Report on the scientific activities of Ms. Benoite de Saporta regarding her request for authorization to supervise doctoral candidates’ research

This report concerns the scientific activities of Dr. Benoite de Saporta regarding her request for authorization to supervise doctoral candidates’ research. My report is based on the documents sent by Dr. Benoite de Saporta, which are very well written and organized, and will cover mainly the period starting in September 2006, when she became maitre de conferences at the University Montesquieu of Bordeaux IV. My report will be divided into the following topics:

1) Teaching Activities
2) Supervising Activities
3) Research Activities
4) Research Projects, Contracts with the Industry, and Other Activities
5) Conclusion

1) Teaching Activities

Since 2006 Dr. Benoite de Saporta has been intensively involved in teaching activities at the University of Bordeaux, in both undergraduate and graduate levels. For the master level she has been lecturing courses in “Mathematics for Finance”, “Finance in Discrete-Time”, “Finance in Continuous-Time”, “Projects in Informatics”, “Markov Chains”, “Random Processes in Finance”, “Probability and Statistics”. For the undergraduate level, she has been lecturing courses in “Mathematics” and “Statistics”. In 2001-2004 at the University of Rennes 1, and in 2005-2006 at the University of Nantes, she also showed a great teaching dedication, with several courses taught. In my opinion these activities show clearly the strong commitment and dedication that Dr. Benoite has been given to the teaching activities. She has not only spent a good number of hours in presenting and preparing these courses but also dealt with a wide variety of subjects, demonstrating a great knowledge on several topics.

2) Supervising Activities

Dr. Benoite de Saporta has co-supervised 2 PhD students, one (Adien Brandejsky) in the period 2009-2012 with Prof. Francois Dufour, and the other one (Karen Gonsalvez) in the period 2007-2010, also with Prof. Francois Dufour. She has also co-supervised one MSc student (Xan Duhalde) in June-July 2008 with Prof. Bernard Bercu.

Regarding the PhD theses I think it is important to point out that both works yielded to publications co-authored by Dr. Benoite de Saporta in important conferences and journals, which shows her relevant participation in the supervision of these students. I believe that the co-supervision of the 2
PhD students along the last years with publications in important journals shows a good level of maturity to supervise doctoral candidates' research by herself in the future.

3) Research Activities

I will mainly focus my comments on Dr. De Saporta recent researches on the Piecewise Deterministic Markov Processes (PDMP's) since this is the subject I am more familiar with, and that I have been working for several years. In my opinion Dr. De Saporta has been making important contributions in this area. Her first international journal publication on this subject (de Saporta, B., Dufour, F., and Gonzalez, K. Numerical method for optimal stopping of PDMP's, published in *Annals of Applied Probability*, 2010) presented some important achievements in this area. In this work the authors provide a numerical method to approximate the value function for the optimal stopping problem of a PDMP, as well as some bounds for the convergence rate of the algorithm and a numerical approximation scheme for deriving a computable stopping rule. This is a hard and rather technical subject that was nicely treated by Dr. de Saporta and the co-authors. In continuation with the results achieved in this paper, Dr. de Saporta and co-authors published 3 other papers in prestigious international journals (*Advances in Applied Probability*, *CAMCoS*, and *Automatica*, all in 2012), dealing with numerical methods for the exit time problem, numerical method to compute expectations of functionals of PDMPs, and theoretical and numerical aspects of impulse control of PDMP's. It is well known that the optimal stopping and impulse control problems are closely related, so the latter paper nicely fits within the previous researches of the authors. Dr. de Saporta has also been working on the subject of parameter estimation for bifurcating autoregressive processes and the tail behavior of Markov switching autoregressive processes, optimal portfolio allocation problems, as well as some more applied aspects of reliability and maintenance of systems, and the achieved results so far on these topics were published in prestigious journals.

Dr. de Saporta finished her PhD in 2004 and has already published 16 papers in prestigious journal, 4 chapters of books, and several conference papers. Besides that she has recently submitted 2 papers to international journals. In my opinion this represents an excellent regularity in her research activity. Her memorial shows that she has been a very active member in the INRIA CQFD team. Bearing in mind all these achievements and her motivation, I believe she has all the means to further improve her already excellent scientific production. I think that her scientific production also shows her capacity to carry out and supervise research projects in an independent way.

4) Research Projects, Contracts with the Industry and Other Activities

Dr. de Saporta has been participating in several research projects and contracts with the industry, playing a central role in all these activities. She is taking part in the international project USP – COFECUB (2013-2016), which is leaded by me from the brazilian side, and by Prof. François Dufour from the french side. This project will initiate a cooperation between Prof. Eduardo Costa (Brazilian researcher) and Dr. de Saporta in quantification methods for ordinary differential
equations with coefficients subject to random variations following a Markov chain. Dr. de Saporta is responsible of the topic “Simulation and Estimation” in an ANR project (2013-2017), leaded by Prof. Florent Malrieu (Univ. Rennes 1). She is also in the project ANR Fautocoes (2009-2013), developed by the INRIA CQFD team, responsible for the research topic “Control of PDMPs”. Regarding the contracts with the industry Dr. de Saporta is taking part in an INRIA-Astrium project (2013-1016) on the study of modeling and optimization in an assembly of a new generation launcher, and in an Astrium project (2008-2013) on the study of probability models for the propagation of fissures. She is also taking part in a DCNS project since 2010 dealing with a submarine trajectory optimization in order to minimize its acoustic signature. She also participated of an EDF project (2010-2012) with the goal of modeling a reactor to simulate and evaluate the probability of unwanted events.

Regarding the editorial activities, Dr. de Saporta carried out the review of several papers for many prestigious journals, including *SIAM J. Control Optim.*, *Stochastic Processes and their Applications*, *Annals of Applied Prob.*, among others. She is also a regular reviewer for the *Mathematical Reviews*. Regarding other academic activities, she has taken some important academic administrative roles related to the organization of conferences, popular scientific divulgations, participation in INRIA committees, selection committees, among other activities.

I believe that the activities presented above show clearly Dr. Benoite strong commitment to a good teamwork, which includes finding financial support for the development of the team researches. Dr. Benoite is not only involved in pure theoretical projects but also in more practical problems which, in my view, will be important to motivate future PhD students.

5) Conclusion

Summing up, I believe that Dr. Benoite showed an outstanding commitment and dedication in all the 4 activities discussed above. I judge that her experience in research and supervision are fully sufficient both, in qualitative and quantitative terms, for the issue of the diploma. I strongly recommend that she receives the authorization to supervise doctoral candidates’ research.

Yours sincerely,

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