Lecture 4 Money, Interest Rates, and Exchange Rates

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What Is Money?

- Money is a liquid/monetary asset
  - narrow measure

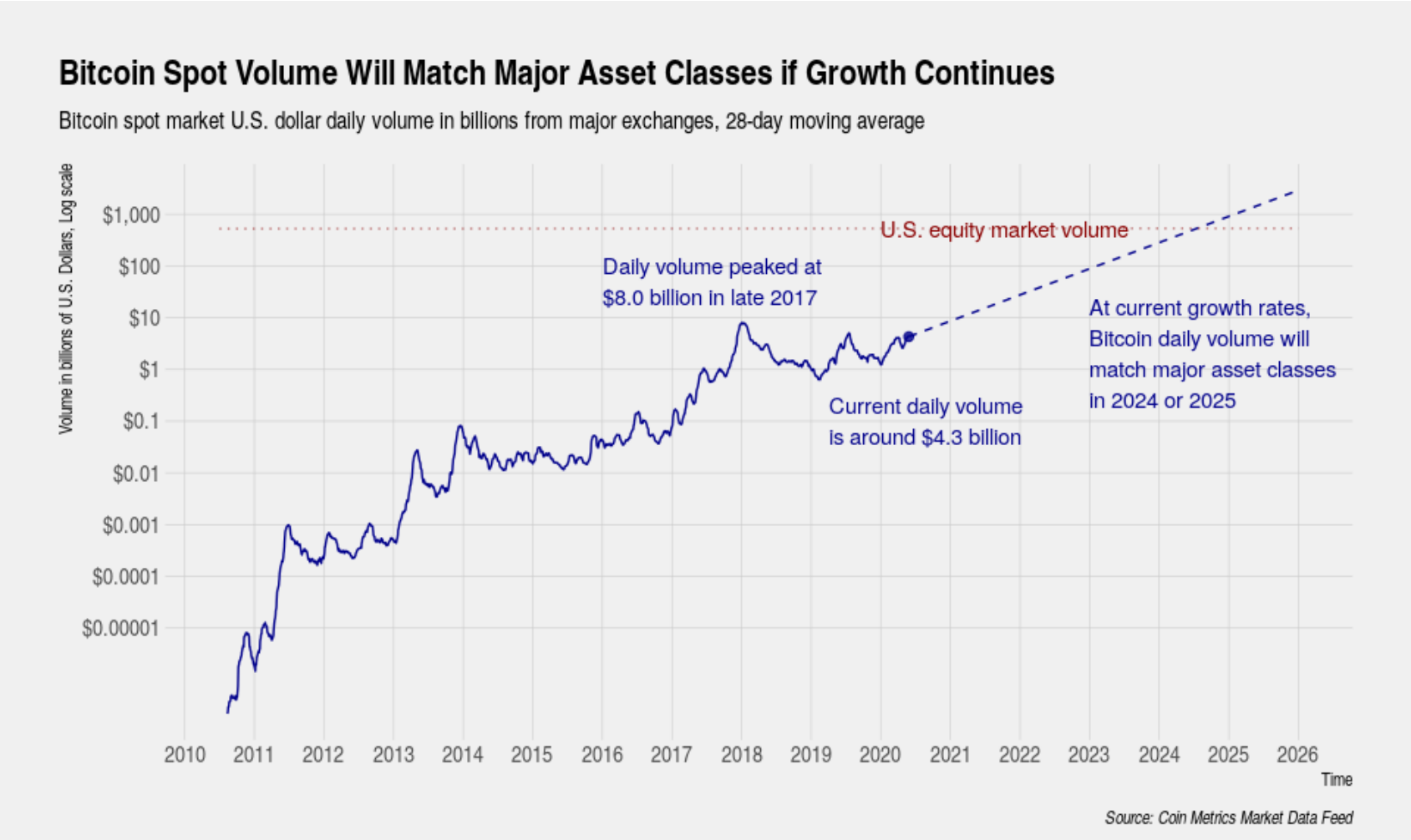
$$\text{M1} = \text{currency} + \text{checkable deposits}$$

  - broader measure includes less liquid/non-monetary assets
  - measure money supply by M1, controlled by Fed
- Why is it important
  - Wicksell (1934), "*Lectures on Political Economy*"
  - Kiyotaki & Moore (2002), "*Evil is the Root of All Money*"
- Functions of money: medium of exchange, unit of account, store of value

What Is Cryptocurrency?

- Decentralized digital money designed to be used over internet, e.g. Bitcoin, Ethereum, Dogecoin
  - transfer value online without a bank/payment processor
  - managed by peer-to-peer networks of computers
  - secured by blockchain—constantly re-verified ledger of all transactions, distributed over network
- Why is it the future of finance
  - buy goods/services or invest
  - not manipulated by central authority
  - equal opportunity to anyone with internet access
  - economic freedom around world

Bitcoin Daily Volume



The Road Ahead...

1. Aggregate Demand for Money
2. Equilibrium in Money Market
3. Money and Exchange Rate in Short Run
4. Money and Exchange Rate in Long Run

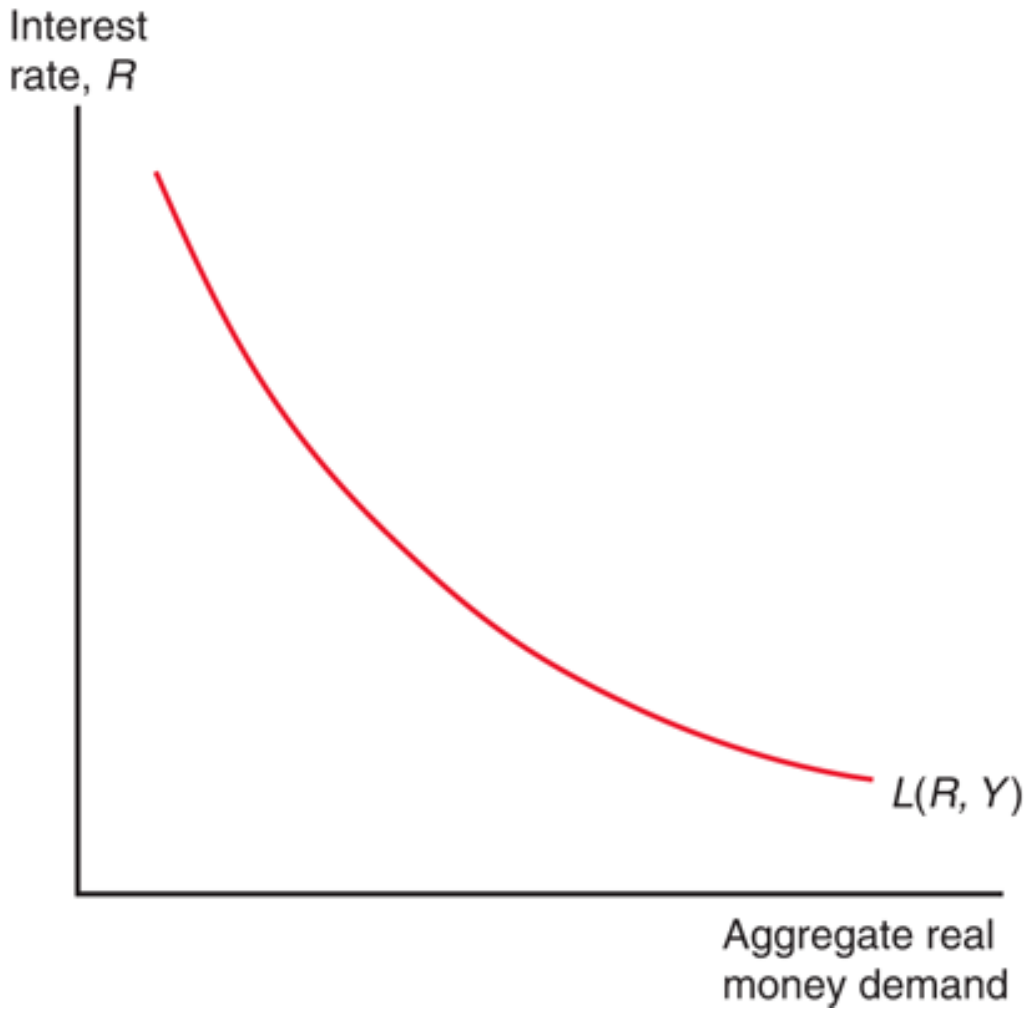
Aggregate Money Demand

Money demand function

$$M^d = P \times L(\underset{(-)}{R}, \underset{(+)}{Y}) \quad \text{or} \quad \frac{M^d}{P} = L(\underset{(-)}{R}, \underset{(+)}{Y})$$

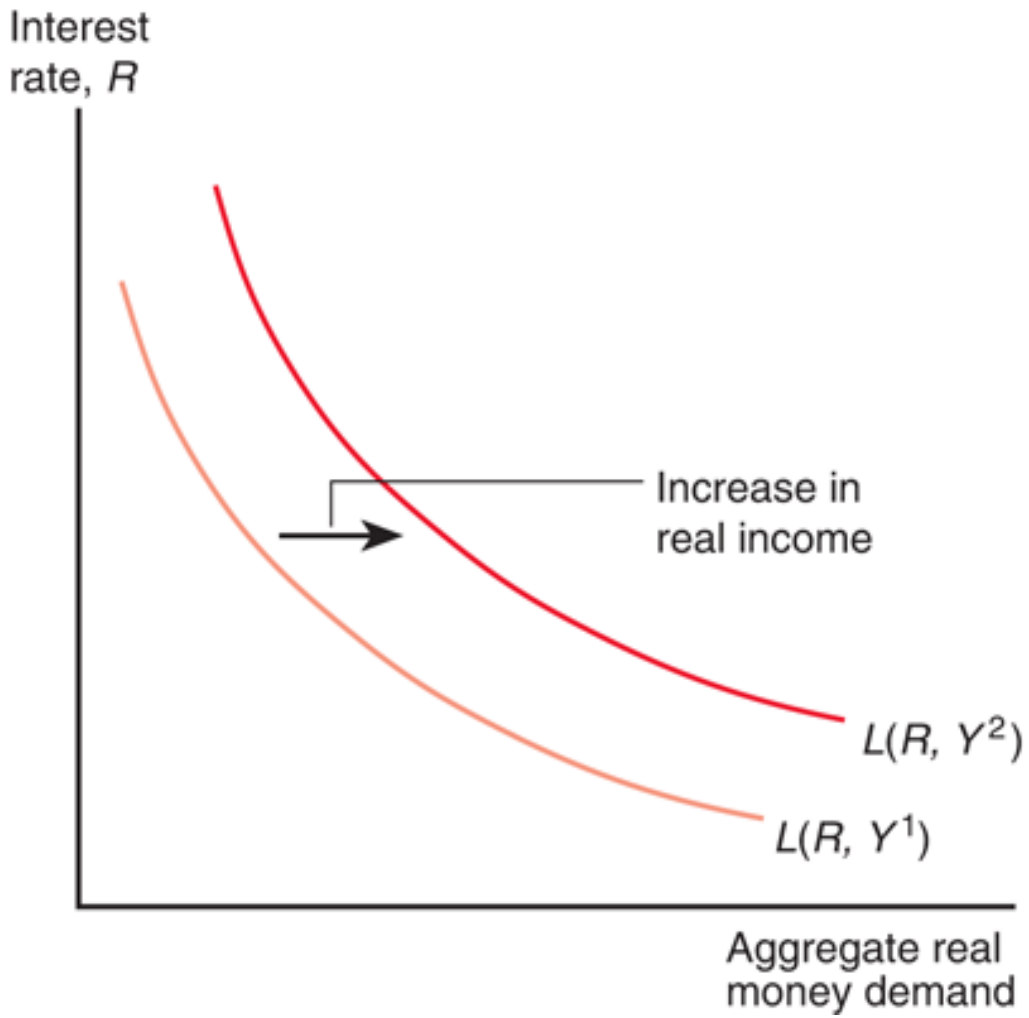
- Three main factors determine M^d
  - R = interest rate on non-monetary assets (opportunity cost/price of holding money)
  - Y = real national income
  - P = general price level
- Exogenous: (Y, P, M^s); endogenous: (M^d, R)

Aggregate Money Demand (Cont'd)



- Real money demand rises as interest rate falls
- Movement along curve

Aggregate Money Demand (Cont'd)



- Real money demand rises at each interest rate
- Shift of curve

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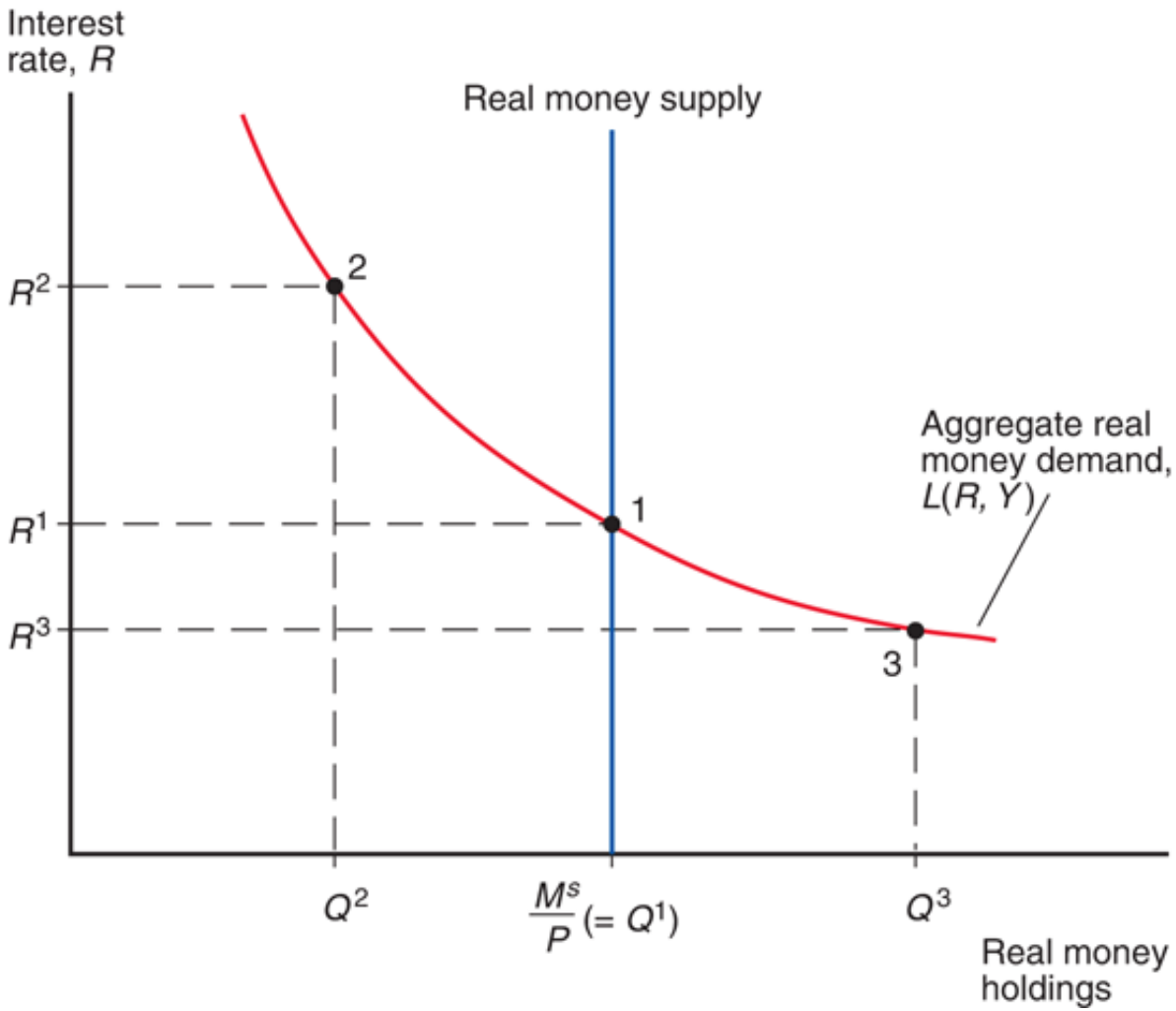
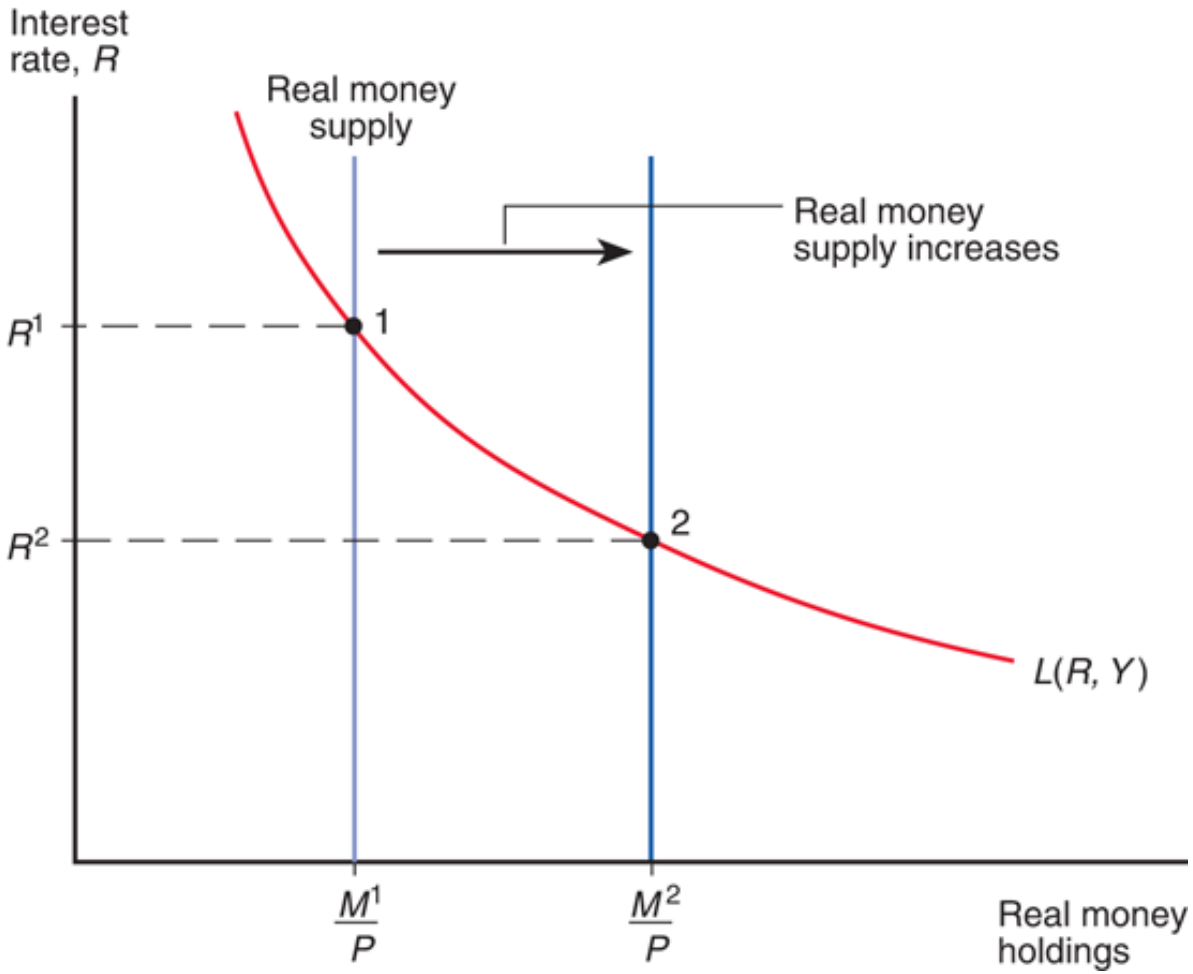
Equilibrium Interest Rate



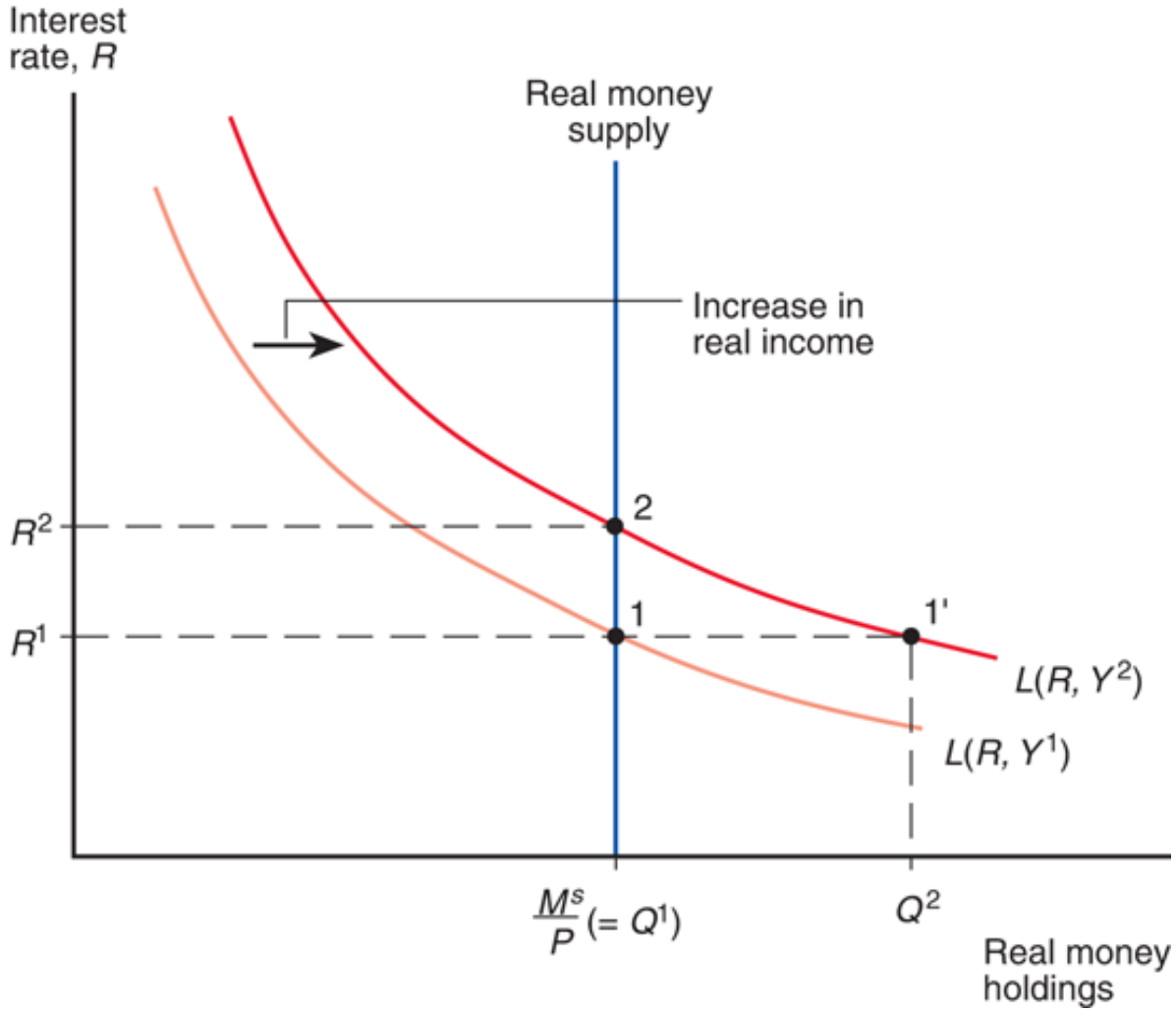
- Money market equilibrium happens when $M^s = M^d$
- Monetary assets v.s. interest-bearing assets

Money Supply and Interest Rate



- Given (Y, P), monetary expansion $(M^s \uparrow)$ lowers R
- What about monetary contraction $(M^s \downarrow)$?

Output and Interest Rate



- Given (M^s, P), higher economic activity $(Y \uparrow)$ raises R
- What about lower economic activity $(Y \downarrow)$?

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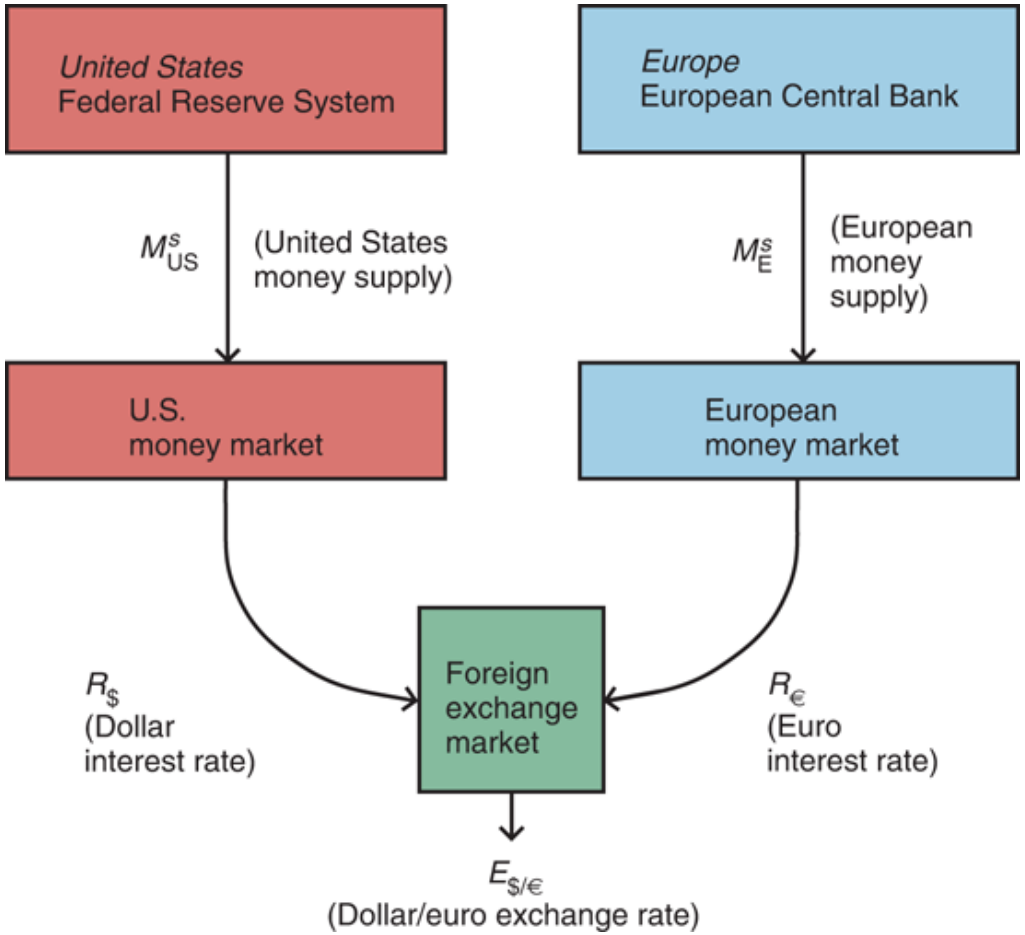
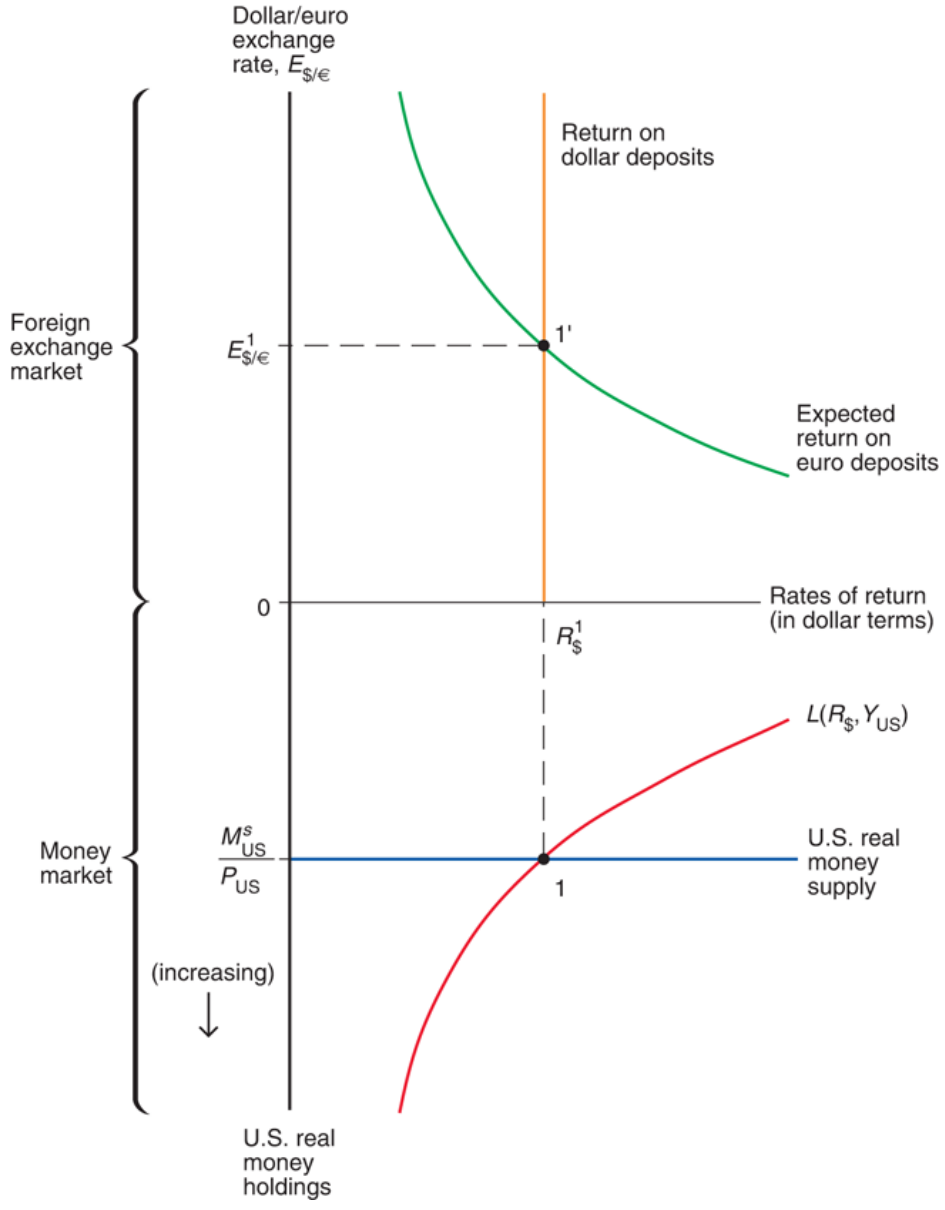
Money and Exchange Rate: Short Run



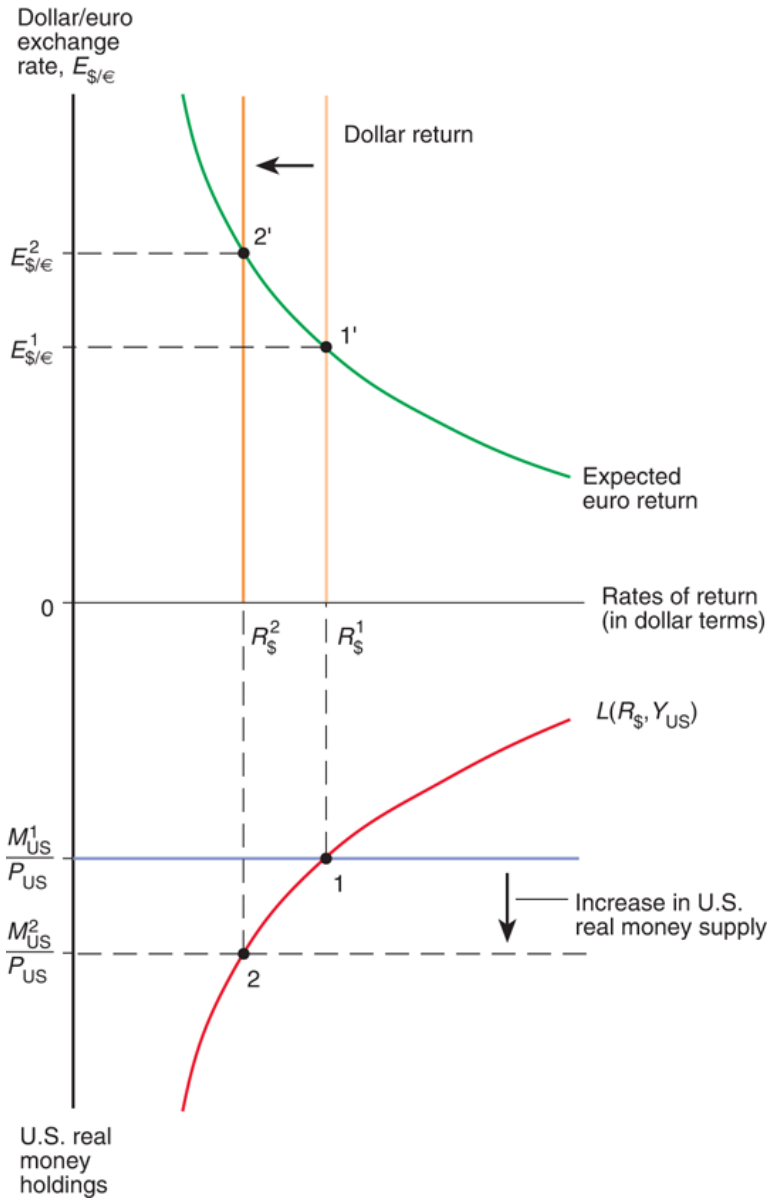
- Simultaneous equilibrium in money market and foreign exchange market

- Exogenous: $(Y,\ P,\ M^s,\ E^e)$; endogenous: $(M^d,\ R,\ E)$

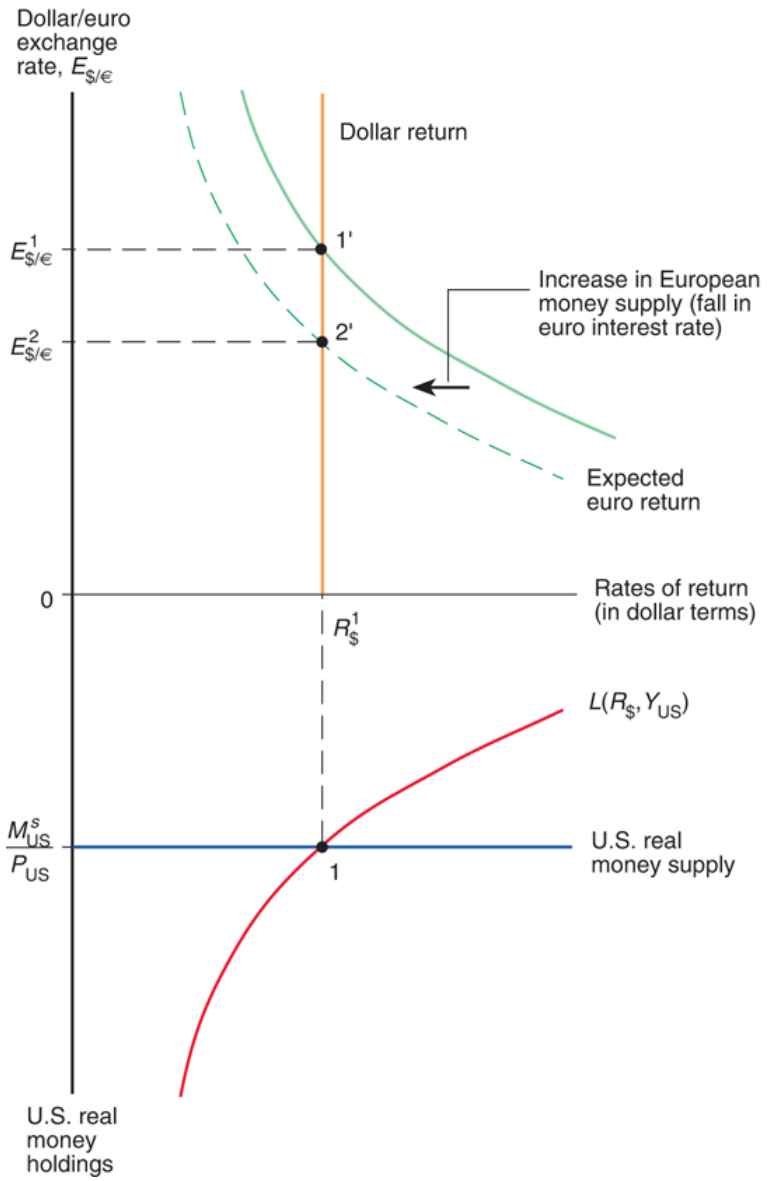
Simultaneous Equilibrium



Money Supply & Exchange Rate



Money Supply & Exchange Rate (Cont'd)



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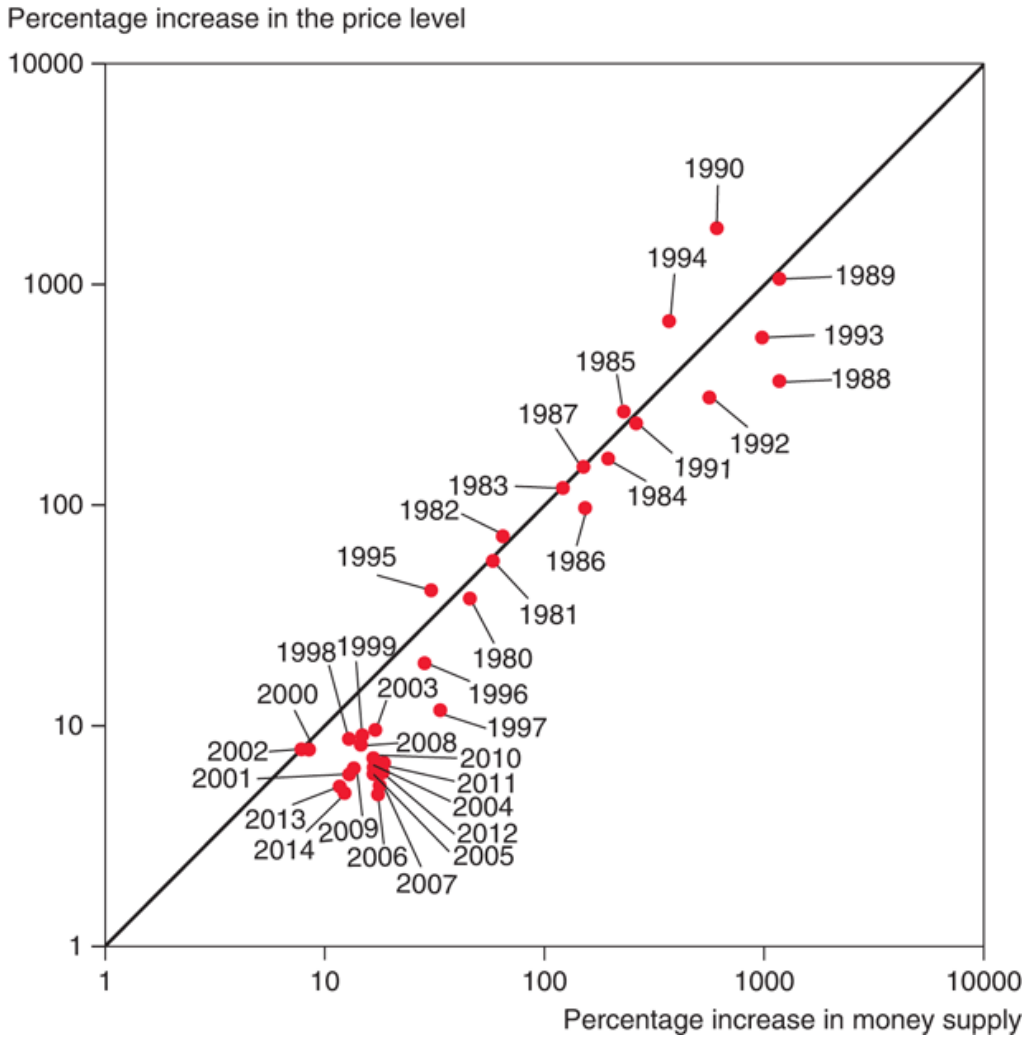
Long-Run Neutrality of Money

Money market equilibrium

$$P = \frac{M^s}{L(R, Y)} \quad \Rightarrow \quad \%\Delta P = \%\Delta M^s - \%\Delta L$$

- Long-run effects of one-time level change in M^s
  - $R =$ natural real interest rate $+$ long-run inflation
  - $Y =$ full-employment real output
  - no change in $(R, Y) \Rightarrow (P, E)$ changes in proportion
  - changes in M^s growth need not be neutral
- As Milton Friedman put it, "*inflation is always and everywhere a monetary phenomenon*"

Evidence on Money Neutrality



- Average money growth and inflation in Latin American, 1987-2007 (source: IMF)

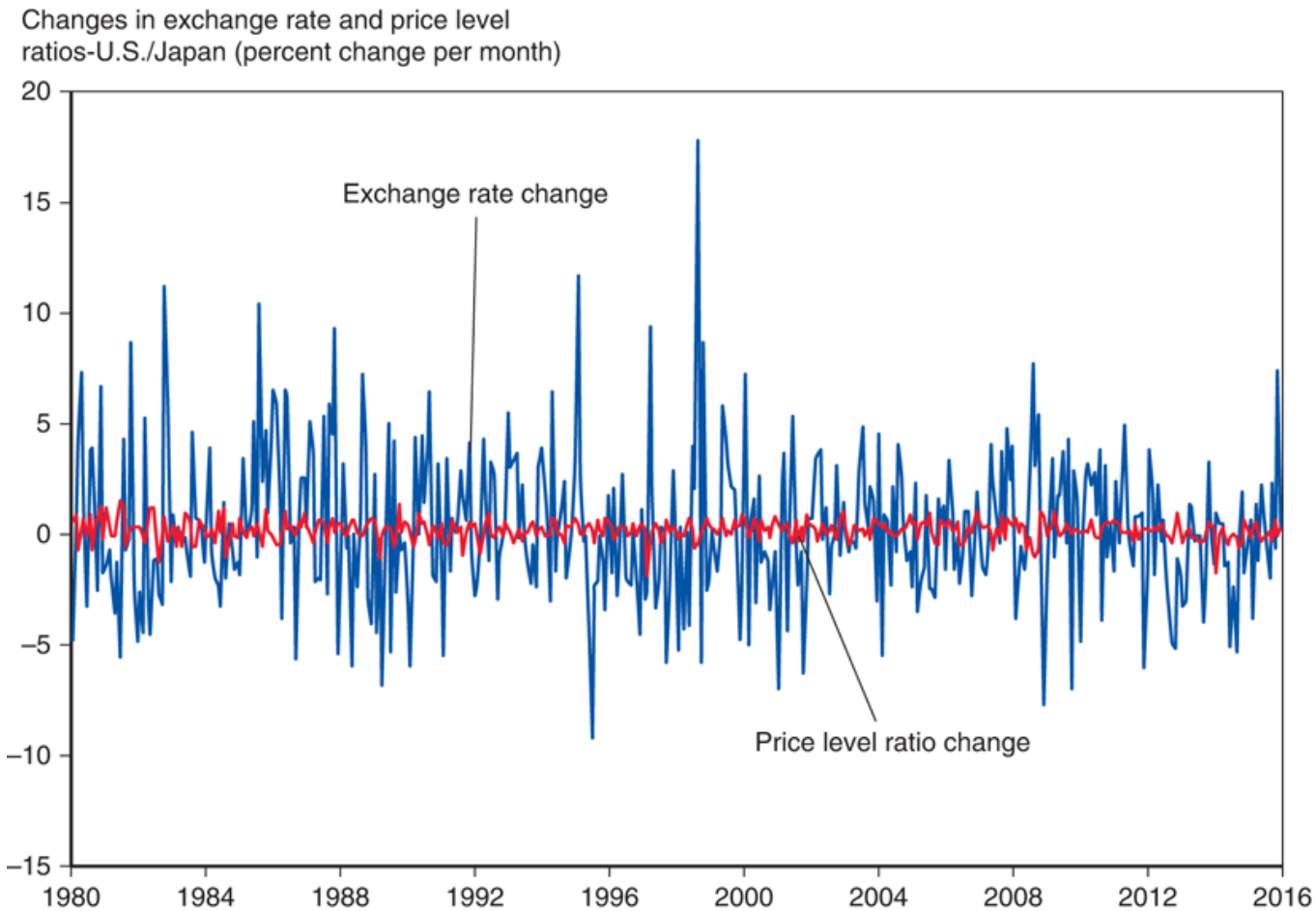
From Short to Long-Run

Price-setting relation (PS)

$$P = (1 + m) \times W, \quad m = \text{markup of price over wage}$$

- Short-run price rigidity
  - wages are written into long-term contracts
  - wage stickiness $\Rightarrow$ price stickiness by PS
- Long-run price flexibility
  - $M^s \uparrow$ creates excess demand for output and labor, inflationary expectations, as well as higher raw materials prices
  - "wage-price spiral" by PS
- Exogenous: $(Y,\ M^s)$; endogenous: $(M^d,\ R,\ P,\ E,\ E^e)$

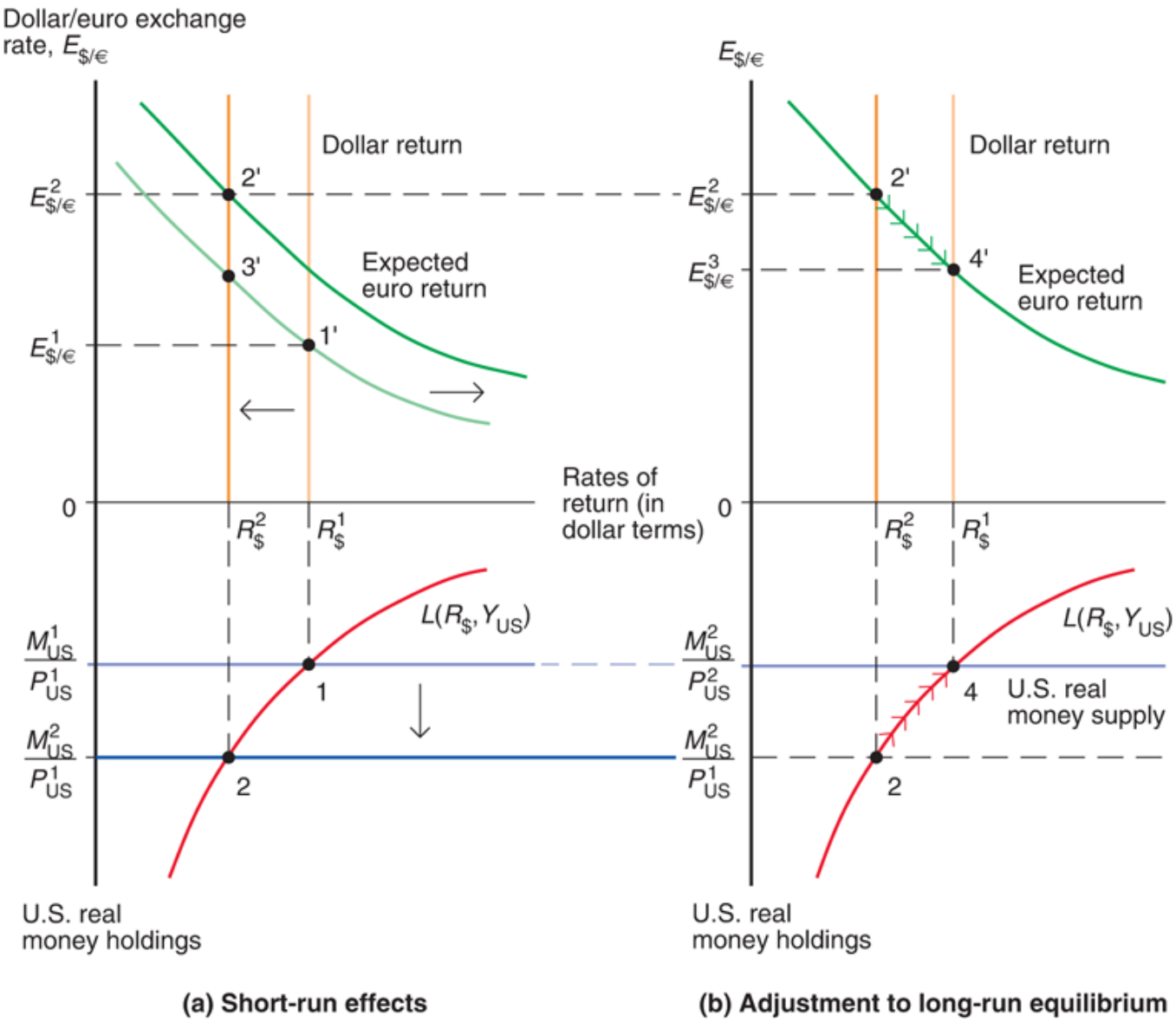
Inflation and Exchange Rate Dynamics



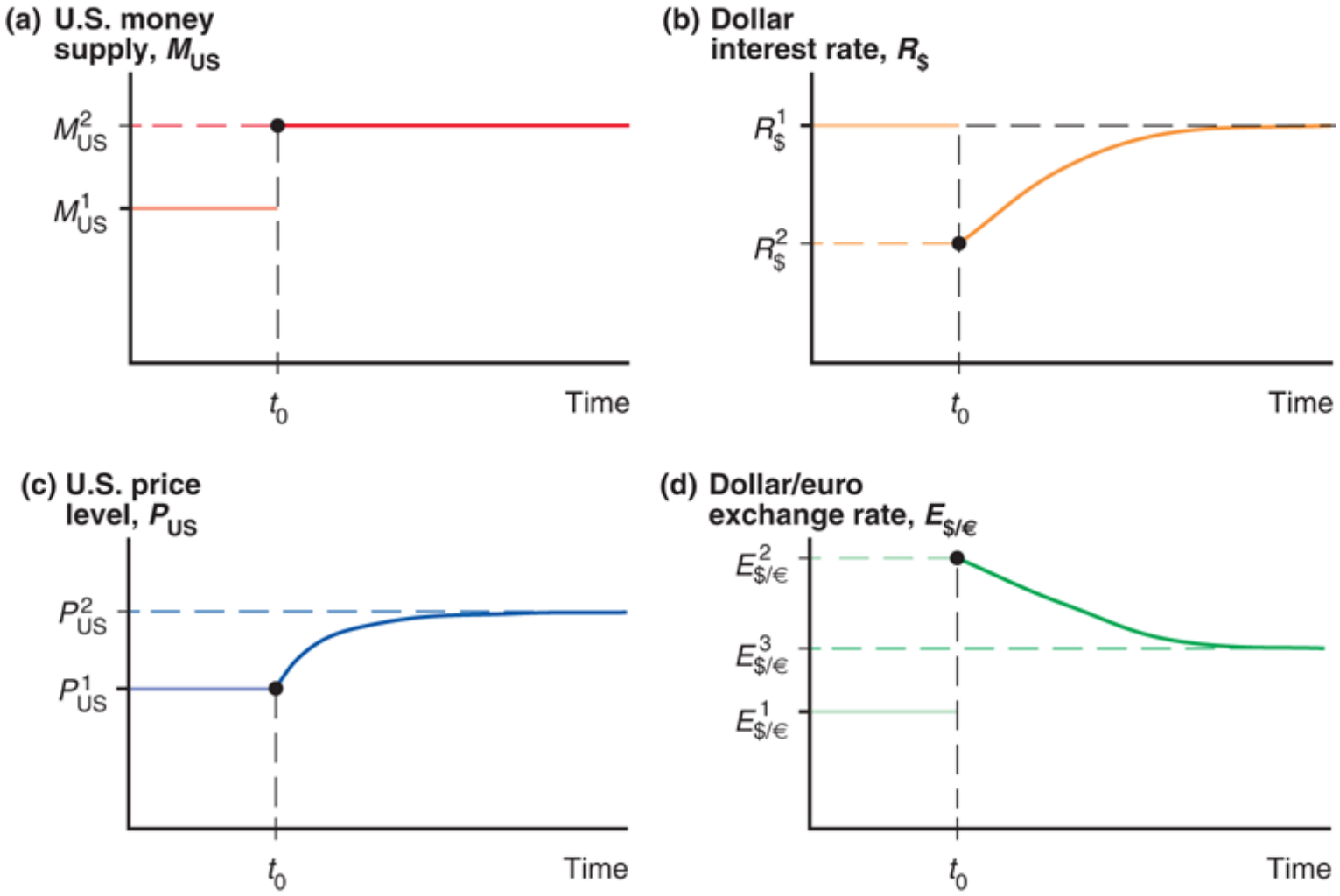
- Percent changes in dollar/yen exchange rate and price ratio–U.S./Japan (source: IMF)

- Exchange rate overshooting

From Short-Run to Long-Run (Cont'd)



Impulse Responses of Key Variables



Readings & Exercises

- Readings
  - KOM: chapter 15
- Exercises
  - KOM: problem 1, 2, 3, 4
  - Would exchange rate still be so volatile if price level were perfectly flexible?