Lecture Note #01 of
Econometrics I & Advanced Econometrics I (2013SY)

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Attention for students who take this class

- In this class, every student is presupposed to have basic knowledge on mathematics, in particular calculus and linear algebra, because of dealing mainly with theoretical issues.

- Please have a textbook for your own.

    Text book Hogg, McKean, and Craig (2012), Introduction to Mathematical Statistics, 7th ed., Pearson.

    Reference books Bierens (2004), Introduction to the Mathematical ans Statistical Foundations of Econometrics, Cambridge Univ. Press. Other references will be noticed in the class.

- Classes will be performed with handouts ans slides. Please give your ear to the contents I will talk.

- Almost every times, assignment (home-work) will be given. As assignments are objects of evaluation, please turn in your assignments even if they are not completed.

- Evaluation will consist of assignments (20%), mid-term exam (30%), and final exam (50%). When mid-term exam is skipped, the weight might be changed.

- The TA sesstion is planned to be held. Time, place, and other details will be noticed whenever the plan is determined. The TA is Mr. KINOSHITA, Ryo. Students are expected to attend.

- Please browse the homepage of this class
    (http://www2.econ.osaka-u.ac.jp/ takeuchi/lec13/gec1/Top_gec1_13.html)
    at least one time a week.

§ 0. Introduction

§ 0.1 What is Econometrics

Econometrics, which is called   in Japanese, is one research field of economics. This was born at early 20th century, and its word origin is,

econometrics = economics + metrics.

'Metrics movement' is one of big academic movement, which had contributed to spreading of positive science for various science fields from the end of 19th century to the beginning of 20th century. In particular, at 1920-30's the research style (methodology) which is dominated in physics has spread to non-natural science. The style is that results deducted by mathematical models should be verified by experiments. In 1930's, other than econometrics, psychometrics was born for psychology. (Psychometric society was established at 1935.

The reasons why such a research style had spread to various sciences are supposed to be following four points;

(1) A philosophy of science which supports methodology of positive science has come on: 'Logical positivism' movement (by Wiener Kreis at Austria, between two WW,), 'Falsificationism' (by K. Popper).

(2) Invention of collection methods and techniques for (observed) data. Proposing scales for observed objects which do not have outer scales such as psychological state and social attitude. (ex. Thurstone scale, Likert scale, Guttman scale.)

(3) Advancement of methods and techniques for summarizing and analysing collected data. Not only advancement of statistical methods for summarizing data and inference based on data but also development of calculation methods which can realize summary and inference by statistical methods are included in them.

(4) By assurance of predictability and relevance, they have dominated in pragmatic societies like as United States.

For the early history of econometrics, Christ (1953) noted that Irving Fisher tried to organized an academic society which promote quantitative and mathematical economics when he was vice-president of American Association for Advancement of Science, at 1910s. However, it did not realized because he had gained few advocates. In spring of 1928, Ragnar Frisch (U. Oslo) had met the mathematician Charles F. Roots (Cornell U.), and they proposed the research for the joint field of economics, mathematics, and statistics. They had joined with Irving Fisher (Yale), and established Econometric Society at December, 1930. Then, *Econometrica* was launched as its academic journal at 1933.

We can know 'econometrics' which Frish and his fellows imaged from Editor's Note in the first issue of *Econometrica*.

A word of explanation regarding the term econometrics may be in order. Its definition is implied in the statement of the scope of the Society, in Seciton I of the Constitution, which reads: "The Econometric Society is an international society for the advancement of economic theory in its relation to statistics and mathematics. The Society shall operate as completely disinterested, scientific organization without political, social, financial, or nationalistic bias. Its main object shall be to promote studies that aim at a unification of the theoretical-quantitative and the empirical-quantitative approach to economic problems and that are penetrated by constructive and rigorous thinking similar to that which has come to dominate in the natural sciences. Any activity which promises ultimately to further such unification of theoretical and factual studies in economics shall be within the sphere of interest of the Society." (*Econometrica*, Vol.1, No.1 (1933), p.1)

My interpretation of the structure of econometrics

- modeling

- statistical & probability theory (←— the contents covering in this class)

- data handling

- story

To show the reason why I will deal with statistical & probability theory, giving two examples;

example 1 Definition of the law of large numbers

example 2 Analysis on counting data.

example 3 Analysis on binary (0-1) data.

§ 0.2 The structure of this class

The main purpose of this class is to acquire foundations of probability and statistics used in econometrics. For probability theory, beginning level of measure theory will be handled. Class plan at this moment is as follows;

§ 0.   Introduction

§ 1.   The foundation of set theory

§ 2.   Probability and probability space

§ 3.   Random variable

§ 4.   Expectation (expected value)

§ 5.   Stochastic distribution

§ 6.   The law of large numbers and the central limit theorem

§ 7.   Markov chain