| Course code | Course Title | L | T | P | C |
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| BCSE336L | Financial Data Analytics | 2 | 0 | 0 | 2 |
| Pre-requisite | NIL | Syllabus version | | | |
| | | 1.0 | | | |

**Course Objectives**

1. To learn to model financial time series using liner ARMA type time series.
2. To study and analyze to test and model heteroscedastic effects using ARCH / GARCH type time series.
3. To learn how to test for unit root and construct ARMA models.

**Course Outcomes**

At the end of the course, the student will be able to

1. Approach and analyze any financial data.
2. Differentiate between various time series models.
3. Perform cross-validation of various financial models developed.
4. Forecast future observations on financial data.

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| **Module:1** | **Financial data and their properties** | **4 hours** |

Asset Returns – Bond Yields and Prices – Implied Volatility – Examples and Visualization of financial data – Multivariate returns.

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| **Module:2** | **Linear models for financial time series** | **4 hours** |

Simple autoregressive models – Simple moving average models – Simple ARMA models – Unit Root nonstationarity – Exponential smoothing.

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| **Module:3** | **Seasonal and Long memory models** | **4 hours** |

Seasonal models – Regression models with time series errors – Long memory models.

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| **Module:4** | **Asset Volatility and Volatility models** | **4 hours** |

Characteristics of Volatility – Structure of a model – Testing for ARCH Effect – ARCH Model – GARCH Model – GARCH-M Model – Exponential Garch Model – Threshold GARCH model – Stochastic volatility model – alternative approaches.

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| **Module:5** | **Applications of Volatility Models** | **4 hours** |

Garch Volatility Term structure – Option pricing and hedging – Time Varying Correlations and Betas – Minimum Variance Portfolios – Prediction.

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| **Module:6** | **High Frequency Financial Data** | **4 hours** |

Nonsynchronous trading – Bid ask spread of trading prices – Empirical characteristics of trading data – Models for price changes.

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| **Module:7** | **Value at Risk** | **4 hours** |

Risk measure and Coherence – Risk metrics –Extreme value approach to Value at Risk – Peak over thresholds.

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| **Module:8** | **Contemporary Issues** | **2 hours** |
| | **Total Lecture hours:** | **30 hours** |

**Text Book(s)**

1. Ruey S. Tsay An Introduction to Analysis of Financial Data with R, Wiley, 2013.

**Reference Books**

1. Analysis of Financial Time Series, by Ruey S. Tsay, 3rd edition, Wiley Series in Probability and Statistics, 2010.
2. William G. Foote, Financial Engineering Analytics: A Practice Manual Using R, 2018.
3. Statistical Analysis of Time-Series Data in SPlus, by Ren´e Carmona, Springer, March 4, 2004.

Mode of Evaluation: CAT / written assignment / Quiz / FAT / Project / Seminar

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| Recommended by Board of Studies | 12-05-2022 | | |
| Approved by Academic Council | No. 66 | Date | 16-06-2022 |