ECON 421: Business Fluctuations

Spring 2015
Tu 6:00PM–9:00PM
Section 102

Created by

Richard Schwinn, Ph.D.

Based on
Macroeconomics, Blanchard and Johnson [2011]

Throughout future sections, the most useful functional relationship found in this chapter is money demand (M^d) as a function of both output (Y) and the interest rate (i).

$$M^d = Y * L(\underset{(-)}{i})$$

- The letter L stands for liquidity.
- What happens if i increases? Can you explain this?
- Notice that if Y doubles M^d doubles as well.

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Terminology

A **stock variable** is a variable that is measured at given point in time.

- Financial wealth is a stock variable.
- Financial wealth equals the sum of money and bonds.
- An individual's financial wealth changes over time by saving or dissaving.

A **flow variable** is one whose value is meaningful only when expressed in terms of a time period.

- Income is also a flow variable, it indicates an instantaneous additions to wealth over a given period of time.
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The Demand for Money

Suppose the financial markets include only two assets:

- Money
- Bonds

Suppose you earn $100 working this weekend. Until you spend this income, you can split it between the two asset classes. For instance, you could keep and 60% in the form of bonds ($60) and 40% in money ($40).

What drives this decision?

- Money's advantage is that it can be used to purchase goods and services but it pays no interest.
- Bonds pay a positive interest rate, but cannot be used for transactions.

The $40 being kept in *money* is divided into further subclasses. Depending on how you allocate your money within these subclasses, **money demand** will likely increase by less than $40.

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Money Demand

Money is needed for transactions.

- We assume that the level of transactions is proportional to nominal income, denoted Y.
- So, money demand should be proportional to Y.
- On the other hand, allocating wealth to money comes at the cost of forgone interest on bonds. So, money demand should decrease with the interest rate.
- Other factors, such as developments abroad, that might lead foreigners to demand money are not included in our analysis

Our model of money demand is thus

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Problem

Suppose that a person's yearly income is \$60,000. Also suppose that this person's money demand function is given by $M^d = Y * (0.35 - i)$

1. What is this person's demand for money when the interest rate is 5%?
2. 10%?
3. Suppose that the interest rate is 10%. In percentage terms, what happens to this person's demand for money if their yearly income is reduced by 50%?
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5. Summarize the effect of income on money demand. In percentage terms, how does this effect depend on the interest rate?

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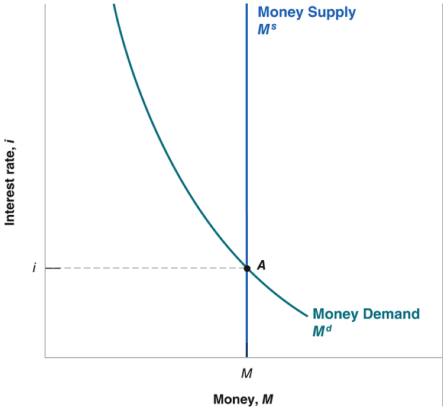
Interest Rate I

$$M^d = Y * L(\underset{(-)}{i})$$

Assume

- $M^s = M^d$
- All money is currency.
- So there are no checking accounts or banks.
- The supply of money is fully in the control of the central bank.
- And take nominal income as given.



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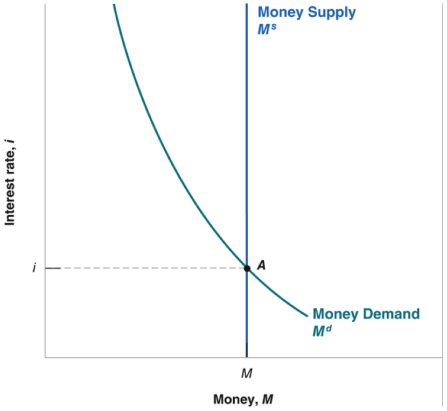

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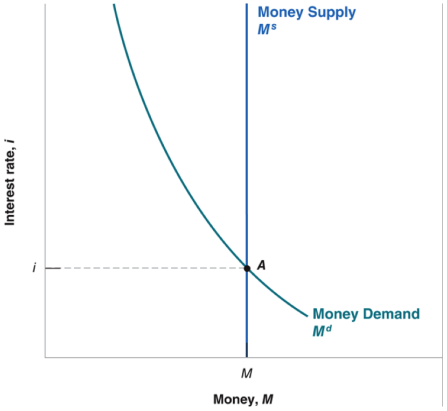

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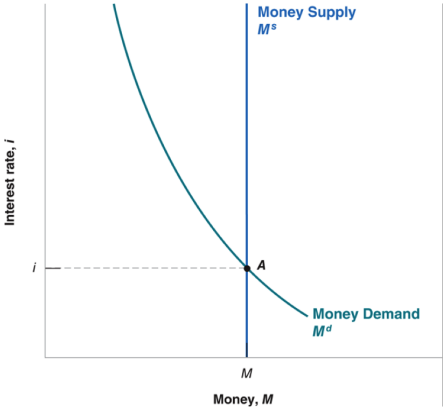

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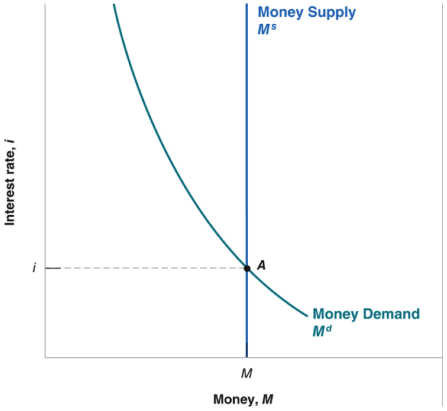
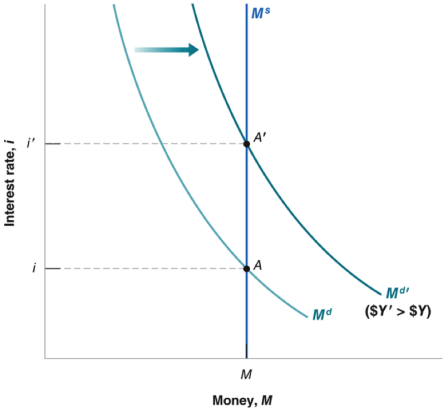


$$M^d = Y * L(\underset{(-)}{i})$$

- Output increases.
- If i is fixed, track rightward from point A to the the new M^d curve.
- But M^s is still at A so the market is in disequilibrium.
- The interest rate must rise in order to reestablish equilibrium.
- A higher interest rate can offset the increased demand for dollars by offering people a reason to save in bonds as opposed to money.



Thus the Y increase shifts the money demand curve to the right and generating a new equilibrium with a higher interest rate.

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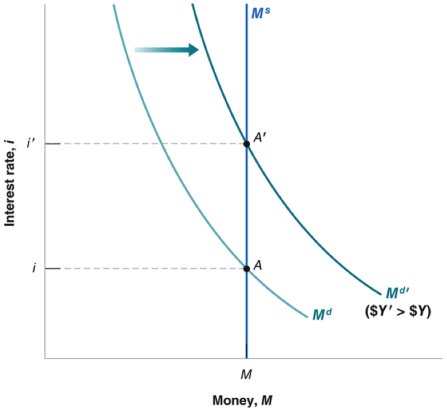

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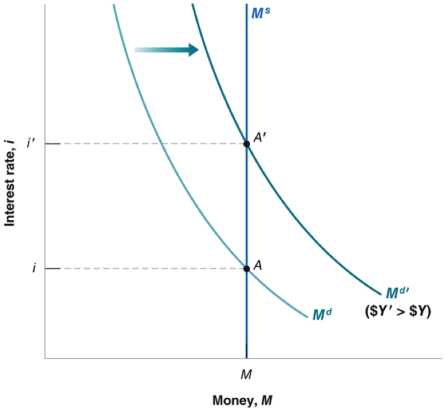

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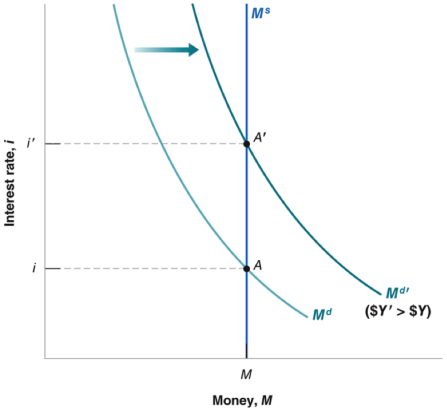

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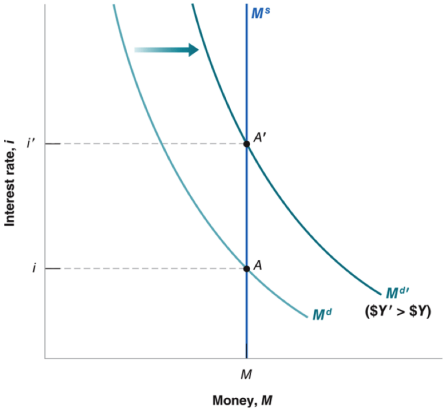

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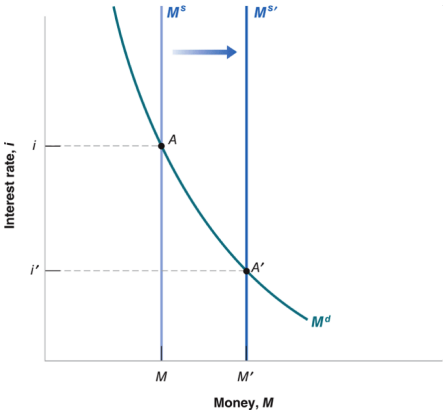
An Increase in the Money Supply

$$M^d = Y * L(\underset{(-)}{i})$$

- An increase in the money supply shifts the vertical line to the right, resulting in a new equilibrium with a lower interest rate.
- In order to induce the private sector to hold more money, bonds must become less attractive (the interest rate falls).



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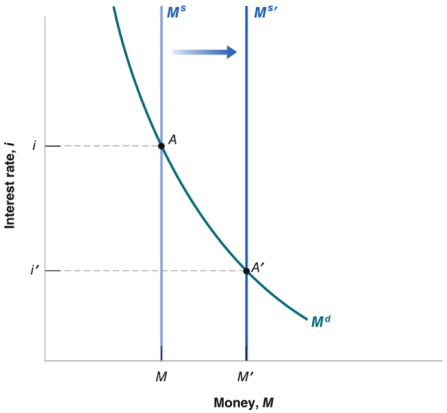

How does the central bank control the money supply?

To increase the money supply,

- The central bank creates currency to purchase bonds,
- Thus increasing assets (through the additional bonds)
- and liabilities (through the new currency created and exchanged for bonds).

To reduce the money supply,

- the central bank sells bonds for existing currency,
- thus reducing assets (through the sale of bonds) and liabilities (through the reduction of currency held by the general public).
- Purchases and sales of bonds by the central bank are called **open market operations**.

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Consider the central banks balance sheet.

- Currency held by the public constitutes the central banks liabilities.
- The central banks assets are any bonds it owns.

Balance Sheet

Assets	Liabilities
Bonds	Money (currency)

The Effects of an Expansionary Open Market Operation

Assets	Liabilities
Change in bond holdings: +$1 million	Change in money stock: +$1 million

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Bond Prices

Suppose a bond promises a payment of \$F one year in the future.

- Call the current price of the bond \$PB.
- Then, the interest rate (or rate of return) on this bond is given by $i = \frac{\$F - \$PB}{\$PB}$.
- This equation can be solved for the bond price: $\$PB = \frac{\$F}{1+i}$.
- Given fixed nominal bond payments, this shows that the nominal interest rate and the bond price are inversely related.
- For example, when the central bank purchases bonds, it increases the demand for them and tends to increase their price, which reduces the interest rate.

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Problem

Consider a bond that promises to pay \$100 in one year.

- What is the interest rate on the bond if its price today is \$75?
- \$85?
- \$95?
- What is the relation between the price of the bond and the interest rate?
- If the interest rate is 8%, what is the price of the bond today?

Recall: $\$PB = \frac{\$F}{1+i}$ & $i = \frac{\$F - \$PB}{\$PB}$.

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Consider a bond that promises to pay \$100 in one year.

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- Suppose you put $30 in a bank account and you keep $10 in cash.
- Banks receive funds (such as your $30) from depositors (individuals and firms) and allow their depositors to write checks against (or withdraw) their account balances.
- These checkable deposits are liabilities of banks.
- On the asset side, banks hold bonds, loans (which are claims against borrowers), and reserves of some of their deposits.
- Some bank reserves are held in cash and the rest in accounts at the central bank.
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Central Bank Liabilities with and without Banks

Adding banks to the economy alters the central bank balance sheet only on the liabilities side.

Balance Sheet

Assets	Liabilities
Bonds	Money (currency)

(a)

Central Bank

Assets	Liabilities
Bonds	Central Bank Money = Reserves + Currency

The Effects of an Expansionary Open Market Operation

Assets	Liabilities
Change in bond holdings: +$1 million	Change in money stock: +$1 million

(b)

Banks

Assets	Liabilities
Reserves Loans Bonds	Checkable deposits

Supply of Central Bank Money

- The money that the central bank has created is called **central bank money** (H).
- Central bank money consists of currency held by the public plus (CU^d) reserves held by banks (R^d).
- The central bank can control the supply of money by stimulating either reserves held by banks by
  - Using OMOs or
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Demand for Central Bank Money

- Let c be the fraction of overall money demand (M^d) which is kept in currency.[1]
- Thus $(1-c)$ is the fraction of overall money demand kept in bank checking accounts.
- Let θ be the fraction of checkable deposits which banks are required to hold.
- Thus we have that:

$$M^d = CU^d + R^d = H \quad (1)$$

$$M^d = currency + \theta(checking\ deposits) = H \quad (2)$$

$$M^d = cM^d + \theta(1-c)M^d = H \quad (3)$$

$$And\ recall\ that\ M^d = Y * L(i) \quad (4)$$

$$M^d = [c + \theta(1-c)]Y\,L(i) = H. \quad (5)$$

[1] And recall that M^d is a fraction of income Y.

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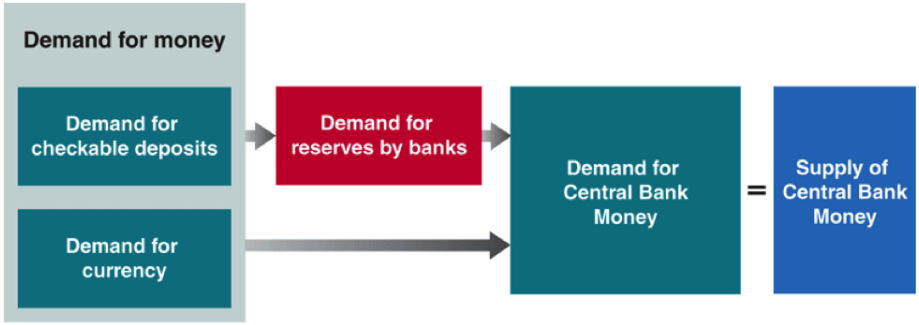

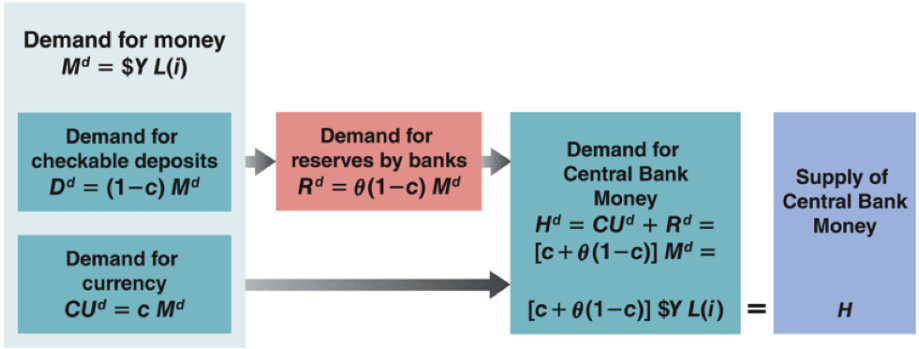

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$$H = [c + \theta(1 - c)]YL(i)$$

- Can you identify money demand (M^d) in the above equation?
- $H = [c + \theta(1 - c)]M^d$
- If we solve for it, we get:

$$M^d = \frac{H}{[c + \theta(1 - c)M^d]}$$

- Notice that the denominator is less than 1 thus $M^d > H$ thus making the term larger.
- Thus, a given increase in central bank money leads to a larger increase in the overall money supply.
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Comments, questions, or concerns?

References

Olivier Jean Blanchard and David Johnson. *Macroeconomics*. Prentice Hall, 6th edition, 2011. ISBN 9780133061635.

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