Chapter 6: The Price Level and Inflation
Measuring the Price Level and Inflation

- Microeconomic causes—changes in individual markets—can explain only a tiny fraction of price change
  - For the most part, price rises came about because of a continually rising price level
    - Average level of dollar prices in the economy
    - 100 years ago one pound of coffee was 15 cents, new suit $6, private college tuition for 1 year $200

- When the price level rises, the value of the dollar—its purchasing power—falls

- We measure many economic variables—such as income, production, wage rate—in dollars
  - Over time, how to keep track of them when unit of measurement—the dollar—is changing?
Connection between money and prices

- Price = the amount of money required to buy one unit of a good
- Value of $1 = how many units of the good does $1 buy?
- Inflation rate = percentage increase in the average level of prices
- Prices are defined in terms of money
  - Need to consider the nature of money
Index Numbers in General

- Most measures of the price level are reported in the form of an index
  - Series of numbers, each one representing a different period
    - are meaningful only in a relative sense
- In general, an index number for any measure is calculated as
  \[
  \frac{\text{Value of measure in current period}}{\text{Value of measure in base period}} \times 100
  \]
- Compress and simplify information so that we can see how things are changing at a glance
The Consumer Price Index

- Consumer Price Index (CPI) is an index of the cost, through time, of a fixed market basket of goods purchased by a typical household in some base period

  - Most widely used measure of the price level in United States
  - Designed to track price paid by typical consumer
  - Compiled and reported by Bureau of Labor Statistics (BLS)

  \[ CPI = \frac{\text{Cost of market basket in current period}}{\text{Cost of market basket in base period}} \times 100 \]

- Two problems must be solved before we even begin
  - Must decide which goods and services should be included in average
  - What weight to give to each item
The Consumer Price Index

Which items to include?
- CPI includes the part of GDP that consumers purchase as final users
- Also includes two types of goods and services that consumers buy although they are not part of GDP
  - HH purchases of used goods
  - HH purchases of imports from other countries

CPI leaves out purchases by businesses and government agencies

CPI tracks the prices of goods and services only
- The prices paid for stocks and bonds are not included
- Housing: CPI includes the price of housing services
The Consumer Price Index

- How much weight to give to each item?
  - When prices change at different rates, some are rising and some are falling, we need to keep track of the change in average price level
    - How to combine all the different prices into a average price level?
    - It would be a mistake to use a simple average of all prices – a proper measure must recognize that we spend very little of our incomes on some good and much more on others.
  - CPI’s approach: track the cost of the CPI market basket– the collection of goods and services that the typical consumer buys
    - BLS surveys thousands of families every couple years, records their spending in detail
  - Market basket’s cost rise by x percent implies; the price level, as reported by the CPI, will increase by x percent.
Tracking and Reporting the Price Level

Figure 1: Broad Categories; Relative Importance in CPI, December 2005

- Housing: 42.4%
- Transportation: 17.4%
- Food and Beverages: 15.0%
- Recreation: 5.6%
- Medical Care: 6.2%
- Clothing: 3.8%
- Education: 3.0%
- Communication: 3.1%
- Other: 3.5%
From Price Index to Inflation Rate

- Consumer Price Index is a measure of the price level in the economy
  - Inflation rate measures how fast price level is changing
    - Percentage change in the price level from one period to the next
    - CPI is reported monthly, but reported rate is seasonally adjusted and reported as an annual rate
  - When price level is rising, as it usually is, inflation rate is positive
  - When price level is falling, as it did during Great Depression, we have a negative inflation rate
    - Called deflation
The Rate of Inflation Using the CPI, 1950–2005

**Figure 2** The Rate of Inflation Using the CPI, 1950–2005
Example 1: Computation of CPI

- Consider the very simple market basket. There are 20 hamburgers and 10 CDs in the basket.
- For each year calculate the cost of the basket, the CPI (take 2000 as the base year), the inflation rate from the preceding year.

<table>
<thead>
<tr>
<th>Prices</th>
<th>Hamburger</th>
<th>CDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>$4</td>
<td>$15</td>
</tr>
<tr>
<td>2001</td>
<td>$5</td>
<td>$15</td>
</tr>
<tr>
<td>2002</td>
<td>$6</td>
<td>$16</td>
</tr>
<tr>
<td>2003</td>
<td>$7</td>
<td>$15</td>
</tr>
</tbody>
</table>
## Solution

<table>
<thead>
<tr>
<th></th>
<th>Cost of basket</th>
<th>CPI</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>$230</td>
<td>100</td>
<td>n.a.</td>
</tr>
<tr>
<td>2001</td>
<td>$250</td>
<td>108.7</td>
<td>8.7%</td>
</tr>
<tr>
<td>2002</td>
<td>$280</td>
<td>121.7</td>
<td>12%</td>
</tr>
<tr>
<td>2003</td>
<td>$290</td>
<td>126.1</td>
<td>3.6%</td>
</tr>
</tbody>
</table>
Example 2: Computing CPI

Take the base year to be 1983 and consider the information below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Retail Price of gasoline per gallon (current dollars)</th>
<th>Consumer Price Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>$0.31</td>
<td>30</td>
</tr>
<tr>
<td>1990</td>
<td>$1.16</td>
<td>131</td>
</tr>
<tr>
<td>2000</td>
<td>$1.51</td>
<td>172</td>
</tr>
</tbody>
</table>

- What was the price of a gallon of gasoline in 1960 in 1983 dollars?
- After adjusting for the effects of general inflation, in which year was gasoline the cheapest? (Calculate gasoline prices for each year in 1983 dollars)
How the CPI is Used

CPI is one of the most important measures of prices in the economy

Used in three major ways

□ As a policy target
  ■ Measure most often used to gauge our success in achieving low inflation

□ To index payments
  ■ An indexed payment is the one that is periodically adjusted so that it rises and falls by the same percentage as a price index (ex?)

□ To translate from nominal to real values
  ■ In order to compare economic values from different periods, we must
    □ Translate nominal variables
      ▪ Measured in the number of dollars
    □ Into real variables
      ▪ Adjusted for the change in dollar’s purchasing power

■ CPI is often used for this translation
Example: Indexation

- My grandmother's Social Security pension is indexed for inflation. Last year inflation, as measured by the change in the CPI, was 1.4%. My grandmother spends 20% of her income on medical care, and divides the remaining 80% of her income among the other CPI categories in the same proportions as does the typical consumer. If the average cost of medical care rose 5% last year, and we ignore all other inaccuracies in the CPI, my grandmother is receiving _______ than enough additional money to keep her standard of living constant.
Tracking and Reporting the Price Level

Broad Categories; Relative Importance in CPI, December 2005

- Housing: 42.4%
- Transportation: 17.4%
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- Communication: 3.1%
- Other: 3.5%
Suppose that from December 2007 to December 2012, your nominal wage rises from $15 to $30 per hour.

- Will you be better off?
  - That depends; how many goods and services you can buy with that money is important (purchasing power!)

- To track your real wage (purchasing power of your wage), you need to look at number of dollars you earn relative to price level.

Real wage formula is as follows:

\[
\text{Real wage in any year} = \frac{\text{Nominal wage in that year}}{\text{CPI in that year}} \times 100
\]
Real Variables and Adjustment for Inflation

- Nominal wage doubled from 2007 to 2012
  - If price of everything you buy also doubles at the same time
    - Your purchasing power is ............

- Nominal wage unchanged from 2007 to 2012
  - Prices doubled in that period
    - Your purchasing power would ............

Assume that Ernesto earned a nominal wage rate of $15 per hour in 2001, the base year for the CPI. If the CPI in 2002 was 102.6 and his nominal wage rate was $16 per hour, what was his real wage rate in 2001?
Trickier example

- Consider an individual who is trying to figure out what has happened to his real wage. He remembers that on his 25th birthday, he was earning $4 per hour, but on his 28th birthday, he was earning $7 per hour. Meanwhile, prices rose during each of those years. While he was 25, prices rose 20%. While he was 26, prices rose 15%, and while he was 27, they rose 6%.

- Between his 25th and 28th birthday, the total percentage increase in the price level was …..

- Between his 25th and 28th birthday, what happened to his real wage?
Real Variables and Adjustment for Inflation

- Real wage in 1975=$8.77, in 2005=$8.32
- Important provisos about wage data
  - Worker compensation
    - Non-wage benefits, employer contributions to retirement accounts and health insurance
  - CPI overestimates inflation somewhat
Real Variables and Adjustment for Inflation

- Important point
  - When we measure changes in macroeconomy, we usually care about purchasing power those dollars represent
  - Not about the number of dollars we are counting

- Translate nominal values into real values using the formula
  \[
  \text{real value} = \frac{\text{nominal value}}{\text{price index}} \times 100
  \]

- How most real values in the economy are calculated
  - One important exception
    - To calculate real GDP, government uses a different procedure
GDP Price Index and Real GDP

- A special price index called GDP price index is calculated for GDP
  - An index of the price level for all final goods and services included in GDP

- Most important differences between CPI and GDP price index
  - Types of goods and services covered by each index
    - GDP price index includes some prices that CPI ignores
    - GDP price index excludes some prices that are part of CPI

- Summarize chief difference between CPI and GDP price index
  - GDP price index measures prices of all goods and services that are included in U.S. GDP
  - While CPI measures prices of all goods and services bought by U.S. households
Costs of Inflation: The Inflation Myth

- Most people think inflation erodes average purchasing power of income
  - By making goods and services more expensive
    - Purchasing power of consumers eroded
- Loss in buyers’ real income can be matched by the rise in sellers’ real income
- Inflation may redistribute purchasing power from one group to another
  - It does not decrease average real income when we include both buyers and sellers in the average
- Often blame inflation for lowering our purchasing power when the real cause lies elsewhere
The Redistributive Cost of Inflation

- One cost of inflation is that it often redistributes purchasing power within society – not generally desirable – sometimes harming the needy, helping those who are already well off.

- How does inflation sometimes redistribute real income?
  - An increase in price level reduces purchasing power of any payment that is specified in nominal terms
  - Inflation can harm people who live on a fixed income

- Inflation can shift purchasing power away from those who are awaiting future payments specified in dollars
  - Toward those who are obligated to make such payments

- Does inflation always redistribute income from one party in a contract to another?
  - No—if inflation is expected by both parties.
Expected Inflation Need Not Shift Purchasing Power

- Over any period, percentage change in a real value ($\%\Delta \text{ Real}$) is approximately equal to percentage change in associated nominal value ($\%\Delta \text{ Nominal}$) minus percentage change in price level ($\%\Delta \text{ P}$)

  - $\%\Delta \text{Real} = \%\Delta \text{Nominal} - \%\Delta \text{ P}$

- If inflation is fully anticipated, and if both parties take it into account, then inflation will not redistribute purchasing power

- When inflation is not correctly anticipated, however, our conclusion is different
Example

Suppose workers agreed to a contract that guaranteed a real wage increase of 3 percent per year. If the inflation rate was 7 percent over the following year, what is the required increase in the nominal wage to meet the contract requirements?
Contracts between lenders and borrowers

- Annual interest rate: Interest payment divided by amount of money you have lent
- Nominal interest rate
  - percentage increase in a lender’s dollars from making a loan
- Real interest rate
  - percentage increase in a lender’s purchasing power from making a loan
    - In absence of inflation, real and nominal interest rates would always be equal
- If both parties correctly anticipate the inflation rate, then no one gains or loses
Unexpected Inflation Does Shift Purchasing Power

- When inflationary expectations are inaccurate
  - Purchasing power is shifted between those obliged to make future payments and those waiting to be paid
  - An inflation rate higher than expected harms those awaiting payment and benefits the payers
  - An inflation rate lower than expected harms the payers and benefits those awaiting payment
  - In lender-borrower example, unexpected inflation has led to better deal for your borrower and a worse deal for you as a lender
The Resource Cost of Inflation

- Inflation imposes an opportunity cost on society as a whole and on each of its members
  - When people must spend time and other resources coping with inflation they pay an opportunity cost
    - Sacrifice goods and services those resources could have produced instead
- Resources used by consumers to cope with inflation
  - Time you could have spent earning income or enjoying leisure activities
Is the CPI accurate: Sources of bias in CPI

- Economists widely agree that CPI overstates the U.S. inflation rate
- Substitution bias
  - People tend to substitute goods that have become relatively cheaper in place of goods that have become relatively more expensive
  - Although BLS partially fixed this problem, CPI still suffers from this bias. Categories of goods whose prices are rising most rapidly are overweighted in the CPI market basket and categories of goods whose prices are rising most slowly are underweighted
Sources of bias in the CPI: Continued

- **New Technologies**
  - CPI excludes new products that tend to drop in price when they first come on the market
  - Those goods using new technologies are introduced to the market basket only after a lag

- **Changes in Quality**
  - Many products’ price rise is due to changes in quality
    - Consumers are getting more

- **Growth in discounting**
  - New discount outlet stores lower the price on many items

- **Overall upward bias in CPI**
  - Depends on what we are trying to measure