

CHAPTER 30

Money Growth and Inflation

PRINCIPLES OF
Economics
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Premium PowerPoint Slides
by Ron Cronovich

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**In this chapter,
look for the answers to these questions:**

- § How does the money supply affect inflation and nominal interest rates?
- § Does the money supply affect real variables like real GDP or the real interest rate?
- § How is inflation like a tax?
- § What are the costs of inflation? How serious are they?

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Introduction

§ This chapter introduces the **quantity theory of money** to explain one of the Ten Principles of Economics from Chapter 1:

Prices rise when the govt prints too much money.

§ Most economists believe the quantity theory is

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The Value of Money

§ P = the price level
(e.g., the CPI or GDP deflator)
 P is

§ $1/P$ is

§ Example: basket contains one candy bar.

§ If $P = \$2$, value of \$1 is 1/2 candy bar

§ If $P = \$3$, value of \$1 is 1/3 candy bar

§ Inflation drives up prices and

The Quantity Theory of Money

§ Developed by 18th century philosopher
David Hume and the classical economists

§ Advocated more recently by Nobel Prize Laureate
Milton Friedman

§

§ We study this theory using two approaches:

1. A supply-demand diagram
2. An equation

Money Supply (MS)

§ In real world, determined by Federal Reserve,
the banking system, consumers.

§ In this model, we assume

Money Demand (MD)

§ Refers to

§ Depends on

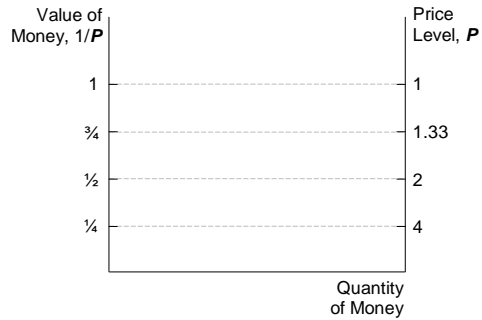
§ Thus, quantity of money demanded is _____ related to the value of money and _____ related to P , other things equal.

(These "other things" include real income, interest rates, availability of ATMs.)

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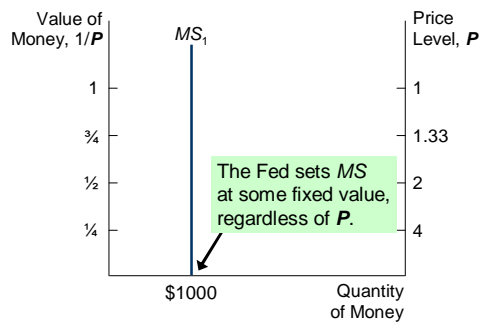
The Money Supply-Demand Diagram



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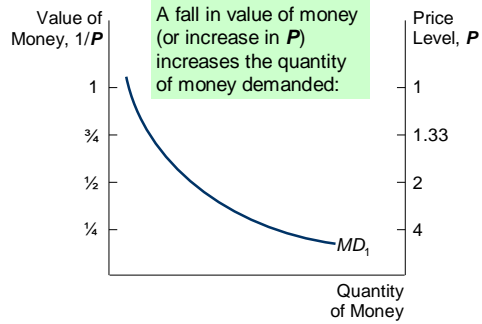
The Money Supply-Demand Diagram



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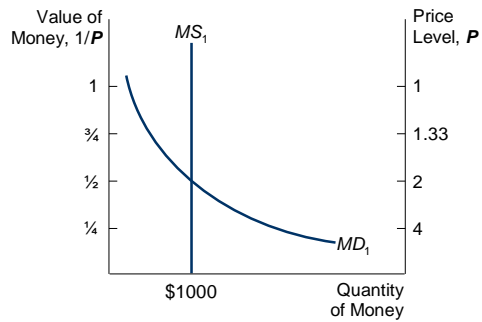
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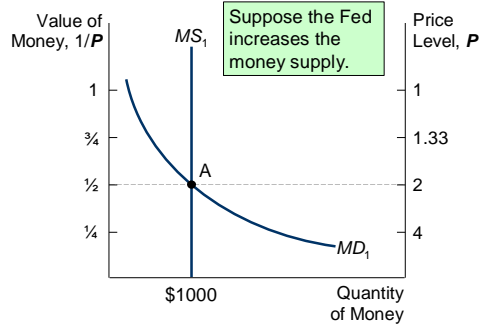
The Money Supply-Demand Diagram



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The Effects of a Monetary Injection



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A Brief Look at the Adjustment Process

Result from graph: Increasing MS causes P to rise.

How does this work? Short version:

§ At the initial P , an increase in MS causes

§ People get rid of their excess money by spending it on g&s or by loaning it to others, who spend it.

Result:

§ But supply of goods

(Other things happen in the short run, which we will study in later chapters.)

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Real vs. Nominal Variables

§ Nominal variables

Examples: nominal GDP,
nominal interest rate (rate of return measured in \$)
nominal wage (\$ per hour worked)

§ Real variables

Examples: real GDP,
real interest rate (measured in output)
real wage (measured in output)

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Real vs. Nominal Variables

Prices are normally measured in terms of money.

§ Price of a compact disc: \$15/cd

§ Price of a pepperoni pizza: \$10/pizza

A **relative price**

§ Relative price of CDs in terms of pizza:

Relative prices are measured in _____,
so they are real variables.

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Real vs. Nominal Wage

An important relative price is the real wage:

W = nominal wage = price of labor, e.g., \$15/hour

P = price level = price of g&s, e.g., \$5/unit of output

Real wage is the price of labor relative to the price of output:

The Classical Dichotomy

§ **Classical dichotomy:**

§ Hume and the classical economists suggested that

§ If central bank doubles the money supply, Hume & classical thinkers contend

§ all nominal variables

§ all real variables

The Neutrality of Money

§ **Monetary neutrality:** the proposition that

§ Doubling money supply causes all nominal prices to double; what happens to relative prices?

§ Initially, relative price of cd in terms of pizza is

$$\frac{\text{price of cd}}{\text{price of pizza}} = \frac{\$15/\text{cd}}{\$10/\text{pizza}} = 1.5 \text{ pizzas per cd}$$

§ After nominal prices double,

$$\frac{\text{price of cd}}{\text{price of pizza}} = \frac{\quad/\text{cd}}{\quad/\text{pizza}} = \quad \text{pizzas per cd}$$

The Neutrality of Money

- § Similarly, the real wage W/P
 - § quantity of labor supplied
 - § quantity of labor demanded
 - § total employment of labor
- § The same applies to employment of capital and other resources.
- § Since employment of all resources is _____, total output is also unchanged by the money supply.

The Neutrality of Money

- § Most economists believe the classical dichotomy and neutrality of money describe the economy in the long run.
- § In later chapters, we will see that monetary changes can have important *short-run* effects on real variables.

The Velocity of Money

§ Velocity of money:

§ Notation:

$P \times Y$ = nominal GDP
= (price level) x (real GDP)

M = money supply

V = velocity

§ Velocity formula:

The Velocity of Money

Example with one good: pizza.

In 2008,

Y = real GDP = 3000 pizzas

P = price level = price of pizza = \$10

$P \times Y$ = nominal GDP = value of pizzas = \$30,000

M = money supply = \$10,000

V = velocity =

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ACTIVE LEARNING 1

Exercise

One good: corn.

The economy has enough labor, capital, and land to produce $Y = 800$ bushels of corn.

V is constant.

In 2008, $MS = \$2000$, $P = \$5/\text{bushel}$.

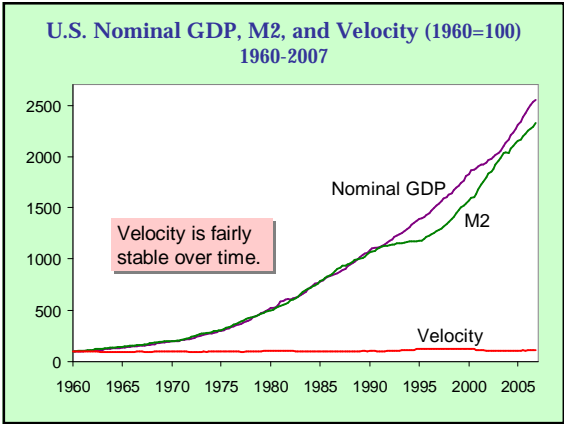
Compute nominal GDP and velocity in 2008.

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ACTIVE LEARNING 1

Answers

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The Quantity Equation

Velocity formula: $V = \frac{P \times Y}{M}$

§ Multiply both sides of formula by M :

§ Called the **quantity equation**

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The Quantity Theory in 5 Steps

Start with quantity equation: $M \times V = P \times Y$

1. V is stable.
2. So, a change in M causes
3. A change in M money is neutral, Y is determined by
4. So, P changes by
5. Rapid money supply growth causes rapid inflation.

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ACTIVE LEARNING 2

Exercise

One good: corn. The economy has enough labor, capital, and land to produce $Y = 800$ bushels of corn. V is constant. In 2008, $MS = \$2000$, $P = \$5/\text{bushel}$.

For 2009, the Fed increases MS by 5%, to $\$2100$.

- a. Compute the 2009 values of nominal GDP and P . Compute the inflation rate for 2008-2009.
- b. Suppose tech. progress causes Y to increase to 824 in 2009. Compute 2008-2009 inflation rate.

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ACTIVE LEARNING 2

Answers

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ACTIVE LEARNING 2

Summary and Lessons about the Quantity Theory of Money

§ If real GDP is constant, then

§ If real GDP is growing, then

§ The bottom line:

§ Economic growth increases # of transactions.

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Hyperinflation

§ Hyperinflation is generally defined as

§ Recall one of the Ten Principles from Chapter 1:

Prices rise when the government prints too much money.

§

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The Inflation Tax

§ When tax revenue is inadequate and ability to borrow is limited, govt may print money to pay for its spending.

§ Almost all hyperinflations start this way.

§ **inflation tax:**

§ In the U.S., the inflation tax today accounts for less than 3% of total revenue.

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The Fisher Effect

§ Rearrange the definition of the real interest rate:

§ The real interest rate is determined by saving & investment in the loanable funds market.

§

§ So, this equation shows how the nominal interest rate is determined.

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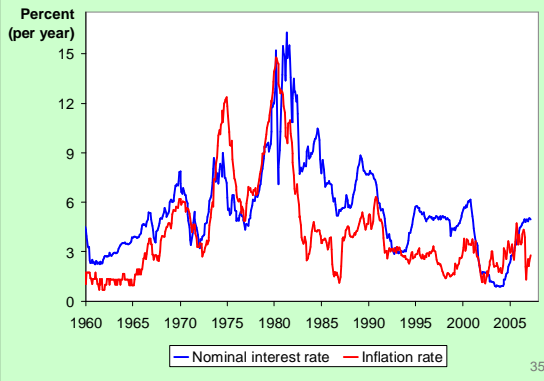
The Fisher Effect

§ In the long run, money is neutral, so a change in the money growth rate affects the inflation rate but not the real interest rate.

§ So, the nominal interest rate

§ This relationship is called the **Fisher effect** after Irving Fisher, who studied it.

U.S. Nominal Interest & Inflation Rates, 1960-2007



The Fisher Effect & the Inflation Tax

$$\text{Nominal interest rate} = \text{Inflation rate} + \text{Real interest rate}$$

§ The inflation tax applies to people's holdings of money, not their holdings of wealth.

§ The Fisher effect: an increase in inflation causes an equal increase in the nominal interest rate, so the real interest rate (on wealth) is unchanged.

The Costs of Inflation

§ The inflation fallacy:

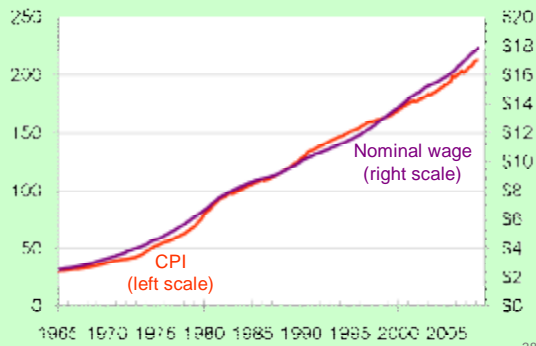
§ But inflation is a general increase in prices of the things people buy and

§ In the long run,

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U.S. Average Hourly Earnings & the CPI



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The Costs of Inflation

§ **Shoeleather costs:** the resources wasted when inflation encourages people to reduce their money holdings

§ **Menu costs:**

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The Costs of Inflation

§ **Misallocation of resources from relative-price variability:**

Firms don't all raise prices at the same time, so relative prices can vary... which distorts the allocation of resources.

§ **Confusion & inconvenience:**

Inflation changes the yardstick we use to measure transactions.

Complicates long-range planning and the comparison of dollar amounts over time.

The Costs of Inflation

§ **Tax distortions:**

ACTIVE LEARNING 3

Tax distortions

You deposit \$1000 in the bank for one year.

CASE 1: inflation = 0%, nom. interest rate = 10%

CASE 2: inflation = 10%, nom. interest rate = 20%

a. In which case does the real value of your deposit grow the most?

Assume the tax rate is 25%.

b. In which case do you pay the most taxes?

c. Compute the after-tax nominal interest rate, then subtract off inflation to get the after-tax real interest rate for both cases.

ACTIVE LEARNING 3
Answers

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A Special Cost of Unexpected Inflation

§ **Arbitrary redistributions of wealth**
Higher-than-expected inflation

Debtors get to repay their debt with dollars that aren't worth as much.

Lower-than-expected inflation

High inflation

So, these arbitrary redistributions are frequent when inflation is high.

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The Costs of Inflation

§ All these costs are quite high for economies experiencing hyperinflation.

§ For economies with low inflation (< 10% per year), these costs are probably much smaller, though their exact size is open to debate.

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CONCLUSION

§ This chapter explains one of the Ten Principles of economics:

Prices rise when the govt prints too much money.

§ We saw that

§ In later chapters, we will see that money has important effects in the short run on real variables like output and employment.

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