

Course title: Time series and regression analysis				
Course code: MPE 178		No. of credits: 4	L-T-P: 42-0-28	Learning hours: 56
Pre-requisite course code and title (if any): MPE 172 or equivalent				
Department: Department of Policy Studies				
Course coordinator: Dr. Kavita Sardana			Course instructor	
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Course type: Elective			Course offered in: All semesters	
Course description: The aim of this course is to provide students with the essential expertise to handle modern time series techniques. Idea is to introduce students to comprehensive set of tools and techniques for analysing various forms of univariate and multivariate time series and for understanding the current literature in applied time series. After the course students will also be able to appreciate and apply key concepts of estimation and forecasting in a time series context. Endeavor will be to provide simple examples that illustrate how the theoretical results are used and applied in Practice.				
Lab Practicals This course places heavy emphasis on solving computer exercises. Practicals will involve applications from the fields of macroeconomics with a focus on issues relating to environment and resource.				
Course objectives:				
1. To understand violation of classical linear model assumptions when continuous random variables change over time.				
2. To learn about theoretical and empirical solutions when assumptions are violated.				
Course contents				
Module	Topic	L	T	P
1	Theory of Univariate Time Series 1. Model Specification 1.1 Normal (Gaussian) White Noise 1.2 AR (1) Process 1.3 Random Walk 1.4 Unit Root Process 1.5 AR (2) Process 1.6 AR(p) Process 1.7 MA (1) process 1.8 ARMA(p) process 1.9 Weakly Dependent processes or integrated of order zero 1.10 Integration of order one 2. Efficiency and Inference 2.1 Testing for First Order Autocorrelation 2.2 Testing for Serial Correlation in the Presence of Lagged Dependent Variable 2.3 Testing for Serial Correlation with Strictly Exogeneous Regressors 2.4 Testing for Higher Order Serial Correlation 2.5 Correcting for Serial Correlation with First Order Autocorrelation, Lagged dependent Variable, and Strictly Exogeneous Regressor 2.6 Serial Correlation Robust Inference after OLS 2.7 Testing for Heteroskedasticity 2.8 Autoregressive Conditional Heteroskedasticity (ARCH and GARCH models) 2.9 Heteroskedasticity and Autocorrelation (HA) in Regression Models 2.10 Heteroskedasticity and Autocorrelation Corrected Inference (HAC)	14		6
2	Theory of Multivariate Time Series 1. Cointegration Analysis 1.1 The Engel-Granger (EG) Approach	7		4

	1.2 The Johansen Approach 1.3 Identification of the beta coefficient and Restriction Tests: With one or more cointegrating vector(s) 1.4 Vector Error Correction Models (VECM)			
3	The Econometric Forecasting: Theory and Application 3.1 Modelling Trends, Seasonality and Cycles 3.2 Graphic Method of Forecasting 3.3 One-step-ahead forecast 3.4 Point forecast 3.5 Forecast Interval 3.6 Vector Autoregressive Model 3.7 Granger Causality 3.8 Scenarios Analysis and Impulse Response Functions	21		18
	Total	42		28
Evaluation criteria: Written Examination (Test 1) 12.5% [Module 1] Written Examination (Test 2) 12.5% [Module 2] Lab Practical (Test 3) 25% [Modules 1-3] Major Exam (Test 4) 50% [Modules 1-3]				
Learning outcomes: After completing this course, the students will be able to <ol style="list-style-type: none"> 1. Distinguish problems in econometrics relating to cross-section and time series [Tests 1-2 and Test 4] 2. To theoretically and empirically formulate problems that can be resolved using time series analysis [Test 3] 3. Proficiency in use of statistical package [Test 3] 				
Materials: Core Reading <ol style="list-style-type: none"> 1. Wooldridge, J.M., 2015. <i>Introductory econometrics: A modern approach</i>. Nelson Education. Chapter 10-12 and 18 Other Readings Module 1 and Module 2 <ol style="list-style-type: none"> 1. Stock, J.H. and Watson, M.W., 2007. <i>Econometrics</i>. Addison Wesley. Chapter 12-16 2. Greene, W.H., 2003. <i>Econometric analysis</i>. Pearson Education India. Chapter 11, 12, 19, 20 				
Student responsibilities: Attendance, feedback, discipline: as per university rules.				

Course reviewers:

1. Prof. Bharat Ramaswami Indian Statistical Institute
2. Prof. Abhiroop Mukhopadhyay, Indian Statistical Institute