

Annexure 9

EPAT - EXCLUSIVE PROGRAM ON ALGORITHMIC AND QUANTITATIVE TRADING

CURRICULUM

1 EPAT Primer

- **Basics of Algorithmic Trading: Know and understand the terminology**
- **Excel: Basics of MS Excel, available functions and many examples to give you a good introduction to the basics**
- **Basics of Python: Installation, basic functions, interactive exercises, and Python Notebook**
- **Options: Terminology, options pricing basic, Greeks and simple option trading strategies**
- **Basic Statistics including Probability Distributions**
- **MATLAB: Tutorial to get an hands-on on MATLAB**
- **Introduction to Machine Learning: Basics of Machine Learning for trading and implement different machine learning algorithms to trade in financial markets**
- **Two preparatory sessions will be conducted to answer queries and resolve doubts on Statistics Primer and Python Primer**

2 Statistics for Financial Markets

- **Data Visualization: Statistics and probability concepts (Bayesian and Frequentist methodologies), moments of data and Central Limit Theorem**
- **Applications of statistics: Random Walk Model for predicting future stock prices using simulations and inferring outcomes, Capital Asset Pricing Model**
- **Modern Portfolio Theory - statistical approximations of risk/reward.**

3 Python: Basics & Its Quant Ecosystem

- **Data types, variables, Python in-built data structures, inbuilt functions, logical operators, and control structures**
- **Introduction to some key libraries NumPy, pandas, and matplotlib**
- **Python concepts for writing functions and implementing strategies**
- **Writing and back testing trading strategies**
- **Two Python tutorials will be conducted to answer queries and resolve doubts on Python.**

4 Market Microstructure for Trading

- **Overview of Electronic and Algorithmic Trading.**

- Various order types, order book dynamics, Spoofing, Price Time Priority Algorithm and Guerilla Algorithm.
- Execution strategy to trade large volumes.
- The algorithmic trading process from a market microstructure perspective.

5Equity, FX, & Futures Strategies

- Understanding of Equities Derivative market
- VWAP strategy: Implementation, effect of VWAP, maintaining log journal
- Different types of Momentum (Time series & Cross-sectional)
- Trend following strategies and Statistical Arbitrage Trading strategy modeling with Python
- Arbitrage, market making and asset allocation strategies using ETFs

6Data Analysis & Modeling in Python

- Implement various OOP concepts in python program - Aggregation, Inheritance, Composition, Encapsulation, and Polymorphism
- Back-testing methodologies & techniques and using Random Walk Hypothesis
- Quantitative analysis using Python: Compute statistical parameters, perform regression analysis, understanding VaR
- Work on sample strategies, trade the Boring Consumer Stocks in Python
- Two tutorials will be conducted after the initial two lectures to answer queries and resolve doubts about Data Analysis and Modeling in Python

7Machine Learning for Trading

- Decision Trees, Support Vector Machine, Neural Networks, Forward propagation, Backward propagation, Various neural network architectures.
- Building a “Principal Component Analysis” manually, conducting a pairs-trading back-test using PCA, Simulation of multiple co-integrated assets, and Sector statistical arbitrage using PCA.
- Using Python and Jupyter notebooks to create features, evaluate models, use feature selection and test raw performance.
- Overview of Alternate Data: Sources, data formats, storage and retrieval choices, Understanding RDF and Knowledge Graph, Tagging Unstructured Data with relevant metadata.
- Using spaCy for common Text processing tasks, Understanding Topic Modeling and Topic Classification.
- Understanding Machine Readable News Programmatic consumption of news.
- Machine Readable News in the Financial Industry: Sample in Production use cases, Sentiment Data in the Financial Industry: Sample in Production use cases.
- Basic ideas of deep reinforcement learning such as reward, explore/exploit, Bellman equation and memory replay.
- Challenges and problems with RL in trading, Implementation of RL in a simple strategy using "gamification".

8 Trading Tech, Infra & Operations

- **System Architecture of an automated trading system**
- **Infrastructure (hardware, physical, network, etc.) requirements**
- **Understanding the business environment (including regulatory environment, financials, business insights, etc.) for setting up an Algorithmic Trading desk**

9 Advanced Statistics for Quant Strategies

- **Time series analysis and statistical functions including autocorrelation function, partial autocorrelation function, maximum likelihood estimation, Akaike Information Criterion**
- **Stationarity of time series, Autoregressive Process, Forecasting using ARIMA**
- **Difference between ARCH and GARCH and Understanding volatility**

10 Trading & Back-testing Platforms

- **Introduction to Interactive Brokers platform and Blueshift**
- **Code and back-test different strategies on various platforms**
- **Using IBridgePy API to automate your trading strategies on Interactive Brokers platform**
- **Interactive Brokers Python API**

11 Portfolio Optimization & Risk Management

- **Different methodologies of evaluating portfolio & strategy performance**
- **Risk Management: Sources of risk, risk limits, risk evaluation & mitigation, risk control systems**
- **Trade sizing for individual trading strategy using conventional methodologies, Kelly criterion, Leverage space theorem**

12 Options Trading & Strategies

- **Options Pricing Models: Conceptual understanding and application to different strategies & asset classes**
- **Option Greeks: Characteristics & Greeks based trading strategies**
- **Implied volatility, smile, skew and forward volatility**
- **Sensitivity analysis of options portfolio with risk management tools**

13 Hands-on Project

- **Self-study project work under mentorship of a domain/expert**
- **Project topic qualifies for area of specialization and enhanced learning**

14 EPAT Exam

- **EPAT exam is conducted at proctored centres in 80+ countries**

BUILD YOUR CAREER

BE WISE

BE RICH

THANK YOU

IICF