

Lecture Notes for Chapter 8 of  
**MACROECONOMICS:**  
An Introduction  
How the Fed  
Moves the Economy

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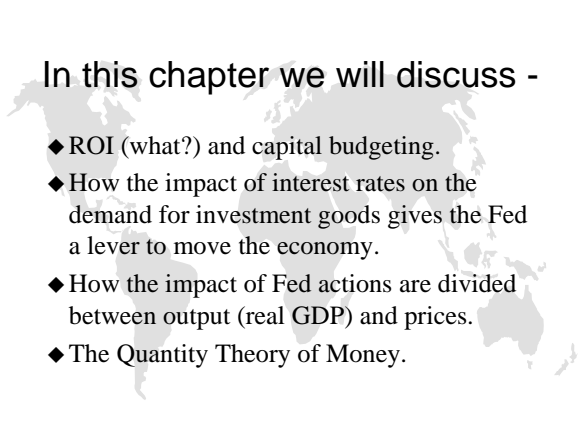
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In this chapter we will discuss -

- ◆ ROI (what?) and capital budgeting.
- ◆ How the impact of interest rates on the demand for investment goods gives the Fed a lever to move the economy.
- ◆ How the impact of Fed actions are divided between output (real GDP) and prices.
- ◆ The Quantity Theory of Money.

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The story in brief:

- ◆ Monetary policy moves interest rates.
- ◆ Interest rates influence demand for capital goods and durable consumer goods.
- ◆ A change in demand affects:
  - sales & production,
  - prices,
  - employment & wages.

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## Should you buy a new delivery van for your business?

- ◆ An MBA will ask “What is the **ROI**?”
- ◆ **Return On Investment**
- ◆  $ROI = \text{Gain}/\text{Cost}$ ; like yield on a bond.
- ◆  $\text{Gain} = \text{net revenue} + (\text{resale value} - \text{cost})$
- ◆ Net revenue includes cost savings, like the coupon on a bond.
- ◆  $(\text{resale value} - \text{cost})$  is price change, negative due to depreciation

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## Suppose

- ◆ A new van saves you \$8,000 in expenses, it costs \$15,000 now, worth \$12,000 in a year.
- ◆  $\text{Gain} = \$8,000 + (\$12,000 - \$15,000)$
- ◆  $ROI = (8 + 12 - 15)/15 = 5/15 = .33 = 33\%$
- ◆ Sounds good. Should you buy that van?

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## Need to ask:

### What is our *cost of capital*?

- ◆ Interest rate on a loan if you borrow, your opportunity cost if you pay cash.
- ◆ If the  $ROI >$  your cost of capital, buy.
- ◆ A menu of projects faces any business
- ◆ The entrepreneur ranks them by their ROI

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## Potential Investment Projects Ranked by ROI

Project:	Cost	ROI
◆ Van	\$15,000	33%
◆ Freezer	\$7,500	25%
◆ Pasta machine	\$2,000	20%
◆ Espresso maker	\$3,000	15%
◆ Display shelving	\$12,000	10%
◆ Satellite phone	\$1,100	5%

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## Which ones are worth doing?

- ◆ If the bank charges you 15% on a loan?
- ◆ If it charges 22%?
- ◆ If you have savings earning 9%?
- ◆ This decision is called *capital budgeting*.

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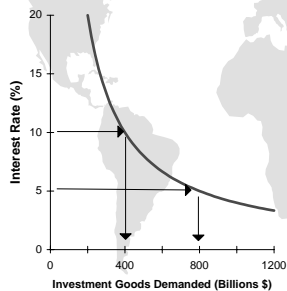
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## How the interest rate affects the demand for capital goods.



- ◆ At low interest rate, many projects profitable
- ◆ At high interest rates, few are
- ◆ We hold prices constant in drawing this curve
- ◆ Consumer decisions are similarly affected.

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## How will a change in interest rate affect the market for trucks?

- ◆ It will shift the demand curve
- ◆ That will alter
  - production of trucks
  - price of trucks.
- ◆ Let's see how supply and demand make this happen

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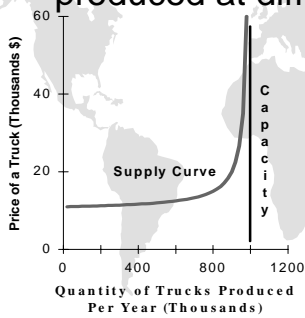
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## Supply curve shows quantities produced at different prices.



- ◆ The Law of Supply: The higher the price, the more will be produced
- ◆ Near full capacity costs rise very steeply
- ◆ Further price increases induce very little additional output.

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## Full capacity is a soft wall

- ◆ Not an exact number of units, rather -
- ◆ A threshold where costs rise sharply.

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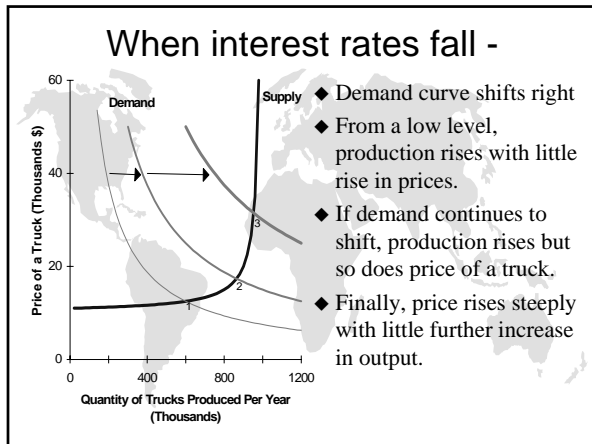
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### The "Natural" or "Full Capacity" Level of Real GDP

- ◆ For the whole economy there is also a "full capacity" output.
- ◆ Beyond that, increases in production are accompanied by sharply higher prices.
- ◆ Also called the "natural" or "full employment" rate of output

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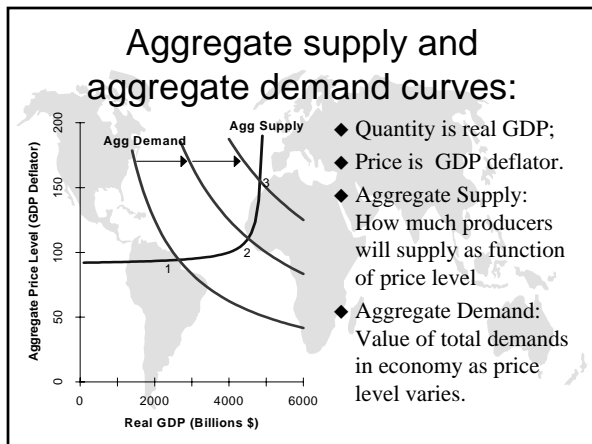
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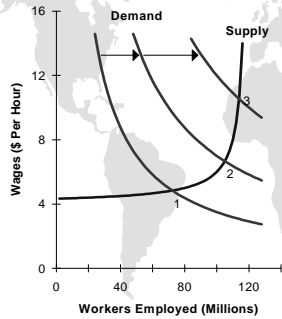
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## The labor market when Fed stimulates aggregate demand



- ◆ Demand for labor shifts to the right.
- ◆ Workers bargain for higher wages.
- ◆ At “full employment” labor supplied increases little, wages rise sharply.
- ◆ Corresponds to “natural rate of unemployment”

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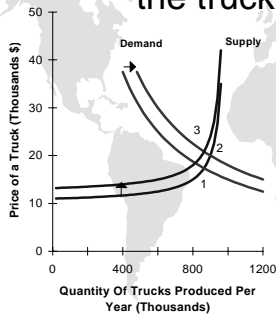
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## How do rising wages affect the truck industry?



- ◆ Higher wages raise the cost of making a truck.
- ◆ That shifts the supply curve upward, since marginal cost higher.
- ◆ Result:
  - Production falls off
  - Price of a truck rises.

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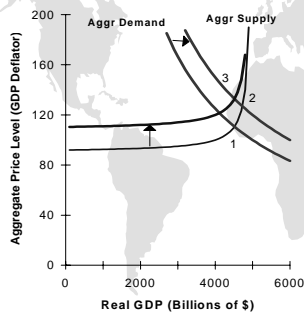
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## Rising wages shift the aggregate supply curve upward.



- ◆ Cost rise for all firms.
- ◆ Supply curves shift up throughout the economy.
- ◆ Aggregate supply shifts upward.
- ◆ Real GDP falls back towards its earlier level.
- ◆ Only prices and wages are higher!

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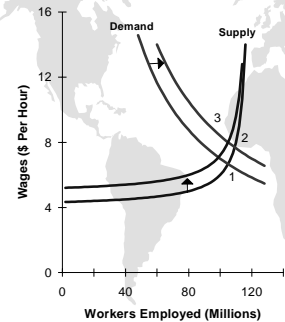
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Workers realize that a dollar buys less than it used to.



- ◆ Supply of labor depends on perceived real wage.
- ◆ Higher cost of living shifts supply upward
- ◆ It takes a higher nominal wage to attract same quantity of labor
- ◆ Employment dips.
- ◆ Wages rise further.

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There seem to be “natural” levels of real GDP and employment.

Attempts by the Fed to get the economy to exceed those levels result only in inflation.

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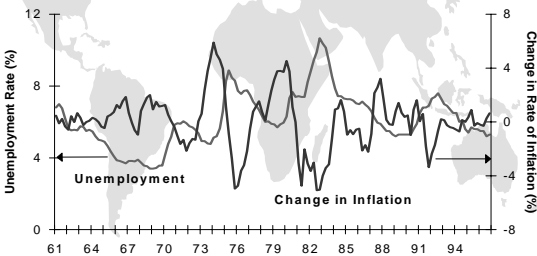
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Response of inflation to fluctuations in unemployment:




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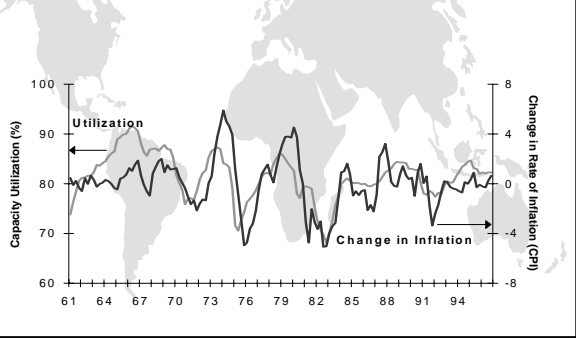
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### Response of inflation to fluctuations in capacity utilization:



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### Limitations of Monetary Policy

- ◆ It **can** stabilize economy near its 'natural' level of output and unemployment.
- ◆ It **cannot** change those 'natural' levels.

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### How do Gov't programs affect 'natural' unemployment?

- ◆ Minimum wage laws?
- ◆ Education?
- ◆ Welfare reform?

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## The Quantity Theory of Money

- ◆ Consider this thought experiment:
- ◆ Fed boosts money supply 10%.
- ◆ Real GDP is already at its natural level.
- ◆ What happens to real GDP and price level?

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## The sequence will be:

- ◆ Interest rates fall.
- ◆ That increases demand for durable goods, and thus aggregate demand.
- ◆ Real GDP rises above natural level.
- ◆ Prices start to rise.
- ◆ Wages are bid up in the labor market.
- ◆ Higher wages push supply curves up.
- ◆ That causes prices to rise further.
- ◆ Output falls back towards its original level.

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## Using our money demand model:

- ◆ Money demand = money supply:
- ◆  $M = k(i) \cdot GDP = k(i) \cdot P \cdot Q$
- ◆ M is supply of money,
- ◆ P is the price level (GDP deflator),
- ◆ Q is the level of output (real GDP).
- ◆ Now Fed boosts money supply by 10%,  
to  $1.1 \cdot M$

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### A year or so later,

- ◆ Q is again be at its natural level, since it grows by 3% per year, at  $1.03 \cdot Q$
- ◆ Assume “i” is the same after a year, so  $k(i)$  does not change. Thus:
- ◆  $1.10 \cdot M = k(i) \cdot (x \cdot P) \cdot (1.03 \cdot Q)$
- ◆ x must be 1.07. since solving we have
- ◆  $x = 1.10/1.03 = 1.068 = 1.10 - 1.03 = 1.07$
- ◆ So the price level has risen by 7%!

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Real growth absorbs 3% of the 10% more money, the remaining 7% boosts price level.

With nominal GDP higher by 10%, supply and demand for money are again in balance at the original interest rate!

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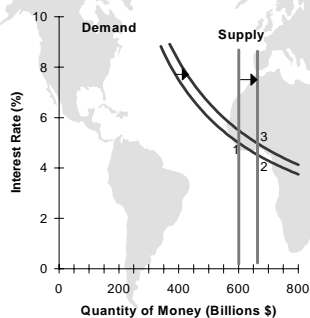
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### The transition graphically:



- ◆ Supply of Money shifts to the right.
- ◆ Demand for Money slowly catches up.
- ◆ Only the price level has been affected. This is:
- ◆ The Quantity Theory of Money.

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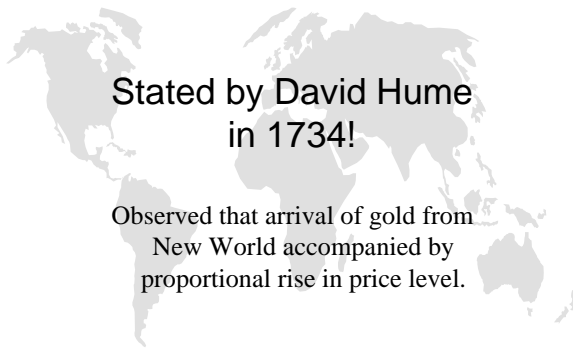
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**Stated by David Hume  
in 1734!**

Observed that arrival of gold from  
New World accompanied by  
proportional rise in price level.

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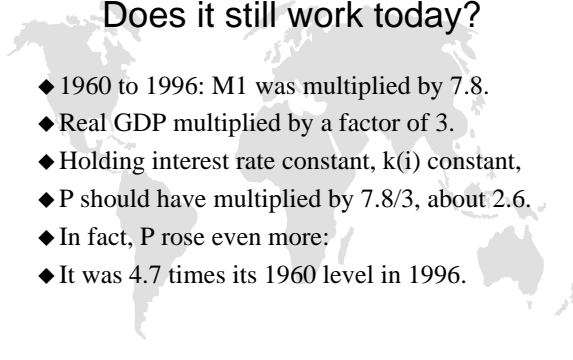
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**Does it still work today?**

- ◆ 1960 to 1996: M1 was multiplied by 7.8.
- ◆ Real GDP multiplied by a factor of 3.
- ◆ Holding interest rate constant,  $k(i)$  constant,
- ◆ P should have multiplied by  $7.8/3$ , about 2.6.
- ◆ In fact, P rose even more:
- ◆ It was 4.7 times its 1960 level in 1996.

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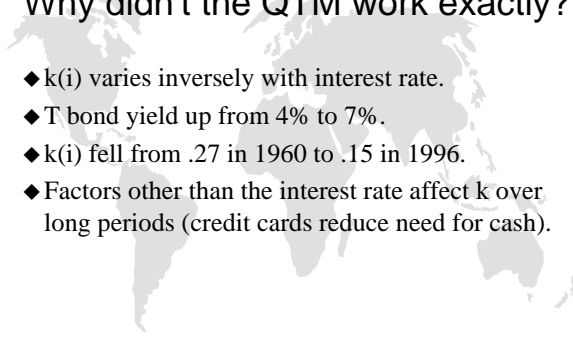
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**Why didn't the QTM work exactly?**

- ◆  $k(i)$  varies inversely with interest rate.
- ◆ T bond yield up from 4% to 7%.
- ◆  $k(i)$  fell from .27 in 1960 to .15 in 1996.
- ◆ Factors other than the interest rate affect  $k$  over long periods (credit cards reduce need for cash).

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Lesson:

If a country increases its money supply at a rate faster than the long term growth rate of real GDP, it will surely experience inflation.

The rate of inflation will be approximately equal to the excess of money growth over the long term real growth rate, about 3% for the U.S.

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