

Lecture 4 Money, Interest Rates, and Exchange Rates

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What Is Money?

- ▶ Money is a liquid/monetary asset

- ▶ narrow measure

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

- ▶ 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

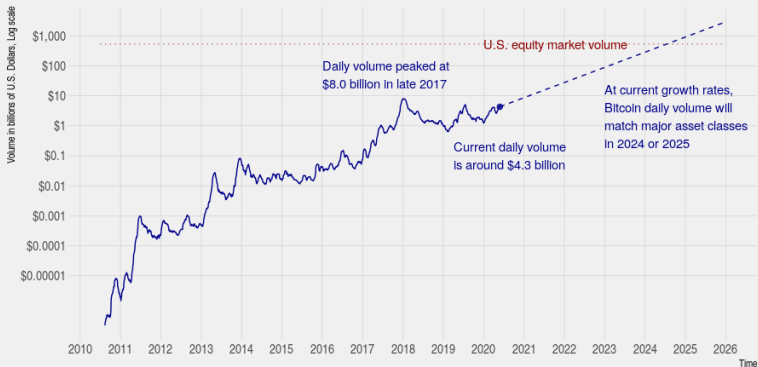
What Is Cryptocurrency?

- ▶ 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
- ▶ Easiest way to acquire cryptocurrency is to purchase via online exchange, e.g. [Coinbase](#)

Bitcoin Daily Volume

Bitcoin Spot Volume Will Match Major Asset Classes if Growth Continues

Bitcoin spot market U.S. dollar daily volume in billions from major exchanges, 28-day moving average



Source: Coin Metrics Market Data Feed

The Road Ahead...

- ▶ Aggregate money demand
- ▶ Equilibrium interest rate
- ▶ Money and exchange rate: short run
- ▶ Money neutrality
- ▶ Money and exchange rate: long run

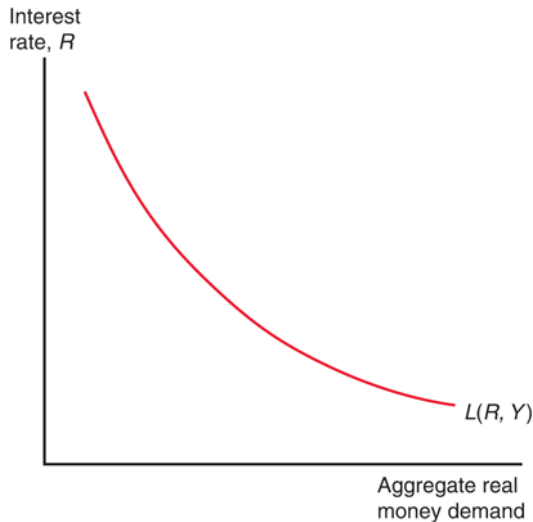
Aggregate Money Demand

Money demand function

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

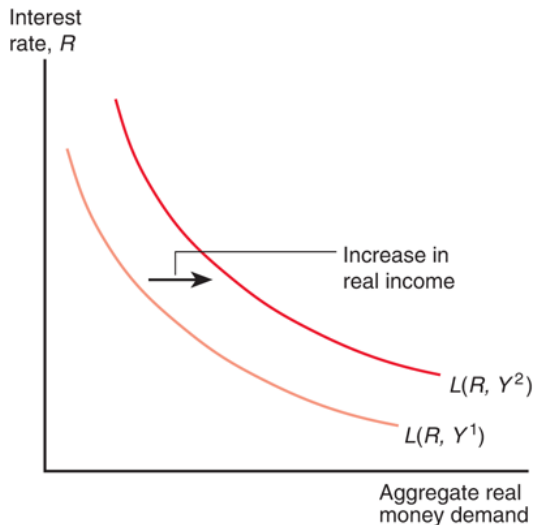
- ▶ Three main factors determine M^d
 - ▶ R = interest rate on non-monetary assets (opportunity cost/price of holding money)
 - ▶ Y = real national income
 - ▶ P = general price level
- ▶ Exogenous: (Y, P, M^s) ; endogenous: (M^d, R)

Aggregate Money Demand (Cont'd)



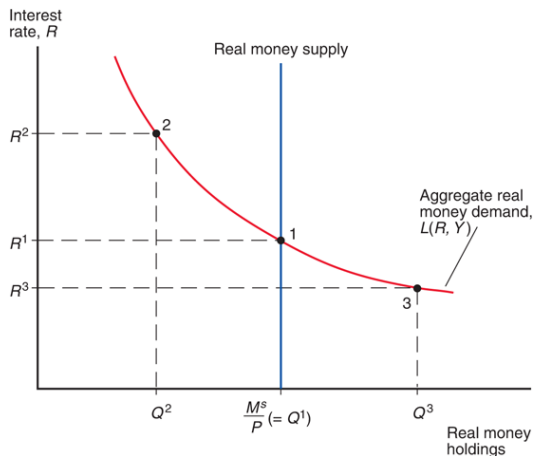
- ▶ Real money demand rises as interest rate falls
- ▶ Movement along curve

Aggregate Money Demand (Cont'd)



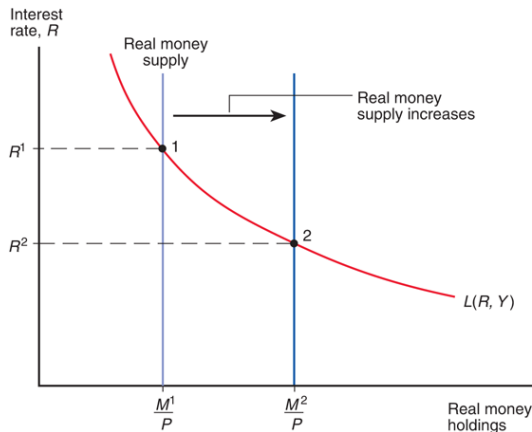
- ▶ Real money demand rises at each interest rate
- ▶ Shift of curve

Equilibrium Interest Rate



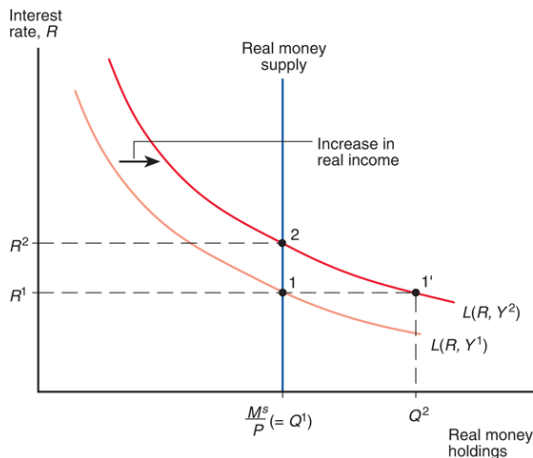
- ▶ Money market equilibrium happens when $M^s = M^d$
- ▶ Monetary assets v.s. interest-bearing assets

Money Supply and Interest Rate



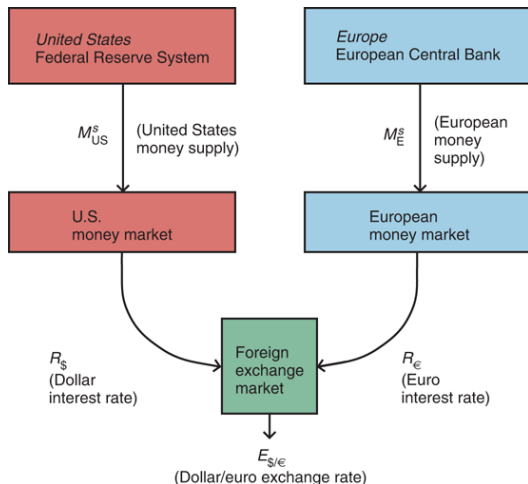
- ▶ Given (Y, P) , monetary expansion ($M^s \uparrow$) lowers R
- ▶ What about monetary contraction ($M^s \downarrow$)?

Output and Interest Rate



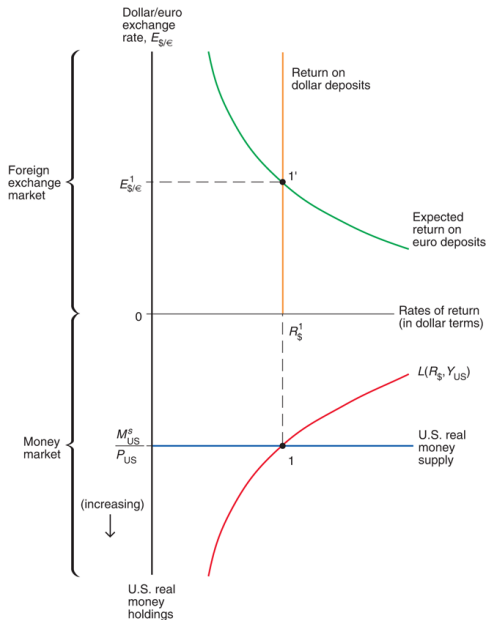
- ▶ Given (M^s, P) , higher economic activity ($Y \uparrow$) raises R
- ▶ What about lower economic activity ($Y \downarrow$)?

Money and Exchange Rate: Short Run

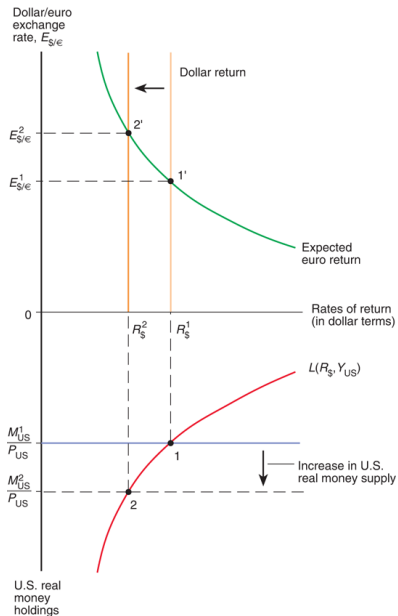


- ▶ Simultaneous equilibrium in money market and foreign exchange market
- ▶ Exogenous: (Y , P , M^s , E^e); endogenous: (M^d , R , E)

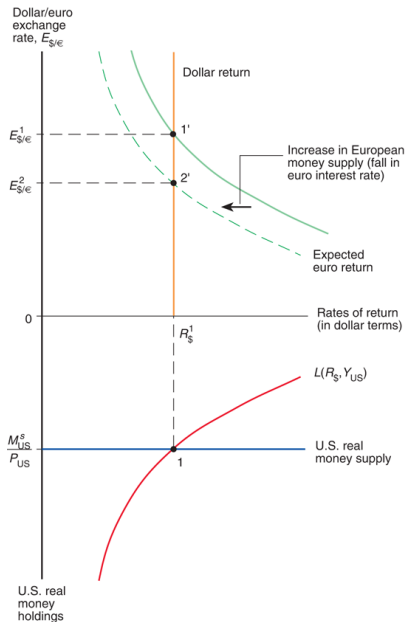
Simultaneous Equilibrium



Money Supply & Exchange Rate



Money Supply & Exchange Rate (Cont'd)



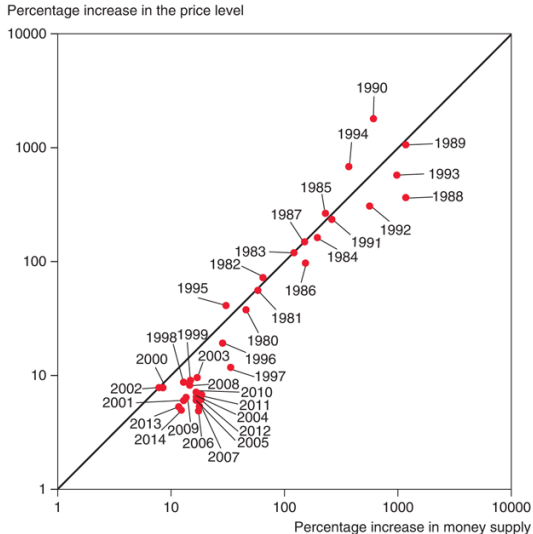
Long-Run Neutrality of Money

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)

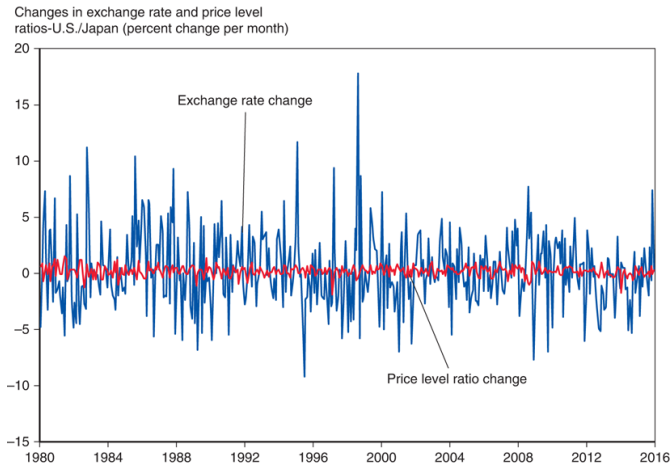
From Short to Long-Run

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)

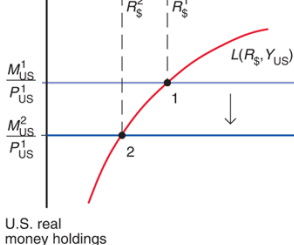
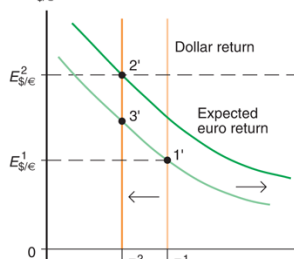
Inflation and Exchange Rate Dynamics



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

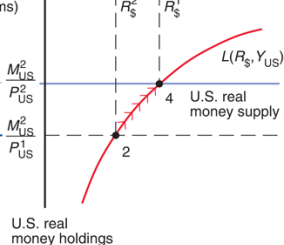
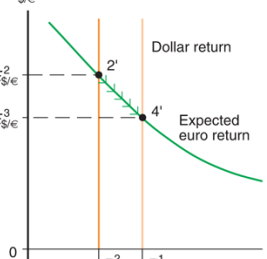
From Short-Run to Long-Run (Cont'd)

Dollar/euro exchange rate, $E_{\$/\epsilon}$



(a) Short-run effects

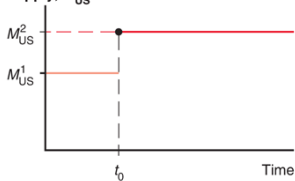
$E_{\$/\epsilon}$



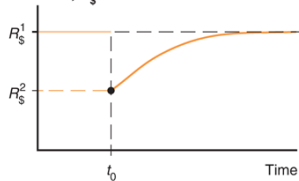
(b) Adjustment to long-run equilibrium

Impulse Responses of Key Variables

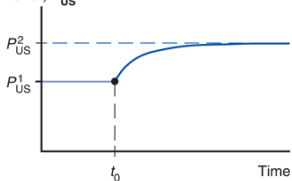
(a) U.S. money supply, M_{US}



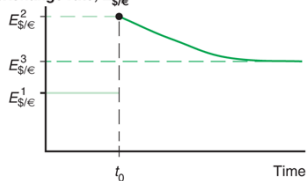
(b) Dollar interest rate, $R_{\$}$



(c) U.S. price level, P_{US}



(d) Dollar/euro exchange rate, $E_{\$/\epsilon}$



Readings & Exercises

- ▶ Readings

- ▶ KOM: chapter 15

- ▶ Exercises

- ▶ KOM: problem 1 (in-class quiz), 2, 3, 4
 - ▶ Would exchange rate still be so volatile if price level were perfectly flexible?