

## Lecture 23: Investment

### I. OVERVIEW

- In the last class, we explored the microeconomics underlying consumption in more detail. We moved beyond the simple Keynesian consumption function and explored two forward looking theories of consumption: the life cycle hypothesis and the permanent income hypothesis.
- If consumption is the largest component of GDP then investment is the most volatile component of GDP and perhaps also the most important from a long term perspective of the economy. Today's lecture takes a closer look at investment.
- We divide investment into 3 parts
  1. Business fixed investment - structures and equipment: 10.4% of GDP
  2. Residential investment - housing newly built as residences or for rental purposes: 4.2% of GDP
  3. Inventory investment - goods produced but unsold and kept in storage: 0.8% of GDP
- Most of our attention will be focused on the business fixed investment and residential investment decisions.

### II. INTRODUCTION TO THE TERM STRUCTURE OF INTEREST RATES

- The monetary policy maker typically influences short-term interest rates by his/her actions: in the United States the Federal Funds rate is the rate most directly influenced by the Fed.
- However, the Fed Funds rate is an interest rate at which banks lend and borrow money overnight. However, most investor decisions deal with much longer term interest rates: mortgage loans are for 30 years, business loans can be for 1-10 years etc.
- The relationship between short and long-term interest rates, also known as the term structure of interest rates is one of the most important, and relevant for day-to-day life, economic relationships. Therefore, to understand the impact of monetary policy on investment, we need to better understand the relationship between short-term interest rates and long-term interest rates in the economy.
- Most interest rates (student loans, car loans, mortgages etc.) are based off the interest rate on government bonds issued by the Federal government, which are considered to be safe assets. Thus a bank looking to make a 30 year mortgage loan to a home buyer will charge an interest rate that is somewhat higher than the interest rate she could earn on a 30 year government bond. After all if she can earn a riskless return by buying a 30 year government bond, she would need a higher return to make a risky mortgage loan.

- This is also why it pays for you as individuals to have good credit. The better your credit is, the lower the interest rate you will have to pay on a loan, since the lender will charge you a lower premium over the safe return.

## Bonds

- You should have learned about the basics of the bond market in 102; the following is a brief refresher course.
- A **bond** is a financial instrument that promises the holder a fixed sum of money at a pre-specified date in the future, which is also known as the maturity date. Some bonds also promise the holder a stream of fixed interest payments, known as coupon payments in the meantime.
- There are three different types of bonds: bonds issued by the U.S. government, bonds issued by various state and local governments, and bonds issued by private and public corporations.
- Bonds issued by the U.S. government fall into three categories: Treasury Bills, Treasury Notes, and Treasury Bonds. Treasury Bills, or T-Bills as they are popularly known, have durations of 13 weeks, 26 weeks, and 52 weeks. Treasury Notes come in durations of 2 years, 5 years, and 10 years. Treasury bonds have a 30-year term.
- Most bonds have a face value, or **par value**, which is the amount that the holder of the bond is entitled to at the end of the period. The bond also has a **coupon rate**, which is the amount of money a person will receive in a year divided by the face value of the bond.
- If you buy a 30-year Treasury bond with a face value of \$1000 and a coupon rate of 5% then you will be holding an instrument that pays you \$1000 after 30 years and also pays you \$50 per year in the interim period.
- All these bonds are traded on a bond market. You can buy bonds directly from the issuer: the U.S. government, for example, holds auctions in which they sell bonds, or on a secondary bond market.

## What Affects the Price of Bonds?

- The worst enemy of bond investors is inflation. Higher inflation reduces the face value and the value of the stream of interest payments of the bond. So the price of bonds will start falling. The fall in the price of bonds is linked to the general rise in interest rates that take place in the presence of rising inflation.
- So rising interest rates in the rest of the economy tend to reduce demand for, and the price of, bonds. Reductions in interest rates tend to raise demand for, and the price of, bonds.
- The continuously changing price of the bond makes it important to calculate the **yield** of the bond, which can differ from the coupon rate of the bond.

- If for example we purchased the \$1000 bond with a coupon rate of 5% for \$975, then the actual interest rate, the yield, earned by the owner of the bond is in fact higher than 5%. Since the owner is making \$50 a year on a \$975 investment, she is actually earning 5.13%.
  - Similarly if the price of the bond was \$1050, then the yield of the bond is only 4.65%.
- **The price of the bond and the yield of the bond move in opposite directions.**
  - As we pointed out earlier, interest rates in the overall economy and bond yields tend to move together.

### **How Reliable are Bonds??**

- Since buying a bond means exchanging money today in exchange for nothing more than a written promise for future payments, one has to always worry about the reliability of the issuer.
- Government bonds issued by the Federal Government are assumed to be safe while bonds issued by state and local governments vary dramatically in quality. Similarly, bonds issued by GM are very different from bonds issued by Mushy Peas-R-Us in terms of how reliable the issuer is.
- There are several services that rate the reliability of bonds, much like your credit report assesses your creditworthiness. The most well-known of these ratings services are Moody's and Standard and Poor's.
- Standard and Poor's rates its bonds AAA, AA, A, BBB, BB, B, CCC, CC with + and - for extra differentiation. Moody's uses a ratings system Aaa, Aa, A, Baa, Ba, B, Caa, and C. The AAA category generally consists of the super safe blue chip companies.
- Typically, the lower your bond rating, the higher the interest rate you have to offer in order to compensate people for holding a more risky bond. So companies with a AAA rating are able to borrow money a lot cheaper than a company with a CCC rating can.
- Since U.S. government bonds carry virtually no default risk, they become useful as benchmarks for other interest rates in the economy. So 30 year mortgage rate fluctuations are closely related to fluctuations in the yield on government bonds. If we understand the relationship between the yields on government bonds of differing maturities, we will have a good understanding of how other interest rates behave in the economy.

### **The Expectations Hypothesis**

- A simple theory of the relationship between long-term bonds and short-term bonds can be built using the idea that a perfectly valid alternative to buying a \$10,000 ten year bond would be to buy two 5 year bonds, one today and one five years from now, which will guarantee a \$10,000 payment at the end of 10 years.

- Using  $r_{m,t}$  to denote the annual yield at time  $t$ , on a bond of duration  $m$ , we can express this simple equivalency as  $10r_{10,t} = 5r_{5,t} + 5r_{5,t+5}$ . This simplifies to the following intuitive relationship

$$r_{10,t} = \frac{1}{2} [r_{5,t} + r_{5,t+5}]$$

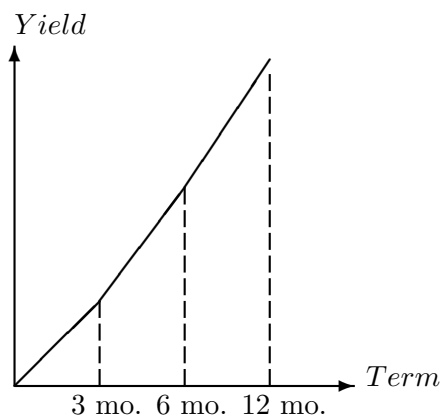
- We could have just as well have calculated the cost of buying 10 successive 1 year bonds to guarantee us \$10,000 at the end of 10 years. In that case, we would get the following relationship

$$r_{10,t} = \frac{1}{10} [r_{1,t} + r_{1,t+1} + r_{1,t+2} + \dots + r_{1,t+9}]$$

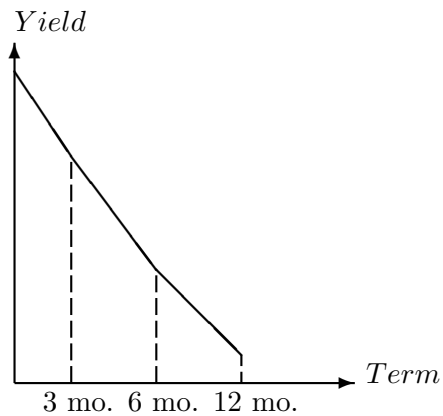
- In other words the yield on the 10 year bond would be the average of the yields on 10 successive 1 year bonds. This relationship is known as the **Expectations Hypothesis**: it basically gives us a way of understanding the term structure of interest rates by stating that long-term interest rates are equal to the average of expected short-term interest rates.
- To put it another way, the expectations hypothesis states that if short bond yields are expected to rise over time, then current long bond yields (which are an average of today's and (rising) future short-bond yields) would exceed current short bond yields.
- In contrast, if short bond yields are expected to fall over time, then we would expect to find that current long bond yields are lower than current short bond yields.

## Yield Curve

- The relationship between short-term interest rates and long-term interest rates in the economy can be summarized by a yield curve: which is a graph of bond yields against bond durations. The shape of this yield curve has important implications for the path of monetary policy.



- If the yield curve is upward sloping (as shown above): long-term yields exceed short-term yields, the expectations hypothesis states that short-term yields are expected to rise over time.



- Conversely, if the yield curve slopes down (as shown above), then short-term yields exceed long-term yields: according to the expectations hypothesis, short-term yields are supposed to decrease over time.
- Finally, if the yield curve were flat, then long-term yields are equal to short-term yields: the expectations hypothesis states that short rates are supposed to be constant.

### Monetary Policy and the Yield Curve

- How does this all relate to monetary policy? Suppose the Fed announces that they are lowering short-term interest rates today with more interest rate cuts to follow in the near future. If short rates are expected to decline over time, then we would expect that long-term interest rates today will fall as well.
- Lower long rates will mean that all the interest rates that are relevant to consumers will fall, and as a result, the economy will benefit from extra spending by firms and consumers. So the Fed is able to transmit its policy actions, which affect very short term rates, to the real economy, which depends on long-term interest rates, by creating expectations about the path of interest rate movements.
- Understanding the expectations hypothesis and the term structure of interest rates is therefore an important component of understanding how monetary policy decisions are transmitted to the real economy.