Course Outline

Course Code : BSE3703
Course Title : AI-Augmented Econometrics for Business
Semester : Semester 1, Academic Year 2026-27
Faculty : School of Business
Department : Strategy & Policy
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Overview

This course is designed to impart to students the highly valued competency to build econometric models — a widely used statistical technique to analyse and quantify the effects of real-world variables in the business context. Building on fundamental econometric modelling, students will acquire the practical skills required to develop rigorous econometric models to corporate benchmark standards and will additionally develop fluency in leveraging AI tools to enhance analytical productivity and decision-making.

A central feature of this curriculum is the integration of AI-powered tools and workflows throughout the course. AI tool usage is embedded within existing topic weeks rather than isolated in standalone sessions, ensuring that students develop practical AI fluency in direct conjunction with core econometric concepts. Students will work with industry-benchmark platforms — including ChatGPT (GPT-4o) for model diagnostics and interpretation, Claude for code generation and debugging, and as the primary analytical engine, complemented by Python/Stata for established econometric workflows. These competencies directly signal readiness for digital transformation roles in industry.

Effective use of real-world case studies is embedded across all topics to reconcile textbook theory with applied practice. Topics include regression models; the use of dummy and instrumental variables; implications of heteroskedasticity, multicollinearity, endogeneity and non-stationarity; statistical approaches to correct for bias; and AI-assisted model selection and diagnostics. Notably, students will learn to design and implement an end-to-end AI-augmented econometric workflow — covering data preparation, model specification, AI-assisted diagnostics, and critical output validation — developing data-driven decision systems applicable across finance, marketing, supply chains, and operations in the business world.

Course Objectives

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

- understand the fundamental concepts behind econometric modelling;
- understand the assumptions behind econometric modelling;
- explain the properties of OLS estimators in econometric models;
- interpret the regression output of econometric models;
- build econometric models for business decision making using AI-augmented workflows;
- apply dummy variables and instrumental variables effectively in econometric models;
- apply appropriate AI tools and workflow approaches to detect and correct for bias in models (which includes heteroskedasticity, multicollinearity, endogeneity, non-stationarity etc.);
- apply appropriate AI tools — including ChatGPT (GPT-4o), Claude and Python/Stata — to enhance productivity, support model development, and improve analytical efficiency in econometric modelling, while critically evaluating their outputs for accuracy, limitations, and potential misuse;

- evaluate the limitations and failure modes of LLMs when applied to econometric tasks, including hallucination of statistical outputs, sensitivity to prompt framing, inability to assess data context, and constraints in causal reasoning; and
- apply critical judgment in assessing AI-generated econometric outputs, distinguishing between AI-assisted efficiency gains and the irreplaceable role of human statistical reasoning in model specification, validation, and interpretation.

General Guide & Reading

Core Textbook

Stock J.H., and Watson M.W. Introduction to Econometrics 4th ed. Pearson.

AI-Specific Reading:

Ludwig J., Mullainathan S., and Rambachan A. Large Language Models: An Applied Econometric Framework. Becker Friedman Institute Working Paper No. 2025-10. University of Chicago, 2025. Available at: https://arxiv.org/abs/2412.07031

(This paper provides an econometric framework for using LLMs in empirical research, covering the conditions under which LLM outputs yield valid estimates, the risks of training data leakage, and the requirement for validation samples. It is directly applicable to the critical evaluation objectives of this course.)

Assessment

Assessment Components	Weightage
Class Participation	10
Midterm Test	30
Group Project and Presentation	30
Final Test	30

Academic Honesty & Plagiarism

Academic integrity and honesty is essential for the pursuit and acquisition of knowledge. The University and School expect every student to uphold academic integrity & honesty at all times. Academic dishonesty is any misrepresentation with the intent to deceive, or failure to acknowledge the source, or falsification of information, or inaccuracy of statements, or cheating at examinations/tests, or inappropriate use of resources.

Plagiarism is "the practice of taking someone else's work or ideas and passing them off as one' own" (The New Oxford Dictionary of English). The University and School will not condone plagiarism. Students should adopt this rule - You have the obligation to make clear to the assessor which is your own work, and which is the work of others. Otherwise, your assessor is entitled to assume that everything being presented for assessment is being presented as entirely your own work. This is a minimum standard. In case of any doubt, you should consult your instructor.

Additional guidance is available at:

- http://www.nus.edu.sg/registrar/administrative-policies-procedures/acceptance-record#NUSCodeofStudentConduct
- http://nus.edu.sg/osa/resources/code-of-student-conduct

Schedule and Outline

Lesson/ Week	Date	Topic	Chapter	Activity (preparation / cases & assignments / follow-up readings & resources)
1	12 Aug 2026	Technical Background	2, 3	General Guide & Reading
2	19 Aug 2026	Simple Linear Regression	4	General Guide & Reading
3	26 Aug 2026	Multivariate Regression Model: AI-Assisted Model Building and Interpretation	6	General Guide & Reading
4	2 Sep 2026	Hypothesis Testing and Inference: Prompt-Guided Statistical Inference and Validation	7	General Guide & Reading
5	9 Sep 2026	Dummy Variables and Properties of OLS Estimators: AI-Augmented Specification and Diagnostics	5.3	General Guide & Reading
6	16 Sep 2026	Heteroskedasticity: AI-Assisted Detection, Correction and Robust Estimation	5.4	General Guide & Reading
7	30 Sep 2026	Midterm Test		
8	7 Oct 2026	Multicollinearity: AI-Driven Diagnosis and Variable Selection	6.7	General Guide & Reading
9	14 Oct 2026	Endogeneity Bias and Instrumental Variables: Human-Led Causal Reasoning with AI Support	12	General Guide & Reading
10	21 Oct 2026	Time Series and Stationarity: AI-Augmented Trend Detection and Unit Root Testing	15	General Guide & Reading
11	28 Oct 2026	Autocorrelation and Nonlinear Regression Function: AI-Assisted Correction and Functional Form Selection	15, 8	General Guide & Reading
12	4 Nov 2026	Group Project Presentation		
13	11 Nov 2026	Final Test		

Note on AI Tool Use and Academic Integrity: Students are expected to document all AI tool usage transparently in submitted work, identifying which outputs were AI-generated and how they were validated. Uncritical reproduction of AI-generated results without human verification does not meet the standards of this course.