MoneyScience

Financial Training for Quants

2 days, Central London

£1999

'Early Bird' and Group Discounts available

2-3 July, 2020

Jörg Kienitz and Nikolai Nowaczyk

present

Machine Learning for Option Pricing, Calibration and Hedging

MASTERCLASS

The goal of this two-day workshop is to provide a detailed overview of machine learning techniques applied for finance. We offer insights into the latest techniques of using such techniques for modelling financial markets where we focus on pricing and calibration.

We not only tackle the theory but give practical guidance and live demonstrations of the computational methods involved. After introducing the subject we cover Gaussian Process Regression and Artificial Neural Networks and show how such methods can be applied to solve option pricing problems, speed up the calculation of xVAs or apply them for hedging.

We further show how to use existing pricing libraries to interact with machine learning environments often set up in Python.

We explain how to set up the methods mainly in Python using Keras, Tensorflow or SciKit Learn. We give many examples which are directly related to financial mathematics and can be explored further after the course. All the material is available as Jupyther notebooks. For Gaussian Processes we use Matlab and Python examples.

This workshop covers the fundamentals and it illustrates the application of state-of-the-art machine learning applications for application to Mathematical Finance.

10% 'EARLY BIRD' DISCOUNT BEFORE APRIL 15

Email: Jacob@moneyscience.com **Telephone:** +44 1275 540 563

Course Highlights

This workshop covers the latest techniques for mastering the application of Gaussian Process Regression methods and Artificial Neural Networks techniques. We consider the theoretical underpinnings and give finance related examples in Matlab and/or Python. Especially we cover:

- Overview of some Machine Learning techniques mainly Deep Learning
- Implementation and Examples for pricing, calibration and hedging
- Gaussian Process Regression for option pricing
- The maths of Neural Networks (with examples)
- Deep learning for pricing using term structure models
- Deep learning for calibrating Stochastic Volatility Models

Course Methodology

Presentation and examples (Matlab/**Jupyter Notebooks**)

Prerequisites

We aim to introduce all concepts from scratch but a good understanding of basic math (linear algebra, optimization, probability and calculus) would be useful.

Who should attend?

Quant developers wishing to supplement their professional expertise with a foundation in Machine Learning.

Course Content

Machine Learning and Finance Overview

- Machine Learning

- Supervised Learning for Classification, Regression
- Unsupervised Learning
- Selfsupervised Learning
- Reinforcement Learning

- Finance

- Pricing and hedging
- Calibration
- Simulation and exposure

Machine Learning and Finance – Programming Overview

- ML and Financial Applications - Technology Overview

- Python, Tensorflow, Keras
- C++, Java, Matlab, QuantLib/ORE

- Interfacing

- Python – Excel (xlwings)
- Python - QuantLib/ORE
- Python - Matlab

- Some illustrations

- Exposure for Bermudan Swaptions in Tensorflow
- Hull-White with PDE in Python using QL
- Monte Carl - Simulation in Tensorflow

Artificial Neural Networks in Finance – introduction and examples I

- Introduction to Artificial Neural Networks

- Construction
- ANN at work

- ANN math recap (with examples)

- on Linear Algebra
- on Optimization: Stochastic gradient descent, …
- on Autodifferentiation: Backpropagation

- Illustration: Learning a function

- It's only an approximation!

- Illustration for pricing:

- Black-Scholes Merton Model
- Term-Structure Models
- Heston

- Preprocessing/feature engineering

- Overfitting / underfitting

- Train, validate, test

- Hyperparameters

- Different types of networks

- FNN - Feed Forward
- CNN - Convolutional
- RNN - Recursive
- LSTM - Long Short Term Memory
- VAE – Variational Autoencoders
- GAN - Generative Adversarial Networks

Artificial Neural Networks in Finance – introduction and examples II

- Calibration basics

- Illustration: Deep calibration

- Heston Model
- Rough Bergomi Model

- Hedging basics

- LSTMs revisited

- Illustration: Deep Hedging

Gaussian Process Regression (GPR)

- Intro to GPR and Regression

- How does it work?
- train, validate, test
- Covariance Functions

- Pricing models and methods

- GPR and Option Pricing (Heston, American options, …)

- Variational Autoencoder

AOB

- ML and Model Validation

- Perspectives

Email: Jacob@moneyscience.com **Telephone:** +44 1275 540 563

About the Speakers

Jörg Kienitz

Jörg is partner at Quaternion Risk Management and owner of the finciraptor website (finciraptor.de). He is primarily involved in consulting on model validation, model development and model implementation. Furthermore, Jörg acts as a trainer for public and onsite classes.

He lectures at the universities of Wuppertal where is an assistant professor and Cape Town where is adjunct associate professor. The topics are advanced financial modeling, numerical methods, stochastics and machine/statistical learning. Further to the academic engagements Jörg talks on finance conferences such as Quant Minds or WBS Quant conference.

Jörg holds a Ph.D. in stochastic analysis and probability theory and authored several papers and four books "Monte Carlo Object Oriented Frameworks in C++" (with Daniel J. Duffy) "Financial Modelling" (with Daniel Wetterau), "Interest Rate Derivatives Explained I" and "Interest Rate Derivatives Explained II" (with Peter Caspers).

Nikolai Nowaczyk

Nikolai is a senior consultant at Quaternion Risk Management. He is primarily involved in consulting on model validation, model development and model implementation.

He talks on Mathematical Finance and Tech conferences including WBS Quant Conference or PyData. The topics are on financial modeling, numerical methods and data analytics. He contributed to the famous SciPy library.

Nikolai holds a Ph.D. in differential geometry and authored several papers.

What do you receive?

The course price includes coffee, tea, lunch and refreshments.— and Day 1 will be followed by drinks and an opportunity to mingle socially.

You will be issued with a certificate of attendance upon completion.

Attention

This course takes place in the form of a series of short seminars and does not involve practical work by the participants. However all code and resources used are provided after the course.

Further Information

Dates: 2 Days – July 2—3rd, 2020
Venue: Central London (TBA)
Cost: £1999 (exc VAT)

Registration

Please Return Application form by email to jacob@moneyscience.com or by post to:

Financial Training
MoneyScience Ltd c/o Jacob Bettany,
Flat 4, Walton Pines
Clevedon
North Somerset, UK
BS21 7BJ

Group Discounts

10% for 2 delegates, 20% for 3 or more delegates. (not eligible for 'early bird')

Enquiries

Jacob Bettany, Managing Director

Tel: +44 (0) 1275 540563
e-mail: jacob@moneyscience.com

Skype: MoneyScience

Registration Form

1st Participant Title (Dr / Mr / Mrs / Ms)	
1st Participant Name	
1st Participant Email	
Additional Participant Title:	
Additional Participant Name:	
Additional Participant Email:	
Contact Telephone Number	
Company Name	
VAT Registration Number (EU)	
Address	
Town	
State	
Country	
How did you hear about this Course?	
Special Dietary Requirements	

SIGNED ……..

PRINT NAME ……...

DATE ……

Please Return Completed Application to:

MoneyScience Ltd c/o Jacob Bettany,
Flat 4, Walton Pines
Clevedon
North Somerset, UK
BS21 7BJ

Or Sign, Scan and Return to **Jacob@moneyscience.com**

☐ **I have read and understand the Terms and Conditions on the page following.**

Cancellation

If a person which has registered for this course is unable to attend for whatever reasons, a substitute representative may be appointed to participate in advance. Cancellation will be accepted only in written form no later than twenty calendar days prior to the date of the course while a cancellation fee in the amount of 10% of the price or block price will be charged. Cancellation of participation within a period of less than twenty calendar days prior to the date of the course is not possible for technical and organisational reasons. MoneyScience reserve the right at all times to cancel participation or cancel the entire seminar for whatever unspecified reasons, including possible force majeure. In this case, the price will be refunded in full to the applying participant.

Terms and Conditions

MoneyScience Training Events are English-language seminars, training sessions and practical workshops delivered by expert, qualified tutors. Our objective is to provide industry professionals with advanced financial know-how and up-to-date analytical methods and skills.

Tuition Language

MoneyScience Events are held in English and all relevant manuals, training software etc. are also provided in English. In order to benefit from participation, a good working knowledge of English, including common financial phrases and related terminology, is required.

Registration

Clients who decided to participate, should submit their registration by mail to us in advance. Subject to availability, the participant will then receive a confirmation of participation. In some case the number of participants is strictly limited to preserve an effective and focused learning environment.

Seminar Prices

The quoted seminar prices are per person and include all course material, lunches and refreshments, The price does not include hotel accommodation. Quoted prices are exclusive of VAT.

Discounts

Bulk discounts are offered when submitting an application for the participation of more than one person. Please contact jacob@moneyscience.com for further details.

Invoicing and Payment

An invoice for the seminar price will be sent to the participants on receipt of their Registration Form and should be paid within days. Full payment of the invoice must be made before the start of the course as a precondition of participation.

Terms of Cancellation

If for whatever reasons a registered participant is unable to attend, a substitute delegate may be appointed to participate instead. For cancellations received 20 days or more before the beginning of the seminar, a 10 % cancellation fee of the full price will be invoiced i.e. 90 % of the price is refunded. For cancellations received less than 20 days prior to the beginning of the seminar, the full price is payable i.e. no refund will be provided. All cancellations must be in writing. MoneyScience reserves the right to cancel the individual participation or cancel the entire seminar or part of it for whatever unspecified reasons, including possible force majeure. In this case, the price paid will be refunded in full or in part, accordingly.