

Money Market - Part 1

EC 313, Macroeconomics

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Book Chapter 4

Overview

Overview

Overview

Why study **financial markets**?

A: To understand how the **interest rate** is determined in the short run!

The goods market we outlined in Chapter 3 did not include an interest rate, but in the real world, the interest rate is mentioned in the news almost every day!

The Goods Market model does not have a role for a Central Bank like **the Federal Reserve**. In short, we study financial markets to understand a realistic element of our economic activity!

Overview

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Recall that the goods market model is built to study one specific **macroeconomic variable** - **aggregate output**. The financial market model we are going to build is intended to study the behavior of another macroeconomics variable - **interest rate**.

Just like any other market where selling and buying happens, the financial market has its own commodity - **money**.

- How many types of money are there?
- How can we sell and buy money?
- What do you use to buy money?
- Who buys money?

Overview

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There are **two types of money**:

Now Money - we also call this **money**. It is the money we use to buy goods like *groceries, services, food*.

Future Money - we call this **asset**. It is just like the other commodities, it is something we can buy using money today.

Each household decides on how much now money they should hold and how much future money they should hold.

Overview

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Now Money:

(Now) Money, which you can use for **transactions**, **pays no interest**.

- **Currency**: paper money, coins, etc.
- **Checkable Deposits**: deposits you have stored with a bank.

Money is used to make transactions, but it earns **no interest**.

Overview

Overview

Now Money:

Demand for (now) money comes from each individual. At the end of the day, it is people who need cash to complete transactions.

Money can be used for transactions because money is **liquid** compared to assets (future money).

Overview

Overview

Now Money:

Supply for (now) money comes from:

Overview

Overview

Now Money:

Supply for (now) money comes from:

The federal reserve bank and **commerical banks**

(Monetary Policy)

Overview

Overview

Now Money:

- Now money is used to fulfill the transactions they need to make.
- The more transactions they need to make, the more now money they need.
- What is the **opportunity cost** of now money? - having **less future money**

Overview

Overview

Future Money:

There are lots of types of **future money (assets)** one can buy.

- Government bonds
- Houses
- Stock Investments (Securities)
- etc

However, to simplify our analysis, we abstract from these various types of assets and only focus on a simple asset - **bond**.

Overview

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Future Money:

Bonds are, simply put, **IOUs** (read: I owe yous) whose price is less than the face value.

Suppose the price for a one-year bond is P_b and the face value is F , the interest rate is given by

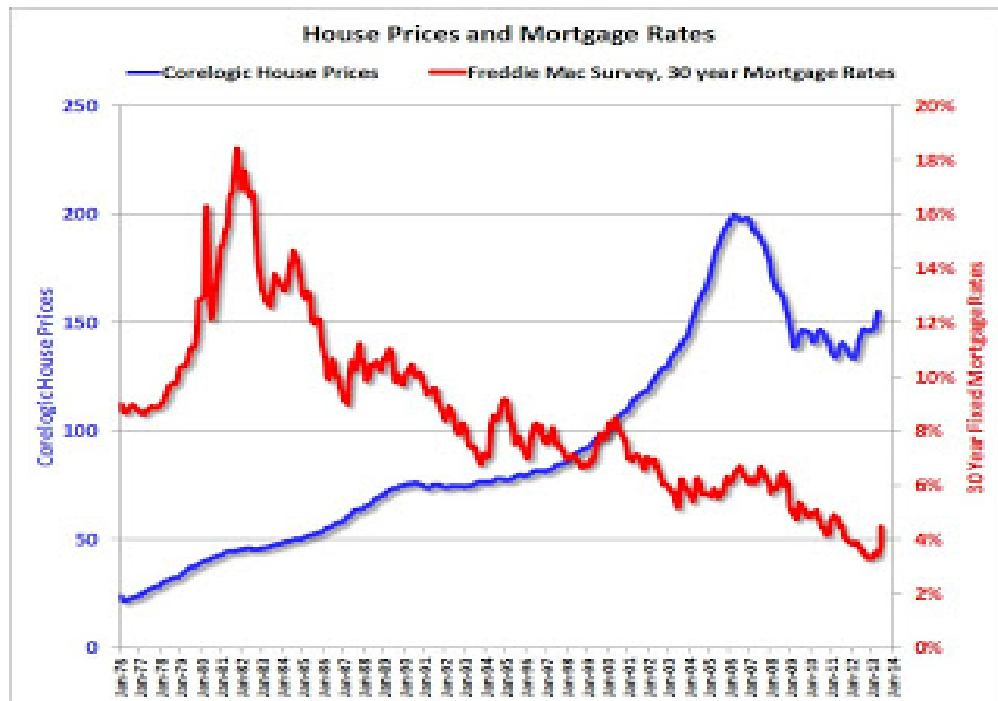
$$i = \frac{F - P_b}{P_b} = \frac{F}{P_b} - 1$$

Note: bond price goes up, the interest rate goes down.

Overview

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Overview

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For example, you go to the bonds market and buy a piece of paper that will give you a claim of \$1000 in a year at the price of \$900. The yearly interest rate of this bond is:

$$\left(\frac{\$1000 - \$900}{\$900} \right) * 100\% = 11.11\%$$

11.11% is a very high interest rate in the United States

Overview

Overview

We will focus on the **(now) money market** and analyze the behavior of the economy at equilibrium

$$\text{Money Demand} = \text{Money Supply}$$

Notice the supply for money comes from the **Central Bank (the Fed)**. This model gives us insight into how **the central bank can influence the money market**.

Money Demand

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Why does an average household hold a mixture of bonds and money?

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- I need to make transactions! Ex: I buy food and beer almost every day. I cannot use bonds to purchase beer, so I make sure that I have some money.

Money Demand

Money Demand

Why does an average household hold a mixture of bonds and money?

- I need to make transactions! Ex: I buy food and beer almost every day. I cannot use bonds to purchase beer, so I make sure that I have some money.
- Thankfully, I do not spend ALL of my money on beer and food. If I'm not using all of my money, I should buy bonds so that I can earn interest.

Money Demand

Money Demand

What determines an average household's proportion of bond holdings and money holdings?

- Level of Transactions: the more purchases I make, the more money (and fewer bonds) I will hold (for a fixed interest rate).
- Interest Rate on Bonds: the higher the interest rate on bonds, the more bonds I would like to purchase.

Money Demand

Money Demand

Use M^D to denote money demand. This can be thought of as the demand for liquidity by all individuals:

$$M^D = \$Y L(i)$$

where "**\$Y**" is nominal GDP, and "i" is the nominal interest rate.

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"**\$Y**" captures the fact that money holdings depend on the level of transactions, which is proportional to nominal income.

- Nominal GDP: used because both higher real income and a higher price level lead to increased money demand!

Money Demand

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Use M^D to denote money demand. This can be thought of as the demand for liquidity by all individuals:

$$M^D(i) = \$Y L(i)$$

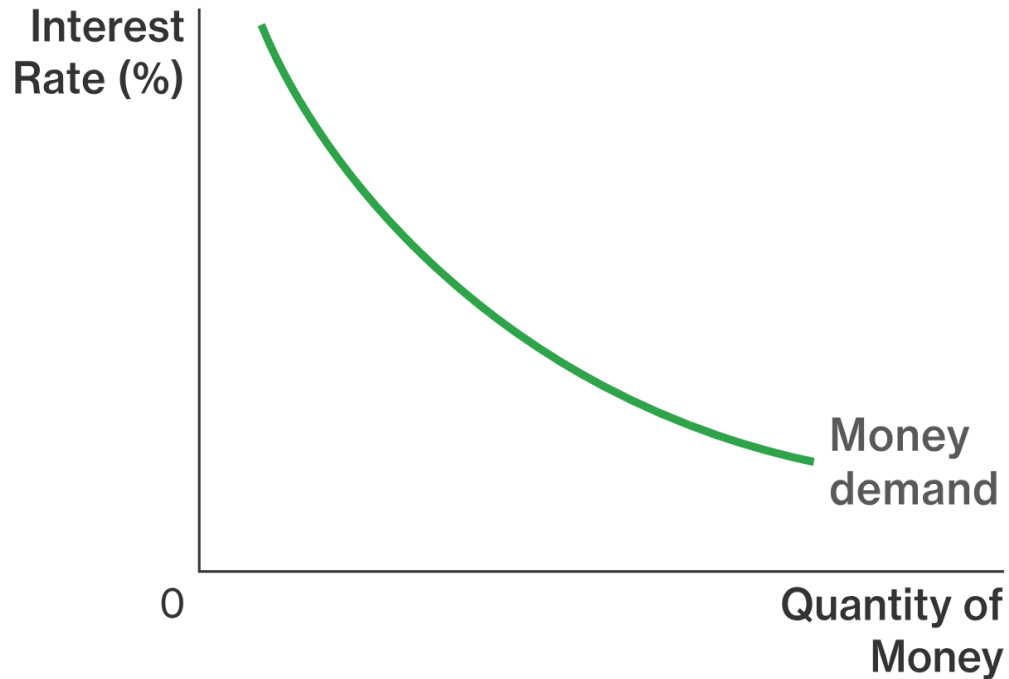
where "**\$Y**" is nominal income, and i is the nominal interest rate.

Q: Do you think $L(i)$ is increasing or decreasing in i ?

A: DECREASING!

Money Demand

Money Demand - Graph



Money Demand

Money Demand - Graph

Q: What happens when the interest rate increases or decreases in our graph?

A: We **move along** the curve MD.

Q: What happens when nominal GDP increases or decreases in our graph?

A: We **shift** the MD curve!

Money Demand

Money Demand - Graph

Interest Rate on Bonds: the higher the interest rate on bonds, the more bonds and less money I will hold (for a fixed level of transactions).

Money Demand

Money Demand - Graph

Interest Rate on Bonds: the higher the interest rate on bonds, the more bonds and less money I will hold (for a fixed level of transactions).

- The M^D curve is graphed for a fixed level of nominal income.

Money Demand

Money Demand - Graph

Interest Rate on Bonds: the higher the interest rate on bonds, the more bonds and less money I will hold (for a fixed level of transactions).

- The M^D curve is graphed for a fixed level of nominal income.
- Therefore, a change in the interest rate moves us along the MD curve!

Money Demand

Money Demand - Graph

Interest Rate on Bonds: the higher the interest rate on bonds, the more bonds and less money I will hold (for a fixed level of transactions).

- The M^D curve is graphed for a fixed level of nominal income.
- Therefore, a change in the interest rate moves us along the MD curve!
- Also, i is on our vertical axis. **If a variable is on one of the axes of a graph, changing that variable moves us along a curve.**

Money Supply

Money Supply

Money Supply

In the real world, there are two types of money:

- **Currency**: Money supplied by **central banks**. This is the paper (or coin) money that we use daily.
 - Currency is the physical money that we carry around.
 - The Federal Reserve in the U.S supplies currency.

Money Supply

Money Supply

In the real world, there are two types of money:

- **Checkable Deposits**: Money supplied by **commercial banks**.
 - When your paycheck is directly deposited to your bank account, this is a checkable deposit.
 - This is money that you can spend with a check (hence checkable deposit) or your debit card.

Money Supply

Money Supply

Recall that both the **Federal Reserve** and **Commercial Banks** can supply money.

- The Federal Reserve supplies money by providing **central bank money**
- The Commerical Banks supply money by **money recreation**.

Money Supply

Money Supply

In this lecture, let's make a simplifying assumption:

Assumption: There are no commercial banks in our economy.

We will relax this assumption in the next lecture by including the commercial banks in our model.

Money Supply

Money Supply

- Now we can characterize money supply M^S . Since the money supply is entirely determined by the central bank, it is reasonable to assume the money supply is **exogenous**
- Money supply being exogenous means it doesn't depend on the variable of interest in our model, which is the interest rate.
- The interest rate is determined by setting $M^D = M^S$

Money Supply

Money Supply

Q: If the money supply is exogenous, what will the equation for MS look like?

$$M^S = M$$

- Recall, M , is assumed to be **exogenous**. We assume the Central Bank arbitrarily chooses M , and its choice is independent of interest rates, output, consumption, government spending, investment, etc.
- We use the word "arbitrarily" because **the model can't predict what money supply the federal reserve bank is going to choose**, but we can still use the model to predict the **effects of their choices on interest rate**.

Money Market Equilibrium

Money Market Equilibrium

Equilibrium - Math Model

In equilibrium, we have the following equations.

$$M^D = \$YL(i)$$

$$M^S = M$$

$$M^D = M^S$$

Solve these equations, we get

$$M = \$YL(i)$$

The above equation is known as the **LM** (L for **liquidity**, M for **Money**) relationship, and it characterizes money market equilibrium in our model.

Money Market Equilibrium

Equilibrium - Math Model

Q: What happens to equilibrium i when nominal income ($\$Y$) decreases?

A: Recall

$$M = \$Y L(i)$$

- The **left-hand side** M is unchanged.
- The **right-hand side** should also be unchanged.
- $\$Y$ goes **down**
- $L(i)$ goes **up**
- How should i change for $L(i)$ to go up? Recall that $L(i)$ is a decreasing function in i .

Money Market Equilibrium

Equilibrium - Math Model

Q: What happens to equilibrium i when money supply (M) decreases?

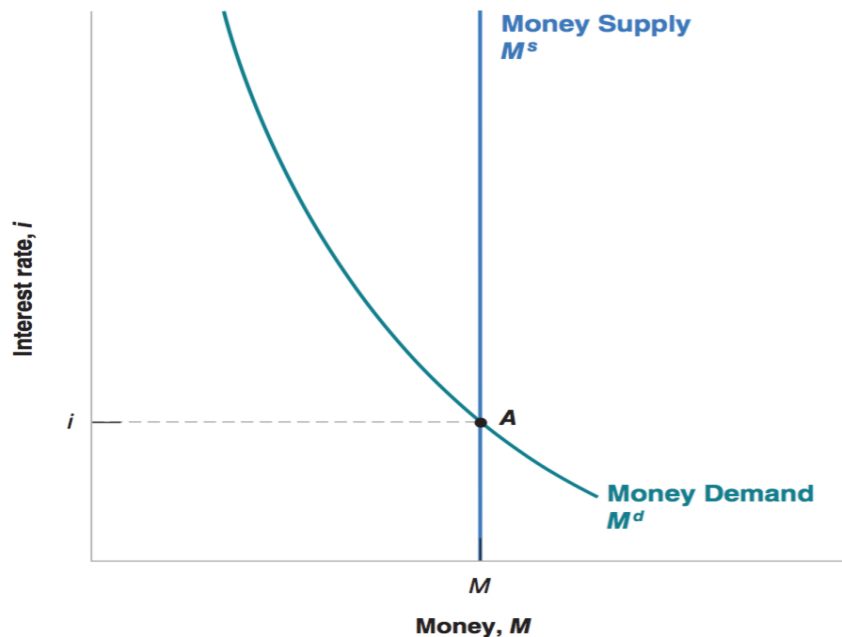
A: Recall

$$M = \$Y L(i)$$

- The **left-hand side** M goes **down**.
- The **right-hand side** should also go **down**.
- $\$Y$ is unchanged
- $L(i)$ must go **down**
- How should i change for $L(i)$ to go down?

Money Market Equilibrium

Equilibrium - Graphs Demo



- What happens to equilibrium i when nominal income ($\$Y$) decreases?
- What happens to equilibrium i when money supply (M) decreases?

Money Market Equilibrium

Equilibrium - Intuition

Q: What happens to equilibrium i when nominal income ($\$Y$) decreases?

- Households need less money because the level of transactions goes down.
- Households want to buy future money (bonds).
- Demand for bonds for future money goes up.
- The bond price goes up.
- The interest rate goes down.

Money Market Equilibrium

Equilibrium - Intuition

Q: What happens to equilibrium i when money supply (M) decreases?

- There is less money supply from the central bank.
- To meet the needs of the money demand, households need to sell their future money (bonds).
- The supply for bonds goes up.
- The price for bonds goes down.
- The interest rate goes up.

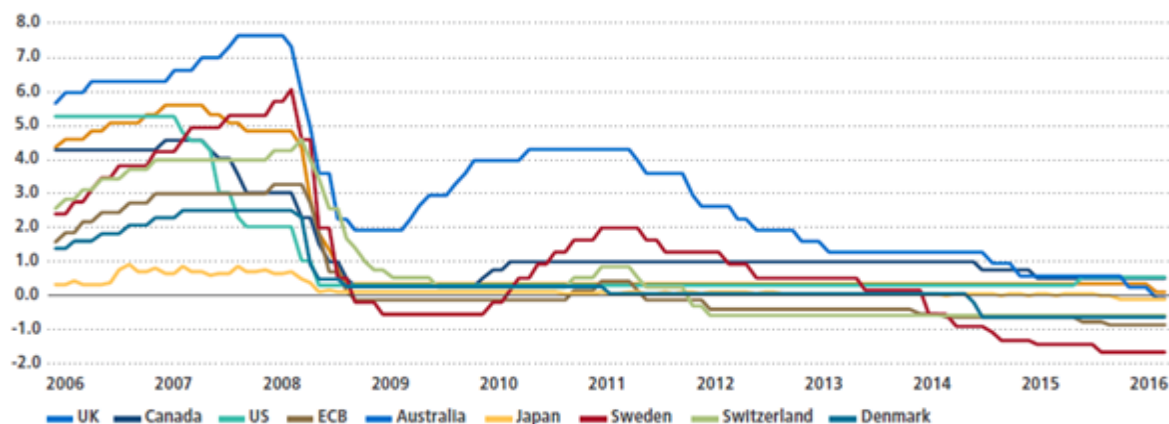
Money Market Equilibrium

Equilibrium - Recession and QE

During the great recession (around 2008), we witnessed that interest rates dropped in most countries. Use what we learned in today's class (math model, graphs, and intuitions) to explain this phenomenon.

Hint: During the recession, most central banks around the world also increased their money supply as a response.

FIGURE 1: GLOBAL CENTRAL BANK RATES



Source: Bloomberg as of 17 October 2016

Money Market Equilibrium

Choosing Money Or Choosing the Interest Rate

We have described the central bank as **choosing the money supply** and letting the interest rate be determined at the point where money supply equals money demand.

$$M = \$YL(i)$$

It is useful to think about the central bank as choosing the interest rate.

When you listen to the news, you do not hear: “The Fed decided to increase the money supply today.” Instead, you hear: “The Fed decided to decrease the interest rate today.”

Money Market Equilibrium

Choosing Money Or Choosing the Interest Rate

We have described the central bank as **choosing the money supply** and letting the interest rate be determined at the point where money supply equals money demand.

$$M = \$Y L(i)$$

Given the nominal GDP $\$Y$ and function $L(\cdot)$, the government can achieve (almost) any i they want by choosing the right amount of M .