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
  - $PV_0 = PMT(PVIF_a - r\% - n) = PMT(PVIF_a - r\% - \infty)$
  - Turns out that with $n \to \infty$, $PV_0 = PMT/i$ 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 GE issue new preferred stock with yields of 10% (perfect substitutes for IBM)
  - Assume $P_{HP} = 100$ and $D_{HP} = 10$ so $i_{HP} = 10\%$ and $P_{GE} = 50$ and $D_{GE} = 5$ so that $i_{GE} = 10\%$
  - 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 $5 for GE. Why pay $100 for IBM and get only $8?
  - With $D_{IBM} = 8$, it is at $8.00, P_{IBM} = 10 = $80 and IBM shares drop to $80
    - $P_{IBM}$ must drop to raise its 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 \( P_{\text{HP}}=100 \) and \( D_{\text{HP}}=10 \) so that \( i_{\text{HP}}=10/100=10\% \) and \( P_{\text{GE}}=50 \) and \( D_{\text{GE}}=5 \) so that \( i_{\text{GE}}=5/50=10\% \)
  - Investors will now demand same 10\% yield on IBM preferred since it's essentially the same as HP and GE preferred
  - Investors can get $10 dividends by paying $100 for HP and GE. Why pay $100 for IBM and get only $8?
- With \( D_{\text{IBM}} \) fixed at $8.00, \( P_{\text{IBM}}=8/10=$80 and IBM shares drop from $100 to $80
  - \( P_{\text{IBM}} \) 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 \( \equiv \) investors \( \equiv \) lenders \( \equiv \) creditors \( \equiv \) you and me, IBM, Prudential Insurance
- Sellers \( \equiv \) issuers \( \equiv \) borrowers \( \equiv \) 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

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- Principal + coupon
  - Bondholder receives an annuity of coupons plus the face value at maturity

\[
P_0 = C(PVIF_{i\%\cdot n}) + 1,000/(1+i)^n
\]

- Four variables: \( P_0, C, i \) and \( n \)
  - Given 3, the calculator can find the 4th
  - 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

- $P_0 = C(PVIF_{a}\%\cdot n) + 1,000/(1+i)^n$
- Recap: $n=50$ periods, $C=40/period$
- If similar bonds are yielding 11%, compounded semiannually, $i=.11/2=.055$
- $P_0 = 40(PVIF_{5.5\%}\cdot 50) + 1000/(1+.055)^{50}$
  - $40=PMT\;5.5\%\rightarrow n\;50\rightarrow FV\;solve\;PV=746.03$
  - $P_0 = 746.03 < 1000$ 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

- $P_0 = C(PVIF_{a}\%\cdot n) + 1,000/(1+i)^n$
- Recap: $n=50$ periods, $C=40/period$
- Let's say you could buy one of these bonds for $1,117.28$
- $1,117.28 = 40(PVIF_{i}\%\cdot 50) + 1000/(1+i)^{50}$
  - $-1117.28=PMT\;40\rightarrow PMT\;50\rightarrow n\;1000\rightarrow FV\;solve\;i = 3.5%/period$ 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 $\equiv$ int rate $\equiv$ 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
    - 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
  
  \[
  \text{yield} = \frac{(1000 - 975)}{975} \times 2 = 5.13\%
  \]
  - Interest is taxable by IRS

Notes and bonds

- Treasury notes
  - Mature in 2, 5 or 10 years
  - Semi-annual coupons electronically
  - \( i_{\text{notes}} > i_{\text{bills}} \)
- 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
    - \( P_{10} = \frac{40}{(PVIF_{a\ 6\%\ 50})} + \frac{1000}{(1.04)^{50}} = 1,000 \)
  - 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
    - \( P_{10} = \frac{40}{(PVIF_{a\ 6\%\ 30})} + \frac{1000}{(1.06)^{30}} = 724.70 \)
    - 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
  - \( P_{10} = \frac{40}{(PVIF_{a\ 2\%\ 30})} + \frac{1000}{(1.02)^{30}} = 1,447.93 \)
    - If you sell now (year 10), 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
- \[ PV_0 = C(PVIF_a -r\% - n) + FV/(1+r)^n \]
- \[ 1,000 = 40(PVIF_{a\%-r\%-20}) + 1447.93/(1+r)^{20} \]
- \[-1,000 => PV \]
- \[ 40 => PMT \]
- \[ 1,447.93 => FV \]
- \[ 20 => n \]
- solve for \( r = 5.31\%/\text{period} \times 2 = 10.62\%/\text{year} \text{ 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 \( \Delta i \)
    - \( \Delta P_{20\%} > \Delta P_{2\%} > \Delta P_{2 \text{ wk}} \)
- 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
  - \( i_{	ext{debenture}} > i_{	ext{mortgage}} \)
  - \( i_{	ext{long-term}} > i_{	ext{short-term}} \)
  - \( i_{	ext{callable}} > i_{	ext{noncallable}} \)
  - \( i_{	ext{nonconvertible}} > i_{	ext{convertible}} \)
  - \( i_{	ext{CCC}} > i_{	ext{AAA}} \)
- 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