the estimator of U is not sensitive to P. But when P is sizable, the estimate of U is sensitive to P. Thus, in situation when P is not very small, the reliability of estimate of U will depend upon how close is the assumed value (estimated value) of P to the true value of P.

Evolution of Cooperation in Social Networks: Simulation Study
Aljaž Ule

The classical economic theory neglects temporal and social embeddedness of economic agents. It states that the rational agent optimises its current payoff within each interaction with the population of similarly rational agents. In such environment phenomena like trust, reciprocity and cooperation cannot exist. Contrary to this classical statement the every day life experience proves that such behaviour does exist and is even optimal within a continuously interacting population of cooperators (though not rational within a single transaction). Using the methodology of experimental economics cooperative behaviour has been studied under various forms of social institutions in a number of recent laboratory studies and was shown to exist between repeatedly interacting agents and even in the single interaction between strangers.
While the economic theory called such behaviour boundedly rational the recent theoretical developments argued that it can be perfectly rational assuming agents interaction embedded in its social environment. Cooperation has been shown to be optimal for a pair of agents playing tit-for-tat strategies in a Prisoners dilemma game for a finite number of rounds and evolutionary arguments have been given to explain the success of cooperation between the group of locally interacting agents. However, the social environment in these models is given exogenously neglecting the individual choice of social links. Allowing for endogenous choice of social environment increases the individuals set of available actions and only a few special cases of network evolution have been analysed. Due to complexity of general analysis we performed a number of dynamic simulations studying the simultaneous evolution of cooperative behaviour and the network structure. An agents type is characterised not only by his choice in the social dilemma game but also by his choice of neighbours. We consider various forms of (bounded) rationality, formalised as the learning processes of agents. Experimental study is proposed to test for the quality of different simulation predictions and the structure of cooperative reasoning.

Virtual Selves and Web Surveys
Vasja Vehovar, Mick P. Couper, Katja Lozar Manfreda, Mateja Vohar, and Salvador Rivas

With rapid transfer of many forms of social inquiry through structured questionnaires to the Web, and increasing use of the Web for many forms of social interaction, it is increasingly important to explore whether the Web is indeed a 'socially neutral' research tool as many believe. Because of Web graphics, interactive na-

ture and context of global environment, social desirability effects in Web surveys may be different as with other self-administered methods, which usually reduce them. In addition, increased use of interactive services, such as multiple user domains, interactive chat rooms and interactive online games encourages widespread adoption of 'virtual personas' on the Web. It is thus important to explore how participation in such interactive services may mitigate potential benefits of the Web for social research.
Our research explores whether those who are frequent participants in so-called 'alternate realities' on the Web are more likely to present their 'virtual personas' or represent their 'real selves' when answering questions in Web surveys.
Users of interactive services are identified in a large national Web survey of Internet users in Slovenia within the project RIS (Research on Internet in Slovenia, http://www.ris.org) at the Faculty of Social Sciences, University of Ljubljana. They are asked a variety of questions relating to self-image and self-presentation and questions known to be subject to social desirability bias. At the end of the survey they are asked for their telephone number. A matched sample of respondents from the population of non-users of interactive services is also selected. Both groups are then administered a telephone survey, with the key self-presentation and social desirability items replicated. We then compare the responses to the telephone survey with those provided in the Web survey. Our hypothesis is that those who are regular participants in interactive services are more likely to present themselves in a different light on the Web than on the telephone, relative to the non-user group.

Visualising Concordance
Gaj Vidmar

The paper presents three new types of graphical display suitable for the previously unaddressed task of visualising concordance. First, an overview of the interrelations between different forms and measures of rank-correlation and concordance is provided, along with the introduction to the methods for comparing concordance between two or more samples. The three new graphs are then presented: the concordance bubble-plot, the concordance scatter-plot and the concordance parallel-coordinates plot, all of which are based on all the pairs of ranks of an object within the group of judges of interest. Examples depicting null, small, moderate, high and perfect concordance are provided. Variants within each graph-type are discussed, together with the possibility of adding information on average ranks of objects to a concordance plot. Strong and weak points of each graph-type are identified. It is argued that the fundamentals of sound and efficient visualisation (as identified in the works of Tufte and Cleveland) are observed by the new

graphs, and that they are suitable for accompanying assessment of inter-group concordance (the L-statistics based comparison of two groups and the multi-group ANACONDA). Finally, some suggestions for further research of the topic are given, including simulation experiments and surveys.

All You Need is Dumb Luck: A Simulation Study of Wealth Distribution Based on Random Appropriation of Assets

Tim Vidmar, Andrej Likar, and Gaj Vidmar

An artificial-society type of study of wealth distribution is presented, based on random interactions between pairs of individuals (entities) in which one entity takes possession of a part of the other one's assets. Albeit based on the simplistic assumption of a zero-sum-game economy, the simulations yielded strikingly realistic results.

A series of simulation experiments was performed with 100.000 entities, initially possessing 100 units of assets each. In each experiment, several hundred million of interactions between entities took place, in each of which a pair of randomly chosen entities was involved. A certain fraction (up to 20 percent or another arbitrary limit) of the first entity's assets was taken away in every interaction and allotted to the second entity.

The distribution of assets after up to one billion interactions is presented. It is compared to the data on annual income in the USA and the income-tax based data on income in Slovenia by means of histograms, the Lorenz curve and inequality coefficients. The qualitative match obtained is perfectly satisfactory. Two indications of stationarity of the simulation processes are provided: a) the dependence of maximum individual wealth on the number of interactions soon 'levels out' and does not fluctuate considerably; b) identical wealth distributions, Lorenz curves, inequality indices and maximum individual wealth characteristics are obtained when the simulation is started either with one entity possessing one million units and all the other entities possessing none, or with the initial wealth being equally distributed among entities.

Some expansions of the initial model were also studied. Elimination of the zero-sum constraint led to modified maximum, minimum and average wealth values, but the degree of inequality in the 'society' remained unchanged. This finding is independent of the way the expansion of the economy is implemented: it does not matter whether the 'winner', the 'looser' or a third entity is awarded additional assets after every interaction.

It is also demonstrated that different maximum fractions of the assets which can be redistributed in a single interaction between two entities result in different Lorenz curves, resembling those of real societies with different levels of inequality.

Finally, a mathematical modelling analogy from the world of physics is discussed - the Maxwell distribution of velocity of gas molecules.

Comparing Closed-Ended with Open-Ended Questions: A Design
Merlijn Wouters

This presentation is about the construction of a research design for comparing open-ended with closed-ended questions. In order to come to a starting point for such a design a few steps are made. First finding a way to classify questions systematically. For this purpose an existing scheme is used for classifying closed-ended questions. Second is determined if this scheme is also useful for open-ended questions. Since this was not completely so, the adjustments to this scheme are discussed thirdly. This newly created scheme forms the starting point for the research design. The design has to fulfil several methodological conditions depending on the way of analysing the data. The quality of data produced by open-ended and closed-ended questions is analysed with the multitrait-multimethod model.

Analysis and Visualization of 2-Mode Networks
Matjaž Zaveršnik, Vladimir Batagelj, and Andrej Mrvar

2-mode data consist of a data matrix A over two sets U (rows) and W (columns). One or both sets can be (very) large. Some examples: (persons, events; participation), (customers, products; consumption), (papers, authors; cited), (persons, journals; reading), ... Such data can be viewed also as a bipartite network.
We can analyze 2-mode network directly or transform it into 1-mode network over U or W. In the paper we shall present different approaches to the analysis and visualization of 2-mode networks and illustrate them on real life examples. These approaches are supported in the program Pajek.

Implementation of Complex Methodological Approach in Market Research for New Product Development (Case Study)
Andraž Zorko

The paper describes the use of a complex research model of several survey techniques, methodological approaches and statistical methods that were successfully used in a case of new product development, a new teenage magazine. The research model consists of four stages and was designed in a way that enabled the control

of the results on each of its four stages. It starts with a primary market research of teenage magazine market combining quantitative and qualitative approach in order to answer two basic questions: should a local version of a foreign teenage magazine be launched, and if not, what kind of a teenage magazine should be launched instead. In this stage cluster analysis was used within quantitative approach for market segmentation and readership analysis. Cluster analysis was also used within an effective qualitative approach which was used for new magazine's content structure suggestion to answer the second question. In the second stage a test model was used for magazine's name selection that uses an interactive role of the interviewee through a CATI interview. The case continues with a third stage where zero-copy test model was conducted via combination of post and telephone interview, again with an interactive role of the interviewee. The statistical analysis used within this model was crucial for the new magazine's final content adjustment. Finally, after the first issue of the new magazine, a four-issue tracking measurement was applied as a last stage of the research model. Again a combination of quantitative and qualitative approach was used to track the penetration level of the magazine and the satisfaction with its content. Within the quantitative approach the penetration level was measured with a three level model according to consumer involvement. The final stage was concluded with the tracking analysis including the actual sales data.

Delphi Method and Analysis in Marketing Research Based on Nonparametric Statistical Techniques
Vesna Žabkar

Classic Delphi method involves an iterated exchange of information between a small group of experts in the pursuit of consensus and efficiencies arising from the collective mind. The method applies an independent surveying of experts. The steps to be followed in generic Delphi forecasting include the selection of experts in the area, contact to the selected experts and request for forecasts/attitudes, computation of the average and range of forecasts/attitudes of the panel, a new contact to the panel, provision of the consensus and range of forecasts/attitudes, asking for revision of their forecasts, and again computation of the average and range of the revised forecasts.
Two particular weaknesses of the majority of studies using the Delphi method have been a lack of a definitive method for conducting the research and a lack of statistical support for the conclusions drawn by the researchers. One approach to overcome these is to use the Modified Delphi technique, which calls for averaging of forecasts/attitudes formed by different experts using an appropriate method. The average of the forecasts is computed by giving different weights to the fore-

casts of different experts.
A paper presents another approach based on nonparametric statistical techniques to conduct Delphi surveys and perform analysis. Using results from a two-round Delphi survey with a feedback loop for the diffusion and discussion of the results it is shown that use of this advanced approach can streamline and strengthen studies, improve the validity of results, and thus better serve the users of the research findings.