Corporate Finance

Summary Financial Management - Sannah

1. The Corporation and Financial Markets

CHAPTER 1.1 - THE FOUR TYPES OF FIRMS

The Law of One Price allows to use market prices to determine the value of an investment opportunity to the firm.

The four types of firms:

1. **Sole Proprietorships** - business owned and run by 1 person. Most common type, but do not account for much sales revenue in the economy
    - Straightforward to set up
    - No separation between the firm and the one owner. Investors cannot hold an ownership stake in the firm
    - Owners has unlimited **personal liability** for any of the firm's debts. Repaying loan from personal assets, otherwise personal bankruptcy
    - The life of a sole proprietorship ≤ to the life of the owner (+ its difficult to transfer ownership)
    - Owners' personal reputations are basis for business success. Personal liability of owner increases customers confidence
2. **Partnerships** - similar to sole proprietorship but with more owners. Key features:
    - All partners are liable for the firm's debt. Any partner can be required to repay all the firm's debts
    - Partnership ends on the death or withdrawal of any single partner. Liquidation can be avoided if partnership agreement provides for buyout of a withdrawn partner
    - Owners' personal reputations are basis for business success. Personal liability of owner increases customers confidence
    - 2 kinds of owners:
        - General partners: personally liable for debt obligations
        - Limited partners: liability limited to investment, death/withdrawal does not dissolve partnership, no management authority, not legally involved in managerial decision making, usually outside investors
3. **Limited Liability Companies** (LLC) - limited partnership, <u>no general partner</u>. All owners have limited liability & can run the business
4. **Corporations** - legal entity separate and distinct from its owners
    - Legal powers: enter into contracts, acquire assets, incur obligations, protection under U.S. Constitution against the seizure of its property
    - Solely responsible for its own obligations, limited liability
    - Owners, employees, customers **not liable** for any obligation the corporation enters into // corporation not liable for any personal obligations of the owners
    - **No restriction on who can own shares**

Formation:

Corporation legally formed. Formal consent to incorporation given by the state (**chartering**). Formation more costly due to the formal process. Corporation is citizen of the state of incorporation, for jurisdictional purposes. Companies typically hire lawyers to draft a **corporate charter**, which includes the articles of incorporation and bylaws, outlining the initial rules for how the corporation will operate.

Ownership:

- A corporation can have an unlimited number of owners, each owning a small fraction of the corporation through shares of stock. The total collection of shares is called the **corporation's equity**. Owners of these shares are known as **shareholders**/ stockholders, or equity holders, and they may receive **dividend payments** based on the number of shares they own. These payments are distributed proportional to the ownership stake.

- No limitation (expertise of qualification) on who can own the stock, allowing for free trade of shares and providing one of the most important advantages of a corporation type of firm: corporations can raise large amounts of capital by selling shares to outside investors. The availability of outside funding enables corporation to dominate the economy.

  Tax Implication: corporation is a separate legal entity, and thus subject to taxation separate from its owners' tax obligations, resulting in **double taxation**.
- **S corporations** are exempt from the double taxation. By electing subchapter S tax treatment, an S corporation's profits and losses are not taxed at the corporate level. Instead, they are directly passed through to the shareholders, who report them on their individual tax returns based on their ownership share. Strict limitations on the qualification for subchapter S tax treatment (limited shareholders etc.)

CHAPTER 1.2 - OWNERSHIP VERSUS CONTROL OF CORPORATIONS

Direct control and ownership are separate. Board of directors & CEO possess direct control of the corporation. **Agency problem** : when managers, despite being hired as the agents of shareholders, put their own self-interest ahead of the interests of shareholders. Solution: minimizing the number of decision managers make for which their self-interest differs from those of the stakeholders. Managers' compensation contract to ensuring compensation is not too closely tied to performance (managers limit risks), or rewards based solely on good performance (managers take excessive risks). Good public policy should ensure that when firms take actions that benefit their shareholders, they are also benefiting society.

Shareholders elect a **board of directors**.

- In most corporations, each share of stock provides a shareholder with one vote in the election of the board of directors, meaning shareholders with more shares have more influence.
- If one or two shareholders own a large portion of the stock, they may either serve on the board themselves or have the power to appoint several directors.
- Dissatisfied investors choose to sell their shares. Shares price will decrease, the board might replace the CEO. The stock price of the corporation is an indicator for corporate leaders that continuously gives them feedback on their shareholders' opinion of their performance.
- Low stock prices create a profit opportunity. In a **hostile takeover**, a corporate raider (person or company) can purchase a large fraction of the stock and acquire votes to replace the board of directors.

The board of directors

- Ultimate decision-making authority
- Makes rules on how the corporation should be run
- How top managers are compensated
- Sets policy
- Monitors the performance of the company
- Delegates decisions that involve day-to-day running to the management

The chief executive officer (CEO): Institutes the rules and policies set by the board of directors/ May be the chairman of the board / Informed by the chief financial officer (CFO)

The financial manager

1. Making investment decisions: analyzing costs and benefits of investments
2. Making financing decisions
3. Managing cash flow: managing working capital

Corporate Bankruptcy - a corporation is run on behalf of its shareholders. But when a corporation borrows money, the debt holders also become investors in the corporation. The debt holders are entitled to seize the assets of the corporation in compensation for the default if the firm fails to repay its debts. The corporation may renegotiate with the debt holders, or file for bankruptcy protection. If debts are not repaid, then a change in ownership: control passes from equity holders to dept holders. Liquidation is then not needed.

Thus, a useful way to understand corporations is to think of there being two sets of investors with claims to its cash flows—debt holders and equity holders. As long as the corporation can satisfy the claims of the debt holders, ownership remains in the hands of the equity holders. If the corporation fails to satisfy debt holders' claims, debt holders may take control of the firm. Thus, a corporate bankruptcy is best thought of as a change in ownership of the corporation, and not necessarily as a failure of the underlying business.

CHAPTER 1.3 - THE STOCK MARKET

Private companies:

- Limited set of shareholders
- Shares are not regularly traded
- Value of the shares can be difficult to determine

Public companies:

- Shares traded on stock market --> provides **liquidity** & determines the market price of the shares. Liquid, meaning it is possible to sell shares quickly for a price close to the price at which one could buy it. The share prices give constant feedback to the managers regarding investors' view of their decisions.
- **Primary market**: newly issued shares sold to investors by the corporation
- **Secondary market**: shares traded between shareholders (corporation not involved)
- Bid price (selling) < ask price (buying stock)
    - Difference in bid vs ask price is the **bid-ask spread**
    - Bid-ask spread is are the transaction costs investors pay in order to trade
    - Bigger bid-ask spread indicates higher volatility: profits (and losses) are larger, thus more risky
    - **Limit order**: an order to buy or sell a set amount at a fixed price
    - Bid-ask spread determined by outstanding limit orders
        - Lowest limit sell order = ask price
        - Highest limit buy order = bid price
        - **Limit order book** is the collection of all limit buy&sell orders (if not visible, trading system is a **dark pool**)
    - **Market order**: orders that trade immediately at the best outstanding limit order
- High frequency traders (HFTs) are traders who, with the aid of computers, will place/update/cancel/and execute trades many times per second in response to new information, profiting both by providing liquidity and by taking advantage of stale limit orders

CHAPTER 1.4 - FINTECH: FINANCE AND TECHNOLOGY

Fintech = financial innovation + technical innovation. Important examples of the use of new technology include telecommunications, security and verification, automation of banking services, big data and machine learning.

- **Blockchain** technology allows a transaction to be recorded in in a publicly verifiable way, without the need for a trusted third party to certify the authenticity of the transaction. It

allows for the digital transfer of assets without the backing of a government or a central clearinghouse.

- **Cryptocurrency** is a currency whose creation and ownership is determined via public blockchain. Transactions are recorded in a public ledger using blockchain technology, allowing individuals to create and trade bitcoins and to verify those transactions digitally.

2. Introduction to Financial Statement Analysis

Firms issue financial statements regularly to communicate financial information to the investment community

Chapter 2.1 - FIRMS' DISCLOSURE OF FINANCIAL INFORMATION

Financial statements are accounting reports with past performance information that a firm issues periodically (quarterly 10-Q and annually 10-K). Company required to file financial statements with the SEC (U.S. Securities and Exchange Commission) and an **annual report** with their financial statements to their shareholders.

Financial Statements:

- **GAAP (Generally Accepted Accounting Principles)** provide a common set of rules
- **Auditor** is the neutral third party who checks the annual financial statements to ensure reliability
- Serving two main purposes:
    1. Providing investors and creditors with an overview of the firm's financial performance
    2. Understanding the levers of management control & influence of operating decisions
- Consists of:
    1. Balance Sheet
    2. Income Statement
    3. Statement of Cash Flows
    4. Statement of Stockholders' Equity
    5. The Management Discussion and Analysis
    6. Notes to the Financial Statements

Chapter 2.2 - THE BALANCE SHEET - statement of financial position

- Goals of the balance sheet:
  - Listing the firm's assets & liabilities
  - **Snapshot** of the firm's financial position at a given point in time
- However, it is a not so accurate assessment of the firm's true equity:
  1. Assets valued based on **historical costs** rather than true value (e.g. actual value of building may have increased or decreased)
  2. Many of the firm's valuable assets are not captured on the balance sheet (e.g. expertise of the employees, value of research & development innovations)

  Therefore, borrowing in excess of the book value of their assets is possible when creditors recognize the **market value** of the assets is *higher than the book value*, leading to difference in the amount investors are willing to pay for the equity

Market Capitalization: value that remains after the firm has paid its debts

Market Value of Equity = # shares outstanding * market price/share

independent on the historical costs of the assets
dependent on what investors expect the assets to produce in the future

Market-to-Book Ratio = $\frac{Market\ Value\ of\ Equity}{Book\ Value\ of\ Equity}$

if ratio>1, the value of the assets exceeds historical costs
low ratio firms classify as **value stocks**
high ratio firms classify as **growth stocks**

Enterprise Value: Value of the underlying business assets, unencumbered by debt and separate from any cash and marketable securities, also called **total enterprise value (TEV)**. Meaning: the costs to take over the business

Enterprise Value = Market Value of Equity + Debt - Cash

Net working capital (NWC) = Current Assets (CA) - Current Liabilities (CL)

- A measure of a company's liquidity: whether company is generating cash or using it
- Capital available in the short term to run business

Current Assets - Assets that could be converted into cash within 1 year

1. Cash & **marketable securities** are short-term, low-risk investments, easily converted to cash like maturing government debt
2. **Accounts receivable** are customers purchased goods or services on credit
3. **Inventories** like raw materials & work-in-progress & finished goods
4. Other: **prepaid expenses** like rent or insurance paid in advance

Long-Term Assets - Real estate/machinery that produce tangible benefits for more than 1 year

1. Net Property, Plant & Equipment (value recorded for equipment will reduce each year by deducting a **depreciation expense. Accumulated depreciation** is the total amount deducted of asset's life. **--> Net Property, Plant & Equipment** is in **book value = purchase price - accumulated deprecation**, if value increases, then its +)
2. Goodwill & **Intangible Assets** = *price paid* for acquired company/tangible assets - *book value* of tangible assets (the change in value of the acquired assets is captured by **amortization,** the depreciation of intangible assets)
3. Other: property not used in business operations, start-up costs, investments in long-term securities, property held for sale

Balance Sheet

Assets *how the firm uses its capital*	Liabilities *sources of capital*
Current Assets - Cash - Accounts receivable - Inventories - Other Total current assets	**Current Liabilities** - Accounts payable - Short-term debt --> operational or financial debts - Maturities of long-term debt - Other Total current liabilities
Long-Term Assets Land, Buildings, Equipment Accumulated Depreciation - - Net Property, Plant & Equipment - Goodwill & intangible assets - Other Total long-term assets	**Long-Term Liabilities** - Long-term debt - Capital lease obligations - Deferred taxes Total long-term liabilities
Total Assets	Total Liabilities
	Assets = Liabilities + **Stockholders' equity** Stock Stockholders' Equity

Current Liabilities - Liabilities that will be satisfied within one year

1. **Accounts payable** are amounts owed to suppliers for services purchased with credit
2. **Short-term debt** (notes payable) include current maturities of long-term debt --> repayments of debt that will occur within the next year
3. Other: not yet paid salary or taxes, deferred/unearned revenue (revenue received for products that have not yet been delivered)

Long-Term Liabilities - Liabilities that extend beyond one year

1. **Long-term debt** loan or debt obligation with a maturity of more than 1 year
2. **Capital leases** are long-term lease contracts that result in regular lease payments like buildings
3. **Deferred taxes** that are owed but not yet paid and thus set aside (when the firm's financial income exceeds its income for tax purposes)

Stockholders' equity (book value of equity) is a measure of the net worth of the firm.

Chapter 2.3 - THE INCOME STATEMENT - statement of financial performance

- Goals of the income statement:
  - Measuring the firm's profit generated by assets and liabilities over **a period of time**
  - Shows the **net income** (earnings)--> profitability during a period
    - Net income ≠ cash earned!!
    - Depreciation and amortization are **non-cash entries**
    - Uses of cash (purchase of building/ inventory) are not reported

- **Gross Profit -** difference between the sales revenues and the costs that only include those *directly* related to producing the goods or services
- **Operating Expenses -** expenses from running the business *not directly* related to producing goods or services. Including administrative expenses, overhead, salaries, marketing and R&D. Depreciation and amortization is an estimate of costs arising from wear and tear of assets
- **Earnings before Interest and Taxes (EBIT) -** including income/expenses from activities that are *not* the central part of the business, like financial investments
- **Pretax Income =** EBIT - the interest expense of outstanding debt
- **Net Income =** Pretax Income - the corporate taxes, representing the total earnings of the firm's equity holders

$$\textbf{Earnings per share (EPS)} = \frac{Net\ Income}{Shares\ Outstanding}$$

Shares Outstanding may differ based on:

- **Stock options**: specific price for a certain amount of shares by a specific date --> shares outstanding will grow
- Issuing **convertible bonds**, a form of debt that can be converted to shares --> **dilution,** growth of #shares as denominator increases, resulting in **diluted EPS** = $\frac{Net\ Income}{Shares\ Outstanding + unvested}$

Income Statement

	Y2	Y1
Total sales		
Cost of sales -		
Gross Profit		
Selling, general, administrative expenses		
Research & development		
Depreciation and amortization -		
Operating Income		
Other income/expenses +/-		
Earnings Before Interest and Taxes (EBIT)		
Interest income (expense) -		
Pretax Income (EBT)		
Taxes -		
Net Income		
Earnings per share		
Diluted earnings per share		

Chapter 2.4 - THE STATEMENT OF CASH FLOWS

- Goals of the statement of cash flows:
  - Determining generated and allocated cash **during a set period**
  - Detailed look at **changes** in a company's cash balance **over time**
  - Very important tot the investors
- Cash outflows (-), assets (-), liabilities (+)
  1. Operating activities --> Net Income (from Income Statement) + non-cash entries
  2. Investment activities --> cash used for investment
  3. Financing activities --> flow of cash between the firm and investors

- **Operating Activities -** adjusting net income by all non-cash items related to operating activity. Cash outflows (-), depreciation (+), assets (-), liabilities (+), deferred taxes (+), stock-based compensation expenses (+).
  - (-) accounts receivable, since increase in this entry represents lending by the firm to customers, which *reduces* the cash available to the firm
  - (+) accounts payable, since borrowing money form suppliers *increases* cash available to the firm
  - (-) inventory, since increase in this entry does not contribute to the income and is a cash expense for the firm (if value of entries decrease, then it's +/- vice versa)
- **Investing Activities -** showing the cash required for investments. **Capital expenditures** include purchase of new property, plant and equipment (only included over time in Income Statement as depreciation expenses). Both the actual capital expenditure as well as other assets purchased and long-term investments are deducted (-)
- **Financing Activities -** dividends paid to shareholders is cash outflow (-).
  - **Retained earnings** = Net Income - Dividends
  - Sale of stock increases the cash flow (+)
  - Increase in borrowing (debt) results in cash inflow (+)

Statement of Cash Flows

	Y2	Y1
Operating Activities		
Net Income		
Depreciation and amortization		
Other non-cash items		
Cash effect of *changes* in...		
Accounts receivable		
Accounts payable		
Inventory +/-		
Cash from Operating Activities		
Investment Activities		
Capital expenditures		
Acquisitions and other investing activity -		
Cash from Investing Activities		
Financing Activities		
Dividends paid		
Sale/ purchase of stock		
Increase in borrowing +/-		
Cash from Financing Activities		
+/-		
Change in cash and cash equivalents		

Chapter 2.5 - OTHER FINANCIAL STATEMENT INFORMATION

Statement of Stockholders' Equity

Change in Stockholders' Equity = Retained Earnings + Net sales of stock
Net Income - Dividends + Sales of Stock - Repurchases of stock

Management Discussion and Analysis (MD&A)

Preface to the financial statement, discussion and reflection by the company's management while mentioning significant events, outline goals and risks that may affect the liquidity or resources. **Off-balance sheet transactions** must be disclosed, which includes transactions/arrangements that can have a material impact on the future performance yet do not appear on the balance sheet (e.g. compensating a buyer).

Notes to the Financial Statements

Extensive notes with details on information provided in the financial statements like accounting assumptions, types of outstanding debts, risk management, leases and taxes.

Chapter 2.6 - FINANCIAL STATEMENT ANALYSIS

Accounting statements are to evaluate in 2 ways:

1. Comparing firm with itself --> analyzing the changes over time
2. Comparing firm to similar firms --> using common set of financial ratios
   - Profitability ratios
   - Liquidity ratios
   - Working capital ratios
   - Interest coverage
   - Leverage
   - Valuation
   - Operating returns

Profitability Ratios

$$Gross\ Margin = \frac{Gross\ Profit}{Sales}$$

Reflects a firms ability to sell a product for more than the cost of production

$$Operating\ Margin = \frac{Operating\ Income}{Sales}$$

Comparing between firms, this is an assessment of the relative efficiency of the firms' operations
Differences in O.M. may be from difference in efficiency of operations, as well as corporate strategy

$$EBIT\ Margin = \frac{EBIT}{Sales}$$

Earnings before interest and taxes from each dollar of sales

$$Net\ Profit\ Margin = \frac{Net\ Income}{Sales}$$

The fraction of each dollar in revenue available to equity holders after interest and taxes
Differences in N.P.M. may result from differences in leverage, determining the interest expense, or from differences in accounting assumptions

Liquidity Ratios

$$Current\ Ratio = \frac{Current\ Assets}{Current\ Liabilities}$$

Comparing a firm's current assets and current liabilities to assess whether the firm has sufficient working capital to meet its short-term needs

$$Quick\ Ratio = \frac{Current\ Assets}{Current\ Liabilities}$$

Comparing cash and 'near cash' assets (short-term investments and accounts receivable) to current liabilities. Excluding inventory since it is not that liquid/ indicates difficulty selling products. Higher ratio --> less risk of a cash shortfall in near future

$$Cash\ Ratio = \frac{Cash}{Current\ Liabilities}$$

Working Capital Ratios

- Higher turnover ratio --> shorter days --> more efficient use of working capital
- Meaningful compared over time or within an industry, but differs across industries

$$Accounts\ Receivable\ Days = \frac{Accounts\ Receivable}{Average\ Daily\ Sales}$$

Speed (#days) at which sales are turned into cash, or at which it collects payment from its customers

$$Accounts\ Payable\ Days = \frac{Accounts\ Payable}{Average\ Daily\ Cost\ of\ Sales}$$

$$Inventory\ Turnover = \frac{Annual\ Cost\ of\ Sales}{Inventory}$$

Interest Coverage Ratios

- Firm's ability to meet its interest obligations
- Comparing earnings with interest expenses
- High ratio --> earning much more than necessary to meet required interest payment (preferably a ratio>5 but definitely ratio>1.5)

$$Interest\ Coverage\ Ratio = \frac{EBIT + Depreciation\ \&\ Amortization}{Interest\ Expenses}$$

Leverage Ratio

- Extent to which the firm relies on debt as a source of financing (leverage)
- Leverage increases risk to the equity holders, the firm may hold cash reserves to reduce this risk
- Net Debt = Total Debt - Excess Cash & Short-term Investments

$$Debt - Equity\ Ratio = \frac{Total\ Debt}{Total\ Equity}$$

Book Debt-Equity Ratio --> difficult as the book value of equity may be negative
Market Debt-Equity Ratio --> using the market capitalization instead of Total Equity

$$Debt - to - Capital\ Ratio = \frac{Total\ Debt}{Total\ Equity + Total\ Debt}$$

The fraction of the firm financed by debt

$$Debt - to - Enterprise\ Ratio = \frac{Net\ Debt}{Market\ Value\ of\ Equity + Net\ Debt}$$

When *100%, indicating the % of business activity financed by debt

$$Equity\ Multiplier = \frac{Total\ Assets}{Book\ Value\ of\ Equity}$$

Capturing the amplification of the firm's accounting returns that results from leverage
Market Value Equity Multiplier = Enterprise Value/Market Value of Equity --> the shareholders' financial risk that result from leverage

Valuation Ratios

Price-Earnings Ratio: ratio of the value of equity to the earnings on a total basis or pre-share basis

- Whether a stock is over- or undervalued --> stock should be proportional to the level of earnings it can generate for its shareholders
- High rate for industries with high expected growth rates
- Riskier firms have lower rates

$$\text{P/E Ratio} = \frac{\text{Market Capitalization}}{\text{Net Income}} = \frac{\text{Share Price}}{\text{Earnings per Share}}$$

Operating Returns --> Comparing income to investment and the ability to use its assets more effectively to increase return over a certain period

Return on Equity (ROE)

- Measure of return earned on the past investments
- High ROE --> firm able to find profitable investment opportunities

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Book Value of Equity}}$$

Return on Assets (ROA)

$$\text{Return on Assets} = \frac{\text{Net Income} + \text{Interest Expense}}{\text{Book Value of Assets}}$$

Return on invested capital (ROIC)

- Measures the after-tax profit generated by the business itself, excl. interest expenses, and comparing this to the capital raised from equity

$$\text{Return on Invested Capital} = \frac{\text{EBIT}\ (1 - \text{tax rate})}{\text{Book Value of Equity} + \text{Net Debt}}$$

DuPont Identity expresses the ROE in terms of profitability, asset efficiency and leverage

$$\text{ROE} = \underbrace{\left(\frac{\text{Net Income}}{\text{Sales}}\right)}_{\text{Net Profit Margin}} \times \underbrace{\left(\frac{\text{Sales}}{\text{Total Assets}}\right)}_{\text{Asset Turnover}} \times \underbrace{\left(\frac{\text{Total Assets}}{\text{Book Value of Equity}}\right)}_{\text{Equity Multiplier}}$$

3. Financial Decision Making and the Law of One Price

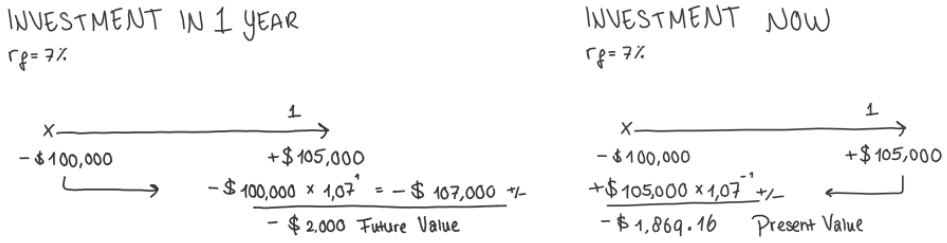
A decision is good for the firm's investors if it increases the firm's value by providing benefits whose value exceeds the costs.
Valuation principle states that we can use current market prices to determine the value today of the costs and benefits associated with a decision. The concept of **net present value (NPV)** compares the costs and benefits of a project in terms of a common unit (dollars today).

CHAPTER 3.1 - VALUING DECISIONS

Decision-making: identify costs and benefits and quantify these in terms of a common measure of value.
Competitive market a market in which goods can be bought and sold at the same price. The price determines the cash value of the product. In a competitive market, the value of the good is independent on the views or preferences of the decision maker.
Valuation principle, the value of an asset to the firm or its investors is determined by its competitive market price. The benefits and costs of a decision should be evaluated using the competitive market prices, when the value of the benefits exceeds the value of the costs, the decision will increase the market value of the firm.

CHAPTER 3.2 - INTEREST RATES AND THE TIME VALUE OF MONEY

A dollar today is worth more than a dollar tomorrow due to investment opportunities for example.
The time value of money is the difference in value between money today and money in the future.
The **risk-free interest rate (r_f)** is the interest rate at which money can be borrowed or lent without risk over that period.



CHAPTER 3.3 - PRESENT VALUE AND THE NPV DECISION RULE

Net Present Value (NPV) = PV(benefits) - PV(costs)

- NPV expresses the value of an investment decision in terms of cash today
- NPV>0, decision increases the value of the firm, and is therefore a good decision
- Highest NPV equals receiving NPV in cash today
- *Regardless of our preferences for cash today versus cash in the future, we should always maximize NPV first. We can then borrow or lend to shift cash flows through time and find our most preferred pattern of cash flows.*

CHAPTER 3.4 - ARBITRAGE AND THE LAW OF ONE PRICE

Arbitrage is the practice of buying and selling equivalent goods in different markets to take advantage of a price difference. Any situation in which it is possible to make a profit without taking any risk or making any investment is an **arbitrage opportunity**. In reality prices will respond to placed trades, causing the arbitrage opportunity to evaporate (competitive market without arbitrate opportunities is a **normal market**). This all leads to the **law of one price**: if equivalent investment opportunities trade simultaneously in different competitive markets, then they must trade for the same price in all markets --> when computing the NPV, any competitive price will do.

4. The Time Value of Money

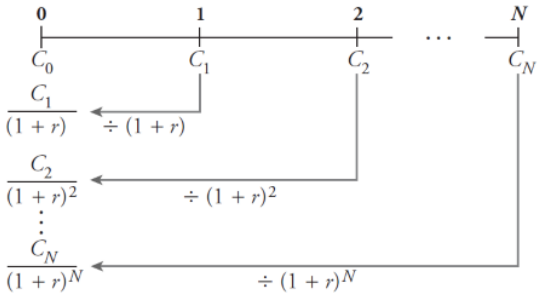
CHAPTER 4.2 - THE THREE RULES OF TIME TRAVEL

1. Only possible to compare or combine values at the same point in time
   Future value - present value = **time value of money**, meaning money today can be invested which results in more money in the future
2. Compounding = moving cash flows forward in time
   Compound interest is interest on interest

   Future Value of Cash Flow (FV) = $C \times (1+r)^n$

3. Discounting = moving cash flows backward in time

   Present Value of a Cash Flow (PV) = $C \div (1+r)^n = \frac{C}{(1+r)^n}$

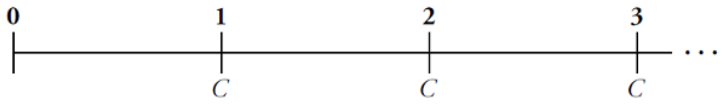


CHAPTER 4.5 - PERPETUITIES AND ANNUITIES

Perpetuity is a stream of equal cash flows that occur at regular intervals and last <u>forever</u>

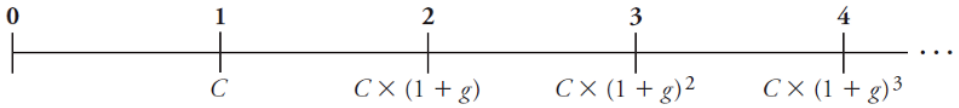
- First cash flow arrives at the end of the first period

$$PV(C \text{ in perpetuity}) = \frac{C}{r}$$



- **Growing perpetuity** is a stream of cash flows that occur at <u>regular intervals & grow at a constant rate (g) forever</u>. First payment at date 1 and does not include growth, and assuming g<r

$$PV(\text{growing perpetuity}) = \frac{C}{r-g}$$

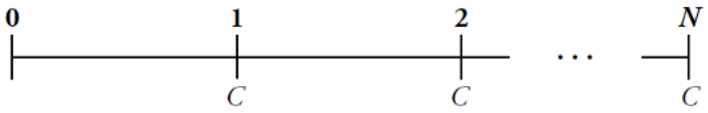


Annuity is a stream on equal cash flows paid
at regular intervals ending after a fixed number of payments

- Examples are car loans, mortgages, etc.

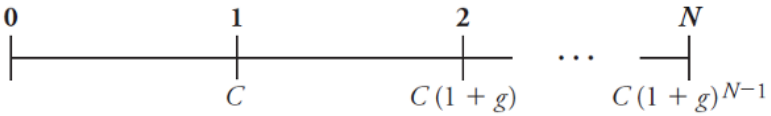
$$PV(\text{annuity of } C \text{ for } N \text{ periods with interest rate } r) = C \times \frac{1}{r}\left(1 - \frac{1}{(1+r)^N}\right)$$

$$\text{FV (annuity)} \quad = C \times \frac{1}{r}\left((1+r)^N - 1\right)$$

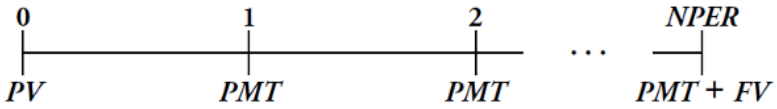


- **Growing annuity** is a stream of growing cash flows paid at regular intervals. First payment end of first period and does not grow, last cash flow is N-1 periods of growth

$$PV = C \times \frac{1}{r-g}\left(1 - \left(\frac{1+g}{1+r}\right)^N\right)$$

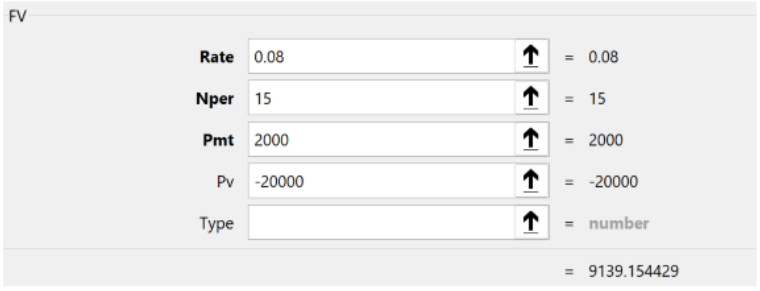


CHAPTER 4.6 - USING AN ANNUITY SPREADSHEET



PMT is present value of the annuity payments
FV present value of final payment
PV initial amount

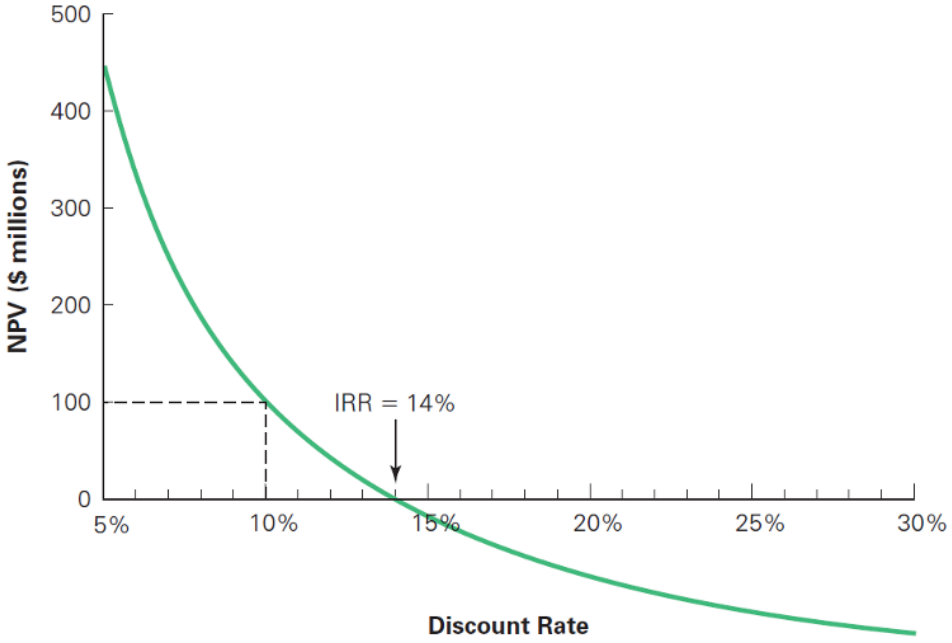
E.g. invest $20,000 with 8% interest, withdraw $2,000 each year, calculate amount in 15 years



CHAPTER 4.9 - THE INTERNAL RATE OF RETURN

The internal rate of return (IRR) is the interest rate that sets the NPV of the cashflows equal to 0

- The IRR of a project provides useful information regarding the sensitivity of the projects NPV to errors in the estimate of its cost of capital
- The difference between cost of capital and the IRR is the max. estimation error in the cost of capital that can exist without altering the original decision



5. Interest Rates

CHAPTER 5.1 - INTEREST RATE QUOTES AND ADJUSTMENTS

Because interest rates tend to change over time, investors will demand different interest rates for different investment horizons based on their expectations.

When evaluating cash flows, use the discount rate

Effective annual rate (EAR) indicates the actual amount of interest that will be earned at the end of 1 year. EAR can be used as a discount rate for annual cash flows.

Converting a discount rate for 1 period to an equivalent discount rate for n periods:

$$\text{Equivalent } n\text{-Period Discount Rate} = (1 + r)^n - 1$$

Adjust the discount rate to match the time period of cash flows

Annual Percentage Rates (APR) indicates the amount of simple interest earned in 1 year --> without the effect of compounding so it doesn't reflect the true amount of interest you will receive over 1 year; the APR cannot be used as a discount rate.

Converting an APR to an EAR

$$1 + EAR = \left(1 + \frac{APR}{k}\right)^k$$

K = compounding periods per year

CHAPTER 5.2 - APPLICATION: DISCOUNT RATES AND LOANS

Amortizing loans: each month you pay interest on the loan + part of the loan balance

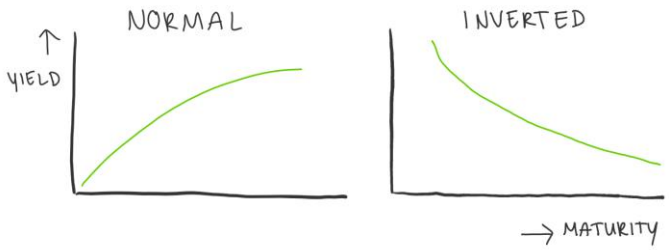
CHAPTER 5.3 - THE DETERMINANTS OF INTEREST RATES

Nominal interest rates indicate the rate at which your money will grow if invested for a certain period. The **real interest rate** determines the rate of growth of your purchasing power after adjusting for inflation.

- Negative real interest rates indicate that the interest rates are insufficient to keep up with inflation. You can buy less at the end of the year than you could have at the start of the year
- Guiding the economy through interest rates: raise interest to reduce investment (lower NPV's) if the economy is 'overheating' and inflation is on the rise, lower interest rates stimulate investment if the economy is slowing or in recession.

Term structure is the relationship between the investment term and the interest rate, plotted in the **yield curve**.

- If **interest rates are expected to rise**, investors prefer short-term investments, and long-term interest rates tend to rise to attract investors.
- If **interest rates are expected to fall**, borrowers prefer long-term loans, and long-term interest rates may drop since investors are willing to lock in at current higher rates.



Normal Yield Curve

When investors expect future short-term interest rates to rise, they anticipate that higher yields will be available in the future. As a result, they demand a higher interest rate for long-term investments to compensate for the opportunity cost of locking in their money at current lower rates. This leads to an upward sloping yield curve, where long-term rates are higher than short-term rates --> Stronger economy, higher inflation, higher interest rates.

Inverted Yield Curve

If investors expect future short-term interest rates to fall, they will be willing to accept lower yields on long-term bonds today, assuming that future short-term rates will decline. This results in a downward sloping yield curve, also known as an inverted yield curve, where long-term rates are lower than short-term rates. An inverted yield curve is often seen as a predictor of economic slowdowns or recessions.

CHAPTER 5.4 - RISK AND TAXES

Borrowers, other than the U.S. Treasury, carry a risk of default, meaning investors may not be fully repaid. To compensate for this risk, investors demand a higher interest rate. The difference between this rate and the U.S. Treasury rate reflects the perceived likelihood of default. So more risk --> higher interest rate --> lower PV.

After-tax interest rate is the reduced amount of interest the investor can keep after paying taxes.
After-Tax Interest Rate = interest*(1-tax rate)

CHAPTER 5.5 - THE OPPORTUNITY COST OF CAPITAL

Opportunity cost of capital is the best available expected return offered in the market on an investment of comparable risk and term to the cash flow being discounted.

6. Valuing Bonds

CHAPTER 6.1 - BOND CASH FLOWS, PRICES AND YIELDS

A bond is a security sold by governments and corporations to raise money from investors today in exchange for promised future payments.

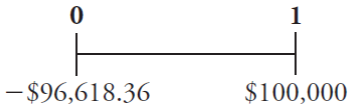
- Terms described in the **bond certificate**, indicating the amounts and dates of payments
- **Maturity date** is the final repayment date
- **The term** of the bond is the time remaining until the repayment date
- **Coupons** are the promised interest payments
- **Face value** is the notional amount used to compute the interest payment (usually repaid at maturity)
- **Coupon rate** (APR) is determined by the amount of each coupon payment (CPN)

$$CPN = \frac{\text{Coupon Rate} \times \text{Face Value}}{\text{Number of Coupon Payments per Year}}$$

	Stock (Equity) Financing	Bond (Debt) Financing
Ownership	Gives up ownership to investors	No ownership rights are given up
Tax implications	Dividends are not tax deductible	Interest on debt is tax deductible
Set payments	Dividends are not required to be paid	For coupon bonds, interest (coupon) payments are legally required to be made
Amount of payments	Dividend payment at the firm's discretion	Coupon payments are legally required to be specified
Time limit of payments	No limit	Time limit (maturity) is part of bond agreement

Zero-coupon bond

- No coupon payments
- Face value of bond is received on maturity date
- E.g. treasury bills by US Government (1Y)
- Trading at discount (price<<face value) --> **pure discount bonds**



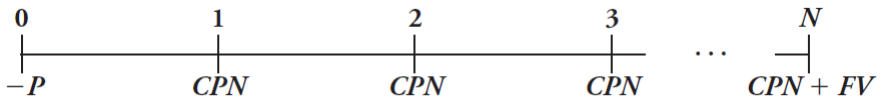
- Although the bond pays no "interest" directly, as an investor you are compensated for the time value of your money by purchasing the bond at a discount to its face value.
- **Yield to maturity (YTM)** captures the total return (coupon payments + discount) you'll earn if you hold the bond until maturity
- By the Law of One Price, the competitive market risk-free interest rate is equal to the YTM of similar bonds/ investment opportunities

$$P = \frac{FV}{(1 + YTM_n)^n}$$

P: current price
FV: face value = future value!!
N: number of periods

Coupon bonds

- Pays investors their face value at maturity
- Regular coupon interest payments are made



- E.g. treasury notes (maturity 1-10 years) and treasury bonds (>10 year)

Yield to Maturity of a Coupon Bond

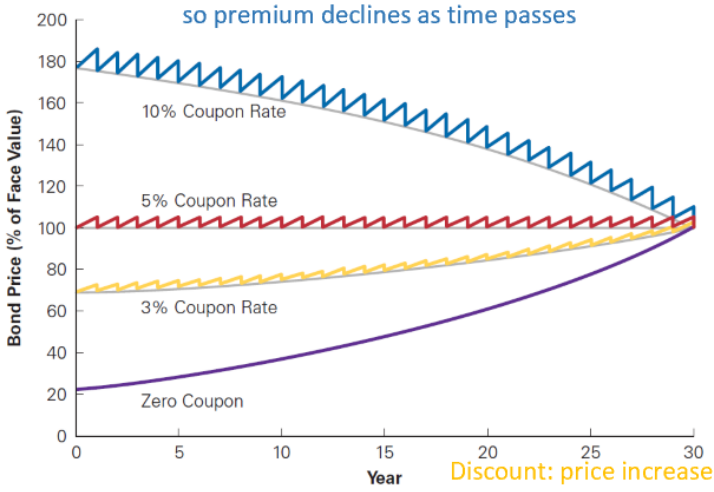
$$P = CPN \times \frac{1}{y}\left(1 - \frac{1}{(1+y)^N}\right) + \frac{FV}{(1+y)^N}$$

- Coupon payments and face values are fixed. PV of the bond's remaining cash flows changes as the time to maturity decreases, and due to changes in the market interest rates. f bond prices rise, YTM lowers --> Inverse relationship
    - **Higher Bond Price = Lower YTM** (you pay more for the same fixed return (CPN), so your yield is lower).
    - **Lower Bond Price = Higher YTM** (you pay less for the same fixed return, so your yield is higher)
- Trading values:
    - coupon rate < YTM --> discount, meaning bond price less than face value
    - coupon rate > YTM --> premium, meaning bond price greater than face value
    - Par, meaning equal to face value

CHAPTER 6.2 - DYNAMIC BEHAVIOR OF BOND PRICES

As the bond gets closer to maturity, the market becomes more confident that it will pay the full face value. The uncertainty about future interest rates diminishes, and any premium or discount slowly erodes.

Premium: price drop after CPN>>price increase between payments, so premium declines as time passes

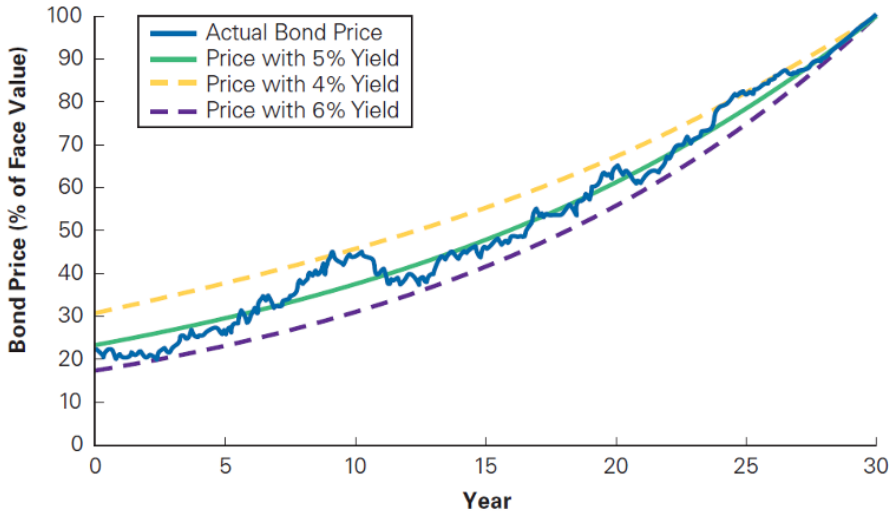


Between coupon payments, the prices of bonds rise at a rate equal to the yield to maturity as the remaining cash flows of the bond become closer. The price of a bond drops by the amount of the coupon payment (CPN) and over time, as the bond accrues interest toward the next coupon, the cash price increases again

Discount: price increase between payments>>coupon payment drop, so discount declines as time passes

Duration is the sensitivity of a bond's price to changes in interest rates. Remember: as interest rates and bond yields rise, bond prices will fall (e.g. Suppose interest rates increase by 1%. A bond with 1 year left to maturity may see a slight price decline, but a bond with 30 years left to maturity may experience a much larger price drop because its cash flows are more heavily discounted by the new, higher interest rate).

- Short maturity bonds are less sensitive to changes in interest rates
- Bonds with higher coupon rates are less sensitive to interest rate changes



Bond prices tend to converge to the face value (FV) as the bond approaches the maturity date, but also moves higher when its yield falls and lower when its yield rises --> **inverse relationship between bond prices and yields**:

- When market interest rates decrease, new bonds are issued at lower coupon rates. This makes existing bonds with higher coupon rates more attractive, so their prices rise.
- Conversely, when market interest rates increase, new bonds offer higher coupon rates. Investors demand a discount on older bonds with lower coupon rates, so the prices of those older bonds fall to make their yields comparable to new bonds.

CHAPTER 6.3 - THE YIELD CURVE AND BOND ARBITRAGE

The Law of One Price states that the price of the portfolio of zero-coupon bonds must be the same as the price of the coupon bond. The price of a coupon bond must be equal to the present value of its coupon payments and face value discounted at the competitive market interest rates.

	0	1	2	3
Coupon bond:		$100	$100	$1100
1-year zero:		$100		
2-year zero:			$100	
3-year zero:				$1100
Zero-coupon Bond portfolio:		$100	$100	$1100

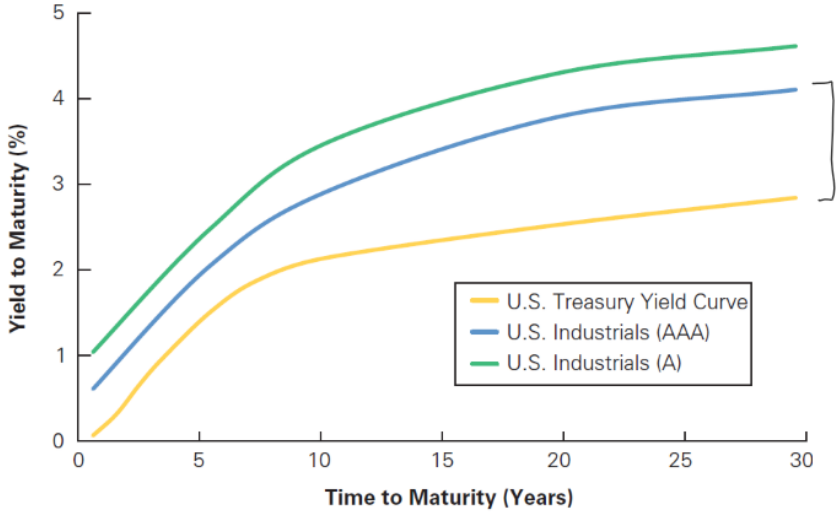
Price of a Coupon Bond

$$P = PV(\text{Bond Cash Flows})$$
$$= \frac{CPN}{1 + YTM_1} + \frac{CPN}{(1 + YTM_2)^2} + \cdots + \frac{CPN + FV}{(1 + YTM_n)^n}$$

CHAPTER 6.4 - CORPORATE BONDS

Corporate bonds hold **credit risk**, meaning that the bond's cash flows are not known with certainty (in contrast, treasury bonds are default-free bonds, the face value will be paid for sure). **YTM** represents the **promised return**, assuming no default, while the **expected return** accounts for the possibility that not all payments will be made due to default risk.

- Investors pay less (FV) for bonds with credit risk, so the price of the bond drops
- The expected return is less than the bond's YTM because the yield to maturity of a bond is calculated using the promised cash flows, not the expected cash flows
- A **higher YTM** doesn't necessarily mean a higher expected return. It could just indicate higher credit risk, which means a greater chance the investor won't receive all the payments.
- Bond ratings indicate the creditworthiness of bonds, where high rates indicate bonds least likely to default. Rating depends on risk of bankruptcy & ability to lay claim to the firm's assets (low priority results in low rates)
    - High rates --> low default risk = investment-grade bonds (AAA)
    - Low rates --> high default risk = speculative bonds / junk bonds (BB)



Difference is called **default spread** or **credit spread**

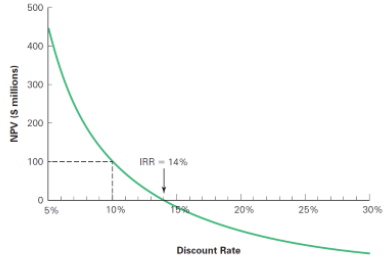
CHAPTER 6.5 - SOVEREIGN BONDS

- **Sovereign bonds** are bonds with risk of default issued by national governments.
- Sovereign bond yields reflect investor expectations of inflation, currency, and default risk.
- Countries may repay their debt by printing additional currency, which generally leads to a rise in inflation and a sharp currency devaluation. When "inflating away" the debt is infeasible or politically unattractive, countries may choose to default on their debt.

7. Investment Decision Rules

CHAPTER 7.2 - THE INTERNAL RATE OF RETURN RULE

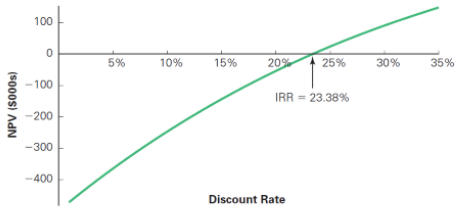
Internal rate of return is the average return earned by taking on the investment opportunity --> IRR when NPV=0



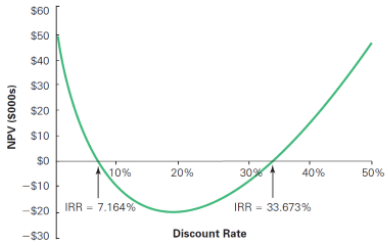
The **internal rate of return (IRR) investment rule** is to take any investment opportunity where IRR>> the opportunity cost of capital.

- Works for a stand-alone project
- If all of the negative cash flows precede its positive cash flows
- NPV is positive for every discount rate below the IRR
- Otherwise the IRR fails…

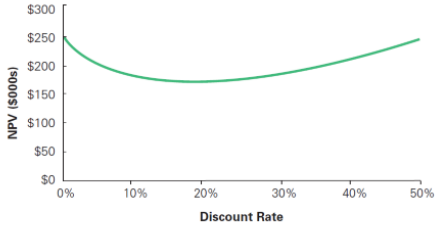
1. Delayed investments
   a. IRR does not distinguish between investing and borrowing cash flows



2. Multiple IRRs
   a. Certain cash flows generate NPV=0 at 2 different discount rates



3. Non-existent IRR
   a. No IRR exist when NPV>0 for all values of the discount rate



4. Ignoring magnitude of project
5. When there is more than 1 opportunity cost of capital
   a. Assuming discount rates stable during term of project
   b. Implies all funds reinvested at IRR

CHAPTER 7.3 - THE PAYBACK RULE

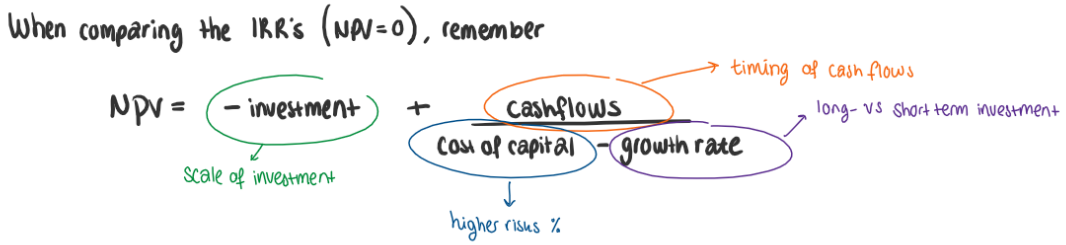
- **Payback period** is the amount of time it takes to pay back the initial investment
- Payback<< pre-specified length of time --> accept project
- $\frac{initial\ costs}{annual\ cash\ flow} \ll expected\ life\ in\ years$
- Pitfalls:
  - Ignores project's cost of capital & time value of money
  - Ignores cash flows after payback period
  - Relies on ad hoc decision criterion --> what/who determines the pre-specified length of time?
  - Therefore usually used for small investment decision

CHAPTER 7.4 - CHOOSING BETWEEN PROJECTS

The NPV expresses the value of a project in terms of cash today. Picking the project with the highest NPV leads to the greatest increase in wealth.

Using IRR when comparing projects is risky because… risks, timing and scale must be the same

1. The IRR says nothing about how much value is created without knowing the scale of the investment (since IRR is a % and is unaffected by the scale of the investment)
2. Difference in timing of the cash flows. Growth rate and long-term>short-term benefits should be considered when comparing investment opportunities
3. The IRR ignores risk differences. High cost of capital lead to higher risks



Incremental IRR is the IRR of the incremental cash flows that would result from replacing one project with the other --> the rate at which it becomes profitable to switch from one project to the other

IRR determines the crossover point of the NPV profiles of both projects / discount rate at which the optimal decision changes, see the figure.

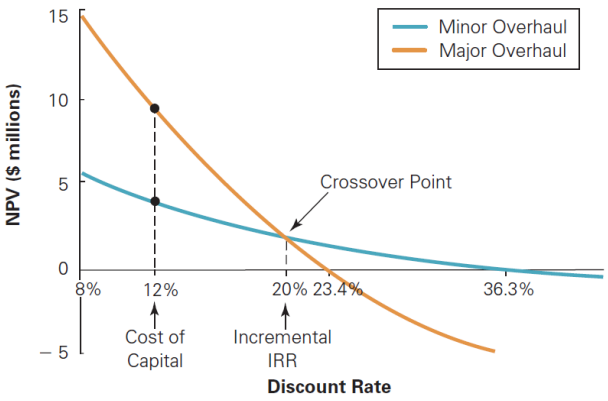
1. Calculate the incremental cash flows = project 1 - project 2

	0	*1*	*2*	*3*
Project 1	-50	25	25	25
Project 2	-10	6	6	6
Incremental Cash Flow	**-40**	**19**	**19**	**19**

2. Then calculate the IRR of the incremental cash flows
3. Compare the incremental IRR with the cost of capital

However:

- Incremental cash flows do not always ensure negative cash flows are followed by positive ones
- Incremental IRR shows when to switch, not if either option has a positive NPV
- Incremental IRR is compared to costs of capital. What if each project has a different cost of capital, which one are you comparing the incremental IRR to?



CHAPTER 7.5 - PROJECT SELECTION WITH RESOURCE CONSTRAINTS

Profitability Index is used to identify the optimal combination of projects to undertake.

$$\text{Profitability Index} = \frac{\text{Value Created}}{\text{Resource Consumed}} = \frac{NPV}{\text{Resource Consumed}}$$

- Make sure to completely use the available resources --> fill up headcounts for example with smaller projects (lower NPV) to make use of every resource.
- Use when there is only a single relevant resource constraint.

8. Fundamentals of Capital Budgeting

Capital Budgeting : the process of analyzing investment opportunities and deciding which ones to accept

CHAPTER 8.1 - FORECASTING EARNINGS

Capital budget lists projects and investments that an company plans to undertake during the coming year.

Incremental earnings is the amount by which the firm's earnings are expected to change as a result of the investment decision.

	Year	0	1	2	3	4	5
Incremental Earnings Forecast ($000s)							
1	Sales	—	26,000	26,000	26,000	26,000	—
2	Cost of Goods Sold	—	(11,000)	(11,000)	(11,000)	(11,000)	—
3	**Gross Profit**	—	15,000	15,000	15,000	15,000	—
4	Selling, General, and Administrative	—	(2,800)	(2,800)	(2,800)	(2,800)	—
5	Research and Development	(15,000)	—	—	—	—	
6	Depreciation	—	(1,500)	(1,500)	(1,500)	(1,500)	(1,500)
7	**EBIT**	(15,000)	10,700	10,700	10,700	10,700	(1,500)
8	Income Tax at 40%	6,000	(4,280)	(4,280)	(4,280)	(4,280)	600
9	**Unlevered Net Income**	**(9,000)**	**6,420**	**6,420**	**6,420**	**6,420**	**(900)**

A. Capital expenditures and depreciation --> using **straight-line depreciation** meaning divided equally over its estimated useful life
B. Interest expenses are not included (evaluation without financing decision) which results in the **unlevered net income**
C. **Marginal corporate tax rate** is the rate the firm will pay on an incremental dollar of pre-tax income
D. **Unlevered Net Income Calculation**

$$= EBIT \times (1 - \tau_c)$$
$$= (\text{Revenues} - \text{Costs} - \text{Depreciation}) \times (1 - \tau_c)$$

E. **Opportunity costs** of using a resource is the value it could have provided in its best alternative use (e.g. not using a space because it is occupied by a project)
F. **Project externalities** are indirect effects of the project that may increase/decrease the profits of other business activities of the firm (e.g. sales of a new product displace sales of an existing product is called **cannibalization**). Externalities include the reduction in sales as well as the costs of goods sold)
G. Not included are the **sunk cost**, any unrecoverable cost for which the firm is already liable --> costs that will be paid regardless of the project decision, examples are
    a. Fixed overhead expenses: activities not directly attributable to a single business activity, but affecting many different areas of the corporation. Additional overhead expenses that arise because of the decision are included.
    b. Past research and development expenditures. Any money spent is a sunk cost and is therefore irrelevant. Its all about the incremental costs and benefits going forward.
    c. Unavoidable competitive effects --> lost sales due to introduction of new products by competitors are lost *anyway*, so these are a sunk cost and not included in the projections.

CHAPTER 8.2 - DETERMINING FREE CASH FLOW AND NPV

Free cash flow is the incremental effect of a project on the firm's available cash separate from any financing decisions.

	Year	0	1	2	3	4	5
Incremental Earnings Forecast ($000s)							
1	Sales	—	23,500	23,500	23,500	23,500	—
2	Cost of Goods Sold	—	(9,500)	(9,500)	(9,500)	(9,500)	—
3	**Gross Profit**	—	14,000	14,000	14,000	14,000	—
4	Selling, General, and Administrative	—	(3,000)	(3,000)	(3,000)	(3,000)	—
5	Research and Development	(15,000)	—	—	—	—	—
6	Depreciation	—	(1,500)	(1,500)	(1,500)	(1,500)	(1,500)
7	**EBIT**	(15,000)	9,500	9,500	9,500	9,500	(1,500)
8	Income Tax at 40%	6,000	(3,800)	(3,800)	(3,800)	(3,800)	600
9	**Unlevered Net Income**	**(9,000)**	**5,700**	**5,700**	**5,700**	**5,700**	**(900)**
Free Cash Flow ($000s)							
10	Plus: Depreciation	—	1,500	1,500	1,500	1,500	1,500
11	Less: Capital Expenditures	(7,500)	—	—	—	—	—
12	Less: Increases in NWC	—	(2,100)	—	—	—	2,100
13	**Free Cash Flow**	**(16,500)**	**5,100**	**7,200**	**7,200**	**7,200**	**2,700**

- Capital expenditures and depreciation --> add back the depreciation over the years and instead "add" the actual investment costs when the purchase is made
- Net working capital (NWC) = current assets - current liabilities
  = cash + inventory + receivables - payables
  TRADE CREDIT

- Increase NWC = investment reduces available cash = reducing free cash flow
  When NWC increases, it means more cash is tied up in operations—whether in the form of inventory, receivables, or other current assets. This reduces the amount of cash the firm has available for other uses, including returning to shareholders or reinvesting in the business.

$$\text{Free Cash Flow} = (\text{Revenues} - \text{Costs}) \times (1 - \tau_c) - \text{CapEx} - \Delta NWC + \tau_c \times \text{Depreciation}$$

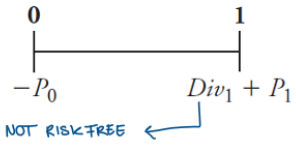
Depreciation tax shield is the tax savings that result from the ability to deduct depreciation, therefore depreciation expenses have a ++ impact on free cash flow

9. Valuing Stocks

CHAPTER 9.1 - THE DIVIDEND-DISCOUNT MODEL

Stock cash flows:

1. Dividend *(Div1)*
2. Selling shares *(P1)*



to compute the PV we discount based on the **equity cost of capital** r_E
for buying: P≤ discounted cash flows, for selling P≥ discounted cash flows, so

$$P_0 = \frac{Div_1 + P_1}{1 + r_E}$$

Total Return

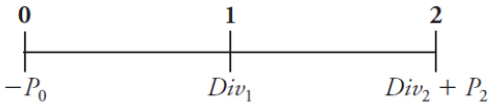
$$r_E = \frac{Div_1 + P_1}{P_0} - 1 = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}}$$

Total return: the expected return that the investor will earn for a 1-year investment in the stock
Dividend Yield: the percentage return the investor expects to earn from the dividend paid by the stock
Capital Gain Rate: capital gain the investor will earn on the stock

The expected total return of the stock should equal the expected return of other investments available in the market with equivalent risk

Dividend-Discount Model

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{P_N}{(1 + r_E)^N}$$



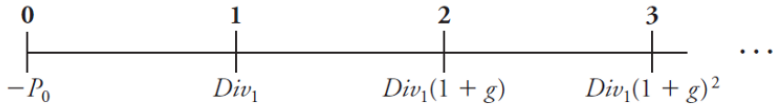
Limitations of DDM:

1. Tremendous amount of uncertainty associated with forecasting a firm's dividend growth rate and future dividends;
2. Small changes in assumed divided growth rate can lead to large changes in the estimated stock price.

CHAPTER 9.2 - APPLYING THE DIVIDEND-DISCOUNT MODEL

Constant Dividend Growth Model

$$P_0 = \frac{Div_1}{r_E - g}$$



To maximize the share price, a firm likes to increase the dividend level & growth rates. However, increasing growth may require investments, which is money that cannot be used to pay dividends.

Increasing dividend

$$Div_t = \underbrace{\frac{\text{Earnings}_t}{\text{Shares Outstanding}_t}}_{EPS_t} \times \text{Dividend Payout Rate}_t$$

- Increase earnings (net income) --> reinvest earnings, only when return on new investment>> r_E
- Increase dividend payout rate (DPR=Earnings/Div1)
- Decrease share outstanding

POSITIVE NPV

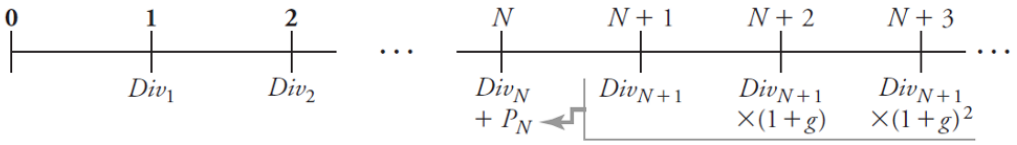
Sustainable growth rate is the rate at which the firm can grow using *only* retained earnings

$$g = \text{Retention Rate} \times \text{Return on New Investment}$$

Dividend Payout Rate + Retention Rate (=Ret. Earnings/earnings) = 1

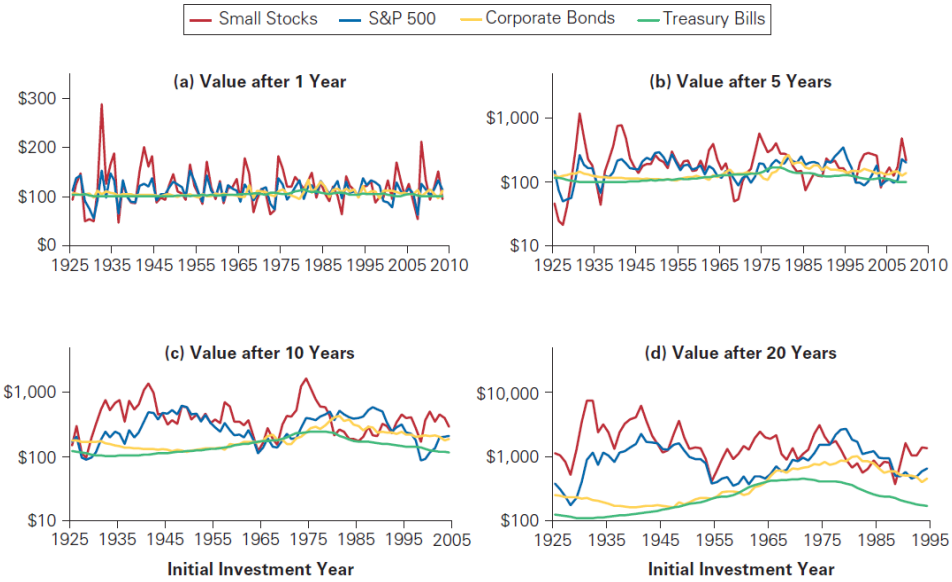
Dividend-Discount Model with Constant Long-Term Growth

$$P_0 = \frac{Div_1}{1+r_E} + \frac{Div_2}{(1+r_E)^2} + \cdots + \frac{Div_N}{(1+r_E)^N} + \frac{1}{(1+r_E)^N}\left(\frac{Div_{N+1}}{r_E - g}\right)$$



10. Capital Markets and the Pricing of Risk

CHAPTER 10.1 - RISK AND RETURN: INSIGHTS FROM 89 YEARS OF INVESTOR HISTORY



Historically, over long horizons, investment in stocks have outperformed investments in bonds. Investing in stocks has been much riskier than investing in bonds.

CHAPTER 10.2 - COMMON MEASURES OF RISK AND RETURN

Comparing different securities (with different initial prices, cash flows, etc) by expressing their performance in terms of their returns. A **probability distribution** summarizes information about possible different returns (R) and their likelihood of occurring (Pr). E.g. a 25% chance the price of a stock worth $100 will rise to $140 --> R=0.4, Pr=25%

- The **expected (mean) return**: the return we expect to earn on average

$$\text{Expected Return} = E[R] = \sum_R p_R \times R$$

- The **variance** is the expected squared deviation from the mean, and the **standard deviation** is the square root of the variance, both measuring the variability of the returns:

Variance and Standard Deviation of the Return Distribution

$$Var(R) = E[(R - E[R])^2] = \sum_R p_R \times (R - E[R])^2$$

$$SD(R) = \sqrt{Var(R)}$$

  - If return is risk-free and never deviates from the mean --> Variance = 0
  - High variance --> returns are highly volatile, meaning that the returns fluctuate significantly from the average return. A high variance indicates:
    - Greater risks: returns are less predictable, large swings in performance (gains as well as losses) are more likely;
    - High potential for gains and losses: high variance can indicate potential for significant gains, as well as potential for large losses;
    - Less stability: greater deviations from expected return, lack of stability makes it more difficult to predict future performance based on past returns;
    - Diversification: high variance *portfolio (see chapter 11)* may suggest lack of sufficient diversification. Well-diversified portfolios have lower variance because not all assets move together in the same direction, which smooths out the overall volatility.
  - The standard deviation of a return is also called its **volatility** (returns more spread out, means higher volatility and variance)

CHAPTER 10.3- HISTORICAL RETURNS OF STOCKS AND BONDS

The **realized return** is the return that actually occurs over a particular period of time.
The **average annual return (R)** of an investment during some historical period is simply the average of the realized returns for each year (R_t)

Average Annual Return of a Security

$$\overline{R} = \frac{1}{T}(R_1 + R_2 + \cdots + R_T) = \frac{1}{T}\sum_{t=1}^{T} R_t$$

Variance Estimate Using Realized Returns

$$Var(R) = \frac{1}{T-1}\sum_{t=1}^{T}(R_t - \overline{R})^2$$

Because a security's historical average return is only an estimate of its true expected return, the **standard error** of the estimate is used to gauge the amount of estimation error, by:

Standard Error of the Estimate of the Expected Return

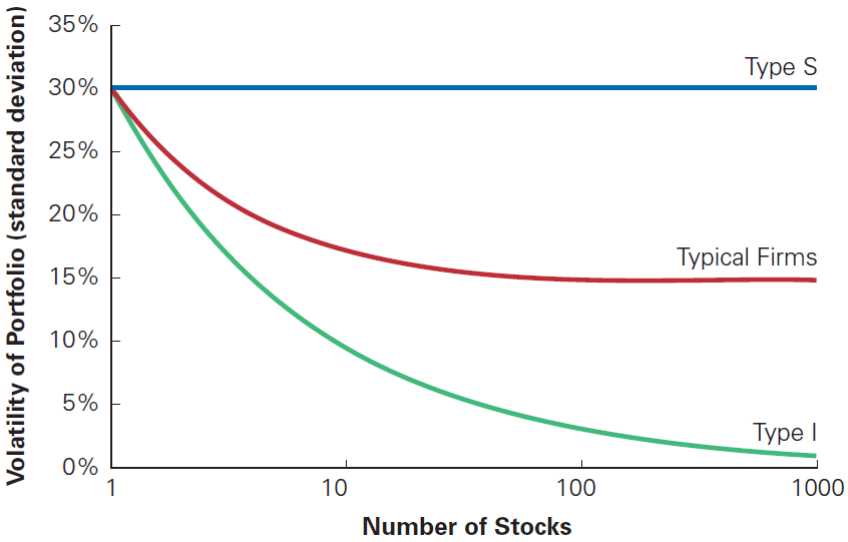
$$SD\ (\text{Average of Independent, Identical Risks}) = \frac{SD\ (\text{Individual Risk})}{\sqrt{\text{Number of Observations}}}$$

CHAPTER 10.6 - DIVERSIFICATION IN STOCK PORTFOLIOS

Stock prices and dividends fluctuate due to 2 types of news:

1. Firm-specific news (about company itself) --> independent idiosyncratic risk, diversification possible, so risk premium is 0
2. Market-wide news (about economy as a whole, affecting all stocks) --> common/systematic risks

! Risk premium is determined by the systematic risk, not on the diversifiable risk!



CHAPTER 10.7 - MEASURING SYSTEMATIC RISK

An **efficient portfolio** contains only systematic risk and cannot be diversified further - that is, there is no way to reduce the risk of the portfolio without lowering its expected return. The **market portfolio** contains all shares of all stocks and securities in the market. The market is often assumed to be efficient. The systematic risk of a security is measured by its **beta (β),** which measures the sensitivity of a security's return (based on the return of the market portfolio)**.** The beta of a security is the expected % change in its return given a 1% change in the return of the market portfolio.

$$\beta = \frac{changes\ in\ return\ firm}{changes\ in\ return\ market\ portfolio} \rightarrow \text{the higher the Beta, the higher the risk}$$

CHAPTER 10.8 - BETA AND THE COST OF CAPITAL

The **market risk premium** is the expected excess return of the market portfolio. It reflects the investors' overall risk tolerance and represents the market price of risk in the economy:

$$\text{Market Risk Premium} = E[R_{Mkt}] - r_f$$

Estimating the Cost of Capital of an Investment from Its Beta

$$r_I = \text{Risk-Free Interest Rate} + \beta_I \times \text{Market Risk Premium}$$
$$= r_f + \beta_I \times (E[R_{Mkt}] - r_f)$$

This formula is referred to as the **Capital Assets Pricing Model (CAPM)**

11. Optimal Portfolio Choice and the Capital Asset Pricing Model

CHAPTER 11.1 - THE EXPECTED RETURN OF A PORTFOLIO

The portfolio weight is the initial fraction x_i of an investor's money in each asset. Portfolio weights add up to 1.

$$x_i = \frac{\text{Value of investment } i}{\text{Total value of portfolio}}$$

The expected return of a portfolio:

$$R_P = x_1 R_1 + x_2 R_2 + \cdots + x_n R_n = \sum_i x_i R_i$$

CHAPTER 11.2 - THE VOLATILITY OF A TWO-STOCK PORTFOLIO

Two important phenomena of combining stocks in a portfolio:

1. **Risk reduction through diversification**: by combining different stocks into a portfolio, the overall risk is reduced because the prices of the stocks do not move identically. Some of the individual risks associated with each stock are averaged out in a diversified portfolio, resulting in lower risk compared to holding individual stocks.
2. **Risk elimination depends on correlation**: the extent of risk reduction in a portfolio depends on how the stocks are correlated and thus how much their prices move together. If stocks tend to move in the same direction, less risk is eliminated. In contrast, if stocks move in opposite directions, more risk is canceled out, significantly reducing the portfolio's overall risk.

Measuring co-movement of returns:

- **Covariance**: the expected product of the deviation of two returns $R_i$and R_j from their means.
    - Positive covariance: stocks move together and returns will be above/below average
    - Negative covariance: stocks move in opposite directions
    - Large magnitude of covariance: stocks are more volatile (larger deviations)

Covariance between Returns R_i and R_j

$$Cov(R_i, R_j) = E[(R_i - E[R_i])(R_j - E[R_j])]$$

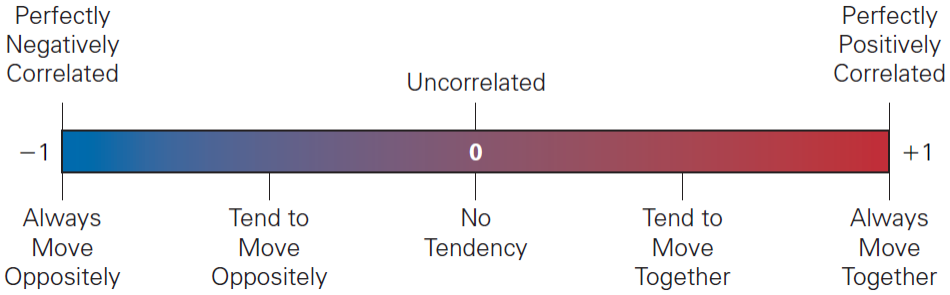
Estimate of the Covariance from Historical Data

$$Cov(R_i, R_j) = \frac{1}{T-1} \sum_t (R_{i,t} - \overline{R}_i)(R_{j,t} - \overline{R}_j)$$

- **Correlation**: a barometer of the degree to which the returns share common risk and tend to move together. Correlation represents the fraction of the volatility due to risk that is common to the securities. Low correlation leads to low volatility.
    - Same sign as covariance, similar interpretation

- +1 --> returns tend to move together as a result of common risk
- 0 --> returns are uncorrelated, no tendency to move either together or in opposition to one another (independent risks are uncorrelated)
- -1 --> returns tend to move in opposite directions

$$Corr(R_i, R_j) = \frac{Cov(R_i, R_j)}{SD(R_i)\ SD(R_j)}$$



The variance of a portfolio depends on the variance of the individual stocks and the covariance of the stocks within it. For a portfolio with two stocks:

- The higher the covariance or correlation, the more variable the portfolio will be
- If the stocks have a perfect positive correlation (+1), the portfolio will have the greatest variance, meaning highly volatile and so the returns will fluctuate significantly from the average or expected return.

The Variance of a Two-Stock Portfolio

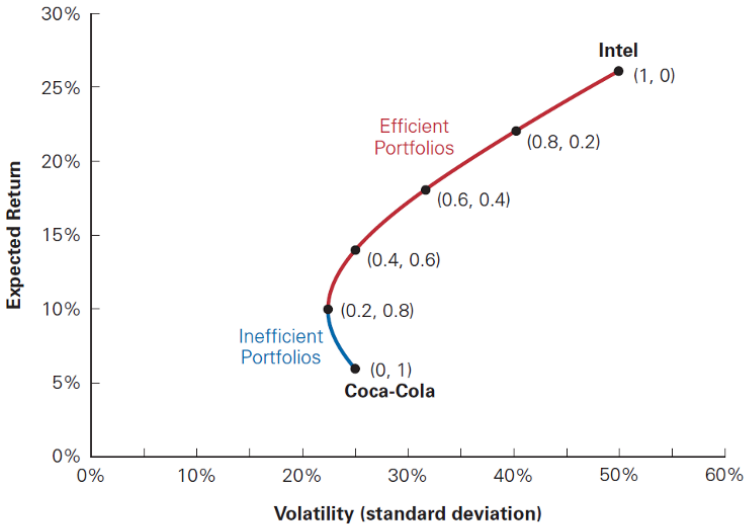
$$Var(R_p) = x_1^2 Var(R_1) + x_2^2 Var(R_2) + 2x_1 x_2 Cov(R_1, R_2)$$

CHAPTER 11.4 - RISK VERSUS RETURN: CHOOSING AN EFFICIENT PORTFOLIO

- A portfolio consists of various stocks. Due to diversification, it is possible to find a portfolio with lower volatility than either stock. However, low volatility comes with low expected return. Investors care about both.

Portfolio Weights		Expected Return (%)	Volatility (%)
x_I	x_C	$E[R_P]$	$SD[R_P]$
1.00	0.00	26.0	50.0
0.80	0.20	22.0	40.3
0.60	0.40	18.0	31.6
0.40	0.60	14.0	25.0
0.20	0.80	10.0	22.4
0.00	1.00	6.0	25.0

- You can plot the volatility and expected return of each portfolio. The curve represents the different set of portfolios.



Inefficient Portfolios: possible to find another portfolio that is better in terms of both expected return and volatility

Efficient Portfolios: there is no other portfolio of the stocks that offer a higher expected return *with lower volatility*. Investors choose among portfolios based on their own preferences for return vs risk.

CHAPTER 11.7 - THE CAPITAL ASSET PRICING MODEL

The Capital Assets Pricing Model (CAPM) is a financial model used to determine the expected return on an investment based on its level of risk, relative to the overall market. CAPM helps investors understand the relationship between the expected return of an asset and its risk, measured by the asset's sensitivity to market movements (beta).

Estimating the Cost of Capital of an Investment from Its Beta

$$r_I = \text{Risk-Free Interest Rate} + \beta_I \times \text{Market Risk Premium}$$

$$= r_f + \beta_I \times (E[R_{Mkt}] - r_f)$$

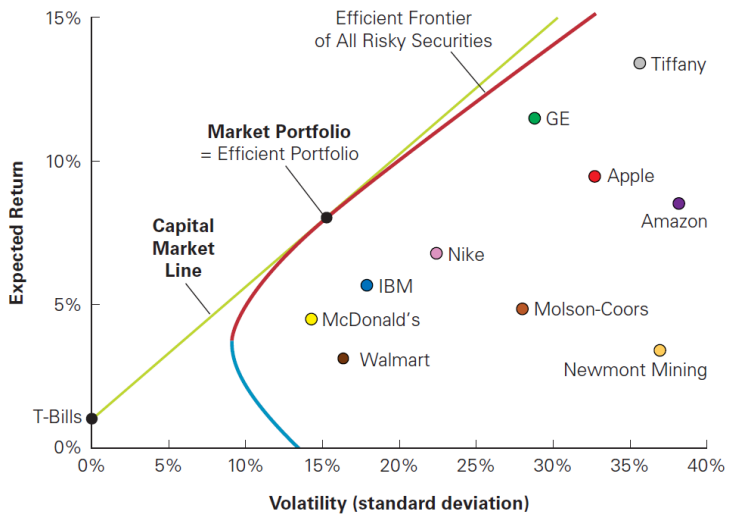
MARKET RISK PREMIUM

- r_f, return on a risk-free investment
- β is a measure of a stock's sensitivity to market movements
  - β > 1 --> asset more volatile than the market
  - β = 1 --> asset moves in line with the market
  - β < 1 --> asset less volatile
- R_m, market return: the expected return of the overall market (e.g S&P500)
- Market risk premium: the additional return expected from holding a risky market portfolio instead of a risk-free asset

CAPM assumptions:

1. Investors can buy and sell all securities at competitive market prices and can borrow and lend at the risk-free interest rate
2. Investors hold only efficient portfolios of traded securities - portfolios that yield the maximum expected return for a given level of volatility
3. Investors have **homogeneous expectations** regarding the volatilities, correlations and expected returns of securities (all investors use publicly available information sources)

When investors have homogeneous expectations, the market portfolio and the efficient portfolio coincide. Therefore, the **capital market line (CML)**, which is the line from the risk-free investment through the market portfolio, represents the highest-expected return available for any level of volatility.



CHAPTER 11.8 - DETERMINING THE RISK PREMIUM

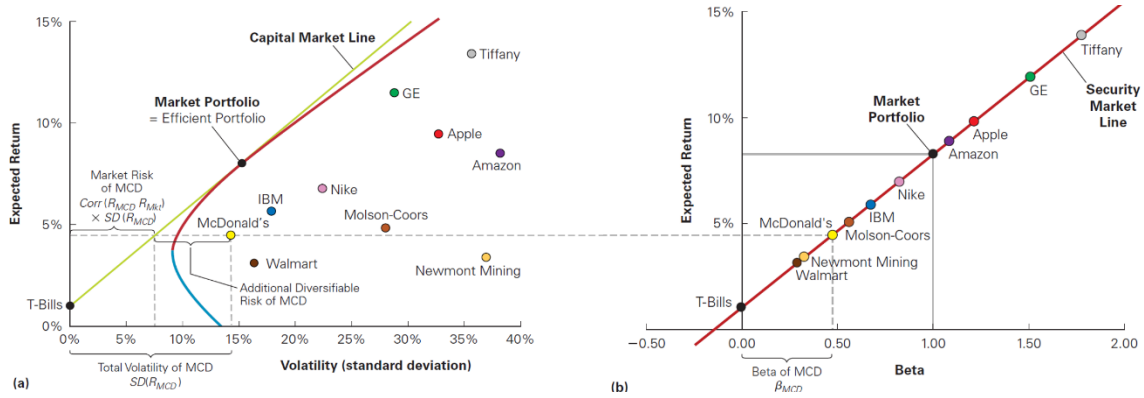
The CAPM Equation for the Expected Return

$$E[R_i] = r_i = r_f + \underbrace{\beta_i \times (E[R_{Mkt}] - r_f)}_{\text{Risk premium for security } i}$$

$$\beta_i = \frac{\overbrace{SD(R_i) \times Corr(R_i, R_{Mkt})}^{\text{Volatility of } i \text{ that is common with the market}}}{SD(R_{Mkt})} = \frac{Cov(R_i, R_{Mkt})}{Var(R_{Mkt})}$$

The efficient portfolio = market portfolio

To determine the appropriate risk premium for an investment, the market risk premium is adjusted by the security's beta (sensitivity to market risk relative to overall market). According to CAPM and the **Law of One Price**, in a competitive market, investments with similar market risk should have the same expected return, as firm-specific risk can be diversified away. Therefore, the expected return of a security should match the expected return of a portfolio on the capital market line with the same level of market risk.



The Capital Market Line

The CML depicts portfolios combining the risk-free investment (only efficient portfolios) and the efficient portfolio, and shows the highest expected return that we can attain for each level of volatility. According to the CAPM, the market portfolio is on the CML and all other stocks and portfolios contain diversifiable risk and lie to the right of the CML

The Security Market Line

The **Security Market Line (SML)** is a graphical representation of the CAPM that shows the relationship between the expected return of an investment (both efficient &inefficient portfolios) and its risk, measured by beta. The SML plots the expected return of an asset as a function of its beta, illustrating the trade-off between risk and return.

- **Y-axis (Expected Return)**: Represents the expected return of a security or portfolio.
- **X-axis (Beta)**: Represents the systematic risk (market risk) of a security relative to the overall market.
- **Slope**: The slope of the SML is the **market risk premium** (the difference between the expected return of the market and the risk-free rate).
- **Intercept**: The intercept of the SML is the **risk-free rate**, which represents the return on a risk-free asset (such as government bonds)

- **Above the SML**: A security with a return above the SML is undervalued because it offers more return for its level of risk.

- **On the SML**: A security on the SML is fairly valued, offering an appropriate return for its level of risk.
- **Below the SML**: A security below the SML is overvalued, providing less return for its level of risk.

The CAPM model assumes competitive markets, investors choosing efficient portfolios, and homogeneous expectations. It leads to two key conclusions:

1. The market portfolio is efficient, and the highest expected return for any volatility level is achieved on the capital market line.
2. The risk premium of any investment is proportional to its beta with the market, described by the security market line.

While CAPM's assumptions are idealized and not entirely accurate, it remains widely used for estimating a security's expected return and an investment's cost of capital.

12. Estimating the Cost of Capital

CHAPTER 12.1 - THE EQUITY COST OF CAPITAL

The cost of capital is the best expected return available in the market on investments with similar risk.

CAPM --> the market portfolio is a well-diversified, efficient portfolio representing the non-diversifiable risk in the economy. Investments with same sensitivity to market risk (Beta) have similar risks. The cost of capital of any investment opportunity = the expected return of available investments with the same beta --> Security Market Line (SML)

The CAPM Equation for the Cost of Capital (Security Market Line)

$$r_i = r_f + \underbrace{\beta_i \times (E[R_{Mkt}] - r_f)}_{\text{Risk premium for security } i}$$

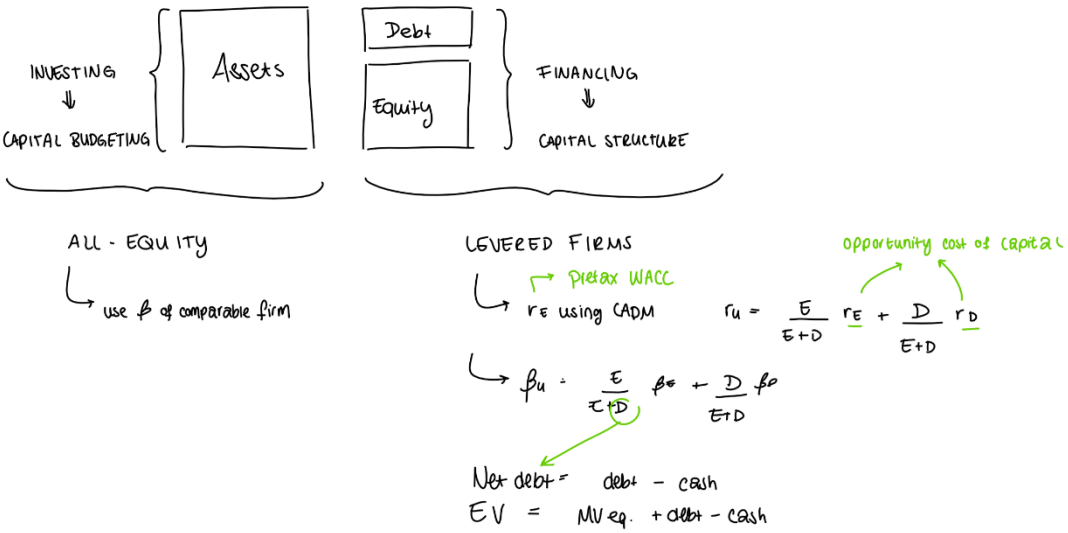
Remember:

- Total risk --> volatility
- Systematic (market) risk --> beta

CHAPTER 12.5 - A PROJECT'S COST OF CAPITAL

Estimating a project's beta by identifying comparable firms in the same line of business as the projects considered undertaking:

A. All-equity comparables (all-equity financed firm, so no debt): use the firm's equity beta and cost of capital as estimates for the project
B. Levered firms comparables: the firm's cash flows will either be used to pay debt or equity holders. The return of the firm's assets is the same as the return of a portfolio of the firm's debt+equity. The beta of the assets will match the beta of the project.



Unlevered cost of capital **Pretax WACC**	**Weighted average cost of capital** **WACC**
• Expected return investors will earn holding firm's assets • All-equity financed project with same risk as firm	• When a firm finances its own project using debt, it will benefit from the interest tax deduction (the corporate tax code allows the firm to deduct interest payments on debt from its taxable income). • Interest expense tax deductible, so WACC < Pretax WACC • Project with same risk and financing as firm itself
Asset or Unlevered Cost of Capital $r_U = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D$ **Asset or Unlevered Beta** $\beta_U = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D$	**Weighted Average Cost of Capital (WACC)** $r_{wacc} = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D(1-\tau_C)$ $r_{wacc} = r_U - \frac{D}{E+D}\tau_C r_D$

E: total market value of equity
D: total market value of debt
r_E: equity cost of capital
r_D: debt cost of capital
τ_c: firm's corporate tax rate

Net debt: Debt - Excess Cash & short-term investment

- Cash represents a risk-free asset, reducing the average risk of the firm's assets
- Risk of enterprise value is more interesting

Industry Asset Betas--> combine estimates of asset betas for different firms in the same industry/line of business. This leads to reduction in estimation error and improvement of the accuracy of the estimated beta for the project.

CHAPTER 12.6 - PROJECT RISK CHARACTERISTICS AND FINANCING

Firm asset betas reflect the market risk of the *average* project in that firm. Individual projects may be more or less sensitive to the overall market. **Operating leverage**, the relative proportion of fixed vs variable costs, is one factor that can increase a project's market risk.

> If asked the value of a project --> calculate expected cash flow (revenue-costs) divide by cost of capital (r=rf+ B (Er - rf))

13.

14. Capital Structure in a Perfect Market

CHAPTER 14.1 - EQUITY VERSUS DEBT FINANCING

The risk of **unlevered equity** (equity with no debt) equals the risk of the project (cost of capital= risk-free interest rate+ risk premium), thus shareholders are earning an appropriate return for the risk they are taking

Equity in a firm that also has debt outstanding is called **levered equity**. Promised payments to debt holder must be made before any payments to equity holders are distributed. Leverage increases the risk of the equity of a firm. It is inappropriate to discount the cash flows of levered equity at the same discount rate used for unlevered equity. Investors in levered equity require a higher expected return to compensate for its increased risk. Thus, leverage increases the risk of equity even when there is no risk that the firm will default.

CHAPTER 14.2 - MODIGLIANI-MILLER 1: LEVERAGE, ARBITRAGE, AND FIRM VALUE

Perfect capital markets:

1. Investors and firms can trade the same set of securities at competitive market prices equal to the present value of their future cash flows
2. There are no taxes, transaction costs, or issuance costs associated with security trading
3. A firm's financing decisions do not change the cash flows generated by its investments, nor do they reveal new information about them

MM Proposition 1, in a perfect capital market, the total value of a firm's securities is equal to the market value of the total cash flows generated by its assets and is not affected by its choice of capital structure: MV equity + MV debt = MV unlevered = MV assets

Homemade leverage is when investors use leverage in their own portfolios to adjust the leverage choice made by the firm.

Market value balance sheet includes all assets and liabilities of the firm (including intangible assets) and all values are current market values (instead of historical costs).

- Value is created by a firm's choice of assets and investments
- MV Equity = MV Assets - MV Debt+Liabilities

Leveraged recapitalization is repurchasing a significant percentage of the outstanding shares with borrowed money

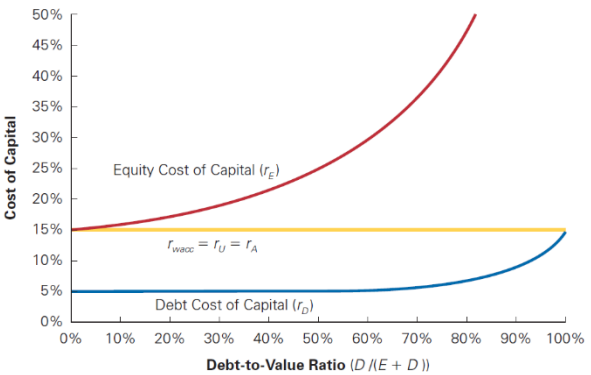
CHAPTER 14.3 - MODIGLIANI-MILLER 2: LEVERAGE, RISK, AND THE COST OF CAPITAL

MM Proposition 2, the cost of capital of levered equity increases with the firm's market value debt-equity ratio.

Cost of Capital of Levered Equity

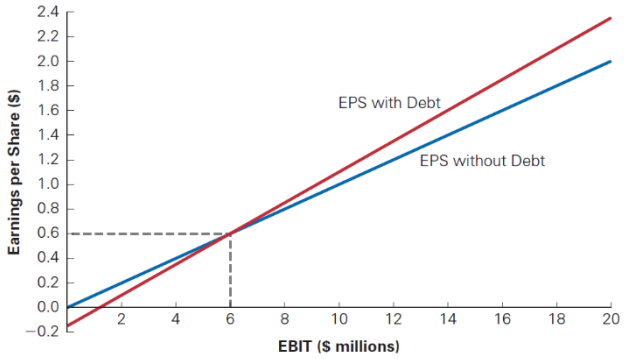
$$r_E = r_U + \frac{D}{E}(r_U - r_D)$$

With perfect capital markets, a firm's WACC is independent of its capital structure and is equal to its equity cost of capital if it is unlevered, which matches the cost of capital of its assets ($r_{wacc} = r_U = r_A$).



CHAPTER 14.4 - CAPITAL STRUCTURE FALLACIES

Earnings per share (EPS) increases with leverage, and so does its risk. While EPS increases on average, this increase is necessary to compensate shareholders for the additional risk they are taking, and so the share price does not increase as a result of the increase in leverage. The sensitivity of EPS to EBIT is higher for a levered firm than for an unlevered firm. Thus, given assets with the same risk, the EPS of a levered firm is more volatile.



CHAPTER 14.5 - MM: BEYOND THE PROPOSITIONS

The **conservation of value principle** for financial markets: with perfect capital markets, financial transactions neither add nor destroy value, but instead represent a repackaging of risk and therefore return.

15. Debt and Taxes

CHAPTER 15.1 - THE INTEREST TAX DEDUCTION

Corporations pay taxes on their profits after interest payments are deducted. The interest expenses reduce the taxable income. Leverage allows the firm to pay out more in total to its investors (including interest payments to debt holders), so it will be able to raise more total capital initially.

	With Leverage	Without Leverage
EBIT	$2800	$2800
Interest expense ⇒ DEBT HOLDERS	−400	0
Income before tax	2400	2800
Taxes (35%)	−840	−980
Net income ⇒ EQUITY HOLDERS	$1560	$1820

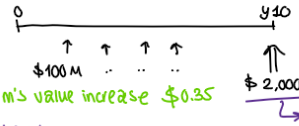
The gain to investors from the tax deductibility of interest payments is referred to as **interest tax shield** = corporate tax rate * interest payments

CHAPTER 15.2 - VALUING THE INTEREST TAX SHIELD

When a firm uses debt, the interest tax shield provides a corporate tax benefit each year. The total value of the levered firm V^L exceeds the value of the unlevered firm V^U due to the present value of the tax savings from debt:

$$V^L = V^U + PV(\text{Interest Tax Shield})$$

INTEREST YEARLY: $100 M for 10 years
REPAY in y10: $2.000 M
MARGINAL TAX RATE: 35%
↳ every $1 of debt, firm's value increase $0.35
rf: 5%



Q: increase in value as result of interest tax shield

interest tax shield = 35% * $ 100 M = $ 35 M each year

$$PV_{ann.} = C \times \frac{1}{r}\left(1 - \frac{1}{(1+r)^N}\right) = 35\,M \times \frac{1}{0.05} * \left(1 - \frac{1}{1.05^{10}}\right) = \$270\,M$$

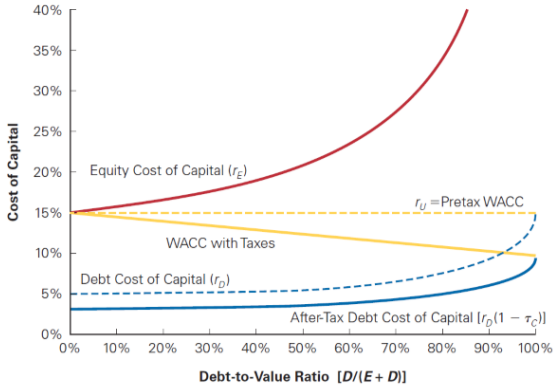
Present Value of Interest Tax Shield of Permanent Debt (D)

$$\begin{aligned} PV(\text{Interest Tax Shield}) &= PV(\tau_c \times \text{Future Interest Payments}) \\ &= \tau_c \times PV(\text{Future Interest Payments}) \\ &= \tau_c \times D \end{aligned}$$

With tax-deductible interest, the effective after-tax borrowing rate is $r(1 - \tau_c)$.

The tax deductibility of interest lowers the effective cost of debt financing

Unlevered cost of capital = pretax WACC
The effective after-tax WACC declines with the leverage as the interest tax shield grows.



Free Cash Flow $4.25 M
↳ growth = 4%
Equity cost of capital → r_E = 10%
Debt cost of capital → r_D = 6%
Corporate tax rate τ_c = 35%
Debt/Equity Ratio 0.50
Q: Value interest tax shield?

$V^L = V^U + PV$ (interest tax shield)
↳ pretax WACC = $\frac{E}{E+D} r_E + \frac{D}{E+D} r_D = \frac{1}{1.05} \cdot 10\% + \frac{0.5}{1.05} \cdot 6\% = 8.67\%$

$V^U = PV_{grow.perpetuity} = \frac{C}{r-g} = \frac{4.25\ M}{8.67-4} = \$91\ M$

WACC = $\frac{E}{E+D} r_E + \frac{D}{E+D} r_D (1-\tau_c) = \frac{1}{1.05} \cdot 10\% + \frac{0.5}{1.05} \cdot 6\% \cdot (1-0.35) = 7.97\%$

$V^L = PV_{grow.perpetuity} = \frac{4.25}{7.97-4} = \$107\ M$

PV (interest tax shield) = $V^L - V^U$ = 107 − 91 = $16 M

CHAPTER 15.3 - RECAPITALIZING TO CAPTURE THE TAX SHIELD

When a firm makes a significant change to its capital structure, the transaction is called a **recapitalization**.

20 M shares outstanding
Market price $15 p/s.
τ_c 35%
levered recap → borrowing $100 M

V^U = 20 M × $15 = $300 M
PV (interest tax shield) = $\tau_c \cdot D$ = 35% · $100 M = $35 M
V^L = $300 M + $35 M = $335 M → = total firm value (Debt + Equity)

Equity = $V^L - D$ = $335 − $100 = $235 M

Equity unlevered = $300 M
Equity levered = $235 M
↳ but: equity holders also benefit from the repurchase, so stock price will increase

Repurchase = $100 M / $15 = 6.667 M shares
New # shares outstanding = 20 M − 6.667 M = 13.333 M
New share price = $\frac{\text{Equity Value}}{\#\text{ shares}} = \frac{\$235\ M}{13.333\ M} = \$17.625$

gain = 17.625 − 15 = $2.625 p/s
$2.625 · 13.333 M shares = $35 M
BENEFIT TAX SHIELD

No arbitrage pricing → $\frac{\$335\ M}{20\ M} = \$16.75$ price per share

When the securities are fairly priced, the original shareholders of a firm capture the full benefit of the interest tax shield from an increase in leverage. **Interest tax shield is one of the firm's assets**.

CHAPTER 15.4 - PERSONAL TAXES

The effective tax advantage of debt τ^*

$$\tau^* = 1 - \frac{(1-\tau_c)(1-\tau_e)}{(1-\tau_i)}$$

20 M shares outstanding
Market price $15 p/s.
τ_c 35%
Levered Recap → borrowing $100 M

$\tau^* = 1 - \frac{(1-35\%)(1-20\%)}{(1-39.6\%)} = 13.9\%$

$V^L = V^U + \tau^* D = \$300\,M + 13.9\% \times \$100\,M = \$313.9\,M$

increase in stock price = $\frac{\$300\,M - \$313.9\,M}{20\,M} = \$0.695$ p/s

CHAPTER 15.5 - OPTIMAL CAPITAL STRUCTURE WITH TAXES

- Modigliani and Miller's theory in perfect capital markets suggested any capital structure was optimal. However, taxes create a benefit for debt financing through interest payments, which provide a tax shield.
- Most U.S. firms prefer issuing debt over equity, often using debt to repurchase shares. Internal funds, like retained earnings, primarily finance firm growth and investment.
- The optimal level of debt is when **interest = EBIT**, maximizing tax savings without exceeding taxable earnings. Excess leverage can lead to diminishing tax advantages and higher investor taxes.
- The optimal fraction of debt in a firm's capital structure depends on its earnings (EBIT).
- Growth firms should limit debt to keep interest payments below expected taxable earnings, ensuring the optimal leverage ratio without excess interest.

$$\text{Debt} \leq EBIT / r_D$$

As a firm's growth rate increases, its equity value rises faster than its optimal debt level, leading to a lower proportion of debt in its capital structure.

16. Financial Distress, Managerial Incentives and Information

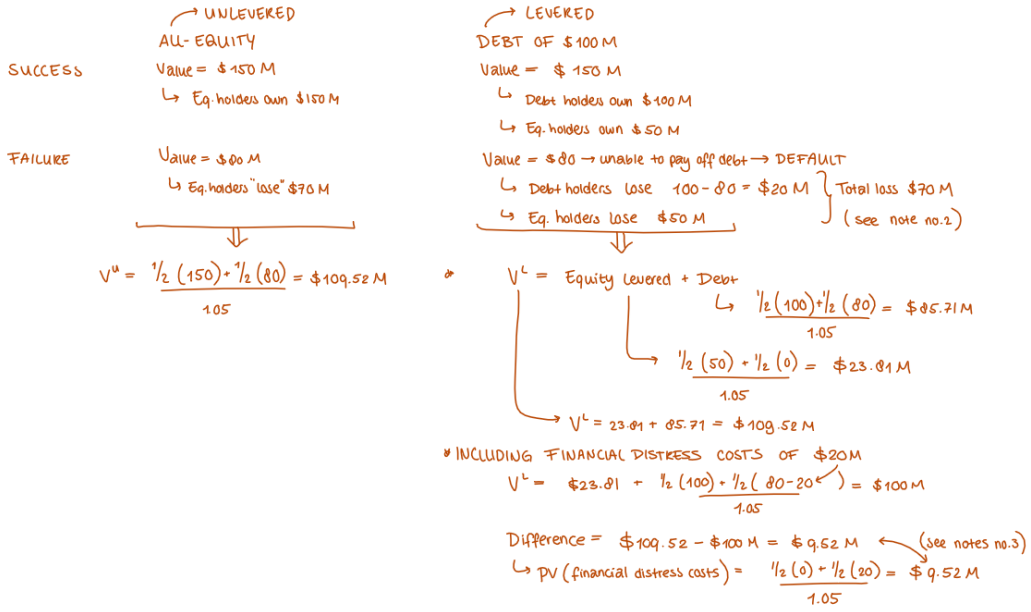
CHAPTER 16.1 - DEFAULT AND BANKRUPTCY IN A PERFECT MARKET

Default: when a firm fails to make the required interest or principal payments on the debt.

- Debt holders are given certain rights to the assets of the firm
- **Bankruptcy**: debt holders take legal ownership of the firm's assets

Study Case:

Success: revenue grows to $150 Million
Failure: value of firm only $80 Million
10 Million stocks



Notes:

1. If a firm has access to capital markets and can issue new securities at a fair price, then it need not default as long as the market value of its assets exceeds its liabilities.
2. In case of failure, the investors lose $70M either way, independent of levered or unlevered. Decline in value of the firm's assets is not caused by bankruptcy, but rather is a result of **economic distress**.
3. When securities are fairly priced, the original shareholders of a firm pay the present value of the costs associated with bankruptcy and financial distress.

CHAPTER 16.2 - THE COSTS OF BANKRUPTCY AND FINANCIAL DISTRESS

The bankruptcy code:

- **Chapter 7 liquidation**: creditors paid (liquidation of assets through auction), game over for company
- **Chapter 11 reorganization**: reorganization plan, business continues (medium large enterprises)
  - Costly process, so for smaller firms --> Small Business Reorganization Act
- **Chapter 13**: personal items protected (in case of sole proprietorship)

Circumventing bankruptcy:

- Workout: negotiation with creditors (not formal)
- Prepack: 1) reorganization plan with main creditors, and 2) court involved to file for Chapter 11 reorganization

Costs of bankruptcy:

1. Direct costs: change from equity holders to debt holders and court fee's
2. Indirect costs : loss of employees, customers, suppliers (debtor-in-possession DIP financing: new debt issued by a bankrupt firm, financing to keep operating), financial distress for the creditor

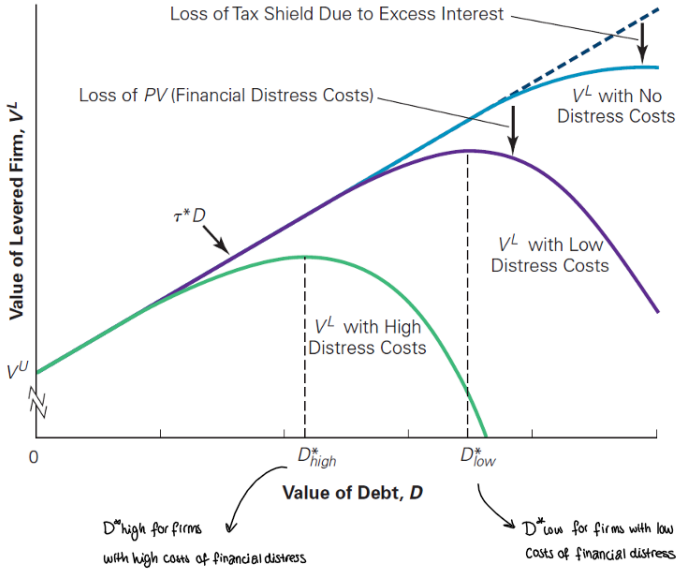
CHAPTER 16.4 - OPTIMAL CAPITAL STRUCTURE: THE TRADE-OFF THEORY

Trade-off theory states that the total value of a levered firm equals the value of the firm without leverage plus the present value of the tax savings from debts, less the present value of financial distress costs. It weighs the benefits of debt that result from shielding cash flows from taxes against the costs of financial distress associated with leverage.

$$V^L = V^U + \underbrace{PV(\text{Interest Tax Shield}) - PV(\text{Financial Distress Costs})}_{\text{Optimal Debt}}$$

PV of financial distress costs: reduction in value of the firm, depending on:

- Probability: #liabilities and volatility
- Magnitude of costs, varying per industry
- Discount rate: market risk and Beta --> Firms with higher betas are more exposed to economic risk, which increases the likelihood of distress during downturns. This makes the beta of distress costs more negative, lowering the discount rate and increasing the present value of these costs. Therefore, firms with higher betas tend to have higher distress costs in present value terms.

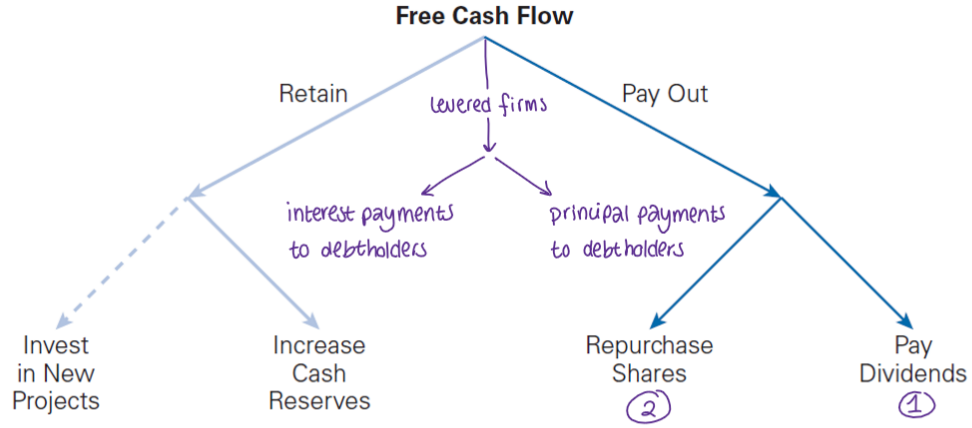


Firms should increase their leverage until it reaches the level of Debt, for which V^L is maximized. At D*, the tax savings from leverage are offset by the increased probaility of incurring the costs of financial distress.

17. Payout Policy

CHAPTER 17.1 - DISTRIBUTION OT SHAREHOLDERS

The payout policy is the choice between retaining cash, repurchasing shares or paying dividends.



1. Dividends -
    a. **Declaration date**: the date on which the board authorizes the dividend (stock trades **cum-dividend**, with dividend)
    b. **Ex-dividend date**: the two business days prior to the record date (anyone purchasing the stock on or after the ex-dividend date will not receive the dividend)
    c. **Record date**: the specific date on which the firm pays the dividend to all shareholders
    d. **Payable date / distribution date**: a month after the record date when the firm mails dividend checks to the registered shareholders
        i. Stock split: when company issues additional shares rather than cash to its shareholders
        ii. Return of capital: giving back part of the initial investment to the shareholders, which reduces the invested capital in the business
2. Repurchase Shares -
    a. **Open market repurchase**: firm announces intention to buy own shares in the open market over a longer period of time, not more than 25% of average daily trading volume
    b. **Tender offer**: buying shares at a prespecified price during a short time period at a premium price
        i. **Dutch auction**: firm lists different prices at which it is prepared to buy shares and shareholders indicate how many shares they are willing to sell at each price, the firm pays the lowest price for its desired number of shares
    c. **Target repurchase**: purchasing shares directly from a major shareholder, price negotiated directly with the seller
        i. **Greenmail**: buying out threatening shareholder at a large premium to prevent hostile take over

CHAPTER 17.2 - COMPARISON OF DIVIDENDS AND SHARE REPURCHASES

Study case:

$20M excess cash, no debt
Free cash flows $48M per year thereafter
Unlevered costs of capital 12%
Shares outstanding 10M

$EV = \frac{\$48M}{12\%} = \$400M$

$\text{Share price} = \frac{\$400M + \$20M}{10M} = \$42$

Possible Payout Policies:

A. Pay dividend with excess cash

Before ex-dividend date → P_{cum} = current dividend + PV(future dividends) = \$2 + $\frac{(\$48M/10M)}{0.12}$ = \$42

After ex-dividend date → P_{ex} = PV(future dividends) = $\frac{\$4.80}{0.12}$ = \$40

} Share price drops by the amount of the dividend

B. Share repurchase - no dividend

Initial share price \$42

Using \$20M to repurchase → \$20M / \$42 = 0.476 M shares
↳ # shares outstanding = 10M − 0.476M = 9.524M
New share price = \$400 M / 9.524 M = \$42 per share

} repurchase has no effect on the stock price

Homemade dividend case → Suppose having 2,000 shares

} by reinvesting dividends or selling shares, investors can replicate their own payout method

Repurchase Shares:
2,000 * \$42 = \$84,000 stock

Suppose you want \$4,000 cash
↳ sell \$4,000 / \$42 = 95 shares
↳ own (2,000 − 95) × \$42 = \$80,000 stock

Pay Dividends:
2,000 × \$40 = \$80,000 stock
2,000 × \$2 = \$ 4,000 cash

Suppose you don't want \$4,000 cash
↳ buy \$4,000 / \$40 = 100 shares
↳ own 2,100 × \$40 = \$84,000 shares

DRIP = dividend reinvestment program

! ex-dividend price

C. High dividend - equity issue

Firm wants to pay \$40 M in dividends now
↳ needs to raise \$40 M − \$20 M = \$20 M
↳ by selling \$20 M / \$42 = 0.67 M shares
↳ # shares outstanding 10 + 0.67 = 10.67 M
↳ dividend per year = $\frac{\$40\ M}{10.67M}$ = \$4.50 per share

P_{cum} = current div. + PV(future div.) = 4.50 + $\frac{4.50}{0.12}$ = \$42

} If firm pays higher current dividend (e.g. \$20 M vs \$40M) it will pay lower future dividends ($\frac{4.80}{0.12}$ vs $\frac{4.50}{0.12}$)

Buying or selling shares is a 0 NPV transaction, hence such transactions have no effect on the initial share price. The **MM Dividend Irrelevance** states that in perfect capital markets, holding fixed the investment policy of a firm, the firm's choice of dividend policy is irrelevant and does not affect the initial share price.

CHAPTER 17.3 - THE TAX DISADVANTAGE OF DIVIDENDS

When receiving dividends, shareholders are taxed according to dividend tax rate.
When selling shares, the homemade dividend is taxed according to the capital gains tax rate.

Suppose firm raises $10M from shareholders, to pay $10M dividend
Dividend tax (τ_d) 40%
Capital gains (τ_g) 15%

Q: How much will shareholders receive after taxes?

Initial amount		$ 10 M	
− Div. tax rate τ_d	(40%)	$ 4 M	Total taxes 4 − 1.5 = $2.5M
+ Capital gains taxes τ_g	15%	$ 1.5M	+/−
Dividends after taxes		$ 7.5 M	

CHAPTER 17.4 - DIVIDEND CAPTURE AND TAX CLIENTELES

The investor earns profit when the after-tax dividend >> after-tax capital loss

$$(P_{cum} - P_{ex})(1 - \tau_g) = Div(1 - \tau_d)$$

$P_{cum} = price\ before\ ex - dividend$
$P_{ex} = price\ after\ ex - dividend$
$\tau_g = tax\ rate\ capital\ gains$
$\tau_d = dividend\ tax\ rate$
$\tau^*_d = effective\ dividend\ tax\ rate$, indicates the tax disadvantage of dividends (each $1 of dividends is worth 1- τ^*_d in capital gains)

$$\tau_d^* = \left(\frac{\tau_d - \tau_g}{1 - \tau_g}\right)$$

The effective dividend tax rate for an investor depends on the tax rates the investor faces on dividends and capital gains. These rates depend on:

- Income level: tax rates vary per tax bracket
- Investment horizon: capital gains of stock held <1Y are taxed at higher rates
- Tax jurisdiction, depending on the state/country
- Type of investor/investment account. Note that corporations have a negative τ^*_d, resulting in a tax advantage associated with dividends

Differences in tax preferences across investor groups create **clientele effects**, in which the dividend policy of a firm is optimized for the tax preference of its investor clientele. The **dividend-capture theory** states that absent transaction costs, investors can trade shares at the time of the dividend so that non-taxed investors receive the dividend.

18. X

19. X

20. X

21. X

22. X

23. Raising Equity Capital

CHAPTER 23.1 - EQUITY FINANCING FOR PRIVATE COMPANIES

Private companies can raise outside equity capital from:

- **angel investors** - rich entrepreneurs providing initial capital to start business (early stage financing) in exchange for a **convertible note** (converting the value of initial investment + accrued interest into equity at a discount to the price paid by new investors, which allows for postponed valuation of the business).
- **venture capital firms** - limited partnership specialized in raising money to invest in the private equity of young firms in exchange for **carried interest** and control in the board of directors.
- **private equity firms** - investing in the equity of existing more mature companies, often those that are underperforming or undervalued, and seek to restructure or optimize their operations to increase profitability. PE firms use debt to finance a portion of their acquisitions, a strategy called **leveraged buyouts (LBOs)**. This allows them to use less of their own capital and amplify returns, although it also increases the company's debt burden.
- **institutional investors** - major investors (e.g. insurance company, foundations) in a variety of assets.
- corporate investors - established corporations purchase equity in young private companies. For corporate strategic objectives & investment returns.

Venture Capital Investing

When a company founder sells equity to outside investors for the first time, it is common for private companies to issue **preferred stock** rather than common stock.

- Preferred stock, especially from mature companies, often comes with **preferential rights** like dividends, liquidation preference, or voting advantages over common stockholders.
- For younger companies, preferred stock typically doesn't pay regular dividends but is usually **convertible** into common stock. This gives investors flexibility—if the company faces financial troubles, preferred stockholders have a **senior claim** on assets. If the company succeeds, they can convert their shares to gain the same rights as common stockholders.

Post-money Valuation = Pre-money Valuation + Amount Invested

- Pre-money Valuation: value of the prior shares outstanding at the price of the funding round
- Post-money Valuation: value of the whole firm (total # of shares) at the funding round price

	Number of Shares	Price per Share ($)	Total Value (in $ million)	Percentage Ownership
Series A	13,713,439	0.67	9.2	83.6%
Series B	2,686,567	0.67	1.8	16.4%
	16,400,006		11.0	100.0%

- When a company founder sells stock to an outsider to raise capital, the founder's ownership shares and control over the company are reduced.
- Benefits of convertible preferred stock (making them worth more than common shares):
  - **Liquidation preference**: minimum amount paid to holders before any payments to common stockholders
  - **Seniority**: later-round investors are repaid before earlier-round investors
  - **Pari Passu**: all investors with equal priority share repayments equally, regardless of their investment round
  - Participation rights
  - Anti-dilution protection: new funding raised at a lower price (down round), investors can convert shares to common shares at a lower price, increasing their ownership

    - Board membership: securing control rights by allowing new investors to negotiate the right to appoint new members to the board of directors
- Equity investors in private companies plan to sell their stock eventually through one of two main exit strategies: an acquisition or a public offering.

CHAPTER 23.2 - THE INITIAL PUBLIC OFFERING

IPO is the process of selling stock to the public for the first time.

Advantages	Disadvantages
Greater liquidity by ability for investors to diversify	Equity holders become more widely dispersed--> lack of ownership concentration and monitoring management
Better **access to capital** through public markets	Compliance with financial disclosure standards is costly and time-consuming

Types of Offerings

Managers of the company work with an **underwriter**, an investment banking firm that manages the offering and designs its structure.

- **Primary offering**: new shares to raise new capital
- **Secondary offering**: existing shares sold by current shareholders as part of exit strategy (due to 180-day **lockup**, preexisting shareholders cannot sell their shares for 180days after IPO)
- **Best-efforts IPO**: underwriter does not guarantee that the stock will be sold, but tries to sell them for the best possible price (usually all-or-none clause)
- **Firm commitment IPO**: underwriter guarantees to sell all of the stock at the offer price. Underwriter purchases the entire issue (offer price **- underwriting spread**) and resells it at the offer price. The underwriter takes the loss in case part of the shares are sold at a lower price
- **Auction IPO**: market determines the price of the stock by placing bids. The auction IPO sets the highest price such that the # of bids ≥ bid price = # offered shares

The Mechanics of an IPO

IPOs are managed by a group of underwriters. The **lead underwriter** is the primary banking firm responsible for managing the deal. The other underwriters, the **syndicate**, help market and sell the issue. Underwriters actively participate in determining the offer price and commit to making a market in the stock after issue, guaranteeing that the stock will be liquid.

The SEC requires the company to prepare a **registration statement**, which provides financial information about the company to investors. The **preliminary prospectus** circulates to the investors before the IPO. The **final prospectus** contains all the details of the IPO, the # of shares and the offer price.

After establishing the price range that provides a reasonable valuation of the company, a road show is arranged in which senior management travels to promote the company to the largest customers. **Book building** is the process of coming up with the offer price based on customers' expressions of interest.

Underwriters use strategies like **underpricing** and the **greenshoe provision** to manage risk when bringing a company to the public market through an IPO (Initial Public Offering).

1. **Underpricing**: Underwriters intentionally set the IPO price lower than the estimated market value of the shares. This ensures demand for the shares and reduces the chance of the stock price dropping below the offering price, which would be a loss for the underwriter.
2. **Greenshoe Provision** (or **over-allotment option**): This is a tool underwriters use to stabilize the share price after the IPO. It allows them to issue and sell up to an additional 15% more shares than originally planned. Here's how it works:
    - If the IPO is **successful** and demand for shares is high, the underwriter exercises the greenshoe option and sells the additional shares, covering their **short position** (the extra shares sold).
    - If the IPO **underperforms** and the stock price falls, the underwriter can cover their short position by **repurchasing** shares at a lower price in the aftermarket. This action can help support the share price and protect the underwriters from losses.

CHAPTER 23.3 - IPO PUZZLES

1. On average, IPOs appear to be underpriced: The price at the end of trading on the first day is often substantially higher than the IPO price.
2. The number of issues is highly cyclical: When times are good, the market is flooded with new issues; when times are bad, the number of issues dries up.
3. The costs of an IPO are very high, and it is unclear why firms willingly incur them.
4. The poor long-run performance of a newly public company (three to five years from the date of issue). That is, on average, a three- to five-year buy and hold strategy appears to be a bad investment.

CHAPTER 23.4 - THE SEASONED EQUITY OFFERING

Seasoned equity offering (SEO) is returning to the equity market to offer new shares for sale.

1. **Cash offer**: firm offers the new shares to investors at large
2. **Rights offer**: firm offers the new shares only to existing shareholders, protecting them from underpricing

- Price usually drops with the announcement of the SEO. The decision to raise financing externally usually implies that a firm plans to pursue an investment opportunity, taking on risks.