W03: Price Level and Inflation

- Why do we need to know the price level?
- Price indices
- Calculation of real variables
- Inflation and inflation rate

Reading: CH. 5.3 pg. 116-120 (until "Alternative price indices"

HW02: assigned Thursday, 1/28, due Friday, 2/05

Price Level: Why Do We Care?

- We are now familiar with the concept of real GDP
- We know how to exclude the price effects from changes in GDP to evaluate the real value of production – just use the base year prices in your calculations
- But what if we wanted to know the real value of our wages, or interest income, or some other economic variable? How is that done?
- First, let's see why we would want to do that

Price Level: Why Do We Care?

- Imagine that these were your wages:

Year	Monthly Nominal Income
2011	$5,000
2012	$6,000
2013	$7,000
2014	$8,000
2015	$9,000

- Can you say that you are doing much better in 2015 than you were in any previous year?

Price Level: Why Do We Care?

- Consider the following example:

Year	Rent	Pizza	Total Needed	Nominal Wages
2012	$550	30 x $15 = $450	$1,000	$1,000
2013	$560	30 x $16 = $480	$1,040	$1,010
1014	$570	30 x $17 = $510	$1,080	$1,020

- The wages are growing, but the prices are growing by more!

Price Level: Why Do We Care?

- So, do we really care if our nominal wage changes?
- We care about **how much stuff we can afford with a given income**, i.e. can I pay my rent and buy the required 30 pizzas with my wage?
- We need to calculate **real income** to measure the ability to afford things with our income

Price Level: Why Do We Care?

$$\text{Real Income} = \frac{\text{Nominal Income}}{\textbf{Price Level}}$$

- How do we find the price level?
- We use special indices, called price indices

Commonly Used Price Indices

- The GDP Deflator
- The Consumer Price Index, or CPI

GDP Deflator

- The price level of the **overall economy**

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

GDP Deflator Example

	Peanut Butter		Jelly	
Year	Quantity	Price	Quantity	Price
2013	20	$4.00	50	$2.00
2014	30	$5.00	100	$2.00

GDP Deflator Example

- **Nominal GDP:**

$$GDP_{13}^{N} = ?$$

$$GDP_{14}^{N} = ?$$

- **Real GDP:**

$$GDP_{13}^{13} = ?$$

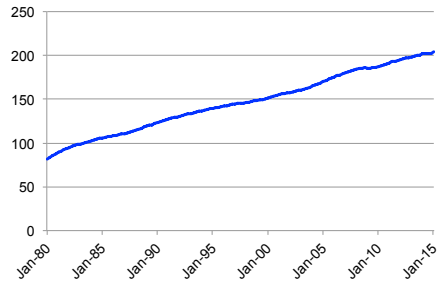
$$GDP_{14}^{13} = ?$$

GDP Deflator

$$\text{GDP deflator}^{13} = \frac{\quad}{\quad} \times 100 =$$

$$\text{GDP deflator}^{14} = \frac{\quad}{\quad} \times 100 =$$

GDP Deflator in U.S., 1980-2015

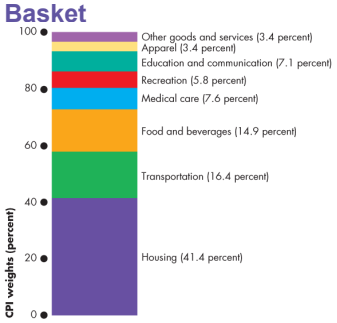


Consumer Price Index

- **CPI** measures the average of the prices paid by urban consumers for a "fixed" basket of consumer goods and services

$$\text{CPI} = \frac{\text{cost of the basket at current prices}}{\text{cost of the basket at base-period prices}} \times 100$$

CPI Basket



- For a full list of weights go to: http://www.bls.gov/cpi/cpiri_2013.pdf

Consumer Price Index Calculation

1. Pick the **reference base period**
   Currently, the reference base period is 1982-1984
2. Assign CPI=100 in the reference base period
3. Use the formula:

$$\text{CPI} = \frac{\text{cost of the basket at current prices}}{\text{cost of the basket at base-period prices}} \times 100$$

Calculating CPI

TABLE 5.1 The CPI: A Simplified Calculation

(a) The cost of the CPI basket at base-period prices: 2014

CPI basket			
Item	Quantity	Price	Cost of CPI Basket
Oranges	10	$1.00	$10
Haircuts	5	$8.00	$40
Cost of CPI basket at base-period prices			$50

(b) The cost of the CPI basket at current-period prices: 2015

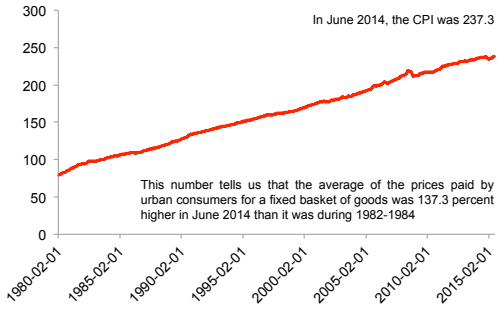
CPI basket			
Item	Quantity	Price	Cost of CPI Basket
Oranges	10	$2.00	$20
Haircuts	5	$10.00	$50
Cost of CPI basket at current-period prices			$70

Calculating CPI

$$\text{CPI} = \frac{\quad}{\quad} \times 100 =$$

The CPI is 40 percent higher in the current period than it was in the base period

CPI Overtime



Calculating CPI

- One more example

Biased CPI

The CPI might overstate the true inflation rate for four reasons:

- New goods bias
- Quality change bias
- Commodity substitution bias
- Outlet substitution bias

Biased CPI

New Goods Bias

New goods that were not available in the base year appear and, if they are more expensive than the goods they replace, they put an upward bias into the CPI

Quality Change Bias

Quality improvements occur every year. Part of the rise in the price is payment for improved quality and is not inflation

The CPI counts all the price rise as inflation

Biased CPI

Commodity Substitution Bias

The market basket of goods used in calculating the CPI is fixed and does not take into account consumers' substitutions away from goods whose relative prices increase

Outlet Substitution Bias

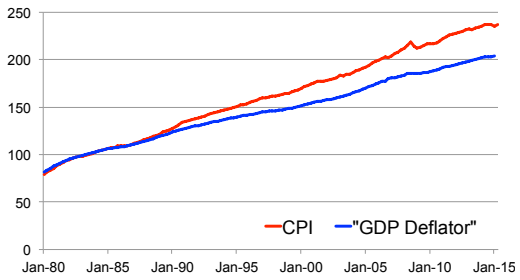
As the structure of retailing changes, people switch to buying from cheaper sources, but the CPI, as measured, does not take account of this outlet substitution

Biased CPI

- **The Magnitude of the Bias**

  Estimates say that the CPI overstates inflation by 1.1 percentage points a year

GDP Deflator vs. CPI



GDP Deflator vs. CPI

- **What are the differences?**
  - The GDP deflator includes things not purchased by households, like trains, subways, and submarines
  - The CPI includes imports like Chinese laptops
  - Housing-related expenditures like shelter and utility bills have a large weight in the CPI

The Real Variables in Macroeconomics

- Recall why we need the price indices:

$$\text{Real Income} = \frac{\text{Nominal Income}}{\textbf{Price Level}}$$

- Once we know the price indices, we can calculate the PL:

$$\text{Price level} = \frac{\text{Price index in current year}}{\text{Price index in comparison year}}$$

The Real Variables in Macroeconomics

- Combine:

$$\text{Real income}_{current}^{\text{in comparison year dollars}} = \text{Nominal income}_{current} \times \frac{\text{Price index}^{\text{comparison year}}}{\text{Price index}^{\text{current year}}}$$

Example

- In 1909, then U.S. President William Howard Taft was paid $75,000 and the CPI was 9
- In 2013, current U.S. President Barack Obama was paid $400,000 and the CPI was 233
- Which president is more wealthy?

Example

- Let's calculate the value of Taft's salary in 2013 dollars, i.e. his real salary in terms of 2013 dollars:

$$\text{Real salary}_{1909}^{\text{in 2013 \$}} = \text{Nominal salary}_{1909} \times \frac{\text{CPI}^{2013}}{\text{CPI}^{1909}}$$

$$\text{Real salary}_{1909}^{\text{in 2013 \$}} = \quad \times \quad \frac{\qquad}{\qquad}$$

Example

- Which president is better off?

Example

- Equivalently, we can calculate the value of Obama's salary in 1909 dollars and compare it to Taft's salary:

$$\text{Real salary}_{2013}^{\text{in 1909 \$}} = \text{Nominal salary}_{2013} \times \frac{\text{CPI}^{1909}}{\text{CPI}^{2013}}$$

$$\text{Real salary}_{2013}^{\text{in 1909 \$}} = \quad \times \quad \text{———}$$

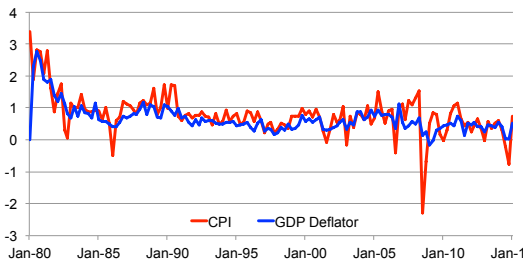
- Now who is better off?

Inflation Rate

- One of the major purposes of the price indices is to measure inflation
- The ***inflation rate*** is the percentage change in the price index from one year to the next:

$$\pi^{2014} = \frac{\text{Price index in 2014 - Price index in 2013}}{\text{Price index in 2013}} \times 100$$

Different Calculation of Inflation Rate



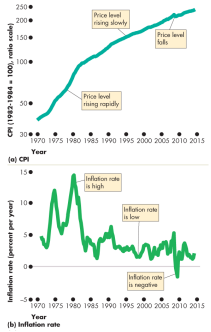
Price Level and Inflation Rate

- The **price level** is the average level of prices and the value of money
- A persistently rising price level is called **inflation**
- A persistently falling price level is called **deflation**

Price Level and Inflation Rate

The inflation rate is:

- High when the price level is rising rapidly and
- Low when the price level is rising slowly
- Negative when the price level is falling



Are Inflation and Deflation Problems?

- Low, steady, and anticipated inflation or deflation is not a problem
- *Unpredictable* inflation or deflation is bad because it redistributes incomes and wealth:
  - Employer vs. worker
  - Lender vs. borrower

Hyperinflation

- A country experiences **hyperinflation** if a monthly inflation rate is equal or greater to 50%
- *Video: http://www.youtube.com/watch?v=sZ6PEyX61ZQ*

Worst Episodes of Hyperinflation

Country	Currency	Month with highest inflation rate	Daily inflation rate	Time required for prices to double
Hungary	Hungarian pengő	Jul-46	207.19%	15 hours
Zimbabwe	Zimbabwe dollar	Nov-08	98.01%	24.7 hours
Yugoslavia	Yugoslav dinar	Jan-94	64.63%	1.4 days
Republika Srpska	Republika Srpska dinar	Jan-94	64.30%	1.4 days
Germany	German Papiermark	Oct-23	20.87%	3.7 days
Greece	Greek drachma	Oct-44	17.84%	4.3 days

Countries with the Highest Annual Inflation

Country	Inflation Rate	Data Source and Year
Venezuela	808 %	*World Bank (2015)*
South Sudan	47.3 %	*World Bank (2011)*
Sudan	36.9 %	*World Bank (2014)*
Argentina	35.1 %	*CIA World Factbook (2015)*
Syria	34.8 %	*CIA World Factbook (2014)*
Belarus	16.2 %	*CIA World Factbook (2014)*

Countries with the Highest Annual Deflation

Country	Inflation Rate	Data Source and Year
Cyprus	-1.4 %	*World Bank (2014)*
Bulgaria	-1.4 %	*World Bank (2014)*
Greece	-0.9 %	*World Bank (2015)*
Niger	-0.8 %	*World Bank (2014)*
Portugal	-0.3 %	*World Bank (2014)*

Countries with the Lowest Annual Inflation

Country	Inflation Rate	Data Source and Year
Poland	0.1 %	*World Bank (2014)*
Lithuania	0.1 %	*World Bank (2014)*
Republic of Congo	0.1 %	*World Bank (2014)*
…		
Germany	0.9 %	*World Bank (2014)*
…		
U.S.	1.6 %	*World Bank (2014)*