Chapter 2
Variables, A Short Taxonomy

Chapter 2, 2.1 Exercises

1. Classify the following as quantitative or qualitative variables.
   
   (a) Height
   (b) Ethnicity
   (c) Number of passengers on a bus
   (d) Weight
   (e) Language
   (f) Religion
   (g) Party affiliation
   (h) US government budget deficit since 2002
   (i) US trade deficit with China since 2002
   (j) Time takes to run 100 meters
   (k) Record of the top 100 runners in 2010 New York Marathon
   (l) Consumer credit outstanding
   (m) Last quarter corporate profits
   (n) Closing price of stocks listed on NYSE on January 28, 2008
   (o) Population of major cities in the US based on the 2000 census
   (p) Unemployment rate of 27 members of the European Union in the last 10 years
   (q) Unemployment rate of 27 members of European Union in 2007
   (s) Record of the top 100 runners in New York Marathon in the last 5 years

2. Classify the qualitative variables in Exercise 1 as dichotomous or multinomial.

3. Classify the quantitative variables in Exercise 1 as discrete or continuous.

4. Classify the economic variables in Exercise 1 as time-series, cross-section, or mixed.

5. Classify k and s in Problem 1 as time-series, cross-section, or mixed.
6. Classify the economic variables in Exercise 1 as stock or flow.

7. Determine the size of the table—the number of rows, columns, and cells—you would need in order to present each of the variables that you identified as mixed in Exercise 1 (for (r) assume 3500 stocks listed on NYSE and 252 trading days).

8. How would you present the unemployment rate of the white and non-white populations in the last 20 years for 50 states of the United States?

**Answers to Chapter 2, Exercises 2.1**

#1 Variables in (b), (e), (f), and (g) are qualitative. The rest are quantitative.

#2 All qualitative variables in exercise #1 are multinomial.

#3 The quantitative variables in (c) and (o) are discrete. The rest are continuous.

#4 Variables in (h), (i), and (l) are time series. Variables in (n), (o), and (q) are cross section. Variables in (p), and (r) are mixed. Depending how one interprets the question, the variable “corporate profit” in (m) could be cross section or time series.

#5 The variable in (k) is cross section and in (s) is mixed.

#6 Variables in (h), (i), and (m) are flows. Variables in (l), (n), (o), (p), (q), and (r) are stocks.

#7 For (p) we need a table of 27 by 10: 27 rows for 27 members of the EU and 10 columns for 10 years. This table has 27 * 10 = 270 cells. If we designate the variable EU Unemployment rate as $EUU_{ij}$, it can be expressed as

$$ EUU_{ij} \quad i = 1, 2, \ldots, 27; \quad j = 1, 2, \ldots, 10 $$

For (r) we need a table with 3500 rows for 3500 corporations listed on NYSE and 252 * 18 = 4,536 columns for 252 trading days over an 18-year period. This table has 3500 * 4536 = 15,876,000 cells. The variable Closing Price of Stock $CPS$ can be expressed as

$$ CPS_{ij} \quad i = 1, 2, \ldots, 3500; \quad j = 1, 2, \ldots, 4536 $$

For part (s) we need a table of 100 rows and 5 columns. This table has 500 cells.

#8 Here the unemployment rate can be expressed as

$$ Urate_{ijk} \quad i = 1, 2, \ldots, 50; \quad j = 1, 2, \ldots, 20; \quad k = 1, 2 $$

where $i$ subscript refers to “state”, $j$ to “time”, and $k$ to “race”, classified as White and non-White. To present this data, we need a 3-dimensional table. Those familiar with a high-level computer programming language, such as FORTRAN and C, know how to use a 3-dimensional “array” to store the data in a computer. For a paper presentation, however, we need two separate tables, one for White and one for non-White. Each table has 50 rows for States and 20 columns for years, a total of 1,000 cells.
Chapter 2 Supplementary Exercises

1. Classify the following as quantitative or qualitative variables.
   (a) Gender
   (b) Brand of soft drink
   (c) Race (classified as white or non-white)
   (d) US trade deficit with China
   (e) Price index
   (f) Price of Gold
   (g) Exchange rate between $ and €
   (h) Military rank
   (i) The US money supply
   (j) Energy use per €1 of GDP of EU members
   (k) Farm productivity in developing countries
   (l) Average manufacturing unit labor costs of G7 countries
   (m) Federal grant to 50 states in 2012
   (n) Real private fixed investment
   (o) Number of spectators in a 90,000 seats stadium
   (p) Population of NAFTA countries in the last 20 years
   (q) Money supply of OECD countries in 2012
   (r) Inflation rate of Latin American countries for the last 10 years
   (s) Closing prices of stocks of companies in S&P 500 index
   (t) Employment status of a person in the work force
   (u) Religion (classified as Christian or non-Christian)
   (v) Ethnicity (classified as Italian or non-Italian)
   (w) Inflation rate of US major metropolitan areas in 2012

2. Classify the qualitative variables in Exercise 1 as dichotomous or multinomial.

3. Classify the quantitative variables in Exercise 1 as discrete or continuous.

4. Classify the economic variables in Exercise 1 as time-series, cross-section, or mixed.

5. Classify the economic variables in Exercise 1 as stock or flow.

6. Determine the size of the table—number of rows, columns, and cells—you would need in order to present each of the variables that you identified as mixed in Exercise 1.

7. How would you present the age distribution of the white and non-white populations in the last 20 years for 50 states of the United States?