8. Robert Reitano, 2010, Introduction to Quantitative Finance, MIT Press.
9. Chance, 2003, Analysis of Derivatives for the CFA Program.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC ELECTIVE -FINANCE (DSE-11)

DSE 11: FINANCIAL ECONOMETRICS

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical / Practice		
Financial Econometrics DSE-11	4	3	1	0	Class XII	Basic knowledge of statistics

Learning Objectives

- Understand the statistical properties of financial returns, including their distribution, time dependency, and linear dependency across asset returns.
- Develop knowledge of univariate time series analysis, including the Lag operator, ARMA processes, and the Box-Jenkins approach.
- Gain proficiency in modeling volatility using conditional heteroscedastic models, such as ARCH and GARCH models, and forecasting with GARCH models.
- Learn multivariate GARCH models, including the VECH model, diagonal VECH model, and BEKK model, and estimation of a multivariate model.
- Acquire knowledge of vector autoregressive models, Granger causality tests, and Johansen cointegration tests and their hypothesis testing methods.

Learning Outcomes

On successful completion of the course the learner will be able to:

- Analyze the statistical properties of financial returns and evaluate their distribution, time dependency, and linear dependency across assets using knowledge and comprehension skills.
- Create and apply univariate time series models, including AR, MA, and ARMA processes, using synthesis and evaluation skills to forecast financial returns.
- Develop and estimate conditional heteroscedastic models, such as ARCH and GARCH models, using analysis and evaluation skills to model and forecast volatility.
- Construct and evaluate multivariate GARCH models, including VECH, Diagonal VECH, and BEKK models, using synthesis and evaluation skills to model volatility and correlations.

Evaluate and apply advanced econometric techniques, including VAR, GCT, and JCT, using analysis and evaluation skills to test hypotheses and model complex relationships in financial time series data.

SYLLABUS OF DSE 11

Unit 1: Statistical Properties of Financial Returns & Univariate Time Series and Applications to Finance (15 hours)

Introduction Asset Returns, Calculation of Asset Returns (Continuous and discreate both), Compare Continuous return with non-Continuous return and explain its benefits. Facts about Financial Returns, Distribution of Asset Returns, Time Dependency, Linear Dependency across Asset Returns.

Introduction to Univariate Time Series, The Lag Operator, Properties of AR Processes, Properties of Moving Average Processes, Autoregressive Moving Average (ARMA) Processes, The Box- Jenkins Approach.

Unit 2: Modelling Volatility – Conditional Heteroscedastic Models (9 hours)

Introduction to Modelling Volatility, ARCH Models, GARCH Models, Estimation of GARCH Models, Forecasting with GARCH Model.

Unit 3: Modelling Volatility and Correlations – Multivariate GARCH Models (9 hours)

Introduction to Modelling Volatility and Correlations, Multivariate GARCH Models, The VECH Model, The Diagonal VECH Model, The BEKK Model, Estimation of a Multivariate Model

Unit 4: Vector Autoregressive Models (VAR), Granger Causality Test (GCT) and Johansen Cointegration Test (JCT) (12 hours)

Introduction to VAR, Deep understanding of VAR, Issues in VAR, Hypothesis Testing in VAR.

Introduction to GCT, Deep understanding of GCT, Issues in GCT, Hypothesis Testing in GCT

Introduction to JCT, Deep understanding of JCT, Issues in JCT, Hypothesis Testing in JCT.

Essential/ recommended Readings

1. Brooks, C. (2014). Introductory econometrics for finance (3rd ed.). Cambridge University Press.
2. Tsay, R. S. (2010). Analysis of financial time series (3rd ed.). Wiley.
3. Bollerslev, T. (2008). Glossary to ARCH (GARCH). Journal of Economic Perspectives, 15(4), 171-174. doi: 10.1257/jep.15.4.171
4. Engle, R. F., & Kroner, K. F. Multivariate simultaneous generalized ARCH. Econometric Theory, 11(1), 122-150. doi: 10.1017/S0266466600009063- Latest edition

Suggestive Readings

1. Chris, Brooks (2019). Introductory Econometrics for Finance. Cambridge University Press.
2. Pindyck, Robert S. and Daniel L. Rubinfeld Econometric Models and Economic Forecasts. Singapore: McGraw Hill.
3. Ramanathan, Ramu (2002). Introductory Econometrics with Applications (5th ed.). Thomson South Western

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