Contents

1 INTRODUCTION

The following report briefly describes the results of the research activities concerning the year 2005.

Presentation

The Institut de statistique has been created in 1992. It coordinates and organises all the statistical activities at the Université catholique de Louvain: research, teaching and consulting.

Research

The research activities of the Institute cover a large number of fields. A major part of the activities are centered on mathematical statistics (semi- and non-parametric statistics, bayesians statistics, multivariate analysis, regression estimation, mixtures models, survival analysis, time series, ...) with important implications in various fields of application (econometrics, biostatistics, insurance, industrial statistics, transportation problems,...).
Since January 2002, the Institut de statistique has been the coordinator of an IAP network : "Statistical techniques and modeling for complex substantive questions with complex data".
This network includes 6 institutions : Université catholique de Louvain (Belgium), Katholieke Universiteit Leuven (Belgium), UHasselt (Belgium), Université Libre de Bruxelles (Belgium), Aachen Technical University (Germany) and Université Joseph Fourier (Grenoble, France).

Teaching

In the field of teaching, the activity of the Institute is as follow:

- basic education
- second cycle education
- third cycle education.
- continued education

Concerning the first and second cycle studies, the Institute is responsible for the organisation of probability and statistics courses offered at the university. Moreover, the Institute organises second and third cycle studies: the "master spécialisé en statistique" (Master), the "diplôme d'études approfondies en statistique" (DEA) with several orientations and the "doctorat en statistique". Since the academic year 2002-2003, the Ph. D. degree has been organised within the context of the Graduate School in Statistics.

The Institute is also organizing a "Certificat en statistique" in the framework of continued education.

More information concerning the programs in statistics is available on the webpage http://www.stat.ucl.ac.be/.

Consulting

The Institute offers consulting services to researchers using statistics in their profession. This service includes discussions on statistical problems encountered by researchers working at other departments or laboratories of the Université catholique de Louvain. Consulting services are also offered to business cooperations searching for support in dealing with statistical questions. Furthermore, service courses (continued education) are provided for interested groups.

Other events of the year 2005

Miscellany

Léopold SIMAR has been chairman of the *55 th Session of the International Statistical Institute*, World Congress, Sydney, Australia.

Léopold SIMAR has been member of the jury for a PhD in Mathematics, Université Pierre et Marie Curie, Paris VI, France.

Sébastien VAN BELLEGEM has been awarded the Marie-Jeanne Laurent-Duhamel price by the "Société Française de Statistique" for the quality of his doctoral thesis in statistics.

Ingrid VAN KEILEGOM has been elected president of the Three Country Corner, local group of the Royal Statistical Society.

Ingrid VAN KEILEGOM is extramural fellow of the research institute CentER, Tilburg University, The Nederlands.

2 PERSONNEL

Academic Members

Michel DENUIT

Dominique DEPRINS

Bernadette GOVAERTS

Christian HAFNER (since September 1st 2005)

Philippe LAMBERT (Academic Secretary)

Christian RITTER

Jean-Marie ROLIN (Chairman since September 1st 2004)

Léopold SIMAR

Sébastien VAN BELLEGEM

Ingrid VAN KEILEGOM

Rainer von SACHS

Associate Academic Members

Luc BAUWENS, Faculty of Economical, Social and Political Sciences

Patrick BOGAERT, Faculty of Biological, Agronomic and Environmental Engineering

Pierre DEVOLDER, Institute of Actuarial Sciences

Marie-Paule KESTEMONT, Faculty of Economical, Social and Political Sciences

Eric LE BOULENGE, Faculty of Sciences

Guy LORIES, Faculty of Psychology

Annie ROBERT, Faculty of Medicine

Michel VERLEYSEN, Faculty of Applied Mathematics

Invited Academic Members

Yves BERGER

Taoufik BOUEZMARNI (since September 1st till December 31)

Libei CHEN

Anne DE FRENNE

Isabelle DE MACQ (since September 1st)

Irène GIJBELS (until October 30 2005)

Emeritus Professor

Michel MOUCHART (em. 2004)

José PARIS (em. 1998)

Researchers and Doctoral Students

Carlos ALMEIDA

Jérôme BARBARIN

Hilmar BÖHM

Jean-Philippe BOUCHER

Natacha BROUHNS

Céline BUGLI (until May 31)

Karim CHEIKH BENAMI

Cindy COURTOIS

Alexandra DASKOVSKA

Antoine DELWARDE

Jeroen DE SMET (since February 1st until June 30)

Anouar EL GHOUCH

Nancy FRANCOIS (until June 15)

Géry GEENENS

Donatien HAINAUT

Cédric HEUCHENNE (until September 14)

Astrid JULLION

Catherine KRIER (until March 31)

Alexandre LAMBERT (until November 30)

Céline LE BAILLY de TILLEGHEM

Xavier MARECHAL

Aurélie MILLER

Giovanni MOTTA

Caroline PIETQUIN (since February 1st until June 30)

Sandra PITREBOIS

Oana PURCARU (until August 31)

Réjane ROUSSEAU

Bianca TEODORESCU

Postdoctoral Researchers

Cédric HEUCHENNE (since September 15)

Davit VARRON (since August 1st)

Valentin ZELENYUK (until August 31)

Associate Researchers

Céline BUGLI (since June 1st)

Nancy FRANCOIS (since June 16)

Maria KEY PRATO

Philippe VANDEN EECKAUT

Computer Scientists

Laurent BUSET

Alain GUILLET (since November 21)

Eric LECOUTRE (until July 31)

Jean-Luc MARRION (Responsible)

Jean-Marie ZELIS (Responsible of the University statistical server)

Administrative Responsible

Chritine DENAYER

Administrative Staff

Anne BALFROID (until February 21)

Anne-Marie BELLEMANS

Monique DESCAMPS

Marguerite HANON (since May 19)

Sophie MALALI

Short Term Visitors

Anestis ANTONIADIS, University J. Fourier, Grenoble, France

Paul BANENS, CQM, The Netherlands

Nicky BEST, Imperial College, London, UK

Yoav BENJAMINI, Tel Aviv University, Israël

Jérémie BIGOT, Université Paul Sabatier, Toulouse, France

Daniela COCCHI, University of Bologna, Italy

Abdelaati DAOUIA,Université Toulouse III, France

Michel DELECROIX, ENSAI, Rennes, ENSAE, Paris, France

Feike DROST, University of Tilburg, The Netherlands

Paul EILERS, Leiden University, The Netherlands

Jean-Pierre FLORENS, IDEI, Université Toulouse I, France

Piotr FRYZLEWICZ, Imperial College, London, UK

Domenico GIANNONE, ULB, Belgium

Montserrat GUILLEN, Universidade de Barcelona, Spain

Wencesloo GONZALEZ-MONTEIGA, Universidade de Santiago de Compostela, Spain

Peter HALL, Australian National University, Canberra, Australia

Daniel J. HENDERSON, State University of New York, USA

Helmut HERWARTZ, University of Kiel, Germany

Nils HJORT, University of Oslo, Norway

Stefan LANG, University of Munich, Germany

Oliver LINTON, London School of Economics, UK

Laura MAYORAL, Universitat Pompeu Fabra, Spain

Ian MC KEAGUE, Columbia University, New York, USA

Antonio MELE, London School of Economics, UK

Mahmed MESFIOUI, Université de Québec, Canada

Richard PAAP, Erasmus University Rotterdam, The Netherlands

Byeong PARK, Seoul National University, South Korea

Steve PORTNOY, University of Illinois, USA

Peihua QIU, University of Minnesota, USA

Jean-François RICHARD, University of Pittsburgh, USA

Bob RIGBY, London Metropolitan University, UK

Juan RODRIGUEZ POO, University of Cantabria, Santander, Spain

Ernesto SAN MARTIN, PUC, Santiago, Chile

Eliana SCHEIHING, Universidad Austral de Chile, Valdivia, Chile

Robin SICKLES, Rice University, Houston, USA

Peter SLOCK, NIS/NIS Statistics, Belgium

Stefan SPERLICH, Universidade Carlos III, Madrid, Spain

Mikis STASINOPOULOS, London Metropolitan University, UK

Thierry VAN DE MERCKT, Vadis, Belgium

Dirk Van den POEL, Gent Universiteit, Belgium

Camille VANDERHOEFT, NIS/INS Statistics, Belgium

Angelika VAN DER LINDE, University of Bremen, Germany

Sabine VERBOVEN, University of Antwerp, Belgium

Paul W. WILSON, University of Texas, Austin, USA

Song XI CHEN, Iowa State University, USA

Doctoral Visitors

Antonio COSMA, University of Lugano, Switzerland

Cinzia DARAIO, University of Pisa, Italy

Jorge Luis OJEDA CABRERA, Universidad de Zaragoza, Spain

Abderrahim OULHAJ, Oxford University, United Kingdom

Heike TRAUTMANN, University of Dortmund, Germany

Valentin ZELENYUK, National University of Kiev, Ukranian

3 THE INSTITUTE OF ACTUARIAL SCIENCE

The Institute of actuarial science has received an interdepartmental status since 2002. It is run jointly by the Institut d'Administration et de Gestion (IAG), the UCL business school, and the Institute of Statistics (STAT), combining so an unique expertise as well in deep mathematical background as in business aspects. It offers actuarial studies at master level. The two-year programme is recognized by the Belgian Actuarial Society (KVBA-ARAB), as well as by the Belgian regulatory authorities to be certified Appointed Actuary.

Working regularly with major actuarial departments of other European and North American universities (KULeuven, Lyon, Strasbourg, Barcelona, Amsterdam, London, Laval, etc.) the Institute develops highly respected degree courses, innovative research projects and offers numerous services to the actuarial community (CPD, colloquia, seminars, consulting, etc.). It benefits from several funding programs (PARC, FRIA and several research projects funded by the Région Wallonne) as well as from two chaires (by the Fortis and AXA groups).

In 2005, six books and more than 25 papers have been authored by the members of the Institute, who were granted several international prizes. Moreover, 23 working papers have been submitted for publication. Eight full-time researchers work under the supervision of the academic members of the Institute.

For a detailed account of the activities, we refer the interested reader to the website http://www.actu.ucl.ac.be.

4 PUBLICATIONS AND EDITING ACTIVITIES

The Institute publishes a Discussion Papers series and a Reprint series. The papers in both series are the output from the statistical research activities. Many collaborations (national and international) are going on with researchers from abroad. The following Discussion Papers and Reprints were issued during the period concerned by this report.

4.1 Discussion Papers

0501. Linearly interpolated FDH efficiency score for nonconvex frontiers

Daraio, C. and L. Simar

This paper address the problem of estimating the monotone boundary of a nonconvex set in a full nonparametric and multivariate setup. This is particularly useful in the context of productivity analysis where the efficient frontier is the locus of optimal production scenarios. Then efficiency scores are defined by the distance of a firm from this efficient boundary. In this setup, the Free Disposal Hull (FDH) estimator has been extensively used due to its flexibilty and because it allows nonconvex attainable production sets. However the nonsmoothness and discontinuities of the FDH is a drawback for conducting inference in finite samples. In particular, it is shown that the bootstrap of the FDH has poor performances and so is not useful in practice. Our estimator, the LFDH, is a linearized version of the FDH, obtained by linear interpolation of appropriate FDH-efficient vertices. It offers a continuous, smooth version of the FDH. We provide an algorithm for computing the estimator, and we establish its asymptotic properties. We also provide an easy way to approximate its asymptotic sampling distribution. The latter could offer bias-corrected estimator and confidence intervals of the efficiency scores. In a Monte-Carlo study, we show that these approximations works well even in moderate sample sizes and that our LFDH estimator outperforms, both in bias and in MSE the original FDH estimator.

0502. Conditional nonparametric frontier models for convex and non convex technologies: a unifying approach

Jeong, S.-O. and L. Simar

The explanation of productivity differentials is very important to identify the economic conditions that create inefficiency and to improve managerial performance. In literature two main approaches have been developed; one-stage approaches and two-stage approaches. Daraio and Simar (2003) propose a full nonparametric methodology based on conditional FDH and conditional order-m frontiers without any convexity assumption on the technology. On the one hand, convexity has always been assumed in mainstream production theory and general equilibrium. On the other hand, in many empirical applications, the convexity assumption can be reasonable and sometimes natural. Leading by these considerations, in this paper we propose a unifying approach to introduce external-environmental variables in nonparametric frontier models for convex and non convex technologies. Developing further the work done in Daraio and Simar (2003) we introduce a conditional DEA estimator, i.e., an estimator of production frontier of DEA type conditional to some external-environmental variables which are neither inputs nor outputs under the control of the producer. A robust version of this conditional estimator is also proposed. These various measures of efficiency provide also indicators of convexity. Illustrations through simulated and real data (mutual funds) examples are reported.

0503. Backfitting versus profiling in general criterion functions

Van Keilegom, I. and R. J. Carroll

We study the backfitting and profile methods for general criterion functions that depend on a parameter of interest β and a nuisance function θ. We show that when different amounts of smoothing are employed for each method to estimate the function θ, the two estimation procedures produce asymptotically the same estimator of β, even when the criterion functions are non-smooth in β and / or θ. The results are applied to a partial linear median regression model and a change point model, both examples of non-smooth criterion functions.

0504. Analysing the results of a designed experiment when the response is a curve: methodology and application in metal injection moulding

Govaerts, B. and J. Noel

In (designed) industrial experiments, the response observed often takes the form of a curve representing, for example, the evolution of a quality characteristic over a period of time. In such context, the polynomial regression approach, usually used in response surface analysis to predict the response as a function of the experimental factors, should be adapted to the functional character of the response. This paper reviews several possible methods of analysing the results of a designed experiment when the response is a curve and compares them with a case study from the metal injection moulding industry. Four different approaches are presented to fit a model to the (functional) data : two step nonlinear modelling; pointwise functional regression; smoothed functional regression and PLS. All the models derived are able to predict the functional response from any design factor setting chosen in the experimental domain. Two inferential problems are discussed : the significance testing of experimental factor effects, and the calculation of prediction intervals around predicted curves. Asymptotic results and bootstrap procedures are compared in this context.

0505. Aggregation of Malmquist Productivity Indexes

Zelenyuk, V.

In this paper we extend the work of Fare and Zelenyuk (2003) to find a theoretically justified method of aggregating Malmquist Productivity Indexes over individual decision making units (firms, countries, etc.) into a group Malmquist Productivity Index. We also consider the aggregation of decomposed parts of the Malmquist Productivity Index to obtain a decompositon of the Malmquist Productivity Index for a particular group.

0506. Product-limit estimators of the survival function with left or right censored data.

Patilea, V. and J.-M. Rolin

The problem of estimating the distribution of a lifetime when data may be left or right censored is considered. Two models are introduced and the corresponding product-limit estimators are derived. Strong uniform convergence and asymptotic normality are proved for the product-limit estimators on the whole range of the observations. A bootstrap procedure that can be applied to confidence intervals construction is proposed.

0507. Semiparametric estimation by model selection for locally stationary processes.

Van Bellegem, S. and R. Dahlhaus

Over the last decades more and more attention has been paid to the problem how to fit a parametric model of time series with time-varying parameters. A typical example is given by autoregressive models with time-varying parameters (tvAR processes). We propose a procedure to fit such time-varying models to general nonstationary processes. The estimator is a maximum Whittle likelihood estimator on sieves. The results do not assume that the observed process belongs to a specific class of time-varying parametric models. We discuss in more details the fitting of tvAR(p) processes for which we treat the problem of the selection of the order p, and propose an iterative algorithm for the computation of the estimator. Comparison with model selection by AIC is provided through simulations.

0508. A survey about Single-Index Models theory.

Geenens, G. and M. Delecroix

One of the most refered semiparametric regression models in literature is certainly the Single-Index Model. It can be seen as a generalization of the Generalized Linear Model, where the link function is kept unknown and has to be estimated via nonparametric techniques. In this paper we propose a complete summary of the theory of the SIM : identification conditions, estimation of the link, estimation of the index and goodness of fit tests, as well as a simulation study permitting to compare the practical performances of different estimators of the index.

0509. Technological change and transition: relative contributions to worldwide growth during the 1990's.

Badunenko, O., Henderson, D. J. and V. Zelenyuk

In this paper we use the procedures developed in the Kumar and Russell (2002) growth-accounting study to examine cross-country growth during the 1990's. Using a data set comprised of developed, newly industrialized, developing and transitional economies, we decompose the growth of output per worker into components attributable to technological catch-up, technological change and capital accumulation. In contrast to the study by Kumar and Russel (2002), which concluded that capital deepening was the major force of growth and change in the world income per worker distribution over the 1965-1990 period, our analysis shows that during the 1990's, the major force in the further divergence of the rich and the poor was due to technological change, whereas capital accumulation played a lesser role. In further contrast, we find that efficiency changes led on average to regress rather than progress. Finally, although on average we find that transitional economies performed similar to the rest of the world, our procedure was able to discover patterns within the set of transitional countries.

0510. Comparison of regression curves with censored responses.

Pardo-Fernandez, J.C. and I. Van Keilegom

In this article we introduce a procedure to test the equality of regression functions when the response variables are censored. The test is based on a comparison of Kaplan-Meier estimators of the distribution of the censored residuals. Kolmogorov-Smirnov and Cramer-von Mises type statistics are considered. Some asymptotic results are proved; weak convergence of the process of interest, convergence of the test statistics and behavior of the process under local alternatives. We also describe a bootstrap procedure in order to approximate the critical values of the test. A simulation study and an application to a real data set conclude the paper.

0511. Ignorable Common Information, Null Sets and Basu's First Theorem.

San Martin, E., Mouchart, M. and J.-M. Rolin

This paper deals with the Intersection Property, or Basu's First Theorem, which is valid under a condition of no common information, also known as measurable separability. After formalizing this notion, the paper reviews general properties and give operational characterizations in two topical cases; the finite one and the multivariate normal one. The paper concludes discussing the relevance of these characterizations for different fields as graphical models, zero entries in contingency tables, causal analysis and estimability in Markov processes.

0512. Nonlinear regression with censored data.

Heuchenne, C. and I. Van Keilegom

Suppose the random vector (X, Y) satisfies the regression model $Y = m(X) + \sigma(X)\epsilon$, where $m(.) = E(Y|.)$ belongs to some parametric class $\{m_\theta(.) : \theta \in \Theta\}$ of regression functions, $\sigma^2(.) = Var(Y|.)$ is unknown and ϵ is independent of X. The response Y is subject to random right censoring, and the covariate X is completely observed. A new estimation procedure for the true, unknown parameter vector θ_0 is proposed, that extends the classical least squares procedure for nonlinear regression to the case where the response is subject to censoring. The consistency and asymptotic normality of the proposed estimator are established. The estimator is compared via simulations with an estimator proposed by Stute in 1999, and both methods are also applied to a fatigue life data set of strain-controlled materials.

0513. Curve registration using fractional polynomials with application to electoencephalograms analysis.

Bugli, C., Lambert, Ph. and J. Bigot

An important issue in functional data analysis consists in deciding whether there is any significant difference between 2 sets of curves. When monitoring some sontinuous process on similar units (like patients in a clinical study), one often notices a typical pattern common to all curves but with variation both in amplitude and dynamics between curves. Our goal consists in synchronizing the individual curves before any further statistical treatment. In this paper, we propose a new registration technique based on fractional polynomials. We compare this method with two alignment methods; the nonparametric method of Ramsay and Silverman (1997) and the landmark registration technique with markers detected using wavelets proposed by Bigot (2005). The methodology is illustrated on a real biomedical study with the registration of electroencephalograms (EEG). We shall show how this can be used to detect a treatment effect.

0514. Bayesian encompassing test under partial observability.

Almeida, C. and M. Mouchart

Florens, Richard and Rolin (2003) proposed a specification test of a parametric hypothesis against a nonparametric one, in the framework of a Bayesian encompassing test. Building on that work we elaborate the procedure under a condition of partial observability. The general procedure is illustrated by the case where only the sign is observable, and more generally when the available data come from a binary reduction of a vector of latent variables.

This example is also used to point out some difficulties when implementing the proposed procedure.

0515. Two-sample tests in functional data analysis starting from discrete data.

Hall, P. and I. Van Keilegom

One of the ways in which functional data analysis differs from other areas of statistics is in the extent to which data are pre-processed prior to analysis. Functional data are invariably recorded discretely, although they are generally substantially smoothed as a prelude even to viewing by statisticians, let along further analysis. This has a potential to interfere with the performance of two-sample statistical tests, since the use of different tuning parameters for the smoothing step, or different observation times or subsample sizes (i.e. numbers of observations per curve), can mask the differences between distributions that a test is really trying to locate. In this paper, and in the context of two-sample tests, we take up this issue. Ways of pre-processing the data, so as to minimise the effects of smoothing, are suggested. We show theoretically and numerically that, by employing exactly the same tuning parameter (e.g. bandwidth) to produce each curve from its raw data, significant contributions to level inaccuracy and power loss can be avoided. Provided a common tuning parameter is used, it is often satisfactory to chooose that parameter along conventional lines, as though the target was estimation of the continuous functions themselves, rather than testing hypotheses about them. Moreover, in this case, using a second-order smoother (such as local-linear methods), the subsample sizes can be almost as small as the square root of sample sizes before the effects of smoothing have any first-order impact on the results of a two-sample test.

0516. Multivariate wavelet-based shape preserving estimation for dependent observations.

Cosma, A., Scaillet, O. and R. von Sachs

We present a new approach on shape preserving estimation of probability distribution and density functions using wavelet methodology for multivariate dependent data. Our estimators preserve shape constraints such as monotonicity, positivity and integration to one, and allow for low spatial regularity of the underlying functions. As important application, we discuss conditional quantile estimation for financial time series data. We show that our methodology can be easily implemented with B-splines, and performs well in a finite sample situation, through Monte Carlo simulations.

0517. On commensurability of directional distance functions.

Salnykov, M. and V. Zelenyuk

Shephard's distance functions are widely used instruments for characterizing technology and for estimating efficiency in contemporary economic theory and practice. Recently, they have been generalized by the Luenberger shortage function, or Chambers-Chung-Fare directional distance function. In this study, we explore a very important property of an economic measure known as commensurabilty or independence of units of measurement up to scalar transformation. Our study discovers both negative and positive results for this property in the context of the directional distance function, which in turn helps us narrow down the most critical issue for this function in practice - the choice of direction of measurement.

0518. Estimation in nonparametric location-scale regression models with censored data.

Heuchenne, C. and I. Van Keilegom

Consider the random vector $(X; Y)$, where X is completely observed and Y is subject to random right censoring. It is well known that the completely nonparametric kernel estimator of the conditional distribution $F(.|x)$ of Y given $X = x$ suffers from inconsistency problems in the right tail (Beran, 1981), and hence any location function $m(x)$ that involves the right tail of $F(.|x)$ (like the conditional mean) cannot be estimated consistently in a completely nonparametric way. In this paper we propose an alternative estimator of $m(x)$, that, under certain conditions, does not share the above inconsistency problems. The estimator is constructed under the model $Y = m(X) + \sigma(X)\epsilon$, where ϵ and X are independent and $\sigma(.)$ is an unknown scale function. We obtain the asymptotic properties of the proposed estimator of $m(x)$, we compare it with the completely nonparametric estimator via simulations and apply it to a study of quasars in astronomy.

0519. Goodness-of-fit tests for parametric models in censored regression.

Pardo-Fernandez, J.C., Van Keilegom, I. and W. Gonzalez-Manteiga

In this article we introduce a goodness-of-fit test for parametric regression models when the response variable is right censored. The test is based on the comparison of a parametric estimator and a nonparametric estimator of the distribution of the residuals. Kolmogorov-Smirnov and Cramer-von Mises type statistics are proposed. A bootstrap mechanism is used to approximate the critical values of the test. Some simulations are included and a real data set is analyzed.

0520. Mean preservation in nonparametric regression with censored data.

Heuchenne, C. and I. Van Keilegom

Consider the heteroscedastic model $Y = m(X) + \sigma(X)\epsilon$, where ϵ and X are independent, Y is subject to right censoring, $m(.)$ is an unknown but smooth location function (like e.g. conditional mean, median, trimmed mean...) and $\sigma(.)$ an unknown but smooth scale function. In this paper we consider the estimation of $m(.)$ under this model. The estimator we propose is a Nadaraya-Watson type estimator, for which the censored observations are replaced by 'synthetic' data points estimated under the above model. The estimator offers an alternative for the completely nonparametric estimator of $m(.)$, which cannot be estimated consistently in a completely nonparametric way, whenever high quantiles of the conditional distribution of Y given $X = x$ are involved. We obtain the asymptotic properties of the proposed estimator of $m(x)$ and study its nite sample behavior in a simulation study. The method is also applied to a study of quasars in astronomy.

0521. Empirical likelihood confidence intervals for dependent duration data.

El Ghouch, A., Van Keilegom, I. and I.W. McKeague

Three types of confidence intervals are developed for a general class of functionals of a survival distribution based on censored dependent data. The confidence intervals are constructed via asymptotic normality (Wald's method), the empirical likelihood (EL) method, and the blockwise EL method in which sample means over blocks of observations are used in place of the original data. Asymptotic results are derived to accurately calibrate the various procedures and their performance is evaluated in a simulation study. The problem of the choice of the blocksize is also discussed.

0522. Power of significance test of dummies in Simar-Wilson two-stage efficiency analysis model.

Zelenyuk, V.

In this note we investigate the power of significance test for dummy-variables in the context of Simar and Wilson (2003) two-stage efficiency analysis model.

0523. Distributional testing in solow's growth accounting model: with application to studying impact of ICT in developed countries.

Zelenyuk, V.

In this paper, we modernize the seminal Solow's growth accounting methodology towards statistical testing of significance of a contribution from each source of decomposition as well as testing whether such contribution caused a multi-club convergence phenomenon. We illustrate our methodology on the data for developed countries, in attempt to gain some insight on how the three sources of productivity growth - (i) change in ICT-capital per worker, (ii) change in Non-ICTcapital per worker, and (iii) change in TFP - have impacted the distribution of labor productivity in developed countries from 1980 to 1995.

0524. Estimation and inference in cross-sectional, stochastic frontier models.

Simar, L. and P.W. Wilson

Conventional approaches for inference about efficiency in parametric stochastic fron tier (PSF) models are based on percentiles of the estimated distribution of the one-sided error term, conditional on the composite error, rather than on the sampling distribution of the inefficiency estimator. When used as confidence intervals, these have extraordi narily poor coverage properties that do not improve with increasing sample size. We present a bootstrap method that gives confidence interval estimates based on sampling distributions, and which have good coverage properties that improve with sample size. In addition, researchers who estimate PSF models typically reject models, samples, or both when residuals have skewness in the "wrong" direction, i.e., in a direction that would seem to indicate absence of inefficiency. We show that correctly specified mod els can generate samples with "wrongly" skewed residuals, even when the variance of the inefficiency process is nonzero. Our bootstrap method provides useful information about inefficiency and model parameters irrespective of whether residuals have the skewness in the desired direction. We also find that a commonly-used Wald test used to test the existence of inefficiency has catastrophic size properties; likelihood-ratio and bootstrap tests are shown in Monte Carlo experiments to perform well both in terms of size and power.

0525. A fully nonparametric stochastic frontier model for panel data.

Henderson, D.J. and L. Simar

In this paper we estimate the frontier and time variant technical efficiency fully nonparametrically by exploiting recent advances in kernel regression estimation of categorical data. Specifically, we model firm (unordered) and time (ordered) categorical variables directly into the conditional mean. This approach allows us to smooth the firm and time specific effects, which formally entered the model linearly. Our setup allows for more flexible and accurate estimates of the frontier and time variant technical efficiency. Further, the estimators are consistent and achieve the standard nonparametric rate of convergence. We apply these techniques to a data set examining labor efficiencies of 17 railway companies over a period of 14 years. Not only are our results for the elasticites more economically intuitive than the parametric and semiparametric procedures, we obtain different rankings in terms of labor efficiencies.

0526. A new test for the parametric form of the variance function in nonparametric regression.

Dette, H. and I. Van Keilegom

In the common nonparametric regression model the problem of testing for the parametric form of the conditional variance is considered. A stochastic process based on the difference between the empirical processes obtained from the standardized nonparametric residuals under the null hypothesis (of a specific parametric form of the variance function) and the alternative is introduced and its weak convergence established. This result is used for the construction of a Cramer von Mises type statistic for testing the parametric form of the conditional variance. The nite sample properties of a bootstrap version of this test are investigated by means of a simulation study. In particular the new procedure is compared with some of the currently available methods for this problem and its performance is illustrated by means of a data example.

0527. Archimedean copula estimation using Bayesian splines smoothing techniques.

Lambert, Ph.

Copulas [1] enable to specify multivariate distributions with given marginals. Various parametric proposals were made in the literature for these quantities, mainly in the bivariate case (see e.g. [2]). They can be systematically derived from multivariate distributions with known marginals, yielding e.g. the normal and the Student copulas. Alternatively, one can restrict his interest to a subfamily of copulas named Archimedean [3]. They are characterized by a strictly decreasing convex function $\varphi(.)$ on $(0, 1)$ such that $\varphi(0^+) = +\infty$ (when strict) and $\varphi(1) = 0$. We propose to approximate $\lambda(.) = \varphi(.) = \varphi'(.)$ using B-splines [4] and show how the associated parameters can be estimated using Markov Chains Monte-Carlo (MCMC, see e.g. [5]). The estimation is reasonably quick. The fitted generator is smooth and parametric. The generated chain(s) can be used to build "credible envelopes" for $\lambda(.)$ and derived quantities such as Kendall's tau, posterior predictive probabilities, etc. Parameters associated to parametric models for the marginals can be estimated jointly with the copula parameters. This is an interesting alternative to the two-steps procedure (see e.g. [6]) which assumes that the regression parameters are fixed known quantities when it comes to copula parameter(s) estimation. A simulation study is performed to evaluate the approach. The practical utility of the method is illustrated by a basic analysis of the dependence structure underlying the diastolic and the systolic blood pressures in male subjects.

0528. Nonparametric simultaneous testing for structural breaks.

Gao, J., Gijbels, I. and S. Van Bellegem

0529. Discrete s-convex extremal distributions: Theroy and applications

Courtois, C., Denuit, M. and S. Van Bellegem

Given a nondegenerated moment space with s fixed moments, explicit formulas for the discrete s- convex extremal distribution have been derived for s = 1, 2, 3 (see [1]). If s = 4, only the maximal distribution is known (see [2]). This paper goes beyond this limitation and proposes a method to derive explicit expressions for general nonnegative integer s. In particular, we derive explicitly the discrete 4-convex minimal distribution. For illustration, we show how this theory allows to bound the probability of extinction in a Galton-Watson branching process. The results are also applied to derive bounds for the probability of ruin in the compound binomial and Poisson insurance risk models.

0530. Strong uniform consistency results of the weighted average of conditional artificial data points

Heuchenne, C.

In this paper, we study strong uniform consistency of a weighted average of artificial data points. This is especially useful when information is incomplete (censored data, missing data . . .). In this case, reconstruction of the information is often achieved nonparametrically by using a local preservation of mean criterion for which the corresponding mean is estimated by a weighted average of new data points. This way of doing enlarges beyond incomplete data context and applies to the estimation of the conditional mean of specific functions of complete data points. As a consequence, we establish the strong uniform consistency of the Nadaraya- Watson (1964) estimator for general transormations of the data points. This result generalizes the one of Hardle, Janssen and Serfling (1988). In addition, the strong uniform consistency of a modulus of continuity will be obtained for this estimator. Applications of those two results are detailed for some popular estimators.

0531. Distribution of desirability index in multicriteria optimization using desirability functions based on the cumulative distribution function of the standard normal

Govaerts, B. and C. Le Bailly de Tilleghem

0532. Uncertainty propagation in multiresponse optimization using a desirability index

Govaerts, B. and C. Le Bailly de Tilleghem

Optimizing the quality of a product is widespread in the industry. Products have to be manufactured such that they best fit some quality properties. Varying the product settings leads to different product qualities and the aim of the manufacturer is to find the factors settings that simultaneously optimize the quality properties. The classical approach to solve such optimization problem is based on response surface methodology. First, a designed experiment is used to collect data and to adjust models capturing the relationship between the responses of interest and the factors settings. Those fitted models can then predict the quality properties for any design point of the experimental domain. Secondly, a desirability index is built to combine the predicted properties into a value belonging to the [0; 1] interval. This index provides a ranking of possible factors settings in the solutions space and the optimum can be found by an adequate optimization algorithm. But, as model predictions are suiled with error, so is the desirability index and the optimal solution found. In practice, in the related literature and design of experiment software, this error is neglected. This paper proposes an optimization methodology based on the fact that a desirability index is a random variable. The expectation of this index is taken as the criteria to be optimized and, since it can only be estimated, confidence and predicted intervals are constructed to take into account the propagation of the models error on the expected or predicted desirability index. The stochastic character of the index leads also to an uncertainty on the optimum and a methodology is proposed to build an equivalence zone containing no significantly different optimal solutions. This methodology is illustrated on a simulated example and compared to the classical optimization methodology.

0533. Generalized time-dependent conditional linear models under left truncation and right censoring

Teodorescu, B., Van Keilegom, I. and R. Cao

Consider the model $\phi(S(z|X)) = \beta(z)^t\overrightarrow{X}$, where ϕ is a known link function, $S(.|X)$ is the survival function of a response Y given a covariate $X, \overrightarrow{X} = (1, X, X^2, ..., X^p)$ and $\beta(z) = (\beta_0, ..., \beta_p(z))^t$ is an unknown vector of time-dependent regression coefficients. The response is subject to left truncation and right censoring. Under this model, which reduces for special choices of ϕ to e.g. Cox's proportional hazards model or the additive hazards model with time dependent coefficients, we study the estimation of the vector $\beta(z)$. A least squares approach is proposed and the asymptotic properties of the proposed estimator are established. The estimator is also compared with a competing maximum likelihood based estimator by means of simulations. Finally, the method is applied to a larynx cancer data set.

0534. Robust specification of the roughness penalty prior distribution in spatially adaptive Bayesian P-splines models

Jullion, A. and Ph. Lambert

We start the paper by pointing the potential important role of the prior distribution of the roughness penalty parameter in the resulting smoothness of Bayesian P-splines models (Ruppert et al. 2003 ; Lang and Brezger 2004). The recommended specification for that distribution yields models that can lack exibility in specific circumstances. In such instances, these are shown to correspond to a frequentist P-splines model (Eilers & Marx, 1996) with a predefined and severe roughness penalty parameter, an obviously undesirable feature. We show that the specification of a hyperprior distribution for one parameter of that prior distribution provides the desired exibility. Alternatively, a mixture prior can also be used. An extension of these two models by enabling adaptive penalties is provided. All the proposed models can be fitted quickly using the convenient Gibbs algorithm.

0535. Index coefficients estimation in single-index models: the generalized maximum rank correlation estimator

Geenens, G. and L. Simar

We propose a new estimator, called the Generalized Maximum Rank Correlation Estimator (GMRC), of the index coefficients in the context of the so-called Single-Index Model : $Y_i = g(\beta_0' X_i) + \epsilon_i$, with g and β_0 unknown. The underlying idea is very simple : given a pair of observations (X_i, Y_i) and (X_j, Y_j), if $g(\beta_0' X_i)$ is greater than $g(\beta_0' X_j)$, it is likely that Y_i be greater than Y_j. In other words, the ranks of the Y_i's and the ranks of the $g(\beta_0' X_i)'$ s would be highly positively correlated. The clue is thus to estimate β_0 by the value of β which maximizes an estimated version of the rank correlation. Han (1987) proposed such kind of estimation method, but assuming the strict monotonicity of the link function g. We relax this assumption. The estimator is shown to be root-n consitent and asymptotically normal, and has multiple advantages. In particular, an extensive simulation study shows its very good finite-sample behavior : in most of the situations, it seems that the GMRC estimator represents the best choice in practice.

0536. Nonparametric "regression" when errors are centred at endpoints

Hall, P. and I. Van Keilegom

Increasing practical interest has been shown in regression problems where the errors, or disturbances, are centred in a way that reflects particular characteristics of the mechanism that generated the data. In economics this occurs in problems involving data on markets, productivity and auctions, where it can be natural to centre at an endpoint of the error distribution, rather than at the distribution's mean. Often these cases have an extreme-value character, and in that broader context, examples involving meteorological and record-value data have been discussed in the literature. We shall suggest nonparametric methods for estimating regression curves in these settings, showing that they have features that contrast so starkly with those in better-understood problems that they lead to apparent contradictions. For example, merely by centring errors at their endpoints rather than their means the problem can change from one with a familiar nonparametric character, where the optimal convergence rate is slower than $n^{-\frac{1}{2}}$, to one in the super-efficient class, where the optimal rate is faster than $n^{-\frac{1}{2}}$. Moreover, when the error are centred in a non-standard way there is greater intrinsic interest in estimating characteristics of the error distribution, as well as of the regression mean itself. The paper will also address this aspect of the problem. The new function-estimation methodology can also be viewed as a competitor of techniques such as data envelopment analysis (DEA) and stochastic frontier analysis (SFA), relative to which it has a greater degree of robustness against outliers.

0537. Instrumental regression in partially linear models

Florens, J.-P., Johannes, J. and S. Van Bellegem

We consider the semiparametric regression $X^t\beta + \phi(Z)$ where β and $\phi(.)$ are unknow slope coefficient vector and function, and where the variables (X, Z) are endogeneous. We propose necessary and sufficient conditions for the identification of the parameters in the presence of instrumental variables. We also focus on the estimation of β. An incorrect parametrization of ϕ generally leads to an inconsistent estimator of β, whereas consistent nonparametric estimators for β have a slow rate of convergence. An additional complication is that the solution of the equation necessitates the inversion of a compact operator which can be estimated nonparametrically. In general this inversion is not stable, thus the estimation of β is ill-posed. In this paper, a $\sqrt{n}$-consistent estimator for β is derived under mild assumptions. One of these assumptions is given by the socalled source condition which we explicit and interpret in the paper. Finally we show that the estimator achieves the semiparametric efficiency bound, even if the model is heteroskedastic.

0538. Functional convergence of quantile-type frontiers with application to parametric approximations

Daoia, A., Florens, J.-P. and L. Simar

Nonparametric estimators of the upper boundary of the support of a multivariate distribution are very appealing because they rely on very few assumptions. But in productivity and efficiency analysis, this upper boundary is a production (or a cost) frontier and a parametric form for it allows for a richer economic interpretation of the production process under analysis. On the other hand, most of the parametric approaches rely on often too restrictive assumptions on the stochastic part of the model and are based on standard regression techniques fitting the shape of the center of the cloud of points rather than its boundary. To overcome these limitations, Florens and Simar (2005) propose a two-stage approach which tries to capture the shape of the cloud of points near its frontier by providing parametric approximations of a nonparametric frontier. In this paper we propose an alternative method using the nonparametric quantile-type frontiers introduced in Aragon, Daouia and Thomas-Agnan (2005) for the nonparametric part of our model. These quantile-type frontiers have the superiority of being more robust to extremes. Our main results concern the functional convergence of the quantile-type frontier process and its uniform complete convergence. Then we provide convergence and asymptotic normality of the resulting estimators of the parametric approximation. We also improve some convergence results obtained by Florens and Simar. The approach is illustrated through simulated and real data sets.

4.2 Published Papers

234. GUYOT-DECLERCK, C., FRANCOIS, N., RITTER, C., GOVAERTS, B. and S. COLLIN. Influence of pH and ageing on beer organoleptic properties. A sensory analysis based on AEDA data. *Food Quality and Preference*, 16, 157-162, 2005.

235. DENUIT, M. and Ph. LAMBERT. Constraints on concordance measures in bivariate discrete data. *Journal of Multivariate Analysis*, 93, 40-57, 2005.

236. HAKIZAMUNGU, J. and J.M. ROLIN. Bayesian nonparametric duration model with censorship. *Statistica. anno LXIII*, 2, 237-248, 2003.

237. GOVAERTS, B., BECK, B., LECOUTRE, E., le BAILLY, C. and Ph. VANDEN EECKAUT. From monitoring data to regional distributions: a practical methodology applied to water risk assessment. *Environmetrics*, 16, 109-127, 2005.

238. MOUCHART, M. and E. SCHEIHING. Bayesian evaluation of non-admissible conditioning. *Journal of Econometrics*, 123, 283-306, 2005.

239. DAUBIOUL, C.A., HORSMANS, Y., LAMBERT, Ph., DANSE, E. and N.M. DELZENNE. Effects of oligofructose on glucose and lipid metabolism in patients with nonalcoholic steatohepatitis: results of a pilot study. *European Journal of Clinical Nutrition*, 59, 723-726, 2005.

240. MESFIOUI, M. and A. TAJAR. On the properties of some nonparametric concordance measures in the discrete case. *Nonparametric Statistics*, 17, 5, 541-554, 2005.

241. HALL, P. and I. VAN KEILEGOM. Testing for monotone increasing hazard rate. *The Annals of Statistics*, 33, 3, 1109-1137, 2005.

242. BROUHNS, N., DENUIT, M. and I. VAN KEILEGOM. Bootstrapping the Poisson log-bilinear model for mortality forecasting. *Scandinavian Actuarial Journal*, 3, 212-224, 2005.

243. GUO, W., DAI, M., OMBAO, H.C. and R. von SACHS. Smoothing spline ANOVA for time-dependent spectral analysis. *Journal of the American Statistical Association*, 98, 463, 643-652, 2003.

244. DELOUILLE, V. and R. von SACHS. Estimation of nonlinear autoregressive models using design-adapted wavelets. *Annals of the Institute of Statistical Mathematics*, 57, 2, 235-253, 2005.

245. OMBAO, H., von SACHS, R. and W. GUO. SLEX analysis of multivariate nonstationary time series. *Journal of the American Statistical Association*, 10, 470, 519-531, 2005.

246. DELOUILLE, V., SIMOENS, J. and R. von SACHS. Smooth design-adapted wavelets for nonparametric stochastic regression. *Journal of the American Statistical Association*, 99, 467, 643-658, 2004.

247. SANCHEZ-SELLERO, C., GONZALEZ-MANTEIGA, W. and I. VAN KEILEGOM. Uniform representation of product-limit integrals with applications. *The Scandinavian Journal of Statistics*, 32, 563-581, 2005.

248. DAOUIA, A. and L. SIMAR. Robust nonparametric estimators of monotone boundaries. *Journal of Multivariate Analysis*, 96, 311-331, 2005.

249. DE MACQ, I. and L. SIMAR. Hyper-rectangular space partitioning trees : a practical approach. *Computational Statistics*, 20, 119-135, 2005.

250. VANDENHENDE, F. and Ph. LAMBERT. Local dependence estimation using semiparametric Archimedian copulas. *The Canadian Journal of Statistics*, 33,3, 377-388, 2005.

251. LAMBERT, Ph. and P.H.C. EILERS. Bayesian proportional hazards model with time-varying regression coefficients : a penalized Poisson regression approach. *Statistics in Medecine*, 24, 3977-3989, 2005.

252. MOUCHART, M. and J. ROMBOUTS. Clustered panel data models : an efficient approach for nowcasting from poor data. *International Journal of Forecasting*, 21, 577-594, 2005.

4.3 Books published by members of the Institute

FLORENS, J.P., MOUCHART, M. and J.M. ROLIN. *Elements of Bayesian Statistics*, 544 pp, Marcel Dekker: New York, 1990.

HÄRDLE, W. and L. SIMAR (editors). *Computer Intensive Methods in Statistics*, 175 pp, *Statistics and Computing, I*, Physica-Verlag: Berlin, 1993.

HÄRDLE, W., KLINKE, S. and B.A. TURLACH. *XploRe: An Interactive Statistical Computing Environment*, 387 pp, *Statistics and Computing*, Springer-Verlag: New York, 1995.

FAN, J. and I. GIJBELS. *Local Polynomial Modelling and its Applications*, 341 pp, Chapman and Hall: London, 1996.

KAAS, R., GOOVAERTS, M.J., DHAENE, J., and M. DENUIT. *Modern Actuarial Risk Theory*, Kluwer Academic Publishers: Dordrecht, 2001.

WUNSCH, G., MOUCHART, M. and J. DUCHÊNE (editors). *The Life Table : Modelling Survival and Death*, book series : *European Studies of Population*, vol. 11, Kluwer Academic Publishers : Dordrecht, 2002.

HÄRDLE, W. and L. SIMAR. *Applied Multivariate Statistical Analysis*, 486 pp., Springer Verlag: Berlin, 2003.

4.4 Editing activities

Michel DENUIT

Proceedings Editor for *Insurance: Mathematics and Economics.*
Member of the Advisory Board of the Wiley Encyclopedia of Quantitative Risk Assessment.
Associate Editor Australian and New-Zeeland Journal of Statistics.
Member of the Advisory Board of the Wiley Encyclopedia of Actuarial Science.
Associate Editor of the International journal of Statistics & Systems.
Advisor for the Wiley-Dunod Series in Statistics and Mathematics.

Irène GIJBELS

Associate Editor of *The Annals of Statistics* since January 2004.
Associate Editor of *Journal of Computational and Graphical Statistics* since October 2000.
Associate Editor of *Statistica Sinica* since August 2002.

Christian HAFNER

Associate Editor of *Computational Statistics.*

Philippe LAMBERT

Co-editor of *B-Stat News.*

Léopold SIMAR

Associate Editor of *Journal of Productivity Analysis.*

Ingrid VAN KEILEGOM

Associate Editor of *Scandinavian Journal of Statistics.*
Associate Editor of *Journal of the Royal Statistical Society - Series B*.
Associate Editor of *Annals of the Institute of Statistical Mathematics.*

Rainer von SACHS

Associate Editor of *Journal of the Royal Statistical Society - Series B.*

5 SEMINARS, WORKSHOPS AND SHORT COURSES

A statistics seminar is organised each week. A diversity of subjects is presented at this seminar. Speakers are mainly coming from outside the University and visitors of the Institute are among the contributors.

From time to time, a joint statistics and econometrics seminar, organised in collaboration with CORE, takes place. At those occasions statisticians and econometricians meet and have extra opportunities to discuss on common research interests and elaborate joint research.

Further, an applied statistics workshop is organised by the Institute on a regular basis. At this applied statistics workshop, emphasis is on talks in which an applied statistical problem is presented.

There is also the doctoral seminar which is an extra stimulant for Ph.D students and other young researchers.

5.1 Statistics Seminars

1. February 11, 2005, Wang LICHUN, Institute of Applied Mathematics, Chinese Academy of Sciences, Beijing, China
   Bayes and empirical Bayes iteration estimators in two seemingly unrelated regression equations.

2. February 18, 2005, Ernesto SAN MARTIN, Pontificia Universidad Católica de Chile, Chili.
   On the estimation of the Rasch model using logistic regression.

3. March 3, 2005, Sabine VERBOVEN, University of Antwerp, Belgium.
   Robust data analysis with LIBRA.

4. March 11, 2005, Antonio COSMA, Instituto di finanza, University of Lugano, Switzerland.
   Multivariate wavelet-based shape preserving estimation for dependent observations.

5. March 18, 2005, Stefan LANG, T.U. Munich, Germany.
   Structured Additive Regression : Model Choice and Variable Selection.

6. Avril 15, 2005, Mikis STASINOPOULOS, London Metropolitan University, United Kingdom.
   Generalized Additive Model for Location, Scale and Shape.

7. April 15, 2005, Steve PORTNOY, University of Illinois, Urbana-Champaign.
   Censored Quantile regression.

8. April 22, 2005, Piotr FRYZLEWICZ, Imperial College, London, United Kingdom.
   Haar-Fisz methodology for nonparametric function estimation.

9. May 20, 2005, Angelika VAN DER LINDE, University of Bremen, Germany.
   Model complexity.

10. September 23, 2005, Davit VARRON, LSTA University of Paris IV, France.
    Large deviations for the increments of the empirical distribution function.

11. September 23, 2005, Christian HAFNER, Institut de statistique, UCL, Belgium.
    Semiparametric multivariate volatility models.

12. October 21, 2005, Richard PAAP, Erasmus University Rotterdam, The Netherlands.
    Explaining individual Response using Aggregated Data.

13. November 4, 2005, Jorge CABRERA, Universidad de Zaragoza, Spain.
    Nonparametric Regression for length-biased data.

14. November 4, 2005, Stefan SPERLICH, University Carlos III, Madrid, Spain.
    Comparison of separable components in different samples.

15. December 16, 2005, Feike DROST, University of Tilburg, The Netherlands.
    Nonparametric risk-neutral return and volatility distributions.

16. December 16, 2005, Helmut HERWARTZ, University of Kiel, Germany.
    Testing for random effects in panel models with spatially correlated disturbances.

5.2 Joint Statistics and Econometrics Seminars

1. February 4, 2005, Antonio MELE, London School of Economics, United Kingdom.
   Simulated nonparametric estimation of dynamic models with applications to finance.

2. February 25, 2005, Valentin ZELENYUK, Institut de statistique, UCL, Belgium.
   Technological Change and Transition : Relative Contributions to Worldwide Growth During the 1990's.

3. March 16, 2005, Peter HALL, Australian National University, Australia.
   Properties of nearest-neighbour classifiers.

4. April 29, 2005, Laura MAYORAL, Universitat Pompeu Fabra, Spain.
   Is the observed persistence spurious or real ?. A test for fractional integration versus structural breaks.

5. October 12, 2005, Markku LANNE, CORE, UCL, Belgium.
   A multivariate generalized orthogonal factor GARCH model.

6. November 25, 2005, Oliver LINTON, London Schools of Economics, United Kingdom.
   A quantilogram approach of evaluating directional predictability.

5.3 Joint Statistics Seminars and Institut de Mathématique Pure et Appliquée

1. July 8, 2005, Song XI CHEN, Iowa State University, USA.
   Empirical Likelihood and its applications.

5.4 Joint Statistics Seminars and IAP network

1. October 21, 2005, Yoav BENJAMINI, Tel Aviv University, Israël.
   Selective confidence intervals in medical research : the problem and an FDR solution.

2. November 25, 2005, Domenico GIANNONE, CORE, UCL, Belgium.
   Nowcasting GDP and Inflation : the Real-Time Informational Content of Macroeconomic Data Releases.

5.5 Applied Statistics Workshops

1. February 10, 2005, Eric LECOUTRE, Institut de statistique, UCL, Belgium.
   Editions de documents, sorties logiciels et "reporting" : formats, outils et méthodes pour le statisticien.

2. March 24, 2005, Paul BANENS, CQM, The Netherlands.
   The difference between Statistical Consultancy and Applying Statistical Methods.

3. April 21, 2005, Marc VRIJENS, Aardex.
   Non adherence to prescribed therapy in clinical trials can be a blessing rather than a curse from the information/learning point of view.

4. May 12, 2005, Heike TRAUTMANN, University of Dortmund, Germany.
   The desirability Index : a statistical tool for multiobjective quality management in production.

5. May 19, 2005, Peter SLOCK and Camille VANDERHOEFT, NIS/INS, Belgium.
   A generic design for multi-stage sampling and incremental contacting & response recording via successive waves.

6. September 22, 2005, Christian RITTER, Institut de statistique, UCL, Belgium.
   On the presentation of data.

7. October 13, 2005, Christian RITTER, Institut de statistique, UCL, Belgium.
   The Golden Triangle of statistical analysis : combining the powers of a data base, a statistical language, and a spreadsheet.

8. November 10, 2005, Thierry VAN DE MERCKT, Vadis, Bruxelles, Belgium.
   La segmentation client : l'histoire d'une technique sous influence métier.

9. November 24, 2005, Peter SLOCK and Camille VANDERHOEFT, NIS/INS, Belgium.
   Sampling, followed by incremental contacting and response recording, for the Belgian Labour Force Survey (LFS).

10. December 8, 2005, Dirk VAN den POEL, Ghent Universiteit, Belgium.
    Why promotion strategies based on market basket analysis do not work.

5.6 Doctoral Seminars

1. February 10, 2005, Réjane ROUSSEAU, Institut de statistique, UCL, Belgium.
   Statistical tools for Metabonomics biomarkers indentification : use of supervised multivariate methods.

2. February 24, 2005, Alexandre LAMBERT, Institut de statistique, UCL, Belgium.
   Nonparametric estimation of discontinuous surfaces.

3. March 10, 2005, Carlos ALMEIDA, Institut de statistique, UCL, Belgium.
   Bayesian specification testing in models involving partial observability.

4. April 21, 2005, Céline LE BAILLY de TILLEGHEM, Institut de statistique, UCL, Belgium.
   Uncertainty Propagation in Multiresponse Optimization Using a Desirability Index.

5. May 19, 2005, Astrid JULLION, Institut de statistique, UCL, Belgium.
   Two extensions of Bayesian P-splines.

6. November 10, 2005, Angélique BACLIN, Institut de statistique, UCL, Belgium.
   Choix de plans d'expérience et étude de la performance des juges en analyse sensorielle.

7. November 24, 2005, Anouar EL GHOUCH, Institut de statistique, UCL, Belgium.
   Nonparametric censored regression with dependent data.

8. November 24, 2005, Bianca TEODORESCU, Institut de statistique, UCL, Belgium.

5.7 Short courses

During the spring 2004, short courses were given by invited professors (see section 2. of this report) within the activities of the Graduate School in Statistics :

- Yoav BENJAMINI, Tel Aviv University, Israël (October 2005).
  "Introduction to FDR approach for multiple inference : concepts, methods and applications in Biostatistics and Genomics"
- Nick BEST, Imperial College, London, United Kingdom (May 2005).
  "Introduction to Bayesian inference in biomedical applications"
- Véronique DELOUILLE, Royal Observatory of Belgium, Belgium (March 2005).
  "Statistical denoising of images, with applications in astronomy"
- Beyong PARK, Seoul National University, South Korea (May 2005).
  "Advanced nonparametric regression techniques"
- Eliana SCHEIHING, Universidade Austral de Chile, Valdivia, Chile (August - September 2005).
  "Markov chain Monte Carlo methods"

6 DOCTORATES

6.1 Doctors honoris causa

Peter HALL, Australian National University, Canberra (1997)

Luc DEVROYE, McGill University, Montréal, Canada (2002)

6.2 Doctoral dissertations

Natacha BROUHNS (December, 2005)

> "Les modèles de régression non linéaires comme solutions à divers problèmes actuarials"
> Promoter: Michel DENUIT

Cédric HEUCHENNE (August, 2005)

> "Mean preservation in censored regression using preliminary nonparametric smoothing"
> Promoter: Ingrid VAN KEILEGOM

Alexandre LAMBERT (August, 2005)

> "Nonparametric estimation in discontinuous curves and surfaces"
> Promoter: Irène GIJBELS

Oana PURCARU (August, 2005)

> "Modelling dependence in acturial science, with emphasis on credibility theory and copulas"
> Promoter: Michel DENUIT

6.3 Ph.D thesis in progress

Carlos ALMEIDA

> "Structural equation modeling with categorical ordered variables"
> Promoter: Michel MOUCHART

Jérome BARBARIN

"Fair valuation of life insurance contracts"
Promoter: Pierre DEVOLDER

Karim CHEIKH BENAMI

"ALM and risk measures"
Promoter: Pierre DEVOLDER

Hilmar BÖHM

"Model selection in principal component analysis for multivariate time series"
Promoter: Rainer von SACHS

Jean-Philippe BOUCHER

"Nonlife ratemaking with panel data"
Promoter: Michel DENUIT

Céline BUGLI

"Statistical analysis of evoked potentials in electroencephalograms"
Promoter: Philippe LAMBERT

Arthur CHARPENTIER

"Dependence structure and limiting results : some applications in finance and insurance"
Promoter: Michel DENUIT, co-Promoter : J. BEIRLANT

Cindy COURTOIS

"Risk theory under partial information and dependence"
Promoter: Michel DENUIT

Alexandra DASKOVSKA

"Dynamical analysis of productivity index"
Promoter: Léopold SIMAR, Sébastien VAN BELLEGEM

Antoine DELWARDE

“Modèles logbilinéaires en sciences actuarielles, avec applications en mortalité prospective et triangles IBNR"
Promoter: Michel DENUIT

Anouar EL GHOUCH

“Empirical likelihood with incomplete data"
Promoter: Ingrid VAN KEILEGOM

Nancy FRANCOIS

“Statistical analysis of time intensity curves in sensory analysis"
Co-Promoters: Bernadette GOVAERTS and Philippe LAMBERT

Gery GEENENS

“Statistical analysis pf time intensity curves in sensory analysis"
Promoter: Léopold SIMAR

Donatien HAINAUT

“Stochastic optimal control and application to pension fund and annuities"
Promoter: Pierre DEVOLDER

Astrid JULLION

“Statistical analysis of PET scan data"
Promoter: Philippe LAMBERT

Maria KEY PRATO

“Detection and quantification of treatment effect on blood pressure profile curves"
Promoter: Philippe LAMBERT

Céline LE BAILLY de TILLEGHEM

"Multiobjective optimization by computer simulations"
Co-Promoters: Bernadette GOVAERTS and Léopold SIMAR

Aurélie MILLER

"Optimal allocation between pay as you fo and funding in pension"
Promoter: Pierre DEVOLDER

Giovanni MOTTA

"Nonparametric estimation in time-varying covariance matrices for multivariate nonstationary time series"
Promoter: Rainer von SACHS

Sandra PITREBOIS

"Bonus-malus scales and segmented tarriffs"
Co-Promoters: Michel DENUIT and J.-F. WALHIN

Réjane ROUSSEAU

"Outils statistiques pour identification de biomarqueurs de toxicité métabonomiques"
Promoter: Bernadette GOVAERTS, Michel VERLEYSEN

Bianca TEODORESCU

"Generalized linear conditional models under left truncation and right censoring"
Promoter: Ingrid VAN KEILEGOM

7 CONTACT DAYS AND CONFERENCES

7.1 FNRS contact day : Workshop on Advances in Bayesian Econometrics

Louvain-la-Neuve, Belgium, August 25 2005

Group of Statistical Analysis

Organisers : Jean-Marie ROLIN and Sébastien VAN BELLEGEM

PROGRAM

“An Integrated Treatment of Monte Carlo Numerical Integration Procedures."
Jean-François RICHARD, University of Pittsburgh, USA

“Bayesian Phylogenetic Analysis of Yeast ATPases Taxa."
"Eliana SCHEIHING, Universidad Austral de Chile, Chile

“Endogeneity in Duration Models."
Jean-Pierre FLORENS, IDEI, Université de Toulouse I, France

“Ignorable Common Information, Null sets and Basu’s First Theorem"
Ernesto SAN MARTIN, Pontificia Universidad catolica de Chile, Chile.

“An Adaptive Specification test for Semiparametric Models"
Juan M. RODRIGUEZ-POO, Univesidad de Saragoza, Spain.

7.2 Third Young Researchers Day (YRD)

Louvain-la-Neuve, Belgium, December 2 2005

Organisers : Carlos ALMEIDA, Angélique BACLIN, Hilmar BOHM, Céline BUGLI, Alexandra DASKOVSKA, Anouar EL GHOUCH, Nancy FRANÇOIS, Gery GEENENS, Cédric HEUCHENNE, Julient HUNT, Astrid JULLION, Maria KEY PRATO, Thomas LALOUX, Alexandre LAMBERT, Céline LE BAILLY de TILLEGHEM, Giovanni MOTTA, Oana PURCARU, Réjane ROUSSEAU, Bianca TEODORESCU.

This meeting is supported by the Graduate School of Statistics of the Institute of Statistics and by the F.N.R.S.

PROGRAM

Arnost KOMAREK , Katholieke Universiteit Leuven , Belgium.
“Bayesian regression models for multivariate doubly-interval-censored."

Mathias HOFMANN, Ludwig-Maximilians-Unviersitat Munchen, Germany.
“A two-component model for counts of infectious diseases."

Simon WOODHEAD, University of Bristol, United Kingdom.
“Bayesian calibration of flood inundation models"

Katrien ANTONIO, Katholieke Universiteit Leuven, Belgium.
“Let’s go Bayesian : an acturial point of view."

Theodore KYPRAIOS, Lancaster University, United Kingdom.
“A class of semi-parametric time series models based on latent branching trees. Construction and Bayesian Inference."

8 ACADEMIC VISITS

The members of the Institute visited other institutions and most of them presented seminars.

January 2005

Ingrid VAN KEILEGOM, “Empirical likelihood tests for two-sample problems via nonparametric density estimation", Department of mathematics, University of California, San Diego, USA.

Ingrid VAN KEILEGOM, “Empirical likelihood tests for two-sample problems via nonparametric density estimation", Department of statistics, University of California, Davis, USA.

February 2005

Sébastien VAN BELLEGEM, Universität Heidelberg, Institut für Angewandte Mathemathik, Germany.

March 2005

Sébastien VAN BELLEGEM, Institut d’Economie Industrielle , Université Toulouse I, France.

Ingrid VAN KEILEGOM, “Empirical likelihood tests for two-sample problems via nonparametric density estimation", Center for statistics, Limburgs Universitair Cemtrum, Belgium.

Ingrid VAN KEILEGOM, “Backfitting versus profiling in general criterion functions", Department of statistics, University of Vigo, Spain.

April 2005

Léopold SIMAR, Department of Economics, University of Texas, Austin, USA.

Sébastien VAN BELLEGEM, Université Libre de Bruxelles, ECARES, Brussels, Belgium.

Ingrid VAN KEILEGOM, “Backfitting versus profiling in general criterion functions", Department of mathematics, University of La Coruña, Spain.

May 2005

Sébastien VAN BELLEGEM, “Semiparametric estimation by model selection for locally stationary processes", Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany.

July 2005

Sébastien VAN BELLEGEM, Department of Statistics, University of Illinois at Urbana-Champaign, USA.

Ingrid VAN KEILEGOM, “Backfitting versus profiling in general criterion functions", Institute of statistics, Aachen University, Germany.

August 2005

Christian RITTER, LUTE, University of Washington, Seattle, USA.

September 2005

Sébastien VAN BELLEGEM, “Instrumental regression in partially linear models", Institut d'Economie Industrielle, Université Toulouse I, France.

October 2005

Christian HAFNER, “Semiparametric multivariate GARCH models", ECARES, Université Libre de Bruxelles, Brussels, Belgium.

Philippe LAMBERT, “Archimedian copula estimation using Bayesian splines smoothing techniques", Leiden University Medical Centre, The Netherlands.

Ingrid VAN KEILEGOM, “Testing for the variance function in nonparametric regression", Department of mathematics, Charles University, Prague, Czech Republic.

Ingrid VAN KEILEGOM, “Testing for the variance function in nonparametric regression", Department of mathematics, University of Liège, Belgium.

November 2005

Christian HAFNER, Stockholm School of Economics, Sweden.

Sébastien VAN BELLEGEM, “Semiparametric estimation by model selection for locally stationary processes", Department of Statistics, University of Illinois at Urbana-Champaign, USA.

December 2005

Léopold SIMAR, Institut d'Economie Industrielle, Université des Sciences Sociales, Toulouse I, France.

9 CONFERENCES AND MEETINGS

The members of the Institute assisted and/or participated to the following conferences.

February 2005

Léopold SIMAR, "Nonparametric Efficiency Analysis : a multivariate conditional quantile approach", invited talk, Institut de Statistique et de Recherche Opérationnelle, ULB, Bruxelles, Belgium.

March 2005

Léopold SIMAR, *AQUAMETHPSR project under the PRIME Network of Excellence supported by the European Commission, 6th Framework Programme*, Working group on "Analysis of Productivity of European Universities", Centro de Investigaĉao de Politicas do Ensimo Superior (CIPES), Porto, Portugal.

April 2005

Michel DENUIT, *Scientific Conference on Insurance and Finance*, invited speaker, German association for Insurance and Financial Mathematics, Berlin, Germany.

Alexandre LAMBERT, *55th Session of the International Statistical Institute* , "Local linear estimation of discontinuous curve and surface : a compromise between smoothing and jum/edge preserving", invited speaker, Sydney, Australia.

Christian RITTER, *Polymer mould innovations*,"Model magic", oral presentation, Gent, Belgium.

Léopold SIMAR, *55th Session of the International Statistical Institute (ISI)*, "Nonparametric Stochastic Frontiers : A Local Maximum Likelihood Approach", Sydney, Australia.

Léopold SIMAR, *Workshop on Efficiency and Productivity Analysis*, "Non parametric Frontiers Models : recent developments and perspectives", invited talk, University of Georgia, Athens, Georgia, USA.

May 2005

Michel DENUIT, "Risk measures and risk management", invited speaker, Eurandom, Eindhoven University of Technology, The Netherlands.

Bernadette GOVAERTS, , "Bayesian Inference in Biomedical Applications using WinBUGS " by Nicky Best , invited , Eli Lilly, Mont-Saint-Guibert, Belgium.

Christian RITTER, *Blowing agents and foaming processes*,"Interfaces to models", oral presentation, Stuttgart, Germany.

Léopold SIMAR, *Franqui Foundation Workshop*,"Nonparametric Stochastic Frontiers : A Local Maximum Likelihood Approach", invited speaker and chairman of a session, ULB, Brussels, Belgium.

Léopold SIMAR, *Applied Stochastic Models and Data Analysis-ASMDA2005*,"Robust Nonparametric Frontier Estimation, using Quantile Frontiers", invited member of the Scientific Committee, presentation and chairman of a session, Brest, France.

Léopold SIMAR, "Robust Nonparametric Estimation of Frontiers", invited talk, Ecole Polytechnique Fédérale de Lausanne, Switzerland.

Sébastien VAN BELLEGEM, *3rd Brussels-Prague Seminar in Mathematical Statistics*, "Simultaneous Testing in Nonparametric Regression with Discontinuities in the Mean and Variance Fucntion", invited, Université Libre de Bruxelles, Belgium.

Ingrid VAN KEILEGOM, *Third Brussels-Prague Seminar in Mathematical Statistics*, "Backfitting versus profiling in general criterion functions", invited presentation, Université Libre de Bruxelles, Belgium.

Rainer von SACHS, "Third International workshop of the IAP network and Francqui Foundation Workshop", Discussant to E. Mammen's talk "Estimation of nonparametric regression models with unknown link functions", Brussels, Belgium.

June 2005

Carlos ALMEIDA, *Fourth Workshop on Bayesian Inference in Stochastic Processes* "Bayesian Encompassing Test under Partial Observability", poster, Villa Monastero, Varenna, Italy.

Michel DENUIT, *Colloque* "Corrélations entre Risques", invited speaker, Paris, France.

Léopold SIMAR, *AQUAMETHPSR project under the PRIME Network of Excellence supported by the European Commission, 6th Framework Programme*,Working group on "Analysis of Productivity of European Universities", Laboratory of Economics and Management, Santa-Anna School of Advanced Studies, Pisa, Italy.

Léopold SIMAR, *9th European Workshop on Efficiency and Productivity Analysis*, "LFDH : a continuous nonparametric envelopment estimator for nonconvex technologies", Member of the Scientific Committee, Brussels, Belgium.

Sébastien VAN BELLEGEM, *XXXVIIèmes journées de statistique*, “Statistical Analysis on nonstationary time series", inaugural plenary session , invited, Pau, France.

Ingrid VAN KEILEGOM, *Second International Statistics Workshop*, “Backfitting versus profiling in general criterion functions", invited presentation, Seoul, South-Korea.

Rainer von SACHS, *XXXVIIèmes journées de statistique* , “Multivariate wavelet-based shape preserving estimation for dependent observations", contributed talk, Pau, France.

July 2005

Astrid JULLION, *25th European Meeting of Statisticians*, “On the use of cross-validation criteria in Bayesian P-splines models", presentation, Oslo, Norway.

Philippe LAMBERT, *25th European Meeting of statisticians*, “Flexible parametric specification of bivariate copulas using Bayesian smoothing splines", speaker, Oslo, Norway.

Léopold SIMAR, *Myths and Reality of Productivity Miracles and Failures in Transitional Economies*, “Advances in Statistical Measurement in Efficiency Analysis", Invited Keynote speaker, EERC-Kiev, Ukraine.

Bianca TEODORESCU, *Perspectives in Modern Statistical Inference III* , “Goodness-of-fit tests for conditional models with time-dependent coefficients under censoring and truncation", contributed paper, Mikulov, Czech Republic.

Ingrid VAN KEILEGOM, *International Seminar on Nonparametric Inference*, “Test for the variance function in nonparametric regression", invited presentation and Session chair, University of La Coruña, Spain.

August 2005

Michel DENUIT, *2005 World Risk and Insurance Economics Congress* , “Application of the Poisson logbilinear projection model to the G5 mortality experience", Salt lake City, Utah, USA.

Christian RITTER, *Conference on the Belgian Statistical Society*,“Presenting a table", oral presentation, Corsendonck, Belgium.

Sébastien VAN BELLEGEM, *Econometric Society World Congress*, “Simultaneous Testing in Nonparametric Regression with Discontinuities in the Mean and Variance Function", contributed paper, London, United Kingdom.

September 2005

Hilmar BOHM, , *Workshop on Nonlinear and Nonstationary Time Series* , participant, Kaiserslautern, Germany.

Bernadette GOVAERTS, *ENBIS Conference*, "Problem based teaching : The wild river workshop ", invited speaker, Newcastle, UK.

Bernadette GOVAERTS, *DIA conference on Statistical Methodology for non-clinical R&D* , invited , Nice, France.

Sébastien VAN BELLEGEM, *Fourth Workshop of the IAP Research Network*, "Analysis of Longitudinal Multilevel Emotion data via Locally stationary time series", invited, Katholieke Universiteit Leuven, Belgium.

Rainer von SACHS, *2005 NBER/NSF Time Series Conference Heidelberg*, Satellite workshop on "Locally stationary time series models" , Kaiserslautern, Germany.

Rainer von SACHS, *2005 PAI Workshop IV*, "A multiscale approach for statistical caracterisation of spatially and temporally heterogeneous brain response images", talk, Leuven, Belgium.

October 2005

Michel DENUIT, *Colloque* "La réassurance : approche technique", invited speaker, Paris, France.

Gery GEENENS, , *13th Annual Meeting of the Belgian Statistical Society* , "Index Coefficients estimation in Single-Index Models : the Generalized Maximum Rank Correlation Estimator", invited speaker, Corsedonck, Belgium.

Bernadette GOVAERTS, *Conférence de la société Belge de statistique* , invited , Oud-Turnhout, Belgium.

Astrid JULLION, *International workshop in statistical medthodology in clinical and non-clinical R&D*, "On the smoothing of PET time-activity curves by Bayesian P-splines", presentation, Nice, France.

Philippe LAMBERT, *3rd word conference on Computational Statistics and Data Analysis*, "Bivariate additive models with a copula dependence structure", speaker, Limassol, Cyprus.

Léopold SIMAR, *13th Annual Meeting of the Belgian Statistical Society* , Corsedonck, Belgium.

Bianca TEODORESCU, *13th Annual Meeting of the Belgian Statistical Society* , "Goodness-of-fit tests for conditional models with time-dependent coefficients under censoring and truncation", contributed paper, Corsedonck, Belgium.

Ingrid VAN KEILEGOM, *Workshop on Statistische und Probabilistische Methoden der Modellwahl*, "Test for the variance function in nonparametric regression", invited presentation , Oberwolfach, Germany.

November 2005

Astrid JULLION, *Workshop on Bayesian inference with biomedical applications* organized by the Biostatistics section of SBS-BVS, "On the smoothing of PET time-activity curves by Bayesian P-splines", presentation, Brussels, Belgium.

Alexandre LAMBERT, *Nonparametric estimation of discontinuous curves and surfaces* , participant, University Center of Statistics, Katholieke Universiteit Leuven, Belgium.

Philippe LAMBERT, *Workshop on Bayesian inference with biomedical applications* organized by the Biostatistics section of SBS-BVS , co-organizer, EORTC, Brussels, Belgium.

Philippe LAMBERT, *Workshop on Bayesian inference with biomedical applications*, "Bayesian proportional hazards model with time varying regression coefficients" , invited talk, EORTC, Brussels, Belgium

Céline LE BAILLY de TILLEGHEM, *Second autumn symposium of the research training group on Statistical modelling* , "Uncaertainty propagation in multiresponse optimization using desirability index", invited speaker, Universitätskolleg Bommerholz, Witten, Germany.

Christian RITTER, *Technical committee of the international commisson on glass*,"Statistical issues in cullet sampling", oral presentation, Venice, Italy.

Réjane ROUSSEAU, *Chiométrie 2005*, "Analyses statistiques multivariées de spectres H-NMR pour l'identification de biomarqueurs métabonomiques de toxicité", invited speaker, Lille, France.

Davit VARRON, *Ex-Post Evaluation IAP 2005*, "Building uniform confidence bands for the conditional c.d.f. by empirical likelihood" and "A nonstandard functional limit law for the increments of the compound empirical d.f.", posters, Université catholique de Louvain, Belgium.

December 2005

Bernadette GOVAERTS, *Chimiométrie 2005* , invited , Lille, France.

Giovanni MOTTA, Worshop on *Factor Identification in High Dimensional Time Series* , Center for Applied Statistics and Economics, Berlin, Germany.

Léopold SIMAR, *Observatory of the European University Panel Session and AQUAMETH meeting* , PRIME Network of Excellence, 6th EC Framework Programme , presentation of “Efficiency and Productivity in European Universities" , IKU-Innovation Research Center, Budapest, Hungary.

Ingrid VAN KEILEGOM, *Workshop on Specification testing*, “Empirical likelihood test for a class of regression models", invited presentation , Santander, Spain.

Rainer von SACHS, , “Modelling, estimation and prediction of locally stationary time series ", seminar talk , Fribourg-Bern, Zwitzerland.

10 RESEARCH PROJECTS UNDER CONTRACTS AND COOPERATION PROJECTS

This section discusses ongoing research projects and cooperation projects at the Institut de statistique that are financed by outside agencies in the form of grants or contracts.

"Statistical techniques and modelling for complex substantive questions with complex data" (2002-2006)

Financing : Interuniversity Attraction Poles Programmes, Belgian Science Policy, Brussels, Belgium

Coordinators : L. SIMAR and I. VAN KEILEGOM

STAT researchers : C. HEUCHENNE, A. DASKOVSKA (until August 31), H. BÖHM (since April 15), V. ZELENYUK and D. VARRON

Partners Institutions :

- Katholieke Universiteit Leuven, Belgium
- UHasselt, Belgium
- Université Libre de Bruxelles, Belgium
- Aachen Technical University, Germany
- Université Joseph Fourier, Grenoble, France

The point of departure of the network activities is that of a broad range of complex substantive data sets and questions arising in various disciplines (including psychology, biomedical sciences, economics, and climatology). The overall aim of our project then is to develop appropriate statistical models and techniques to deal with these data and questions.

"Local modelling and estimation of volatile highdimensional statistical systems" (2004-2006)

Financing : Fonds spéciaux de recherche (FSR)

Promoter : R. von SACHS

Researchers : H. BÖHM (until April 14) and A. DASKOVSKA (since September 1st)

The goal of this project is to develop statistical methods to model and estimate multivariate statistical signals with a time-varying variance-covariance structure. In particular the problem of dimension reduction is addressed, where Principal Component Analysis is an important tool. In order to derive a sound mathematical theory of treating the non-stationary nature of the observed data, the concept of local stationarity is employed. Applications to classical PCA in the time domain as well as to multivariate analysis of non-stationary EEG signals in the frequency domain will be treated subsequently.

“Policies for research and innovation in the move towards the european research area" (2005-2006)

Financing : Union Européenne

Promoter : L. SIMAR

Researchers : L. SIMAR

Using advanced quantitative methods for evaluating the performance of Public Sector Research. Analysing in particular the system of the european universities and the availability of national data at the microlevel.

11 ACTIVITIES IN APPLIED STATISTICS

The Institut de statistique is developing many contacts within the Université catholique de Louvain and with several companies in the field of applied statistics. In addition to the seminars organised weekly (see point 5), the members of the Institute participate to research contracts in applied statistics and offer consulting services to other departments and institutions of the University. They also offer some courses of continued education at the University and in companies.

The major activities are described below.

11.1 Services for the Université catholique de Louvain

The Institut de statistique offers a consulting service to the University community. Researchers of the others faculties receive advice concerning appropriate methodologies and suitable statistical packages for their specific problems. Hence, scientific collaborations between different disciplines are often created.
More information is available on the web page:
http://www.stat.ucl.ac.be/ISconsultation

The scientific members and the computer scientists of the Institute are developing their knowledge about the evolution of many statistical software and they often give advice in this context. The Institute hosts the "Statistical application server" used daily by UCL researchers and students for their statistical computations.
More information concerning this server is available on the web page:
http://wwwsas.stat.ucl.ac.be

11.2 Applied research contracts

“Analysis and interpretation of electroencephalograms (EEG) in drug discovery" (2001-2005)

Financing : Eli Lilly (October 2001 till August 2003)
FSR (September 2003)
FRIA (October 2003 - 2005)

Promoter : Ph. LAMBERT

Researcher : C. BUGLI

Electroencephalograms (EEG) can be used to improve the understanding of the effects of experimental drugs on the body. Such signals can for example be generated during a drug development process using human volunteers exposed to varying drug concentrations. EEG signals typically take the form of longitudinal continuous responses measured at high frequency during at most 10 minutes at various locations at the surface of the skull. Currently, very simple descriptive analyses of such data are undertaken. Typically, each signal (generated at one electrode) is subdivided in consecutive periods of (say) 2 seconds. It is assumed stationary in these small epochs and separately analyzed using Fourier transforms. The goal of the project is

- to evaluate the potential of independent component analysis.
- to develop functional data analysis models to analyse event related potentials.
- to illustrate the potential of these techniques to quantify the effect of a treatment on the brain.

EEG signals generated during cross-over trials where patients alternatively received a placebo and a drug reported to have a large and well understood effect on the brain are potential elements to use in that illustration.

"Statistical analysis of PET scan data" (2003-2007)

Financing : Eli Lilly (July 2003 till June 2004)
FSR (July 2004 till June 2005)
Eli Lilly (July 2005 till June 2006)

Promoter : Ph. LAMBERT

Researcher : A. JULLION

The goal of this research is to build statistical longitudinal models for the analysis of Positron Emission Tomography (PET) scan data. In particular, we plan to set up methods leading to new definitions of receptor occupancy and enabling to quantify associated measures of precision.

The final tool will allow to visualize where the drug is acting on the brain and how that action is changing over time.

Statistical evaluation of the medal distribution methodology in international wine tasting competitions : Application to the "Concours Mondial de Bruxelles" (2004-2005)

Financing : Vinopress, Brussels, Belgium

Promoters : B. GOVAERTS and C. RITTER

The goal of the project is to assess the medal allocation methodology in the Brussels Wine tasting international competition. It will provide a wide review of the literature, a statistical analysis of data available from former competitions and suggestions to improve reliability of future ones.

“Robust models for the analysis of clustered survival data" (2001-2005)

Financing : Fonds propres (patrimoine), Conventions

Promoter : Ph. LAMBERT

Researchers : D. COLLET and A. KIMBER (University of Reading)

This is a joint project with Prof. Dave Collett and Alan Kimber (University of Reading). We are extending the accelerated failure time model to deal with clustered survival data. These tools are robust alternatives to the frailty proportional hazard model which is usually proposed to deal with heterogeneity in survival data. They are used to analyse the survival times of grafted patients coming from one of several transplant centres in the UK. The data are provided by UK transplant (Bristol, UK).

“Modelling dynamics and volatilities of multivariate economic time series" (2005-2007)

Financing : Fonds spéciaux de recherche (FSR)

Promoter : R. von SACHS

Researchers : A. DASKOVSKA

Through a multivariate modelling framework, we aim at understanding and prediction the temporal dependence in (co)-volatilities of financial time series. Two main questions are addressed : How can multivariate models be sufficiently flexible to incorporate the dynamics of high-dimensional econometric data changing smoothly or abruptly over time ? How can the rapidly growing model complexity (dimensionality, number of parameters) be efficiently controlled ?

“Modern risk management models for insurance companies and pension funds" (2004-2009)

Financing : Communauté française Wallonie-Bruxelles, projet ARC

Promoter : M. DENUIT, P. DEVOLDER, J-M. ROLIN and Y. SMEERS

Researchers : C. COURTOIS, D. HAINAUT, A. MILLER and J-P. BOUCHER

Project description :

1. Generalized life insurance policies
2. Risk theory under partial information
3. Unification of actuarial and financial pricing techniques
4. Risk management in incomplete markets

"Development of computer solutions in the field of risk management" (2003-2006)

Financing : Programme FIRST SPIN-OFF de la Direction générale des Rechnologies, de la Recherche et de l'Energie du Ministère de la Région wallonne - DGTRE Division de la Recherche et la Coopération scientifique.

Promoter : M. DENUIT

Researchers : X. MARECHAL

This project aims at developing new tools of risk management in insurance. The goal is to bring an answer to the technological needs of the insurance companies (risk selection, a posteriori ratemaking, dynamical financial analysis, fraud detection, reinsurance, reserving), of the pension funds (fair valuation of the liabilities of the fund, cash-flows projections, longevity of the insured and of the large companies (level of self-insurance, control of the premium of the insurers). The project also covers the development of prospective tools enabling the assessment of the future consequences of political decisions. Besides the necessary scientific developments for better risk management, the project also aims at developing computer solutions enabling the transfer to the business world (insurance companies, reinsurance companies, pension funds) of the technologies proposed at the university.

"Modern statistical methods for risk valuation" (2003-2005)

Financing : Fonds pour la Formation à la recherche dans l'Industrie et l'Agriculture

Promoter : M. DENUIT

Researchers : A. DELWARDE

The project aims to develop realistic valuation models different from the usual actuarial vision which looks for explicit solutions in quite simple models. Numerical techniques will be used (simulations, MCMC methods) and proved to be more accurate than classical analysis techniques. Applications will deal with mortality projections, non linear effects in IARD tarification, and predictive laws in credibility theory.

"Functional Statistical Inference. New approaches in Finance, Environmental Science, Industry and Economy" (2005-2008)

Financing : Spanish Ministery of Education and Science

Researcher : I. VAN KEILEGOM

Many efforts have been devoted, in recent times, to the study of statistical inference on curves. In this project, our aim is to develop new theoretical methodologies in order to make inference on curves, with applications in different frameworks : finite populations, goodness-of-fit testing, neural networks, machine learning, functional data analysis, set estimation, spatial and spatio-temporal statistics and finance series. Many of the new methods to be developed, will be implemented for the first time. They may also represent modifications on previous versions and their validity will be tested by theoretical results and simulation studies. Applications will be made on different settings as environmental science (SO2 predictions in a power plant, concentration of heavy metals in mosses in Galicia..), Economy (prediction of the home income at nut3 level in Galicia, ..), Industry (control of wastewater treatment by anaerobic processes) and Finance (semiparametric inference in portofolio design, ..).

11.3 Consulting for firms and public organisms

The principal consulting contracts treated in 2005 are the following:

Client : asbl La Rue, Brussels, Belgium.
Subject : Design and analysis of a survey on salubrity of accomodation.
STAT participants : A. EL GHOUCH and E. LECOUTRE

Client : Glaverbel, Jumet, Belgium.
Subject : Analysis of optical defects in windshields
STAT participant : C. RITTER

Client : Musées Royaux des Beaux-Arts, Brussels, Belgium.
Subject : Analysis of a survey
STAT participants : G. GEENENS, E. LECOUTRE and B. GOVAERTS

Client : Hôpital militaire, Neder-Over-Heembeek, Belgium.
Subjet : Analysis of the biological effect of radars radiations
STAT participant : R. ROUSSEAU

11.4 Continued education for companies

Society : Glaverbel R&D Center, Jumet, Belgium;
Two days of courses on "Statistique l'industrie : fondement et perspectives".
STAT participants : C. RITTER and B. GOVAERTS

Society : Police fédérale, Brussels, Belgium.
Three days of courses on "Multivariate Statistical Analysis".
STAT participants : G. GEENENS and L. SIMAR