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**CITIZENSHIPS** : Côte d'Ivoire; Permanent Resident of Canada

**FIELDS OF SPECIALIZATION** : Financial Economics, Industrial Organization

**Ph.D. THESIS** Title : Essays on inference in state space models and commodity market analysis  
Thesis supervisors : William McCausland and Gérard Gaudet  
Date of completion : Summer 2010

**EDUCATION** 2010 (expected) : Ph.D. in Economics, Université de Montréal, Québec  
2002 : Masters in Econometrics and Finance, Université Paris 2 Panthéon Assas, France  
2000 : Masters in Statistics and Economics, École Nationale Supérieure de Statistique et d'Économie Appliquée (ENSEA), Côte d'Ivoire  
1997 : BA in Mathematics, Institut National Polytechnique Houphouët-Boigny, Côte d'Ivoire

## **PROFESSIONAL ACTIVITIES**

2007-2009 : Lecturer, Université de Montréal  
Analysis of Economic Data, Mathematics for Economic Analysis.  
2000-2005 : Teaching and Research Assistant, ENSEA, Côte d'Ivoire  
Courses: Probability, Stochastic calculus and derivative valuation, Financial econometrics, Data analysis, Commodity market analysis.  
Applied research in statistics and econometrics, graduate student advising.  
2004-2005 : Head of the Curriculum, DESS Analyses Statistiques Appliquées au Développement, ENSEA  
Curriculum planning, scheduling, student recruitment, budget management.  
2004-2005 : Statistical Consultant, Axes Marketing, Côte d'Ivoire.  
August-December 1999 : Statistical Consultant, Institut National de la Statistique, Côte d'Ivoire.

**FELLOWSHIPS** 2007-present : Ph.D. Fellowship, Université de Montréal  
2005-2007 : Banque Laurentienne  
2001-2002 : Agence Française de Coopération  
1995-2000 : Gouvernement de Côte d'Ivoire

## **WORKING PAPERS AND ONGOING WORKS**

- [1] «The HESSIAN Method with Conditional Dependence» (with William McCausland), 2009 [**Job Market Paper**].  
[2] «Reputation and Endogenous Membership in Mixed Duopsonies», 2008 (working paper).  
[3] «The Generalized HESSIAN for Nonlinear Non Gaussian State-Space Models» (with William McCausland) (work in progress).  
[4] «Bayesian Sequential Parameter Estimation in a Commodity Term Structure» (work in progress).  
[5] «Asset Volatility Analysis : Stochastic Volatility Models», 2002 (Masters thesis).

**RESEARCH INTERESTS** : Bayesian Econometrics, State Space Models, Risk Management.

**COMPUTER SKILLS** : C++, MATLAB, LATEX, SAS, STATA.

## **REFERENCES**

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## THESIS SUMMARY

My thesis consists of three essays in the fields of computational statistics and commodity market analysis. Growing models of asset price dynamic and term structure curves use nonlinear or non-Gaussian state space form. The first and second papers develop parameter estimation and state smoothing in such models, that are computationally efficient and numerically efficient in posterior simulations. We illustrate the method using empirical examples featuring stochastic volatility models.

The third paper deals with organizational aspects in commodity markets. The liberalization of agriculture markets in Africa raises the issues of commodity risk management for small farmers. A necessary condition for small farmers to use financial derivatives markets to hedge their risk exposure is to constitute themselves in viable farmer-owned cooperatives. The paper builds a model that explains why some small farmers in Africa fail to do so.

### **The HESSIAN Method with Conditional Dependence [Job market paper]**

This article develops a computationally efficient procedure for parameter estimation and state smoothing in state space models where the state vector is Gaussian and the observation vector need not be. The procedure is based on a close approximation of conditional density of states given observed data. The approximate density is obtained through a Taylor series expansion of the target density and does not use data augmentation, commonly used in the literature. We allow conditional dependence between the observed vector and the innovations of the state equation, so that the conditional density of the current observation given state vector depends not only on the current state but also on the next. Many important models feature this type of dependence, including stochastic volatility models with the leverage effect. This approximation can be used as an importance distribution for importance sampling, or as a proposal distribution for Monte Carlo Markov chain (MCMC) methods. Applications include the approximation of likelihood functions and Bayesian posterior inference. Our approximation is closely related to a similar approximation in McCausland (2008) for models where vector of observation is conditionally independent of state innovations. We illustrate using an empirical example featuring stochastic volatility with leverage. We allow the return innovations to have the Gaussian or Student-t distribution.

### **Generalized HESSIAN for Nonlinear NonGaussian State Space Model**

This paper introduces a method for proposal or importance density construction in nonlinear non-Gaussian state space models. This density is obtained from a polynomial approximation of the conditional density of states given observed data, around the mode of this target density. We allow the state vector to have Markovian dynamic and the vector of observations can be conditionally independent or dependent with the state innovations. The approximate density can be used to estimate the likelihood function, for classical inference, or can be used as a proposal density in Markov chain Monte Carlo methods for Bayesian posterior inference. The algorithms provided are computationally efficient. Our methodology is related to similar work in Djegnéné and McCausland (2009) for models where the state vector is Gaussian and the observation vector need not be. We illustrate the method with Markov switching stochastic volatility models.

### **Reputation and Endogenous Membership in Mixed Duopsonies**

This paper studies competition on the price paid to farmers between a farmer-owned cooperative (FOC) and an investor-owned firm (IOF). Using Hotelling's spatial model, it is shown that a cooperative's reputation and market imperfections, such as financial constraints and incompetency, are key factors explaining the difficult growth of cooperatives. Cooperatives play an active role in raising financial resources in order to pay at least the delivery price at storage. After storage, there is uncertainty concerning the farmer's residual claim, which may be diverted. The trust relationship between the farmer and the cooperative, or the cooperative's reputation, then becomes a key factor in explaining the farmer's decision to patronize the cooperative. The delivery price, which also influences the farmer's decision, depends on how easy it is for the cooperative to raise financial resources. Financial market imperfections and cooperative incompetency play an important role at this level. It is shown that a good reputation and a more competent managers raise the cooperatives' market share and force the investor-owned firm to increase the price it pays to the farmers. Those conclusions fit the empirical observations better than the models of Sexton (1990), Albæk and Schultz (1998) and Karantininis and Zago (2001) on the same subject.