Advanced Econometric Analysis

***Theoretical and Applied Advanced Econometric Analysis with STATA* is an instructor-led course. By the end of this course, you would have learnt:**

- **OLS, MLE and GMM method**
- **Qualitative Response Regression Models (Logit/Probit/Tobit/M-Logit/O Logit)**
- **Count Data Models**
- **Simultaneous-Equation Models**
- **Non-Linear Regression Models and Extensions of the Two Variable Linear Regression Model**
- **Dynamic Econometric Models**
- **Panel Data Regression Models**
- **DID Models & Quantile Regression**
- **Principal Component Analysis**
- **Linear Discriminant Analysis (In Progress)**

Approximate Training Hours: 45-50 hours spanning over the period of 5 weeks.

Prerequisites: Basic calculus, matrices, Probability distributions and Basic Econometrics.

Detailed course outline of the topics covered under Theoretical and Applied Advanced Econometric Analysis for Decision Making with STATA (*using OLS, MLE AND GMM method***):**

Topic	Details of the topic
Methods	OLS, MLE, GMM and Iteration method

Qualitative Response Regression Models	Qualitative Response Regression Models: Nature of qualitative response models, Linear Probability Model (LPM), Maximum Likelihood Estimation method, The Logit Model (Odds Ratio and Margins), The Probit Model, Multinomial Logit model (Relative Risk Ratio) and Tobit model.
Count Data Models	Poisson Regression, Negative Binomial Regression, Zero-Inflated Count Models (Zero-inflated Poisson, Zero-inflated Negative Binomial), Zero-Truncated Count Models (Zero-truncated Poisson, Zero-truncated Negative Binomial), Hurdle Models and Random-effects Count Models.
Simultaneous Equation Models	Simultaneous Equation Models- Learning about the nature of simultaneous equation model, the identification problem: Under identification, Just or Exact, Identification and Overidentification, Rules for identification (Order and Rank Condition), A test of simultaneity (Hausman Specification Test), Tests for Exogeneity. Approaches to estimation: Recursive Models and OLS, The method of Indirect Least Squares, The method of Two-Stage Least Squares (Overidentified equation) and 3SLS.
Dynamic Econometric Models	Dynamic Econometric Models- The reasons for lags, Estimation of distributed lag models: Ad Hoc Estimation, The Koyck Approach: The Adaptive Expectations Model, Stock Adjustment or Partial Adjustment Model. Estimation of Autoregressive Models, The method of Instrumental Variable, The Almon Approach to Distributed Lag Models. Causality Test (Granger Causality).
Panel Data Regression Models	Panel Data Regression Models- Why Panel Data is used, Estimation of Panel Data Regression Models: Pooled OLS, First difference, Fixed effect (within estimator), Fixed effect (LSDV), Random effect, Random coefficient model, Dynamic Panel data models (DL, ARDL).

DID Models & Quantile Regression	DID is a quasi-experimental design that makes use of longitudinal data from treatment and control groups to obtain an appropriate counterfactual to estimate a causal effect. DID is typically used to estimate the effect of a specific intervention or treatment (such as a passage of law, enactment of policy, or large-scale program implementation) by comparing the changes in outcomes over time between a population that is enrolled in a program (the intervention group) and a population that is not (the control group). **Methods- Regression Adjustment((teffects), didregress, xtdidregress** Quantile Regression. In Quantile regression models, the default form is median regression, where the objective is to estimate the median of the dependent variable, conditional on the values of the independent variables. This method is similar to ordinary regression, where the objective is to estimate the conditional mean of the dependent variable. Simply put, median regression finds a line through the data that minimizes the sum of the absolute residuals rather than the sum of the squares of the residuals, as in ordinary regression. **Stata functions- qreg, qreg with quantile and bsqreg(bootstrap)**
Non-Linear Regression Models and Extensions of the Two-Variable Linear Regression Model	Non-Linear Regression Models and Extensions of the Two-Variable Linear Regression Model- Scaling and units of measurement, Regression on standardized variables, functional forms of regression models, Log-Linear Model, Semi- Log models, Reciprocal Models. Estimating nonlinear regression model- The trial-and-Error Method, Approaches to estimating nonlinear regression models: Direct search or trial and error of derivative free method, Direct Optimization, Iterative Linearization Method.
Principal Component Analysis & Linear Discriminant Analysis	**Principal Component Analysis** with axioms for weightage and scale free method.

Note: Sooner going to add these new topics.

Count Data models and Linear discriminant Analysis (Work in Progress)

Data sets for practice

1. STATA press- Example Data sets.

2. NSSO data sets for practice from extracted rounds.

3. IHDS data set 2004-05 and 2011-12

4. NSE data sets (in progress)

5. World Bank data, (country wise and indicator wise).

6. Data sets by Wooldridge, and exercise tables from Gujarati.

References:

1. Business Statistics, 3rd Edition Norean R. Sharpe, Georgetown University Richard D. De Veaux, Williams College Paul F. Velleman, Cornell University.

2. Basic Statistics for Business & Economics by Douglas Lind & William Marchal-5th Edition

3. Statistical Analysis with Business and Economic Applications by Ya-Lun Chou, 1969 Edition.

4. A Handbook of Statistical Analyses using Stata, by Sophia & Brian, Third Edition

5. An Introduction to Stata Programming, By Christopher F. Baum, First Edition.

6. Introductory Econometrics: A Modern Approach by Wooldridge (with data sets) -2 Edition

7. Basic Econometrics by Damodar Gujarati – 4th Edition

8. All derivations from A. Koutsoyannis "Theory of Econometrics" -2nd Edition

9. Econometric Analysis by William Greene -5th Edition

10. Introduction to Econometrics, by G.S. Maddala-3rd Edition

11. Econometric Analysis of Cross Section and Panel Data, Jeffrey M. Wooldridge