



**CALCUTTA  
BUSINESS  
SCHOOL**

#### **ABOUT CALCUTTA BUSINESS SCHOOL (CBS)**

Calcutta Business School (CBS) is an autonomous institution offering an AICTE approved two year fully residential Post Graduate Diploma in Management (PGDM) Program and several Management Development Programs.

The School, modeled on some of the top ranking business schools in the world, is located in a sprawling 15-acre fully residential, eco- friendly and intelligent campus on the outskirts of Kolkata. Its objective is to provide an environment that is academically challenging as well as made enjoyable through a variety of avenues provided to students for self-expression and development.

CBS, founded by the Shri Shikshayatan Foundation, is governed by a board consisting of eminent industrialists and former directors of IIMs with Mr. S. K. Birla as the Chairman. It also has an advisory board comprising highly reputed academics and business leaders representing the country's renowned institutions and reputed companies cutting across industries.

The full-time faculty members of CBS have distinguished academic background with several of them having Ph.D degrees from top ranking institutions like The Wharton School at the University of Pennsylvania, Johns Hopkins University, USA; IIMs, IEST Shibpur, Banaras Hindu University. Several faculty members also have significant experience in industry. This combination of faculty members allows CBS to offer a management programme that is relevant to industry and is also strong in academic rigour. CBS has created an eco-system that is conducive to leadership development through extensive co-curricular and extra-curricular activities.

#### **For more details please contact**

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**CALCUTTA BUSINESS SCHOOL**

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## **Two-Day Workshop on Empirical Research in Finance**

**Dates : July 27-28, 2018**

**Venue : Calcutta Business School**

#### **ABOUT THE WORKSHOP**

In the financial sector, a large volume of data is generated at regular intervals. Data on stock prices, exchange rates, option prices, net asset values, commodity prices and portfolio performance are available on real time basis. The data is both cross-section and time-series in nature. This volume of large data is also readily available due to advances in information technology. Any researcher in the area of finance has now easy access to this data.

In order to analyze this large volume of data and generate meaningful results, there is a need to learn the application of appropriate techniques to test various hypotheses.

#### **OBJECTIVES**

- Impart understanding of statistical, econometric and machine learning tools.
- Enable participants to develop framework for forecasting of returns, forecasting volatility, risk analysis, market trend analysis, portfolio design, decomposition of a time series, etc.
- Demonstrate the applications of nonlinear techniques in modelling financial market data exhibiting high degree chaotic and random behavior.
- Impart hands on training of these techniques in a lab environment.

#### **LEARNING OUTCOME**

Participants will be able to apply the tools in various research problems in the area of finance.



## SESSION PLAN

### DAY 1

- **Session 1:** 10 am – 11.30 am
- Introduction to Financial Markets, Players and Instruments/Asset, Sources of Financial Information – Reading of Web Pages of Stock Exchanges, Commodity Exchanges, Reserve Bank of India, SEBI, AMFI, Value Research, Metastock, Moneycontrol, etc.
- Tea Break:** 11.30 am – 11.45 am
- **Session 2:** 11.45 am – 1.15 pm
- Different Types of Financial Data: Time Series, Cross-Section and Pooled.
  - Fundamentals of Time Series Econometrics, Basic Assumptions, Software Packages.
  - Different Time Series Data, Fundamental Characteristics, Concepts of Linear Models, Basics of Regression Analysis.
- Lunch Break:** 1.15 pm – 2 pm
- **Session 3:** 2 pm – 3.30 pm
- Stationarity Checking (ADF, PP, KPSS Tests), Delving into Causal Interaction among Various Financial Assets through Co-Integration and Granger Causality Tests, Examples.
- Tea Break:** 3.30 pm – 3.45 pm
- **Session 4:** 3.45 pm – 5.00 pm
- Demonstration of Vector Auto Regression and Vector Error Correction Models, Volatility Estimation through ARCH, GARCH Models, Volatility Spill Over, Implications of Econometric Models in Portfolio Construction and Realignment, Examples.
  - Lab Session

### DAY 2

- **Session 1:** 10 am – 11.30 am
- Introduction to Recurrence Plots (RP) and Recurrence Quantification Analysis (RQA), Applications of RP and RQA in modelling Nonlinear Dynamics of Financial Time Series viz. Emerging and Developed Markets, Price of Gold, Crude Oil, Commodities, etc.
  - Windowed Recurrence Analysis and Cross Recurrence Quantification analysis to Examine Local Features, Lab sessions in R.
- Tea Break:** 11.30 am – 11.45 am
- **Session 2:** 11.45 am – 1.15 pm
- Introduction to Wavelet Analysis for Time Series Decomposition, Discrete Wavelet Transformation (DWT) and Continuous Wavelet Transformation (CWT).
  - CWT based Power Spectrum and Wavelet Coherence Analysis to Examine Interactions between Global Equity and Commodity Markets, Wavelet Multiple Correlation (WMC) and Wavelet Multiple Cross Correlation analysis (WMCC) to Study Market Integration.
- Lunch Break:** 1.15 pm – 2 pm
- **Session 3:** 2 pm – 3.30 pm
- Machine Learning Techniques for Predictive Modelling of Financial Markets, Discussions on Artificial Neural Networks, Support Vector Machines, Decision Tree and Random Forests for Forecasting Exercise, Lab Sessions in R.
  - Illustrations of Machine Learning Models in Forecasting Exchange Rate, Various Market Indices, Returns, etc. Hybrid Forecasting Framework of Wavelet Decomposition and Machine Learning Tools for Predictive Analytics.
- Tea Break:** 3.30 pm – 3.45 pm
- **Session 4:** 3.45 pm – 5.00 pm
- Future Research Directions and Advanced Modelling through Deep Learning Models (Deep Belief Network, Restricted Boltzmann Machines, etc.).

## PROGRAM CO-ORDINATOR



**Indranil Ghosh**  
Assistant Professor  
Calcutta Business School

Indranil Ghosh completed his graduation and post-graduation in Information Technology and Industrial Engineering & Management from West Bengal University of Technology (Currently known as Maulana Abul Kalam Azad University of Technology). He is currently working as an Assistant Professor in the area of Decision Science and Systems Management at Calcutta Business School, Calcutta India. His research area includes Machine Learning, Pattern Recognition, Modelling Financial Markets, etc. Previously he had worked as Systems Engineer at Infosys Limited, India and as project linked person at Indian Statistical Institute.

## RESOURCE PERSONS

1. Professor Tamal Datta Chaudhuri, Professor and Dean, Calcutta Business School
2. Professor Dipankar Coondoo, Visiting Professor, Institute of Development Studies Kolkata & Professor, Indian Statistical Institute Kolkata
3. Professor Indranil Ghosh, Assistant Professor, Calcutta Business School

## WHO SHOULD ATTEND?

Faculty members, students, researchers and practitioners.

## REGISTRATION FEE

For Students : Rs. 500/- For Faculty Members : Rs. 1500/- For Industry Participants : Rs. 3000/- . Last Date of Registration : July 20, 2018

Payment can be made in the form of A/C payee Cheque/DD favouring "**Calcutta Business School**" and payable at "Kolkata" (DD). RTGS/NEFT/ECS can be made to our Savings A/C No. 001794600000085 with YES BANK, Russel Street Branch, Kolkata (IFSC Code. YESB0000017), under intimation to us. Our PAN No. AAAAM0247J; Service Tax No. AAAAM0247JSD002.

