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11.481J / 1.284J / ESD.192J Analyzing and Accounting for Regional Economic Growth
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Price Indices



Photo source: U.S. Dept. of Labor

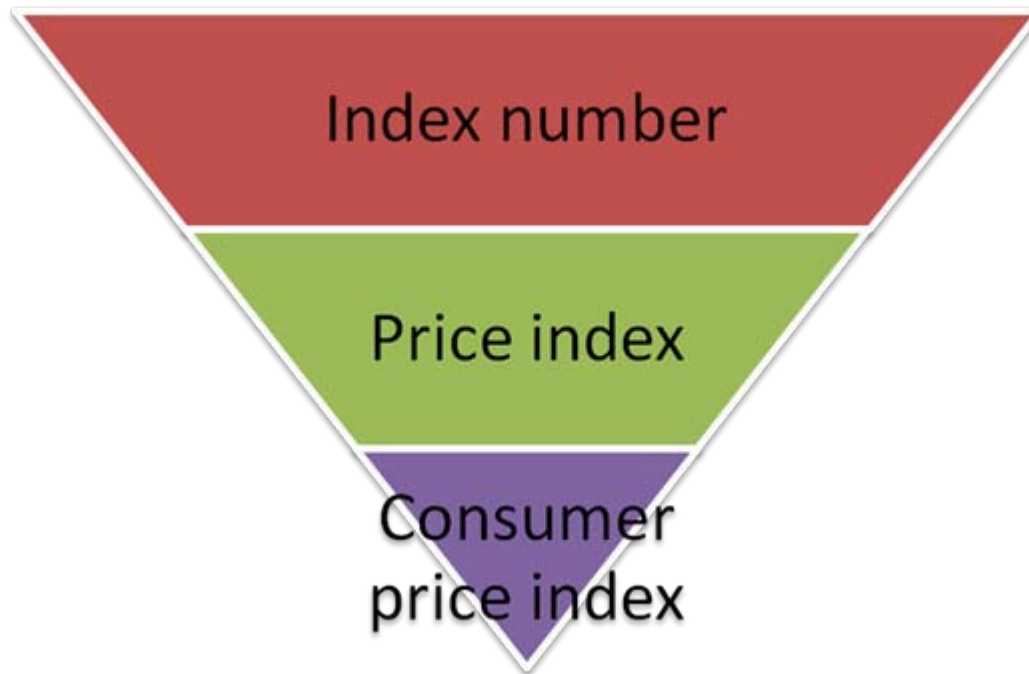
Thomas H. Wonnacott and Ronald J. Wonnacott (1990). Introductory Statistics for Business and Economics. 4th Ed. New York: John Wiley and Sons, pp. 664-677.

U.S. Department of Labor, Bureau of Labor Statistics (2007). Chapter 17: "Consumer Price Index", in BLS Handbook of Methods. Washington, DC: U.S. Government Printing Office. <http://www.bls.gov/opub/hom/pdf/homch17.pdf>

Mark A. Wynne and Fiona D. Sigalla (1994). "The Consumer Price Index." Economic Review: Federal Reserve Board of Dallas. 2nd Quarter (Summer), pp. 1-22.

Jerry A. Hausman (1998). "New Products and Price Indexes." NBER Reporter, (Fall), pp. 10-12.

- Purpose: Nominal prices → Real prices
- Synopsis:



Index numbers

An **index number** is an economic data measure, reflecting **price or quantity** compared with a standard or base value.

- compare business activity, the cost of living, employment and etc.
- reduce unwieldy business data into easily understood terms.

Index numbers

	Price index	Quantity index	Total cost index
Definition	Show how a whole set of price has changed	Measure the increase in the quantities purchased	Measure how much total cost increased
Assumption	Fixed quantity (or standard of living)	Fixed price (or cost of living)	Changes in both price and quantity
Applying to personal consumers	The cost of living	The standard of living	Total personal consumption

The calculation of price index

$$\text{Price Index} = \frac{\sum \text{current prices} \times \text{fixed quantity}}{\sum \text{base prices} \times \text{fixed quantity}}$$



Shopping cart in 1990
(base year)

Beef Price: \$8

Quantity consumed: 10



Shopping cart in 2009
(current year)

\$15

12

$$\text{Laspeyres Index} = \frac{\$15 \times 10}{\$8 \times 10}$$

fixed quantity : base year

$$\text{Paasche Index} = \frac{\$15 \times 12}{\$8 \times 12}$$

fixed quantity : current year

Types of Price index

- **Consumer Price Index**
(CPI): the price index for personal consumption.
- **Producer Price Index (PPI):**
the price index for intermediate consumption.
- **GNP deflator**
- **Employment Cost Index**
(ECI)

Two photographs (people shopping in grocery store, buckets of cement) removed due to copyright restrictions.

CPI

- **Assumption**: constant standard of living
- **CPI** is a measure of the average *change* over time in the prices paid by personal consumers for a fixed market basket of consumer goods and services.
- CPI v.s. cost-of-living index
 - Different in the treatment of public goods, such as safety, education, water quality, and crime.





United States

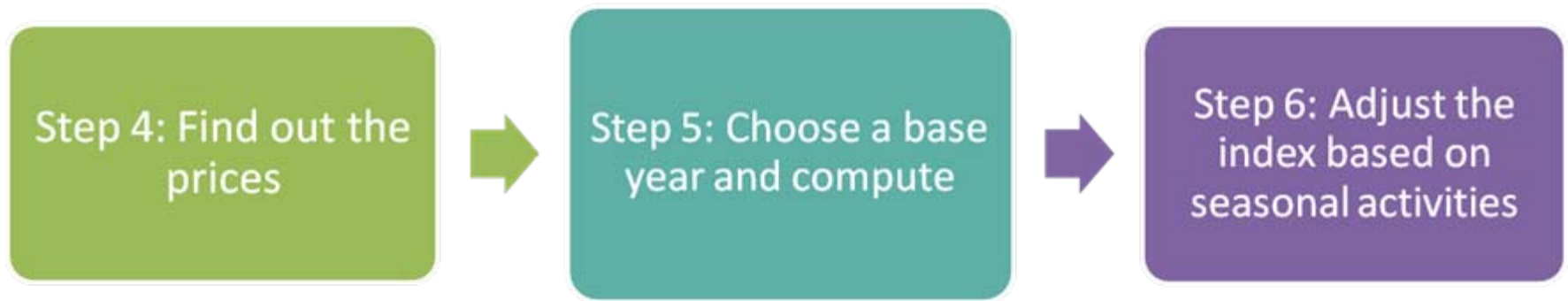
- Urban consumer (CPI_U)
- Urban wage earner (CPI_W)
- 26 Metropolitan area

People's Republic of China

- Urban consumer
- Rural consumer

 U.S. : Housing (42%), Transportation (17%), Food (15%), Medical care (6%)

 China: Food (33%), recreation (14%),
excludes real estate and gasoline.



- Base year:
last year, last month, 1982-1984 (U.S.), 1978 (China)
- Current CPI-U (U.S.) in March: -0.1% (base time: February 2009)
- Current CPI (China) in March : -1.2% (base time: February 2009)

- Seasonal food or clothes
- Christmas
- Natural disasters

Usage

- Measure inflation and evaluate government economic policy.
- Adjust other economic statistics data
- Adjust consumers' income payments
- **Price index and regional accounts**

CPI
PPI
GNP deflator



	Interindustry sales (z)				Sales to final demand (f)				Total sales (x)
	z_{11}	z_{12}	...	z_{1n}	c_1	v_1	β_1	e_1	x_1
	z_{21}	z_{22}	...	z_{2n}	c_2	v_2	β_2	e_2	x_2
	⋮	⋮		⋮	⋮	⋮	⋮	⋮	⋮
	z_{n1}	z_{n2}	...	z_{nn}	c_n	v_n	β_n	e_n	x_n
Value added	l_1	l_2	...	l_n	Transactions between the payments sectors (including imports) and final demand				L
Imports	ov_1	ov_2	...	ov_n					OV
Total outlays (x)	m_1	m_2	...	m_n					M
	x_1	x_2	...	x_n	C	I	G	E	

Figure by MIT OpenCourseWare.

Critique

Small Bias = Big Problem!

“... Overstating inflation by 1.1 percentage points per year from 1973 to 1995 would mean that real inflation-adjusted hourly wages have actually increased 13 percent instead of falling by 13 percent as is currently reported.”

-D. Mark Wilson (1998). “How to Improve the Consumer Price Index,” The Heritage Foundation, <http://www.heritage.org/Research/labor/BG1177.cfm>.

Critique

Threats to the CPI:

#1: Substitution Bias (product and outlet)

#2: Quality Bias

#3: New Goods Bias

#4: Poor Generalizability

#5: And more:

- List vs. transaction price

- Treatment of durable goods

- Ambiguities in measurement

Substitution Bias

CPI will have a substitution bias if:

- Households substitute between goods in response to relative price changes
- There are differences in relative price changes (not all goods' prices increase or decrease together)

Example: Orange juice

Product Substitution

vs.

Outlet Substitution

Images of apple and orange (product substitution) and Wal-Mart logo (outlet substitution) removed.

Wynne and Sigalla (1994)

Quality Bias

The CPI will **overestimate** inflation if the quality of goods and services is **increasing**.

Examples: smaller computers, faster internet service, airbags in cars

The CPI will **underestimate** inflation if the quality of goods and services is **deteriorating**.

Examples: full-service to self-service gas stations, professors vs. teaching assistants, fewer in-flight services provided by airlines

New Goods Bias

The CPI is biased upwards due to new goods, because:

- The CPI ignores gains in consumer welfare from new products
- The CPI is often slow to include new products, so initial decreases in prices are not measured

Examples: voicemail, cell phones, iPods, BlackBerry devices, etc.

Poor Generalizability

Using the Same Index for:

Different Types of People

- Is the CPI basket representative for 25-year old graduate students and 65-year old retirees?
- Is the “market basket” representative for the rich and the poor?

Different Regions

- Does the CPI adequately reflect prices and purchasing habits of people in New York City and Cheyenne, Wyoming?

Summary

- Substitution Bias
- Quality Bias
- New Goods Bias
- Poor Generalizability

Why **You** Should Care

- CPI is the most widely used measure of inflation in the United States.
- 30% of federal government spending is adjusted for inflation using CPI: Social Security, food stamps, school lunch programs, Federal Civil Service Pensions
- CPI is used to adjust tax brackets to prevent “bracket creep”

Wilson (1998)

U.S. Department of Labor, Bureau of Labor Statistics (2007)