

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

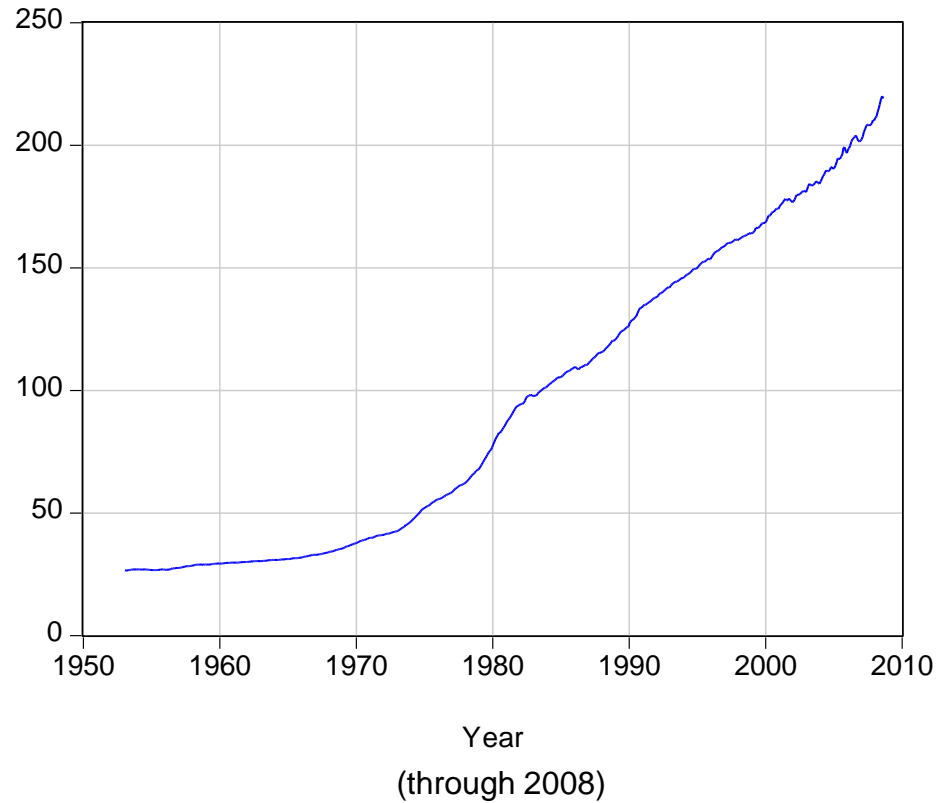
Consumer Price Index for All Urban Consumers

Base year

	1982-4 = 100	1967 = 100
8/11	226.5	678.6
8/10	218.3	654.0
8/09	215.8	646.5
1982-4	100.0	299.5
1967	(33.4)	100.0

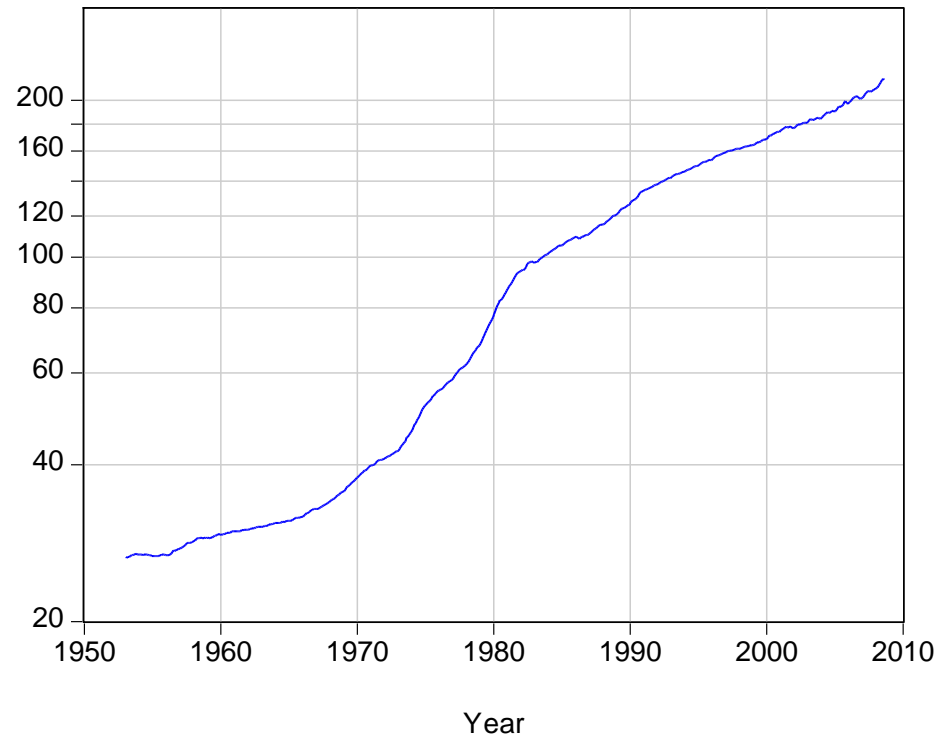
- CPI computed monthly by Bureau of Labor Statistics (BLS) in US Dept. of Labor (stats.bls.gov)
- Is final on release, has 1 month computation lag.

CPI-U
1982-84 = 100
Linear Scale



Growth rates hard to visualize with linear scale
Logarithmic scale better for this purpose.

CPI-U
1982-84 = 100
Logarithmic Scale



(through 2008)

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 = Price level in year t

P_{t-1} = Price level in year t-1

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

Δ (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 π with any Base Year (within rounding error):

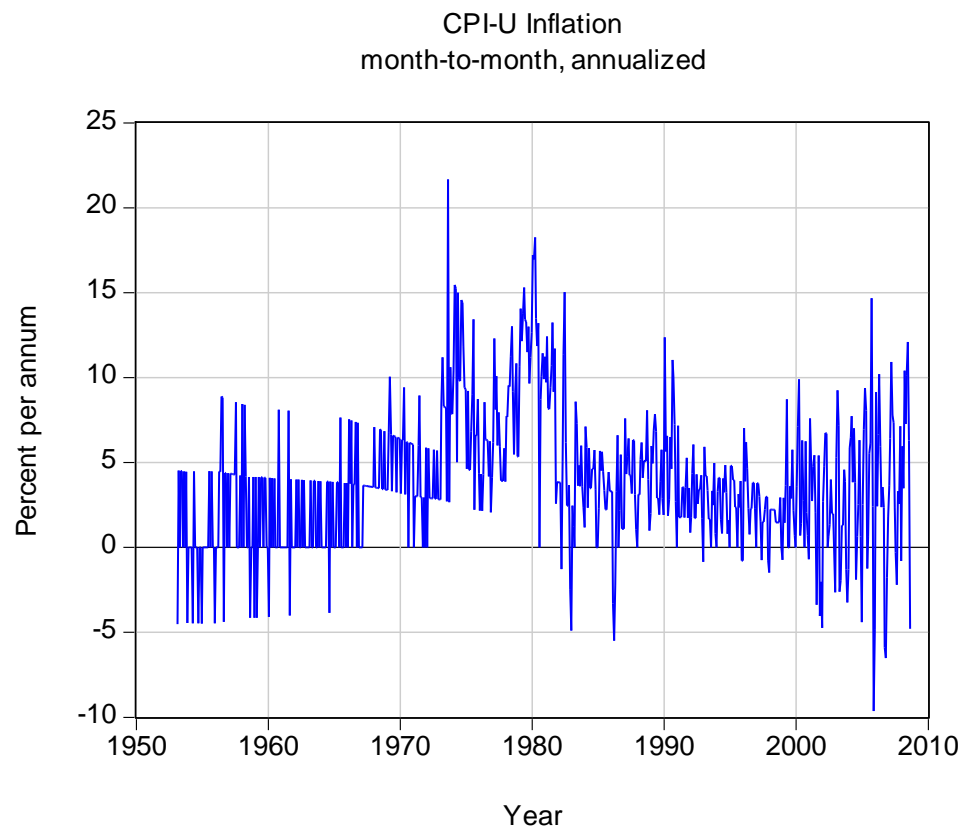
8/10 – 8/11 (1967 = 100):

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

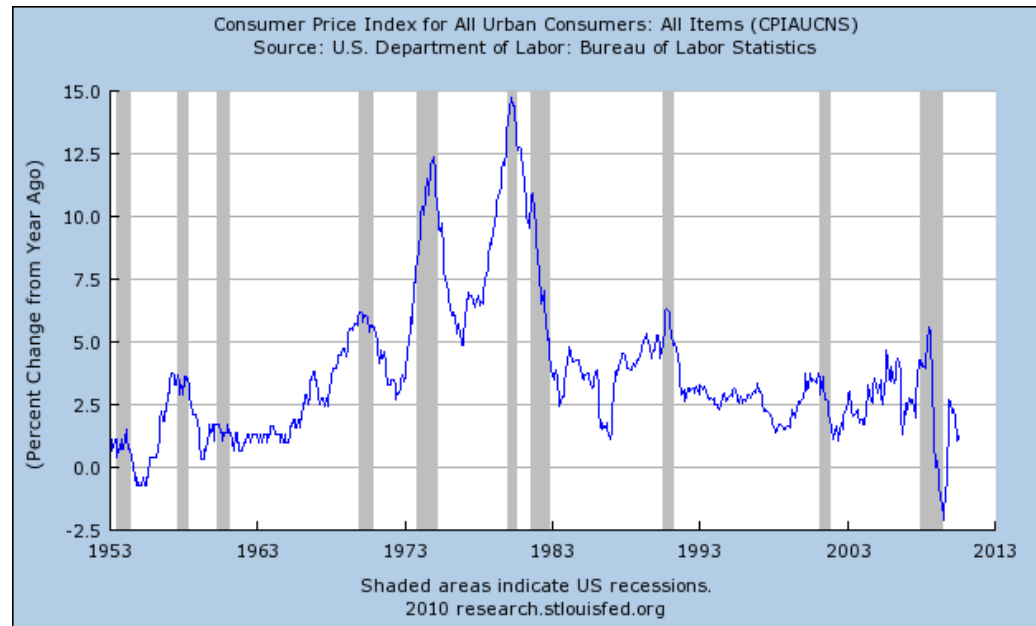
8/09 – 8/10:

$$\pi = \frac{654.0 - 646.5}{646.5} = .012 = 1.2\% \text{ annual inflation}$$

Month-to-month π 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?

GARFIELD 1978



GARFIELD 1978



Boskin Congressional Commission Report, 1996

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

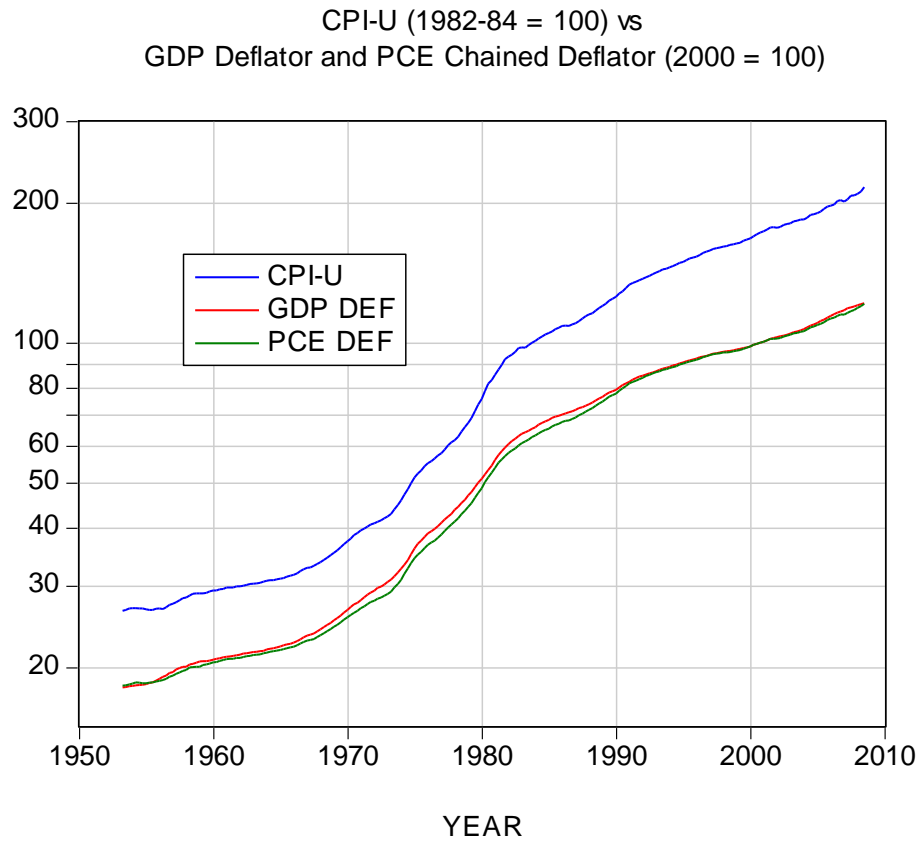
- 0.6% due to new products, eg
 - computers
 - cell phones
 - DVD players
- 0.4% due to substitution away from goods whose prices have increased.
 - eg gas \uparrow \rightarrow less driving, better fuel economy
- 0.1% due to shopping locations
 - eg Wal-Mart

Some improvements made, but Fed now prefers
PCE Deflator to CPI-U

Other Price Indices (Commerce Dept.)

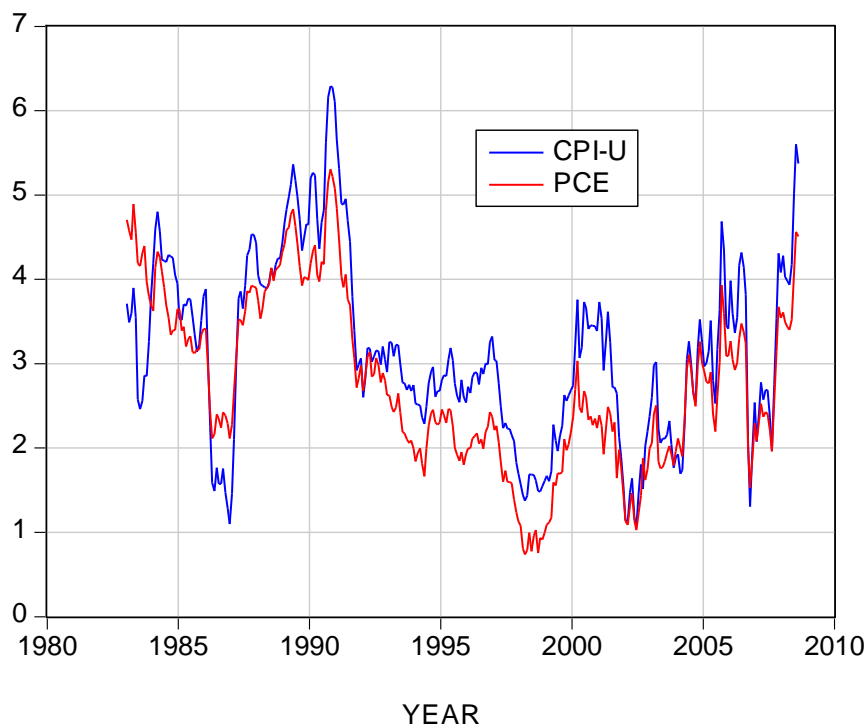
- GDP Deflator
 - Gross Domestic Product
 - Base Year = 2005 currently
 - was 2000, 1996, 1987, etc.
 - Quarterly, revised after first release.
- PCE Deflator
 - Personal Consumption Expenditures
 - Base Year same as GDP Deflator
 - Monthly, revised after first release
- Producer Price Indices (PPIs)
 - 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.**

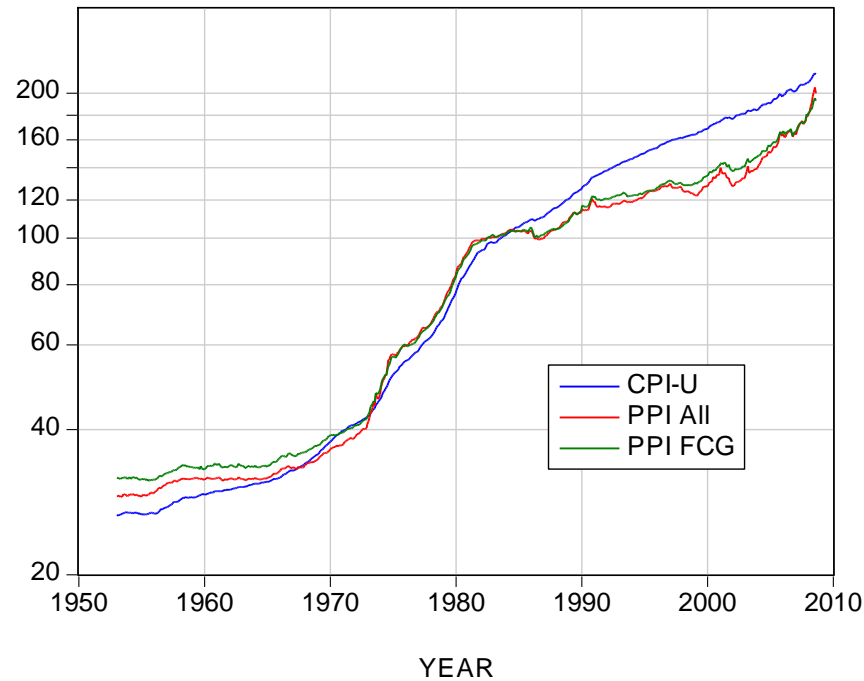
CPI-U vs PCE Inflation,
1983-2008 (year-over-year)
CPI-U inflation averages 0.40%/yr more than PCE inflation



⇒ good estimate of final PCE π is CPI π , 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.

CPI-U (1982-84 = 100) vs
PPI All Commodities, PPI Finished Consumer Goods (1982=100)



Real vs. Nominal Quantities

Nominal – Current (year t) \$

Real – Base year (year t_0) \$

P_t = Price Index

Y_t = Nominal Income (upper case)

$y_t = Y_t \cdot P_0 / P_t$ = Real Income (lower case)
(in year t_0 \$)

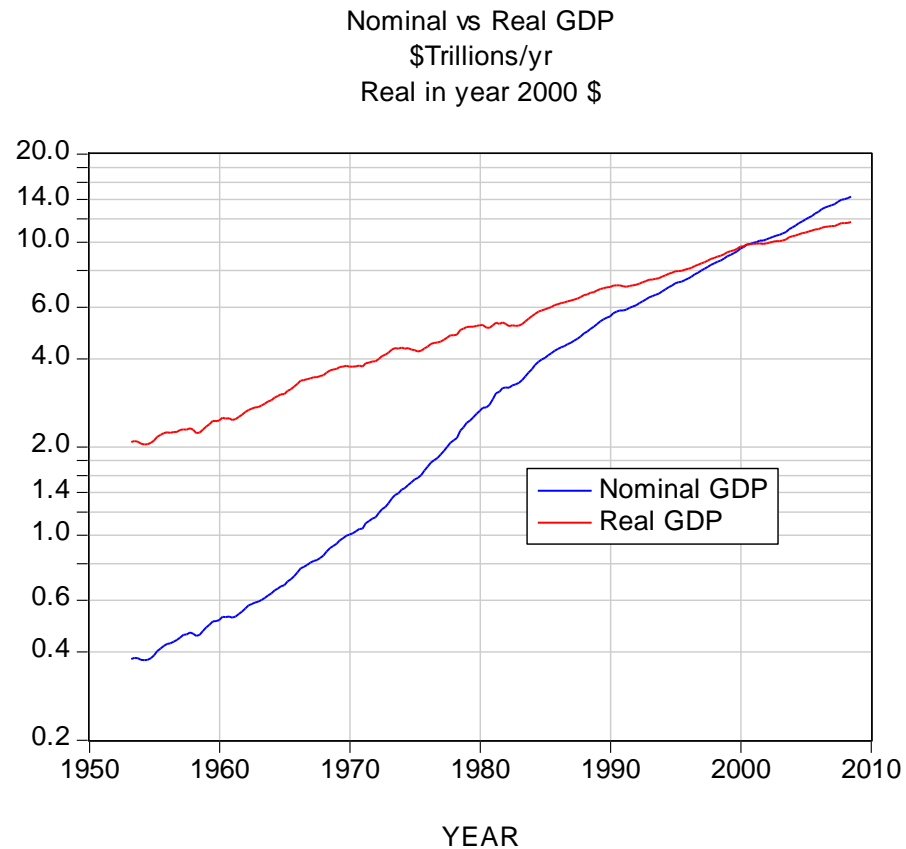
To simplify, we often take $P_0 = 1.00$. Then,

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

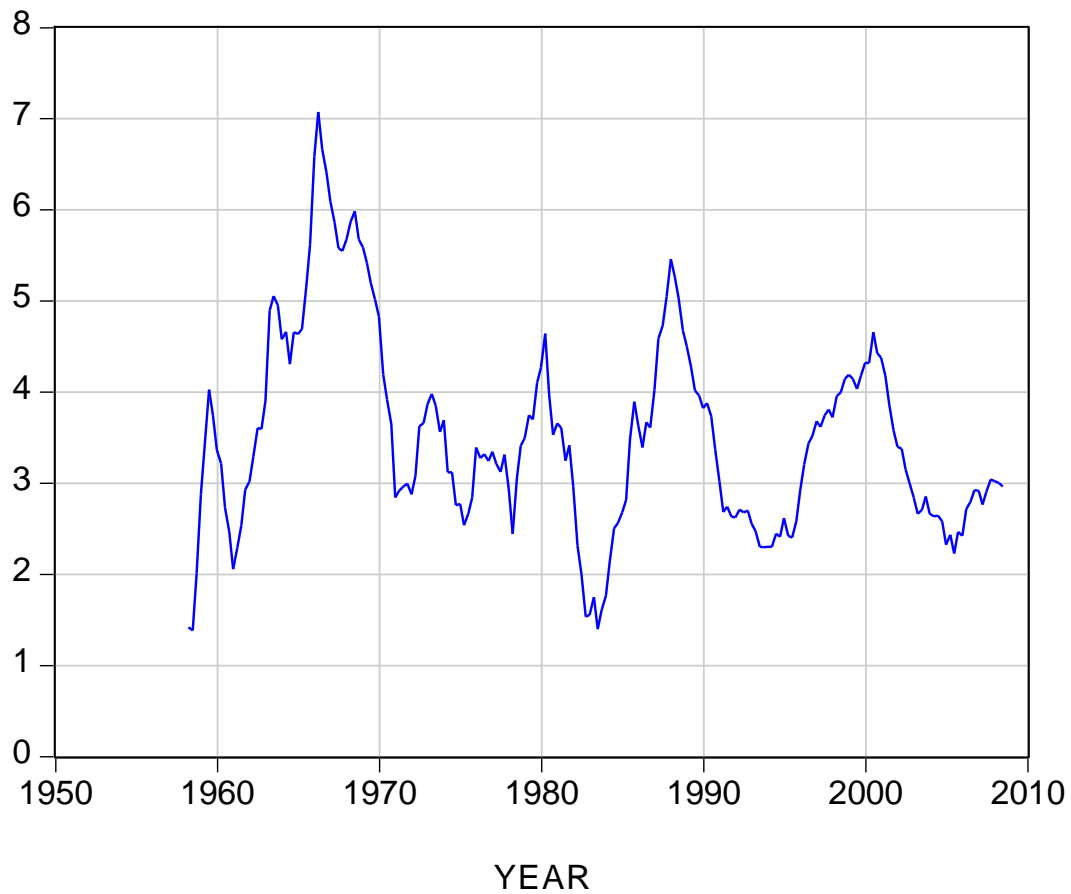
Similarly, if M_t = Nominal Money Stock (upper case),

$m_t = M_t / P_t = M / P$ = 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
 - provided 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 $S = D$:
 $M^S / P^* = m^D$ or $M^S = P^* m^D$
 $\Rightarrow P^* = M^S / m^D$ QTOM
- QTOM asserts
 $P \rightarrow P^*$ in Long Run.

Implications of QTOM

$$P \rightarrow P^* = M^S / m^D$$

- If m^D constant,
 $M^S \uparrow \rightarrow P \uparrow$, $M^S \downarrow \rightarrow P \downarrow$
- If M^S constant,
 $m^D \uparrow \rightarrow P \downarrow$, $m^D \downarrow \rightarrow P \uparrow$
- 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 π .
 - sellers whose P 's rise after their cost of living goes up lose from π .

⇒ 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

Agg D = Agg S, even at non-equil. P's.

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

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

XS S of M = XS D for Goods

(XS = excess)

Implications of Walras' Law:

$$XS \text{ of } M = XS \text{ D for Goods}$$

1. $M^S / P > m^D$ ($P < P^* = M^S / m^D$)

$\Rightarrow D_{\text{goods}} > S_{\text{goods}}$

$\Rightarrow P \uparrow$ on average until $P = P^*$

2. $M^S / P < m^D$ ($P > P^* = M^S / m^D$)

$\Rightarrow S_{\text{goods}} > D_{\text{goods}}$

$\Rightarrow P \downarrow$ on average until $P = P^*$

Either way, $P \rightarrow P^*$ in Long Run, per QTOM

- HW 2 due Fri 5 PM.
- Next Tues:
 - Interest rates: nominal vs. real
 - M&B 6, 8, 19 pp. 1-3,
 - M&I 4.1, 7.1