

Report of the research visit of Dr. Minoo Kamrani during the summer of 2021

November 8, 2021

The purpose of writing this report is to summarize my scientific activities during my research visit in Montan University Loeben of Austria from 17.07.2021 till 18.09.2021 which was supported by the IMU-CDC Individual Research Travel Support Program Grant.

My primary field is the numerical analysis of stochastic differential equations. During my research visit, with Professor Dr. Erika Hausenblas, we started a project about the stochastic Cox-Ingress model and its numerical modeling.

The Cox-Ingersoll- Ross (CIR) model comes up in financial mathematics in a natural way; it describes interest rate movements as driven by only one source of market risk. The main problem is to preserve the positivity of the process. In the proposed project, we were interested in finding an adaptive numerical method in which the step size is chosen adaptively such that in each step, the solution remains positive. The method is based on a backward Euler scheme with a combination of a backstop method which is a strongly convergent method.

Our aim was first to verify the convergence of the proposed method and evaluate the rate of convergence. Furthermore, we proved that the method ensures the positivity of solutions in the sense that it avoids using the backstop method with arbitrarily high probability. Secondly, we aimed to implement the scheme and to compare the efficiency of our algorithm. In this way, the theoretical results were verified by numerical experiments; So, during the stay, the scheme was implemented in MATLAB, and the numerical experience was pursued. The advantages of the new method were elaborated; in particular, the new algorithm compared by available techniques for the CIR processes.

As a result of my visit one manuscript is partly finished, and it will be submitted soon after some revision. Also, this visit helped us to discuss about the extension of the proposed adaptive method for SDEs with fractional Brownian motions, which is a very interesting topic. Furthermore, in the future, this visit will promote the development of cooperation between Iran and Austria, such that we can exchange students and researchers.