Principles of Economics (Spring 2024)
Lecture 18
Measure the Cost of Living

Part I

CPI – ___consumer price index___

- **Definition of the CPI**

  The CPI is a measure of the ___overall cost___ of the goods and services ___bought___ by a ___typical consumer___.

  o The CPI is computed and reported every month by the Bureau of Labor Statistics (BLS).

- **How the CPI Is Calculated**

  1. ___Fix___ the ___basket___. The BLS ~~serv~~ surveys consumers to find the basket of goods and services bought by the typical consumer, and determines ___which prices___ are more important to the typical consumer, and therefore, should be given ___greater weight___.

  2. ___Find___ the ___prices___. Find the prices of each good and service in the basket at each point in ___time___.

  3. ___Compute___ the basket's ___cost___. Keep the basket of goods the ___same___, use the data on ___prices___ to calculate the cost of the basket of goods and services at ___different times___, and therefore, ___isolate___ the effects of ___price change___ from the effects of ___quantity changes___.

  4. ___Choose___ a ___base year___ and ___compute___ the ___CPI___. Designate one year as the base year, the benchmark against which other years are to be compared.

$$CPI = \frac{\text{Price of Basket of Goods \& Services in Current Year}}{\text{Price of Basket in Base Year}} \times 100$$

  5. ___Compute___ the ___inflation rate___.

$$\text{inflation rate \# in year}_2 = \frac{CPI \text{ in year}_2 - CPI \text{ in year}_1}{CPI \text{ in year}_1} \times 100$$

Example 1: A hypothetical economy in which consumers buy only hot dogs and hamburgers

---

Step 1: Survey Consumers to Determine a Fixed Basket of Goods

Basket = 4 Hot Dogs, 2 Hamburgers (__Weighted__ Using __different Quantities__)

Step 2: Find the Price of Each Good in Each Year

Year	Price of Hot Dogs ($)	Price of Hamburgers ($)
2019	1	2
2020	2	3
2021	3	4

Step 3: Compute the Cost of the Basket of Goods in Each Year

2019	$1 * 4 + $2 * 2 = $8
2020	$2×4 + $3×2 = $14
2021	$3×4 + $4×2 = $20

Step 4: Choose One Year as a Base Year (2019) and Compute the CPI in Each Year

2019	$\frac{\$8}{\$8} \times 100 = 100$
2020	$\frac{\$14}{\$8} \times 100 = 175$
2021	$\frac{\$20}{\$8} \times 100 = 250$

Step 5: Use the CPI to Compute the Inflation Rate from the Previous Year

2020	$\frac{175-100}{100} \times 100 = 75$
2021	$\frac{250-175}{175} \times 100 = \frac{300}{7} = 43$

- The CPI for the base year always equals _____ 100 _____.

- The CPI in 2020 is _____ 175 _____, meaning that the price of the basket in 2020 is _____ 175 _____ percent of its price in the base year, i.e., a basket of goods that costs $ _____ 100 _____ in the base year costs $ _____ 175 _____ in 2020.

- **Problems of the CPI in Measuring the Cost of Living**

  ○ _Substitution bias_____. Some prices _rise faster_____ than others over time, and consumers _substitute towards_____ goods that become relatively _cheaper_____. The CPI _misses_____ this substitution because it uses a _____fixed_____ basket of goods, and therefore, _____overstates_____ the increases in the cost of living.

  ○ _Introduction of_____ of _new goods_____. As new goods are introduced, consumers have _more choices_____, and _each dollar_____ is _worth more_____. The CPI misses this effect because it uses a fixed basket of goods, and therefore, overstates the increases in the cost of living.

  ○ _Unmeasured quality change_____. _Improvement_____ in the quality of goods in the basket _increase____ the value of each dollar, while _deteriorating_____ quality of goods in the basket _____lowers_____ the value of each dollar. The BLS tries to account for quality changes but probably misses some, as quality is _hard_____ to _measure_____.

  ➢ Generally, the CPI puts an _upward bias_____ in measuring inflation.

Part II

Differences between the GDP Deflator and the CPI

- The GDP deflator reflects the prices of all goods and services ___produced___ ___domestically___, whereas the CPI reflects the prices of all goods and services ___bought___ by ___consumers___.

  o This difference is particularly important when the price of ___oil___ changes. For example, the United States produces some oil, but much of the oil is ___imported___. As a result, oil and oil products such as gasoline and heating oil make up a ___much larger share___ of ___consumer spending___ than of ___GDP___. When the price of oil rises, the ___CPI___ rises by much more than does the ___GDP deflator___.

- The CPI compares the price of a ___fixed___ basket of goods and services with the price of the basket in the ___base___ year, while the GDP deflator compares the price of ___currently___ produced goods and services with the price of those goods and services in the base year, and therefore, the group of goods and services changes over time.

  ⇒ o Imported consumer goods: included in the ___CPI___ but excluded from the ___GDP deflator___.

  o Capital goods (produced domestically): excluded from the ___CPI___ but included in the ___GDP deflator___.

Exercise 1

In each scenario, determine the effects on the CPI and the GDP deflator.

1) Starbucks raises the price of muffins.

   CPI ↑

   GDP (GDP deflator) ↑

2) Caterpillar raises the price of the industrial tractors it manufactures at its Illinois factory.

   CPI ⟷, not changed, because it's not what normal consumers would buy

   GDP ↑

3) Armani raises the price of the Italian jeans it sells in the U.S.

   CPI ↑

   GDP, not changed, because it's not produced domestically

Part III

Correct Economic Variables for the Effects of Inflation

A price index such as the CPI measures the price level and thus determines the ___size___ of the inflation correction.

- Dollar Figures from Different Times

  o Inflation makes it harder to compare dollar amounts from different times. To turn dollar figures from year T into today's dollars:

$$\text{Amount in Today's Dollars} = \text{Amount in Year T's Dollars} * \frac{\text{Price level Today}}{\text{Price level in Year T}}$$

Exercise 2

Babe Ruth's salary was $80,000 in 1931. Government statistics show a CPI of 15.2 for 1931 and 251 for 2018. How much is Ruth's salary in 2018 dollars?

$$\$ 80,000 \times \frac{251}{15.2} = \$ 1,321,053$$

- **Nominal and Real Interest Rates**

    o Nominal interest rate: the interest rate not corrected for inflation, measures the rate of growth in the ___dollar value___ of a deposit or debt.

    o Real interest rate: the interest rate corrected for inflation, measures the rate of growth in the ___purchasing power___ of a deposit or debt.

    o ___Real Interest Rate = Nominal Interest Rate − Inflation Rate___

Assume: Price of good is P_1, total amount of money is m_1.
if year T_1; And are P_2, m_2 correspondingly in year T_2.
Nominal interest rate is NIR. real interest rate is RIR
Inflation Rate is IfR

So:
$$P_2 = P_1 (1 + IfR)$$
$$m_2 = m_1 (1 + NIR)$$

purchasing power in year T_1:
$$m_1 / P_1$$

purchasing power in year T_2:
$$m_2 / P_2$$

So:
$$\frac{m_2}{P_2} = \frac{m_1}{P_1} (1 + RIR)$$

or:
$$\frac{1 + NIR}{1 + IfR} = 1 + RIR$$

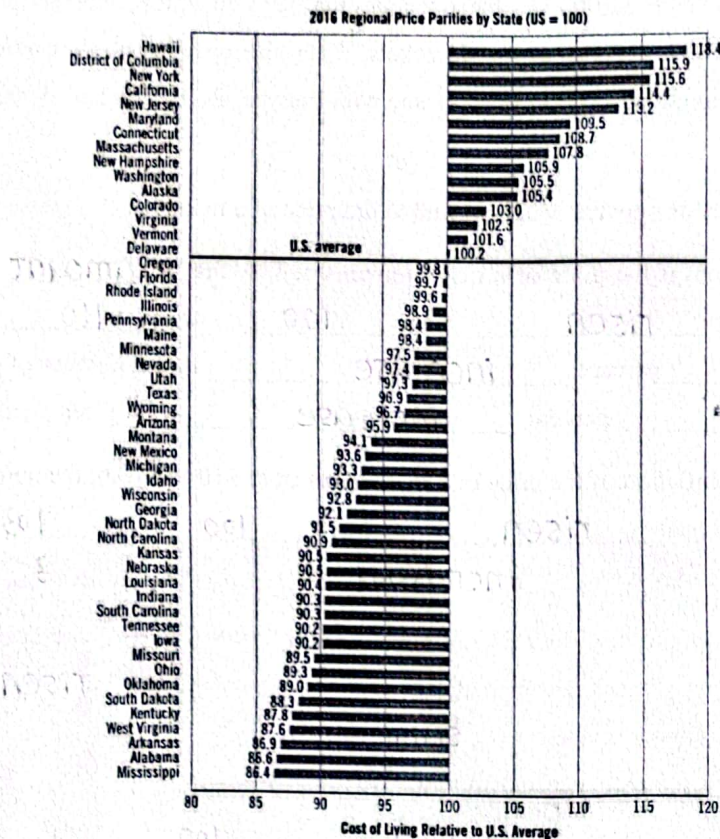$$\Rightarrow RIR = \frac{NIR - IfR}{1 + IfR} \approx NIR - IfR$$

Example 2

Suppose Sara deposits $1,000 in a bank account that pays an annual interest rate of 10 percent. Sara is a film buff and spends all her money on movie tickets. When she made her deposit, a ticket cost $10. A year later, after Sara has accumulated $100 in interest, she withdrew her $1,100. Is Sara $100 richer than she was a year earlier?

The answer depends on what has happened to the price of a ticket:

- Zero inflation: if the price of a ticket remains at $10, the ___amount___ she can buy has ___risen___ from ___100___ to ___110___ tickets. The ___10___ percent ___increase___ in the number of dollars means a ___10___ percent ___increase___ in her purchasing power.

- Six percent inflation: if the price of a ticket rises from $10 to $10.6, the number of tickets she can buy has ___risen___ from ___100___ to ___103___. Her purchasing power has ___increased___ by about ___3___ percent.

- Ten percent inflation: if the price of a ticket rises from $10 to $11, she can still buy only ___100___ tickets. Even though Sara's dollar wealth has ___risen___, her purchasing power is the ___same___ as it was a year earlier.

- Twelve percent inflation: if the price of a ticket increases from $10 to $11.2, the number of tickets she can buy has ___fallen___ from ___100___ to ___98___. Even with her ___greater___ number of dollars, her purchasing power has ___decreased___ by about ___2___ percent.

- Two percent deflation: if the price of a ticket falls from $10 to $9.8, the number of tickets she can buy ___rises___ from ___100___ to ___112___. Her purchasing power ___increases___ by about ___12___ percent.

➢ The number of dollars in her possession has ___rises___; but Sara does not care about the ___amount___ of ___money___ itself, rather she cares about the ___amount___ of ___goods___ and ___services___ ___she can buy with it___, i.e., the ___purchasing power___: the ___higher___ the rate of inflation, the ___smaller___ the ___increase___ in Sara's purchasing power; if the rate of inflation ___exceeds___ the rate of interest, her purchasing power actually ___falls___; if there is ___deflation___, her purchasing power ___rises___ by more than the interest rate.

Example 3: Regional Variation in the Cost of Living

2016 Regional Price Parities by State (US = 100)

State	Value
Hawaii	118.4
District of Columbia	115.9
New York	115.6
California	114.4
New Jersey	113.2
Maryland	109.5
Connecticut	108.7
Massachusetts	107.8
New Hampshire	105.9
Washington	105.5
Alaska	105.4
Colorado	103.0
Virginia	102.3
Vermont	101.6
Delaware	100.2
Oregon	99.8
Florida	99.7
Rhode Island	99.6
Illinois	98.9
Pennsylvania	98.4
Maine	98.4
Minnesota	97.5
Nevada	97.4
Utah	97.3
Texas	96.9
Wyoming	96.7
Arizona	95.9
Montana	94.1
New Mexico	93.6
Michigan	93.3
Idaho	93.0
Wisconsin	92.8
Georgia	92.1
North Dakota	91.5
North Carolina	90.9
Kansas	90.5
Nebraska	90.5
Louisiana	90.4
Indiana	90.3
South Carolina	90.3
Tennessee	90.2
Iowa	90.2
Missouri	89.5
Ohio	89.3
Oklahoma	89.0
South Dakota	88.3
Kentucky	87.8
West Virginia	87.6
Arkansas	86.9
Alabama	86.6
Mississippi	86.4

Cost of Living Relative to U.S. Average

What accounts for these differences?

1) _____**Small**_____ part: prices of _____**goods**_____, e.g., food and clothing – they are _____**tradable**_____ and can be easily _____**easily transported**_____ from one state to another.

2) _____**Larger**_____ part: prices of _____**services**_____, e.g., haircut – transporting is _____**costly**_____, and therefore, large price disparities can persist.

3) _____**Particularly important**_____ part: prices of _____**housing service**_____ – a _____**large share**_____ of a typical consumer's _____**budget**_____; a house or apartment building _____**cannot**_____ easily be _____**moved**_____ and the land is completely _____**immobile**_____ – differences in housing costs can be persistently large.

Exercise 3

B The largest component in the basket of goods and services used to compute the CPI is

    A. food and beverages.
    B. housing.
    C. medical care.
    D. apparel.

Exercise 4

D If the CPI is 200 for the year 1980 and 300 today, then $600 in 1980 has the same purchasing power as _____ has today.

    A. $400.
    B. $500.
    C. $700.
    D. $900.

Exercise 5

D You deposit $2,000 in a savings account, and a year later you have $2,100. Meanwhile, the CPI rises from 200 to 204. In this case, the nominal interest rate is _____ percent, and the real interest rate is _____ percent.

    A. 1; 5.
    B. 3; 5.
    C. 5; 1.
    D. 5; 3.