

**EE 325**

**Introductory Econometrics**

EE 325 (Ajarn Kaewkwan Tangtipongkul)

# Introductory Econometrics

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Textbook: Gujarati, D.N. and D.C. Poter (2009) Basic Econometrics. 5<sup>th</sup> ed. Singapore, Mcgraw-Hill



# Introduction

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- ▶ What is Econometrics?
- ▶ Methodology of Econometrics



# What is Econometrics?

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Econometrics means “economic measurement”

Econometrics based upon the development of statistical methods for estimating economic relationships, testing economic theories, and evaluating and implementing government and business policy



# Example

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- ▶ The effects of political campaign expenditures on voting outcomes
- ▶ The effect of school spending on student performance in the field of education
- ▶ The rate of change of money wages in relation to the unemployment rate (Phillips curve)
- ▶ The demand for the company's product is related to advertising expenditure

# Methodology of Econometrics

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## 8 Steps in Empirical Economic Analysis

1. Statement of Theory or Hypothesis
2. Specification of Mathematical Model of the Theory
3. Specification of the statistical, or econometric, model
4. Obtaining the data
5. Estimation of the parameters of the econometric model
6. Hypothesis testing
7. Forecasting or prediction
8. Using the model for control or policy purposes



# Statement of Theory or Hypothesis

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## Example

Keynes postulated that the marginal propensity to consume (MPC), the rate of change of consumption for a unit change in income, is greater than zero but less than 1



## Specification of Mathematical Model of the Theory

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$$Y = \beta_1 + \beta_2 X \quad 0 < \beta_2 < 1$$

Where       $Y =$  consumption expenditure  
               $X =$  income

# Specification of the statistical, or econometric model

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$$Y = \beta_1 + \beta_2 X + u$$

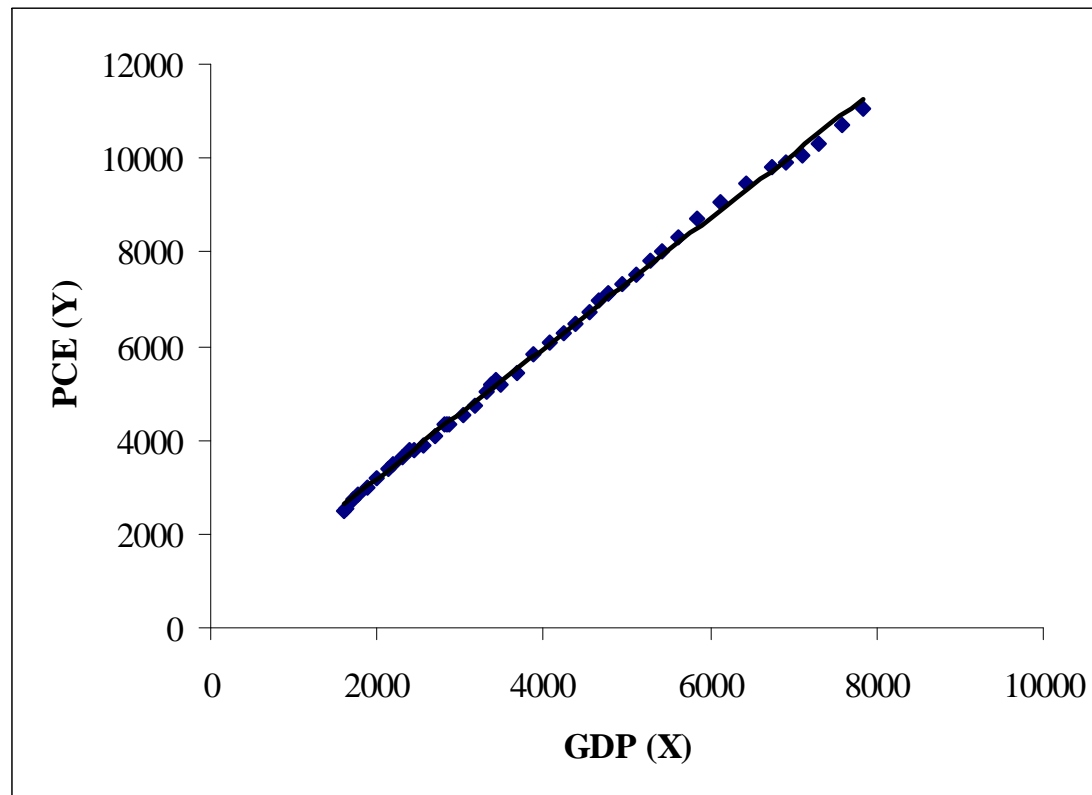
$u$  known as the disturbance or error term



## Obtaining the data

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- ▶ Aggregate personal consumption expenditure and gross domestic product from period 1960-2005 in the United States measured in billion dollars.
- ▶ The data are in real terms. They are measured in constant (2000) prices



## Estimation of the parameters of the econometric model

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$$\hat{Y}_t = -299.5913 + 0.7218X_t$$

MPC was about 0.72 – For the sample period an increase in real income of one dollar led, on average, to an increase of about 72 cents in real consumption expenditure



## Hypothesis testing (Statistic Inference)

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We must enquire whether this estimate is sufficiently below unity to convince us that this is not a chance occurrence of the particular data we have used.

In other words, is 0.72 statistically less than 1?



## Forecasting or prediction

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To illustrate, suppose we want to predict the mean consumption expenditure for 2006. The GDP value for 2006 was 11319.4 billion dollars. We obtain:

$$\begin{aligned}\hat{Y}_{2006} &= -299.5913 + 0.7218(11319.4) \\ &= 7870.7516\end{aligned}$$

Thus, given the value of the GDP, the mean, forecast consumption expenditure is about 7870 billion dollars.



The actual value of the consumption expenditure reported in 2006 was 8044 billion dollars. The estimated model thus **under predicted** the actual consumption expenditure by about 174 billion dollars. We could say that **forecast error** is about 174 billion dollars.



Suppose the president decides to propose a reduction in the income tax. What will be the effect of such a policy on income and thereby on consumption expenditure and ultimately on employment?

As macroeconomic theory shows, the change in income, a dollar's worth of change in investment expenditure is given by the income multiplier, which is defined as

$$M = \frac{1}{1 - MPC}$$

$$MPC = 0.72, M = 3.57$$

An increase (decrease) of a dollar in investment will eventually lead to more than a threefold increase (decrease) in income.

## Using the model for control or policy purposes

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Suppose we have the estimated consumption function given in

$$8750 = -299.5913 + 0.7218(GDP_{2006})$$

$$\hat{Y}_t = -299.5913 + 0.7218X_t$$

Suppose further the government believes that consumer expenditure of about 8750 billion dollars will keep the unemployment rate at its current level of about 4.2% (early 2006). What level of income will guarantee the target amount of consumption expenditure?



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An income level of about 12537 billion dollars, given an MPC of about 0.72, will produce an expenditure of about 8750 billion dollars.

By appropriate fiscal and monetary policy mix, the government can manipulate the **control variable X** to produce the desired level of the **target variable Y**



## Source

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Gujarati, D.N. (2009) Basic Econometrics. 5th ed.  
Singapore, McGraw-Hill.

