Corporate Decisions

- Investment decision vs. financing decision
  - until now we have focused on the investment decision
    - we have taken the financing decision as fixed and focused on choosing the investment
    - our financing assumption has been all-equity financing
  - now we turn to think about the financing decision
    - this is the choices in raising money to fund the investments
      - we will take the current and future investment decisions as fixed and discuss financing strategies
        - reinvestment of earnings versus dividends
        - raising external funds
          - equity or debt
          - long-term for short-term debt
          - standard instrument or complex instrument
      - we will continue to assume that financing and investment decisions are independent
How Do We Make Financing Decisions?

- **Back to NPV**
  - basic premise is that securities are priced as NPV = 0
  - why are securities different from real projects?
    - competition for securities is higher than for real projects
      - more competition means economic rents are competed away
    - less specific skill needed for holding securities
      - real projects require some sort of project-specific skill
    - more liquid secondary market for securities
      - means their abandonment value is higher – easier to exit
  - firm’s value = NPV of projects + NPV of financing
  - difficulty is finding financing strategies with NPV > 0
    - financing strategies that create positive NPV for the firm, in most cases, mean negative NPV for investor
      - if investors willingly buy expected negative NPV securities they must be mis-interpreting some information about the firm
        - this can happen because of incomplete access to information or biased interpretation of available information

**Efficient Markets**

- Investors can have access to different information or interpret available information differently
  - the role of the market is to aggregate the information of all investors about each security
    - by trading in normal markets the market price of each security will reflect the average information about that security in the market
      - some will be more optimistic than the market average, some less
    - competition amongst these different investors to maximize the expected NPV of the securities they hold the role results in active trading of the security
      - the role of this trading is to work out these differences in expectations about cash flows and risk based upon the available information about the security
  - the idea that competition among investors eliminates all (expected) positive NPV opportunities amongst securities is known as the efficient market hypothesis
    - all securities can be assumed to be fairly prices given information available to investors
Efficient Market Hypothesis

- Obvious implication of efficient market hypothesis:
  - prices change quickly in response to new information that changes the expected cash flow or rate of return
    - the validity of this interpretation of the hypothesis depends on the degree of competition amongst investors and the number of investors that have access to the value relevant information

Example

Suppose new value-relevant information about the firm becomes available that is public and easy to interpret
  - i.e., a public announcement, news release, financial statement
  - if the impact of this information on firm value is easily assessed, competition amongst investors will impound the new information into the market price very quickly
  - for the average investor, the price will have changed by the time they were able to trade
  - reasonable to assume in that efficient markets hypothesis holds as prices adjust to new info quickly

Market Efficiency

- What if new info is private or hard to interpret?
  - detailed professional analysis of public information
    - complex combinations of publicly available data
  - private information about future
    - likely that this inform will only be in hands of a few investors

Example

Suppose new value-relevant information about the firm becomes available to a few or is private
  - these informed traders can trade on this information and gain positive NPV as prices move only slowly in correct direction
  - only as info becomes available to more investors or informed investors trade enough will price move to new NPV = 0 level
  - by regulation, trading on private (non publicly disclosed) information is illegal - insider trading
    - possible that complex evaluation of public information can lead to positive NPV investment decisions for some investors

Implication: positive NPV securities are hard to find without special skills or private information
Market Efficiency

- Another interpretation of efficient market hypothesis is that the investors use the available information rationally to set the price so that it is zero NPV
  - if not then a rational investor could arbitrage the situation
    - this rules out irrational pricing situations like bubbles
- implication for investors
  - securities are fairly priced and without special skills or superior information, security selection will not matter
    - investor can focus on diversification and desired risk-return tradeoff holding risk free and an efficient market portfolio
      » basis of "index investing"
  - any additional return to carefully analyzing investments will simply be the market rate of return on additional time and effort
    - evidence suggests that most money managers overcharge for this skill
      » majority of managed funds do not outperform a passive diversified investment after fees

Enforcing Market Efficiency

- Market efficiency is self enforcing
  - suppose market efficiency was violated
    - then I could use public information like past prices to better predict future prices and trade using this info to make NPV>0
      » if I see a price increase today and know, based upon past history, it is more often followed by another increase than by a drop, so I buy the security and capture the gain of the next price increase
    - however, others will see this pattern and make the same trades
      » this will bid up the price of the stock today to a level where the expected change next period is just the required return
        » either see it by looking carefully at the past prices or watching me trade
  - the same story holds for any easy to interpret and public information source
    » but it requires that you know how to understand and make use of the value-relevant public information to trade profitably
Patterns of Corporate Financing

- Most financing for investment by US non-financial corporations comes from internally generated funds
  - debt is issued to cover shortfalls or maintain leverage
    - net equity issuance is negative due to share repurchases

Sources and Uses of funds by US Non-financial Corporations
(as % of Gross Investment)

<table>
<thead>
<tr>
<th>Year</th>
<th>Uses of Funds</th>
<th>Sources of Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gross Investment ($B)</td>
<td>Internal Funds</td>
</tr>
<tr>
<td>1997</td>
<td>732.7</td>
<td>90%</td>
</tr>
<tr>
<td>1998</td>
<td>732.4</td>
<td>86%</td>
</tr>
<tr>
<td>1999</td>
<td>846.2</td>
<td>78%</td>
</tr>
<tr>
<td>2000</td>
<td>900.3</td>
<td>69%</td>
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<tr>
<td>2001</td>
<td>885.0</td>
<td>73%</td>
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<tr>
<td>2002</td>
<td>782.4</td>
<td>92%</td>
</tr>
<tr>
<td>2003</td>
<td>819.1</td>
<td>88%</td>
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<tr>
<td>2004</td>
<td>999.8</td>
<td>81%</td>
</tr>
<tr>
<td>2005</td>
<td>918.6</td>
<td>118%</td>
</tr>
<tr>
<td>2006</td>
<td>988.5</td>
<td>94%</td>
</tr>
<tr>
<td>2007</td>
<td>1165.9</td>
<td>74%</td>
</tr>
</tbody>
</table>

Equity Capital

- From the authorized shares, some amount of the shares are issued
  - they may be issued privately if the firm is privately held or publicly if the firm is publicly traded
    - a first time public issue is called an IPO (initial public offering)
      whereas issuance of additional shares to the public is known as a seasoned equity offering
        - the amount per share raised is broken into “par value” and capital surplus (or additional paid-in capital)
        - shares held by shareholders are issued and outstanding
          - firm may buy back some shares
            - these are called Treasury shares
            - they are issued but not outstanding
  - to increase authorized shares the firm must get permission of existing shareholders
**Payoff to Equity**

- Equity gets paid, once the firm has met its fixed claims (usually debt)
  - the minimum payoff to equity is zero and the maximum is unlimited
  - consider the payoff to equity as a function of asset value at liquidation for a firm with fixed claims, D

![Equity payoff diagram]

**Alternative Kinds of Equity**

- There are some other forms of residual claims on cash flows with limited liability
  - partnerships can issue ownership shares
    - master-limited partnerships
      - units in a partnership where owner is a limited partner
      - there must be a general partner with unlimited liability
      - partnership shares avoid corporate income tax
        - partners face only personal taxation on partnership income
  - trusts or REITS (real estate investment trusts)
    - ownership shares in a trust with claims on cash flows from some activity
    - trusts face no tax as long as they pay out all income
      - trust must be a passive owner of a single asset
      - common form is a REIT in which small investors can own a claim on cash flows from large commercial real estate projects
        - like mega-malls or office buildings
Preferred Stock

- Preferred stock is legally an equity security
  - however, it is like debt in that it offers a high dividend
    - often dividend yields are similar to bond rates
    - but the dividend payment is not assured
      - management can stop preferred dividend payment
  - however, preferred stock must be paid all of its dividends before dividends can be paid to common stock
    - other features
      - like equity, it has no maturity date
      - it has limited voting rights
      - it stands ahead of common stock in case of liquidation
      - preferred dividends are paid out of after-tax income
      - only 30% of dividends paid to other corporations are taxable
  - provides only a small portion of most firms’ capital needs
    - often used by banks when they need more capital

Issuing Securities

- New enterprises usually start with owner’ funds and some small loans
  - if a company is successful, it grows by re-investing earnings
    - to grow fast it needs more external funding
  - sources of external funding
    - angel investors
      - rich individuals who invest in small start ups for ownership share
    - venture capital firms
      - LLP funds that provide capital to small firms for an ownership share
        - they provide the capital slowly over time to maintain incentives encouraging entrepreneurs to work hard for success
    - institutional investors
      - pension funds, endowments, insurance companies
        - invest directly in small firms or as limited partners in VC firms
    - corporate investors
      - established companies investing in small private firms
        - often times for strategic purposes more so than just financial return
Initial Public Offering

- A small percentage of start ups become successful enough to go public
  - going public means selling shares to the public
    - this is done through an initial public offering (IPO)
    - this allows the firm to raise significant amounts of capital
      - partially a primary offering - new shares to raise capital
      - partially secondary offering - selling of pre-existing shares
        » this is how venture capitalists or institutional investors cash out their gains
  - instead of IPO, some firms sell out to a larger firm
    - large firms buy out venture capitalist’s share
    - some firms even attempt to remain private
      - only a small number of really large private firms
        » though private equity firms have recently been increasing the number

Other Issue Procedures

- The standard approach has the underwriters carefully “building a book” of investor demand
  - book-building is the process of obtaining “orders” for the shares in advance
    » this is how they know the interest and the right price at which to proceed
  - other processes for issuing shares
    » fixed price offer
      - price and quantity are announced and people subscribe to purchase shares
        » underwriter buys unsubscribed shares
    » auctions
      - investors submit bids stating price and quantity
        » securities are sold to highest bidder
      - recently some IPOs have been done this way on-line
        » Google went public this way in 2004
Seasoned Equity Offers (SEO)

- Firms can also make additional equity issues
  - the shares in these subsequent offers are called seasoned equity
  - one approach (common in the US) is the **cash offer**
    - firm issues new shares to investors at large
  - another approach (more common outside US) is a **rights offers**
    - firm issues new shares only to existing shareholders

- **cash offers**
  - same process as IPO in registration and use of an underwriter
  - firms can have a **shelf registration** that allows them to register securities with the SEC for sale up to 2 years in the future

- **rights offer**
  - firm offers “rights” to existing shareholders to purchase new shares at a price well below the current market price
    - number of rights is based upon shares held
  - despite discount, rights offers are designed to protects existing SH from under pricing unless they fail to exercise (or sell) their rights

Underpricing and Cash versus Rights Offer

**Example**

A firm is worth $100M and has 10M shares. \( P = $10/\text{share} \)

Firm want to raise $50M by issuing 10M shares at $5.

The value of the firm after the issuance will be $150M ($100 existing assets plus $50 in new assets)

With 20M shares after the issue (10M old + 10M new), the share price will be $7.5/\text{share} \quad ($150/20M = $7.5/\text{share})

In the **cash offer**, the new shares are sold to new shareholders at $5, $2.5 less than they are worth

existing shareholders suffer a $2.5/\text{share} loss on the new issue via the under pricing as all shares are now worth $7.5

In a **rights offer**, the firm offers 1 right per share to existing SHs
one right plus $5 gets allows you to purchase a new share of stock
if all rights are exercised the share price will also end up being $7.5 per share but the $2.5 windfall of under pricing now goes to the existing shareholders

if an existing SH does not want to exercise his right, he can sell it for $2.5, exactly the existing SH’s loss in value per share
Costs of Equity Issues

- Seasoned equity offers also involve costs
  - SEOS have similar legal and administrative costs as IPOs but generally lower cost than IPOs
    - while IPOs cost about 7% seasoned offers cost about 5%
      » less risk in knowing true market price and liquidity in the market
    - rights offers have even lower fees
      » don’t really need underwriters
  - there is also a price reaction to SEOS
    - an announcement of a SEO generally results in an immediate drop in the market value of the firm of around 3%
    - why is this the case
      » price drops because supply rises?
    - how about the cynical view of the timing of an issue
      » manager has incentive to time issue when she believes shares are “over-valued” by market
      » market reacts to this possibility by reducing the value of the firm

Debt

- Debt is much more diverse than equity
  - it is a fixed claim on the firm with required regular interest payments
    - these fixed claims place a burden on the firm to make payments or to be in default on the debt
      » firms that are unable to make promised payments to creditors are said to be bankrupt
    - bankruptcy is an event which defines when a creditor can assert his right to control the firm’s assets
      » bankruptcy means a legal procedure is triggered under which claimants on the firm either
        1. reorganize the firm’s capital structure to allow the firm to continue
        2. liquidate the firm by selling off the assets
    - since lenders have no voting power within the firm, interest payments are considered a cost and deducted from pre-tax income
      » this in contrast to dividends which are paid from after-tax income
Payoff to Debt

- Debt gets paid first, and it has a cap on how much it can receive
  - however, with limited liability for equity, the minimum payoff to debt is zero and the maximum is full face value
  - consider the payoff to debt with a face value of D as a function of asset value at liquidation

![Diagram showing the payoff to debt](attachment:slide21.png)

Forms of Debt

- Let’s consider some of the major characteristics of debt
  - maturity
    - firms issue debt in all maturities
      - Disney issues 100 year bond, some UK firms issue perpetuities
      - short term debt is typically commercial paper or bank loans
  - repayment provisions
    - long-term loans are often repaid in a steady fashion
      - sinking fund is a fund into which the firm pays, accumulating funds to repurchase and retire publicly traded debt
      - other debt has principal repaid only at maturity
    - firms sometimes reserve the right to call the bond
      - this is repaying entire issue before maturity
      - they pre-set a price at which they will buy back the bonds
      - investors charge a return premium (require a higher YTM) for allowing firms to retain this right

![Diagram showing forms of debt](attachment:slide22.png)
Forms of Debt

- **Seniority**
  - not all debt is first in line to be paid off in case of liquidation
    - senior debt is always first in line
  - some debt is **subordinated**
    - this debt is a junior claim on the firm
    - subordinated lenders stand behind general lenders in liquidation line
      - but ahead of preferred and common stockholders

- **Security or Collateral**
  - lending may be secured or unsecured
    - unsecured claims are called **debentures**
    - common security for secured debt is a mortgage on the property or plant
      - secured bondholders have first claim on mortgaged assets in case of default, debentures have a junior claim on these assets
    - sometimes borrowing is secured by other assets
      - this is referred to as **securitization** or **asset back securities**
      - collateral is sold to a trust who then borrows from investors

- **Default risk**
  - even secured senior debt can be risky
  - often debt is rated by a rating agency to indicate the likelihood of repayment
    - agencies like S&P and Moody’s provide credit ratings for a fee
  - **investment grade** debt must receive one of top 4 ratings
    - AAA,AA,A or BBB (S&P) or AAA, Aa, A or Baa (Moody’s)
  - debt rated below these levels is referred to as a **junk bond**

- **Public versus private placed debt**
  - In a **public issue** of debt, bonds are offered to anyone and once issued are freely traded
  - in a **private placement**, bonds are sold to a small number of qualified institutional buyers (QIBs) and can only be resold to QIBs
    - bank debt is another form of private placement
      - it is generally not traded after issuance
Features of Debt

- Fixed versus floating rates
  - Debt can be issued with a fixed interest rate
    - Typically based upon some credit spread above an equivalent maturity government bond
  - Debt can be issued with a floating interest rate
    - International bonds are often set based upon LIBOR
      - London Inter-Bank Offer Rate - the rate for banks in London
    - Bank loans are typically floating rate and have rate linked to LIBOR or the prime rate (a local bank benchmark rate)
  - The debt can have a real interest rate
    - Inflation indexed bonds pay a real interest rate plus realized inflation

- Country and currency
  - Firms may borrow at home or abroad, and in either location they can borrow in any currency they like
    - US$ bonds can be issued abroad, they are called eurodollar bonds
      - A eurocurrency is a bank deposit/loan held outside the country of its currency
    - Eurobonds are bonds outside the country of the bond’s currency

Valuing Debt Instruments

- Debt is valued as PV of cash flows
  - As we have seen LT debt is priced on a yield basis using YTM
  - ST debt is priced on a discount basis

Example

Consider a 90 day T-bill priced at a discount of 5% APR

Price is a discount off face value, \( P = FV \times (1 - \text{discount} / m) \)

\( m = \text{compounds per year}; \ m = 360/90 = 4 \)

\( Price = 100 \times (1 - (5\%/360/90)) = 98.75 \)

The yield can be computed as Face Value / Price - 1

\( Yield = 100/98.75 - 1 = 1.265\% \)

The annualized money market yield (MMY) = yield \( \times m \)

\( MMY = 1.265 \times (360/90) = 5.06\% \)

Bond equivalent yield (BEY) - just MMY adj for 365 day year

\( BEY = 1.265 \times 365/90 = 5.074\% \)

Annual compound yield = \( (1 + \text{YTM})^{(365/\text{Maturity})} - 1 \)

\( ACY = (1.01265)^{365/90} - 1 = 5.23\% \)

All of these rates can be used to describe the return on ST debt
Term Structure

- When pricing LT debt, we can wither use the average YTM or use the spot interest rates
  - the market has a specific interest rate for each maturity
  - these are known as the spot rates
    - the interest rate for a single CF of any maturity
    - in reality there are interest rates for cash flows at every maturity
      - $r_1, r_2, \ldots, r_N$
    - the YTM is a simple way of averaging these differing rates of return over the life of the cash flows
    - to determine the spot rate we must look at the price of stripped bonds
      - strip bonds or strips are bonds that make a single cash payment
        - from the YTM on these strips we can determine the spot rates
    - the spot rates, along with the expectations theory of the term structure, allow us to determine what we expect future short term interest rates to be

Expectation Theory of the Term Structure

- A simple arbitrage theory that explains the market’s expectation of future spot interest rates
  - for any two spot interest rates today, $r_k$ and $r_n$ ($k<n$), arbitrage defines the expected (n-k) maturity spot interest rate in k periods
    \[
    (1 + r_n)^n = (1 + r_k)^k \times (1 + f_{n-k})^{(n-k)}
    \]
    where $f_{n-k}$ = expectation of the n-k period rate, k periods in the future

- **Example**
  Suppose you have $1,000 to invest for 2 years.
  
  **Invest $1,000 for 2 years in a 2 year bond with YTM = 5.00%**
  
  Initial investment: $1,000
  
  Future Value (FV) = $1,000 x (1 + 0.05)^2 = $1102.5

  **Invest $1,000 for 1 year in a 1 year bond with YTM = 4.00% and then reinvest next year in another 1 year bond at the expected YTM for a 1 year bond, 1 year from now of f_2**
  
  FV = $1,000 x (1 + 0.04) x (1 + f_2) = $1,040 x (1 + f_2)

  by arbitrage the market expectation of $f_2$ must be such that these two have the same future value

  $1102.5 = ($1040) x (1 + f_2) => f_2 = 6.010\%$
Debt Duration

What do we really mean by long term debt?
- which is longer term debt: a 5 year zero coupon bond or a 10 year mortgage?
  - the first makes only one payment at year 5
  - the second makes annual interest and principal payments
- a real measure of maturity would take into account the average time to receive the cash flows back
  - call this measure the duration of the bond
    - duration is just a CF weighted average of the repayment time
      - if a bond has current market value $V$ then
        \[ \text{Duration} = \frac{1}{V} \sum_{t=1}^{T} t \cdot PV(C_t) \]
      - more generally
        \[ \text{Duration} = \sum_{t=1}^{T} \frac{t \cdot PV(C_t)}{V_0} \]
        - where $t$ = the year of the cash flow, $T$ is maturity of bond , and
          - $V_0$ is current market value
          - longer duration means your money is tied up for a longer period

Example of Duration

Consider question from above with
- $1,000$ face value 5 yr zero-coupon debt with 6% IRR
  - cash flows = 0 (t = 1,…,4) cash flow = $1000 (t= 5)
  - $V_0 = $1000/(1.06)^5 = $747.26$ \( PV(C_5) = $747.26 \)
  - Duration = 0 + 0 + 0 + 0 + 5 \( \frac{747.26}{747.26} \) = 5 years
- $1,000 annual payment 10 yr mortgage at 8%
  - cash flows = $149.03 (t = 1,…,10), $V_0$ = face value = $1,000
  - PV of CF 1 2 3 ... 10
    \[
    \begin{array}{cccc}
    (149.03/1.08) & (149.03/1.08^2) & (149.03/1.08^3) & \ldots & (149.03/1.08^{10}) \\
    137.99 & 127.77 & 118.30 & \ldots & 69.02 \\
    \end{array}
    \]
  - Duration = 1\( \cdot 137.99/1,000 \) + 2\( \cdot 127.77/1,000 \) + \ldots + 10\( \cdot 69.02/1,000 \)
    = 4.87 years
  - duration of 10 year mortgage shorter than 5 year zero coupon bond
    - this is because the mortgage returns money every year while the zero waits until the end
Duration and Interest Rate Risk

- The higher the duration of a bond, the more sensitive price will be to a change in interest rates.
  - Suppose market interest rate in previous example fall 1% for both bonds immediately after issuance.
    - We know the price of both bonds will go up but which more?
  - Determine impact of rate change on price of bonds.
    - 5 year zero coupon with IRR change from 6% to 5%:
      \[ P'_0 = \frac{1,000}{1.05^5} = 783.53 \]
      - Change of $783.53 / $747.26 – 1 = 4.85%
    - 10 year mortgage with rates change from 8% to 7%:
      \[ P'_0 = PV \text{ of } 10 \text{ annual pmts of } $149.03 \text{ at 7}\% = 1,046.72 \]
      - Change of $1,046.72 / 1,000 – 1 = 4.67%
  - An approx to the bond’s price sensitivity is modified duration.
    \[ MD = \frac{- \text{Duration}}{1 + i} \]
    - Bond price change is then approximately = MD x chg in interest rate.
      - For zero coupon, MD = -5 / 1.05 = -4.76 => price chg = -4.76 x (-1%)
      - For mortgage, MD = -4.87 / 1.07 = -4.55 => price chg = -4.55 x (-1%)

Convertible Securities

- Some firms issues securities that allow owners the option to convert into something else.
  - A warrant:
    - Gives the holder the right, but not the obligation, to purchase a set number of shares at a set price before a set date.
      - This is an option and options always have positive value.
      - Firms can issue these to raise some money now and possibly more money later when the warrant is exercised.
  - Convertible bond:
    - A bond that gives its owner the option to exchange the bond for a pre-determined number of shares.
      - If stock price goes up, they convert and share in the profits; if not, they remain a bondholder.
        - This is simply a bond and a warrant packaged together.
        - Since an option has value, the convertible debt will have a lower interest rate than straight debt.
Payoff to a Convertible Bond

- Convertible debt has the right to be exchanged for a certain number of shares
  - consider the payoff to a convertible bond with face value = $1000 and the right to be converted into 100 shares
    - conversion price is $10 per share
  - the firm already has 100 shares outstanding in the market
  - between 0 - $2000 the payoff looks like normal debt
    - at asset value of $2000 the original equity has a price of $10/share
    - \( E = (V - D) = 2000 - 1000 = 1000 \Rightarrow \frac{10}{share} \)
    - at this point bond holders convert and new equity shares in half the asset value

Summary

- Financing of investment
  - Basic idea of market efficiency
    - efficient market hypothesis
    - implications for investing and financing
  - Patterns of corporate financing
    - heavy use of internal funds due to "low cost"
    - net debt issuance and net equity retirement
    - impact on capital structure

- Securities
  - features of equity - both common and preferred
    - processes for selling equity
  - features of debt
    - Expectation Theory of the Term Structure
    - duration as a way to measure maturity of debt