ʃαΜφ 2010

Sixth International Conference on Sensitivity Analysis of Model Output

Program

19-22 July 2010 Università Bocconi Milan (Italy)

Local Organizer Contact

Conference secretariat
e-mail: **samo2010@unibocconi.it**
tel. +39 025836.3397
fax +39 025836.5640

Università Commerciale
Luigi Bocconi

JRC
EUROPEAN COMMISSION

FOREWORD

Dear Colleague,

Welcome to the **Sixth International Conference on Sensitivity Analysis of Model Output (SAMO 2010)**!

Every three years since 1995, the tradition of the SAMO Conference returns, becoming the main outlet for researchers all over the world to present their most recent research outcomes in the field of Sensitivity Analysis.

The 2010 Edition includes: 100 papers submitted, 8 keynote speeches given by some of the top researchers in the field, 16 posters and 74 contributed presentations divided into 16 sessions.

We hope you will enjoy SAMO 2010 as a great opportunity to value innovation as well as an opportunity to join the current debate on internationally-adopted techniques to perform Sensitivity and Uncertainty Analysis of Model Output.

The SAMO 2010 covers all kinds of techniques, including local Sensitivity Analysis, screening methods, variance-based approaches and moment-independent techniques. Applications range from seismic risk assessment, to nanotechnologies, architecture building, environmental models, biological models, industrial safety assessment, and many others.

This reveals our research field's multidisciplinary nature once again, which contributes to the assessment and corroboration of quantitative models and assists policy-makers in making informed decisions.

SAMO 2010 has been divided into 16 sessions, starting on Monday 19 July and ending on Thursday 22.

Held in Milan, the Conference is hosted by Università Bocconi at their new building on campus which provides offices for Faculty and Research. The building, designed by the Irish practice, Grafton Architects, was named World Building of the Year at the inaugural World Architecture Festival Awards (WAF Awards 2008, Barcelona Centre Conventions International).

Outside the Bocconi Campus lies one of Italy and Europe's most vibrant, elegant and unique cities. We encourage you to enjoy Milan, including its many restaurants, museums and architectural monuments, as well as its world-famous shopping district, and the surrounding area with, among others, the beautiful lakes of Como and Maggiore.

We would like to kindly thank you for your participation at SAMO 2010 and wish you a pleasant stay in Milan!

The SAMO 2010 Program Chairs
Emanuele Borgonovo, Andrea Saltelli
and Stefano Tarantola

SAMO 2010 Organization

The Conference was organized by the Econometrics and Applied Statistics Unit, Joint Research Centre of the European Commission (Ispra, Italy) and ELEUSI, Università Bocconi.

The EAS Unit works on applied research on statistics and econometrics and provides analytical support to the services of the European Commission in the fields of macro-economics, single market and innovation.

ELEUSI is Università Bocconi's research center devoted to the creation and utilization of quantitative methods for solutions in risk analysis, decision-making and managerial problems. Sensitivity analysis is a key area of the center research activity. A steering committee composed of some of the most respected international expert in the field helps establishing the scientific guidelines of the research center (www.eleusi.uniboc-coni.it > People > Steering Committee).

Università Bocconi

Upon its founding in 1902, Università Bocconi became the first Italian university to offer a degree in economics. In the ensuing century Bocconi has cultivated and maintained this role of leadership in academic fields related to the world of commerce through quality teaching and research in management, law and statistics, as well as economics. Today the University offers several international study programs in English at all levels from Bachelor to PhD and Executive levels, and more than one tenth of the student body is from outside Italy.

Bocconi's size and specialization enables it to avail itself of a diversity of viewpoints within the social sciences. Ideas coming from more than one area can readily converge in the form of multidisciplinary research that makes a significant contribution. In addition, the University enjoys leading-edge input from a vast network of partner universities in 50 countries, facilitating international research projects of the highest order.

Empirical analysis in particular plays an ever-increasing role in economic research, and there are strong connections between this type of advanced study and the issues faced by institutions and companies today. Aiming for importance in all aspects of society, the University carries out both pure and applied research in various fields including statistics, business administration, econometrics, finance and law.

By placing emphasis on merit in education, ethics in commerce and excellence in research, Università Bocconi strives to make a constructive contribution to the innovation and development of both the world of European business and European society in general.

Scientific Committee

Emanuele Borgonovo, Università Bocconi, Milan, Italy
Francois Hemez, Los Alamos National Laboratory, USA
Jon Helton, Sandia National Laboratories, Albuquerque, USA
Sergei Kucherenko, Imperial College, London, United Kingdom
Marco Ratto, Joint Research Centre, Ispra, Italy
Andrea Saltelli, Joint Research Centre, Ispra, Italy
Stefano Tarantola, Joint Research Centre, Ispra, Italy
Tamás Turányi, Eötvös University, Budapest, Hungary

Keynote Speakers

George Apostolakis, Commissioner, Nuclear Regulatory Commission of the US, USA
Jon Helton, Sandia National Laboratories, Albuquerque, USA
Bertrand Iooss, Electricitè de France, France
Peter Kennedy, Simon Fraser University, USA
John Norton, Australian National University, Australia
Herschel Rabitz, Princeton University, USA
Jerry Ravetz, Oxford, United Kingdom
Andrea Saltelli, Joint Research Centre, Ispra, Italy (Opening Speaker)

Conference Proceedings and Special Issues

The extended abstracts have been published in the new conference proceedings series *Procedia* by Elsevier. The volume is entitled *Proceedings of the Sixth International Conference on Sensitivity Analysis of Model Output*.

After the conference, full papers will be considered for publication in a special issue of the Journal *Reliability Engineering and System Safety*. The deadline for submitting full papers for the special issue shall be **15 October 2010**. The editorial policy of the special issue coincides with the policy of the Journal. Therefore, please consider the scientific policy of RESS and conform your manuscript to the editing instructions of the Journal when submitting the paper. This will help avoid delays in the review process. **Important:** When submitting the paper electronically through the Elsevier EES system at http://ees.elsevier.com/ress/, it is important that the category "**Special Issue: SAMO 2010**" be selected at the "Article Type" step in the submission process. This category is a requirement for the paper to be processed within the special issue.

SAMO 2010 Program & Papers

■ MONDAY 19 JULY

8:30am	Registration	Gallery, via Röntgen1
10:00am	**Plenary Session**	**Room AS02**

Welcome Address
Lorenzo Peccati Vice Rector of Human Resources Management, Università Bocconi

Introduction and Operating Issues
Emanuele Borgonovo Director, ELEUSI Università Bocconi

Opening Speech - How to Avoid a Perfunctory Sensitivity Analysis
Andrea Saltelli Head, Econometrics and Applied Statistics Unit. JRC of the European Commission

11:15am	Coffee break	
11:30am	**Parallel Sessions**	

SESSION 19_1A.	Chair **Curtis Smith**	ROOM AS01

Application of Global Sensitivity Analysis to Nuclear Reactor Calculations F. Puente Espel, S. Tarantola, S. Ghrayeb, K. Ivanov

Use of Moment Independent Importance Measures in the Framework of Seismic Fragility Analysis I. Zentner, S. Tarantola, E. Borgonovo

SESSION 19_1B.	Chair **Bertrand Iooss**	ROOM AS03

Investigation on the Structure of a Networked System S. La Rovere, P. Vestrucci

Importance Measures on Networks J.C. Ruiz, C. M. Rocco

12:30pm	Lunch	
2:00pm	**Parallel Sessions**	

SESSION 19_2A.	Chair **Enrico Zio**	ROOM AS01

Variance Decomposition Sensitivity Analysis of a Passive Heat Removal System Model Y. Yu, T. Liu, J. Tong, J. Zhao, F. Di Maio, E. Zio, A. Zhang

Sensitivity Analysis of the Model of a Nuclear Passive System by Means of Subset Simulation E. Zio, N. Pedroni

Total Order Reliability Importance in Space PSA E. Borgonovo, C. Smith

An Identification and Grouping Approach to Analyze the Output of a Dynamic Safety Assessment L. Podofillini, D. Mercurio, V.N. Dang, E. Zio

SESSION 19_2B.	Chair **Jon C. Helton**	ROOM AS03

EFAST Analysis Applied to a PA Model for a Generic HLW Repository in Clay S.M. Spiessl, D.A. Becker, A. Rübel

Uncertainty Propagation and Sensitivity Analysis of Coupled Thermalhydraulic-Neutronic Nuclear Power Plant Simulations: Influence of Uncertainty in Neutronic Data F. Ánchel, T. Barrachina, R. Miró, R. Macián-Juan

Use of Replicated Latin Hypercube Sampling to Estimate Sampling Variance in Uncertainty and Sensitivity Analysis Results for the Geologic Disposal of Radioactive Waste C.W. Hansen, J.C. Helton, C.J. Sallaberry

A Measure for Estimating the Effect of the Input Uncertainty on the Mean Value of the Model Output Q. Liu, T. Homma

4:00pm	Coffee break	
4:30pm	**Plenary Session**	**Room AS02**

Keynote Speech - Model Uncertainty: A Regulatory Perspective
George E. Apostolakis Commissioner, United States Nuclear Regulatory Commission

	Social Events	
7:30pm	Concert Pianist Roberto Plano	Aula Magna via Röntgen 1
8:30pm	Gala Dinner	Foyer Aula Magna via Röntgen 1

■ TUESDAY 20 JULY

8:30am	Late Registration	Gallery, via Röntgen1
9:00am	**Parallel Sessions**	

SESSION 20_1A.	Chair **Ricardo Bolado**	ROOM AS01

Applications of Sparse Grid Interpolation: Sensitivity Analysis and Experiment Design G.T. Buzzard, D. Changkuon, M.M. Donahue, A.E. Rundell

Distributional Sensitivity Analysis D.L. Allaire, K.E. Willcox

Guidelines for Optimal Estimation of Correlation Ratios Based on Monte Carlo Simulation of Computer Codes R. Bolado, E. Plischke, S. Tarantola, A. Badea

Uncertainty Quantification Via Codimension One Domain Partitioning and New Concentration Inequality T.J. Sullivan

SESSION 20_1B. Chair **Paolo Giudici** ROOM AS03

Optimal Sensitivity Analysis under Constraints: Application to Fisheries J.P. Gauchi, S. Lehuta, S. Mahévas

Screening Groups of Parameters Using the Morris Method to Select Parameters for Variance Based Sensitivity Analysis S.M. Thorsen

Empirical Relationship between Sensitivity Index and Mean Square Error of Prediction: A Case Study for Greenhouse Gas Emission M. Lamboni, D. Makowski, H. Monod

Modeling the Evolution of the Antarctic Ice Sheet in the 200 ky C. Balconi, F. Baratelli, M. Giudici, C. Vassena

11:00am	Coffee break	

| **11:30am** | **Plenary Session** | **Room AS02** |

Keynote Speech - Uncertainty and Sensitivity Analysis in Performance Assessment for the Proposed Repository for High-Level Radioactive Waste at Yucca Mountain, Nevada
Jon C. Helton SANDIA National Laboratories

12:30pm	Lunch	

| **2:00pm** | **Parallel Sessions** | |

SESSION 20_2A. Chair **Tamás Turányi** ROOM AS01

Uncertainty Analysis of Varying Temperature Chemical Kinetic Systems Nagy Tibor, Tamás Turányi

Derivative Based Global Sensitivity Measures I.M. Sobol', S. Kucherenko

Preliminary Results for the Global Sensitivity Analysis of SALTIRSOIL Model Outputs F. Visconti, J.M. de Paz, J.L. Rubio, J. Sánchez

SESSION 20_2B. Chair **Andrea Saltelli** ROOM AS03

Adjoint Sensitivity Analysis for Hybrid Systems and Its Application to Identification of Biological Systems K. Fujarewicz

What Do Tigers and Backswimmers Have in Common? An Analysis of Structure and Sensitivity in Individual Based Models M.A. Imron, A. Gergs, U. Berger

Sensitivity Study for a Bed-Load Transport Routing Scheme Applied to a Large Alpine Catchment B. Gems, S. Achleitner, F. Schöberl, M. Aufleger

3:30pm	Coffee break	

| **4:00pm** | **Parallel Sessions** | |

SESSION 20_3A. Chair **George Apostolakis** ROOM AS01

Sensitivity Analysis for Quantile Regression A.L. Vasnev

Sensitivity Analysis of a Hierachical Qualitative Model - The Analysis of MASC
M. Carpani, J.E. Bergez, H. Monod

Evaluating the Uncertainty of Hydrological Model Simulations Coupled with Meteorological Forecasts at Different Spatial Scales A. Ceppi, G. Ravazzani, D. Rabuffetti, M. Mancini

Quality of High Dimensional Numerical "Space Filling Designs" for the Sensitivity Analysis of Interference Optical Filters O. Vasseur, M. Claeys-Bruno, M. Sergent

SESSION 20_3B. Chair **Herschel Rabitz** ROOM AS03

The Effect of Quality and Reserves Uncertainty to Production Scheduling of a Lignite Mine Feeding a Power Plant M. Galetakis, C. Roumpos

Calibration of a Crop Simulation Model Using an Evolutionary Algorithm With Self-Adaptation P. Stratonovitch, M.A. Semenov

Direct Sensitivity Computation for 1D Hydrodynamic Modelling vs Classical Empirical and Monte Carlo Approaches C. Delenne, T. Feret, V. Guinot, B. Cappelaere

Partial Order Investigation of Multiple Indicator Systems Using Variance-based Sensitivity Analysis P. Annoni, R. Brüggemann, A. Saltelli

| **6:00pm** | **Plenary Session** | **Room AS02** |

Keynote Speech - High Dimensional Model Representation (HDMR): Regression and Global Sensitivity Analysis
Herschel Rabitz Princeton University

■ WEDNESDAY 21 JULY

8:30am	Late Registration	Gallery, via Röntgen 1

| **9:00am** | **Parallel Sessions** | |

SESSION 21_1A. Chair **Stefano Tarantola** ROOM AS01

Substitutability vs. Complementarity: Rethinking STI Composite Indicators Building with an Application of Sensitivity Analysis G. Cerulli, A. Filippetti

Sensitivity Analysis in Stochastic Second Order Cone Programming for Mobile Ad Hoc Networks F. Maggioni, S.W. Wallace, M. Bertocchi, E. Allevi

Regression Sensitivity Analysis for Cash Flow Simulation Based Real Option Valuation T.J. Haahtela

A Simple and Flexible Mean-Risk Model A. Cillo, P. Delquié

SESSION 21_1B. Chair **Emanuele Borgonovo** ROOM AS03

Identifiability and Sensitivity Analysis of a Photodynamic Therapy Model S. Dobre, T. Bastogne, M. Barberi-Heyob, A. Richard

Global Sensitivity Analysis of the Process-Based Wheat Simulation Model SiriusQuality1 Identifies Key Genotype Parameters and Unravels Parameters Interactions J. He, P. Stratonovitch, V. Allard, M.A. Semenov, P. Martre

Cost-effectiveness of Varicella and Zoster Vaccination in England&Wales: Importance Measures for Correlated Parameters J. Bilcke, A.J. van Hoek, N. Hens, M. Aerts, W.J. Edmunds, P. Beutels

The Use of Sensitivity Analysis for the Design of Functional Structural Plant Models Q. Wu, P.H. Counède

11:00am	Coffee break	
11:30am	**Plenary Session**	**Room AS02**

Keynote Speech - Sensitivity Analysis in the Context of Quality Assurance
Jerry Ravetz Oxford

12:30	Lunch	
2:00pm	**Parallel Sessions**	

SESSION 21_2A.	Chair Marco Percoco	ROOM AS01

Theorems and Analytical Test Cases in Moment Independent Sensitivity Analysis
E. Borgonovo, W. Castaings, S. Tarantola

Uncertainty Importance and Risk-Based Decision Making in the Inoperability Input-Output Model E. Borgonovo, M. Percoco

Sampling Plans for the Estimation of moment Independent Importance Measures
W. Castaings, E. Borgonovo, S. Tarantola

SESSION 21_2B.	Chair Jerry Ravetz	ROOM AS03

Modeling Uncertainties in Complex Systems N. Rachdi, J.C. Fort, T. Klein, F. Mangeant

URANIE: The CEA/DEN Uncertainty and Sensitivity Platform F. Gaudier

Adaptive Monte Carlo Approach for Sensitivity Analysis I. Dimov, R. Georgieva

3:30pm	Coffee break	
4:00pm	**Parallel Sessions**	

SESSION 21_3A.	Chair William Castaings	ROOM AS01

Model Choice Considerations and Information Integration Using Analytical Hierarchy Process J.R. Langenbrunner, F.M. Hemez, J.M. Booker, T.J. Ross

Sensitivity Analysis Via 'Derived Parameters' J.L. Cormenzana, R. Bolado

Variance-Based Sensitivity Indices for Models with Dependent Inputs Thierry Mara

Improving Random Balance Designs for the Estimation of First Order Sensitivity Indices S. Tarantola, M. Koda

SESSION 21_3B.	Chair Peter Kennedy	ROOM AS03

An Original Sensitivity Statistic within a New Adaptive Accelerated Monte-Carlo Method M. Munoz Zuniga, J. Garnier, E. Remy

Development of a Localized Probabilistic Sensitivity Method to Determine Random Variable Regional Importance H. Millwater, G. Singh

Adaptive Monte Carlo Algorithm for Sensitivity Studies of Eulerian Large-Scale Air Pollution Models I. Dimov, R. Georgieva, T. Ostromsky

An Adaptive Correlation Ratio Method E. Plischke

6:00pm	**Plenary Session**	**Room AS02**

Keynote Speech - Abusing Econometrics
Peter Kennedy Simon Fraser University

■ THURSDAY 22 JULY

8:30am	Late Registration	Gallery, via Röntgen1
9:00am	**Parallel Sessions**	

SESSION 22_1A.	Chair Sergei Kucherenko	ROOM AS01

Joint Metamodeling for Sensitivity Analysis of Continuous and Stochastic Inputs of a Computer Code A. Marrel

A Comparative Analysis of Emulators for the Sensitivity Analysis of a Land Surface Process Model G. P. Petropoulos, M. Ratto, S. Tarantola

A Comparison of the Three Metamodel-Based Methods for Global Sensitivity Analysis: GP Modelling, HDMR and LAR-gPC G. Blatman, B. Sudret

Distribution-Based Global Sensitivity Analysis Using Polynomial Chaos Expansions
Y. Caniou, B. Sudret

SESSION 22_1B.	Chair Francois Hemez	ROOM AS03

An Application of Global Sensitivity Analysis in Evaluation of Transmission Line Fault-Locating Algorithms R. Zivanovic

Practical Applications of Uncertainty and Sensitivity Techniques in Building Energy Simulation H.E. Mechri, V. Corrado

Sensitivity Analysis Using Stochastic Expansion Methods to Calculate Variance-Based Sensitivity Indices V.G. Weirs, L.P. Swiler, W.J. Rider, B.M. Adams, J.R. Kamm, M.S. Eldred

Sensitivity and Uncertainty Quantification Techniques Applied to Systems of Conservation Laws J.R. Kamm, W.J. Rider, V.G. Weirs, S. Tarantola, M. Ratto

11:00am	Coffee break	

11:30am	Plenary Session	Room AS02

Keynote Speech - Model Uses and their Implications for Identification and Model Testing
John Norton Australian National University

12:30pm	Lunch

2:00pm	Parallel Sessions

SESSION 22_2A.	Chair Gabriella Dellino	ROOM AS01

Quasi-Random-Sampling High Dimensional Model Representations for the Construction of Reduced Discrete Time State Space Dynamic Models R.S.C. Lambert, N. Shah, S.S. Kucherenko

Maximin Design on Non-Hypercube Domain and Kernel Interpolation P. Barbillon

Sensitivity Analysis of a Model that Describes the Biofiltration of TRS Compounds J. Silva, G. Aroca

SESSION 22_2B.	Chair John Norton	ROOM AS03

Sensitivity Analysis in Advanced Building Industry Z. Kala

Bearing Capacity of Reinforced Foundations: Statistical Approach and Sensitivity Analysis A. Dey

Analytic Properties of High Dimensional Model Representations F. Beccacece, E. Borgonovo

3:30pm	Coffee break

4:00pm	Parallel Session

SESSION 22_3A.	Chair Bertrand Iooss	ROOM AS01

Simulation-Optimization under Uncertainty through Metamodeling and Bootstrapping G. Dellino, J.P.C. Kleijnen, C. Meloni

Sensitivity Analysis for Tire/Road Interface Model R. Kiébré, F. Anstett-Collin, M. Basset

A Computer-Aided Framework for Systematic Model Development, Analysis and Identification in Innovative Product-Process Engineering M. Heitzig, G. Sin, P. Glarborg, R. Gani

SESSION 22_3B.	Chair Paola Annoni	ROOM AS03

Effects of the Oil Export Price Increase on the Economy of Kazakhstan: Results from the Sensitivity Analysis Z. Kapsalyamova

Sensitivity Analysis as a Sustainable Building Design Help M. Haase, I. Andresen, B. Time, A.G. Hestnes

Uncertainty and Sensitivity Analysis of National Road Transport Inventories Compiled with COPERT 4 I. Kioutsioukis, C. Kouridis, D. Gkatzoflias, P. Dilara, L. Ntziachristos

5:30pm	Plenary Session	Room AS02

Keynote Speech - Computer Experiments with Functional Outputs: Global Sensitivity Analysis and Metamodelling
Bertand Iooss Electricité de France

6:30pm	Conclusions and Farewell	Room AS02

SAMO 2010 Poster Session

Relative Sensitivity of Conditional Distributions to Kurtosis Deviations in the Joint Model
M.A. Gómez-Villegas, P. Main, H. Navarro, R. Susi

Computation of Sensitivity Indices with Different Routines for Latin Hypercube Designs
D. Mohan Rao, Jamuna Konda

Solute Transport in Geological Porous Media: Estimation of Dispersion Coefficients
F. Baratelli, L. Cattaneo, M. Giudici, C. Vassena

Combined Global Sensitivity Analysis and Population PBPK Modeling for Assessing Consistency of TCDD Toxicokinetics Data in Mice
L. Yengo, C. Brochot, A. Péry

Sensitivity Analysis Associated with the Evaluation of Measurement Uncertainty: Application to a Computational Code in Metrology
A. Allard, N. Fischer, F. Didieux

Climate Change and Irrigation Water Need Sensitivity Analysis
R. Gondim, A. Maia, M. De Castro

Robust Method for Sensitivity Analysis in Simulation Model/a Comparison Study
Huda Abdullah Rashid

Decision Support Systems Based on the Economic Feasibility Assessment for Municipal Solid Waste (MSW) Management under Uncertainty Using SimLab® Toolpack
Boguslaw Bieda

Uncertainty and Sensitivity Analysis of SWMM Model in Computation of Manhole Water Depth and Subcatchment Peak Flood
R. A. Sharifan, A. Roshan, M. Aflatoni, A.Jahedi, M. Zolghadr

Sensitivity Analysis of Load Carrying Capacity in AFM-based Manipulation
M.H. Korayem, A. Amanati

Identifying Important Observations Using Cross Validation and Computationally Frugal Sensitivity Analysis Methods
L. Foglia, M.C. Hill, S.W. Mehl, P. Perona, P. Burlando

Water Hammer Model Sensitivity Study by the FAST Method
A. Kaliatka, M. Vaisnoras, E. Uspuras

Uncertainty and Sensitivity Analysis in Code Environmental Model for Risk Assessments from Industrial Source Complex
J. Carlos García-Díaz, J. M. Gozalvez-Zafrilla

Determination of the Uncertainty Bounds of a Continuous Distillation Code: Effect of Input Variability and Model Uncertainty
J.M. Gozalvez-Zafrilla, J. Carlos García-Díaz, A. Santafé-Moros

Evaluation of MARS Modeling Technique for Sensitivity Analysis of Model Output
D. Shahsavani, S. Tarantola, M. Ratto

SAMO Past Editions

1995 SAMO (Belgirate, Italy)
1998 SAMO (Venice, Italy)
2001 SAMO (Madrid, Spain)
2004 SAMO (Santa Fe, USA)
2007 SAMO (Budapest, Hungary)

SAMO Summer Schools

The SAMO Summer Schools is an interrelated initiative organized by the EAS Unit of the Joint Research Centre, European Commission (http://sensitivity-analysis.jrc.ec.europa.eu/)
Up to the date, five editions of the SAMO Summer Schools have been organized in Venice (1999, 2002, 2004, 2006, and 2008).
The forthcoming SAMO Summer School will be held at Villa La Stella (Fiesole) from 14 to 17 of September.

Acknowledgments