



Dr. B.R. Ambedkar
School of Economics
University
Bengaluru

A Unitary University, Govt. of Karnataka

M.Sc. Financial Economics
Course Structure and Syllabus

May 2024

MSc Financial Economics

The demand for highly skilled experts in financial economics continues to increase rapidly in the modern economy. This demand exists in the public sector (central banks, international organisations, academic institutions) and especially, in the private sector (commercial banks and insurance companies).

The MSc Financial Economics course at Dr. B. R. Ambedkar School of Economics University is designed to meet this demand, for those who seek a quantitative degree in Financial Economics, by combining a solid training in Finance and Economics principles, as well as the quantitative methods needed for the analysis of financial markets. In the first-year students will be given rigorous training in core papers like Advanced Macroeconomics, Microeconomics, Advanced Econometrics Quantitative methods etc. along with introductory courses to Financial Economics. In the second-year students shall be trained in specialized papers in finance in the areas of risk management, financial modelling, security analysis, valuation, stochastic process, operations research, actuarial economics etc. Importantly, hands-on data analysis modules with applications relevant to Financial Economics using tools like R/Python/Matlab are to be a part of the curriculum, which would equip students to analyse market trends and work on big data. Students can take up a dissertation instead of a paper in 3rd semester or 4th semester depending on the availability of guides, number of students and the minimum requirements as per the academic regulations.

Internships with industry, banks and financial institutions would be an integral part of the programme.

Students are required to take up certification programs, that would help them to be industry ready. The faculty shall specify the certificate programs to be taken up as a part of the courses.

Eligibility criteria

Candidate should have completed BSc/BSc(Honors) in Economics or BA (Honors) in Economics or BA Economics with Mathematics and Statistics as other major courses from a recognized University with a minimum of 55% marks (50% for SC/ST) in aggregate.

Course Structure

1. Core courses

Semester I	Semester II
All Core courses (4 credit)	All Core courses (4 credit)
Financial Economics I	Financial Economics II
Advanced Microeconomics	Advanced Macroeconomics
Advanced Econometrics I	Advanced Econometrics II
Quantitative Methods	Game Theory
Programming with R (2 credit)	Programming with Python (2 credit)
Advanced Research Methods	Internship (2 credit)
Semester III	Semester IV
Core Courses- 3 (4 credit)	Core courses- 2(4 credit)
Asset Pricing Models	Fixed Income Securities
Applied Corporate Finance	Financial Derivatives
Investment Analysis & Portfolio Management	

2. Electives (any 5 electives to be taken in two semesters)

Electives- Any 2*	Electives- Any 3
Financial Risk Management	Behavioural Finance
Financial Analytics and Big Data	Financial Engineering
Financial Econometrics	Financial Modelling
Economics of Banking and Finance	Machine Learning models in Finance
Economics of Insurance	Forecasting Financial Markets
Empirical Finance	Industrial Economics and Strategy
Entrepreneurial finance	Trading Strategies
Corporate valuation	Advanced Business Analytics
International Finance	Law and Finance
Personal Finance	Dissertation**

*Based on the electives offered, students shall opt for 2- 3 electives a semester, ensuring that they complete 5 elective courses

*** Dissertation shall be offered to all students in either Semester III or IV depending on the faculty availability.

Total Credit from core course: $18+22+2+12+8= 62$

Minimum credit required from Electives: 20

Minimum Credit required to complete the course: 82

Bengaluru Dr B. R. Ambedkar School of Economics University			
MSc Financial Economics Course			
Subject Code	Subject	Credits	
Semester I			
All core courses	Advanced Microeconomics [PFE1401]	4	
	Quantitative Techniques in Economics [PFQ1401]	4	
	Advanced Econometrics-I [PFQ1402]	4	
	Financial Economics-I [PFE1402]	4	
	Advanced Research Methods [PFE1404]	4	
	Programming with R [PFQ1203]	2	
Semester II			
All core courses	Advanced Macroeconomics [PFE2401]	4	
	Financial Economics-II [PFE2402]	4	
	Advanced Econometrics-II [PFQ2401]	4	
	Game theory [PFQ2402]	4	
	Programming with Python [PFQ2201]		
	Internship [PFS2201]	2	
Semester III			
Core Courses	Asset Pricing Models [PFE3401]	4	
	Applied Corporate Finance [PFE3402]	4	
	Investment Analysis & Portfolio Management [PFE3403]	4	
Semester IV			
Core Courses	Fixed Income Securities [PFE4401]	4	
	Options and Derivatives [PFE4402]	4	
Electives			
Semester III	Financial Risk Management [PFD3401]	4	
Electives	Financial Analytics and Big Data [PFD3402]	4	
	Financial Econometrics [PFD3403]	4	
	Economics of Banking and Finance [PFD3404]	4	
	Economics of Insurance [PFD3405]	4	
	Empirical Finance [PFD3406]	4	
	Entrepreneurial finance [PFD3407]	4	
	Corporate valuation [PFD3408]	4	
	International Finance [PFD3409]	4	
	Personal Finance [PFD3410]	4	

Semester IV			
Electives	Behavioural Finance [PFD4401]	4	
	Financial Engineering [PFD4402]	4	
	Financial Modelling [PFD4403]	4	
	Artificial Intelligence and Machine Learning in Finance [PFD4404]	4	
	Forecasting Financial Markets [PFD4405]	4	
	Industrial Economics and Strategy [PFD4406]	4	
	Trading Strategies [PFD4407]	4	
	Advanced Business Analytics [PFD4408]	4	
	Fintech [PFD4409]	4	
	Law and Finance [PFD4410]	4	
	Machine Learning Models in Finance [PFD4411]	4	
	Dissertation [PFD4412]	4	

Syllabus

Financial Economics- I

Course Objective:

The main objective of this course is to introduce students to the basic theories, and concepts in Finance. This course bridges economics and finance and lays the foundation for the MSc Financial Economics program. The course starts from the economic foundations and elaborates on financial economics. Students will get an over view of the functioning of the financial markets, importance of risk/ uncertainty, applications of time value of money, market efficiency and decisions.

Learning outcome:

- Explain the theoretical underpinnings of financial economics
- Evaluate the link between the financial system and the real economy
- Assess the importance of risk in the economy
- Application of the concept of time value of money in real life instances like mortgages, amortization, EMI's etc.
- Evaluate the firm's investment decisions.

Modules

1. Introduction to Finance

Capital Markets- function, securities, participants; Consumption and investment decision under certainty; Consumer preferences and opportunities; Market rate of interest; Production and investment decision; Entrepreneurs opportunities; investment decisions by managers; Valuation of firms by investors;

2. Risk

Utility theory: preference and choice; stochastic dominance; Behavioural approach; Assumptions underlying financial economics; utility maximization in contingent claim markets; Risk and uncertainties; Methods of risk transfer; expected utility theory and Arrow-Pratt conditions; risk measures; stochastic ordering; Value at risk; Capital market imperfections and financial decisions; Arbitrage;

3. Pricing of Risky assets

Mean variance portfolio choice; Efficient frontier; Markowitz portfolios; Capital Asset Pricing Models; Arbitrage Pricing Theory; Factor models; General principles of asset pricing- Applications using Excel/R

4. Time value of money

Present value; Future value; Interest rates- nominal and real interest rate; term structure of interest rate; Annuities, deferred annuities; Sinking funds; capital recovery; deferred payments; EMI's, Investments; Stock and Bond valuation Case studies; Applications in Excel/R

5. Capital Budgeting

Capital Budgeting techniques, NPV, Payback period, ; Internal Rate of return; Project analysis; Estimation of cash flows; discounting; cost of capital; Constraint analysis; Agency problems, compensation and performance measurement; Case studies; Applications in Excel/R

Core texts

Fabozzi, F. J., Neave, E. H., & Zhou, G. (2011). *Financial economics*. Wiley.

Copeland, T. E., Weston, J. F., & Shastri, K. (2005). *Financial theory and corporate policy*, Boston: Pearson Addison Wesley.

Additional readings:

LeRoy, S. F., & Werner, J. (2014). *Principles of financial economics*. Cambridge University Press.

Bailey, R. E. (2005). *The economics of financial markets*. Cambridge University Press.

Evstigneev, T. Hens and K.R. Schenk-Hoppé, *Mathematical Financial Economics*, Springer, 2015.

Tirole, J. (2010). *The theory of corporate finance*. Princeton university press.

MacLean, L. C., & Ziemba, W. T. (2013). *Handbook of the fundamentals of financial decision making (Vol. 4)*. World Scientific.

Laopodis, N. T. (2021). *Financial Economics and Econometrics*. Routledge.

Fabozzi, F. J., Modigliani, F., & Jones, F. J. (2010). *Foundations of financial markets and institutions*. Pearson/Addison-Wesley.

Mele, A. (2022). *Financial Economics*. MIT Press.

Ross, S. A., R. W. Westerfield, and B. D. Jordan (2012), 'Fundamentals of Corporate Finance', 10th Ed. McGraw-Hill

Baker, H.K. and English P. (2011) *Capital budgeting valuation; Financial analysis for today's investment projects*.

Advanced Microeconomics

Course Objective: This course examines the economic decisions made by households and firms and their interaction. It also studies the equilibrium in presence of externalities/public goods and information asymmetry. Additionally, there will be a discussion of social choice theory and welfare economics.

Learning outcomes: Students should be able to appreciate the nuances of consumer behaviour, the motivations and decision-making at the level of firms, the functioning of various market structures; and the associated welfare outcomes.

1. Theory of consumer behaviour:

Preference and choice; Demand; Duality; Revealed preference; Aggregate demand; utilitarianism and its critique, irrationality and economic theory

2. Theory of the firm:

Production sets; Profit maximization and cost minimization; Supply; Aggregation; Duality in production, Simon's views on rational decision-making in business; the entrepreneurial state

3. Choice under uncertainty:

Expected utility theory; Money lotteries; Risk aversion; Stochastic dominance

4. Competitive markets

Imperfect competition; Externalities; Tirole on market power and regulation; Roth and Shapley on market design

5. Adverse selection:

Market for lemons; Information and efficiency of market outcomes; Signalling; Screening; Moral hazard and Principal-agent problem under asymmetric information; Information and market performance; free riding

6. General equilibrium:

General equilibrium in competitive markets; General equilibrium theory in consumption and production, General equilibrium under uncertainty

7. Welfare economics:

Fundamental theorem of welfare economics, Social choice theory; Social Choice and Arrow's Theorem and possibility of social choice; Measurability, Comparability, and Invariance using Rawlsian form and Utilitarian form; Social Justice; Social choice and Gibbard-Satterthwaite Theorem; Deaton on welfare; cooperative conflict

Core text:

Mas-Colell, A., Whinston, M. D., & Green, J. R. (1995). *Microeconomic theory* (Vol. 1). New York: Oxford university press.

Additional Readings:

Jehle, G. A. & Reny P. J. (2010). *Advanced microeconomic theory*, 3rd ed

Krugman, P., & Wells, R. (2010). *Microeconomics* (for AP). New York: Worth Publishers.

Rubinstein, A. (2012). *Lecture notes in microeconomic theory: the economic agent*. Princeton University Press.

Kreps, David M. *Microeconomic Foundations I: Choice and Competitive Markets*. Vol. 1. Princeton University Press, 2012.

Akerlof, G. A. (1978). The market for “lemons”: Quality uncertainty and the market mechanism. In *Uncertainty in economics* (pp. 235-251). Academic Press.

Bowles, S. (2009). *Microeconomics: behavior, institutions, and evolution*. Princeton University Press.

Jeffrey, M. P. (2017). *MICROECONOMICS: Theory and Applications with Calculus Plus Myeconlab with Pearson Etext*. Pearson

Varian, H. R., *Microeconomic analysis* 3rd Ed WW Norton.

Quantitative Techniques in Economics

Course objective:

This course is designed to teach students advanced quantitative techniques in statistics and mathematics. The course gives quick refresher to some of the fundamental concepts in mathematics and statistics before delving deeper into the application side. The program includes probability theory, differential calculus, multivariate calculus, optimization, and dynamics.

Learning outcomes: Help students to successfully use mathematics in economics and business applications and enhance their ability to communicate economic ideas and make economic arguments with the help of mathematical equations.

1. Probability Theorem

Random variables; Concept of probability; conditional probability; Probability density & distributions -types; Central Limit Theorem; Stochastic process; Markov Chains; Poisson process; Brownian Motions; Estimation- OLS, Maximum likelihood and method of moment estimation; Interval estimation.

2. Hypothesis testing

Inferential statistics; Decision rules, alpha beta risk. p-values; Uni-, bi-, multi-variate tests for mean, variance and proportion; ANOVA; MANOVA, ANCOVA, MANCOVA; Tests of goodness of fit

3. Differential Calculus

Single variable calculus and its applications; Functions and Real Analysis; Derivative, limit, inequalities, absolute values, limit theorems and continuity and differentiability of a function. Differentiation of function of several variables; higher order derivatives; Taylor's approximation; Euler's theorem; Exact differential equations. Non-linear differential equations of first orders the quantitative; Discrete time: First order differential equations. The dynamic stability of equilibrium.

4. Optimization and applications

Unconstrained optimization – first order and second order conditions; global maxima and global minima; constrained optimization- equality and inequality constraints; mixed constraints; Kuhn Tucker formulation; Multiplier; Lagrange multiplier method; Envelope theorems; Homogeneous and Homothetic Functions; Concave and Quasiconcave Function; Economic applications; Linear and Non-linear Optimization; Duality theory; Linear programming

5. Dynamics

Static input – output models – The genesis of dynamic systems. Solving simultaneous dynamic equations. Dynamic input-output models. Application to inflation – unemployment model.

Linear programming – Graphical approach, the general LP problem, introduction to duality theory, the duality theorem-A general economic interpretation.

Reference

Ross, S. M. (2014). Introduction to probability models. Academic press.

Ross, S. (2009). A First Course in Probability 8th Edition. Pearson.

Chung, K. L. (2012). Elementary probability theory with stochastic processes. Springer Science & Business Media.

Freedman, D., Pisani, R., Purves, R., & Statistics, W. W. (1998). Norton & Company. New York.

Simon, C. and L. Blume, Mathematics for Economists, Norton, London, 1994

Sydsaeter, K., Hammond, P., Seierstad, A., & Strom, A. (2008). Further mathematics for economic analysis. Pearson education.

Wainwright, K. (2005). Fundamental methods of mathematical economics/Alpha C. Chiang, Kevin Wainwright. Boston, Mass.: McGraw-Hill/Irwin,.

Bartle, R. G., & Sherbert, D. R. (2000). Introduction to real analysis (Vol. 2). New York: Wiley.

Advanced Econometrics-I

Course objective: This course is meant to familiarize students with time series econometric techniques, commonly used in financial analysis, policy formulation and academic research. Each module includes lab sessions where students apply these concepts using relevant data. Understanding of Basic econometrics concepts and Statistics is a prerequisite for this course.

Learning outcomes: The students will be able to choose the appropriate time series techniques to analyse various economic problems and draw suitable inferences.

1. Basic concepts of Econometrics

Recap of OLS (using matrix method). The concept of data generating process - Stochastic process and Deterministic process, white noise process, stationary and non-stationary stochastic process – with and without intercept and trend, difference stationary and trend stationary process, concept of unit root, tests for detecting unit root.

2. Univariate Time Series Models

Autoregressive (AR) model, Moving Average (MA) model, ARMA, ARIMA and SARIMA models, Box Jenkins Methodology – model identification, diagnostics, forecasting – dynamic vs static forecasts, Smooth transition models, applied extensions of ARIMA

3. Multivariate time series models

Cointegration – Engle Granger and Johansen Juselius methodology, error correction model - VAR models –lag length selection, factorization – Cholesky decomposition and structural factorization, Causality tests in VAR framework, impulse response functions, variance decomposition - ARDL approach – cointegration with mix of I(0) and I(1) variables, bounds testing, error correction model; NARDL model.

4. Volatility modelling

Modelling high frequency data; testing for ARCH effect, estimating ARCH models – ARCH, GARCH, ARCH – M, TGARCH, EGARCH, diagnostic checks.

5. Introduction to Spectral Analysis and Bayesian Approach

Time domain and Frequency domain, The spectrum and its properties, Spectral representation for weekly stationary process, spectrum estimation, Wavelet coherence analysis. Bayesian analysis – Overview of classical and Bayesian views on probability, the role of priors, posterior estimation, Gibbs sampling, Markov Chain Monte Carlo (MCMC) methods, Application of Bayesian methods- Bayesian linear regression, Bayesian Vector Auto regression; Introduction to special econometrics.

Reference

Kerry Patterson (2000), *An Introduction to Applied Econometrics*, Palgrave Macmillan.

Chris Brooks (2002), *Introductory Econometrics for Finance*, Cambridge UP

James D. Hamilton (1994), *Time Series Analysis*, Princeton University Press.

Pesaran, M. H. (2015). *Time series and panel data econometrics*. Oxford University Press.

Walter Enders (2015), *Applied Econometric Time Series*, 4th Edition, Wiley.

Bernardo, Jose M. and Adrian F. M. Smith (1994): *Bayesian Theory*, Wiley Series in Probability and Statistics, John Wiley & Sons

Chan, Joshua, Gary M. Koop, Dale J. Poirier and Justin L. Tobias (2019): *Bayesian Econometric Methods*, 2nd Edition, Cambridge University Press

Davidson, R., & MacKinnon, J. G. (2004). *Econometric theory and methods* (Vol. 5). New York: Oxford University Press.

Koopmans, L. H. (1995). *The spectral analysis of time series*. Elsevier.

Peter Kennedy (2008) *A Guide to Econometrics*, 6th Edition, Blackwell Publishing

Priestley, M. B. (1981). *Spectral analysis and time series: probability and mathematical statistics*

Verbeek, M. (2008). *A guide to modern econometrics*. John Wiley & Sons.

Programming with R

Course Objective: This course aims to introduce students to programming using R. This program is a blend of probability theory and programming. Given the increasing importance of programming in corporate, policy and academic career, this program starts right from basic coding and proceeds to data visualizations, various regression techniques.

Learning outcome: This program enables students to write their own codes for various applications with special focus on techniques used in Economics. The students would become familiar with Data visualization and various regression techniques using R programming

1. Introduction to R

Supervised vs. unsupervised learning; R basic commands; R Studio; R markdown, Quarto; Syntax, Strings, Math, Booleans, If- else; Vectors, Lists, Matrices, Arrays, Data frames, Factors; Data structures; Control structures, functions ; Loop functions, debugging tools ; Descriptive statistics; Data tabulation; Data cleaning- missing values, outliers, winzorization, merging and appending; Webscraping

Packages: dplyr, tidyverse, lubridate, reshape2, tidyr, purr, rvest

2. Data Visualization

Continuous Data; Categorical data; Interactive plots and animated plots

Packages: ggplot2, plotly

3. Regression Analysis using R

Regression libraries; Simple linear regression; Multiple regression; Qualitative predictors; Interaction terms; Diagnostic tests

4. Classification

Discrete choice models; Logistic regression; Linear discriminant analysis; Quadratic discriminant analysis; K-nearest neighbours

5. Introduction to Machine Learning

Basics of decision trees- Regression trees, Classification trees; Trees vs. linear models; Introduction to Bagging, Random forests, Boosting, SVM

Reference

Grolemund, G., & Wickham, H. (2018). R for data science.

Lander, J. P. (2018), R for Everyone: Advanced Analytics and Graphics (second edition)

James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). An introduction to statistical learning (Vol. 112, p. 18). New York: Springer.

Chang, W. (2018). R graphics cookbook: practical recipes for visualizing data. O'Reilly Media.

Mailund, T. (2017). Beginning Data Science in R: Data Analysis, Visualization, and Modelling for the Data Scientist. Apress.

Semester II
Financial Economics- II

Course Objective:

This course builds on Financial Economics- I and goes deeper into the functioning of the financial markets and firm performance. The first part gives an overview of the financial system from Indian and Global standpoints. Various security instruments used by firms to raise capital is discussed in the second module. The third and fourth module deals with the financial statements and analysis of financial ratios. Students will also learn about capital structure decisions of the firm.

Learning outcome:

- Explain the functioning of the financial markets
- Elaborate on the different securities issued in the capital markets
- Ability to analyse a financial statement
- Application of financial ratios in investment decisions
- Evaluate the security issue decisions by firms.
- Analyze the impact of pay-out decisions

Modules:

1. Overview of Financial system

Functions of financial system; Banks; Non- banking Financial institutions; Money market and Capital Market; Primary and secondary markets; Derivative market; Payment systems; Insurance; Fund houses; Financial intermediaries; Regulations; Indian Financial system; Types of financial securities; Instruments in capital and money markets; Global Financial markets; Market integration; Global capital flows; interlinkages between Indian markets and global financial markets; recent developments; Climate Finance; Sustainable Finance

2. Financial statement analysis and reporting

Balance sheet; Profit and Loss Statement; Cash flow statement; Construction of BS, P&L statement and CF- statement; Accounting standards and regulations;

3. Financial ratio analysis

Profitability ratios; Efficiency ratios; Liquidity ratios; Solvency ratios; Market ratios; Ratio analysis and firm performance, Applications in Excel

4. Financing decisions and market efficiency

Efficient market hypothesis; Corporate financing decisions; Debt issues; Equity issues; Modigliani Miller model; Capital Structure decisions; Credit risk and value of corporate debt; information asymmetry in equity issues; Market timing theory;

5. Payout policy

Dividend policy; relevance of dividends; Managerial discretion in dividend policy; stock repurchases; stock splits; Bonus issues;

Core text

- Robinson, T. R. (2020). International financial statement analysis. John Wiley & Sons.
- Pathak, B. V. (2018). Indian financial system. Pearson Education India.
- Fabozzi, F. J., Neave, E. H., & Zhou, G. (2011). Financial economics. Wiley.

Reference:

- Fridson, M. S., & Alvarez, F. (2022). Financial statement analysis: a practitioner's guide. John Wiley & Sons.
- Wahlen, J. M., Baginski, S. P., & Bradshaw, M. (2014). Financial reporting, financial statement analysis and valuation. Cengage learning.
- Mishkin, F. S., & Eakins, S. G. (2006). Financial markets and institutions. Pearson Education India.
- Vernimmen, P., Quiry, P., & Le Fur, Y. (2022). Corporate finance: theory and practice. John Wiley & Sons.
- Ross, S. A. (2018). Corporate finance: McGraw-Hill Education.
- Copeland, T. E., Weston, J. F., & Shastri, K. (2005). Financial theory and corporate policy (Vol. 4). Boston: Pearson Addison Wesley.

Advanced Macroeconomics

Course Objective: The course discusses various macroeconomic concepts according to the extant schools of thought. Further, the concepts of consumption, savings, and investment are discussed in the dynamic framework. It also examines the various financial crises and banking systems.

Learning outcomes: Students will be in a position to distinguish between the ideas of the different schools of thought, as they are apparent in policy discussions. They will be equipped with methodological and analytical skills and will be able to fruitfully apply these skills to macroeconomic policy formulation.

1. Classical and Keynesian Economics

Recap of various schools of thought: Classical school, Keynesian, Monetarist, New classical, New Keynesian; Goods market and Money market: IS-LM frame work, interaction of real and monetary sectors; Effectiveness of fiscal and monetary policy under IS-LM frame work; Crowding-out effect; Open economy IS-LM model; Unemployment and Labour market; Demand for labour; Supply of labour; Neoclassical labour market equilibrium; Keynesian labour market; All three markets together: Aggregate Demand and Aggregate Supply

2. Role of expectation in macroeconomics

Adaptive expectation hypothesis; Expectation augmented Philips curve; Rational expectation hypothesis and equilibrium approach; Lucas supply function; Policy ineffectiveness theorem; The Lucas critique; Real Business Cycle Theory; Role of News

3. Microeconomic foundations of Macroeconomics

Imperfect competition; Core propositions of New Keynesian Economics; Small menu cost model; Implicit wage contract model; Efficiency wage theory; Insider-outsider model; coordination failures and non-Walrasian theories; Introduction to DSGE model

4. Consumption and Investment

Consumption under Certainty: The Life-Cycle Hypothesis (LCH) and Permanent Income Hypothesis (PIH); Consumption under uncertainty: The Random Walk Hypothesis (RWH) – Two tests of Random Walk Hypothesis; Interest Rate and Saving; Consumption and risky assets; Alternative views of consumption; Investment and stock of capital; Investment with adjustment costs; Tobin's q ; Uncertainty and investments; Financial market imperfections; Basic Infinite Horizon Models of Consumption and Investment: The Ramsey problem; The Decentralized economy; The Government in the decentralized economy; The Overlapping Generations Model.

5. Credit market and Money market

The consumption-saving decision and credit markets: Two period model of the Economy; Ricardian equivalence theorem; Credit market imperfections and consumption; Asymmetric information and the financial crisis; Limited commitment and the financial crisis; Social security programs; Financial sector and financial crisis; Fractional reserve banking; The theory of Bank runs; Theory of unconventional monetary policy

Reference:

Romer, David. Advanced macroeconomics. McGraw Hill, 2012.

Wickens, Michael. Macroeconomic Theory: A Dynamic General Equilibrium Approach. Second Edition, Princeton University Press, 2012.

Williamson, Stephen D. Macroeconomics, Sixth Edition, Pearson Publication, 2018.

Schiller, Bradley, and Gebhardt, Karen. The Macro Economy Today, 15th Edition, McGraw-Hill Education, 2019.

Snowdon, Brian, and Howard R. Vane. Modern macroeconomics: its origins, development and current state. Edward Elgar Publishing, 2005.

Blanchard, Olivier, and David R. Johnson. Macroeconomics, Global Edition. Essex: Pearson Education Limited, 2013.

Canova, F. (2011). Methods for applied macroeconomic research. Princeton university press.

Cencini, A. (2005). Macroeconomic foundations of macroeconomics (Vol. 72). Psychology Press.

Clarida, Richard, Jordi Galí, and Mark Gertler. 1999. "The Science of Monetary Policy: A New Keynesian Perspective." *Journal of Economic Literature* 37(2): 1661–1707

Galí, J. (2015). Monetary policy, inflation, and the business cycle: an introduction to the new Keynesian framework and its applications. Princeton University Press.

Mankiw, N. Gregory, and Mark P. Taylor. Macroeconomics. Cengage, 2017.

Paul Levine, 2019. "The State of DSGE Modelling," School of Economics Discussion Papers 0319, School of Economics, University of Surrey.

Romer, P. (2016). The trouble with macroeconomics. *The American Economist*, 20, 1-20.

Sargent, Thomas J. Dynamic macroeconomic theory. Harvard University Press, 2009.

Snowdon, B., Vane, H. R., & Wynarczyk, P. (1994). A modern guide to macroeconomics.

Advanced Econometrics-II

Course Objective: This course focus on cross- section and panel data regression models. It also covers various models associated with qualitative dependent variables and quantile regression models. The main objective of this course is to provide a sound understanding of the econometric principles associated with these models along with applications

Learning outcomes: students will be able to apply the advanced econometric tools to cross-section and panel data, and arrive at suitable inferences.

11. Qualitative Dependent Variable Models

Limited dependent Variable – Logit Model (using ML perspective- confusion matrix, ROC, Accuracy score)– Probit Model - Tobit Model - Two-limit Tobit, truncated regression model - Heckman Two-step method - Hurdle model- Count data Model: Poisson, Negative Binomial and Zero-inflated model; Multinomial Logit model; Ordered logit model; Nested logit model;

Textbooks: Woolridge, Stock and Watson

2. Generalized Method of Moments

Endogeneity in linear regression models, Instrumental Variables Approach- Instrumental variables, Instrumental variables estimator. Finite-sample and asymptotic properties of the IV estimator. Choice of instruments, Generalized Method of Moments (GMM) Estimator. Asymptotic properties of GMM estimator. Efficient GMM estimator. Test of overidentifying restrictions.

Textbooks: Woolridge, Johnston Dinardo, Stock and Watson

3. Panel Data Models

Pooled regression, fixed effects; random effects, first difference models; Hausman test; Time series correlation in panel data; Panel unit root tests; Co- integration tests; Dynamic panel data model: panel IV, Arellano-Bond estimates, panel VAR; Panel ARDL Models; Heteroskedasticity and serial correlation in panel data; Spatial Panel Data

Textbook: Woolridge, Baltagi.

4. Quantile Regression.

Review of Quantiles. Population Quantiles, Sample Quantiles. Conditional Quantile Function. Quantile Regression Estimator.

Textbook: Koenker , Mostly Harmless Econometrics

5. Advanced Models

Difference-in-difference; Dimension reduction techniques- Propensity score matching; Principal component Analysis; non-parametric techniques; randomised control trials

Textbook: Mostly Harmless Econometrics

Reference

Baltagi, B. (2008). *Econometric analysis of panel data*. John Wiley & Sons.

Long, J. Scott. 1997. *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA: Sage.

Agresti, A. (2018). *An introduction to categorical data analysis*. John Wiley & Sons.

Wooldridge, J.M, *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge

Cameron, A. C. & Trivedi, P. K. (2005), *Microeconometrics: Methods and Applications*. Cambridge University Press

Greene, W.H. (2011). *Econometric analysis*. 7th edition. Prentice Hall. New York.

Hsiao, C., *Analysis of Panel Data*, Cambridge University Press, 2nd ed, 2004; 3rd ed., 2014.

Pesaran, M.H., *Time Series and Panel Data Econometrics*. Oxford: Oxford Univ Press, 2015.

Koenker, R. (2005). *Quantile Regression (Econometric Society Monographs)*. Cambridge: Cambridge University Press.

Koenker, Roger , Victor Chernozhukov , Xuming He and Limin Peng , "Handbook of Quantile Regression" (Boca Raton: CRC Press, 25 Oct 2017), accessed 13 Nov 2020 , Routledge Handbooks Online.

Game Theory & applications

Course Objective: Game theory studies strategic interactions amongst rational decision-makers. Traditionally, game-theoretic tools have been applied to solve problems in Economics, Business, Political Science, Biology, Sociology, Computer Science, Logic, and Ethics. In recent years, applications of game theory have been successfully extended to several areas of engineered / networked systems such as wireline and wireless communications, static and dynamic spectrum auction, social and economic networks. This course is intended to provide students with a comprehensive treatment of game theory with specific emphasis on applications in Economics.

Learning outcomes

1. To apply game theory concepts like Nash Equilibrium, mixed strategies, and dominant strategies to analyze decision-making processes in various scenarios, including markets, auctions, and voting systems.
2. To gain the skills to design games (strategic interactions) that encourage desired behaviors and understand the potential inefficiencies of equilibria compared to optimal social outcomes.

1. Strategic Games and Nash Equilibrium

Theory of rational choice; Strategies, costs, and payoffs ; Strategic games; Examples (Prisoner's dilemma); Nash Equilibrium, concepts and examples; Best response functions; Dominant strategies; Pure strategy v/s Mixed strategy; Symmetric games and symmetric equilibria; Cournot's model of duopoly market; Bertrand's model of duopoly market; Electoral Competition; War of Attrition; Voting; Auctions; Accident Laws

2. Mixed Strategy Nash Equilibrium

Introduction; Strategic games with randomisation; Mixed strategy Nash equilibrium: concept and examples; Dominated Actions; Formation of Players' beliefs

3. Extensive Games and Nash Equilibrium

Introduction to extensive games; Strategies and outcomes; Nash equilibrium; Subgame perfect Nash equilibrium; Backward induction; Stackelberg model of duopoly markets; Ultimatum game

4. Designing games

Repeated games; Bayesian games

Routing games; Selfish routing; Quantifying inefficiency of equilibria; Price of Anarchy; Social optimum; Price of stability; Scheduling games

Population games; Evolutionary game theory; Evolutionary stable strategy; Replicator dynamics

5. Cooperative and Non-Cooperative Games

Cooperative game theory, Non-cooperative games; Nash bargaining; Adaptive decision making; Mechanism design; Algorithmic mechanism design; Distributed algorithmic mechanism design

Reference:

Maschler, M., and E. Solan. S. Zamir (2013). Game theory. Cambridge University Press

Başar, T., & Olsder, G. J. (1998). Dynamic noncooperative game theory. Society for Industrial and Applied Mathematics.

Fudenberg, D., & Tirole, J. (1991). Game theory mit press. Cambridge, MA, 86.

Gibbons, R. (1992). A primer in game theory–Prentice-Hall.

Karlin, A. R., & Peres, Y. (2017). Game theory, alive (Vol. 101). American Mathematical Soc.

Leyton-Brown, K., & Shoham, Y. (2008). Essentials of game theory: A concise multidisciplinary introduction. Synthesis lectures on artificial intelligence and machine learning, 2(1), 1-88.

Osborne, M. J. (2004). An introduction to game theory (Vol. 3, No. 3). New York: Oxford university press.

Osborne, M. J., & Rubinstein, A. (1994). A course in game theory. MIT press.

Weibull, J. W. (1997). Evolutionary game theory. MIT press.

Advanced Research Methods

Course Objective: The core objective of this course is to familiarize the students with the philosophy of research and prepare for academic research. This course begins by introducing the scientific research and the evolution of research methodology in Economics over the years.

Learning outcomes: Students will have an understanding of the process of knowledge creation in the social sciences. Further, they will be in a better position to write research reports up to good academic standards.

1. Philosophy of Science & Research-

Epistemology, Positivism, Empiricism and Interpretivism; Nature of Science- Karl Popper, Thomas Kuhn, Lakatos; Logic- Rules, Logical Fallacy; Models of Scientific Explanation: Hypothetico-Deductive Model, Deductive-Nomological Model, and Inductive Approach

2. Methodology of Economics

Seven decades of Research Methodology in Economics; Types of research, types of knowledge and methods for the three types of research; Research process; Research Design; Research Literature; Identification of Research gap; Research Proposal

3. Data and Sampling

Methods of sampling and Sampling Design; Data- types; Data collection tools; Questionnaire design; Sampling errors; Different data Sources

4. Experimental Studies and design

Case studies; basic experimental design; randomised design; factorial designs

5. Research Results Reporting, Referencing Techniques and Plagiarism

Types of research reports, Structure of a research report, Presentation of tabular data and figures; Preparing bibliography, foot notes and annexure; Style of reference writing; Ethics in research; Plagiarism in research; Avoiding plagiarism; Introduction to software packages of detecting plagiarism

Reference

Davis, J. B., Hands, D. W., & Mäki, U. (1998). *The handbook of economic methodology*.

Hausman, D. M. (Ed.). (1994). *The philosophy of economics: An anthology*. Cambridge University Press.

McCloskey, Dierdre. (1998). *Rhetoric of Economics*. University of Wisconsin Press

Daniel Hausman, "Appendix: An Introduction to Philosophy of Science," *The Inexact and Separate Science of Economics*. Cambridge: Cambridge University Press, 1992, pp. 281-329

- Hausman, D. M. (1989). Economic methodology in a nutshell. *Journal of Economic Perspectives*, 3(2), 115-127.
- Boumans, M., & Davis, J. B. (2015). *Economic methodology: Understanding economics as a science*. Macmillan International Higher Education.
- Godfrey-Smith, P. (2009). *Theory and reality: An introduction to the philosophy of science*. University of Chicago Press.
- Lakatos, I. (1968, January). Criticism and the methodology of scientific research programmes. In *Proceedings of the Aristotelian society* (Vol. 69, pp. 149-186). Aristotelian Society, Wiley.
- Popper, K. (2014). *Conjectures and refutations: The growth of scientific knowledge*. routledge.
- Popper, K. R. (1982). Science: conjectures and refutations. *Philosophy of science and the occult*, 104-111.
- Karl Popper, "Science: Conjectures and Refutations," in *Conjectures and Refutations*. London: Routledge and Kegan Paul, 1963,
- Popper, K. (2005). *The logic of scientific discovery*. Routledge.
- Boumans, M., & Davis, J. B. (2015). *Economic methodology: Understanding economics as a science*. Macmillan International Higher Education.
- Blaug, M. (1975). Kuhn versus Lakatos, or paradigms versus research programmes in the history of economics. *History of Political Economy*, 7(4), 399-433.
- Kuhn, T. S. (2012). *The structure of scientific revolutions*. University of Chicago press.
- Reiss, J. (2013). *Philosophy of economics: a contemporary introduction*. Routledge.

Programming with Python

Course Objective: This course aims to introduce students to Python programming. The Python programming language is one of the most popular programming languages worldwide and this course will be of great interest to all learners who would like to understand the basics of programming using the Python language and its applications in several domains.

Learning Outcome:

- To apply Python fundamentals to manipulate and analyze data
- To master data visualization techniques
- To implement various regression algorithms
- To build and evaluate classification models
- To apply machine learning in practice:

Module 1: Basic Operations

Installing Python and choosing an IDE (e.g., Jupyter Notebook, PyCharm);

Basic Data Types and Operations: Numbers, strings, booleans, and lists, Operators and expressions, Variables and data assignment, Basic input and output (using print); Control Flow: Conditional statements (if-else), Loops (for, while), Nested control flow; Functions: Defining and calling functions, Arguments and return values, Local and global variables;

Data Structures: Lists, tuples, dictionaries, Indexing and slicing; List comprehensions and dictionary methods;

Data Transformation and Manipulation: String formatting and methods, Date and time handling, File handling (reading and writing); Introduction to NumPy and Pandas: Creating and accessing NumPy arrays, Basic operations on arrays, Introduction to Pandas Data Frames Indexing, selecting, and filtering data

Packages: numpy, pandas

Module 2: Data Visualization

Common types of charts and graphs; Choosing the right visualization for data;

Matplotlib Basics: Creating basic plots (scatter, line, bar), Customizing plots (labels, titles, legends), Subplots and figure layout

Seaborn for Statistical Visualization: Statistical plots (boxplots, violin plots, histograms), Categorical data visualization, Creating publication-quality graphs

Interactive Visualization with Plotly/Bokeh: Creating interactive charts and dashboards. Adding hover tools and custom interactions, Building interactive web applications with Plotly/Bokeh

Packages: matplotlib, seaborn, plotly, bokeh

Module 3: Regression Techniques in Machine Learning

Introduction to Machine Learning: Supervised learning and tasks: Regression and Classification; Common regression algorithms (Linear, Polynomial, Ridge, Lasso, Support Vector Regression, Decision Tree regression); Implementing Regression in Python: Preprocessing data for regression analysis, Training and evaluating regression models using Scikit-learn; Visualizing model predictions and residuals; Model Selection and Feature Engineering: Choosing the right regression model for your data, Feature engineering techniques to improve model performance

Packages: scikitlearn

Module 4: Classification Techniques in Machine Learning

Introduction to Classification: Binary and multi-class classification problems, Performance metrics for classification (accuracy, precision, recall), Common classification algorithms (Logistic Regression, Decision Trees, K-Nearest Neighbors, Support Vector Machines); Implementing Classification in Python: Data preparation for classification tasks, Training and evaluating classification models using Scikit-learn, Visualizing model predictions and decision boundaries; Model Optimization and Hyperparameter Tuning: Cross-validation for robust model evaluation; Tuning hyperparameters to improve model accuracy,

Case Studies and Project

Core texts:

Grus, J. (2019). Data science from scratch: first principles with python. O'Reilly Media.

VanderPlas, J. (2016). Python data science handbook: Essential tools for working with data. " O'Reilly Media, Inc."

Downey, A. Think Python. 2nd Ed " O'Reilly Media, Inc."

Semester III

Asset Pricing

Course Objective

The course introduces the basic theory of asset pricing and use quantitative tools necessary for understanding how asset prices are determined, and how to use invest in financial assets. focus on pricing, trading and the uses of specific asset classes (stocks, bonds, and derivatives). The course emphasizes the interaction between investment decisions, financial intermediaries, and the broader macroeconomic environment.

1. Static Portfolio Choice and Asset Pricing

Utility Theory and risk aversion; Static Portfolio Choice; Static Equilibrium Asset Pricing; Arbitrage Pricing and Multifactor Models; Test Methodology

2. Stochastic Discount Factor

SDF in a Complete Market; Utility maximization and SDF; Growth-Optimal Portfolio and the SDF; Solving Portfolio Choice Problems; Perfect Risksharing; SDF in incomplete markets; Properties of the SDF; GMM framework

3. Intertemporal Portfolio Choice and Asset Pricing

Market Efficiency and Autocorrelation in Stock Returns; Present value models with Constant Discount rates; Time varying discount rates; VAR Analysis of Returns; Predictive Return Regressions; Drifting Steady-State Models; Cross-Section of Stock Returns and equity premium

4. Consumption-Based and Production based Asset Pricing

Lognormal Consumption; Beyond Lognormality; Long-Run Risk Models; Ambiguity Aversion; Habit Formation; Physical Investment with Adjustment Costs; General Equilibrium with Production;

5. Advanced Topics

Household Finance; Risk sharing and Speculation; Private Information; Asymmetric Information and Liquidity; Liquidity and Asset Pricing; Market Microstructure

Core texts

Campbell, Financial Decisions and Markets: A Course in Asset Pricing, Princeton University Press, 2017.

Cochrane, Asset Pricing, Revised Ed., Princeton University Press, 2005.

Additional readings

Back, K. (2010). Asset pricing and portfolio choice theory. Oxford University Press.

Duffie, Dynamic Asset Pricing Theory, 3rd Ed., Princeton University Press, 2001.

Applied Corporate Finance

Course Objective: The course is designed to give an overview of the theoretical framework for understanding and analyzing major financial problems and decisions associated with modern firms in the market environment. This course introduces a business corporation, their functions and the role of capital market. Valuation of the firms is given importance so is the capital structure decisions of firms. The course also delves into Mergers and Acquisition and Corporate Governance practices of the firms. Understanding of Financial Economics is a prerequisite to this course.

Learning outcome:

- Ability to value a firm
- Analyse the Merger and Acquisition decisions
- Evaluate the corporate governance practices
- Analyze the security issue decisions and its impact on firm performance

1. Introduction

Why corporate Finance? Types of corporations; Control and ownership, Role of capital markets; Value creation and corporate management; Information Asymmetry, Agency problems and corporate Finance

2. Advanced Valuation

Recap of Risk-returns, Estimating cost of capital, Market portfolio, Debt cost of capital and Project's cost of capital; Weighted Average Cost of Capital for valuation, Valuing equity cash flows- Free cash flow to Equity and firm; Cost of Equity; cost of debt; cost of capital

3. Public and private equity capital markets

Long term equity financing- Initial Public Offers- advantages and disadvantages of going public, seasonal equity offerings; Long term debt financing- private debt and public debt; Short term debt financing- Overview of Working Capital, Trade Credit receivables, payables, inventory, cash holdings; Matching principle in short term financing- financing with bank loans and commercial papers, secured financing; Strategic and Financial Restructuring

4. Mergers and Acquisitions

Reasons to Acquire; Takeover Process; Takeover Defenses; Value addition from take over; Market reaction to a take over- free rider problem, leveraged buyouts M&A in India case studies

5. Corporate Governance

Governance in financial and non-financial corporates; Corporate Governance and agency costs, Board composition and firm performance; Monitoring by the Board of Directors and Others; Compensation Policies; Managing agency conflict; Corporate governance norms in India; Uday Kotak Committee report

Core Text

Damodaran, A. (2014). Applied corporate finance. John Wiley & Sons.

Berk, J., & DeMarzo, P. (2016). Corporate Finance, GE. Pearson Australia Pty Limited.

Additional readings

Vernimmen, P., Quiry, P., Dallochio, M., Le Fur, Y., & Salvi, A. (2014). Corporate finance: theory and practice. John Wiley & Sons.

Brealey, R. and S. Myers, Principles of Corporate Finance, fifth edition, New York, McGraw Hill, 1997

Copeland, T. E. and J. F. Weston, Financial Theory and Corporate Policy, Addison Wesley, 1992

Ross, S. A., Westerfield, R., & Jordan, B. D. (2008). Fundamentals of corporate finance. Tata McGraw-Hill Education.

Asquith, P., & Weiss, L. A. (2019). Lessons in corporate finance: A case studies approach to financial tools, financial policies, and valuation. John Wiley & Sons.

Parrino, R., Kidwell, D. S., & Bates, T. (2011). Fundamentals of corporate finance. John Wiley & Sons.

Investment Analysis & Portfolio Management

Course Objective

This course is designed to provide a comprehensive understanding of investment management, including asset pricing models, portfolio theory, and the principles and techniques of investment analysis and portfolio management. The course will cover various types of investment vehicles and markets, including fixed income securities, equity securities, alternative investments, and international investments.

Learning Outcomes

- Understand the fundamental principles of investment management and portfolio theory.
- Analyze and evaluate the risk and return characteristics of various investment vehicles.
- Construct and manage investment portfolios that meet specific investment objectives and constraints.
- Understand and analyze alternative investments, including real estate, private equity, hedge funds, and commodities.
- Evaluate the performance of investment portfolios using appropriate performance evaluation techniques.

1. Modern Portfolio Theory and Asset Allocation

Overview of modern portfolio theory; Efficient frontier and portfolio optimization; Risk and return characteristics of different asset classes; Asset allocation strategies; Measuring portfolio performance

2. Equity Valuation and Investment Strategies

Fundamental analysis and valuation of equity securities; Technical analysis and its applications; Equity investment strategies such as value investing and growth investing; Equity portfolio construction and management; Risk management techniques

3. Fixed Income Securities and Portfolio Management

Fixed income security valuation and pricing; Interest rate risk and credit risk management; Strategies for investing in fixed income securities; Yield curve analysis and bond portfolio management; Risk management techniques for fixed income portfolios

4. Alternative Investments and Portfolio Diversification

Overview of alternative investments-private equity, hedge funds, and real estate; Alternative investment strategies and risk-return characteristics; Portfolio diversification and risk management using alternative investments; Analyzing and evaluating alternative investments

5: Portfolio Performance Evaluation and Behavioral Finance

Performance evaluation techniques for investment portfolios; Behavioural biases and their impact on investment decisions; Understanding investor psychology and behaviour; Behavioural finance and its implications for portfolio management; Ethical considerations in portfolio management

Core texts

Bodie, Z., Kane, A., & Marcus, A. J. (2019). *Investments* (11th ed.). McGraw-Hill Education.

Damodaran, A. (2012). *Investment valuation: Tools and techniques for determining the value of any asset* (3rd ed.). John Wiley & Sons.

Additional readings

Bernstein, W. J. (2000). *The intelligent asset allocator: How to build your portfolio to maximize returns and minimize risk*. McGraw-Hill.

Graham, B., & Dodd, D. L. (2008). *Security analysis: Principles and techniques* (6th ed.). McGraw-Hill.

Solnik, B., & McLeavey, D. (2014). *International investments* (8th ed.). Pearson.

Semester IV

Fixed Income Securities

Course objective

This course aims to provide a comprehensive understanding of fixed income securities. The course covers bond pricing, yield measures, interest rate risk management, credit analysis, securitization, and fixed income portfolio management. The course will also cover the regulatory framework and the role of fixed income securities in the financial market. Applications of fixed income securities in various financial settings will also be explored through case studies and projects.

Learning Outcomes: Upon successful completion of this course, students will be able to:

- Analyze and value fixed income securities
- Evaluate the risks and returns associated with different fixed income securities
- Understand the regulatory framework governing fixed income securities
- Apply fixed income portfolio management techniques to real-world situations
- Conduct credit analysis and securitization of fixed income securities in practical scenarios

1. Introduction to Fixed Income Securities

Types of fixed income securities; Bond pricing and yield measures; Interest rate risk and its impact on bond prices and returns; Yield curves and the term structure of interest rates; Duration, modified duration, and convexity; Valuation of corporate bonds; Analysis of government bond auctions; Evaluation of interest rate movements

2. Credit Analysis and Securitization

Credit risk analysis and credit ratings; Asset-backed securities and mortgage-backed securities; Collateralized debt obligations; Legal and regulatory framework for securitization; Credit analysis of companies and credit derivatives; Structuring and pricing of securitized products; Evaluation of the impact of securitization on financial markets

3. Fixed Income Portfolio Management

Active and passive portfolio management strategies; Asset allocation and portfolio optimization; Risk management techniques for fixed income portfolios; Performance evaluation of fixed income portfolios; Portfolio management strategies for institutional investors; Analysis of fixed income mutual funds; Designing fixed income investment strategies for individual investors

4. Interest Rate Risk Management

Hedging interest rate risk with futures, swaps, and options; Yield curve strategies; Duration matching and cash flow matching; Interest rate models and their applications; Regulatory

framework for interest rate risk management; Management of interest rate risk in banks; Hedging strategies for fixed income investors; Analysis of interest rate risk exposure of companies

5. International Fixed Income Securities

International bond markets and their characteristics; Currency risk management; International fixed income portfolio management; International bond issuances and their regulatory framework; Impact on global financial markets; Technological advancements and their impact on fixed income markets; Market developments- green bonds and social bonds

Core texts

Fabozzi, F. J., & Markowitz, H. (2011). *The Theory and Practice of Investment Management: Asset Allocation, Valuation, Portfolio Construction, and Strategies* (1st ed.). John Wiley & Sons.

Reilly, F. K., & Brown, K. C. (2012). *Investment Analysis and Portfolio Management* (10th ed.). South-Western College Pub.

Additional Readings

Elton, E. J., Gruber, M. J., Brown, S. J., & Goetzmann, W. N. (2009). *Modern Portfolio Theory and Investment Analysis* (8th ed.). John Wiley & Sons

Frank Fabozzi (2014, 9th edition), “Bond Markets, Analysis and Strategies” (Reading list: F)

Sundaresan, S. (2009). *Fixed income markets and their derivatives*. Academic Press.

Veronesi, P. (Ed.). (2016). *Handbook of fixed-income securities*. John Wiley & Sons.

Jarrow, R. A. (2019). *Modeling fixed income securities and interest rate options*. Chapman and Hall/CRC.

Commodity Derivatives & Risk Management, Prabina Rajib

Choudhry, M. (2014). *The Handbook of Fixed Income Securities* (9th ed.). John Wiley & Sons.

Desai, M. (2016). *Fixed Income Securities and Derivatives Handbook: Analysis and Valuation*. CRC Press

Bhalla, V. K. (2015). *Treasury and Risk Management: Principles and Practice*. Oxford University Press.

Financial Derivatives

Course Objective:

This course explores advanced concepts and applications of financial derivatives, including options, futures, swaps, and other complex derivatives. Students will learn about the valuation, pricing, and risk management of these instruments, as well as their use in hedging and trading strategies. The course will also cover the latest developments and trends in the derivatives markets.

Learning outcomes

- Explain various derivative products such as futures, options, and swaps;
- Learn futures and options and their pricing and trading strategies
- Apply basic techniques for the valuation of derivatives
- To apply hedging models in assessing price risk of various derivatives
- To explain the functioning and performance in Indian and Global Markets

1. Options

Options terminology and characteristics; Option pricing models- Black-Scholes model and binomial trees; Advanced option strategies-butterfly spreads and straddles; Exotic options-barrier options and Asian options; Volatility modeling and estimation; Valuing and hedging options using various pricing models; Designing and implementing option trading strategies; Analyzing the impact of volatility on option prices

2. Futures and Forwards

Futures and forwards terminology and characteristics; Pricing futures and forwards using the cost-of-carry model and other approaches; Hedging with futures and forwards; Spreading and arbitrage strategies; Analyzing the effectiveness of hedging strategies; Designing and implementing futures and forwards trading strategies; Emerging trends in the futures and forwards markets

3. Swaps

Swap terminology and characteristics; Pricing interest rate swaps and other types of swaps; Hedging with swaps; Credit risk in swaps and counterparty risk mitigation; Designing and implementing swap trading strategies; Analyzing the impact of credit risk on swap prices

4, Other Complex Derivatives

Structured products, including collateralized debt obligations and credit default swaps; Equity derivatives; Commodity derivatives; Valuing and hedging structured products and other complex derivatives; Designing and implementing trading strategies with complex derivatives; Analyzing the risk characteristics of complex derivatives

5. Risk Management with Derivatives

Hedging with derivatives in corporate finance and risk management; Advanced risk management techniques using derivatives; Derivatives and systemic risk; Regulatory issues and challenges in derivatives markets; Ethics and governance in derivatives trading; Designing and implementing risk management strategies using derivatives; Analyzing the

impact of derivatives on systemic risk; Evaluating the ethical implications of derivatives trading

Core Text

Hull, J. (2018). Options, Futures, and Other Derivatives. Pearson.

Additional readings

McDonald, R. L., (2013). Derivatives markets 3rd Ed. Pearson

Wilmott, P. (2013). Paul Wilmott Introduces Quantitative Finance. Wiley.

Rebonato, R. (2012). Interest Rate Derivatives: A Practitioner's Guide. Wiley.

Kolb, R. W. (2014). Financial Derivatives. Wiley.

Craighead, C. W., & Perold, A. F. (2015). Corporate Risk Management. HBS Case Collection.

Hilpisch, Y. (2015). Derivatives analytics with Python: data analysis, models, simulation, calibration and hedging. John Wiley & Sons.

Electives

Financial Econometrics

Course Objective: This course enables students with a comprehensive understanding of various time series models, including linear and non-linear models, volatility modeling, continuous-time models, principal component analysis, and factor models. They will learn to apply these models to real-world financial data, analyze their results, and make informed decisions based on their findings.

Learning Outcomes:

1. Demonstrate a deep understanding of different time series models, including AR, MA, ARIMA, GARCH, and state-space models, and their applications in financial modeling.
2. Apply non-linear time series models, such as bilinear, TAR, STAR, and Markov switching models, to analyze financial data and identify trends and patterns.
3. Analyze and forecast volatility of returns using ARCH, GARCH, and stochastic volatility models.
4. Apply principal component analysis and factor models to large financial datasets and interpret the results to identify underlying factors driving market movements.
5. Implement state-space models using the Kalman filter and smoothing techniques, and use them to analyze and forecast financial data.

Modules:

1. Linear and Non linear Time series Models

Asset returns and properties; Unit root and stationarity; AR, MA, ARMA, ARIMA, Seasonal Models; Bilinear Model; Threshold Autoregressive (TAR) Model; Smooth Transition AR (STAR) Model; Markov Switching Model; Nonparametric Methods, Functional Coefficient AR Model, Nonlinear Additive AR Model, Nonlinear State-Space Model, Nonlinearity Tests-parametric and non- parametric; VAR; VARMA; Cointegration

2. Modeling Volatility of Returns

ARCH and GARCH models; Forecasting Volatility; Multivariate GARCH models; e Integrated GARCH Model; GARCH-M Model; Exponential GARCH Model; Threshold GARCH Model; Stochastic Volatility Model

3. Continuous-Time Models

Wiener Process; Generalized Wiener Process; Ito Process; Ito's Lemma; Derivation of Black–Scholes Differential Equation; Black–Scholes Pricing Formulas

4. Principal Component Analysis and Factor Models

Factor Models, Single and Multi Factor models; Fundamental Factor Models- BARRA Factor Model and Fama–French Approach; Principal Component Analysis- estimation and applications; Factor Analysis- estimation and applications

5. State-Space Models, Kalman Filter, Markov Chain and Monte Carlo Methods

Local Trend Model; Kalman Filter; State Smoothing; Linear State-Space Models; Kalman Filter and Smoothing: Applications

Markov Chain Simulation; Monte Carlo Simulation; Bayesian Inference; Markov Switching Models, Forecasting

Reference

Tsay, R. S. (2005). Analysis of financial time series. John Wiley & Sons.

Campbell, J. Y., Champbell, J. J., Campbell, J. W., Lo, A. W., Lo, A. W., & MacKinlay, A. C. (1997). The econometrics of financial markets. Princeton University Press.

Fabozzi, F. J., Focardi, S. M., Rachev, S. T., & Arshanapalli, B. G. (2014). The basics of financial econometrics: Tools, concepts, and asset management applications. John Wiley & Sons.

Fan, J., & Yao, Q. (2017). The elements of financial econometrics. Cambridge University Press.

Gourieroux, C., & Jasiak, J. (2022). Financial econometrics: Problems, models, and methods (Vol. 2). Princeton University Press.

Rachev, S. T., Mitnik, S., Fabozzi, F. J., & Focardi, S. M. (2007). Financial econometrics: from basics to advanced modeling techniques. John Wiley & Sons.

Enders, W. (2008). Applied econometric time series. John Wiley & Sons.

Brooks, C. (2019). Introductory econometrics for finance. Cambridge University Press.

Financial Risk Management

Course objective: This course provides a comprehensive understanding of risk and risk management concepts, including various types and sources of risk, corporate risk management practices, and risk measurement and modeling techniques. They will learn to apply these concepts to real-world financial scenarios, analyze the results, and make informed decisions based on their findings.

Learning Outcomes:

1. Demonstrate a deep understanding of risk and risk management concepts, including types and sources of risk, corporate risk management practices, and risk measurement and modeling techniques.
2. Apply risk measurement and modeling techniques, such as value at risk, decision trees, simulation models, and logistic regression, to real-world financial scenarios.
3. Analyze credit risk using the 5 C's of credit, credit scoring, counterparty risk, and credit portfolio management techniques.
4. Develop and implement asset and liability management strategies using cash flow models, funds transfer pricing, and liquidity risk measures.
5. Apply operational risk management frameworks, risk identification techniques, and potential loss distribution models to manage operational risk in financial institutions.

Modules:

1. Risk and risk management

Concept of Risk; definition; Types and sources of risk- market, credit, liquidity, operational, legal and regulatory, business, strategic and reputational risk; Corporate Risk Management- Practices, Objectives, instruments, strategy and evaluation; Bank regulation and risk management; Basel norms; Corporate Governance and risk management- policies, monitoring, audit;

Case studies and applications

2. Risk measurement and Modelling

Risk Measures- Standard Deviation; Beta; Value at Risk- framework, definition, Calculation; Non linear VaR and its variants; Extreme value Thoery; Decision Trees; Simulation models- Monte Carlo Simulation; Real Options; Delphi Method; Risk Maps; Risk Dashboards; Scenario Analysis; Stress Testing; Models based on Logistic regression and PCA; Risk Reporting;

3. Credit Risk

The 5 C's of Credit; Credit Scoring; Counterparty Risk; Credit Portfolio Management; Credit models for banking; Retail Credit Management; Loan Management; Bond Portfolio Management; Credit Derivatives; Credit Default Swaps; Collateralized Debt Obligation; Credit risk stress testing; Portfolio Credit Risk Models; Hedging credit risk; The 2008 Crisis and Lessons; Sovereign Risk

4. Asset and Liability Management

Liquidity Risk Management with Cash Flow Models- Measurement, liquidity exposure, hedging liquidity exposure; Liquidity planning; Cash Liquidity Risk and Liquidity Risk Measures; Regulation for Liquidity Risk; Funds Transfer Pricing and Profitability of Cash Flows- Funds Transfer Pricing Concept, Risk-Based Funds Transfer Pricing; Funds Transfer Rate and Risk Adjusted Returns ; Profitability Measures and Decompositions

5. Operational risk

Operational Risk Management Framework; Risk Identification; measuring and modelling operational risk; Operational risk indicators; Operational risk tools- Loss events, estimating potential losses; potential loss distribution models, loss simulation, Scenario analysis; Regulations around operational risk; Case studies

Reference

Hull, J. (2012). Risk management and financial institutions, John Wiley & Sons.

Rejda, G. E., & McNamara, M. J. (2020). Principles of Risk Management and Insurance 14th edition.

Skoglund, J., & Chen, W. (2015). Financial risk management: Applications in market, credit, asset and liability management and firmwide risk. John Wiley & Sons.

Hopkin, P. (2018). Fundamentals of risk management: understanding, evaluating and implementing effective risk management. Kogan Page Publishers.

Hubbert, S. (2011). Essential mathematics for market risk management. John Wiley & Sons.

Financial Analytics and Big data

Course Objective: The key objective of this course is to familiarize the students on various financial analytics tools and applications. The course will introduce various machine learning techniques and other algorithms used both supervised and unsupervised learning methods. These techniques will be applied in various scenarios in consumer behaviour, portfolio analysis, commodity prices and Risk evaluation.

Learning Outcomes:

1. Apply various unsupervised learning techniques, such as K-means, tSNE, PCA, ICA, SOM, and Auto Encoders, to financial analytics problems
2. Implement supervised learning techniques, such as decision trees, ELM, RF, ANN, DNN, SVM, KNN, and Naïve Bayes, to financial analytics problems to make informed decisions based on historical data.
3. Analyze consumer behavior in B2C and B2B scenarios using base analysis, X-sell, growth and shrinkage analysis, and entity value analysis, and apply rule-based algorithms, K-means, tSNE, SOM, and U-MAP to identify patterns and trends.
4. Develop and apply stock selection models, such as Canslim, value-based, and volatility-based selection, to portfolio analysis, and use inter-market analysis and alpha and beta to evaluate portfolio performance.
5. Evaluate credit risk using approval risk, behavioral risk, credit rating, scoring models, and risk in portfolios, probability of loss, probability of default, Loss given Default, Exposure to Default, and Value at Risk, and apply fraud detection techniques to operational risk.

Modules

Module 1- Financial Analytics Techniques

Unsupervised learning- K-means, tSNE, PCA, ICA, SOM, Auto Encoders;

Supervised learning- Decision trees, ELM, RF, ANN, DNN, SVM, KNN, Naïve Bayes

Module 2- Consumer Behaviour

B2C and B2B- Base analysis; X-sell; Growth and shrinkage analysis; Entity value analysis;

Rule based algorithms, K- means, tSNE, SOM, U- MAP;

Module 3- Portfolio Analysis

Stock Selection models- Canslim, value based, volatility based selection; inter- market analysis; Alpha, beta

Module 4- Commodity Prices

Price prediction, direction prediction; anomaly detection and prediction;

Module 5- Risk

Credit risk- approval risk, behavioural risk, credit rating, scoring models

Risk in portfolios, probability of loss, probability of default, Loss give Default, Exposure to Default, VaR

Operational risk- fraud detection

Reference

Aldridge, I., & Avellaneda, M. (2021). *Big data science in finance*. John Wiley & Sons.

Klaas, J. (2019). *Machine learning for finance: principles and practice for financial insiders*. Packt Publishing Ltd.

Dixon, M. F., Halperin, I., & Bilokon, P. (2020). *Machine learning in finance (Vol. 1170)*. Berlin/Heidelberg, Germany: Springer International Publishing.

Trading Strategies

Course Description: This course aims to equip students with a comprehensive understanding of navigating financial markets, crafting trading strategies, and utilizing different analytical tools. We will explore trading rules, tax implications, technical and fundamental analysis, algorithmic trading, and specific instruments like derivatives and currencies. Learning Outcome

Learning outcomes

- Navigate financial markets and understand various trading regulations.
- Apply technical and fundamental analysis to identify trading opportunities.
- Design and implement trading strategies for different timeframes (including intraday).
- Utilize algorithmic trading for automation and quantitative analysis.
- Master trading in derivatives and currencies with specific strategies.

Financial Markets and Trading Fundamentals

Overview of financial markets: Equities, currencies, options, futures, and derivatives; Trading rules and regulations: Exchanges, clearinghouses, and market conduct; Types of trading: Day trading, swing trading, position trading, scalping; Tax implications of trading activities: Capital gains, income taxes, reporting requirements.

2. Technical Analysis and Intraday Trading Strategies

Dow Theory; Candlestick charts, chart patterns, and technical indicators; Trend analysis, support and resistance levels, volume analysis; Moving averages, relative strength index (RSI), Bollinger Bands; Intraday trading strategies: Scalping, breakout, momentum, mean reversion; Backtesting and optimization of technical trading strategies.

Momentum indicators-Trend indicators, Volatility Indicators, Volume Indicators and many more. Price Action Strategies- Pin bars, Inside bars.Fakey Patterns

3. Fundamental Analysis and Investment

Company valuation techniques: discounted cash flow analysis (DCF), price-to-earnings (P/E) ratio, EV/EBITDA etc; Investment strategies: Long-term value investing, growth investing, dividend investing.

Algorithmic Trading and Quantitative Strategies

Introduction to algorithmic trading; Quantitative data analysis and statistical tools; Backtesting and machine learning in trading strategies; High-frequency trading and ethical considerations; Automated order execution and portfolio management strategies.

Trading in Derivatives and Currencies

Options contracts: Calls, puts, spreads, put-call parity; key concepts; Various Option trading Strategies

Futures contracts: Hedging strategies, margin requirements, delivery mechanisms.

Currency trading: Market dynamics, carry trade, technical analysis for forex. Momentum indicators- Trend indicators; Volatility Indicators; Volume Indicators; Trading strategies- Price Action: Pin bars, inside bars, Fakey Patterns; Fibonacci Ratios: Retracement and extensions; Heikinashi Trading; Elliott Wave Theory

Swaps and trading strategies

Specific trading strategies for options and forex markets.

Financial Modelling

Course Objective: The Financial Modelling course aims to equip students with the necessary skills to build and interpret financial models for various applications, including valuation, credit analysis, and risk management.

Learning Outcomes:

1. Understand and apply financial modeling concepts, techniques, and tools in Excel to real-world business problems.
2. Develop financial models for valuation, credit analysis, and risk management using advanced Excel skills and/or Visual Basic for Applications (VBA).
3. Perform scenario testing and sensitivity analyses using financial models to make informed decisions in a business setting.
4. Evaluate the applicability of financial models to real-world scenarios by drawing parallels between empirically observed market outcomes and predicted models.
5. Demonstrate proficiency in data integrity, data intuition, and communication/presentation skills, which are critical for sound, informed business decision-making.

1: Basic Coding and Financial Modeling

Understanding basic coding in Excel and R: Functions, Formulae, and Documentation; Basics of Financial Modeling; Understanding Financial models; Revising a Bad Financial Model

2: Advanced Financial Modeling and Analysis

Calculating Accrued Interest, Day Counts, and Annual Interest Expense; Understanding the ACCRINT function; Understanding the Basics of Accounting; Modelling a Business Start-up

3: Valuation and Risk Management

Reconstructing Financial Statements; Detecting False Financial Statements; Ratio Analysis to Understand Financial Statements; Modelling Integrated Financial Statements; Resolve Circular References; Restating Financial Statements; Modelling Operating Leases; Understanding EPS (In and Out of Money)

4: Advanced Topics in Financial Modeling

Understanding Bond Refunding; Modelling the Refunding Decision; Modelling TVM with Excel Functions; Modelling NPV with Different Lives and Risks; Modelling Issues with the Dividend Growth Model; Preparing for WACC Calculations; Weighted Average Cost of Capital; Modelling Various Methods of Measurement; Understanding the Difference in Betas; Downloading External Data; Modelling a Cash Funded Valuation; Forecasting Debt Requirements (Adjusting Iterations); Modelling an LBO; Forecasting the Returns to an LBO; Scenario Analysis in Excel; Modelling Issues in Depreciation; Modelling Issues in Capital Structure (Solver and Goal Seek); Modelling Credit Issues;

Determination of a Borrowing Base; Modelling Corporate Insolvency; Valuation of a Distressed Company;

5: Modelling risk

Modelling Risk; Standard Risk Measures for Investments; Modelling VaR; Forecasting Maximum Expected Losses; Sensitivity Analysis in Financial Analysis; Black-Scholes Option Pricing; Real Option Valuation; Acquisition of a Resource Company; Real Option Valuation in Bankruptcy; Valuation of Equity of a Bankrupt Airline; Modelling Corporate Liquidation; Valuation of Returns to Private Equity in an Insolvency; Absolute Priority Rule

International Finance

Course Description: This course provides advanced knowledge and practical tools for navigating the dynamic world of international finance. The course explores the complexities of multinational financial management, delve into exchange rate determination theories, master international trade and investment strategies, and gain insights into the global monetary system.

Learning Outcomes:

1. Analyze the financial management strategies employed by multinational corporations (MNCs) in a globalized environment.
2. Apply economic theories and models to understand the factors influencing exchange rate fluctuations.
3. Implement international arbitrage techniques to capitalize on global market inefficiencies.
4. Develop sound investment and financing strategies for international operations.

Modules:

1. Multinational Financial Management

Business strategies and structures for international operations; Methods for conducting international business (exporting, importing, FDI); International flow of funds: Balance of Payments, trade flows, capital flows, and facilitating agencies; Global Financial Risks: Political, economic, and currency risk management in international finance.

2. Exchange Rate Determination

Purchasing Power Parity Theory and Floating Exchange Rate Experience; Modern Models of Exchange Rate Determination; The Portfolio Balance Model; Empirical Evidence on Exchange Rates; Fixed, Floating and Managed Exchange Rates; Exchange Rate Forecasting Techniques: Understanding market analysis methods for predicting exchange rate movements.

3. International Arbitrage and Interest Rate Parity (IRP)

Locational Arbitrage; Triangular Arbitrage; Covered Interest Arbitrage, Interest Rate Parity (IRP), Variation in Forward Premiums; Hedging Strategies: Leveraging financial instruments to mitigate foreign exchange risk.

4. International Investment and Financing

International cash management strategies for MNCs; Portfolio investment decisions in a global context; Capital budgeting techniques for foreign investment projects; International long-term financing options (equity, debt); Cross-border Mergers and Acquisitions (M&A) Financial considerations for international M&A transactions.

5. The International Monetary System

The role of international institutions (IMF, World Bank) in global financial stability; International financial crises and their impact on global markets; Financial Globalization: Opportunity and Crisis; Developing Countries: Growth, Crisis, and Reform

Core texts

Pilbeam, Keith. International finance. Bloomsbury Publishing, 2023.

Krugman, Paul R., Maurice Obstfeld and Marc Melitz. International economics: Theory and policy. Pearson Education, 2022

Levi, Maurice D. International finance. Routledge, 5th Ed

Behavioural Finance

This course explores the psychology of financial decision-making, delving into the biases and heuristics that influence investors and market behavior. We will challenge the traditional assumptions of rationality in financial markets, analyze how emotions and cognitive limitations impact investment choices, and explore practical applications of behavioral finance in managing your own portfolio and understanding broader market trends.

Learning outcomes

1. Critically evaluate the limitations of the Efficient Market Hypothesis and the role of behavioral finance in explaining market anomalies.
2. Identify and analyze key cognitive and emotional biases that influence investor behavior.
3. Apply behavioral finance principles to real-world investment scenarios, developing strategies to mitigate bias and make sounder financial decisions.
4. Evaluate the ethical implications of behavioral biases in financial markets and propose solutions for promoting investor well-being.

Modules

1. Foundational Theories of Behavioural Finance

Decision making and human behaviour; Assumptions and foundation of Behavioural finance; Kahneman and Tversky, Thaler, Shiller; Challenges to Efficient Markets Hypothesis; Emotional Factors and Social Forces; Neuroscientific and Evolutionary Perspective; Prospect Theory and Mental Accounting; Overconfidence and Representativeness

Case Study: Application of Foundational Theories in Real-world Scenarios

2. Limits to Arbitrage and Market Anomalies, Stock Returns and the Equity Premium

Understanding Arbitrage and its Limits; Market Anomalies: Types, Causes and Implications; Stock Returns and the Equity Premium Puzzle;

Case Study: Analysis of Market Anomalies and Stock Returns

3. Theories of Behavioural Finance

Heuristics and Biases in Financial Decision Making; Investor Sentiment and Market Behaviour; Behavioural Asset Pricing Models;

Case Study: Application of Behavioural Finance Theories in Investment Strategies

4. Behavioural Biases

Cognitive Biases in Finance: Overconfidence, Anchoring, Confirmation Bias;

Emotional Biases in Finance: Loss Aversion, Regret Aversion, Endowment Effect

Other Investment biases

Case Study: Impact of Behavioural Biases on Investment Decisions

5. Behavioural Corporate Finance

Behavioural Aspects of Investment, Financing, and Payout Policies; Corporate Governance and Managerial Biases; Behavioural Factors in Mergers and Acquisitions

Case Study: Application of Behavioural Finance in Corporate Decision Making

Core texts

Ackert, Lucy, and Richard Deaves. "Behavioral finance: Psychology, decision-making, and markets."

Thaler, Richard H., ed. *Advances in behavioral finance, Volume II*. Princeton University Press,

Montier, J. *Behavioural investing: a practitioner's guide to applying behavioural finance*. John Wiley & Sons.

Financial Engineering

Course Objective: The objective of this course is to provide students with a comprehensive understanding of financial engineering principles and their practical applications. The course will focus on the quantitative and analytical skills necessary to understand and apply financial engineering concepts in real-world scenarios. The course will cover a range of topics, including derivative pricing, portfolio optimization, risk management, and the role of financial engineering in the broader financial industry.

Learning Outcomes:

1. Understand and apply the fundamental concepts of financial engineering, including derivative pricing, portfolio optimization, and risk management.
2. Develop and implement quantitative models for financial products and understand their applications in the financial industry.
3. Analyze and manage financial risks using various financial engineering tools and techniques.
4. Understand the role of financial engineering in the broader context of the financial industry and its impact on financial markets.

Modules:

1. Overview of Financial Engineering:

Changing Environment and Increasing Price Risks, Financial analysis vs financial engineering, Financial Engineering as a response to Increased Risks, Knowledge base of a financial engineer-mathematical & statistical skills, Modelling skills, Product Knowledge, knowledge of relevant technology, accounting, tax and legal; Types of Risks and Risk Management, Tools of Risk Management; Discussion on existing financial instruments; Other Innovations and recent trends: Debt Market Innovations, Mortgage-Backed Securities, Hybrid Securities, Asset-Liability Management, Exotic Options, Synthetic Instruments, Developments in Equity-Based Strategies, Direct and Cross Hedges

2. Derivative Pricing

Pricing of Futures and Forwards: Understanding the pricing mechanisms of futures and forwards.

Pricing of Options: Introduction to the Binomial and Black-Scholes Models for option pricing.

Pricing of Swaps: Understanding the pricing and valuation of interest rate and currency swaps.

Numerical Methods in Derivative Pricing: Introduction to numerical methods used in derivative pricing.

3. Equity Derivatives

Modeling Volatility; Local volatility models; Stochastic volatility models; Modeling Jumps; Poisson process; Merton jump-diffusion model; Affine stochastic volatility jump (ASVJ) model; Calibration and Monte Carlo implementation of jump models

5. Advanced Topics in Financial Engineering

Exotic Options and Structured Products: Understanding the pricing and valuation of exotic options and structured products.

Interest Rate Models and Fixed Income Derivatives: Introduction to interest rate models and fixed income derivatives.

Credit Derivatives and Securitization: Understanding the concepts of credit derivatives and securitization.

Computational Finance and Machine Learning in Finance: Introduction to the use of computational finance and machine learning in financial engineering.

References

1. Lyuu, Yuh-Dauh. Financial engineering and computation: principles, mathematics, algorithms. Cambridge University Press, 2002.
2. Beaumont, Perry H. Financial Engineering Principles: a unified theory for financial product analysis and valuation.. John Wiley & Sons, 2004.
3. Neftci, Salih N. Principles of financial engineering. Academic Press, 2008.
4. Marshall Financial Engineering, Pearson Education India 2015
5. Zopounidis, Constantin, Michael Doumpos, and Panos M. Pardalos, eds. Handbook of financial engineering. Vol. 18. Springer Science & Business Media, 2010.

Financial Analytics and Big data

Course Objective: The key objective of this course is to familiarize the students on various financial analytics tools and applications. The course will introduce various machine learning techniques and other algorithms used both supervised and unsupervised learning methods. These techniques will be applied in various scenarios in consumer behaviour, portfolio analysis, commodity prices and Risk evaluation.

Learning outcomes

1. Apply machine learning techniques for financial analysis
2. Extract insights from financial data for informed decision-making
3. Evaluate financial risk using quantitative methods
4. Predict financial outcomes using various models

Modules

1. Financial Analytics Techniques

Unsupervised learning- K-means, tSNE, PCA, ICA, SOM, Auto Encoders;

Supervised learning- Decision trees, ELM, RF, ANN, DNN, SVM, KNN, Naïve Bayes

2. Consumer Behaviour

B2C and B2B- Base analysis; X-sell; Growth and shrinkage analysis; Entity value analysis;

Rule based algorithms, K- means, tSNE, SOM, U- MAP;

3. Portfolio Analysis

Stock Selection models- Canslim, value based, volatility based selection; inter- market analysis; Alpha, beta

4. Commodity Prices

Price prediction, direction prediction; anomaly detection and prediction;

5. Risk

Credit risk- approval risk, behavioural risk, scoring models

Risk in portfolios, probability of loss, probability of default, Loss give Default, Exposure to Default, VaR

Operational risk

Machine Learning models in Finance

Course objective: This course provides a comprehensive introduction to Machine Learning (ML) techniques and their practical applications across various domains. Students will gain theoretical knowledge of core ML algorithms and hands-on experience applying them to real-world case studies using RapidMiner. While the focus is on using RapidMiner, assignments may involve implementing specific algorithms in Python to solidify understanding.

Learning Outcomes:

1. Explain the fundamental concepts of Machine Learning and various ML algorithms.
2. Apply appropriate ML techniques to solve problems in different domains using RapidMiner.
3. Analyze and interpret results obtained from ML models.
4. Critically evaluate the strengths and limitations of different ML algorithms.
5. Gain practical experience working with real-world case studies using a user-friendly ML platform.

1. Machine Learning and Use Cases in Finance

Dimensionality reduction and ensemble methods; Artificial Neural Networks and Deep Learning

Credit Scoring

Fraud Analytics

Automobile Insurance Premium Prediction

Analysis of Stock Market Indices

Case Study: Application of Machine Learning in Finance

2. Machine Learning and Use Cases in Sales and Marketing

Product Propensity

Association Rule Mining

Market Segmentation

Case Study: Application of Machine Learning in Sales and Marketing

3. Natural Language Processing (NLP) for Finance

Text Analysis Techniques for Financial News and Sentiment Analysis

Topic Modeling and Identifying Market Trends from News Data

NLP for Regulatory Compliance and Document Processing

Case Study: Analyzing Earnings Calls and Investor Sentiment using NLP5. Deep Learning for Finance

4. Deep Learning for Finance

Introduction to Deep Learning Architectures (Convolutional Neural Networks, Recurrent Neural Networks)

Financial Time Series Forecasting with LSTMs

Deep Learning for Image Recognition in Finance (e.g., Document Fraud Detection, Algorithmic Trading Signals)

Case Study: Stock Price Prediction using Deep Learning Model

5. Machine Learning in Asset Pricing

Classical linear factor models; Kernel methods and Gaussian processes for non-linear factor modelling; Ensemble Methods for Asset Pricing-Bagging, boosting, and random forests for combining multiple models; Hierarchical clustering and nested clustered optimization; Improving portfolio construction using ensemble methods; Deep Learning for Asset Pricing

The University shall offer electives based on the student demand and faculty availability. The syllabus of such courses shall be prepared by the faculty and approved by the Vice Chancellor and ratified by the Curriculum Advisory Committee.

Prepared in May 2024.