

macro

Topic 7:
Money and Inflation
 (chapter 4)

macroeconomics
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PowerPoint® Slides
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In this chapter you will learn

- The classical theory of inflation
 - causes
 - effects
 - social costs
- “Classical” -- assumes prices are flexible & markets clear.
- Applies to the long run.

CHAPTER 4 Money and Inflation slide 1

U.S. inflation & its trend, 1960-2001

CHAPTER 4 Money and Inflation slide 2

The connection between money and prices

- Inflation rate = _____
_____.
- price = amount of money required to buy a good.
- Because prices are defined in terms of money, we need to consider the nature of money, the supply of money, and how it is controlled.

Money: definition



Money is _____

_____.

Money: functions

1. _____
we use it to buy stuff
2. _____
transfers purchasing power from the present to the future
3. _____
the common unit by which everyone measures prices and values

Money: types

1. _____
 - has no intrinsic value
 - example: the paper currency we use
2. _____
 - has intrinsic value
 - examples: gold coins, cigarettes in P.O.W. camps

Discussion Question

Which of these are money?

- a. Currency
- b. Checks
- c. Deposits in checking accounts (called demand deposits)
- d. Credit cards
- e. Certificates of deposit (called time deposits)

The money supply & monetary policy

- The _____ is the quantity of money available in the economy.
- _____ is the control over the money supply.



The central bank

- Monetary policy is conducted by a country's

- In the U.S., the central bank is called the Federal Reserve ("the Fed").



*The Federal Reserve Building
Washington, DC*

Money supply measures, April 2002

Symbol	Assets included	Amount (billions)
C	Currency	\$598.7
M1	C + _____, travelers' checks, other checkable deposits	1174.0
M2	M1 + _____, savings deposits, money market mutual funds, money market deposit accounts	5480.1
M3	M2 + _____, repurchase agreements, institutional money market mutual fund balances	8054.4

The Quantity Theory of Money

- A simple theory linking the inflation rate to the growth rate of the money supply.
- Begins with a concept called "**velocity**"...

Velocity

- basic concept: the rate at which money circulates
- definition: _____
- example: In 2001,
 - \$500 billion in transactions
 - money supply = \$100 billion
 - The average dollar is used in five transactions in 2001
 - So, velocity = ____

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Velocity, cont.

- This suggests the following definition:

where

V = velocity

T = value of all transactions

M = money supply

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Velocity, cont.

- Use nominal GDP as a proxy for total transactions.

Then,

$$V = \frac{P \times Y}{M}$$

where

P = price of output (GDP deflator)

Y = quantity of output (real GDP)

P × Y = value of output (nominal GDP)

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The quantity equation

- The **quantity equation**

follows from the preceding definition of velocity.

- It is an identity: it holds by definition of the variables.

Money demand and the quantity equation

- $M/P =$ _____, the purchasing power of the money supply.

- A simple money demand function:

$$(M/P)^d = \text{_____}$$

where

k = how much money people wish to hold for each dollar of income.

(k is exogenous)

Money demand and the quantity equation

- money demand: $(M/P)^d = k Y$
- quantity equation: $M \cdot V = P \cdot Y$
- The connection between them: _____
- When people hold lots of money relative to their incomes (k is _____), money changes hands infrequently (V is _____).

back to the Quantity Theory of Money

- starts with quantity equation
- assumes V is constant & exogenous:

$$V = \bar{V}$$

- With this assumption, the quantity equation can be written as

$$M \times \bar{V} = P \times Y$$

The Quantity Theory of Money, cont.

$$M \times \bar{V} = P \times Y$$

How the price level is determined:

- With V constant, the money supply determines _____ ($P \times Y$)
- _____ is determined by the economy's supplies of K and L and the production function (chap 3)
- The price level is
 $P =$ _____

The Quantity Theory of Money, cont.

- The quantity equation in growth rates:

$$\frac{\Delta M}{M} + \frac{\Delta V}{V} = \frac{\Delta P}{P} + \frac{\Delta Y}{Y}$$

The quantity theory of money assumes

$$V \text{ is constant, so } \frac{\Delta V}{V} = 0.$$

The Quantity Theory of Money, cont.

Let π (Greek letter "pi")
denote the inflation rate:

$$p = \frac{\Delta P}{P}$$

The result from the
preceding slide was:

$$\frac{\Delta M}{M} = \frac{\Delta P}{P} + \frac{\Delta Y}{Y}$$

Solve this result
for π to get

The Quantity Theory of Money, cont.

- Normal economic growth requires a certain amount of money supply growth to facilitate the growth in transactions.

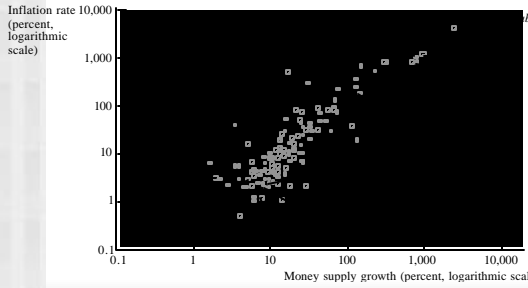
- _____
_____.

The Quantity Theory of Money, cont.

$\Delta Y/Y$ depends on growth in the factors of production and on technological progress (all of which we take as given, for now).

Hence, the Quantity Theory of Money predicts a

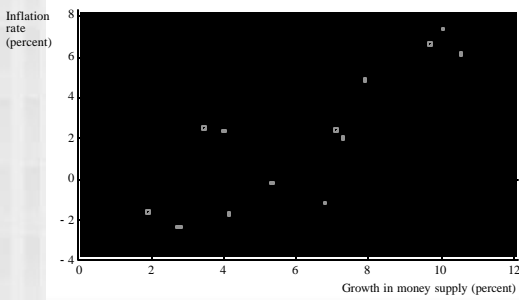
International data on inflation and money growth



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U.S. data on inflation and money growth



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Seigniorage

- To spend more without raising taxes or selling bonds, the govt can print money.
- The "revenue" _____

- The _____:
Printing money to raise revenue causes inflation. Inflation is like a tax on people who hold money.

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Inflation and interest rates

- _____ interest rate, i
not adjusted for inflation
- _____ interest rate, r
adjusted for inflation:
$$r = i - \pi$$

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The Fisher Effect

- The Fisher equation: _____
- Chap 3: $S = I$ determines r .
- Hence, an increase in π
causes an equal increase in i .
- This one-for-one relationship
is called the _____.

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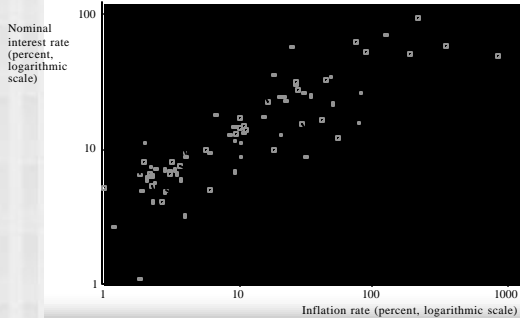
U.S. inflation and nominal interest rates, 1952-1998



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Inflation and nominal interest rates across countries



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Exercise:

Suppose V is constant, M is growing 5% per year, Y is growing 2% per year, and $r = 4$.

- a. Solve for i (the nominal interest rate).
- b. If the Fed increases the money growth rate by 2 percentage points per year, find Δi .
- c. Suppose the growth rate of Y falls to 1% per year.
 - What will happen to π ?
 - What must the Fed do if it wishes to keep π constant?

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Answers:

Suppose V is constant, M is growing 5% per year, Y is growing 2% per year, and $r = 4$.

- a.
- b.
- c.

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Two real interest rates

- π = actual inflation rate
(not known until after it has occurred)
- π^e = expected inflation rate
- $i - \pi^e =$ _____ real interest rate:

- $i - \pi =$ _____ real interest rate:

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Money demand and the nominal interest rate

- The Quantity Theory of Money assumes that the demand for real money balances depends only on real income Y .
- We now consider another determinant of money demand: the nominal interest rate.
- The nominal interest rate i is the _____ (instead of bonds or other interest-earning assets).
- Hence, _____.

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The money demand function

(M/P)^d = real money demand, depends

- _____
 i is the opp. cost of holding money
- _____
higher Y \Rightarrow more spending
 \Rightarrow so, need more money

(L is used for the money demand function because money is the most liquid asset.)

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The money demand function

$$(M/P)^d = L(i, Y)$$

When people are deciding whether to hold money or bonds, they don't know what inflation will turn out to be.

Hence, the nominal interest rate relevant for money demand is _____.

Equilibrium

$$\frac{M}{P} = L(r + p^e, Y)$$

The supply of real money balances

Real money demand

What determines what

$$\frac{M}{P} = L(r + p^e, Y)$$

variable _____ how determined (in the long run)

- M**
- r**
- Y**
- P**

How **P** responds to **DM**

$$\frac{\mathbf{M}}{\mathbf{P}} = \mathbf{L}(r + p^e, \mathbf{Y})$$

- For given values of **r**, **Y**, and π^e , a change in **M** causes **P** to _____
_____ --- just like in the Quantity Theory of Money.

What about expected inflation?

- Over the long run, people don't consistently over- or under-forecast inflation, so $\pi^e = \pi$ on average.
- In the short run, π^e may change when people get new information.
- EX: Suppose Fed announces it will increase **M** next year. People will expect next year's **P** to be higher, so π^e rises.
- This will affect **P** now, even though **M** hasn't changed yet.
(continued...)

How **P** responds to $D\pi^e$

$$\frac{\mathbf{M}}{\mathbf{P}} = \mathbf{L}(r + p^e, \mathbf{Y})$$

- For given values of **r**, **Y**, and **M**,

$\uparrow p^e \Rightarrow$
 \Rightarrow
 \Rightarrow

Discussion Question

Why is inflation bad?

- What costs does inflation impose on society? List all the ones you can think of.
- Focus on the long run.
- Think like an economist.

A common misperception

- Common misperception: inflation reduces real wages
- This is true only in the short run, when nominal wages are fixed by contracts.
- (Chap 3) In the long run, the real wage is determined by labor supply and the marginal product of labor, not the price level or inflation rate.
- Consider the data...

The classical view of inflation

- The classical view:
A change in the price level is merely a change in the units of measurement.

So why, then, is inflation a social problem?

The social costs of inflation

...fall into two categories:

1. costs when inflation is expected
2. additional costs when inflation is different than people had expected.

The costs of expected inflation:

1. _____

- def: the costs and inconveniences of reducing money balances to avoid the inflation tax.
- $\uparrow \pi \Rightarrow \uparrow i$
 $\Rightarrow \downarrow$ real money balances
- Remember: In long run, inflation doesn't affect real income or real spending.
- So, same monthly spending but lower average money holdings means more frequent trips to the bank to withdraw smaller amounts of cash.

The costs of expected inflation:

2. _____

- def: _____.
- Examples:
 - print new menus
 - print & mail new catalogs
- The higher is inflation, the more frequently firms must change their prices and incur these costs.

The costs of expected inflation:

3.

- Firms facing menu costs change prices infrequently.
- Example:
Suppose a firm issues new catalog each January. As the general price level rises throughout the year, the firm's relative price will fall.
- Different firms change their prices at different times, leading to relative price distortions...
- ...which cause microeconomic inefficiencies in the allocation of resources.

The costs of expected inflation:

4.

Some taxes are not adjusted to account for inflation, such as the capital gains tax.

Example:

- 1/1/2001: you bought \$10,000 worth of Starbucks stock
- 12/31/2001: you sold the stock for \$11,000, so your nominal capital gain was \$1000 (10%).
- Suppose $\pi = 10\%$ in 2001.
Your real capital gain is \$0.
- But the govt requires you to pay taxes on your \$1000 nominal gain!!

The costs of expected inflation:

5.

- Inflation makes it harder to compare nominal values from different time periods.
- This complicates long-range financial planning.

Additional cost of *unexpected* inflation:

- Many long-term contracts not indexed, but based on π^e .
- If π turns out different from π^e , then some gain at others' expense.

Example: borrowers & lenders

- If $\pi > \pi^e$, then _____ and purchasing power is transferred from _____.
- If $\pi < \pi^e$, then purchasing power is transferred from _____.

Additional cost of high inflation:

- When inflation is high, it's more variable and unpredictable:
 π turns out different from π^e more often, and the differences tend to be larger (though not systematically positive or negative)
- Arbitrary redistributions of wealth become more likely.
- This creates higher uncertainty, which makes risk averse people worse off.

One benefit of inflation

- Nominal wages are rarely reduced, even when the equilibrium real wage falls.
- Inflation allows the real wages to reach equilibrium levels without nominal wage cuts.
- Therefore, moderate inflation improves the functioning of labor markets.

Hyperinflation

- def: $\pi \geq 50\%$ per month
- All the costs of moderate inflation described above become **HUGE** under hyperinflation.
- Money ceases to function as a store of value, and may not serve its other functions (unit of account, medium of exchange).
- People may conduct transactions with barter or a stable foreign currency.

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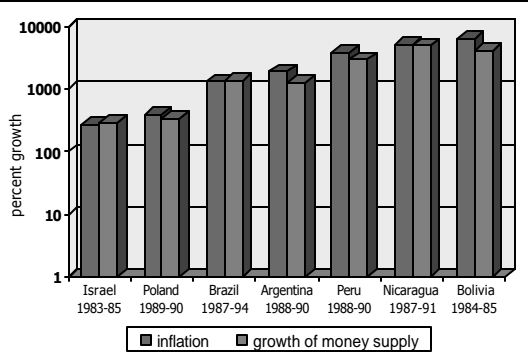
What causes hyperinflation?

- Hyperinflation is caused by _____:
- When the central bank prints money, the price level rises.
- If it prints money rapidly enough, the result is hyperinflation.

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Recent episodes of hyperinflation



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Why governments create hyperinflation

- When a government cannot raise taxes or sell bonds,
- it must finance spending increases by printing money.
- In theory, the solution to hyperinflation is simple: _____.
- In the real world,

_____.

The Classical Dichotomy

Real variables are _____:
quantities and relative prices, e.g.

- quantity of output produced
- _____: output earned per hour of work
- _____: output earned in the future by lending one unit of output today

Nominal variables: _____, e.g.

- _____: dollars per hour of work
- _____: dollars earned in future by lending one dollar today
- _____: the amount of dollars needed to buy a representative basket of goods

The Classical Dichotomy

- Note: Real variables were explained in Chap 3, nominal ones in Chap 4.

- **Classical Dichotomy**: the theoretical separation of real and nominal variables in the classical model, which implies

_____.

- _____: Changes in the money supply do not affect real variables. In the real world, money is approximately neutral in the long run.

Chapter summary

1. Quantity theory of money
 - assumption: velocity is stable
 - conclusion: the money growth rate determines the inflation rate.
2. Money demand
 - depends on income in the Quantity Theory
 - more generally, it also depends on the nominal interest rate;

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Chapter summary

3. Nominal interest rate
 - equals real interest rate + inflation.
 - Fisher effect: it moves one-for-one with expected inflation.
4. Hyperinflation
 - caused by rapid money supply growth when money printed to finance government budget deficits
 - stopping it requires fiscal reforms to eliminate govt's need for printing money

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Chapter summary

5. Classical dichotomy
 - In classical theory, money is neutral--does not affect real variables.
 - So, we can study how real variables are determined w/o reference to nominal ones.
 - Then, eq'm in money market determines price level and all nominal variables.

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