Scientific Report

First name / Family name	María Suárez Taboada
Nationality	Spanish
Name of the *Host Organisation*	CWI The Netherlands
First Name / family name of the *Scientific Coordinator*	C.W. Oosterlee
Period of the fellowship	01/02/2013 to 31/01/2014

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

My research activity was carried out in the Scientific Computing group at CWI The Netherlands, the national research institute for mathematics and computer science in the Netherlands, under the supervision of Professor C.W. Oosterlee.

During the fellowship period, I focused my research on uncertainty quantification which is an established research field in computational fluid dynamics but so far it was not used in computational finance. Due to that, the first part of the fellowship focused on the study of the literature around this topic in order to figure out which kind of applications could be targetted in our research field. We obtained some initial results about the quantification of the impact of uncertainty in some model parameters to price a ratchet caplet under the LIBOR Market Model framework in close cooperation with Dr. Jeroen Witteveen who is an expert in uncertainty quantification. He is on a tenure track position at the CWI. Next step was focused on the Heston model, which is an important stochastic volatility model in financial practice. All the research work was based on it. Throughout this part of the felllowship, we were also working with Dr. Lech Grzelak who is an expert in Computational Finance. He is a postdoc with Prof. Oosterlee and he is working at Rabobank as well. His knowledge from a practitioner point of view was very fruitful for this work. Our main objective was to study the generation of exact samples of integrated stochastic quantities using the Stochastic Collocation method in order to obtain an accurate and efficient methodology for financial derivative valuation as well as for risk management.

In my ABCDE Research Training Programme, some work on wind derivatives had been planned but at the end, we decided to focus on uncertainty quantification, due to the available expertise, and the novelty of the topic in computational finance. However, I attended some talks, courses and meetings on that topic which should be seen as an initial step to do some research in the future on wind derivatives.

I would like to remark that during this period, I had the opportunity to attend interesting conferences and courses in my field. Moreover, I was able to expand my scientific contact network. In my opinion, the Exchange Programme gives to the fellows the opportunity to improve their research skills and it is also a excellent way to do networking. The ERCIM Seminars were well-organized to meet interesting people from different fields and to have an overview about their work.

Finally, due to the research stay I gathered sufficient academic experience and was offered an academic position in Spain. This is really very important for my career.

As I said during my talk in the ERCIM Seminars, I was completely sure that this fellowship was going to be positive for my research career.Now, I have to remark that it was even better than I expected. CWI provides a perfect environment to research and in particular, working in the group leading by Professor Oosterlee is a challenging way to grow up as a researcher.

Nowadays, I stay in contact with Professor Oosterlee and we aim to cooperate and publish papers in the near future.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

At this moment, Prof. Oosterlee and me are still working on paper joined with Lech Grzelak and Jeroen Witteveen. We would like to submit it as soon as possible as long as we think it is a challenge topic and a new application to our field.
The paper will be called as follows:

M. Suárez-Taboada, Jeroen A.S. Witteveen, L. Grzelak, C.W. Oosterlee. *Fast generation of exact samplea using the stochastic collocation method.*

The paper will be finalized and submitted in the Spring of 2014.

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

During my visits to different research centers, I could also attend to some interesting courses:

1.- *Stochastic Volatility Models,* John Gatheral (Baruch College) at KU Leuven, Leuven, Belgium, 18/04/2013-19/04/2013.
3.- *Summer School on Computational Aspects of Uncertainty Quantification*, Advanced courses by Bert Debusschere (SANDIA National Labs) and M. Giles (Oxford University) at University of Leuven, Leuven, Belgium, 30/05/2013-31/05/2013 .
4.- *An introduction to electricity markets and derivatives*, Rene Aid, (EDF R&D - Finance for Energy Market Research Centre) at University of Oslo, Oslo, Norway,16/09/2013-17/09/2013.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

1. My first stay took place at KU Leuven, Belgium, 18/04/2013-19/04/2013. My stay there was supervised by Professor Wim Schoutens, the scientific leader of the Computational Finance group. He is a well-known expert in my field of interest so the visit was very fruitful to learn more about stochastic volatility models.

2. The second stay was at KU Leuven with Prof. Dirk Nuyens in Belgium, 27/05/2013-31/05/2013. I also attended an advanced course at the University of Leuven about Monte Carlo methods given by Prof. Mike Giles from Oxford University and about aspects of Uncertainty Quantification given by Bert Debusschere. This visit was also very interesting to gain a deep insight in the available techniques in Computational Finance.

3. The third stay was at University of Oslo in Norway, under the supervision of Prof. Fred Ben Spenth, 13/09/2013-27/09/2013. The research interest was to work on a project around American options in energy markets which is also very challenging and fits with the first ideas of my ABCDE Research Training Programme. I could also attend an advanced course about electricity markets and derivatives given by Rene Aid.