Bonds and preferred stock

Investing in fixed income securities

Basic definitions

- Stock: share of ownership
  - Stockholders are the owners of the firm
  - Two types of stock: preferred and common
    - **Preferred stock: relatively unimportant, safer than common stock but very limited gains**
    - Common stock: ultimate owners of the firm, risky, unlimited earnings potential
- **Bond: Corporate IOU, a debt of the firm**
  - **Bondholders are creditors, not owners of the firm**
  - **Safer position but lower expected returns than stock**

Preferred(?) stock

- Preferred shareholders legally rank behind all creditors (banks, bond holders) but ahead of common stockholders in claim on income and assets
- No voting rights – who cares
- Not very common nowadays
- Like common stock, preferred stock has no maturity date
- **Pays a fixed dividend** – does not rise as company profits rise
  - $8.00 now and $8.00 thirty years from now

Return on preferred stock

- Buy a share at its current market price and receive an infinite annuity of dividends
- Use our PV of annuity formula
  - $PV_0 = PMT(PVIF_a - i\% - n) = PMT(PVIF_a - i\% - \infty)$
  - Turns out that with n=>∞, **PV_0=PMT/i or i=PMT/PV_0**
- If P_{IBM} = $100 and D_{IBM} = $8.00, yield or rate of return i = D/P = 8/100 = 8.0% (<=remember!)
- You'll receive an $8.00 a year dividend (actually $2.00 each quarter) for ever – the $8.00 is fixed

Inverse relationship

- Even though preferred stock is not important, let's use it to illustrate a very important relationship between interest rate* and price
- P = D/i or i = D/P (D is fixed or constant)
- As interest rate rises, price falls
- As price rises, interest rate falls

* interest rate ≡ return ≡ yield

Why P changes as i changes

- Say HP and [illegible] issue new [illegible]ferred stock with yields of 1[illegible] ([illegible]fect substitute for IBM)
  - Assume P_{HP}=10[illegible] and D_{HP}=10 so i_{HP}=1[illegible]0=10% [illegible] P_{GE}=50 and [illegible]=5 so that i_{GE}=5[illegible]=10%
  - Inve[illegible]s will now de[illegible]nd same 10[illegible]ield on IBM prefe[illegible]d since it's es[illegible]ially the sa[illegible] as HP and GE p[illegible]rred i_{IBM}=10[illegible]$_{IBM}$/P_{IBM}
  - Inves[illegible] can get $10 div[illegible]ds by [illegible]ying $100 for HP and[illegible]. Why pay $10[illegible] IB[illegible]nd get only $8?
- With D_{IBM} [illegible]d at $8.00, P[illegible]10=$80 and IBM shares c[illegible]om $1[illegible] $80
  - P_{IBM} must drop to [illegible] yield up to the market rate

Why P changes as i changes

- Say HP and GE issue new preferred stock with yields of 10% (perfect substitutes for IBM)
  - Assume P_{HP}=100 and D_{HP}=10 so that i_{HP}=10/100=10% and P_{GE}=50 and D_{GE}=5 so that i_{GE}=5/50=10%
  - Investors will now demand same 10% yield on IBM preferred since it's essentially the same as HP and GE preferred i_{IBM}=10%=D_{IBM}/P_{IBM}
  - Investors can get $10 dividends by paying $100 for HP and GE. Why pay $100 for IBM and get only $8?
- With D_{IBM} fixed at $8.00, P_{IBM}=8/.10=$80 and IBM shares drop from $100 to $80
  - P_{IBM} must drop to raise its yield up to the market rate

Example of interest rate risk

- Even though the likelihood of IBM defaulting on its preferred stock is very, very low, there's still risk present
- If interest rates rise (in our example i goes from 8% to 10%), price of the stock drops from $100 to $80 and that's a capital loss of $20 a share
- **Interest rate risk is especially important when investing in bonds**

Bonds

- Bonds: interest bearing IOU's issued by corporations, municipalities and US Gov't
- Initial buyer lends money to the seller
  - Bondholders are creditors, not owners
- Buyers ≡ investors ≡ lenders ≡ creditors ≡ you and me, IBM, Prudential Insurance
- Sellers ≡ issuers ≡ borrowers ≡ HP, IBM, City of Bethlehem, U. S. Treasury

First in line

- Bondholders have a prior claim on income and assets – at the head of the line
  - Bond's coupon interest payment must be paid before any dividends
  - At bankruptcy, all creditors must be 100% satisfied before any stock or equity holders
- Bond is a contract between the issuer and the investors
  - Everything is spelled out in advance

Everything is fixed

- Principal ≡ face value ≡ par value ≡ $1000
- Annual coupon = 8% payable semi-annual
  - Coupon = (.08x1000)/2 = $40 every 6 months
  - Olden days, granny clipped her coupons (below)
- Maturity date = August 1, 20XX (25 years)
  - Maturity = 2 x 25 = 50 periods => 50 coupons below

40	40	40	40	40	40	40	40	40	40
40	40	40	40	40	40	40	40	40	40
40	40	40	40	40	40	40	40	40	40
40	40	40	40	40	40	40	40	40	40
40	40	40	40	40	40	40	40	40	40

Coupons + principal

- Bondholder receives an annuity of coupons plus the face value at maturity
- $P_0 = C(PVIF_a\text{-}i\%\text{-}n) + 1{,}000/(1+i)^n$
- Four variables: P_0, C, i and n
  - Given 3, the calculator can find the 4^{th}
  - Realistically you'll always know C and n
- Given i, find P – what's the bond's price?
- Given P, find i – what's the bond's yield or return?

Given the yield, find the price

- $P_0 = C(PVIF_a\text{-}i\%\text{-}n) + 1{,}000/(1+i)^n$
- Recap: n=50 periods, C=$40/period
- If similar bonds are yielding 11%, compounded semiannually, i=.11/2=.055
- $P_0 = 40(PVIF_a\text{-}5.5\%\text{-}50) + 1000/(1+.055)^{50}$
  - 40=>PMT 5.5=>i 50=>n 1000=>FV solve PV=-746.03
  - P_0 = $746.03 < 1000 sells at a discount
  - If you pay $746.03 for the bond and **hold it for 25 years** (50 periods) you'll earn 11%/yr, csa

Given the price, find the yield

- $P_0 = C(PVIF_a\text{-}i\%\text{-}n) + 1{,}000/(1+i)^n$
- Recap: n=50 periods, C=$40/period
- Let's say you could buy one of these bonds for $1,117.28
- $1{,}117.28 = 40(PVIF_a\text{-}i\%\text{-}50) + 1000/(1+i)^{50}$
  - -1117.28=>PV 40=>PMT 50=>n 1000=>FV solve i = 3.5%/period or 7%/yr csa
  - If you pay $1,117.28 for the bond and **hold it for 25 years** (50 periods) you'll earn 7%/yr, csa

Enough yields and prices for now

- If you pay $746.03 for the bond and hold it for 25 years (50 periods) you'll earn 11%/yr, csa
- If you pay $1,117.28 for the bond and hold it for 25 years (50 periods) you'll earn 7%/yr, csa
- We'll see later what happens if you sell early
- Since the coupons and $1000 par are fixed, the more you pay for the bond, the lower will be the yield ≡ int rate ≡ return

Types of bonds

- Corporates
- Treasuries
  - Bills, notes and bonds
- Munies
  - General obligations
  - Revenue bonds

Corporate bonds

- Long-term debt or IOU's of a corporation
  - **Interest paid is tax-deductible for the firm**
    - Gives firm incentive to use debt financing
    - Interest received by investors is taxed as regular income
- Moody's and Standard & Poor's rate nearly all bonds
  - Paid a fee by the issuing company
    - Increases a bond's marketability
  - Ratings are based on perceived risk

Bond ratings

- Moody's
  - High grade
    - Aaa
    - Aa
    - A
  - Medium grade
    - Baa
    - Ba
    - B
  - Speculative grade
    - B
    - Caa
    - Ca
  - Default
    - C
- Standard & Poor's
  - High grade
    - AAA
    - AA
    - A
  - Medium grade
    - BBB
    - BB
    - B
  - Speculative grade
    - CCC
    - CC
    - C
  - Default
    - DDD
    - DD
    - D

Risk vs. yield

- Higher ratings mean lower probability of default
  - So, lower interest rates or yields
- Lower ratings mean higher probability of failure
  - So, higher interest rates or yields are necessary to induce investors to buy them
- "Junk Bonds" – Ba and BB and below
  - aka "high-yield" bonds – nicer name only
  - Still junk
- Yields on corporate > yields on US Gov'ts

What you need to know

- Details are spelled out in indenture
  - Big legal document, no need to read
  - Check out the prospectus if interested
- Most important things to know:
  - Is it secured or unsecured?
  - What's its coupon rate?
  - How long to maturity?
  - Is it a convertible or a coupe?
  - Is it callable?

Collateral or security

- Mortgage bonds
  - Secured by specific pledged assets of firm
  - If failure, pledged assets sold => proceeds go to bond holders
  - Safest bonds – lowest yielding bonds
- Debentures
  - Unsecured, backed by firm's earning power
  - If failure, general creditors (ahead of stock)
  - Riskiest bonds – highest yielding

Coupon and maturity

- Coupon = (coupon rate x par value) / 2
  - Fixed semi-annual interest payment
- Maturity in periods = maturity in years x 2
  - Short-term (< 5 years) safer, lower yielding
  - Intermediate-term (5 to 10 years)
  - Long-term (10 to 30 years) riskier, higher yielding
- Can always sell a bond in bond market prior to maturity

Convertible bonds

- Some bonds contain a "convertible feature"
  - Gives **investor the option** of exchanging bond for a specified number of shares of firm's common stock
  - Conversion ratio of, say, 20 shares per bond
    - Conversion price = 1,000/20 = $50/share
  - If firm does well and its stock price rises above $50 to, say $60, investor can swap bond for 20x60=$1,200 of stock
- Investors find attractive – so lower yields

Callable bonds

- Some bonds contain a "call feature"
  - Gives **firm option** of redeeming bonds at specified price prior to maturity if interest rates have dropped
  - Rather than continuing to pay old rate of 12%, firm issues new bonds at 8% and uses proceeds to "call" old bonds – saves 4%
  - Investors lose the 12% and replace with 8%
- Investors find unattractive – so higher yields

Government bonds

- Issued by the U. S. Treasury
  - Default-free since government can always print money to pay interest
  - Interest received is exempt from state and local taxes
  - Never callable
  - Purchase directly from gov't, thru banks or in securities mkt using broker, in $1,000 units
- Bills, notes and bonds

T-Bills

- Short-term (28, 91 or 182 day maturities)
- Sold each week on a discount basis
  - Mature at face value – no coupon
  - Buy a 6-month T-Bill for $975, matures for $1000

$$yield = \frac{(1000-975)}{975} x2 = 5.13\%$$

  - **Interest is taxable by IRS**

Notes and bonds

- Treasury notes
  - Mature in 2, 5 or 10 years
  - Semi-annual coupons electronically
  - $i_{notes} > i_{bills}$
- Treasury bonds
  - Mature in 10 to 30 years
  - Semi-annual coupons electronically
  - Highest yielding
  - 30-year Treasury is the bench-mark

Secondary market

- Market for trading Treasury securities is enormous
  - You can buy any maturity
  - Want a 2-week T-Bill?
    - We got that
  - Want 7.5 year note?
    - We got that, too
- Prices (and therefore, yields) are determined by supply and demand

Municipal bonds - munies

- Issued by state and local governments
- Two types of munies
  - General obligation bonds
    - Backed by full faith and credit (taxing power) of the issuer
  - Revenue bonds
    - Proceeds fund a specific project
      - Hospital, toll road, power plant, etc.
    - Backed only by revenue generated from project
      - Riskier – so higher yields than general obligation bonds

What's so special about munies

- **Interest received is exempt from federal income taxes**
- **Interest received is exempt from state and local income taxes if investor lives in same state as issuer**
- $yield_{muni} < yield_{corp\ bonds}$ (deceiving)
  - Say 30% tax-bracket
  - Stated rates $i_{corp}=10\%$ and $i_{muni}=8\%$
  - After-tax rates $i_{corp}=.10(1-.30)=7\%$ vs $i_{muni}=8\%$

Bond yields and prices

- **Even if bond is 100% default-free, it's still susceptible to interest rate risk**
  - **If interest rates rise, bond prices fall**
- Our original AAA-rated debenture at issuance
  - Coupon=8%/yr, maturity=25 yrs, par=$1,000
    - Coupon=.08x1000/2=$40/per and n=25x2=50 per
  - Other 25-yr AAA debentures yield 8%/yr=4%/per
    - $P_0 = 40(PVIF_a\text{-}4\%\text{-}50) + 1000/(1.04)^{50} = \$1{,}000$
    - Normally bonds are issued close to par = $1,000

What a difference 10 yrs makes

- Let's pick up the action 10 years later
  - 15 years (30 periods) left to maturity
  - Now 15-yr AAA debentures yield 12%/yr = 6%/per
  - $P_{10} = 40(PVIF_a\text{-}6\%\text{-}30) + 1000/(1.06)^{30}$
  - 40=>PMT 6=>i 30=>n 1000=>FV solve PV=-724.70
  - P_{10} = $724.70
  - If you sell now (year 10), **take a $275 capital loss**
  - If you don't sell, you'll get $1,000 in 15 yrs
    - **But your money is tied up earning 8% when it could be earning 12% - *you need to learn to think this way!***

Same 10 years, happier scenario

- Instead of AAA-debenture rate rising from 8% to 12%/yr, assume it drops to 4%/yr or 2%/period
  - $P_{10} = 40(PVIF_a\text{-}2\%\text{-}30) + 1000/(1.02)^{30}$
  - 40=>PMT 2=>i 30=>n 1000=>FV solve PV=-1,447.93
  - P_{10} = $1,447.93 and you'd get a $448 capital gain
- Remember our important inverse relationship between yield and price?
- What rate of return did you make in this happy scenario?

Your 10-year return

- You paid $1,000, received coupons for 10 years (20 periods), sold it for $1,447.93
- $PV_0 = C(PVIF_a\text{-}r\%\text{-}n) + FV/(1+r)^n$
- $1{,}000 = 40(PVIF_a\text{-}r\%\text{-}20) + 1447.93/(1+r)^{20}$
- -1,000=>PV 40=>PMT 1,447.93=>FV 20=>n solve for r = 5.31%/period x 2 = 10.62%/year csa

Maturity and yield

- Maturity is key factor affecting bond's yield
  - Long-term bonds are inherently riskier than short-term bonds
  - Lots more can go wrong over the life of 20-year bond than over the life of a 2-year bond or a 2-week bond (T-Bill)
  - For a given Δi
    - $\Delta P_{20\ yr} > \Delta P_{2\ yr} > \Delta P_{2\ wk}$
- Normally $i_{LT} > i_{ST}$ to compensate for higher risk

Inducing investors to buy

- If bond has an unattractive feature, issuer will need to offer an incentive to investor in the form of a higher yield
  - $i_{debenture} > i_{mortgage}$
  - $i_{long\text{-}term} > i_{short\text{-}term}$
  - $i_{callable} > i_{noncallable}$
  - $i_{nonconvertible} > i_{convertible}$
  - $i_{CCC} > i_{AAA}$
- But is the extra yield worth it?

Lots of time and effort

- Investing in stocks and bonds can be financially rewarding
- But takes a lot of time to research the buy and sell decisions
- Is there an easier way to get the benefits of investing in stocks and bond?
- Yes – see next module