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Measuring the Cost of Living

PRINCIPLES OF  
MACROECONOMICS  
FOURTH CANADIAN EDITION

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In this chapter, look for the answers to these questions:

- What is the Consumer Price Index (CPI)?  
How is it calculated? What's it used for?
- What are the problems with the CPI? How serious are they?
- How does the CPI differ from the GDP deflator?
- How can we use the CPI to compare dollar amounts from different years? Why would we want to do this, anyway?
- How can we correct interest rates for inflation?

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The Consumer Price Index (CPI)

- Inflation refers to a situation in which the economy's overall price level is rising.
- The inflation rate is the percentage change in the price level from the previous period.
- The **consumer price index (CPI)** is a measure of the overall cost of the goods and services bought by a typical consumer.
- Statistics Canada reports the CPI each month.
- It is used to monitor changes in the cost of living over time.

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### How the CPI Is Calculated

- **Determine the Basket:** Determine what prices are most important to the typical consumer.
  - If the typical consumer buys more hot dogs than hamburgers, then the price of hot dogs is more important and is given more weight in measuring the cost of living.
  - Statistics Canada sets these weights by surveying consumers to find out the basket of goods the typical consumer buys

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### How the CPI Is Calculated

- **Find the Prices:** Find the prices of each of the goods and services in the basket for each point in time.
- **Compute the Basket's Cost:** Use the data on prices to calculate the cost of the basket of goods and services at different times.

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### How the CPI Is Calculated

- **Choose a Base Year and Compute the Index:**
  - Designate one year as the base year, making it the benchmark against which other years are compared.
  - Compute the index by dividing the price of the basket in one year by the price in the base year and multiplying by 100.

$$100 \times \frac{\text{cost of basket in current year}}{\text{cost of basket in base year}} = \text{CPI}$$

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### How the CPI Is Calculated

- **Compute the inflation rate.**

The percentage change in the CPI from the preceding period.

$$\text{inflation rate} = \frac{\text{CPI this year} - \text{CPI last year}}{\text{CPI last year}} \times 100\%$$

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### EXAMPLE

basket: {4 pizzas, 10 lattes}

year	price of pizza	price of latte	cost of basket
2004	\$10	\$2.00	$\$10 \times 4 + \$2 \times 10 = \$60$
2005	\$11	\$2.50	$\$11 \times 4 + \$2.5 \times 10 = \$69$
2006	\$12	\$3.00	$\$12 \times 4 + \$3 \times 10 = \$78$

Compute CPI in each year:

Inflation rate:

$$\begin{array}{lcl} \text{2004: } 100 \times (\$60/\$60) = 100 & \left. \begin{array}{l} \\ \\ \end{array} \right\} & 15\% \\ \text{2005: } 100 \times (\$69/\$60) = 115 & & \\ \text{2006: } 100 \times (\$78/\$60) = 130 & \left. \begin{array}{l} \\ \\ \end{array} \right\} & 13\% \end{array}$$

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### ACTIVE LEARNING 1: Calculate the CPI

The basket contains  
20 movie tickets  
and 10 textbooks.

The table shows their  
prices for 2004-2006.

The base year is 2004.

	movie tickets	text-books
2004	\$10	\$50
2005	\$10	\$60
2006	\$12	\$60

- How much did the basket cost in 2004?
- What is the CPI in 2005?
- What is the inflation rate from 2005-2006?

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### ACTIVE LEARNING 1: Answers

The basket contains  
20 movie tickets  
and 10 textbooks.

	movie tickets	text- books
2004	\$10	\$50
2005	\$10	\$60
2006	\$12	\$60

- A. How much did  
the basket cost in  
2004?

$$(\$10 \times 20) + (\$50 \times 10) = \$700$$

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### ACTIVE LEARNING 1: Answers

The basket contains  
20 movie tickets  
and 10 textbooks.

	movie tickets	text- books
2004	\$10	\$50
2005	\$10	\$60
2006	\$12	\$60

- B. What is the CPI  
in 2005?

$$\begin{aligned} \text{cost of basket in 2005} \\ = (\$10 \times 20) + (\$60 \times 10) &= \$800 \end{aligned}$$

$$\text{CPI in 2005} = 100 \times (\$800/\$700) = 114.3$$

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### ACTIVE LEARNING 1: Answers

The basket contains  
20 movie tickets  
and 10 textbooks.

	movie tickets	text- books
2004	\$10	\$50
2005	\$10	\$60
2006	\$12	\$60

- C. What is the  
inflation rate from  
2005-2006?

$$\begin{aligned} \text{cost of basket in 2006} \\ = (\$12 \times 20) + (\$60 \times 10) &= \$840 \end{aligned}$$

$$\text{CPI in 2006} = 100 \times (\$840/\$700) = 120$$

$$\text{Inflation rate} = (120 - 114.3)/114.3 = 5\%$$

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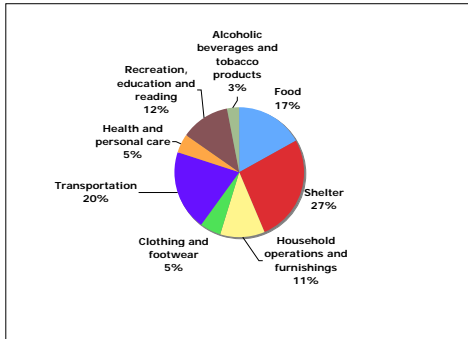
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### FYI: What's in the CPI's Basket?



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### How the CPI Is Calculated

- Statistics Canada computes many other indexes
  - CPI for each province
  - For 16 cities
  - Food
  - Clothing
  - Core inflation: Measure of the underlying trend in inflation.

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### Problems in Measuring the Cost of Living

- The CPI is an accurate measure of the selected goods that make up the typical bundle, but it is not a perfect measure of the cost of living.
- Three problems with the index are widely acknowledged but difficult to solve
  - Substitution bias
  - Introduction of new goods
  - Unmeasured quality changes

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**Problems With the CPI:**  
***Substitution Bias***

- Over time, some prices rise faster than others.
- Consumers substitute toward goods that become relatively cheaper.
- The CPI misses this substitution because it uses a fixed basket of goods.
- Thus, the CPI overstates increases in the cost of living.

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**Problems With the CPI:**  
***Introduction of New Goods***

- When new goods become available, variety increases, allowing consumers to find products that more closely meet their needs.
- This has the effect of making each dollar more valuable.
- The CPI misses this effect because it uses a fixed basket of goods.
- Thus, the CPI overstates increases in the cost of living.

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**Problems With the CPI:**  
***Unmeasured Quality Change***

- Improvements in the quality of goods in the basket increase the value of each dollar.
- Statistics Canada tries to account for quality changes, but probably misses some quality improvements, as quality is hard to measure.
- Thus, the CPI overstates increases in the cost of living.

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### Problems With the CPI

- Each of these problems causes the CPI to overstate cost of living increases.
- Statistics Canada has made technical adjustments, but the CPI probably still overstates inflation by about 0.5 percent per year.
- This is important, because many government programs and many contracts have COLAs tied to the CPI.

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### The GDP Deflator versus the Consumer Price Index

- The GDP deflator
  - reflects the current level of prices relative to the level of prices in the base year.
  - is monitored by economists to gauge how quickly prices are rising
  - is calculated as follows:

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

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### Contrasting the CPI and GDP Deflator

#### Imported consumer goods:

- included in CPI
- excluded from GDP deflator

#### Capital goods:

- excluded from CPI
- included in GDP deflator (if produced domestically)

#### The basket:

- CPI uses fixed basket
- GDP deflator uses basket of currently produced goods & services

This matters if different prices are changing by different amounts.

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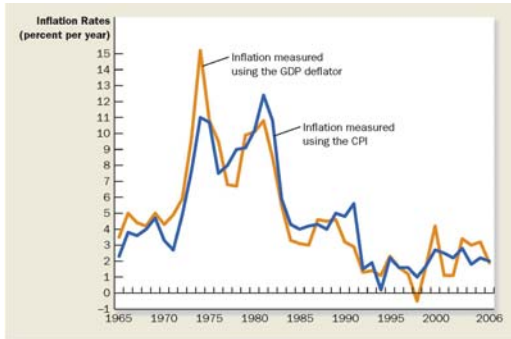
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## Contrasting the CPI and GDP Deflator



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## ACTIVE LEARNING 2: CPI vs. GDP deflator

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

- Starbucks raises the price of Frappuccinos.
- Canadian Machinery Corp. raises the price of its precision tools it manufactures at its Kitchener plant.
- Armani raises the price of the Italian jeans it sells in Canada

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## ACTIVE LEARNING 2: Answers

- Starbucks raises the price of Frappuccinos.  
*The CPI and GDP deflator both rise.*
- Canadian Machinery Corp. raises the price of its precision tools it manufactures at its Kitchener plant.  
*The GDP deflator rises, the CPI does not.*
- Armani raises the price of the Italian jeans it sells in the U.S.  
*The CPI rises, the GDP deflator does not.*

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## CORRECTING ECONOMIC VARIABLES FOR THE EFFECTS OF INFLATION

- Price indexes are used to correct for the effects of inflation when comparing dollar figures from different times.

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## Comparing Dollar Figures from Different Times

- Inflation makes it harder to compare dollar amounts from different times.
- We can use the CPI to adjust figures so that they can be compared.

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## EXAMPLE: The High Price of Gasoline

- Do the following to convert (inflate) the price of gas in 1957 to dollars in 2003:

$$\begin{aligned} & \text{1957 gas price in 1997 dollars} \\ &= 1957 \text{ gas price} \times \frac{\text{CPI in 2003}}{\text{CPI in 1957}} \\ &= 9.5 \text{ cents} \times (122/17.6) \\ &= 65.8 \text{ cents} \end{aligned}$$

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### ACTIVE LEARNING 3: Exercise

1980: CPI = 90,  
avg starting salary for econ majors = \$24,000

Today: CPI = 180,  
avg starting salary for econ majors = \$50,000

*Are econ majors better off today or in 1980?*

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### ACTIVE LEARNING 3: Answers

1980: CPI = 90,  
avg starting salary for econ majors = \$24,000

Today: CPI = 180,  
avg starting salary for econ majors = \$50,000

#### Solution

Convert 1980 salary into "today's dollars"

$\$24,000 \times (180/90) = \$48,000$ .

After adjusting for inflation, salary is higher today than in 1980.

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### Correcting Variables for Inflation: Indexation

A dollar amount is *indexed* for inflation if it is automatically corrected for inflation by law or in a contract.

For example, the increase in the CPI automatically determines

- the COLA in many multi-year labour contracts
- the adjustments in Canada Pension Plan and Social Security benefits are adjusted annually.
- Tax brackets

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## Case Study: Mr. Index Goes to Hollywood

Film	Year of Release	Total Domestic Gross (in millions of 2004 U.S. dollars)
1. <i>Gone with the Wind</i>	1939	\$1254
2. <i>Star Wars</i>	1977	1084
3. <i>The Sound of Music</i>	1965	870
4. <i>E.T.: The Extra-Terrestrial</i>	1982	861
5. <i>The Ten Commandments</i>	1956	801
6. <i>Titanic</i>	1997	789
7. <i>Jaws</i>	1975	783
8. <i>Doctor Zhivago</i>	1965	740
9. <i>The Jungle Book</i>	1967	662
10. <i>Snow White and the Seven Dwarfs</i>	1937	650

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## Correcting Variables for Inflation: Real vs. Nominal Interest Rates

The nominal interest rate:

- the interest rate not corrected for inflation
- the rate of growth in the dollar value of a deposit or debt

The real interest rate:

- corrected for inflation
- the rate of growth in the purchasing power of a deposit or debt

Real interest rate

$$= (\text{nominal interest rate}) - (\text{inflation rate})$$

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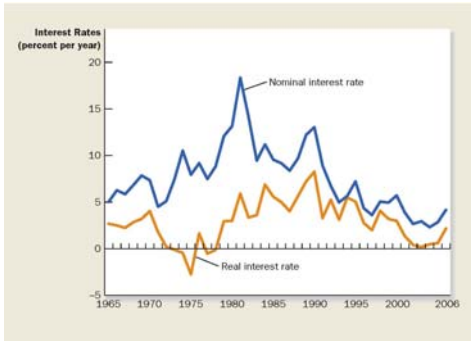
## Real and Nominal Interest Rates: EXAMPLE

- Deposit \$1,000 for one year.
- Nominal interest rate is 9%.
- During that year, inflation is 3.5%.
- Real interest rate
  - = Nominal interest rate – Inflation
  - = 9.0% – 3.5% = **5.5%**
- The purchasing power of the \$1000 deposit has grown 5.5%.

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## Real and Nominal Interest Rates



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## CHAPTER SUMMARY

- The Consumer Price Index is a measure of the cost of living. The CPI tracks the cost of the typical consumer's "basket" of goods & services.
- The CPI is used to make Cost of Living Adjustments, and to correct economic variables for the effects of inflation.
- The real interest rate is corrected for inflation, and is computed by subtracting the inflation rate from the nominal interest rate.

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## End: Chapter 6

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