



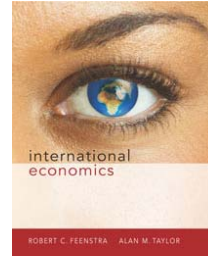
Advanced International Economics

ECON 758

Professor Yamin Ahmad

Lecture 9:

- Money
- Interest Rates
- Exchange Rates



In This Lecture

- What is money?
- Control of the supply of money
- The demand for money
- A model of real money balances and interest rates
- A model of real money balances, interest rates and exchange rates
- Long run effects of changes in money on prices, interest rates and exchange rates

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



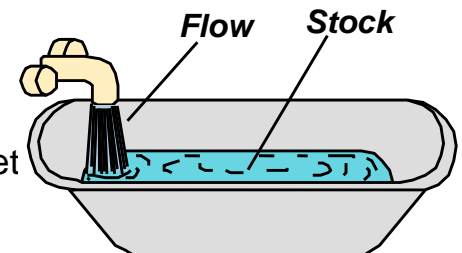
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What is Money...(cont.)

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

- Money
 - Stock
- Wealth: Money + Asset
 - 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.

9-5



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.

9-6



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.

9-7



So... What Is Money?

- Money is an asset that is widely used and accepted as a means of payment.
 - Different groups of assets may be classified as money.
 - Currency and checking accounts form a useful definition of money, but bank deposits in the foreign exchange market are excluded from this definition.

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

9-8

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.

9-9

What Is Money? (cont.)

- Money is very **liquid**: it can be easily and quickly used to pay for goods and services.
- Money, however, pays **little or no rate of return**.
- Suppose we can group assets into money (**liquid assets**) and all other assets (**illiquid assets**).
 - All other assets are less liquid but pay a higher return.

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

9-10

Money Supply

- The **money supply** is the quantity of money available in the economy.
- **Monetary policy** is the control over the money supply.
- Who controls the quantity of money that circulates in an economy, the money supply?

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

9-11

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.

9-12

Money Supply

- Central banks determine the money supply.
 - The Federal Reserve directly regulates the amount of currency in circulation.
 - It indirectly controls the amount of checking deposits issued by private banks.

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

9-13

Money Demand

- **Money demand** is the amount of assets that people are willing to hold as money (instead of illiquid assets).
 - We will consider individual money demand and aggregate money demand.
 - What influences willingness to hold money?

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

9-14

What Influences Individual Demand for Money?

1. **Expected returns/interest rate** on money relative to the expected returns on other assets.
2. **Risk**: the risk of holding money principally comes from unexpected inflation, thereby unexpectedly reducing the purchasing power of money.
 - but many other assets have this risk too, so this risk is not very important in money demand
3. **Liquidity**: A need for greater liquidity occurs when either the price of transactions increases or the quantity of goods bought in transactions increases.

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

9-15

What Influences Aggregate Demand for Money?

1. **Interest rates**: money pays little or no interest, so the interest rate is the opportunity cost of holding money instead of other assets, like bonds, which have a higher expected return/interest rate.
 - A higher interest rate means a higher opportunity cost of holding money → lower money demand.
2. **Prices**: the prices of goods and services bought in transactions will influence the willingness to hold money to conduct those transactions.
 - A higher price level means a greater need for liquidity to buy the same amount of goods and services → higher money demand.

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

9-16

What Influences Aggregate Demand for Money? (cont.)

3. **Income:** greater income implies more goods and services can be bought, so that more money is needed to conduct transactions.
 - A higher real national income means more goods and services are being produced and bought in transactions, increasing the need for liquidity → higher money demand.

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

9-17

A Model of Aggregate Money Demand

The aggregate demand for money can be expressed by:

$$M^d = P \times L(R, Y)$$

where:

P is the price level

Y is real national income

R is a measure of interest rates

$L(R, Y)$ is the aggregate *real* money demand

Alternatively:

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

Aggregate real money demand is a function of national income and interest rates.

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

9-18

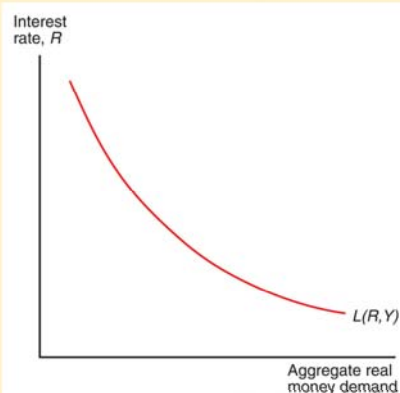
A Model of Aggregate Money Demand (cont.)

Figure 14-1

Aggregate Real Money Demand and the Interest Rate

The downward-sloping real money demand schedule shows that for a given real income level, Y , real money demand rises as the interest rate falls.

For a given level of income, real money demand decreases as the interest rate increases.



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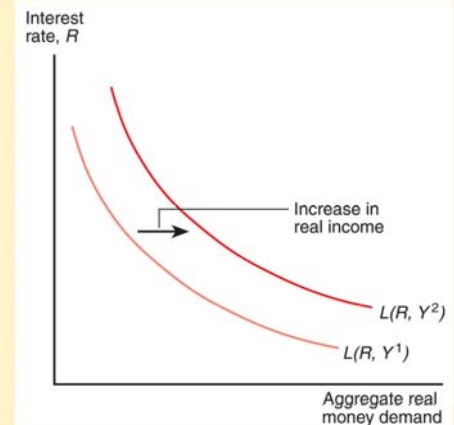
A Model of Aggregate Money Demand (cont.)

Figure 14-2

Effect on the Aggregate Real Money Demand Schedule of a Rise in Real Income

An increase in real income from Y^1 to Y^2 raises the demand for real money balances at every level of the interest rate and causes the whole demand schedule to shift upward.

When income increases, real money demand increases at every interest rate.



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

9-20

The Money Market

- The money market uses the (aggregate) money demand and (aggregate) money supply.
- The condition for equilibrium in the money market is:

$$M^s = M^d$$
- Alternatively, we can define equilibrium using the supply of real money and the demand for real money (by dividing both sides by the price level):

$$M^s/P = L(R, Y)$$

- This equilibrium condition will yield an equilibrium interest rate.

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

9-21

The Money Market (cont.)

- When there is an **excess supply of money**, there is an **excess demand for interest bearing assets**.
 - People with an excess supply of money are willing to acquire interest bearing assets (by giving up their supply of money) at a lower interest rate.
 - Potential money holders are more willing to hold additional quantities of money as the interest rate (the opportunity cost of holding money) falls.

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

9-22

The Money Market (cont.)

- When there is an **excess demand for money**, there is an **excess supply of interest bearing assets**.
 - People who desire money but do not have access to it are willing to sell assets with a higher interest rate in return for the money balances that they desire.
 - Those with money balances are more willing to give them up in return for interest bearing assets as the interest rate on these assets rises and as the opportunity cost of holding money (the interest rate) rises.

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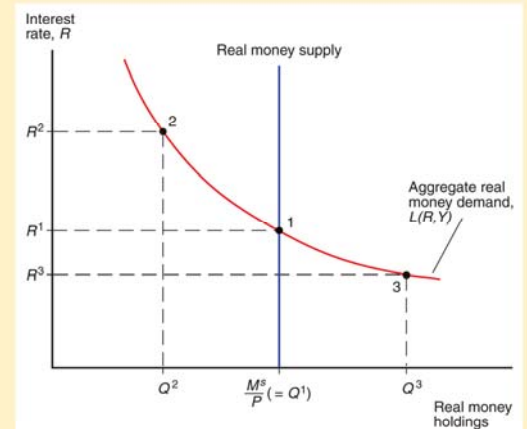
9-23

Money Market Equilibrium

Figure 14-3

Determination of the Equilibrium Interest Rate

With P and Y given and a real money supply of M^s/P , money market equilibrium is at point 1. At this point aggregate real money demand and the real money supply are equal and the equilibrium interest rate is R^1 .



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9-24

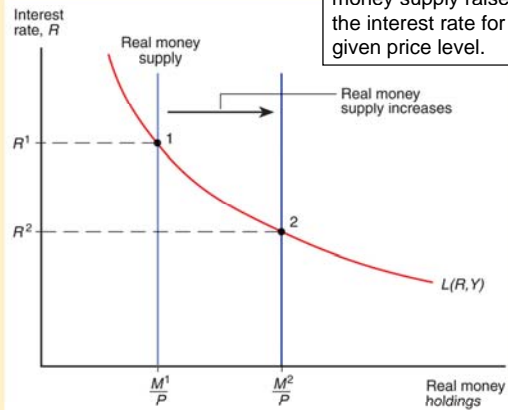
Changes in the Money Supply

Figure 14-4

Effect of an Increase in the Money Supply on the Interest Rate

For a given price level, P , and real income level, Y , an increase in the money supply from M^1 to M^2 reduces the interest rate from R^1 (point 1) to R^2 (point 2).

An increase in the money supply lowers the interest rate for a given price level.



A decrease in the money supply raises the interest rate for a given price level.

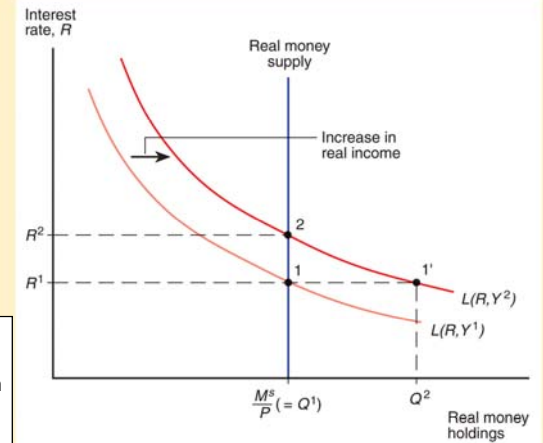
Changes in National Income

Figure 14-5

Effect on the Interest Rate of a Rise in Real Income

Given the real money supply, $M^1/P (= Q^1)$, a rise in real income from Y^1 to Y^2 raises the interest rate from R^1 (point 1) to R^2 (point 2).

An increase in national income increases equilibrium interest rates for a given price level.

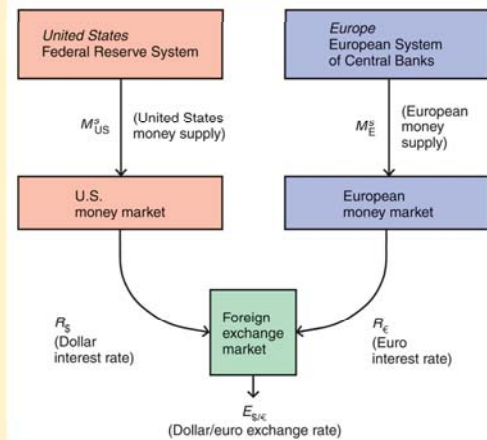


Linking the Money Market to the Foreign Exchange Market

Figure 14-7

Money Market/Exchange Rate Linkages

Monetary policy actions by the Fed affect the U.S. interest rate, changing the dollar/euro exchange rate that clears the foreign exchange market. The ESCB can affect the exchange rate by changing the European money supply and interest rate.



Linking the Money Market to the Foreign Exchange Market

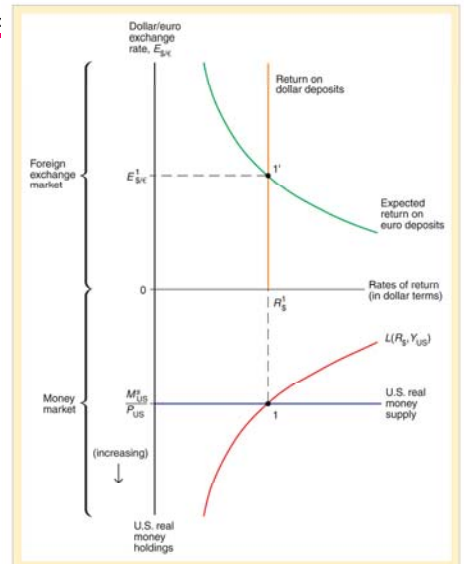


Figure 14-6

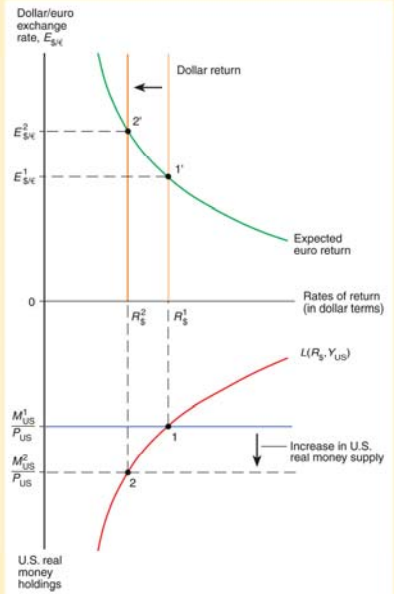
Simultaneous Equilibrium in the U.S. Money Market and the Foreign Exchange Market

Both asset markets are in equilibrium at the interest rate R_s^1 and exchange rate $E_{\$/\text{€}}^1$; at these values money supply equals money demand (point 1) and the interest parity condition holds (point 1').



Changes in the Domestic Money Supply

Figure 14-8
Effect on the Dollar/Euro Exchange Rate and Dollar Interest Rate of an Increase in the U.S. Money Supply
 Given P_{US} and Y_{US} , when the money supply rises from M_{US}^1 to M_{US}^2 , the dollar interest rate declines (as money market equilibrium is reestablished at point 2) and the dollar depreciates against the euro (as foreign exchange market equilibrium is reestablished at point 2').



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

9-30

Changes in the Money Supply

- An increase in a country's money supply causes its currency to depreciate.
- A decrease in a country's money supply causes its currency to appreciate.

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

9-30



Changes in the Foreign Money Supply

- How would a change in the euro money supply affect the US money market and foreign exchange market?
- An increase in the EU money supply causes a depreciation of the euro (appreciation of the dollar).
- A decrease in the EU money supply causes an appreciation of the euro (a depreciation of the dollar).

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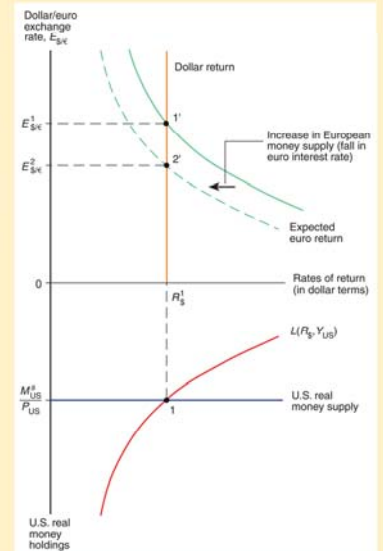
9-31



Changes in the Foreign Money Supply (cont.)

Figure 14-9
Effect of an Increase in the European Money Supply on the Dollar/Euro Exchange Rate

By lowering the dollar return on euro deposits (shown as a leftward shift in the expected euro return curve), an increase in Europe's money supply causes the dollar to appreciate against the euro. Equilibrium in the foreign exchange market shifts from point 1' to point 2', but equilibrium in the U.S. money market remains at point 1.



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

9-32

Changes in the Foreign Money Supply (cont.)

- The increase in the EU money supply reduces interest rates in the EU, reducing the expected return on euro deposits.
- This reduction in the expected return on euro deposits leads to a depreciation of the euro.
- The change in the EU money supply does not change the US money market equilibrium.

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

9-33

Long Run and Short Run

- The difference between the short run and long run lies in the idea that prices, wages and certain factors of production may be constrained in the short run, but not in the long run
- Here we assume that in the *short run*, the price level is fixed at some level.
 - the analysis heretofore has been a short run analysis.

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

9-34

Long Run and Short Run (cont.)

- In the *long run*, prices of factors of production and of output are allowed to adjust to demand and supply in their respective markets.
 - Wages adjust to the demand and supply of labor.
 - Real output and income are determined by the amount of workers and other factors of production — by the economy's productive capacity—not by the supply of money.
 - The interest rate depends on the supply of saving and the demand for saving in the economy and the inflation rate — and thus is also independent of the money supply level.

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

9-35

Long Run and Short Run (cont.)

- In the long run, the level of the money supply does not influence the amount of real output nor the interest rate.
 - Long run *monetary neutrality*.
- But in the long run, prices of output and inputs *adjust proportionally* to changes in the money supply:
 - Long run equilibrium: $M^s/P = L(R, Y)$
 - $M^s = P \times L(R, Y)$
 - increases in the money supply are matched by proportional increases in the price level.

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

9-36

Long Run and Short Run (cont.)

- In the long run, there is a direct relationship between the inflation rate and changes in the money supply.
 - $M^s = P \times L(R, Y)$
 - $P = M^s/L(R, Y)$
 - $\Delta P/P = \Delta M^s/M^s - \Delta L/L$
 - The inflation rate equals growth rate in money supply minus the growth rate for money demand.

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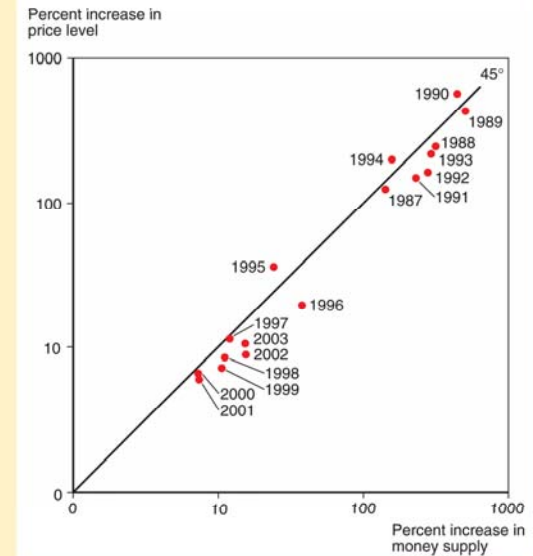
9-37

Figure 14-10

Average Money Growth and Inflation in Western Hemisphere Developing Countries, by Year, 1987–2003

Even year by year, there is a strong positive relation between average Latin American money supply growth and inflation. (Both axes have logarithmic scales.)

Source: IMF, *World Economic Outlook*, various issues. Regional aggregates are weighted by shares of dollar GDP in total regional dollar GDP.



9-38

Money and Prices in the Long Run

- How does a change in the money supply cause prices of output and inputs to change?

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

9-39

Money and Prices in the Long Run (cont.)

1. **Excess demand:** an increase in the money supply implies that people have more funds available to pay for goods and services.
 - To meet strong demand, producers hire more workers, creating a strong demand for labor, or make existing employees work harder.
 - Wages rise to attract more workers or to compensate workers for overtime.
 - Prices of output will eventually rise to compensate for higher costs.
 - **Alternatively**, for a fixed amount of output and inputs, producers can charge higher prices and still sell all of their output due to the strong demand.

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

9-40

Money and Prices in the Long Run (cont.)

2. Inflationary expectations:

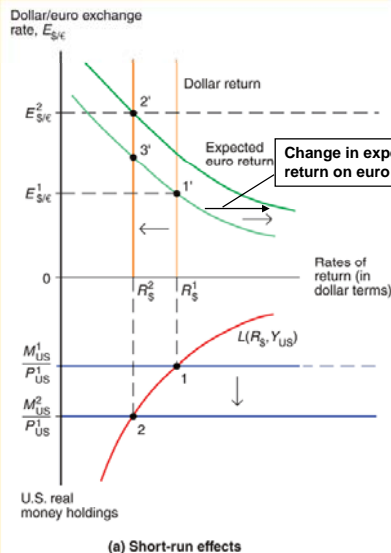
- If workers expect future prices to rise due to an expected money supply increase, they will want to be compensated.
- And if producers expect the same, they are more willing to raise wages.
- Producers will be able to match higher costs if they expect to raise prices.
- **Result:** expectations about inflation caused by an expected money supply increase leads to actual inflation.

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

Money, Prices and the Exchange Rates and Expectations

- When we consider price changes in the long run, inflationary expectations will have an effect in the foreign exchange market.
- Suppose that expectations about inflation change as people change their minds, but actual adjustment of prices occurs afterwards.

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



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Money, Prices and the Exchange Rates and Expectations (cont.)

The expected return on euro deposits rises because of inflationary expectations:

- The dollar is expected to be less valuable when buying goods and services and less valuable when buying euros.
- The dollar is expected to depreciate, increasing the return on deposits in euros.

Figure 14-12
Short-Run and Long-Run Effects of an Increase in the U.S. Money Supply (Given Real Output, Y)
(a) Short-run adjustment of the asset markets. (b) How the interest rate, price level, and exchange rate move over time as the economy approaches its long-run equilibrium.

ectures.

Money, Prices and the Exchange Rates in the Long Run

As prices increases, the real money supply decreases and the domestic interest rate returns to its long run rate.

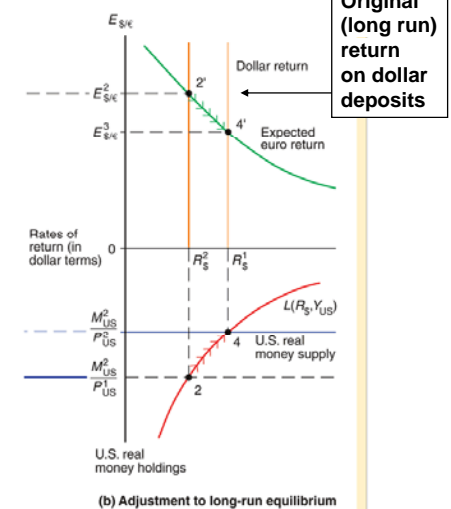


Figure 14-12
Short-Run and Long-Run Effects of an Increase in the U.S. Money Supply (Given Real Output, Y)
(a) Short-run adjustment of the asset markets. (b) How the interest rate, price level, and exchange rate move over time as the economy approaches its long-run equilibrium.

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Money, Prices and the Exchange Rates in the Long Run (cont.)

- A permanent increase in a country's money supply causes a proportional long run depreciation of its currency.
 - However, the dynamics of the model predict a **large depreciation first and a smaller subsequent appreciation.**
- A permanent decrease in a country's money supply causes a proportional long run appreciation of its currency.
 - However, the dynamics of the model predict a **large appreciation first and a smaller subsequent depreciation.**

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

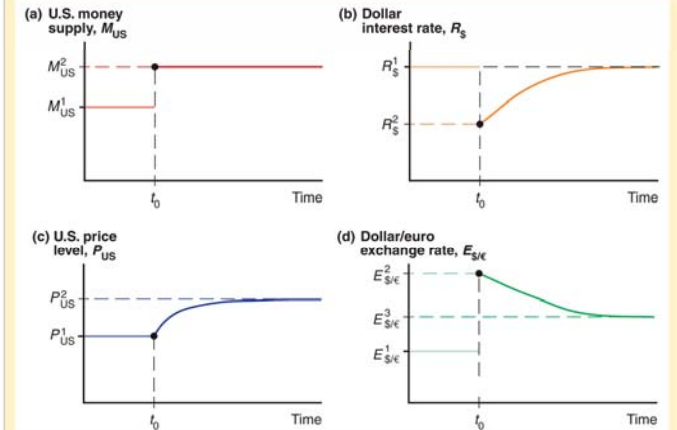


Figure 14-13

Time Paths of U.S. Economic Variables After a Permanent Increase in the U.S. Money Supply

After the money supply increases at t_0 in panel (a), the interest rate (in panel (b)), price level (in panel (c)), and exchange rate (in panel (d)) move as shown toward their long-run levels. As indicated in panel (d) by the initial jump from $E_{\$/\text{€}}^1$ to $E_{\$/\text{€}}^2$, the exchange rate overshoots in the short run before settling down to its long-run level, $E_{\$/\text{€}}^3$.

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



Exchange Rate Overshooting

- The exchange rate is said to **overshoot** when its immediate response to a change is greater than its long run response.
 - We assume that changes in the money supply have immediate effects on interest rates and exchange rates.
 - We assume that people change their expectations about inflation immediately after a change in the money supply.
- Overshooting helps explain why exchange rates are so **volatile**.
- Overshooting occurs in the model because prices do not adjust quickly, but expectations about prices do.

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



Exchange Rate Volatility

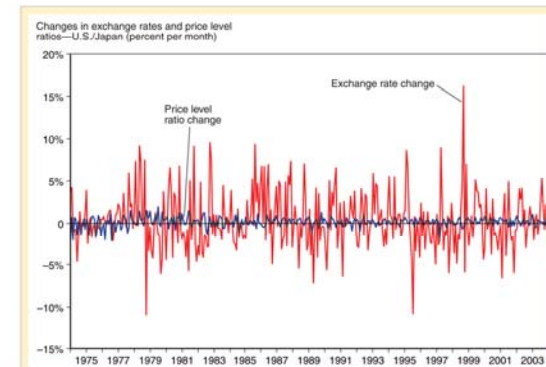


Figure 14-11

Month-to-Month Variability of the Dollar/Yen Exchange Rate and of the U.S./Japan Price Level Ratio, 1974–2004

The much greater month-to-month variability of the exchange rate suggests that price levels are relatively sticky in the short run.

Source: International Monetary Fund, *International Financial Statistics*.

Changes in price levels are less volatile, suggesting that price levels change slowly.

Exchange rates are influenced by interest rates and expectations, which may change rapidly, making exchange rates volatile.

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

Summary

1. Money demand on an individual level is determined by interest rates and liquidity, the latter of which is influenced by prices and income.
2. Money demand on an aggregate level is determined by interest rates, the price level and national income.
 - Aggregate real money demand depends negatively on the interest rate and positively on real national income.
3. Money supply equals money demand—or real money supply equals real money demand—at the equilibrium interest rate in the money market.

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

9-49

Summary (cont.)

4. Short run scenario: changes in the money supply affect the domestic interest rate, as well as the exchange rate.
 - An increase in the domestic money supply
 1. lowers the domestic interest rate,
 2. lowering the rate of return on domestic deposits,
 3. causing the domestic currency to depreciate.

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

9-50

Summary (cont.)

5. Long run scenario: changes in the level of the money supply are matched by a proportional change in prices, and do not affect real income and interest rates.
 - An increase in the money supply
 1. causes expectations about inflation to adjust,
 2. causing the domestic currency to depreciate further,
 3. and causes prices to adjust proportionally in the long run,
 4. causing interest rates return to their long run rate,
 5. and causes a proportional long run depreciation in the exchange rate.

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

9-51

Summary (cont.)

6. Expectations about inflation adjust quickly, but prices adjust only in the long run, which results in overshooting of exchange rate.
 - Overshooting occurs when the immediate response of the exchange rate due to a change is greater than its long run response.
 - Overshooting helps explain why exchange rates are so volatile.

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

9-52