DEEP QUANT FINANCE

EXCEL & PYTHON

PEAKS2TAILS

OUR TRAINEES WORK IN

| Consulting |
| Investment Banks |
| Rating Agencies |

Brownian Motion

Probability density
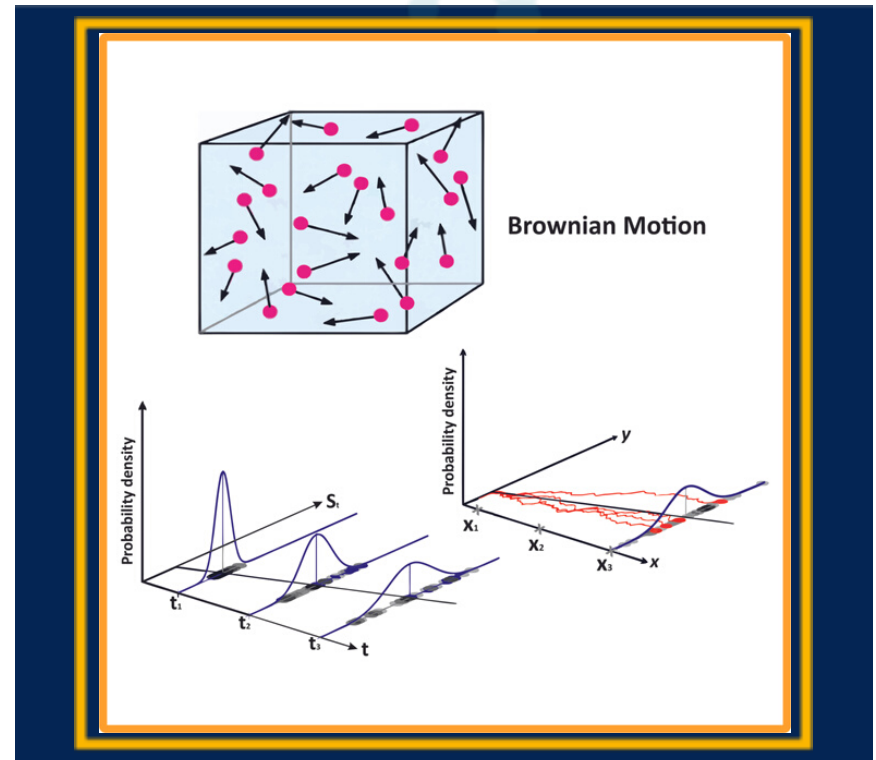
ABOUT US

Peak2tails LLP is a distinguished risk training and consulting firm founded in 2019, dedicated to providing comprehensive services to individuals and corporations. With a core focus on risk management, Peak2tails LLP was established by industry experts Satypriya Ojha and Karan Aggarwal, both of whom are **highly qualified FRM** (Financial Risk Manager) and **CQF** (Certificate in Quantitative Finance) **professionals**. The firm specializes in simplifying complex quantitative concepts through user-friendly spreadsheet models, offering a unique value proposition to its clients.

SERVICES

Risk Training:

Peak2tails LLP is renowned for its exceptional risk training programs, catering to professionals seeking to enhance their expertise in areas such as Market Risk, Credit Risk, Data Science, and other quantitative disciplines. Having successfully trained over 1000 professionals, our training courses provide practical knowledge and skills, enabling participants to navigate challenging risk environments effectively.

Risk Consulting:

On the corporate front, Peak2tails LLP specializes in risk consulting projects, particularly focused on Credit Risk & Market Risk for banks & non-banking financial companies (NBFCs). With extensive experience in handling diverse consulting engagements, we collaborate closely with our clients to develop tailored risk management strategies, optimize processes, & ensure regulatory compliance. Our unique approach of simplifying quantitative concepts using spreadsheet models helps clients grasp complex risk frameworks effortlessly.

Unique Selling Proposition (USP):

Simplifying Tough Quantitative Concepts:

At Peak2tails LLP, we excel in simplifying tough quantitative concepts through the use of intuitive spreadsheet models. We understand that complex financial and risk concepts can often be challenging to comprehend. Our expertise lies in translating intricate theories into practical models that are easy to understand, enabling our clients to make informed decisions and effectively manage risks.

ABOUT THE COURSE

This course is designed to fulfil the needs of a modern day Quant professional. It takes you through a systematic journey of financial engineering concepts starting with the famous Black scholes model all the way to using artificial intelligence for valuation and risk modelling. The foundation of the course rests on three legs. The first component is to master the martingale and numeraire based approach to derivative pricing with a tree or monte carlo simulation based implementation. The second component is to master the PDE journey to pricing which involves finite difference schemes. The third component is quantitative portfolio management which involves using statistical models to build portfolios for investors. We will cover these topics in a structured meticulous manner with increasing difficulty with lots of visuals, practice problems and build python routines from scratch in a reusable and scalable fashion. And finally, the use of Machine learning which is changing the face of Quant finance today will be covered as an overlay to the traditional models in finance. The hallmark of this course is a structured learning roadmap, a ton of reusable artifacts in form of spreadsheets and python routines and a lifelong empowerment to be an independent and complete Quant professional.

MODULE 1
FINANCE BASICS WITH PYTHON

Peaks2Tails

Setting up Python Infrastructure	• Anaconda installation • Exploring Jupyter
Arithmetic operations	• Basic operators • Using the 'math' library
Data Structure	• Int, float, bool, string • Tuple, list, set, dictionary
Object Oriented Programming	• Functions • Class

Excel + Python Lab – *Create a Custom Class for Black Scholes Option Price and Greek*

Numerical computing with NumPy	• Lists vs NumPy arrays • Indexing • Vectorization • Linear algebra

Excel + Python Lab – *Create a Custom Class for Multiple Linear Regression*

Data Analysis with Pandas	• The DataFrame Class • Data pre-processing • Basic Analytics • Basic Visualization • Concatenation, Joining & Merging • Pivot Table

Data Visualization with Matplotlib, Seaborn & Cufflinks	• 2D plots (Scatter, line chart, column chart, bar chart, histograms) • 3D plots (3D scatter, Surface plots, Contour plots) • Financial Plots (Candle stick, Bollinger bands)

Calculus	• Limits & Derivatives • Integration • ODEs / PDEs using SciPy

Excel + Python Lab – *Solving the heat equation.*

30 CLASSES

Numerical Integration

- Riemann Integral
- Trapezoidal method
- Simpson's method
- Gaussian Quadrature

Excel + Python Lab – *Custom class to find CDF of normal distribution using numerical integration*

Probability & Statistics with SciPy

- Discrete distributions (Bernoulli, Binomial, Poisson, Uniform)
- Continuous distributions (Normal, T, lognormal, Chi-squared, F)

Excel + PythonLab – *Custom Class for numerical computation of Expectation and Variance*

Univariate Financial Time Series Analysis with Statsmodels

- Prices and Returns
- Moments (Mean, Variance, Skewness, Kurtosis)
- Correlation & Covariance
- ACF, PACF
- AR, MA, ARMA, ARIMA models
- Stationarity & Unit root tests
- Regression with ARMA errors
- Cointegration
- Seasonality

Excel + Python Lab – *Custom class to perform Box-Jenkins methodology to fit the best model.*

Multivariate Financial Time Series Analysis by Statsmodels

- VAR
- VECM

Excel + Python Lab – *Joint forecasting of macro-economic time series*

Conditional Volatility Models

- EWMA
- GARCH

Excel + Python Lab – *Custom Class for Value-at-Risk under different volatility models*

Monte Carlo Methods

- Generating Random numbers
- Value of PI using Monte Carlo
- Solving an integral with Monte Carlo
- Acceptance Rejection Method
- Conditional Monte Carlo
- Variance Reduction techniques (Antithetic Sampling, Control Variate
- Low discrepancy sequence (Halton, Sobol)

Copula Models

- Copula definition and properties
- Gaussian and T copula
- Archimedean Copula

Excel + Python Lab – *Simulating default times for a nth to default basket CDS.*

MODULE 2

STOCHASTIC CALCULUS FOR FINANCE

6 CLASSES

Stochastic process

- Random Walk process
- Wiener process
- Named stochastic process (ABM, GBM, OU)
- Conditional Expectation
- Martingales & Markov properties
- Ito's Lemma
- Ito Isometry
- Ito Integral
- Estimation & Calibration

Change of Measure

- Probability, Sigma Algebra, Filtration
- Tower property
- Radon Nikodym derivative
- Girsanov theorem

EQUITY DERIVATIVES

20 CLASSES

Binomial Asset Pricing Model

- Stock price model
- Valuing a European Option
  - i. Replicating strategy
  - ii. Delta-hedging strategy
  - iii. Risk neutral expectation
- Value an American Option
- Option with dividends

Excel and Python Lab – Custom Class for pricing an option using binomial tree model.

Jump Process

- Jumps in Asset Dynamics
- Exponential Levy process
- Variance Gamma process
- Characteristic Function
- Fast Fourier transform for Option pricing

Finite Difference Methods for Option pricing

- Explicit Scheme
- Implicit Scheme
- Crank Nicolson
- Stability Analysis

Excel and Python Lab –Price first generation exotics using Finite Difference

Black Scholes

- ES aggregation framework for IMCC
- NMRF and stressed capital

Excel and Python Lab – Custom class for Exotic pricing and Greeks

Monte Carlo methods for Option pricing

- Fundamental theorem of Asset pricing
- Feynman-Kac theorem
- Simulating GBM (Euler Scheme, Milstein Scheme, Explicit Scheme)
- Pricing First generation exotics using MCS.
- Least Square Monte Carlo for Bermudan Options
- Fast Monte Carlo Greeks (pathwise & likelihood ratio methods)

Volatility Surface

- Historical volatility, Local volatility, Implied Volatility
- Term Structure, Smile, Surface
- Dupire Local volatility model
- Stochastic volatility models (SABR, Heston)

Excel and Python Lab– Custom class for pricing under Heston and SABR models

INTEREST RATE & FX DERIVATIVES

12 CLASSES

Rates and Rate Instruments

- Spot vs forward
- Short rates vs instantaneous forward rates
- Term structure concepts
- Fundamental theorem of asset pricing
- Bank account & zero-coupon bond
- Coupon bond (fixed, floating)
- FRAs, Swaps, CMS

Excel + Python Lab – valuation of Bonds, FRAs and Swaps

Term Structure Models

- Short rate models (Vasicek, CIR)
- No Arbitrage Models (Ho Lee, Hull-White I, Hull-White II)
- The HJM framework
- Market Models (BGM)

Options on rates

- The Black-76 model
- Caps & Floors
- Swaptions

Excel + Python Lab – Calibration of swaption volatility surface

FX Instruments

- FX forward
- FX option
- FX swap
- Cross Currency Interest rate swap

Excel + Python Lab – Pricing of FX derivatives with volatility smile

Excel + Python Lab – CVA calculation for a portfolio of derivatives

MODULE 5

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QUANTITATIVE PORTFOLIO MANAGEMENT

5 CLASSES

Portfolio Theory & Optimization	• Modern Portfolio Theory • CAPM • Mean Variance Optimization • Black Litterman

Excel + Python Lab *– A real life portfolio optimization problem*
Excel + Python Lab *– Implementation of Pairs-trading (A statistical arbitrage trading strategy)*

MODULE 6

MACHINE LEARNING FOR FINANCE

10 CLASSES

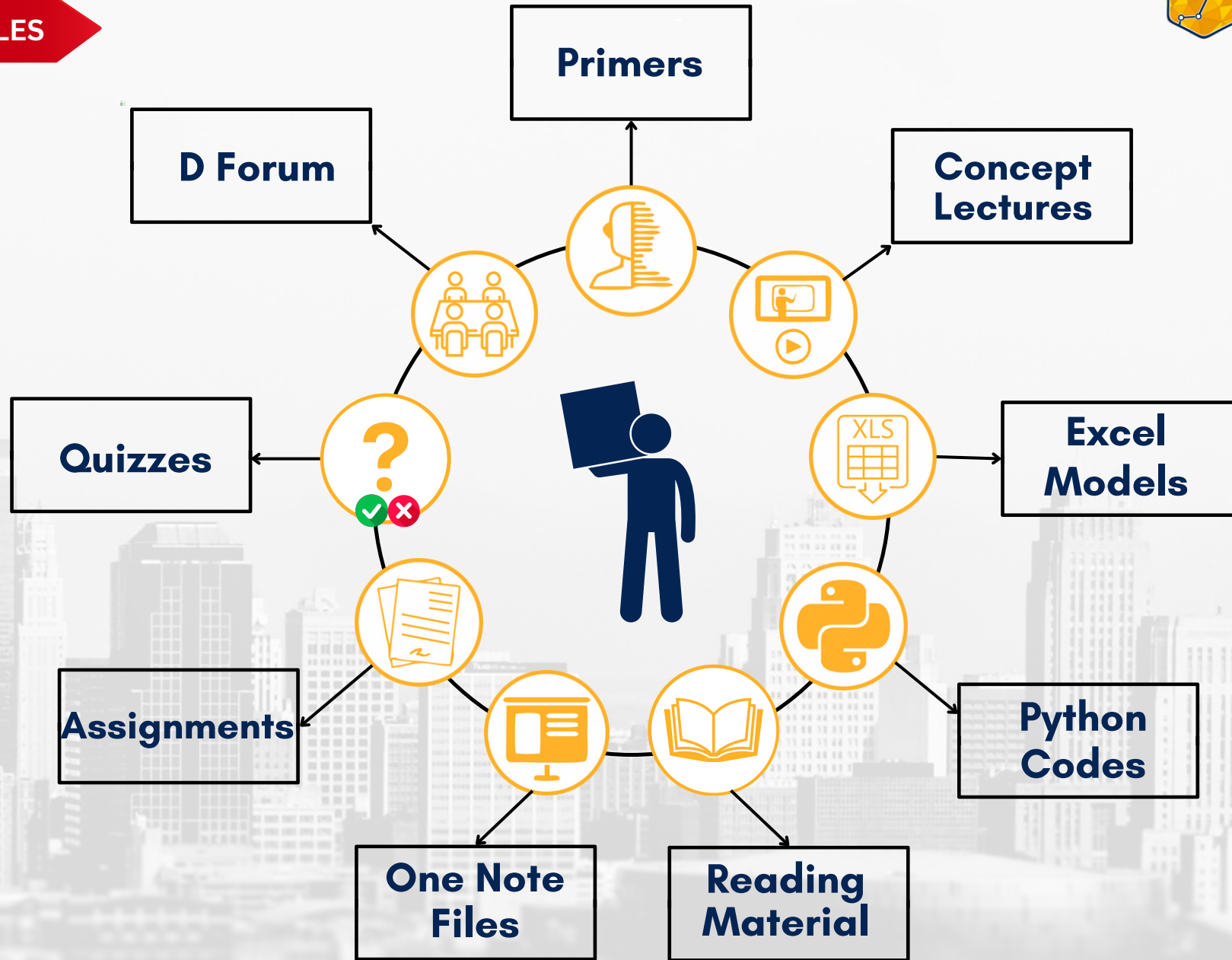| **FX Instruments**	• Logistic Regression for predicting default • Support Vector Machines for anomaly detection • Naïve Bayes for Sentiment Classification • Ensemble methods (Bagging, Boosting) for LGD
Traditional Unsupervised algorithms using Scikit Learn	• PCA based value at risk for an interest rate portfolio • K means clustering for volatility regime
Deep Learning with Tensorflow	• Artificial Neural Network for Option Price • LSTM for stock price prediction • Building a Trading strategy with Reinforcement learning (OpenAI Gym)

CLASSES DETAILS

WEEKEND LIVE CLASSES

TIME
6:00 PM - 8:00 PM

RECORDINGS ARE ALSO AVAILABLE FOR SELF PACED LEARNING

PEAKS2TAILS

Primers

D Forum

Concept Lectures

Quizzes

Excel Models

Assignments

Python Codes

One Note Files

Reading Material

KNOW YOUR TRAINER

SATYAPRIYA OJHA

Satyapriya Ojha is a highly skilled Capital Markets and Risk professional with **12+ years of experience in Regulatory Capital, Valuation and Analytics**.

He is an IIT & IIM graduate and holds FRM charter (top quartile in all subjects of part I & part II) and a distinction from CQF institute. He is an expert in quantitative models used in valuation and risk management . He has worked as a consultant in several regulatory projects for some of the top banks in the US in BASEL III and FRTB space. Currently, he serves as a product owner for a top wealth management firm engaged in quantitative portfolio management for institutional clients.

![Peaks2Tails logo]

APPLICATION MODULE (AM)

1st Day

Excel sheet will be mailed to all the participants containing **unfilled templates** with corresponding **write-up** containing the directions to fill the Templates.

01 The templates provided may consist of two to five Excel sheets.

02 It's an open book exam, so students can refer to the existing excels or notes for filling the templates.

03 Students are marked based on the following criteria
a) Knowledge of Credit Risk concepts – 50%
b) Application of Credit Risk concepts – 30%
c) Presentation – 20%

04 Students should send their exams by **1st Day** (**midnight 11.59pm IST**) to **exams@peaks2tails.com**. Failure to do so can lead to the exam being unmarked leading to a **failure status.**

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CONCEPTUAL MODULE (CM)

2nd Day

MCQ test
will be forwarded to all the participants
that will contain
**50 questions with 3 options,
1 correct answer**
and **no negative marking.**

01 A spreadsheet will be provided for you to select options a, b, or c corresponding to each question number.

02 It's an open book exam, so students can refer to notes or any material to mark the answers.

03 Each question will contain 1 mark, so the conceptual Module will contain a total of 50 marks.

04 Total duration of exam is 3 hrs, so students should send their marked excels to **exams@peaks2tails.com before 1.30 pm**. Failure to do so can lead to the exam being unmarked leading to a failure status.

SAMPLE CERTIFICATE

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LETTER
OF RECOMMENDATION

This is to certify that

Amit Agarwal

has successfully completed
150 Hours Bootcamp on Credit Risk Modelling

KARAN
AGGARWAL

SOLUTIONING · CONSULTING
PEAKS2TAILS
TRAINING · CONSULTING

SATYAPRIYA
OJHA

PLACEMENT ASSISTANCE

PEAKS2TAILS

Customized CV Preparation & Interview Guide

Join Network of more than 500 Professionals

Tie-up with Banks consulting & Rating agencies

EMI

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FREQUENTLY ASKED QUESTIONS

TENURE :	3/6/9/12 Months
CHARGES :	No interest, no processing fees & no hidden charges
APPLICABLE COURSES :	Courses valued above Rs.40000 & having lifetime access
REQUIREMENTS :	Applicant has to be a Salaried person
DOCUMENTS :	3 Months Salary Slips & Bank Statements
PROCESSING TIME :	4 – 6 Hours

PREQUISITE 📌
Basic knowledge of maths (specially calculus) and stats
Programming background not required

CERTIFICATE 🎓
On successful completion of assignments and exams

FEES 💸
48,000 For 1 Year Access
60,000 For Lifetime Access

DURATION ⌛
175 Hours

MODE 📹
Online

LANGUAGE 🗣
English

MODUS OPERANDI

Batch - 2024 Cohort

Peaks2Tails

Recordings

DTH player

Every Sunday Live Session-

🕐 6:00 pm – 8:00 pm IST
📹 Zoom Meeting

Examination-

Once a Year

PEAKS2TAILS

Training

Solutions

Consulting

Contact us:

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WATCH DEMOS ON OUR YOUTUBE CHANNEL

Peaks2Tails Company