<u>CURRICULUM VITAE</u>

Alain Galli

Name *Alain Galli*
Date of Birth *05/13/1950*
French

Diploma *Thèse de 3ém cycle in Applied Mathematics . Grenoble 1979*

2015-2018 Part time Associate Professor in the mathematic department of the FGV. Rio de Janeiro, Brazil

Up to June 2015 Professor & Research director, Mines-Paristech (formerly Ecole des Mines de Paris),

Activities

Head of Petroleum group (1987-2001) **Centre de Geostatistique Mines-Paristech**
Joint Head of the finance group at the **CERNA Mines-Paristech** (since Oct 2001)

Main Skills

Petroleum Geostatistics
Mathematical Finance
Real option evaluation of Petroleum & Mining Projects.
Management under uncertainty

Geostatistics: Advisor for 10 theses -1979-2001

Mathematical Finance: Advisor of 6 theses 2001- 2015

Theses directed when at the Centre de Geostatistique

- SIMON LOPEZ . Modélisation de Réservoirs Chenalisés Méandriformes (2003)(Co. Advisor with Isabelle Cojan, up to my departure to the Cerna) .
- Development of new stochastic process-based models for reservoirs.

- DAVID GERAETS. Modélisation stochastique de champs de vitesse géophysique en exploration pétrolière (2002)
  Continuation of previous work on seismic, focused on the probabilistic relationship between stack velocities and instantaneous velocities.

- Fabrizio Felletti. Quantificazione e Previsione delle Variazioni di Facies In una Successione Torbidita(FM. Di CASTAGNOLA, Bacino Terziaro Piemontese. University degli study di Milano. (1999) (Co director with Prof. Gelati)
  Geological interpretation and stochastic modelling of a turbiditic system.

- IOOSS Bertrand. Tomographie statistique en sismique réflexion : estimation d'un modèle de vitesse stochastique. Thèse Doct. : Géostatistique : Paris, ENSMP : 1998. 159 p.

Extension of Mustafa Touati's work to the case of acoustics under the Rytov parabolic approximation. Then integration of the geometry of the reflector under the approximation of small perturbations.

- SCHUHLER Estelle. Apport de la géostatistique aux modèles probabilistes de la finance. Thèse Doct. : Géostatistique : Paris, ENSMP : 1998. 250 p.
  The contribution of geostatistics to the fields of option pricing, risk analysis and yield curve building.

- MOULIÈRE Dominique. Intégration d'informations sismiques pour la simulation de réservoirs. Thèse Doct. : Géostatistique : Paris, ENSMP : 1998. 182 p. (Co director with H. Beucher)
  Two methods for integrating seismic constraints for geostatistical reservoir simulation.

- TOUATI Mustafa. Contribution géostatistique au traitement des données sismiques. Thèse Doct. : Géostatistique : Paris, ENSMP, 1996. 159 p.
  Development of a probabilistic model for wave propagation based on geometrical optics and perturbation methods. Application to determine the covariance of velocities from statistics of travel times.

- LANGLAIS Valérie. Estimation sous contraintes d'inégalités. Thèse Doct. : Géostatistique : Paris, ENSMP : 1990. 212 p.
  Geostatistical estimation with hard data and inequality constraints

- DONG Anne. Estimation géostatistique des phénomènes régis par des équations aux dérivées partielles. Thèse. Doct. : Géostatistique : Paris, ENSMP : 1990. 260 p.Development of geostatistical estimation methods for variables linked by partial differential equations. With an application to hydrology.

- IKONOMI Angelin. Etude géostatistique des problèmes géométriques posés par un gisement multicouche monoclinal pétrolier. Thèse Doct. : Géostatistique : Paris, ENSMP : 1989. 129 p.
  Study of the geometry and the internal heterogeneity of a petroleum reservoir.

Theses directed in finance

Alireza Javaheri (Goldman Sachs), The Volatility Process: A Study of Stock Market Dynamics via Parametric Stochastic Volatility Models and a Comparison to the Information embedded in the Option Prices. PhD Thesis Ecole des Mines de Paris October 2004.

Nicolas Rouveyrollis. (Cerna,Mines-Paristech) Pricing electricity Derivatives. PhD Thesis Ecole des Mines de Paris January 2006

Marta Ryazanova. (Cerna, Mines-Paristech) Statistical arbitrage. PhD Thesis Ecole des Mines de Paris December 2008

Zaizhi Wang (Pricing-Partners) . Produits Dérivés des Matières Premières: Modélisation et Evaluation (co advisor with E. Benhamou). Dec 2011
Models & calibration of options for commodities using models with stochastic volatility

José-Marcio Martins da Cruz. (Centre de Calcul, Mines-Paristech). Contribution au problème de classements de messages èlectroniques dans une communauté. Mai 2011
Statistical models for spam detection

Marc-Henri Thoumin (Société Générale Londres). Sovereign risk: Modelling interdependencies (2015)

PUBLICATIONS

Books

Armstrong, M., H. Beucher, B. Doligez, A. Galli, F. Geffroy, G. Leloc'h,, D. Renard et Eschard, R. (2011) Plurigaussian Simulations in Geosciences. Springer-Verlag Berlin 200p ISBN 3-540-42390-7, 2nd édition

Armstrong, M., Galli, A., Leloc'h, G., Geffroy, F. et Eschard, R. (2003) Plurigaussian Simulations in Geosciences. Springer-Verlag Berlin 149p ISBN 3-540-42390-7

Armstrong M., Bettini C., Champigny C., Galli A. and Remacre A. (2002) Geostatistics Rio 2000, (Eds) Proceedings of the Geostatistics Sessions of the 31st International Geological Congress, Rio de Janeiro, Brazil, 6-17 August 2000, Kluwer Acad. Publ., Dordrecht, Holland 235p (Quantitative Geology and Geostatistics 12) ISBN 1-4020-0470-2

Selected Publications relevant for the petroleum industry

1. Geostatistics

Iooss, B., Geraets,D., Mukerji,T. ,Samuelides,Y., Touati,M., Galli,A. . Inferring the spatial distribution of velocity heterogeneities by statistical traveltime tomography. Geophysics , Sept-Oct 2003,Volume 68, Issue5, pp 1714-1730

Geraets D., Galli A., (2002) Statistical Traveltime Tomography in terms of stacking velocity. published in Pure and Applied Geophysics, special issue on "Seismic waves in random media V"

Geraets D., Galli A., Ruffo P., Della Rossa E., 2001. Instantaneous velocity field characterization through stacking velocity variography, Expanded abstract,SEG International Exposition and Seventy-First Annual Meeting, September 9-14 2001, San Antonio, Texas.

Armstrong, M. Galli A (1999) Derivative Based Plurigaussian Simulations, Proceedings of IAMG'99, held in Trondheim, Norway 6-11 August, ed S.J. Lippard, A. Ness, R Sinding-Larsen, pp591-596

Touati M.,Iooss B, Galli A. 1999. Quantitative control of migration, a geostatistical attempt. Mathematical Geology, Vol 31,Number 3, April 1999.

Azpiritxaga I., Correa A., Galli A. et al. 1998. Seismic constraints for a stochastic reservoir model, Block I Eicene C6, Lake Maracaibo, Venezuela. *Expanded abstracts, AAPG 1998 International Conference & Exhibition*, Rio de Janeiro, 8-11 Nov. 1998.

Ioos B., Galli A., Touati M. 1998. Velocity correlation function estimation for seismic reflection traveltimes. In *SEG International Exposition and Sixty-Eighth Annual Meeting, Sept. 13-18, 1998, New Orleans*, pp. 1724-1727.

Touati M., Galli A., Ruffo P., Della Rossa E. 1997. Migration uncertainties : a probabilistic approach. In E.Y. Baafi, N.A. Schofield eds., *Geostatistics Wollongong '96*. Vol. 1. Dordrecht : Kluwer. 597-608.

Volpi B., Galli A., Ravenne C. 1997. Vertical proportion curves : a qualitative and quantitative tool for reservoir characterization. In *Memorias del I Congreso Latinoamericano de Sedimentologia,* Soc. Venezolana de Geól. Tomo 1, 351-358, Nov. 1997.

Le Loc'h G., Galli A. 1997. Truncated plurigaussian method : theoretical and practical points of view. In Baafi et al. eds., *Geostatistics Wollongong '96*. Vol. 1. Dordrecht : Kluwer. 211-222.

Galli A., Goblet P., GriffinD., Ledoux E., Le Loc'h G., Mackay R., Renard P. 1996. Quick upscaling of flow and transport related parameters. CEE: Geoscience 2, Reservoir Engineering Project, Topic 4. 167 p.

Rhea L., Person M., Galli A. et al. 1994. Geostatistical models of secondary oil migration within heterogeneous carrier beds : a theoretical example. *AAPG Bulletin*, *78 (*11), 1679-1691.

Le Loc'h G., Beucher H., Galli A., Doligez B., Heresim Group. 1994. Improvement in the truncated gaussian method : combining several Gaussian functions. In Proc. ECMOR IV, *4th European Conference on the Mathematics of Oil Recovery, Røros, Norway.* 13 p.
Galli A., Beucher H., Le Loc'h G., Doligez B., Heresim Group. 1994. The pros and cons of the truncated gaussian method. In Armstrong et al. eds., *Geostatistical Simulations*. Dordrecht : Kluwer. 217-233.
Seigneurin A., Muller D., Galli A. et al. 1993. Optimization of the well-spacing with a geostatistical model Tunu field - Mahakam area. In *Proc. Indonesian Petroleum Association, 22nd Annual Convention, Jakarta, Indonesia.* 17 p.
Beucher H., Galli A., Le Loc'h G., Ravenne C., Heresim Group. 1993. Including a regional trend in reservoir modelling using the truncated Gaussian method. In Soares ed., *Geostat Tróia '92*. Vol. 1. Dordrecht : Kluwer. 555-566.

2. Finance, real options & management under uncertainty

Armstrong, M. & A. Galli (2013) Using copulas and multi-stage optimisation to manage major production incidents, Proceedings of 36th APCOM Conference held in Porto Alegre, Brazil from 5-8 Nov 2013
Galli A. & M. Armstrong (2013) Risk & discount rates for evaluating a Mining Project Proceedings of 36th APCOM Conference held in Porto Alegre, Brazil from 5-8 Nov 2013
Grant Nicholas, Peter Dowd and Alain Galli (2013). Hedging strategies for Mining Companies using Real Option Valuation combined with conditional simulations. Proceedings of 36th APCOM Conference held in Porto Alegre, Brazil from 5-8 Nov 2013.
Armstrong, M., A.A. Ndiaye, R. Razansimba & A. Galli, (2013) Scenario Reduction in Mining, Journal of Mathematical Geosciences 45:165-182, DOI: 10.1007/s11004-012-9420-7
Armstrong, M., A. Galli & A.A. Ndiaye (2009) A Case Study on the Impact of Hedging Against Foreign Exchange Risk and Energy Price Risk, Proceedings of the Project Evaluation Conference organised by the AusIMM in Melbourne, 21-22 April 2009
Prange, M., M. Armstrong, W. Bailey, B. Couët, H. Djikpesse, D. Wilkinson & A. Galli, (2006) Better Valuation of Future Information under Uncertainty, SPE Annual Technical Conference and Exhibition, San Antonio, Texas, U.S.A., 24-27 September 2006. SPE103028.
Armstrong,M. Galli A., Bailey, W & Couet,B. (2005) Incorporating Technical Uncertainty in Real Option Evaluation of Oil Projects. *JPSE*
Galli.A., Armstrong M., & Guimaraes Dias M-A. (2004) The value of Information: A Bayesian Real Option Approach. SPE Annual Technical Conference and Exhibition, Houston, Texas, U.S.A., 26–29 September 2004. SPE 90418
Galli.A., Armstrong M.,Cunha Mattos Portella R., Gomes de Souza Jr O. Kouki Yokota H. (2004) Stochastic-Aided Design and Bayesian Updating: New Tools to Use Expert Knowledge in Quantitative Models That Incorporate Uncertainty. SPE Annual Technical Conference and Exhibition, Houston, Texas, U.S.A., 26–29 September 2004. SPE90414.
Galli A.,Armstrong M.. Integrating Technical Uncertainty into Real Options. "Integrating Technical Uncertainty into Real Options, Presented at the SPE ATW "Risk Analysis Applied to Field Development Under Uncertainty", Rio de Janeiro, 29-30 August, 2002.
Galli A., Jung T., Armstrong M. & Lhote O. (2001) Real Option Evaluation of a Satellite Field in the North Sea, SPE congres. New Orleans 2001
Galli A., Armstrong M. Jehl,B. 1999. Comparing three methods for evaluating oil projects. *JPT October 1999,* pp 44-49