Lecture Notes for Chapter 7 of
Macroeconomics:
An Introduction

The Demand for Money

2/19/08

In this chapter we will discuss -

- What does 'demand for money' mean?
- Why do we need to know about it?
- What is the price of money?
- How the supply and demand for money determine the interest rate.
- The Fed controls the supply of money, so the Fed can control the interest rate.

Why Study the Demand for Money?

- Fed controls the supply of money through open market operations.
- The demand for money depends on the interest rate.
- Interest rate is a price, and it adjusts to balance the supply and demand for money.
- That means the Fed can control interest rates by changing the supply of money.

Why are interest rates important?

- Low interest rates stimulate spending on
  - plant and equipment
  - and consumer durables.
- High interest rates discourage spending,
  - affect GDP and employment,
  - finally, prices and wages too.
- ***Control over interest rates gives the Fed a lever to move the economy.***

What is the Demand for Money?

- How much money would you like to have?
  - One billion?
  - Two? That can't be it.
- Instead
  'How much money (currency and bank deposits) do you wish to hold, <u>given</u> your total wealth.'

Puzzle -

- Why hold any money at all?
- It pays no interest.
- It loses purchasing power to inflation.

Motives for holding money:

- 1. To settle transactions.
  - Money is the medium of exchange.
- 2. As a precautionary store of liquidity.
  - Money is the most liquid of all assets.
- 3. To reduce the riskiness of your portfolio.
  - Money is the least risky of all assets.

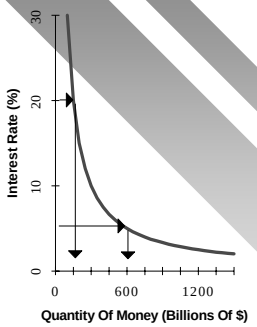
What does it cost to hold money?

- The interest you could have earned!
- That is the ***opportunity cost***.
- At today's T bill yield, what does it cost you to hold an extra $1,000?
- *The optimal amount of money to hold is the amount that balances the benefits of holding money against the opportunity cost.*

The quantity of money we demand depends on:

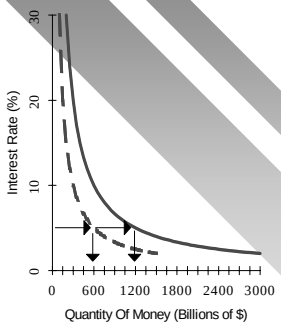
- *The interest rate*
  - the cost of holding money.
- *Income*
  - which affects transactions demand
- *Wealth*
  - which affects portfolio demand

A graph of the demand for money:



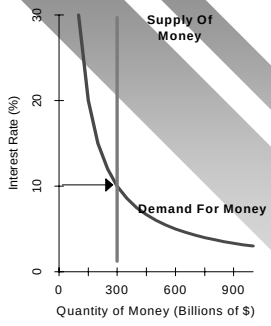
- holding income and wealth constant.
- varies inversely with the interest rate
- reflected in negative slope of demand curve.
- What happens at very low interest rate?
- At very high interest rate?

What happens to the demand curve if income and wealth double?



- Transactions demand doubles.
- Portfolio demand doubles.
- Quantity of M demanded doubles.
- Changes in income or wealth *shift the demand curve*.

The supply of money, the quantity available, is set by the Fed.



- Fed controls supply of M
- Suppose $300 billion.
- Vertical line at $300 b.
- Quantity demanded equals quantity supplied at interest rate of 10%.
- People then willing to hold the money that exists.

Keep in mind -

- Someone holds each dollar that exists
- You can reduce your holding of money by spending it or buying assets
- But individuals cannot changes the total amount of money held by everyone
- Only the Fed can change the total

What keeps the interest rate at 10%?

- If it drops to 9%, we want to hold more money.
- Everybody tries to sell bonds to get cash.
- But cannot all change quantity of money they hold, because total quantity of money is fixed.
- Price of bonds falls, interest rate back to 10%!
- At 10%, we are willing to hold the quantity of money supplied by the Fed.

Because the interest rate will remain at 10% until one of the two curves shifts, economists refer to this point as the equilibrium interest rate.

Puzzle:
Why do we think of the interest rate as determined by the supply and demand for money, rather than by the supply and demand for bonds?

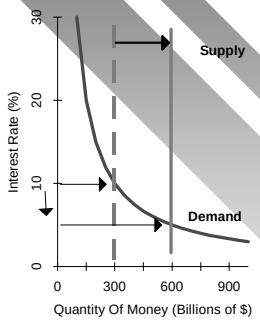
The markets for money and for bonds are two sides of the same coin.

- You divide your portfolio between
  - money, which provides liquidity,
  - and bonds, which pay interest but are risky,
  - taking into account the interest rate you can earn on bonds.
- The demand for money determines the demand for bonds, and vice versa, since your total portfolio is a given.

Thus, we can think of the interest rate as determined in *either* the bond market or the money market.

- What about the stock market? Real estate?
- "Bonds" stand for all non-money assets.
- "The interest rate" represents the return.
- T bill and bond yields are benchmarks.
- Motivation:people always have a choice between bonds and stocks and real estate.

What happens when the Fed increases the supply of money?



- Fed boosts money supply from $300 b to $600 b
- What will induce them to hold more?
- Income and wealth change slowly, but
- the interest rate falls quickly to 5%.
- How quickly? This minute!

Money is now cheaper to hold, because there is more of it available.

- When there is a big orange crop, the price of orange juice falls.
- It has to, to clear the market.
- When the Fed expands the money supply, the interest rate falls.
- It has to, to clear the market.

The interest rate will also change when there is a shift in the demand for money due to:

- Changes in nominal income or wealth,
- Volume of trading in the stock market
- Seasonal fluctuation in retail sales
- The Fed actually increases the money supply every holiday season.
  - What would happen if it didn't?

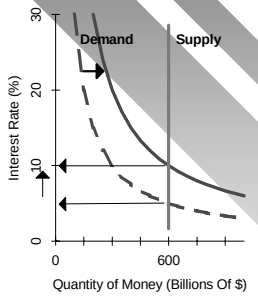
A model is a cartoon of the economy

- Focus is on key variables, leave out others.
- Summarizes relationships using simplifying assumptions.
- Test of a model is not whether it is an accurate description of reality,
- but whether it is useful for
  - explaining
  - predicting.

A model of the demand for money:

- $M^d = k(i) \bullet GDP$
- "M^d" is the quantity of money demanded,
- "k(i)" is a function of the interest rate "i"
- GDP is the measure of nominal income.
- quantity of money demanded, at a given interest rate, is proportional to GDP.
- k(i) is inversely related to i, giving the demand curve its downward slope.

What happens to the interest rate if nominal GDP doubles?



- Money demand is proportional to GDP
- so money demand doubles at a any "i"
- The new intersection of demand and supply must occur at a higher interest rate
- here at 10%.

An implication of our money demand model:

- To keep the interest rate constant, Fed must increase supply of money at the same rate as nominal GDP.
- Then both supply and demand curves are shifting to the right at the same rate, keeping "i" constant.

In a dynamic economy

- Real income and prices are both growing
- The interest rate will depend on relative growth rates of money and nominal income.
- If money grows more slowly than GDP, then interest rates rise;
- If faster than GDP, interest rates fall

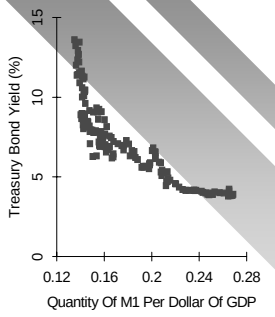
Does the demand for money really depend on the interest rate?

- Is k(i) a function of i?
- Let's calculate k(i) at each point in time
- then plot "k" against "i"
- and see if there is a negative relationship

To calculate “k” at a point in time:

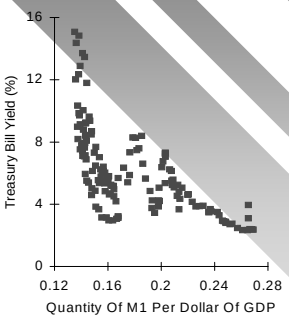
- The demand for money is $M^d = k(i) \cdot GDP$
- supply of money is $M^s = M$, quantity supplied by the Fed.
- In equilibrium supply equals demand, so
- $k(i) \cdot GDP = M$, now solve for k(i):
- $k(i) = M/GDP$, which is
- the demand for money per dollar of GDP.

Is “k” inversely related to "i"?



- Each point is k & T bond yield during one quarter
- 1960 through mid-1994.
- Pattern downward sloping & concave,
- but not exactly on a curve,
- scattered around a curve.

Relation between k and T bill yield



- Much “noisier”
- Short term interest rates more volatile
- Still see: downward sloping concave shape

Why doesn't the model describe the demand for money exactly?

- Left out variables, asset transactions such as volume on the NYSE, home sales.
- More complex models address these issues, but simple model is useful approximation.
- Keeps those 247 Fed economists busy!

The "velocity" of money.

- Definition: V = GDP/M
- Rate at which dollars circulate through economy.
- Number of times a dollar gets used per year.
- Velocity is higher when the interest rate is higher since people will hold less M per dollar of GDP.
- Should be higher in Brazil than in Switzerland,
- It is!

Velocity depends on the interest rate:

- Substituting [k(i) • GDP] for M we get,
- V = GDP/[GDP • k(i)] = 1/k(i) = V(i)
- Since k(i) varies *inversely* with i, V(i) varies *directly* with the interest rate.
- In places and times where inflation and interest rates are high, the velocity of money is also high.


That’s all!