

## ECON 206 MACROECONOMIC ANALYSIS

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Chapter # 8

### What is inflation?

- Inflation is the rate of increase in prices over time
- If  $P_t$  is the price level at time  $t$ , then inflation,  $\pi$ , is the growth rate in  $P_t$ :

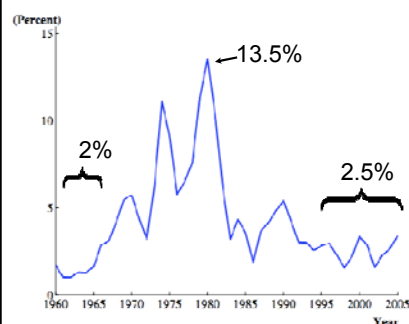
$$\pi = g_P = \frac{\Delta P_t}{P_t}$$

- (That's the Greek letter "pi," and it is a *variable*, not some number like 3.141592...)
- Inflation measures the rate at which the average price is rising — if your income is not rising as fast as inflation, then your power to purchase the average good is deteriorating!
- How has inflation behaved in the U.S. over time?

## Inflation

Chapter 8

During recent history, inflation has been low, then **extremely high** and variable, and then low again



- In the 1960s, inflation was **low** and not particularly volatile, around 2% per year
- But as the Vietnam War escalated, and as the oil shocks hit the world economy in the 1970s, inflation **increased** and became considerably more volatile, peaking in 1980 at 13.5%
- Then it fell, and for the last 10-15 years, inflation has been relatively **subdued**

### Our objectives today

- What is **inflation**? Why is it costly? How costly can it be?
- Where does inflation come from? What is the *quantity theory of money*?
- How are the nominal interest rate, the real interest rate, and inflation related?
- How does government fiscal policy (taxes versus spending) affect inflation?

### Why did this "Great Inflation" in the late 1970s happen?

- Part of the reason involves the external shocks — the oil shocks — that also increased unemployment worldwide during this period
- But part of the reason, it is now widely agreed, involved **bad policymaking**
- How? The central bank was "printing" too much money
- The central bank, **the Federal Reserve** in the U.S., regulates the money supply, while the U.S. Mint actually prints money
- *Technically, the central bank doesn't really set the money supply, it sets a target nominal interest rate — we'll talk about this in later chapters*
- To understand when and why too much money actually becomes "too much," we need the **Quantity Theory of Money**

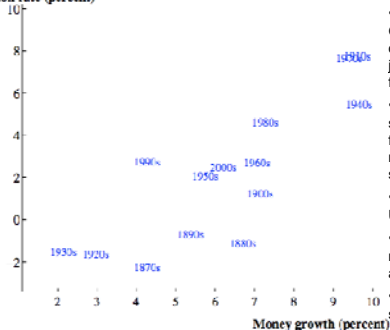
## But first, *what is money?*

- The cash in your pocket is obviously money, right?
- In modern economies, the cash in your pocket is nothing but a credit, a medium of exchange, with no intrinsic value. Historically, money was legally linked to amounts of gold, but that is no longer the case
- What else is credit? *Bank accounts*, credit cards, IOUs...
- We'll define money — usually in terms of the size of the money supply — based on how *liquid* it is: how rapidly you can get it to trade for goods and services
- From most liquid to least, money consists of:  
Cash, Banks' reserves, Checking accounts, Savings, money market accounts

Take the growth rate of both sides of  $P_t = \frac{M_t V_t}{Y_t}$  where  $g_V = 0$

$$g_P = \pi = g_M - g_Y = \% \Delta M - \% \Delta Y$$

Inflation rate (percent)



\*The growth rate of real GDP,  $g_Y$ , is basically constant at 2% or so — just like we saw in the first 6 chapters

\*What this equation says is that inflation is a function of the growth rate of the money supply

\*Is this what we see in U.S. data?

\*Yes, although the relationship isn't *exactly* a straight line

\*Other countries show similar trends

## How do we move from money to inflation?

- Money is a *nominal*, not a *real* quantity: your \$10 bill will buy only so many goods as you can afford given their prices  
 $\$10 = p \times q = \$2 \text{ per latté times } 5 \text{ lattés}$
- This simple relationship is *almost* all we need to know in order to compare the **nation's** money supply to the **nation's** P and Q — which are the price level and real GDP, so  $P \times Q = \text{nominal GDP}$
- The extra twist is that in the economy, the same money gets used multiple times during a year
- We use the term “velocity” and the letter “V” to measure this
- So for the aggregate economy:  $M \times V = P \times Y$
- The money supply (M) times velocity (V) is equal to the price level (P) times real GDP (Y), where V = usages of the \$10 bill per year

## What does inflation affect?

- Changes in prices erode the real value of *any* nominal amounts
- **Labor income:**
  - Suppose you were making \$50,000 a year in 2006: you worked 40 hours a week x 50 weeks = 2,000 hours, and your wage was \$25 per hour
  - What if in 2007, the prices of everything you bought went up by 3% — but you were still making \$50,000 a year?
  - Your nominal income is the same, but your real income has fallen by 3%, and you could think of this as a decrease in your real wage rate of 3% (why? because of this next part.)
- **Capital income:**
  - Suppose you had bought a **corporate bond**: you paid \$100 to a company in return for a one-year bond which pays \$106 after a year
  - That's a 6% nominal interest rate. But if inflation is 3%, what's the real value of the bond payoff?

## What does this quantity theory of money tell us about the price level?

$$M_t V_t = P_t Y_t$$

- Rearranging for  $P_t$ , we find:  $P_t = \frac{M_t V_t}{Y_t}$
- In the long run,
  - Velocity (V) is some constant (It could change in theory, but it tends to be basically constant)
  - Real GDP (Y) is growing steadily and fairly predictably, so at  $t$ , it is just some given level
- Under these conditions, changes in the money supply ( $M_t$ ) will feed directly into changes in the price level ( $P_t$ )
- By extension, the central bank can manipulate *growth* in the money supply and thus affect *inflation*...

Your bond that costs \$100 today pays you \$106 next year — a nominal interest rate of 6% — but inflation is 3%.

What is your real return on the bond?

One way we could proceed is to deflate \$106 by a growth factor of 3%

$$\text{real return} = \frac{106}{1 + 0.03} = 102.9 = 2.9\% \text{ real return}$$

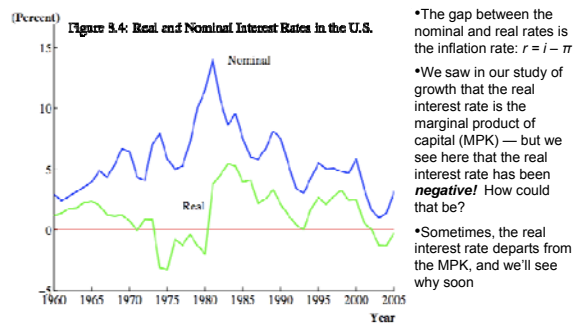
But when interest rates and inflation are *small*, we can use our growth rate rules and get *close enough* to the right answer:

growth in the real value of the bond =  
growth in (the nominal value *divided by* the inflation factor)

the real interest rate = the nominal interest rate *minus* inflation

$$r = i - \pi \quad \boxed{3\% = 6\% - 3\%}$$

Real and nominal interest rates have fluctuated over time, not always together, because inflation has fluctuated over time



But in the 1970s, the Federal Reserve didn't want to collect seignorage, right? Why was inflation high?

- The best way to understand high inflation during the 1970s is by thinking about the quantity theory equations:

$$P_t = \frac{M_t V_t}{Y_t} \quad g_P = \pi = g_M - g_Y = \% \Delta M - \% \Delta Y$$

- What if  $g_Y$  is smaller than you think — in other words, what if real output isn't growing as fast as you project?
- Inflation ( $\pi$ ) will be higher than it otherwise would be!
- This is a pretty good explanation of the 1970s — productivity growth slowed quite a bit, and nobody knew it at the time — so money growth was too high, and so was inflation

Inflation can fluctuate a lot — that's when it becomes costly, when we can't predict it

- Who is particularly exposed to unexpected inflation?
- Retirees with pensions that are fixed in nominal terms (Social Security is actually indexed to inflation, so that money is safe from inflation)
- Borrowers and lenders who agree to nominal interest rates — when inflation increases (decreases) unexpectedly, the real value of interest payments declines, which helps (hurts) borrowers
- Workers earning minimum wage — because it's a *nominal* wage target
- Upper middle-class families who may become hit by the Alternative Minimum Tax (AMT), which is not indexed to inflation
- Everyone who has to go to the bank more often because cash loses its value more rapidly ("shoe-leather costs")
- Everyone who has to keep updating their prices ("menu costs")

Next time:

- We start to talk about business cycles: recessions and expansions, and what government policy can do
- Chapter 9, an overview of the short-run model

If inflation is costly, why would central banks (governments) ever print too much money?

- Unfortunately, printing money is a way to pay bills!
- Government can finance its spending ( $G$ ) several ways:

$$G = T + \Delta B + \Delta M$$

through taxes ( $T$ ), new bonds ( $\Delta B$ ), or new money ( $\Delta M$ )

- The revenue from  $\Delta M$  is called "seignorage" — "right of the lord or ruler." Back in the days of metal coins, kings stamped the metal into coins and kept some metal themselves!
- Who pays this "inflation tax?" People who hold currency
- (Printing money doesn't really work unless it is *unexpected*)