

The Department of Economics (Autonomous), University of Mumbai, is offering a **Certificate Course in Computational Finance** to commence from Saturday, September 6, 2014. The details are given below:

## **Certificate course in Computational Finance**

**Preamble:** This course is designed to enable finance professionals to use applied financial econometrics and portfolio optimisation techniques in their day to day work. The target audience is financial professionals who are working with quantitative data sources for decision making, though fresh graduates might also benefit from this course. This One year course covering 132 hours will be taught over 34 weekends over two semesters. It will have 120 hours of teaching and 12 hours of hands on practice. Each session will be for 4hrs. This will combine theory and empirical application using an open source free software called R. The course is divided into two parts. Each part will be taught in one semester over 15 weeks with two additional weeks given to students to complete the project component. **The lectures will be conducted on Saturdays and Sundays.**

Part A: Econometrics of Finance (62 hours):

1. General Introduction to R and programming in R (8 hours)
2. Introduction to Basic Statistics: Random variables, discrete and continuous distributions-statistical inference including maximum likelihood– trend-cycle decomposition – (12 hours)
3. Multiple Linear Regression: Theory and Practice – (12 hours)
4. Univariate ARIMA Modelling: identification, estimation and forecasting for financial time series – (12 hours)
5. Modelling volatility: Univariate ARCH, GARCH models and variants – (6 hours)
6. Introduction to spectral analysis:- periodic functions, population spectrum and the sample periodogram: ( 6 hours)
7. Handling non-stationary data: Cointegration, error correction and Causality. (6 hours)

Part B: Portfolio Optimisation Framework (58 hours)

1. Modelling Asset Returns: Generic functions to manipulate assets- Financial functions to manipulate assets-Basic statistics of financial assets- Robust Mean and Covariance estimate of assets- Modelling asset returns-testing asset returns for normality-fitting asset returns-simulating asset returns from given distribution- Selecting similar or dissimilar assets-grouping asset return by hierarchical clustering –group asset returns by K mean clustering-contributed cluster algorithms in R- Comparing Multivariate returns and risk statistics- pair wise dependencies of asset plotting, testing and describing using R. ( 16 hours)

2. Portfolio Framework Theory: Markowitz Portfolio Theory- Feasible set and efficient frontier- Minimum variance portfolio- Capital market line and tangency portfolio- Box and group constrain mean variance portfolio- Covariance risk budget constraints- Mean-CVaR portfolio theory handling portfolio classes in R using portfolio functions- Functions to compute and optimize portfolios ( 10 hours)

3:-Computing Minimum Risk Efficient Portfolio-Global minimum variance portfolio-tangency portfolio-Mean Variance Portfolio Frontier- Frontier computation and graphical display-Long only portfolio frontier-Box only portfolio frontier-Group constraint portfolio frontier-Box dash group constraint portfolio frontier-Robust portfolio and covariance estimation: Robust mean and covariance estimators-MCD portfolio-The MVE portfolio-Shrunked mean-variance portfolio- Writing your own covariance estimator. (16 hours)

4: Computing Mean CVaR portfolios: computing a feasible mean CVaR portfolio- Global minimum mean CVaR portfolio- Computing max return/ risk Ratio mean CVaR portfolio -Mean CVaR Portfolio Frontier: the long only portfolio frontier, the unlimited short portfolio frontier-box constraint portfolio frontier-the group constrain portfolio frontier other constrain ( 10 hours)

5: Portfolio Back Testing and case studies ( 6 hours)

References:

1.Wortz D,Chalabi C,William C and Ellis A (2009) : Portfolio Optimization with R/Rmetrics, Rmetrics Association and Finance Online.

2.Cowpertwait Paul S.P and Metcalfe A.W (2009): Introductory Time Series with R, Springer.

## Certificate Course in Computational Finance

**Lectures will be held on every weekend, Saturday evening from 6.00 pm to 8.00 pm and Sunday morning from 11.00 am to 1.00 pm.**

**Intake: Total of 30 students**

**Eligibility: Graduate in any discipline with a minimum 50% marks from a recognised University admitted on the basis of an entrance examination. The entrance examination will test basic quantitative aptitude.**

**Examinations: In each semester , there will be a 20 marks written examination. The student will have to submit a 20 marks project two weeks after the end of the teaching period in each semester, which will be followed by a 10 marks viva voce.**

**Total fees: Rs.60,000/**

**Application forms can be had from the office of the Department of Economics, University of Mumbai, 3<sup>rd</sup>, Ranade Bhavan, Vidyanagari, Kalina, Santa Cruz (east), Mumbai 400 098 between 10.30 am to 6.00 pm on any working day or can be downloaded from [www.mu.ac.in/arts/social\\_science/eco/Information\\_Entrance%20Test.pdf](http://www.mu.ac.in/arts/social_science/eco/Information_Entrance%20Test.pdf)**

**Last date for the receipt of duly filled application forms:**

**September 10 2014**

**Date of the entrance examination:**

**September 14 2014**

**For any clarifications, you may contact the Coordinator for the course, Dr.Neeraj Hatekar on [certcompfin@gmail.com](mailto:certcompfin@gmail.com)**

**DEPARTMENT OF ECONOMICS (AUTONOMOUS)**  
**UNIVERSITY OF MUMBAI**  
**3<sup>rd</sup> floor, Justice M.G. Ranade Bhawan, Vidyanagari, Mumbai - 400098**

APPLICATION FORM FOR THE ENTRANCE EXAMINATION FOR CERTIFICATE COURSE IN  
COMPUTATIONAL FINANCE 2014-15

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**For office use only:**

**Examination Roll Number:**

**Application Number:**

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Recent Passport  
Size Photograph

1. Name of Candidate:  
(in capital letters)

\_\_\_\_\_

(Surname)                      (First name)                      (Middle name)

2. Gender: Female / Male / Other \_\_\_\_\_

3. Date of Birth: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
(Date) / (Month) / (Year)

4. Whether you belong to reserved category: Yes / No \_\_\_\_\_

If yes, give details about your reserved category: \_\_\_\_\_

5. Nationality: \_\_\_\_\_

6. Permanent Address: \_\_\_\_\_

\_\_\_\_\_

Pin code

7. Address for Correspondence: \_\_\_\_\_

\_\_\_\_\_

Pin code

8. Residential Telephone Number (with code): \_\_\_\_\_

Mobile Number: \_\_\_\_\_ Email: \_\_\_\_\_

(PTO)

### 9. Educational History

In case you have not completed your present degree, mention all the marks/grades obtained till now.

Name of Exam & Faculty	Month & Year of Passing	Name of University	Subjects	Percentage & Grade

(Please attach attested photo copies of mark lists mentioned above)

10. Name of the Bank \_\_\_\_\_ Branch \_\_\_\_\_

Demand Draft Number \_\_\_\_\_ Date \_\_\_\_\_ Amount \_\_\_\_\_

Place :

Date :

(Signature of the Candidate)

### **General Instructions:**

- i. Completed application forms should reach the Department Office by **25<sup>TH</sup> AUGUST 2014**.
- ii. All necessary documents including Caste Certificate wherever applicable should be submitted along with the application form.
- iii. All forms must be submitted with the requisite application fee (Crossed Demand Draft on a scheduled bank drawn in favour of '**Finance & Accounts Officer, University of Mumbai**', payable at **Mumbai**) along with **one self – addressed stamped envelope**. **Write your name & address behind the Demand Draft**.
- iv. Candidates will appear for the Entrance Examination at their own cost.

### **IMPORTANT DATES**

Last date for receipt of completed forms: **25<sup>TH</sup> AUGUST 2014**

Date of Entrance Test: **31<sup>ST</sup> AUGUST 2014**

1.

1. There will be an examination fee (non-refundable) of Rs. 150/- (for students belonging to reserved categories the lower examination fee of Rs.50/-), in the form of a Demand Draft payable to the **'Finance & Accounts Officer, University of Mumbai'**, payable at **Mumbai** to be posted to **'The Director, Department of Economics (Autonomous), University of Mumbai, Vidyanagari, Santacruz (E), Mumbai 4 000 98 '**, along with a self-addressed stamped envelope. Write your name and address behind the Demand Draft.

2. Seats will be reserved as per Government and University rules, which may be amended from time to time. A copy of the required relevant certificates must accompany all categories of students belonging to reserved categories.

3. Students from outside the University of Mumbai will be admitted subject to their obtaining a provisional eligibility certificate from the Eligibility Section of the University of Mumbai for the Certificate course.

4. Students obtaining at least 45% marks in Third/Final year (or equivalent) of University of Mumbai in the graduate examination and 50% marks in Third/Final year of other than University of Mumbai (any recognised Indian or foreign University) will be eligible to apply for the Entrance Test. Students in the last year of their graduation can also do so; however, their final admission to the course would depend on their having obtained the required marks at the graduation examination.

5. The requirement for minimum marks will be relaxed for students belonging to the SC/ST and other reserved categories only from the state of Maharashtra as per government/university rules. (40% marks in Third/Final year for students belonging to all reserved categories of the University of Mumbai and 45% for other than University of Mumbai).

6. A maximum of 30 students will be admitted on the basis of merit, subject to various reservations as applicable.

**7..How to Apply:** Application forms and prospectus may be purchased from the Department on all Working days. The duly filled form with all necessary documents can be sent along with a **Demand Draft** of Rs. 150/- (Rs. 50/- for students belonging to reserved categories), payable to the **'Finance & Accounts Officer, University of Mumbai'**, by post to **The Director, Department of Economics (Autonomous), University of Mumbai, Vidyanagari, Santacruz (E), Mumbai 400098**, along with a self-addressed stamped envelope. Write your name and address behind the Demand Draft. Payment in any other form will not be accepted. **No cheques will be accepted under any circumstances.**

**8. Internet Download:** Application forms for the Entrance Test can also be downloaded from the University of Mumbai website

[www.mu.ac.in/arts/social\\_science/eco/Information\\_Entrance%20Test.pdf](http://www.mu.ac.in/arts/social_science/eco/Information_Entrance%20Test.pdf)

9. The Director, Department of Economics (Autonomous) reserves the right to amend / modify all Or parts the above as necessary.

**DIRECTOR.**

