Lecture 3

- The Price Level
- Real vs. Nominal Quantities
- The Quantity Theory of Money
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• The Price Level
• Real vs. Nominal Quantities
• The Quantity Theory of Money

➤ Paper (Fiat) money valuable only because it will buy stuff.
➤ How is its purchasing power measured and determined?
The Price Level

CPI-U

**Consumer Price Index for All Urban Consumers**

Base year

1982-4 = 100      1967 = 100

<table>
<thead>
<tr>
<th>Date</th>
<th>Index 1982-4</th>
<th>Index 1967</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/11</td>
<td>226.5</td>
<td>678.6</td>
</tr>
<tr>
<td>8/10</td>
<td>218.3</td>
<td>654.0</td>
</tr>
<tr>
<td>8/09</td>
<td>215.8</td>
<td>646.5</td>
</tr>
<tr>
<td>1982-4</td>
<td>100.0</td>
<td>299.5</td>
</tr>
<tr>
<td>1967</td>
<td>(33.4)</td>
<td>100.0</td>
</tr>
</tbody>
</table>

- CPI computed monthly by Bureau of Labor Statistics (BLS) in US Dept. of Labor (stats.bls.gov)
- Is final on release, has 1 month computation lag.
Growth rates hard to visualize with linear scale
Logarithmic scale better for this purpose.
With logarithmic scale, slope indicates growth rate. CPI grew faster 1968-82 than before or after.
Inflation = rate of growth of price level.

\[ P_t = \text{Price level in year } t \]
\[ P_{t-1} = \text{Price level in year } t-1 \]

\[ \pi = \frac{\Delta P}{P} = \frac{P_t - P_{t-1}}{P_{t-1}} = \text{annual inflation rate} \]

\( \Delta \) (Delta) indicates change in variable.

Deflation = negative inflation

= rate of decline of price level.

Less common than inflation.
$8/10 - 8/11 \ (1982-4 = 100)$:

$$\pi = \frac{226.5 - 218.3}{218.3} = .038 = 3.8\% \text{ annual inflation}$$

$8/09 - 8/10$:

$$\pi = \frac{218.3 - 215.8}{215.8} = .012 = 1.2\% \text{ annual inflation}$$

Same $\pi$ with any Base Year (within rounding error):

$8/10 - 8/11 \ (1967 = 100)$:

$$\pi = \frac{678.6 - 654.0}{654.0} = .038 = 3.8\% \text{ annual inflation}$$

$8/09 - 8/10$:

$$\pi = \frac{654.0 - 646.5}{646.5} = .012 = 1.2\% \text{ annual inflation}$$
Month-to-month $\pi$ is mostly noise, rounding error:

CPI-U Inflation
month-to-month, annualized

Year
Percent per annum

Month-to-month $\pi$ is mostly noise, rounding error:
Year-over-year inflation is more meaningful, shows considerable persistence from yr to yr:

- Inflation was in double digits, 1973-74, 1979-81.
  - Why?
  - Could this ever recur?
- Inflation was negative, 2008-9.
  - Is this a big problem?
  - Is it likely to continue?
GOOD NEWS, GARFIELD!

THE ADMINISTRATION SAYS THE RATE OF INFLATION IS GOING DOWN.
GOOD NEWS, GARFIELD!

THE ADMINISTRATION SAYS
THE RATE OF INFLATION
IS GOING DOWN.

THAT AND A BUCK-FIFTY
WILL GET YOU A
CUP OF COFFEE.

7-18

JIM DAVIS
Boskin Congressional Commission Report, 1996

Says CPI-U overstated “true” inflation by about 1.1%/yr (0.8 – 1.6%)

– 0.6% due to new products, eg
  • computers
  • cell phones
  • DVD players

– 0.4% due to substitution away from goods whose prices have increased.
  • eg gas ↑ → less driving, better fuel economy

– 0.1% due to shopping locations
  • eg Wal-Mart

Some improvements made, but Fed now prefers PCE Deflator to CPI-U
Other Price Indices (Commerce Dept.)

• GDP Deflator
  – Gross Domestic Product
  – Base Year = 2005 currently
    • was 2000, 1996, 1987, etc.
  – Quarterly, revised after first release.

• PCE Deflator
  – Personal Consumption Expenditures
  – Base Year same as GDP Deflator
  – Monthly, revised after first release

• Producer Price Indices (PPIs)
  – Wholesale Prices
  – Base Year = 1982 currently
  – Monthly, released before CPI, but noisy.
GDP, PCE Deflators very similar to one another. Both tell similar story to CPI-U
• CPI-U inflation averages **0.40%/yr more** than PCE inflation, otherwise similar, since 1983 CPI upgrade.
• Final CPI-U available on first release, **PCE must wait months or years for final version.**

CPI-U vs PCE Inflation,
1983-2008 (year-over-year)
CPI-U inflation averages 0.40%/yr more than PCE inflation

⇒ good estimate of final PCE $\pi$ is CPI $\pi$, minus 0.40%!
• PPI inflation noisy, may differ substantially from CPI-U, PCE inflation.
• PPI for Finished Consumer goods doesn’t include services or retail markups that are in CPI.
Real vs. Nominal Quantities

Nominal – Current (year t) $

Real – Base year (year t₀) $

\( P_t = \text{Price Index} \)

\( Y_t = \text{Nominal Income (upper case)} \)

\( y_t = Y_t \cdot P_0 / P_t = \text{Real Income (lower case)} \)

(in year t₀ $)

To simplify, we often take \( P_0 = 1.00 \). Then,

\( y_t = Y_t / P_t \quad \text{or} \quad y = Y / P \)

Similarly, if \( M_t = \text{Nominal Money Stock (upper case)} \),

\( m_t = M_t / P_t = M / P = \text{Real Money Stock (lower case)} \).
Most of growth in nominal income has just been inflation. Real income usually grows fairly steadily at 2 – 4% / yr.
Real GDP Growth Rate
5-year trailing average, annual percentages
Avg = 3.24%/yr.
The Quantity Theory of Money  
(M&I Ch. 2)

• $M^S$ = Nominal M Stock  
  – supplied by govt, banks
• $m^D$ = Real M Demand  
  – determined by  
    • real volume of transactions using M  
    • average time M held

• $P^*$ = Equilibrium P-level at which $S = D$:  
  \[ \frac{M^S}{P^*} = m^D \quad \text{or} \quad M^S = P^* \cdot m^D \]  
  \[ \Rightarrow P^* = \frac{M^S}{m^D} \]  
  QTOM

• QTOM asserts  
  $P \rightarrow P^*$ in Long Run.
Implications of QTOM

\[ P \rightarrow P^* = \frac{M^S}{m^D} \]

- If \( m^D \) constant,
  \[ M^S \uparrow \rightarrow P \uparrow, \quad M^S \downarrow \rightarrow P \downarrow \]
- If \( M^S \) constant,
  \[ m^D \uparrow \rightarrow P \downarrow, \quad m^D \downarrow \rightarrow P \uparrow \]
- If \( M^S, m^D \uparrow \) or \( \downarrow \) in same proportion,
  \[ P \) constant. \]
The Ripple Effect

- Placing rock in pond raises level uniformly.
- Dropping rock in pond causes splash, ripples
  - but eventually level rises uniformly.
- $M \uparrow$ disturbs relative prices at first.
  - sellers whose $P$’s rise before their cost of living goes up gain from $\pi$.
  - sellers whose $P$’s rise after their cost of living goes up lose from $\pi$.
  $\Rightarrow$ Inflation induces transfer from “last in line” to “first in line”

This is one of 3 income transfers that may be caused by inflation. (more later)
Walras’ Law

Budget Constraints imply

\[ \text{Agg D} = \text{Agg S}, \text{ even at non-equil. P’s.} \]

so \( D_{\text{goods}} + m^D = S_{\text{goods}} + M^S / P, \)

\( M^S / P - m^D = D_{\text{goods}} - S_{\text{goods}}, \) or

\[ \text{XS S of M} = \text{XS D for Goods} \quad (\text{XS = excess}) \]
Implications of Walras’ Law:

**XS S of M = XS D for Goods**

1. \( \frac{M^S}{P} > m^D \) \( \rightarrow \) \( \frac{D_{\text{goods}}}{S_{\text{goods}}} \)
   \( \rightarrow \) \( P \uparrow \) on average until \( P = P^* \)

2. \( \frac{M^S}{P} < m^D \) \( \rightarrow \) \( \frac{S_{\text{goods}}}{D_{\text{goods}}} \)
   \( \rightarrow \) \( P \downarrow \) on average until \( P = P^* \)

Either way, \( P \rightarrow P^* \) in Long Run, per QTOM
• HW 2 due Fri 5 PM.
• Next:
  – Interest rates: nominal vs. real
  – M&B 6, 8, 19 pp. 1-3,
  – M&I 4.1, 7.1