



# Jump Processes in Risk Management

(December 17-21, 2018)

Venue: Indian Institute of Technology Roorkee, Roorkee-247667, Uttarakhand, India

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## Overview

The financial crisis of 2008-2009 has once again made it clear that the extreme behavior of financial instruments cannot be described by using the traditional models based on Gaussian processes. The Gaussian processes based models are not capable to capture events such as market crashes, changes in credit ratings, defaults, etc. Such event-driven uncertainties are more appropriately modelled by jump processes. After the financial crisis, jump processes are becoming increasingly significant for modelling real world situations. This has led to increased interest in jump processes amongst academicians and practitioners alike.

The goal of this course is to show that jump processes, and in particular Lévy processes, provide an easy-to use toolbox for evaluating and hedging financial risks. After a short introduction to the theory of Lévy processes, we will study their applications to risk management and explore the financial problems where the use of jump processes is particularly important. The lecture session on the Lévy processes and their applications in risk management and finance will be accompanied by hands-on training and implementation of several numerical simulations using Python in additional tutorial sessions.

The course will consist of 10 lectures of 1 hour each and 10 exercise/tutorial sessions of 1 hour each.

### Objective:

The primary objectives of the course are as follows:

- i. To understand why Lévy processes are more realistic models in risk management and finance.
- ii. To learn the intuitive and mathematical descriptions of the Lévy processes and their applications in risk management and finance.
- iii. To implement numerical simulations of several problems arising in risk management and finance by using Python computing tools.
- iv. To enhance skills of the participants to tackle problems arising in financial industry.
- v. To motivate participants for research.

<b>Course Information</b>	<b>Duration: Dec. 17 – 21, 2018</b>
<b>Modules</b>	<p>Module 1: Introduction. Compound Poisson processes and jump-diffusions. Characteristic functions. Numerical simulation of compound Poisson processes.</p> <p>Module 2: Examples of Lévy processes with finite jump intensity: Kou's model, Merton's model. Poisson random measures.</p> <p>Module 3: Trajectories of Lévy processes and Lévy-Khintchine formula. Further examples of Lévy processes used in financial modeling: variance gamma model.</p> <p>Module 4: Further examples of Lévy processes used in financial modeling: normal inverse Gaussian model. Numerical simulation of Lévy processes.</p> <p>Module 5: Basic stochastic calculus for Lévy processes. Exponential Lévy models.</p> <p>Module 6: Stochastic exponential of a Lévy process. Application: evaluating the risks of the CPPI strategy (constant proportion portfolio insurance).</p> <p>Module 7: Option pricing in Lévy models. Absence of arbitrage and market incompleteness.</p> <p>Module 8: Market incompleteness. Fourier transform methods for option pricing.</p> <p>Module 9: Hedging options in Lévy models. Quadratic hedging strategy.</p> <p>Module 10: Utility-based hedging and its approximations.</p> <p><b>Number of participants for the course will be limited to fifty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ You are quantitative researcher, trader or risk manager in a financial institution, interested in becoming proficient with models based on jump processes.</li> <li>▪ You are a research scientist / professor interested in learning the theory and financial applications of Lévy processes.</li> <li>▪ You are a student at master or PhD level studying probability theory, stochastic processes, or mathematical finance and interested in pursuing a research career in mathematical finance or a professional career in quantitative analysis / risk management.</li> </ul>
<b>Fees</b>	<p>The participation fees for attending the course are as follows:</p> <ul style="list-style-type: none"> <li>• Participants from abroad: US \$500</li> <li>• Industry/ Research Organizations: Rs. 15000.00</li> <li>• Academic Institutions (Faculty): Rs. 7000.00</li> <li>• Academic Institutions (Students): Rs. 3500.00</li> </ul> <p>➤ Students have to show the proof of their full-time student enrollment in academic institute.</p> <p>The above fees include all instructional materials, computer use for tutorials and assignments, free internet facility.</p>

**Fee does not include accommodation and food. On request basis, participants may be provided with accommodation on payment basis.**

**Note:**

**1. The registration fee should be sent in advance through bank draft drawn in favor of "Dean SRIC, IIT Roorkee" and payable at Roorkee latest by Nov. 30, 2018.**

**2. The Complete form along with payment may please be sent to:  
Dr. Chaman Kumar, Department of Mathematics, IIT Roorkee, Roorkee-247667, Uttarakhand,  
e-mail: [c.kumarfma@iitr.ac.in](mailto:c.kumarfma@iitr.ac.in)**

# The Faculty

## Prof. Peter Tankov



Peter Tankov is a Professor of Quantitative Finance and co-head of the quantitative finance and risk management track at ENSAE, an engineering school in Paris. A graduate of Ecole Polytechnique, he has previously worked as professor at University Paris-Diderot, assistant professor at Ecole Polytechnique, and visiting professor at Imperial College London.

Peter's research interests lie in the fields of stochastic processes, quantitative finance and energy mathematics ; topics on which he has written over 40 research papers. He is a recognized expert on the use of jump processes in finance and the author of the widely read book *Financial Modelling with Jump Processes* written jointly with Rama Cont. Peter is a member of editorial boards of leading finance journals *Mathematical Finance*, *Finance and Stochastics* and *SIAM Journal on Financial Mathematics* and the recipient of the *Best Young Researcher in Finance* award of the Europlace Finance Institute.

## Dr Chaman Kumar



Chaman Kumar is an Assistant Professor of Probability and Stochastic Analysis at the Indian Institute of Technology Roorkee. He completed his PhD at the School of Mathematics, University of Edinburgh, United Kingdom. He held the positions of Visiting Scientist at the Stat-Math Unit, Indian Statistical Institute, Delhi and Whittaker Research Fellow at the School of Mathematics, University of Edinburgh.

Kumar is a leading expert in the numerical approximation of SDE driven by Lévy noise and their applications in finance. He has published several articles in journals of international repute including SINUM and EJP.

## Registration Deadline

30 Nov 2018

## Venue

Department of Mathematics  
Indian Institute of Technology  
Roorkee, Roorkee-247667  
[www.iitr.ac.in](http://www.iitr.ac.in)

## Course Co-ordinator

Dr Chaman Kumar,  
Department of Mathematics,  
IIT Roorkee, Roorkee  
247667, Uttarakhand,

E-mail:

[c.kumarfma@iitr.ac.in](mailto:c.kumarfma@iitr.ac.in)

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For Registration Visit  
<http://www.gian.iitkgp.ac.in/GREGN>

Indian Institute of Technology Roorkee

Registration Form

## *Jump Processes in Risk Management*

(MHRD Scheme on Global Initiative on Academic Network (GIAN))

December 17 – 21, 2018

- Name .....
- Designation .....
- Affiliation .....
- Address for Correspondence .....  
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- Email: .....
- Phone No: .....
- Accommodation required: **Yes / No**
- Type: Hotel/Hostel/Guest House (accommodation shared basis may be available @Rs. 500/  
per day)
- Cheque/DD No. ....
- Dated ..... for Rs. ....

Date

Signature of the participant

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