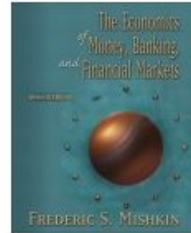


ECON 354 Money and Banking

Professor Yamin Ahmad

Lecture 2:

- What is money?
- Review of AD/AS and the effects of monetary policy



Main Concepts

Part I:

- What is Money; Classifications of Money; Functions of Money
- The Quantity Theory of Money
 - Velocity
 - The Quantity Equation as a Demand for Money
 - The Relationship between Inflation and Money Growth

Part II:

- The Quantity Equation as Aggregate Demand
- Short and Long Run Effects of Monetary Policy Actions
- Stabilization Policy

Note: These lecture notes are incomplete without having attended lectures.

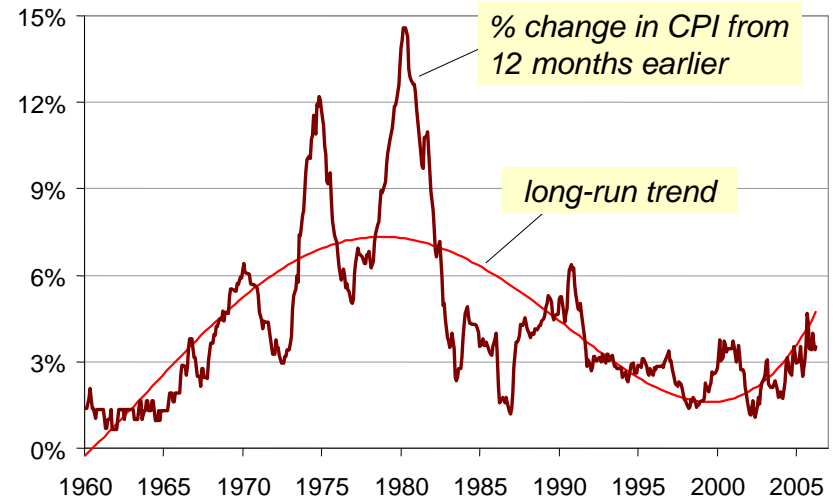
Part I:

Money...

*"If money were to grow on trees, everybody would be dealing in bananas."
(- M. A.)*

Note: These lecture notes are incomplete without having attended lectures.

U.S. inflation and its trend, 1960-2006



Note: These lecture notes are incomplete without having attended lectures.

The connection between money and prices

- **Inflation rate** = the percentage increase in the average level of prices.
- **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.

Note: These lecture notes are incomplete without having attended lectures.

What is Money: Definitions

1. **Money is the stock of assets that can be readily used to make transactions.**
2. **Money is anything that is generally accepted in payment for goods and services**

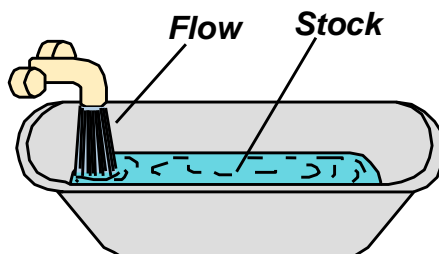


Note: These lecture notes are incomplete without having attended lectures.

What is Money...(cont.)

It is important to distinguish between money, wealth and income:

- Money
 - Stock
- Wealth: Money + Assets
 - Stock
- Income: earnings at a point in time
 - Flow



Note: These lecture notes are incomplete without having attended lectures.

Classifications of Money

- In the United States:
 - **M1** = Currency + Traveler's Checks + Demand Deposits + Other Checkable Deposits
 - **M2** = M1 + Small denomination time deposits & repurchase agreements + Savings Deposits and money market deposit accounts + Money Market mutual fund shares (noninstitutional)
 - **M3** = M2 + Large denomination time deposits and repurchase agreements + Money Market mutual fund shares (institutional) + Repurchase Agreements + Eurodollars
[Note: As of March 2006, the Fed has discontinued M3]
- See: <http://www.federalreserve.gov/releases/h6/hist/>

Note: These lecture notes are incomplete without having attended lectures.

Money supply measures, April 2006

symbol	assets included	amount (\$ billions)
C	Currency	\$739
M1	C + demand deposits, travelers' checks, other checkable deposits	\$1391
M2	M1 + small time deposits, savings deposits, money market mutual funds, money market deposit accounts	\$6799

Note: These lecture notes are incomplete without having attended lectures.

Money: Functions

- **Medium of Exchange**
we use it to buy stuff
- **Store of Value**
transfers purchasing power from the present to the future
- **Unit of Account**
the common unit by which everyone measures prices and values

⇒ Money helps to:

- Lower transaction costs
- Increase Liquidity in an economy

Note: These lecture notes are incomplete without having attended lectures.

Money as a Medium of Exchange

- **Defn:** A **medium of exchange** is any object that is accepted in exchange for goods and services
- Examples of medium's of exchange:
 - Barter
 - Cigarettes (WWII POW Camp)
 - Credit Card
- **Barter** – goods and services exchanged directly for other goods and services
 - “Double Coincidence of Wants”

Note: These lecture notes are incomplete without having attended lectures.

Money as a Unit of Account

- No unit of account:
- Money as a unit of account: The opportunity cost of one movie is 24 sticks of gum.

Good	Price in units of another good
Movie	2 six-packs of soda
Soda	2 ice-cream cones
Ice Cream	3 packs of jelly beans
Jelly Beans	2 sticks of gum
Gum	1 local phone call

Note: These lecture notes are incomplete without having attended lectures.

Money: Types

1. Fiat Money

- has no intrinsic value
- example: the paper currency we use

2. Commodity Money

- has intrinsic value
- examples:
 - gold coins,
 - cigarettes in P.O.W. camps (also in film: *The Shawshank Redemption* starring Tim Robbins and Morgan Freeman)

Note: These lecture notes are incomplete without having attended lectures.

Evolution of Payments System

- Precious metals like gold and silver (commodity money)
- Paper currency (fiat money)
- Checks
- Electronic means of payment
- Electronic money: Debit cards, Stored-value cards, Smart cards, E-cash

Note: These lecture notes are incomplete without having attended lectures.

What can serve as money?

Commodities must satisfy the following properties to serve as money:

- Widely accepted
- Standardized
- Divisible
- Easy to carry
- Not deteriorate easily

Note: These lecture notes are incomplete without having attended lectures.

Discussion Question

Which of these are money?

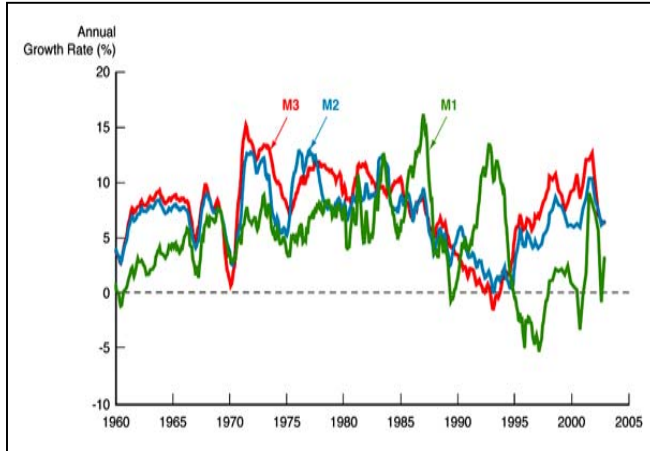
- a. Currency
- b. Checks
- c. Deposits in checking accounts (“demand deposits”)
- d. Credit cards
- e. Certificates of deposit (“time deposits”)

Note: These lecture notes are incomplete without having attended lectures.

Best Definition of Money...?

What happened to money in:

- 1968 – 71
- Post 1989
- Different stories about what happened to money



Note: These lecture notes are incomplete without having attended lectures.

Reliability of Money Data

Problems arise because:

- Lack of frequency in reporting deposits
 - Seasonal variations
- ⇒ Focus on long run monetary movements!

Period	Initial Rate	Revised Rate	Difference (Revised Rate - Initial Rate)
January	2.2	5.4	3.2
February	6.8	8.7	1.9
March	-1.4	0.2	1.6
April	-4.0	-2.6	1.4
May	14.8	15.4	0.6
June	7.6	7.1	-0.5
July	13.6	11.0	-2.6
August	9.9	8.6	-1.3
September	5.1	5.7	0.6
October	10.9	8.3	-2.6
November	10.2	8.0	-2.2
December	2.8	2.8	0.0
Average	6.5	6.5	0.0

Source: Federal Reserve Statistical Release H.6: www.federalreserve.gov/releases/h6

Note: These lecture notes are incomplete without having attended lectures.

The money supply and monetary policy definitions

- The **money supply** is the quantity of money available in the economy.
- **Monetary policy** is the control over the money supply.

Note: These lecture notes are incomplete without having attended lectures.

The central bank

- Monetary policy is conducted by a country's **central bank**.
- In the U.S., the central bank is called the **Federal Reserve** ("the Fed").



*The Federal Reserve Building
Washington, DC*

Note: These lecture notes are incomplete without having attended lectures.

The Quantity Theory of Money

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

Note: These lecture notes are incomplete without having attended lectures.

Velocity

- Basic Concept: the rate at which money circulates
- **Definition**: the number of times the average dollar bill changes hands in a given time period
- example: In 2007,
 - \$500 billion in transactions
 - money supply = \$100 billion
 - The average dollar is used in five transactions in 2007
 - So, velocity = 5

Note: These lecture notes are incomplete without having attended lectures.

Velocity, *cont.*

- This suggests the following definition:

$$V = \frac{T}{M}$$

where

V = velocity

T = value of all transactions

M = money supply

Note: These lecture notes are incomplete without having attended lectures.

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)

- Question: What is the difference between nominal GDP and total transactions?

Note: These lecture notes are incomplete without having attended lectures.

The quantity equation

- The **quantity equation**

$$M \times V = P \times Y$$

follows from the preceding definition of velocity.

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

Note: These lecture notes are incomplete without having attended lectures.

Money demand and the quantity equation

- M/P = **real money balances**, the purchasing power of the money supply.

- A simple money demand function:

$$(M/P)^d = kY$$

where

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

(k is exogenous)

Note: These lecture notes are incomplete without having attended lectures.

Money demand and the quantity equation

- Money demand: $(M/P)^d = kY$
- Quantity equation: $M \times V = P \times Y$
- The connection between them: $k = 1/V$
- When people hold lots of money relative to their incomes (k is high), money changes hands infrequently (V is low).

Note: These lecture notes are incomplete without having attended lectures.

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

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

Note: These lecture notes are incomplete without having attended lectures.

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 nominal GDP ($P \times Y$).
- Real GDP is determined by the economy's supplies of K and L and the production function.
- The price level is $P = (\text{nominal GDP})/(\text{real GDP})$, i.e. PY/Y

Note: These lecture notes are incomplete without having attended lectures.

A Quick Digression: Two arithmetic tricks for working with percentage changes

1. For any variables X and Y ,
percentage change in $(X \times Y)$
 \approx percentage change in X
+ percentage change in Y

EX: If your hourly wage rises 5% and you work 7% more hours, then your wage income rises approximately 12%.

Note: These lecture notes are incomplete without having attended lectures.

Two arithmetic tricks for working with percentage changes

2. percentage change in (X/Y)
 \approx percentage change in X
– percentage change in Y

EX: GDP deflator = $100 \times \text{NGDP}/\text{RGDP}$.

If NGDP rises 9% and RGDP rises 4%, then the inflation rate is approximately 5%.

Note: These lecture notes are incomplete without having attended lectures.

The quantity theory of money, *cont.*

- So, from the preceding slides:
The growth rate of a product equals the sum of the growth rates.
- 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 is constant, so $\frac{\Delta V}{V} = 0$.

Note: These lecture notes are incomplete without having attended lectures.

The quantity theory of money, *cont.*

π (Greek letter “pi”)
denotes the inflation rate:

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

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

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

Note: These lecture notes are incomplete without having attended lectures.

The quantity theory of money, *cont.*

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

- Normal economic growth requires a certain amount of money supply growth to facilitate the growth in transactions.
- Money growth in excess of this amount leads to inflation.

Note: These lecture notes are incomplete without having attended lectures.

The quantity theory of money, *cont.*

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

$\Delta Y/Y$ 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 predicts a one-for-one relation between changes in the money growth rate and changes in the inflation rate.

Note: These lecture notes are incomplete without having attended lectures.

Confronting the quantity theory with data

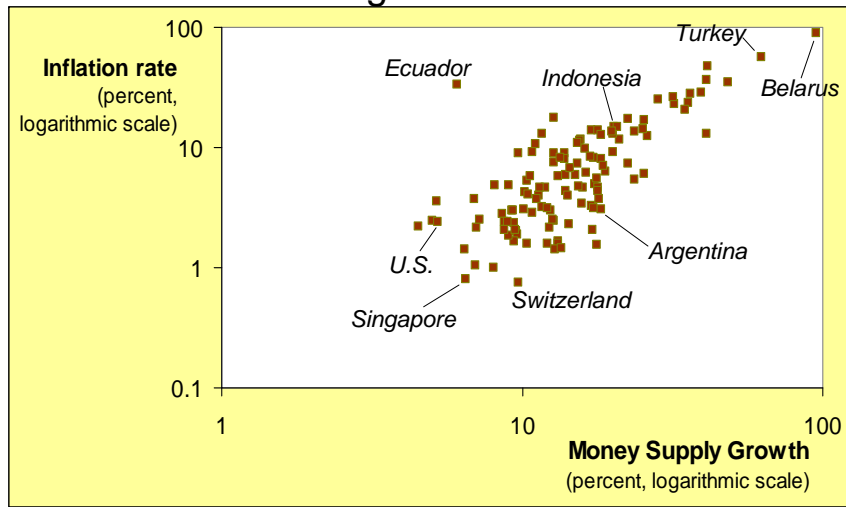
The quantity theory of money implies

1. countries with higher money growth rates should have higher inflation rates.
2. the long-run trend behavior of a country's inflation should be similar to the long-run trend in the country's money growth rate.

Are the data consistent with these implications?

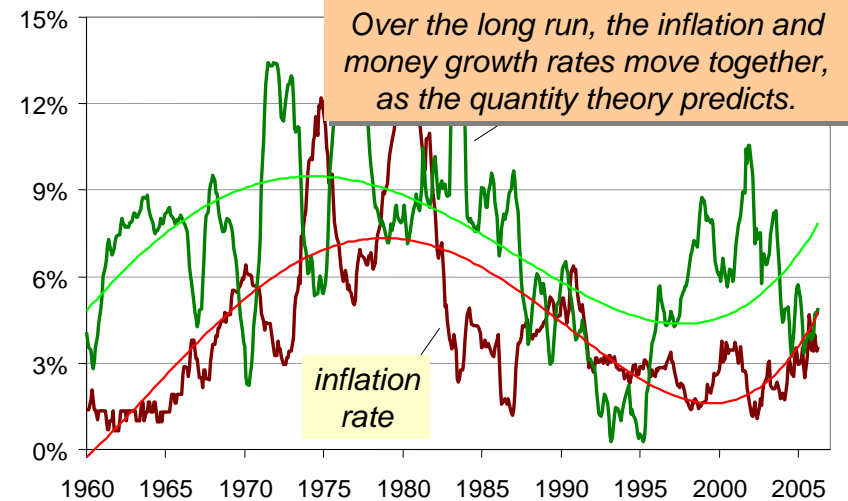
Note: These lecture notes are incomplete without having attended lectures.

International data on inflation and money growth



Note: These lecture notes are incomplete without having attended lectures.

U.S. inflation and money growth, 1960-2006



Note: These lecture notes are incomplete without having attended lectures.

Summary of Part I:

1. Money

- the stock of assets used for transactions
- serves as a medium of exchange, store of value, and unit of account.
- Commodity money has intrinsic value, fiat money does not.
- Central bank controls the money supply.

2. Quantity theory of money assumes velocity is stable, concludes that the money growth rate determines the inflation rate.

Note: These lecture notes are incomplete without having attended lectures.

Part II:

Review of AD/AS and the Effects of Monetary Policy

What happens when the Fed changes the quantity of money circulating in the economy?

Time horizons in macroeconomics

- **Long run**
Prices are flexible, respond to changes in supply or demand.
- **Short run**
Many prices are “sticky” at some predetermined level.

The economy behaves much differently when prices are sticky.

Note: These lecture notes are incomplete without having attended lectures.

Classical Macro Theory

- Output is determined by the supply side:
 - supplies of capital, labor
 - technology.
- Changes in demand for goods & services (**C, I, G**) only affect prices, not quantities.
- Assumes complete price flexibility.
- Applies to the long run.

Note: These lecture notes are incomplete without having attended lectures.

When prices are sticky...

- ...output and employment also depend on demand, which is affected by
- fiscal policy (**G** and **T**)
 - monetary policy (**M**)
 - other factors, like exogenous changes in **C** or **I**.

Note: These lecture notes are incomplete without having attended lectures.

The Model of Aggregate Demand and Supply

- the paradigm most mainstream economists and policymakers use to think about economic fluctuations and policies to stabilize the economy
- shows how the price level and aggregate output are determined
- shows how the economy's behavior is different in the short run and long run

Note: These lecture notes are incomplete without having attended lectures.

Aggregate Demand

- The aggregate demand curve shows the relationship between the price level and the quantity of output demanded.
- For this lecture's intro to the *AD/AS* model, we use a simple theory of aggregate demand based on the quantity theory of money.

Note: These lecture notes are incomplete without having attended lectures.

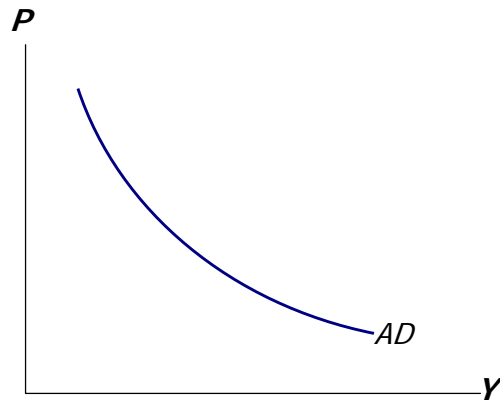
The Quantity Equation as Aggregate Demand

- Consider the following equation of exchange: **The Quantity Equation**
$$MV = PY$$
- For given values of *M* and *V*, this equation implies an inverse relationship between *P* and *Y*
- In general, the AD curve will be derived from the IS/LM Model

Note: These lecture notes are incomplete without having attended lectures.

The downward-sloping *AD* curve

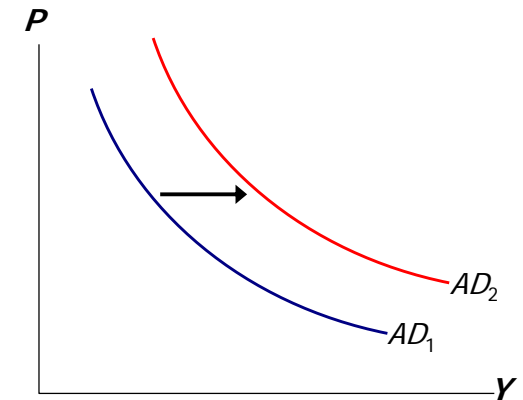
An increase in the price level causes a fall in real money balances (M/P), causing a decrease in the demand for goods & services.



Note: These lecture notes are incomplete without having attended lectures.

Shifting the *AD* curve

An increase in the money supply shifts the *AD* curve to the right.



Note: These lecture notes are incomplete without having attended lectures.

Question: Why did the AD shift?

- Consider the following:
 - For a given price level (i.e. holding the price level fixed), if M increased, what would happen to demand? i.e. would it increase or decrease as a result?
- Question:
 - Suppose now that something caused velocity, V , to increase. What happens to the demand curve?

Note: These lecture notes are incomplete without having attended lectures.

Aggregate Supply in the long run

- In the long run, output is determined by factor supplies and technology

$$\bar{Y} = F(\bar{K}, \bar{L})$$

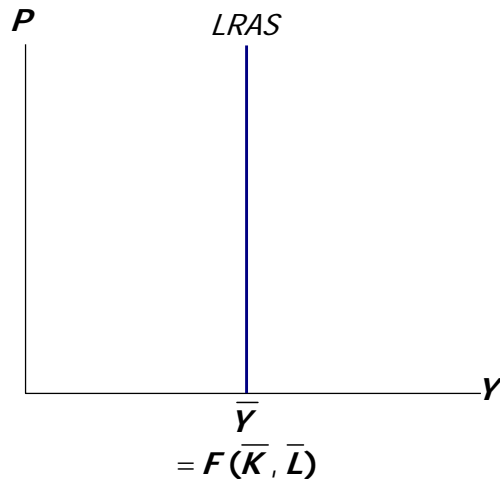
\bar{Y} is the **full-employment** or **natural** level of output, the level of output at which the economy's resources are fully employed.

“Full employment” means that unemployment equals its natural rate (not zero).

Note: These lecture notes are incomplete without having attended lectures.

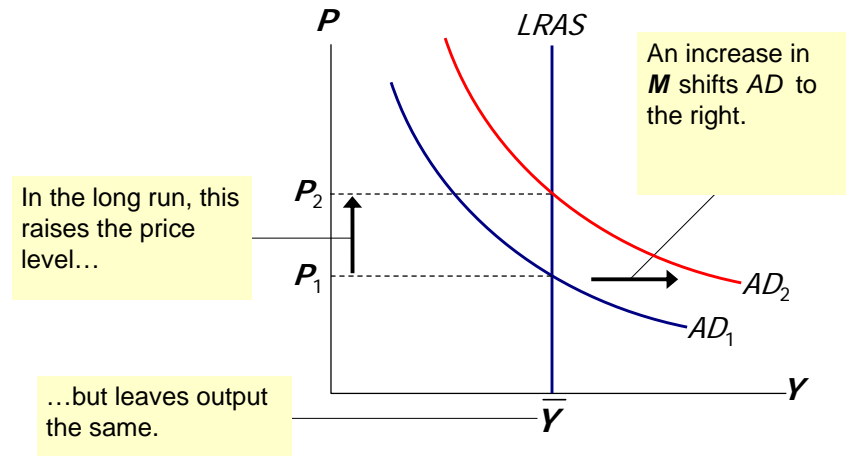
The long-run aggregate supply curve

\bar{Y} does not depend on P , so $LRAS$ is vertical.



Note: These lecture notes are incomplete without having attended lectures.

Long-run effects of an increase in M



Note: These lecture notes are incomplete without having attended lectures.

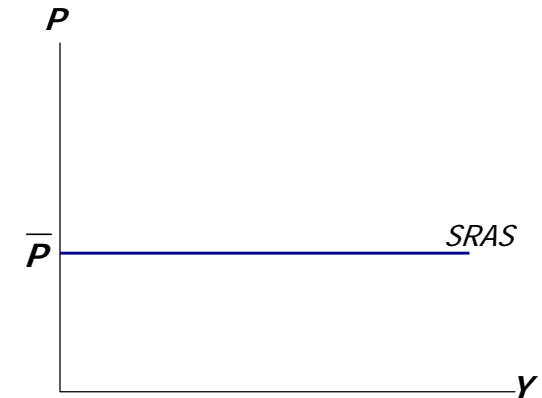
Aggregate Supply in the short run

- Many prices are sticky in the short run.
- For now we will assume
 - all prices are stuck at a predetermined level in the short run.
 - firms are willing to sell as much at that price level as their customers are willing to buy.
- Therefore, the short-run aggregate supply (SRAS) curve is horizontal:

Note: These lecture notes are incomplete without having attended lectures.

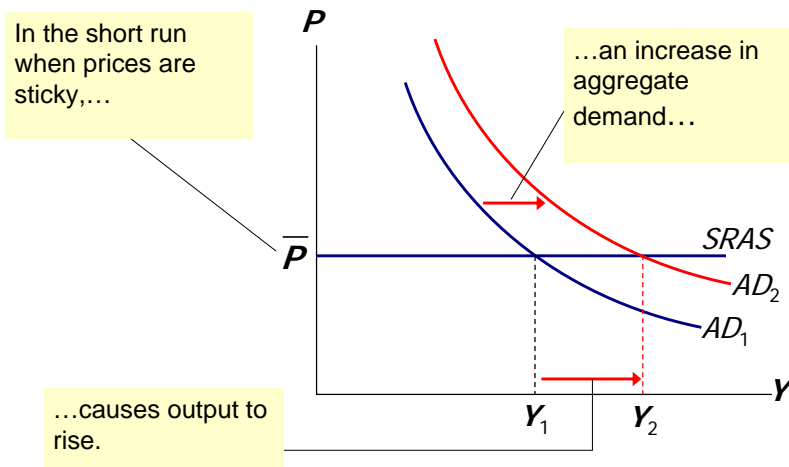
The short-run aggregate supply curve

The SRAS curve is horizontal:
The price level is fixed at a predetermined level, and firms sell as much as buyers demand.



Note: These lecture notes are incomplete without having attended lectures.

Short-run effects of an increase in M



Note: These lecture notes are incomplete without having attended lectures.

From the short run to the long run

Over time, prices gradually become “unstuck.” When they do, will they rise or fall?

In the short-run equilibrium, if	then over time, P will...
$Y > \bar{Y}$	rise
$Y < \bar{Y}$	fall
$Y = \bar{Y}$	remain constant

The adjustment of prices is what moves the economy to its long-run equilibrium.

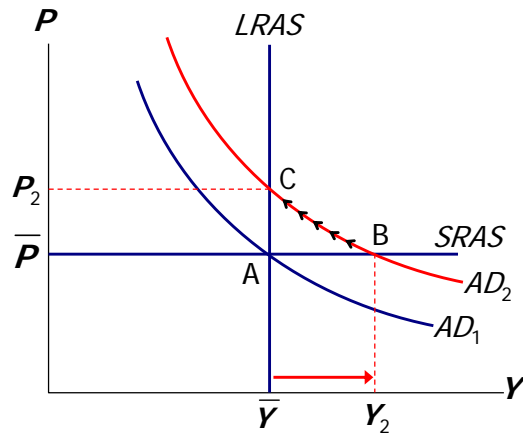
Note: These lecture notes are incomplete without having attended lectures.

The SR & LR effects of $\Delta M > 0$

A = initial equilibrium

B = new short-run eq'm after Fed increases M

C = long-run equilibrium



Note: These lecture notes are incomplete without having attended lectures.

Shock!!!

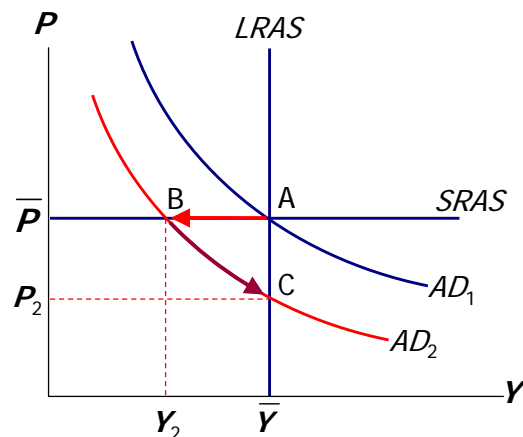
- **Shocks**: exogenous changes in agg. supply or demand
- Shocks temporarily push the economy away from full employment.
- Example: exogenous decrease in velocity
If the money supply is held constant, a decrease in V means people will be using their money in fewer transactions, causing a decrease in demand for goods and services.

Note: These lecture notes are incomplete without having attended lectures.

The Effects of a Negative Demand Shock

AD shifts left, depressing output and employment in the short run.

Over time, prices fall and the economy moves down its demand curve toward full-employment.



Note: These lecture notes are incomplete without having attended lectures.

Supply shocks

- A **supply shock** alters production costs, affects the prices that firms charge. (also called **price shocks**)
- Examples of *adverse* supply shocks:
 - Bad weather reduces crop yields, pushing up food prices.
 - Workers unionize, negotiate wage increases.
 - New environmental regulations require firms to reduce emissions. Firms charge higher prices to help cover the costs of compliance.
- *Favorable* supply shocks lower costs and prices.

Note: These lecture notes are incomplete without having attended lectures.

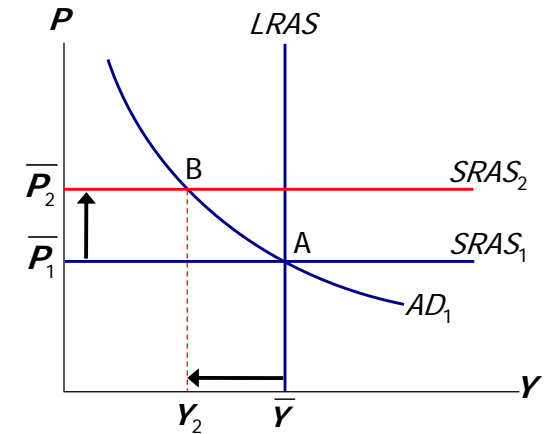
Stabilization policy

- **Def:** policy actions aimed at reducing the severity of short-run economic fluctuations.
- **Example:** Using monetary policy to combat the effects of adverse supply shocks:

Note: These lecture notes are incomplete without having attended lectures.

Stabilizing Output with Monetary Policy

The adverse supply shock moves the economy to point B.

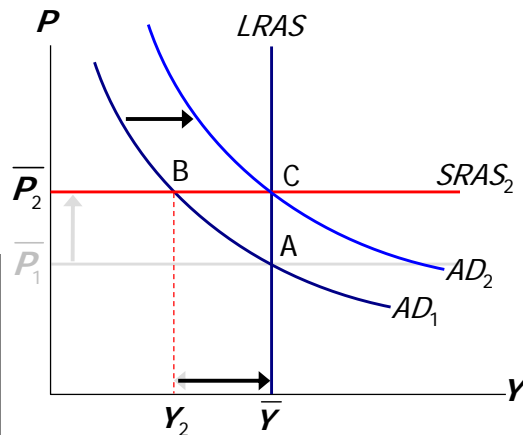


Note: These lecture notes are incomplete without having attended lectures.

Stabilizing Output with Monetary Policy

But the Fed accommodates the shock by raising agg. demand.

results:
 P is permanently higher, but Y remains at its full-employment level.



Note: These lecture notes are incomplete without having attended lectures.

Summary of Part II

1. Long run: prices are flexible, output and employment are always at their natural rates, and the classical theory applies.
 Short run: prices are sticky, shocks can push output and employment away from their natural rates.
2. Aggregate demand and supply: a framework to analyze economic fluctuations

Note: These lecture notes are incomplete without having attended lectures.

Summary of Part II

3. The aggregate demand curve slopes downward.
4. The long-run aggregate supply curve is vertical, because output depends on technology and factor supplies, but not prices.
5. The short-run aggregate supply curve is horizontal, because prices are sticky at predetermined levels.

Note: These lecture notes are incomplete without having attended lectures.

Summary of Part II

6. Shocks to aggregate demand and supply cause fluctuations in GDP and employment in the short run.
7. The Fed can attempt to stabilize the economy with monetary policy.

Note: These lecture notes are incomplete without having attended lectures.