

# 1. INTRODUCTION

## (CH. 1)

### [1] What questions can we answer?

- (1) Does reducing class size improve elementary school education?
  - Estimate how much.
- (2) Is there racial discrimination in the market for home loans?
  - Estimate how much.
- (3) Cigarette taxes reduce smoking?
  - Estimate how much.
- (4) What will the GDP growth rate next year? [Back to the future?]
  - Forecasting.
- (5) Are people's consumption decisions rational?
  - Testing hypothesis.
  - True or false?

## [2] Data: Sources and Types

### (1) Experimental V.S. Observational data

- Experimental data:
  - Data from experiments.
  - EX: Tennessee class size experiments.
  - Adequate to analyze the causal effect of one variable on the other.
- Observational data:
  - Non-experimental data.
  - EX: Survey data, historical records on mortgage applications.
  - Hard to evaluate causal effects.

(2) Cross-Section Data

- Consist of multiple entities observed at a single time period

<b>TABLE 1.1 Selected Observations on Test Scores and Other Variables for California School Districts in 1998</b>				
<b>Observation (district) number</b>	<b>District average test score (fifth grade)</b>	<b>Student-teacher ratio</b>	<b>Expenditure per pupil (\$)</b>	<b>% of students learning English</b>
1	690.8	17.89	\$6,385	0.0%
2	661.2	21.52	5,099	4.6
3	643.6	18.70	5,502	30.0
4	647.7	17.36	7,102	0.0
5	640.8	18.67	5,236	13.9
⋮	⋮	⋮	⋮	⋮
418	645.0	21.89	4,403	24.3
419	672.2	20.20	4,776	3.0
420	655.8	19.04	5,993	5.0

*Note:* The California test score data set is described in Appendix 4.1.

(3) Time Series Data

- Consists of a single entity observed at multiple time periods.

**TABLE 1.2** Selected Observations on the Rates of Consumer Price Index (CPI) Inflation and Unemployment in the United States: Quarterly Data, 1959–2000.

Obervation number	Date (Year:quarter)	CPI inflation rate (% per year at an annual rate)	Unemployment rate (%)
1	1959:II	0.7%	5.1%
2	1959:III	2.1	5.3
3	1959:IV	2.4	5.6
4	1960:I	0.4	5.1
5	1960:II	2.4	5.2
⋮	⋮	⋮	⋮
165	2000:II	3.0	4.0
166	2000:III	3.5	4.0
167	2000:IV	2.8	4.0

*Note:* The U.S. inflation and unemployment data set is described in Appendix 12.1.

(4) Panel Data

- Consist of multiple entities, where each entity is observed at two or more time period.

**TABLE 1.3** Selected Observations on Cigarette Sales, Prices, and Taxes, by State and Year for U.S. States, 1985–1995

Observation number	State	Year	Cigarette sales (packs per capita)	Average price per pack (including taxes)	Total taxes (cigarette excise tax + sales tax)
1	Alabama	1985	116.5	\$1.022	\$0.333
2	Arkansas	1985	128.5	1.015	0.370
3	Arizona	1985	104.5	1.086	0.362
⋮	⋮	⋮	⋮	⋮	⋮
47	West Virginia	1985	112.8	1.089	0.382
48	Wyoming	1985	129.4	0.935	0.240
49	Alabama	1986	117.2	1.080	0.334
⋮	⋮	⋮	⋮	⋮	⋮
96	Wyoming	1986	127.8	1.007	0.240
97	Alabama	1987	115.8	1.135	0.335
⋮	⋮	⋮	⋮	⋮	⋮
528	Wyoming	1995	112.2	1.585	0.360

*Note:* The cigarette consumption data set is described in Appendix 10.1.