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Chapter 2

Theories, models and data

---Made by Chang LI

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CONTENT

2.1 Observations, theories and models

2.2 Variables, data and index numbers

2.3 Testing economic models & analysis

2.4 Diagrams and economic analysis

2.5 Ethics, efficiency and beliefs .

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Data! Data!

<https://www.youtube.com/watch?v=w09D-aosxTQ>

Watch the video above, and identify the data type.

Types of DATA

3. Longitudinal data:

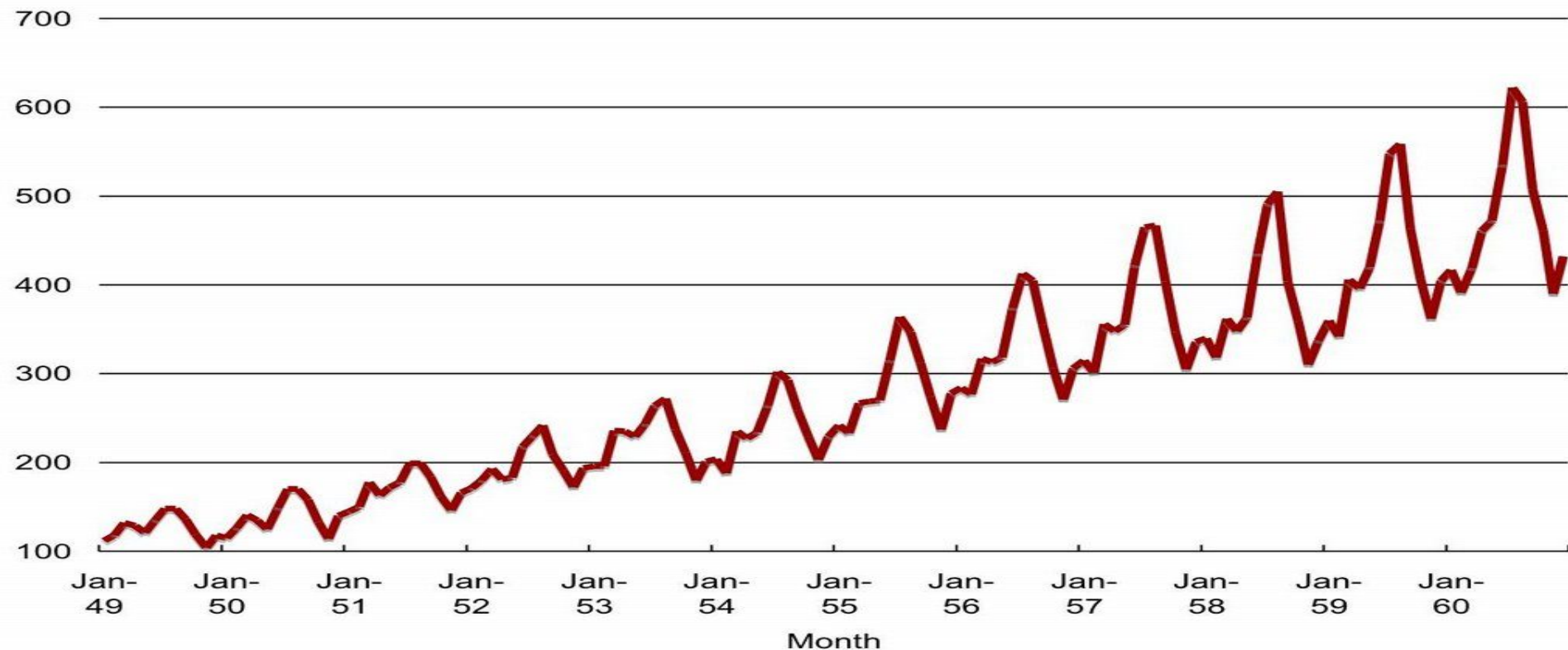
follow the same units of observation through time.

	A	B	C	D	E	F
1	Daily Behavior					
2		Monday	Tuesday	Wednesday	Thursday	Friday
3	Student A	Yellow	Green	Yellow	Green	Green
4	Student B	Blue	Yellow	Yellow	Orange	Yellow
5	Student C	Green	Blue	Green	Blue	Yellow
6	Student D	Yellow	Yellow	Yellow	Yellow	Orange
7	Student E	Green	Green	Green	Green	Green
8	Student F	Yellow	Orange	Orange	Green	Yellow
9	Student G	Yellow	Blue	Green	Orange	Red
10	Student H	Yellow	Yellow	Green	Orange	Blue
11	Student I	Red	Orange	Yellow	Orange	Red
12	Student J	Blue	Green	Blue	Blue	Blue
13	Student K	Green	Orange	Yellow	Orange	Red

Types of DATA...

1. Time-series:

a set of measurements made sequentially at different points in time.



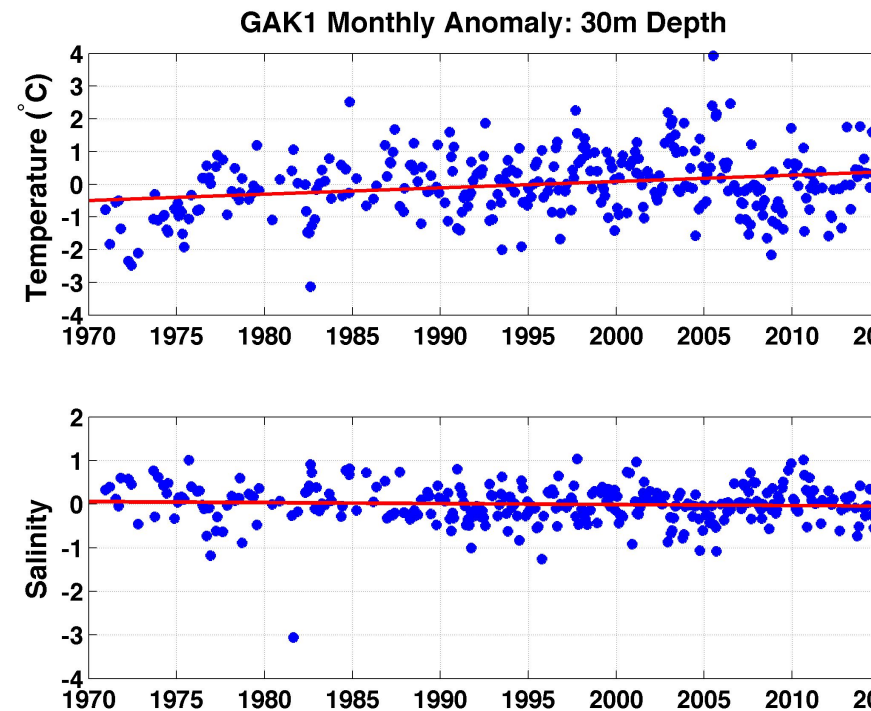
Types of DATA...

1. Time-series

High (low) frequency data: series with short (long) intervals between observations.

Day	Sample One	Sample Two	Sample Three	Sample Four	Sample Five
1	102.7	102.2	102.7	103.3	103.6
2	108.2	108.8	106.7	106.6	109.1
3	101.9	103.0	100.6	101.4	101.3
4	103.9	105.5	104.3	104.5	104.5
5	97.2	99.0	96.5	94.9	96.5
6	94.4	93.0	93.0	95.2	93.6
7	104.7	103.6	103.7	104.7	104.5
8	102.5	102.7	101.2	100.6	103.1
9	101.9	103.1	101.0	101.2	101.4
10	95.0	95.3	95.3	94.4	94.2

From Table 12.1, *Integrated Enterprise Excellence Volume III - Improvement Project Execution: A Management and Black Belt Guide for Going Beyond Lean Six Sigma and the Balanced Scorecard*, Forrest W. Breyfogle III, Bridgeway Books/Citius Publishing, Austin, TX, 2008.



Difference between Longitudinal and time-series

A time series is simple a sequence of data points spaced out over time, usually with regular time intervals.

A longitudinal design is rather more specific, keeping the same sample for each observation over time.

If we think of designs made up of n cases measured on k occasions, then the following loose definition seems to me to be descriptive of the distinction:

- longitudinal designs: high n ; low k
- time series: low n , high k

Types of DATA...

2. Cross-section data:

values for different variables recorded at a point in time

	Canada	U.S.	Mexico
2016	456	560	354

2.1 Observations, theories and models

1. The **observation** is based on facts or data but it need not have any economic content. The economist' s task is to distinguish between coincidence and economic causation.

eg: Person who likes smile tends to be lucky;

80% Boys like basketball ---- 40% girls like basketball.

2. **Econometrics** is the science of examining and quantifying relationships between economic variables.

2.1 Observations, theories and models

Understand this process:

1. Observation --->

2. Theory --->

3. More observation --->

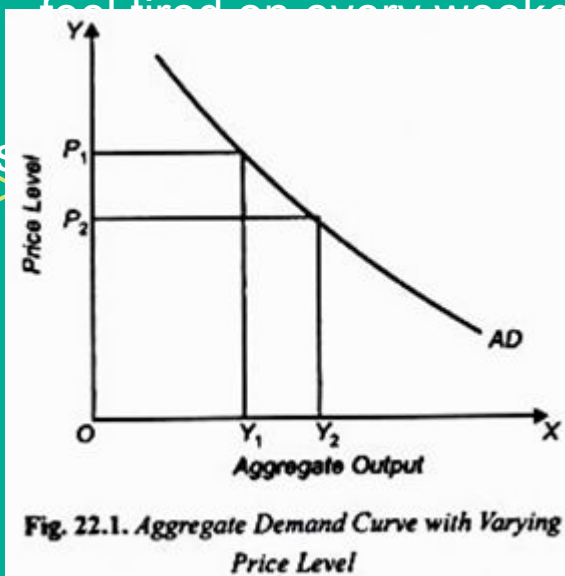
4. Model --->

5. Econometrics --->

You're a waiter in one restaurant. You find you feel tired on every weekend rather than workweek, and you find out that you have more customer each day

in weekend

As a sociologist, you find out that people eat in weekend because they have more leisure time



You find out an equation to express the relationship between leisure time and eat in restaurant

2.2 Variables, data and index numbers

Variables: measures that can take on different values.
eg: interest rate, exchange rate

Data :the recorded values of variables
eg: 1.00 CAD = 0.753845 USD (Sep 22, 2015)

Index number: value for a variable, or an average of a set of variables, expressed relative to a given base value.

Index numbers

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value for a variable, or an average of a set of variables, expressed relative to a given base value.

Compare the size of these data:

1990: A 586369075 B 790753790

2015: A 469469642 B 4695326897

Compare the size of these data

1990: A 100 B 134.86

2015: A 80 B 800.75

Easy to be compared!

Index numbers

Formula:

Value of index =

(Absolute value in year t / Absolute value in base year) × 100

Try it:

Suppose we are doing research on house pricing. In 1990 (based year), the price is \$330,000, whereas in 2000, the price is \$395,000. What is the price index for 1990? And 2000?

100; 119.7

Practice!!!

3. A basket of goods in 1987 cost \$783, while the value of the same basket in 1997 was \$1133. The value of this price index in 1997, based on 1987 = 100, was:

- A) 144.7.
- B) 242.
- C) 69.1.
- D) 117.4.

Practice!!!

3. A basket of goods in 1987 cost \$783, while the value of the same basket in 1997 was \$1133. The value of this price index in 1997, based on 1987 = 100, was:

- A) 144.7. ($= 1133/783 * 100\%$)
- B) 242.
- C) 69.1.
- D) 117.4.

Practice!!!

5. If the weekly earnings index for the construction industry was 340 for 1987 (1970 = 100):

A) Workers in the construction industry earned \$340 per week.

B) They earned 340 per cent as much in 1987 as they did in 1970.

C) Workers earned \$100 per week in 1970 and \$340 in 1987.

D) Real weekly earnings fell by 3.4 percent.

Practice!!!



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Price index

1. Percentage change

= (change in values)/original value × 100

2. **Consumer price index (CPI)**: the average price level for consumer goods and services

3. **Inflation rate**: the annual percentage increase in the consumer price index

4. **Deflation rate**: the annual percentage decrease in the consumer price index

5. **Real price index**: a nominal price index divided by the consumer price index, scaled by 100.

6. **Nominal price index**: the current dollar price of a good or service.

5) Suppose that the consumer price index of a country was 160 at year-end 2004 and 168 at the end of 2005. What was the country's inflation rate during 2005?

- a. 5 percent
- b. 8 percent
- c. 60 percent
- d. 68 percent

6) If the consumer price index (CPI) at the end of year one was 100 and was 108 at the end of year two, the inflation rate during year two was

- a. zero; the CPI of 100 indicates that prices were stable.
- b. 8 percent.
- c. 5 percent.
- d. 108 percent.

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- d. 108 percent.

7) Suppose that the consumer price index (CPI) was 160 in 2004 and 166 in 2005, inflation during 2005 was

- a. zero; prices were stable.
- b. 3.8 percent.
- c. 6 percent.
- d. 66 percent.

8) If the consumer price index (CPI) was 180 at year-end 2004 and 189 at year-end 2005, inflation during 2005 was

- a. zero; prices were stable during 2005.
- b. 4.8 percent.
- c. 5 percent.
- d. 9 percent.

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3) An increase in the CPI from 200 to 225 would indicate an annual rate of measured inflation of

- a. 1.3%
- b. 12.5%
- c. 25%
- d. 200%
- e. 225%

4) If actual inflation is more than expected inflation, which of the following groups will most certainly benefit?

- a. Lenders
- b. Borrowers
- c. Minorities
- d. Women
- e. Men

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Practice!!!

6. Using the above table, in 1977 the greatest share of income was spent on:

- A) Bluars.
- B) Widgets.
- C) Zaflings.
- D) Skylids.

Good	Quantity purchase	Price/unit 1977 (\$)	Price/unit 1997 (\$)
Zaflings	100	2	10
Bluars	75	10	14
Widgets	50	4	2
Skylids	25	40	50

Practice!!!

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Practice!

Which year is the base year?

Calculate the inflation rate for 2000-2001, 2001-2002, and 2002-2003.

Year	CPI
2000	88
2001	100
2002	105
2003	121

Practice!!!

4. When economists compute the real value of an economic variable denominated in dollars, they do so by:

- A) Dividing the nominal value by 100.
- B) Multiplying the nominal value by the price level.
- C) Dividing the nominal value by the price index.
- D) Subtracting the price level from the nominal value and multiplying by 100.

Practice!!!

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Practice

If 2010 is the based year, calculate the real price of for the good A,B,C,D,E for both year 2010 and 2011

Year	Price A	CPI	Price B	Price C	Price D	Price E
2010	15	100	7	15	31	40
2011	18	111	9	32	32	40

11. The following table represents the Consumer Price Index for apples over 4 years. Calculate the nominal price index (i) and the real price index (ii) for apples for 2004.

a) i) 113.33 ii) 101.59

b) i) 106.67 ii) 98.55

c) i) 113.33 ii) 98.55

d) i) 98.55 ii) 113.33

Year	CPI	Price (Apple)
2001	94	14
2002	100	15
2003	105	16
2004	115	17

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Year	CPI	Price (Apple)
2001	94	14
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By how much have apples increased/decreased in price in 2001 and 2003 in comparison to the typical good consumers buy as measured by the CPI?

- a) 2001: 7.41% Increase 2003: 6.67% Increase
- b) 2001: 0.71% Decrease 2003: 1.59% Increase
- c) 2001: 2.89% Increase 2003: 1.05% Increase
- d) 2001: 6.38% Decrease 2003: 2.35% Increase

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9) Suppose a market basket of goods and services costs \$1,000 in the base year and the consumer price index (CPI) is currently 110. This indicates the price of the market basket of goods and services is now

- a. \$110.
- b. \$1,000.
- c. \$1,100.
- d. \$1,225.

9) Suppose a market basket of goods and services costs \$1,000 in the base year and the consumer price index (CPI) is currently 110. This indicates the price of the market basket of goods and services is now

- a. \$110.
- b. \$1,000.
- c. **\$1,100.**
- d. \$1,225.

1) If Real GDP = \$200 billion and the price index = 200, Nominal GDP is

- a. \$4 billion
- b. \$400 billion
- c. \$200 billion
- d. \$2 billion
- e. Impossible to determine since the base year is not given.

2) If your nominal income rises 4 percent and your real income falls 1 percent, by how much did the price level change?

- a. 5% decrease
- b. $\frac{1}{4}$ % increase
- c. 3% increase
- d. 3% decrease
- e. 5% increase

2.5 Ethics, efficiency and beliefs

Positive economics studies objective or scientific explanations of how the economy functions.

Normative economics offers recommendations that incorporate value judgments.

Positive & Normative statement

- Question in last week:
- "The increase of xxx machine should increase the production" is a positive statement. although it contains "should"
- WHY?

.....Look at these two sentences:

The increase of xxx machine should increase the production.

The government should increase tax rates to decrease poverty.

Both sentences have the word 'should'. But the meaning is totally different grammatically.

The first sentence says that we expect that if we increase the number of xxx machine, the production quantity increases. This sentence is just trying to explain a fact that more input means more production. This is not a policy suggestion. This is just trying to explain how the economy or how the production process works.

However, the second sentence suggests that if you want to decrease poverty, you should increase tax rates. It is not a fact. It is just a policy suggestion and not explaining the current situation of an economy.

...what you told the student is correct that it usually works but not all the time. They should still understand the meaning of the sentence and not just looking for the word 'should'...

(Sept. 2015)



SO...

Normative statement in general have the word "should" "ought to", but it is not a rule, you could use it, but the most important thing is to understand the meaning of sentences