Department of Economics

Course Name: Time Series Econometrics		
Semester: Spring 2023		
Course Code: Econ 403	**Course Type:** Elective	**Course Credits:** 3 (3-0)
Class Timings: 14:00 – 15:15 **Tuesday & Thursday**	**Section:** A	**Place:** E214
Instructor Name: Dr. Tanvir Ahmed		**Pre-requisites:** Econ 300

A Note from the Instructor:
I have been an HEC Approved Ph.D. supervisor since 2017, and have more than 19 years of teaching and research experience in various Pakistani Universities. Before joining as Professor of Economics, I served as Associate Professor at Forman Christian College (A Chartered University), Lahore, Assistant Professor and Lecturer at Government College University, Faisalabad, and Lecturer at University of Agriculture, Faisalabad. I taught several courses at undergraduate and postgraduate levels in FCC. Besides teaching, I supervised research theses of M.Sc. Economics and MPhil Applied Economics students on various socioeconomic issues, published/presented articles in various international and national journals/conferences, and worked as PI/Co-PI in research projects funded by national and international agencies. I traveled abroad several times during my professional career to share my research with international scholars and get training from them.

Instructor Contact Details

Office Location: Business and Social Sciences Building, Room # 006

Email: tanvirahmed@fccollege.edu.pk

Website: https://sites.google.com/site/tanvirahmedphd/

Other: 042-99231581-88 Ext. 400

Office Hours (face to face and/ or online): Monday, Wednesday & Friday (09:30 -10:45)
                         Monday & Wednesday (12:00 – 12:45)
                         or by appointment

Guidelines for online office Hours: Zoom meetings can be arranged at the student's request during the stipulated time for office hours. A student will email at least an hour before the meeting to access a personalized zoom link for online discussion during office hours.

Course Description:
This introductory course in time series econometrics will focus on the theoretical underpinnings and assumptions underlying the methods. It is a theoretical course but will use computer software to illustrate the application of introduced methodologies. Topics related to time-series econometrics, i.e., dynamic econometric models, autoregressive and distributive lag models, estimation of autoregressive models, causality in

economics, approaches to forecasting, ARMA and ARIMA modeling, estimation of volatility in financial time series, ARCH and GARCH models, vector auto-regressive (VAR), co-integration and error correction modeling will be covered in this course.

Pre-requisites: Econ 300

Mode of Instruction (Asynchronous/Synchronous):
- On-campus class (synchronous)
- Email and moodle (asynchronous)

Main Mode of Instruction: In-person, email, Moodle

Technology Requirements:
- Moodle/email will be the mode of communication with students to assign tasks and activities.
- Lectures will be delivered in class for students by using a whiteboard/projector.
- Students should access their official email and moodle account regularly.
- Submission of activities will be made through moodle or email, or by hand.

Considerations for Students with Limited Internet/Technology Access: Students with limited internet facilities can access the teaching material through their email and moodle accounts.

Course Objectives
The course is designed for students to
1. Understand the stationary and non-stationary time series data
2. Describe the dynamic econometric models, autoregressive and distributive lag models, ARMA and ARIMA, ARCH and GARCH, vector auto-regressive, co-integration, and error correction modeling.
3. Apply appropriate estimation techniques to time series data.
4. Analyze real-time series data by using Eviews.

Student Learning Outcomes (SLOs):

On the successful completion of this course, students can:
1. Differentiate between stationary and non-stationary time series data
2. Elaborate autoregressive, moving average, ARMA, ARIMA, ARCH, and GARCH models.
3. Explain the dynamic and distributive lag models
4. Estimate vector auto-regressive, co-integration, and error correction modeling.
5. Select appropriate estimation technique for time series data.
6. Use Eviews to analyze real-time series data.

Course Content, Learning Material & Activities Schedule

The schedule is tentative because it is not possible to anticipate exactly how much time each topic will require. Please check out the online resources and alternate options for instructional tasks as linked below.

Wk	Course Objectives/ Student Learning Outcomes (SLOs)	Topic/ Title	Instructional Material (OERs) & Relevant Technology (material or links or videos etc)	Assessment & Rubrics (with the due date)	Teaching-Learning Activities

1		Introduction and rapport building, Brief introduction to the course, Types of data, Time series econometrics, Basic options in Eviews	Asteriou, Chapter 2 & 3		Lecture/ Discussion
2	SLO - 1	Basic concepts in time series econometrics, Stochastic processes, Stationary processes, Purely random processes, Non-stationary processes, Integrated variables, Random walk models, Deterministic versus stochastic trends in economic time series, Trend stationary and difference stationary processes	Gujarati, Chapter 21 Brooks, Chapter 8 Time series data https://www.youtube.com/watch?v=quEVYlIsVKM&list=PL3FE7gBXZjSJk88TVlx_bRPxYjj7aXX9H&index=74 Stationarity in Time Series https://www.youtube.com/watch?v=xbzJp78kOiI&list=RDCMUC2XO4HDxzfMOZIV1l795g1Q&index=4		Lecture/ Class activity/ Discussion/ Videos
3	SLO – 1, 5 & 6	Graphical analysis, Autocorrelation function and partial autocorrelation function, Correlogram, Unit root test (Dickey-Fuller test, Augmented-Dickey Fuller test, The Philips-Peron test)	Asteriou, Chapter 16 Gujarati, Chapter 21 Brooks, Chapter 8 Unit Root, Stochastic Trend, Random Walk, Dicky-Fuller test in Time Series https://www.youtube.com/watch?v=jAa8Wu3pwOE&list=RDCMUC2XO4HDxzfMOZIV1l795g1Q&index=3 Augmented Dickey-Fuller Test https://www.youtube.com/watch?v=ovpHuz6YMLc&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=54	Quiz 1 (Wk - 3, Thursday)	Lecture/ Assessment/ Class activity/ Discussion/ Video
4	SLO – 2, 5 & 6	First-order, second-order, and p-th order autoregressive process (i.e., AR(1) model, AR(2) model, AR(p) model), Properties of the autoregressive models, Estimation of AR models	Asteriou, Chapter 13 Brooks, Chapter 6 Gujarati, Chapter 22 Time series analysis AR, MA, ARMA, ARIMA https://www.youtube.com/watch?v=Aw77aMLj9uM&list=RDCMUC2XO4HD		Lecture/ Class activity/ Discussion/ Video

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5	SLO – 2, 5 & 6	First-order and higher-order moving average models (i.e., MA(1) and MA(q) model), Properties of moving average models, Estimation of MA models	Asteriou, Chapter 13 Brooks, Chapter 6 Gujarati, Chapter 22		Lecture/ Class activity/ Discussion
6	SLO – 2, 5 & 6	ARMA (1,1), ARMA(p, q) models, Box-Jenkins approach for ARIMA model (Identification, estimation and diagnostic checking), Estimation of ARMA models	Asteriou, Chapter 13 Brooks, Chapter 6 Gujarati, Chapter 22 ARIMA https://www.youtube.com/watch?v=GytfzaIr2iM&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=18 https://www.youtube.com/watch?v=U7romRtaduE&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=19 https://www.youtube.com/watch?v=RhjqqessLqg&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=20 https://www.youtube.com/watch?v=vLhbVakW-QM&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=21	Assignment 1 (Wk - 7, Tuesday)	Lecture/ Assessment/ Class activity/ Discussion/ Video
7	SLO – 3, 5 & 6	Autoregressive and distributed-lag models, The role of "time," or "lag," in economics, The reasons for lags, Estimation of distributed-lag models, The Koyck approach to distributed-Lag models, Rationalization of the Koyck Model: The adaptive expectations model	Asteriou, Chapter 10 Gujarati, Chapter 17 Dynamic Models https://www.youtube.com/watch?v=kVXPwfoMPJM&list=PLNKHLr7tsvPw3K9F3ZycKbGIfMBwIeSnJ&index=4&t=0s ARDL https://www.youtube.com/watch?v=tRIVTIQYcHw&list=PL92YnqQQ1gbhUV	Quiz 2 (Wk - 7, Thursday)	Lecture/ Assessment/ Class activity/ Discussion/ Video

			YZnIzIDzYt3TG4j75Do&index=30		
8	SLO – 3 & 5	Another Rationalization of the Koyck Model: The Stock Adjustment, or Partial Adjustment Model	Asteriou, Chapter 10 Gujarati, Chapter 17	**mid-exam (Wk – 8, Tuesday)**	Lecture/ Assessment/ Class activity/ Discussion
9	SLO – 3 & 5	Estimation under Partial Adjustment model, Combination of Adaptive Expectations and Partial Adjustment Models, Estimation of autoregressive models, The method of instrumental variables	Asteriou, Chapter 10 Gujarati, Chapter 17		Lecture/ Class activity/ Discussion
10	SLO – 2 & 5	ARCH and GARCH processes, An empirical application of ARCH and GARCH model, Estimation of ARCH and GARCH models	Asteriou, Chapter 14 Brooks, Chapter 9 ARCH vs GARCH (The Background) https://www.youtube.com/watch?v=B-fYft6b4nE&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=13 ARCH Modeling https://www.youtube.com/watch?v=2iGMdxTx3z8&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=14 https://www.youtube.com/watch?v=FEKCsM51bUM&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=15 https://www.youtube.com/watch?v=a3Io0doMwXk&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=16	Quiz 3 (Wk – 10, Thursday)	Lecture/ Assessment/ Class activity/ Discussion/ Video

11	SLO – 2 & 5	The ARCH-M model, Additional properties of GARCH processes, Other models of conditional variance	Asteriou, Chapter 14 Brooks, Chapter 9 Modelling Volatility and Economic Forecasting https://www.youtube.com/watch?v=n2GXY4JWgNQ&list=PLNKHLr7tsvPw3K9F3ZycKbGIfMBwIeSnJ&index=6&t=0s		Lecture/ Class activity/ Discussion/ Video
12	SLO – 4, 5 & 6	The VAR models, Structure, Pros, and cons of the VAR models, Granger causality test and VAR model, Estimation of VAR	Asteriou, Chapter 15 Brooks, Chapter 7 Gujarati, Chapter 22 VAR and VEC Models https://www.youtube.com/watch?v=XK3cEJw93jA VAR https://www.youtube.com/watch?v=GI44mOtsNxM&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=35	Assignment 2 (Wk-13, Tuesday)	Lecture/ Assessment/ Class activity/ Discussion/ Video
13	SLO – 4, 5 & 6	Co-integration and Error Correction Mechanism, Testing for cointegration in a single equation, Drawbacks of Engle-Granger approach, Estimation of cointegration under Engle-Granger	Asteriou, Chapter 17 Brooks, Chapter 8 Cointegration https://www.youtube.com/watch?v=TWUNfSkEfFA&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=53 https://www.youtube.com/watch?v=TB4m9M1sIJ0&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=52 https://www.youtube.com/watch?v=xpBmXkz1jAg&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=51 ARDL-VECM https://www.youtube.com/watch?v=esI_ww51ItM&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=22	Quiz 4 (Wk – 13, Thursday)	Lecture/ Assessment/ Class activity/ Discussion/ Video

			https://www.youtube.com/watch?v=hvJ6VZQlw5c&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=23 https://www.youtube.com/watch?v=yv5vwQhmH2Y&list=PL92YnqQQ1gbhUVYZnIzIDzYt3TG4j75Do&index=29		
14	SLO – 4, 5 & 6	Advantages of cointegration under multiple equation approach, Steps of Johansen approach, Estimation under Johansen approach	Asteriou, Chapter 17 Brooks, Chapter 8		Lecture/ Class activity/ Discussion
15			Final Exam		

Textbooks, Materials, Supplies and other
Recommended Book:
- ➢ Asteriou, D. and S. G. Hall (2021) *Applied Econometrics*, Fourth Edition, Macmillan Education Limited.
- ➢ Brooks, C. (2019) Introductory Econometrics for Finance, Fourth Edition, Cambridge University Press.
- ➢ Gujarati, N. D., Porter, D. C. and Gunasekar, S. (2017) *Basic Econometrics*, 5th Edition, Mcgraw.

Course Requirements:
Assignments: Assignments will be handed over to students after completing the topic. It will be based upon the topics covered in the classes and will include end chapter questions and instructor-designed questions. Students will prepare a handwritten document for each assignment after its notification and submit its solution within the due date. Late submissions without valid justification will not be accepted.

All students will abide by University Academic Integrity policies for assignments. Any violation (cheating during assessment, plagiarism, falsifying the data) by the student will be reported to the Academic Integrity Committee.

Quizzes & Exams:
Quizzes will be conducted on the announced date.
Students will ensure their presence in quizzes, midterm, and final exams.
Students should not use any helping material in exams. Copying in exams will result in an F grade.
The course covered in the midterm exam will also be included in the final term exam.

Make-Ups:
No make-up quiz and final exam will be arranged for students who miss them on scheduled days. However, the mid-exam will be arranged for students who face family or personal emergencies and will notify it to me within 24 hours afterward.

Grading Legend
Below is the grading legend of FCCU (published in all catalogues and available on the FCCU website) as approved by the Academic Council

Grades	Quality Points	Numerical Value	Meaning
A	4.00	93-100	Superior
A-	3.70	90-92	
B+	3.30	87-89	Good
B	3.00	83-86	
B-	2.70	80-82	
C+	2.30	77-79	Satisfactory
C	2.00	73-76	
C-	1.70	70-72	
D+	1.30	67-69	Passing
D	1.00	60-66	
F	0.00	59 or below	Failing
NS	0.00	0.00	Did not show up in class
W	-	-	Officially Withdrawn
AW	-	-	Administrative Withdrawal/Dismissal
AU	-	-	Audit/Listener Status
I	-	-	Incomplete

The entire course is worth 100%, the breakup is as follows:

Assignments:	15% (2 Assignments)
Quizzes:	20 % (4 Quizzes)
Midterm exam:	30 %
Final term exam:	35 %
TOTAL	100%

Attendance Policy:
Students should attend all lectures. Those students whose attendance falls below 70% will not be allowed to sit in the final examination. Attendance will be marked before the start of the lecture and will not be marked after the lecture.

'Out-of-class' Study Requirements:

Students should

- Check their email and Moodle accounts frequently.
- Follow the course outline and read the topic from the recommended text/PPTs/handouts.
- Revise their class lecture regularly to secure a good grade.
- Visit me during office hours if they have any problems during lectures and out of the class study.

Student Conduct & Other Issues:

- Students are expected to attend class regularly.
- Be up to date with their readings.
- Be prepared to participate in class discussions.
- Students should submit assignments within due dates.
- Students must keep their cell phones in silent mode during the class.

Please ask questions in class or during office hours if you have any problems. Do not wait until just before an exam to ask questions. Schedule an appointment if you need extra time than the class or office hours.

Changes to the Syllabus:

This syllabus was designed to convey course information and requirements as accurately as possible. It is important to note however that it may be subject to change during the course depending on the needs of the class and other situational factors. Such changes would be for your benefit and you will be notified of them as soon as possible.

Student Support Services

Students can contact the Campus Counseling Center at 0331-444-1518 or ccc@fccollege.edu.pk.

Writing Center
Mercy Health Center

Other Useful Policy Documents:

Sexual Harassment Policy
Anti-Corruption Policy
Academic integrity
Plagiarism Policy
Academic Calendar

I expect that you will strictly follow the core values of FCCU and put your entire efforts to learn as per the course requirements, attend classes, read the textbook(s)/other assigned reading material and do the assignments in the stipulated time period