Fundamentals of Corporate Finance notes

Contents

Chapter 1 – Goals and Governance of the Firm

Investment and Financing decisions

The investment (Capital Budgeting) Decision

- CAPEX Decision = Capital budgeting or capital expenditure decision
- Tangible and intangible assets = Factories vs. R&D
- The investment

The Financing Decision

- Financing decision = Decision on the sources and amounts of financing for the investments and operations
  - Equity investors = Equity financing
  - Debt investors = Investors are lenders
- Decision between type of investors = Capital structure decision

- Real assets = Assets used to produce goods and services
  - When a firm invest, they acquire real assets.
  - It financed the real assets by **financial assets** = Financial claims to the income generated by the firm's real assets (stock or bank loans)

- Financial assets that are traded in public markets = Securities

The investment decision = purchase of real assets
The financing decision = sale of financial assets

What is a corporation?

- Corporation = A business organized as a separate legal entity owned by stockholders
  - It has a "articles of incorporation, which sets the purpose, financed, managed and governed.

- Shareholders have **limited liabilities**, as the corporation is distinct from its shareholders

Two types of business organizations:

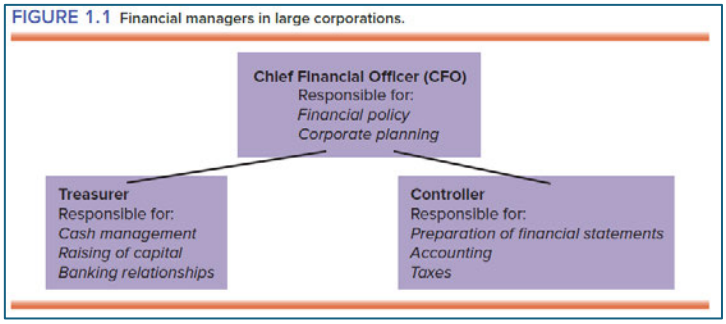
- Closely held / Private company
- Public companies

Other forms of business organizations

- Sole proprietorship
- Partnership (Tax advantage → No need to pay income taxes, partners pay personal income taxes
  - But unlimited liability
- Limited partnership:
  - General partners → Unlimited personal liability for debts
  - Limited partners → Only liable for the money they invest + don't participate in management
- LLP = Limited liability partnerships
- LLC = Limited liability companies
- PC = Professional corporation (Limited liability but able to be sued personally e.g., for malpractice)

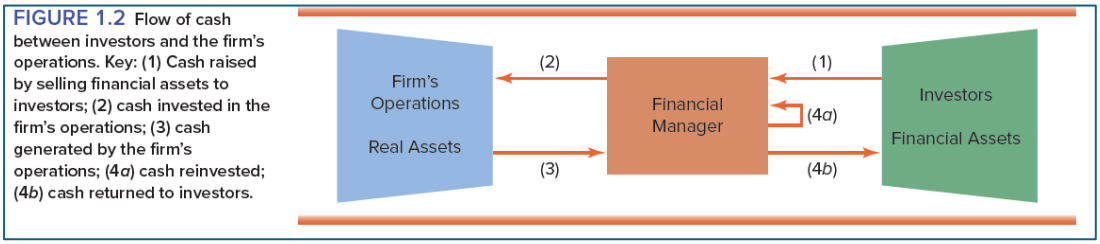
Who is the financial manager?

- CFO = Chief financial officer (Supervises all financial functions and sets overall financial strategy



- Treasurer = Responsible for financing, cash management, and relationships with banks and other financial institutions

- Controller = Responsible for budgeting, accounting, and taxes (Prepares financial statements and manages internal budgets + tax affairs)

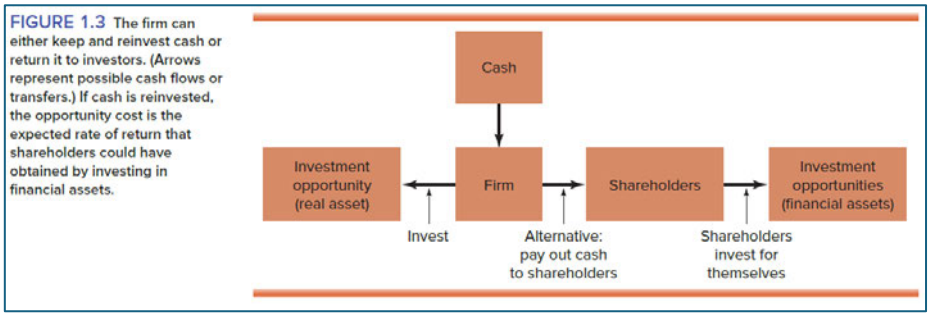


Goals of the corporation

<u>Shareholders want maximized market value.</u>

- Profit maximization is not a well-defined corporate objective.
    - Short-term profit maximization can hurt long-term, if e.g., they choose to cut back on maintenance of train staff to save on the expenses.

<u>The investment trade-off</u>



- Should the excess money be reinvested or pay out as dividends?
    - Depends on the **rate of return**
        - If rate of return for the investment project > rate of return the shareholders can get by investing on their own = Shareholder's would vote for the investment project

- If cash is reinvested = Opportunity cost is the expected rate of return that shareholders could have obtained by investing in financial assets
- As long as the company proposed investments offer higher rate of return than its shareholders can earn for themselves, the company can keep the money and increase its market value.
- ****Hurdle rate** or **opportunity cost of capital** = The minimum acceptable rate of return on capital investments set by the investment opportunities available to shareholders in financial markets
- However, we still have to take risk into consideration when thinking about investment projects.

Agency Problems, Executive Compensation, and Corporate Governance

- Agency problems = Managers are agents for stockholders and are tempted to act in their own interest rather than maximizing value
    - Losses in value due to agency problems or from the cost of mitigating agency problems = Agency costs

- Claimants/stakeholders = Anyone with a financial interest in the corporation

Controlled in practice:

1. Internal controls and decision-making procedures to prevent wasteful spending and discourage careless investment.
2. Corporations try to design compensation schemes that align managers' and shareholders' interests.
3. The corporations are constrained by systems of corporate governance.

<u>Executive Compensation</u>

- Compensation packages = Based on performance
- Stock option or money option.
    - Stock option = Aligning shareholders with agents (managers)

<u>Corporate governance</u>

- The laws, regulations, institutions, and corporate practices that protect shareholders and other investors.

- **Legal requirements** = Laws and regulations that protect investors from self-dealing by insiders (Duty of fiduciary)

- **Board of directors** = Elected by shareholders and is supposed to represent their interest

- **Activist shareholders** = Institutional shareholders, including pension funds, have become more active in monitoring management and pushing for changes
    - **Blockholders** = Investors who own 5%, 10% or more of the outstanding shares
        - Wall Street Walk = Sell out and move to other investment projects (when disagreeing with management)

- **Takeovers** = The further the stock price falls, the easier it is for another company to buy up the majority of shares and take over.

- **Information for Investors** = The U.S. Securities and Exchange Commission (SEC) sets accounting and reporting standards for public companies.

The Ethics of Maximizing Value

- Honest financial firms seek to build long-term relationships with their customers and to establish a name for fair dealing and financial integrity.
- There need to be no conflict between value maximization and ethical behaviour.
- The surest route to maximum value starts with products and services that satisfy customers. A good reputation with customers, employees, and other stakeholders is important for the firm's long-run profitability and value.

Chapter 2 – Financial Markets and Institutions

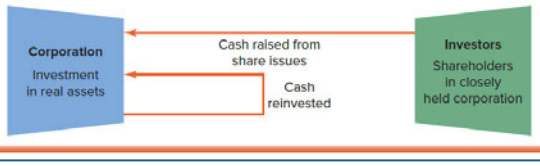
2.1 The Importance of Financial Markets and Institutions

- IPO = First issuance for shares (turning the company public)
- A modern financial system offers financing in many different forms, depending on the company's age, its growth rate, and the nature of its business.
- Supply companies with cash.

2.2 The Flow of Savings to Corporations

- The money that corporations invest in real assets comes ultimately from savings by investors. But there can be many stops on the road between savings and corporate investment. The road can pass through financial markets, financial intermediaries, or both.

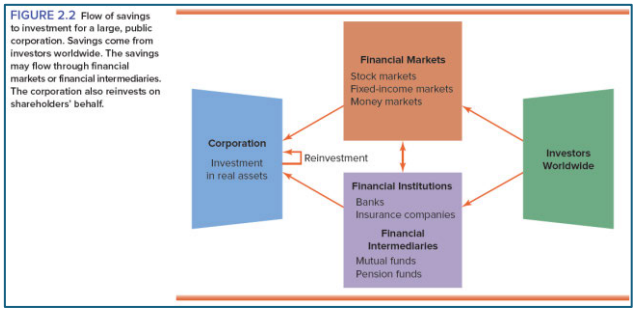
FIGURE 2.1 Flow of savings to investment in a closely held corporation. Investors use savings to buy additional shares. Investors also save when the corporation reinvests on their behalf.



- Cash retained and reinvested in the firm's operations is cash saved and invested on behalf of the firm's shareholders.

- Bank loan = Bank raised money by attracting savings accounts

FIGURE 2.2 Flow of savings to investment for a large, public corporation. Savings come from investors worldwide. The savings may flow through financial markets or financial intermediaries. The corporation also reinvests on shareholders' behalf.



- **Banks** obtain most of their funds by taking in deposits, but also by issuing shares of their own in stock markets.
- **Insurance companies** take in funds when they sell policies and can invest those funds either by making direct loans or by buying bonds.
- **Pension funds** similarly invest the pension contributions of plan participants.
- **Debt-oriented mutual funds** also may buy bonds, and **equity funds** may buy shares.

- **Financial intermediary** = E.g., a Bank that has shares in another company, so when I buy shares of the Bank, I indirectly own a share of the third/other company.

Stock market (a.k.a. Equity markets)
- Financial market = Market where securities are issued and traded
- A security = A traded financial asset

- **New issue** = Primary issue and is sold on the primary market (which is a market where you sell new securities by corporations)

- **Secondary market / Secondary transactions** = Market which previously issued securities are traded among investors. This is transactions between existing securities.

Other Financial Markets
- Most debt securities are traded **over the counter** through a network of banks and security dealers.
- Government debt is also traded *over the counter*.

- **Debt or fixed-income market** = Market for debt securities

- Capital markets = Markets for long-term financing (debt and equity)

- Money market = Market for short-term financing (less than one year)
    - E.g., Commercial paper = Debt issues with maturity of no more than 270 days

- *Foreign exchange markets*
    - Companies with international trade must be able to transfer money between other currencies, using a network of international banks

- *Commodities markets*
    - Corn, wheat, gold, etc.

- *Markets for options and other derivatives*
    - Derivatives are securities whose payoffs depend on the prices of other securities or commodities.
    - Commodity and derivative markets are not sources of financing but markets where the financial manager can adjust the firm's exposure to business risks.

Financial intermediaries

- **Financial intermediaries** = An organization that raises money from investors and provides financing for individuals, corporations, or other organizations.
    - Invest its money in *financial assets and not real assets*

- **Mutual fund** = An investment company that pools the savings of many investors and invest in a portfolio of securities
    - Raise money by selling shares to investors
    - Mutual funds offer investors low-cost diversification and professional management. For most investors, it's more efficient to buy a mutual fund than to assemble a diversified portfolio of stocks and bonds.
    - *Money flow:*

- **Hedge funds** = Private investment fund that pursues complex, high-risk investment strategies
    - Hedge funds usually follow complex, high-risk investment strategies, access is usually restricted to knowledgeable investors such as pension funds, endowment funds, and wealthy individuals.
    - Hedge funds try to attract the most talented managers with high compensation packages that they can pay because they charge investors potentially hefty, performance-related fees, for example, 20% of trading profits.
    - A strategy (Short selling):
        - A short seller borrows a security from another investor and sells it. Of course, the seller must sooner or later buy the security back and return it to its original owner. The short seller earns a profit if the security can be bought back at a lower price than it was sold for.

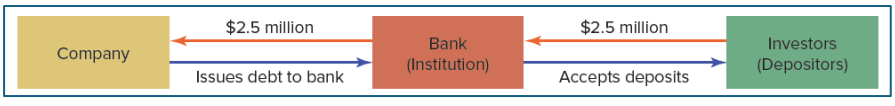
- **401 (K) plan** = Defined contribution plans. A retirement saving plan set up by the firm in the name of an employee. Some % of salary goes to that account and from that is being invested.

- **Pension funds** = Defined-benefit plans. A fund set up, funded, and managed by the employer to provide the assets necessary to pay promised retirement benefits to employees.

Financial institutions

- **Financial institutions** = Banks, insurance company, or similar financial intermediary
    - Invest in securities, led money to individuals, businesses, or other organizations.

- **Commercial Banks** = Major sources of loans for corporations
    - It provides debt financing for a company and provides a place for depositors to park their money safely.



- **Investment Banks** = They advise and assist companies in obtaining finance
  - They underwrite stock offerings by purchasing the new shares from the issuing company at a negotiated price and then reselling the shares to investors.
  - They advise on takeovers, mergers, and acquisitions.
  - They offer investment advice and manage investment portfolios for individual and institutional investors.
  - They run trading desks for foreign exchange, commodities, bonds, options, and other derivatives.
  - Investment banks can invest their own money in start-ups and other ventures.

- **Insurance Companies** = Insurance companies are more important than banks for the *long-term* financing of business. They provide financial capital either by loans or bonds.

2.3 Functions of Financial Markets and Intermediaries

Transporting cash across time (Manage cash flow efficiently across time)

- Finance shifts money over time:
  - Saving → Deposit money today withdraws later with interest.
  - Borrowing → Get money now, repay in the future.
- Lenders & Borrowers Benefit:
  - Lenders move money forward (investment).
  - Borrowers move money back (loans).
- Businesses & Governments also use this:
  - Firms borrow/sell shares for investments.
  - Governments issue debt to fund spending.
- Long-term financial planning:
  - Retirement savings (pension funds).
  - Life insurance transfers wealth to heirs.
- Financial institutions & markets make it easier:
  - Avoids searching for lenders/borrowers manually.
  - Banks monitor loans to ensure proper use & reduce risk.

Risk transfer and Diversification.

- Financial markets and intermediaries allow investors and businesses to reduce and reallocate risk.
- Insurance Companies:
  - Homeowner's insurance reduces risk of fire, theft, or accidents.
  - Insurance firms diversify risk by issuing thousands of policies, pooling risks across many customers.
- Investment Diversification:
  - Investors can reduce risk by buying shares in mutual funds.
  - Index funds (e.g., Vanguard 500 Index Fund) spread risk across hundreds of stocks.
  - Diversification eliminates company-specific risk but still carries overall market risk.

- Exchange-Traded Funds (ETFs):
    - ETFs track stock market indexes and can be traded like stocks.
    - More efficient & lower cost than mutual funds.
    - Example: SPDRs (Spiders) track the S&P 500 index with billions invested.
- Risk Management via Financial Markets:
    - Commodity markets allow risk-sharing (e.g., wheat farmers & baking companies).
    - Futures contracts stabilize prices by allowing sellers and buyers to lock in future prices.

Liquidity

- Ability to sell an asset on short notice at close to the market value

How Financial Markets Provide Liquidity:

- Banks & Deposits:
    - Banks provide liquidity by allowing depositors to withdraw money even if the bank has invested those funds in illiquid assets (e.g., real estate loans).
    - Directly lending to a borrower (without a bank) would make retrieving funds difficult.

- Stock Market Liquidity:
    - Public company shares are highly liquid because they trade continuously.
    - Investors can sell shares quickly without significantly affecting prices.

- Mutual Funds & ETFs:
    - Mutual funds redeem shares in cash because they invest in tradable securities.
    - ETFs track stock indexes and allow easy buying/selling like individual stocks.

- Liquidity Varies by Market:
    - Highly Liquid Markets:
        - Foreign exchange (currencies) → Large transactions happen instantly with minimal price impact.
        - U.S. Treasury securities → Very liquid due to strong demand.

    - Less Liquid Assets:
        - Small company stocks → Large sell orders can drop the price.
        - Real estate → Selling property quickly can result in lower prices.

- Liquidity & Market Conditions:
    - Selling in a rush (e.g., panic selling) may force a lower price.
    - Bank runs occur when too many depositors withdraw funds simultaneously, but deposit insurance prevents widespread panic.

The payment mechanism

- Checking accounts, credit cards, and electronic transfers allow individuals and firms to send and receive payments quickly and safely over long distances.

Information Provided by Financial Markets

- Financial markets provide essential data that help businesses and investors make informed decisions.

Key Areas Where Financial Markets Provide Information:

- Commodity Prices:
    - Companies use futures prices to estimate and lock in costs for raw materials.

- Interest Rates
    - Businesses determine borrowing costs by analysing bond interest rates.
    - If the company look at other fixed-income tools with same rating, they can estimate their own borrowing costs

- Company Valuations
    - The market capitalization of a company is determined by **stock price × shares outstanding.**
    - Stock prices reflect investor confidence in a company's current and future performance.
        - *Stock prices and company values summarize investors' collective assessment of how well a company is doing, both its current performance and its future prospects. Thus, an increase in stock price sends a positive signal from investors to managers.*

- Cost of Capital
    - Minimum acceptable rate of return on capital investment.
    - Firms use financial markets to estimate their cost of capital, the minimum return required on investment projects.
    - Projects must generate returns higher than the cost of capital to create value.
    - Riskier projects → Higher expected returns needed (determined by market rates, and often higher than interest rates)

2.4 The Crisis of 2007-2009

Financial Markets & Institutions Matter: The crisis confirmed their importance; when they failed, the global economy suffered.

- Roots of the Crisis:
    - Easy-money policies by the U.S. Federal Reserve after the 2000 dot-com bubble burst.
    - Large balance-of-payments surpluses from Asian economies invested in U.S. debt, lowering interest rates and encouraging lax credit.
- Subprime Mortgage Boom:
    - Banks expanded subprime lending, offering risky loans (e.g., "NINJA" loans – No Income, No Job, No Assets).
    - Mortgages were packaged into Mortgage-Backed Securities (MBSs), but many remained on bank balance sheets.
- Housing Bubble & Collapse:

  - House prices doubled from 2001 to mid-2006; then declined, leading to mass mortgage defaults.
  - Bear Stearns suffered major losses in mortgage investments by mid-2007.

- Crisis Peaks in 2008:
  - U.S. government bailed out Fannie Mae & Freddie Mac.
  - Bear Stearns was acquired by JPMorgan Chase with Federal Reserve support.
  - Lehman Brothers collapsed in September 2008.
  - Bank of America took over Merrill Lynch; AIG received an $85 billion government loan.
  - U.S. Treasury announced a $700 billion plan to buy toxic mortgage assets.
- Ripple Effects & Global Recession:
  - Panic led banks to stop lending to each other, drying up credit supply.
  - Business investment fell; unemployment soared; bankruptcies tripled.
  - European banks also suffered, leading to sovereign debt crises (e.g., Greece defaulted on €100 billion in debt in 2011).
- Key Lessons from the Crisis:
  - Liquidity Matters: The sudden loss of liquidity worsened the crisis, as financial markets couldn't function properly.
  - Excessive Debt is Dangerous: Investment banks like Lehman relied heavily on short-term debt, making them vulnerable. Post-crisis, regulators required banks to hold more equity capital.
  - Agency Problems: Executives prioritized short-term profits and bonuses over long-term financial health, leading to reckless risk-taking.

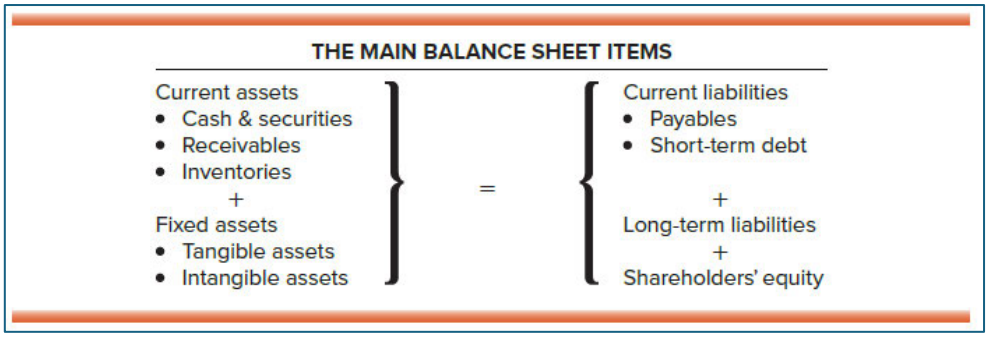
Chapter 3 – Accounting and Finance

3.1 The Balance Sheet

- Quarterly reports = 10Qs
- Annual financial statements = 10Ks
- The balance sheet presents a snapshot of the firm's assets and liabilities at one particular moment.

$$Working\ capital\ or\ Net\ current\ assets = Current\ assets - current\ liabilities$$

- Shareholders or Residual claimants → Shareholders equity = Net assets = Total assets – Total liabilities



Common size balance sheets

- All items in the balance sheet are expressed as a percentage of total assets.

TABLE 3.2 Target's common-size balance sheet (all items expressed as a percentage of total assets).

	Year Ending February 1			Year Ending February 1	
Assets	2020	2019	Liabilities and Shareholders' Equity	2020	2019
Current assets			Current liabilities		
Cash and marketable securities	6.0%	3.8%	Debt due for repayment	0.4%	2.5%
Receivables	1.2%	1.5%	Accounts payable	23.2%	23.6%
Inventories	21.0%	23.0%	Other current liabilities	10.3%	10.2%
Other current assets	2.0%	2.0%	Total current liabilities	33.9%	36.4%
Total current assets	30.2%	30.3%			
			Long-term debt	26.5%	24.8%
Fixed assets			Other long-term liabilities	12.0%	11.5%
Tangible fixed assets					
Property, plant, and equipment	112.6%	111.9%	Total liabilities	72.3%	72.6%
Less accumulated depreciation	46.0%	45.3%			
Net tangible fixed assets	66.7%	66.6%	Shareholders' equity:		
			Common stock and other paid-in capital	14.7%	14.7%
Intangible asset (goodwill)	1.6%	1.7%	Retained earnings	13.0%	12.6%
Other assets	1.6%	1.4%	Total shareholders' equity	27.7%	27.4%
Total assets	100.0%	100.0%	Total liabilities and shareholders' equity	100.0%	100.0%

Source: Derived from Target annual reports.

Book Values and Market Values

- Generally accepted accounting principles (GAAP)
    - U.S. procedures for preparing financial statements.

- Book Value
    - Net worth of the firm according to the balance sheet (NBV)
    - Historical cost = Purchasing price
    - Market values of assets and liabilities do not generally equal their book values. Book values are based on historical or original values. Market values measure current values of assets and liabilities (long-term liabilities market value is affected by interest rates).

- Market-value balance sheet
    - A market-value balance sheet records a firm's assets and liabilities at their current market values, rather than historical costs.
    - Unlike a traditional balance sheet, it reflects real-time financial conditions by including depreciation-adjusted and market-based valuations.
    - The difference between market-value assets and liabilities represents the market value of shareholders' equity.
    - Stock price is determined by dividing the market value of shareholders' equity by the number of outstanding shares.

3.2 The Income Statement

- Income statement

Financial statement that shows the revenues, expenses, and net income of a firm over a period of time.

$$EBIT\ (Earnings\ before\ interest\ and\ taxes) = Total\ revenues - Costs - Depreciation$$

- Common-size income statement
- All items on the income statement are expressed as a percentage of revenues.

Income versus Cash Flow

- Current expenditures e.g., wages
    - Deducted from current profits
- Capital expenditures e.g., buying a new machine
    - Depreciated
- *To calculate the cash produced by the business, it is necessary to add the depreciation charge (which is not a cash payment) back to accounting profits and to subtract the expenditure on new capital equipment (which is a cash payment*

Cash vs Accrual Accounting

- Cash accounting records transactions when cash flows occur, while accrual accounting records them when they are earned/incurred.
- Example:
    - Period 1: Firm spends $60 to produce goods (cash outflow).
    - Period 2: Goods are sold for $100, but payment is delayed.
    - Period 3: Cash is received (+$100).

- Accrual accounting records revenue and costs when they occur, not when cash is received or paid.

- Income statement approach:
    - Revenue: $100
    - Cost of Goods Sold (COGS): $60
    - Profit: $40

Cash Flow Adjustments

- Inventory treatment:
    - Cost spent in period 1 is recorded as an investment in inventory.
    - When goods are sold in period 2, inventory is reduced, and COGS is recorded.

- Accounts receivable:
    - Sales recorded when made (period 2), but cash is not received until later.
    - Balance sheet adjusts for investment in receivables (unpaid bills).
    - Cash inflow occurs when payment is collected.
- Income statement matches costs with revenue; inventories track goods not yet sold.

3.3 The Statement of Cash Flows

Statement of cash flows shows the firm's cash inflows and outflows from operations as well as from its investments and financing activities.

Cash Flow from Operations: This section shows how much cash the company generates from normal business activities. It starts with net income and adjusts for:

- Depreciation & Amortization (added back since it's a non-cash expense)
- Changes in working capital:

- Increase in accounts receivable → reduces cash (customers owe more)
- Decrease in inventory → increases cash (less money tied up in stock)
- Increase in accounts payable → increases cash (company delays payments)

Cash Flow from Investing Activities

- This section tracks money spent on capital expenditures (CapEx) and other investments.
- Capital expenditures (e.g., purchasing new equipment or property) → reduces cash.
- Selling assets or investments → increases cash.

Cash Flow from Financing Activities

- This section reflects how the company raises or returns capital:
  - Borrowing money (long-term or short-term debt issued) → increases cash.
  - Repaying debt → reduces cash.
  - Issuing new shares of stock → increases cash.
  - Paying dividends or stock buybacks → reduces cash.

Free cash flow (FCF)

The Cash flow available for distribution to investors after firm pays for new investments or additions to working capital.

$$Free\ Cash\ Flow = Interest\ payments\ to\ debt\ investors + Shareholders'operating\ cash\ flow - Capital\ exenditures$$

- Free Cash Flow (FCF) measures how much cash a company generates after covering capital expenditures, meaning the cash available for investors (debt + equity holders).

3.4 Accounting Practice and Malpractice

Companies often manage earnings to meet investor expectations, sometimes using questionable accounting practices.

Common Accounting Manipulations

- Revenue Recognition Issues
  - Channel Stuffing: Pushing extra sales to customers before the end of a period to inflate revenue.
  - Example: Under Armour pressured retailers to take early shipments.
- Cookie-Jar Reserves
  - Overstating reserves in good years to release them later and smooth earnings.
  - Example: Freddie Mac manipulated reserves for steady profits.

- Off-Balance Sheet Liabilities
  - Hiding debt in special-purpose entities (SPEs) to make financials look stronger.
  - Example: Enron used SPEs to conceal debt before its collapse.

Regulation & Corporate Transparency

- Sarbanes-Oxley Act (SOX) (After Enron & WorldCom scandals)
    - Created Public Company Accounting Oversight Board (PCAOB)
    - Stricter auditor independence & financial controls
    - Required CEOs & CFOs to certify financial statements

Rules-Based vs. Principles-Based Accounting

- U.S. GAAP (Rules-Based): Strict, detailed rules → easier to exploit loopholes.
- IFRS (Principles-Based): Used globally; focuses on broad guidelines for flexibility.
- SEC abandoned full IFRS adoption for the U.S.

3.5 Taxes

Corporate Taxation

Key Concepts:

- Corporate tax rate (2021) = 21% (reduced from 35% in 2017)
- $Taxable\ income = Revenue - Expenses - Deductions$
- Some expenses are deductible, reducing taxable income, while others are not.

What is Deductible?

- Interest on debt: Companies can subtract interest expenses from income, reducing taxes.
    - Firm A (Debt financing) paid less tax because it deducted interest, proving that debt financing reduces taxable income.
    - Firm B paid more taxes since it had no interest deduction.

- Depreciation: Companies spread out the cost of assets over time (instead of deducting it all at once).
- Dividends are NOT deductible: This results in double taxation (corporate + personal tax).

Loss Carry forward Rule

- If a company loses money, it does not receive a tax refund.
- Instead, it can carry losses forward and use them to offset up to 80% of future taxable income.
- Companies with losses defer tax payments to profitable years by carrying losses forward.

Personal Taxation

Key Concepts:

- Progressive tax system: The more you earn, the higher your tax rate.
- Marginal tax rate: The tax rate on each additional dollar earned.
- Average tax rate: Total tax paid ÷ Total income.
- The average tax rate is always lower than the marginal tax rate because income is taxed in brackets.

Investment Taxation (Capital Gains & Dividends)

- How Investment Income is Taxed
  - Capital Gains (profit from selling an asset)
  - Dividends (cash paid from company profits to shareholders)
- Capital Gains Tax
  - Taxed ONLY when the asset is sold (not when it increases in value).
  - Encourages long-term investing because taxes can be deferred.

- Investors prefer long-term capital gains because they are taxed at lower rates than regular income.
- Capital gains are only taxed when realized (when you sell the asset).

Key take aways:

- Corporations prefer debt financing because interest is tax-deductible, reducing taxable income.
- Double taxation occurs when corporate profits are taxed, and then dividends are taxed again at the personal level.
- Personal tax is progressive, with higher rates for higher incomes.
- Capital gains tax is deferred until the asset is sold, which benefits long-term investors.
- Companies can carry losses forward to offset future taxable income, reducing taxes over time.

Chapter 5: The Time Value of Money

5.1 Future Values and Compound Interest

- Interest = Interest rate * Initial investment
- Value of investment after one year = Initial investment * (1+ interest)
  - Opportunity cost is the money you give up today by investing, hoping that they increase in the future.
- Value of investment after two years = Initial investment * (1+ interest) * (1+ interest)

$$Initial * (1 + r)^2$$

- Future value (FV): Amount to which an investment will grow after earning interest

$$Future\ Value\ (FV)\ of\ \$100 = \$100 * (1 + r)^t$$

- Compound interest/Compounding = Earning interest on interest
  - Compound growth means that value increases each period by the factor (1 + growth rate). The value after t periods will equal the initial value times (1 + growth rate)^t. When money is invested at compound interest, the growth rate is the interest rate
- Simple interest = Interest earned only on the original investment; no interest is earned on interest

5.2 Present Values

- A dollar today is worth more than a dollar tomorrow.
- Present value (PV): Value today of a future cash flow (Always calculated using compound interest)

$$Present\ Value\ (PV)\ in\ 1\ period = \frac{Future\ value}{1+r}$$

$$Present\ Value\ (PV)\ in\ 2\ periods = \frac{Future\ value}{(1+r)^2}$$

- General formula for present value

$$Present\ value = \frac{Future\ value\ after\ t\ periods}{(1+r)^t}$$

$$PV = Future\ payment * \frac{1}{(1+r)^t}$$

- To calculate PV, we discount future value at the interet rate r
- This calculation is called **Discounted cash-flow (DFC) calculation,** where interest rate r is the **discount rate**
  - DFC = Method of calculating present value by discounting future cash flows
  - Discount rate = Interest rate used to compute present values of future cash flows

Future value and present value summed up:

To work out how much you will have in the future if you invest for t years at an interest rate r, multiply the initial investment by (1 + r) ^t. To find the present value of a future payment, run the process in reverse and divide by (1 + r) ^t.

- **Always use compound interest to calculate present values

Discount factor

The present value of a $1 future payment

$$\frac{1}{(1+\mathrm{r})^{\mathrm{t}}}$$

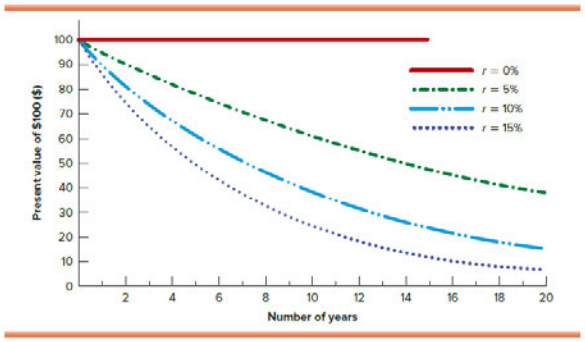


FIGURE 5.3 Present value of a future cash flow of $100. Notice that the longer you have to wait for your money, the less it is worth today.

Always discount the cash flows to a common date, before comparing them.

Interest rate

$$\mathrm{PV} = \$1{,}000 * \left(\frac{1}{(1+\mathrm{r})^{10}}\right) = 609.26$$

To find the interest rate we rearrange it:

$$609.26 * (1+r)^{10} = 1000$$

$$(1+r)^{10} = 1{,}6413$$

$$1 + r = 1{,}6413^{\frac{1}{10}}$$

$$r = 0{,}0508$$

5.3 Multiple Cash flows

Future value

To find the FV of a stream of CF, calculate the FV of each CF and then add up these FVs

E.g.,

$$(1200 * (1{,}08)^3 + 1400 * (1{,}08)^2 + 1400 * (1{,}08^1) = 4224{,}61 \textbf{ Total FV}$$

Present value

General principle: The PV of a stream of future CFs is the amount you need to invest today to generate that stream

5.4 Using spreadsheets to calculate time value of money

Single CF:

- FV = FV (rate, nper, pmt, PV)
- PV= PV (rate, nper, pmt, FV)

When using excel to find the future value, the PV is entered as a negative number, because that is the purchasing price.

Also PMT is zero

Multiple CFs:

- We calculate each and then add them together either by:

$$= PV(\text{ rate, nper, pmt, FV})$$

Or

$$= \frac{CF}{1 + r^t}$$

5.5 Level CF: Perpetuity and annuity

Annuity = equally spaced, level cash flow that is finite

Perpetuity = A steam that last for ever

Perpetuity:

$$Cash\ payment\ from\ perpetuity = interest\ rate * PV$$

$$C = r * PV$$

We can rearrange this relationship to derive the PV of perpetuity, given the interest rate and the cash payments

$$PV = \frac{C}{r}$$

That starts in the future:

$$PV\ of\ perpetuity = \frac{C}{r} * \frac{1}{1 + r^t}$$

$$so\ the\ PV * disocunt\ factor$$

Annuity:

$$PV\ of\ t'year\ annuity = C[\frac{1}{r} - \frac{1}{r(1 + r)^t})$$

It is also the annuity factor, so we can also say

$$Payment * annuity\ factor = PV\ of\ t'year\ annuity$$

We can always value a annuity by calculating the PV of each CF and finding the total, however using the annuity factor is a lot easier and faster.

You can calculate the **present value of an annuity lasting t years** as:

$$PVannuity = C[\frac{1}{r} - \frac{1}{r(1+r)^t})$$

This works because:

- $\frac{C}{r}$ *is the value of a perpetuity starting now (i.e., forever).*
- $\frac{1}{r(1+r)^t})$ *is the value today of a perpetuity that starts at year t (i.e., delayed perpetuity).*

Subtracting the delayed perpetuity removes all the infinite payments after year t, leaving you with just the finite series of payments for the first t years — which is exactly what an annuity is.

Future value of an Annuity

1. First find the present value of the cash flow streams
2. Then multiply by 1+r^t → To find the FV

$$\text{FV of annuity of \$1 a year} = \text{PV of annuity of \$1 a year} * (1 + \text{r})^{\text{t}}$$

$$=> \left[\frac{1}{r} - \frac{1}{r(1+r)^t}\right] * (1+r)^t$$

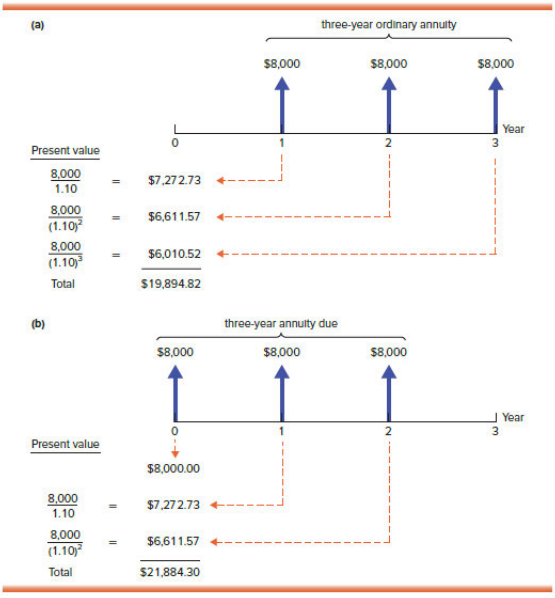
$$=> \frac{(1+r)^t - 1}{r}$$

Annuity due

Is known as a level stream of payments starting immediately

$$PV\ of\ annuity\ due = PV\ of\ ordinary\ annuity * (1+r)$$
$$FV\ of\ annuity\ due = FV\ of\ ordinary\ annuity * (1+r)$$

FIGURE 5.12 The cash payments on the ordinary annuity in panel *a* start in year 1. The first payment on the annuity due in panel *b* occurs immediately. The annuity due is therefore more valuable.



5.6 Using spreadsheet

It is the same principle as before with:

- FV = FV (rate, nper, pmt, PV)
- PV= PV (rate, nper, pmt, FV)

However, now the PMT is not zero. We enter the regular annuity payment in the PMT as a negative number

5.7 Effective Annual Interest Rate

The effective annual interest rate is the interest rate that is annualized using compound interest

$$1 + effective\ annual\ rate = (1 + monthly\ rate)^{12}$$

The annual percentage rate (APR) is the interest rate that is annualized using simple interest

$$1\%\ for\ 12\ months\ are\ 12\%$$

$$Monthly\ interest\ rate = \frac{APR}{12} = \frac{12}{12} = 1\%$$

Now converting to annually compounded interest rate

$$1 + effective\ annual\ rate = (1 + monthly\ rate)^{12} = (1 + 0{,}1)^{12} = 1{,}1268 - 1 = 12{,}68\%$$

The effective annual rate is the rate at which the funds invested will grow per the course of a year. It equals the rate of interest per period compounded for the number of periods in a year

$$\text{Effective annual interest rate} = 1 + (\frac{\text{APR}}{\text{m}})^{m} - 1\ where\ m\ is\ the\ compunding\ periods$$

5.8 Inflation and the time value of money

Nominal interest rate is the rate at which money invested grows
Real interest rate is the rate at which the purchasing power of an investment increases

$$Real\ FV\ og\ investment = \frac{1000 * (1 + nominal\ interest\ rate)}{1 + inflation\ rate}$$

If the nominal interest rate and the inflation rate is the same, your money has not grown ↓

$$1 + real\ interest\ rate = \frac{1 + nominal\ interest\ rate}{1 + inflation\ rate}$$

$$Real\ interest\ rate\ \approx nominal\ interest\ rate - inflation\ rate$$

Valuing Real Cash Payments

$$PV = \frac{C}{disocunt\ factor} = PV = \frac{C}{\frac{1 + inflation\ rate}{real\ intere\ rate}}$$

Current dollar CF must be discounted by the nominal interest rate: Real CF must be discounted by the real interest rate.

Chapter 6 – Valuing Bonds

6.1 Bond Pricing

- Treasury bonds with maturity of 2 to 10 years at the time of issue = Notes
- Corporate bonds sometimes called = Debentures

- Some bonds have:
  - A fixed interest payment (most of them)
  - Payments may go up or down as short-term interest rates change
  - Long maturity or short maturity

Example:
- 7,5% coupon bonds maturing in 2024
- Each year the bondholder receives interest of 7,5% of the bonds face value/ principal / par value
- Face value of 1,000$
- Thus, the annual interest payment is:

$$7{,}5\% * 1{,}000 = 75\$$$

- This interest payment = Bond's coupon
- The percent of face value = coupon rate
- Bond's value = present value of the cash flows
  - Find the value = Discount each future payment by the current interest rate

Suppose the going interest rate on medium-term government bonds is 3%. Then the present value of the 7.5s of 2024 is

$$\text{PV} = \frac{75}{1.03} + \frac{75}{1.03^2} + \frac{75}{1.03^3} + \frac{1{,}075}{1.03^4} = \$1{,}167.27$$

- Bond prices are usually expressed as a percentage of their face value. So, we can say that your Treasury bond is worth 116.727%.

Annuity formula:

$$PV = PV(Coupons) + PV\ (Face\ Value)$$

This is the (coupon * annuity factor) + (face value + discount factor)

Example from before:

$$75\$ * \left(\frac{1}{0.03} - \frac{1}{0.03(1.03)^4}\right) + 1{,}000\$ * \frac{1}{0.03^4}$$

If the bond has many years left, it is usually easier to value the coupon payments as an annuity rather than valuing each individual payment and then add on the present value of the final payment

Financial calculator:

You can calculate bond prices easily using a financial calculator or spreadsheet. The trick is to recognize that the bond provides its owner with *both* a recurring payment (the coupons) *and* an additional one-time cash flow (the face value). For the 7.5% bond, the time to maturity is four years, the annual coupon payment is $75, and face value is $1,000. The interest rate is 3%. Therefore, the inputs for a financial calculator would be:

	n	i	PV	PMT	FV
Inputs	4	3		75	1000
Compute			1167.27		

Now compute PV, and you should get an answer of −1,167.27, which is the initial cash outflow required to purchase the bond.

Financial Calculator Using a Financial Calculator to Compute Bond Yield

You can use a financial calculator to calculate the yield to maturity on our 7.5% Treasury bond. The inputs are:

	n	i	PV	PMT	FV
Inputs	4		−1167.72	75	1000
Compute		3			

Now compute *i* and you should get an answer of 3%.

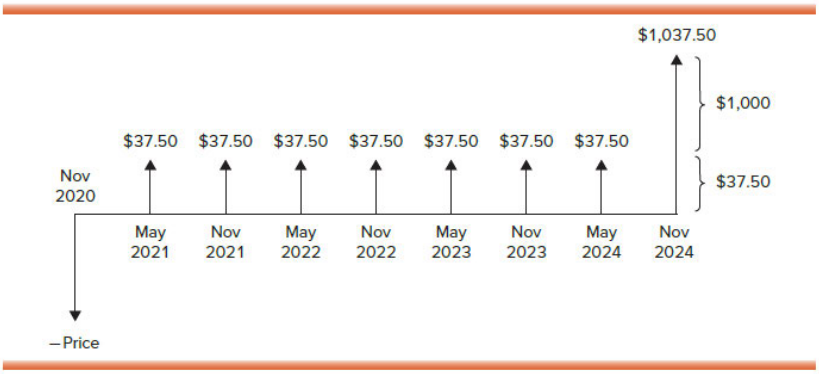
Let's now redo this calculation but recognize that the coupons are paid semiannually. Instead of four annual coupon payments of $37.50, the bond makes eight semiannual payments of $37.50. If the bond is selling for $1,167.72, we can find the semiannual yield as follows:

	n	i	PV	PMT	FV
Inputs	8		−1167.72	37.5	1000
Compute		1.1509			

This yield to maturity, of course, is a six-month yield, not an annual one. Bond dealers would typically annualize the semiannual rate by doubling it, so the yield to maturity would be quoted as 1.1509 × 2 = 2.3018%.

Semi-annual Coupon Payments

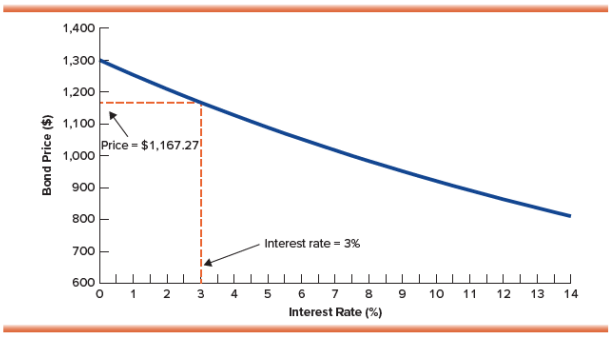
$$PV = \frac{37.5}{1.015} + \frac{37.5}{1.015^2} + \frac{37.5}{1.015^3} + \ldots + \frac{37.5}{1.015^7} + \frac{1{,}037.5}{1.015^8} = \$1{,}168.43$$



6.2 Interest Rates and Bond Prices

- The lower interest rate = the higher price
- Interest rates and bond prices must move in opposite directions
    - When interest rates fall, the cash flow are discounted at a lower rate -> Bond prices increase, and opposite.

FIGURE 6.4 The value of the 7.5% bond falls as interest rates rise.



- Interest rate risk = Risk in bond prices due to fluctuations in interest rates
    - When the interest rate rises, the present value of the payments to be received by the bondholder falls and bond prices fall. Conversely, a decline in the interest rate increases the present value of those payments and the price of bonds. Hence, bondholders are exposed to interest rate risk.

Interest rate risk and bond maturity:

- Short term bonds are less affected by long-term bonds when interest rate changes/ fluctuate

6.3 Yield to Maturity

- Rate of return:
    - Prices at face value (par and par bond) = coupon rate

	Cash Paid to You in Year				
You Pay	1	2	3	4	Rate of Return
$1,000	$75	$75	$75	$1,075	7.5%

- Bonds at a premium (premium bond) = experience a capital loss over the life of the bond, so rate of return is lower than the coupon rate
- Bonds at a discount (discount bond) = experience a capital gain over the life of the bond, so rate of return is greater than the coupon rate.

- Yield to maturity is defined as the discount rate, y, that makes the present value of the bond's payments equal to its price.
- Also defined as the discount rate that equates the bond's price to the PV of all promised future cash flows

Example:

- Price of the 7,5% coupon bond is 1,167.27$, then tied to maturity is found by solving for y

$$\text{PV} = \frac{75}{(1+y)} + \frac{75}{(1+y^2)} + \frac{75}{(1+y^3)} + \frac{1{,}075}{(1+y^4)} = \$1{,}167.27$$

6.4 Bond Rates of Return

- If interest rates rise in a period, bond price will fall, and rate of return in that period will be lower than the yield to maturity

Formula for rate of return:

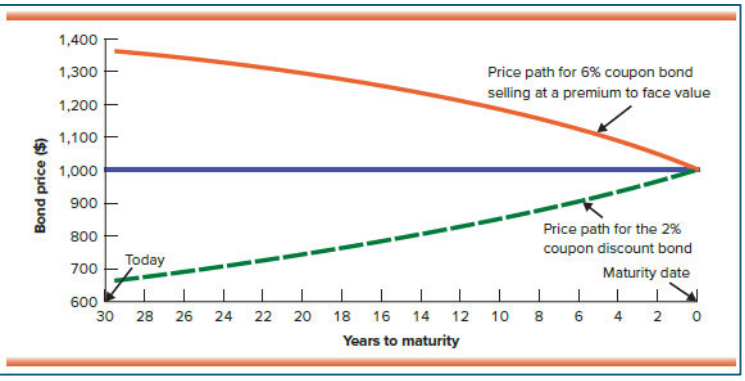
$$Rate\ of\ return = \frac{coupon\ income + Price\ change}{Investment}$$

- Which is the total income per period per dollar invested.

Is there *any* connection between the yield to maturity and the rate of return during a particular period?

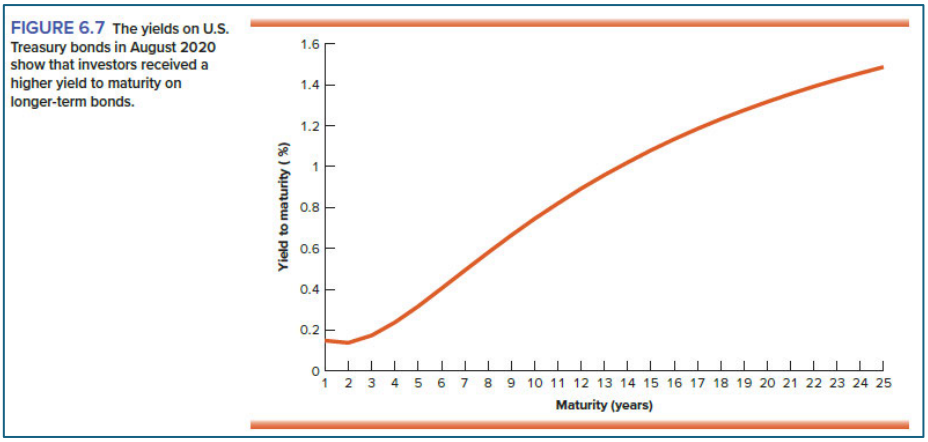
- Yes: If the bond's yield to maturity remains unchanged, its price adjusts over time, making the total return equal to the yield to maturity. If interest rates rise, the return is lower; if they fall, the return is higher.

FIGURE 6.6 How bond prices change as they approach maturity, assuming an unchanged yield to maturity of 4%. Prices of both premium and discount bonds approach face value as their maturity date approaches.



6.5 The yield curve

- It plots the relationship between bond yields to maturity and time to maturity



- Even with an upward-sloping yield curve, investors may avoid long-term bonds for two reasons.
    - First, long-term bond prices fluctuate more than short-term bonds, making them riskier if interest rates rise.
    - Second, short-term investors can benefit from rising rates by reinvesting at higher yields, which often leads to an upward-sloping yield curve.

Nominal and real rates of interest

Example:

- Nominal interest rate is 8%
- Inflation is 4%
- Real interest rate is:

$$1 + real\ interest\ rate = \frac{1 + nominal\ interest\ rate}{1 + inflation\ rate} = \frac{1.08}{1.04} = 1.0385$$

Real interest rate = .385 = 3.85%

TIPS (Treasury Inflation-Protected Securities) = Bond that is indexed which payments are linked to inflation

- The real cash flows on TIPS are fixed, but the nominal cash flows (interest and principal) are increased as the consumer price index increases.

Treasury issues 3% coupon, two-year TIPS. The *real* cash flows on the two-year TIPS are therefore:

	Year 1	Year 2
Real cash flows	$30	$1,030

The *nominal* cash flows on TIPS depend on the inflation rate. For example, assume that inflation turns out to be 5% in year 1 and a further 4% in year 2. Then the *nominal* cash flows would be:

	Year 1	Year 2
Nominal cash flows	$30 × 1.05 = $31.50	$1,030 × 1.05 × 1.04 = $1,124.76

- In periods of high and variable inflation, we would expect to see much more variation in the nominal rate than the real rate

TIPS:

- If inflation **exceeds 1.7%,** TIPS outperform nominal bonds because their principal adjusts for inflation, boosting returns. Nominal bonds, with a **fixed 0.7%** yield, lose value as inflation rises. If inflation is **lower than 1.7**%, nominal bonds provide a better real return.

6.6 Corporate Bonds and the Risk of Default

- Default risk = The risk that a bond issuer may default on its bonds. Also called **credit risk**.
    - Companies compensate for this risk by increasing the interest on their bonds

- Credit risk = See default risk.
- Default premium = The additional yield on a bond that investors require for bearing credit risk.
    - Is the difference between the promised yield on a corporate bond and the yield on a U.S treasury bond with the same coupon and maturity

- Investment grade = Bonds rated Baa or above by Moody's or BBB or above by Standard & Poor's or Fitch.
    - AAA is the best, AA is next best, A is less good, Baa etc.

- Junk bond= Bond with a rating below Baa or BBB.

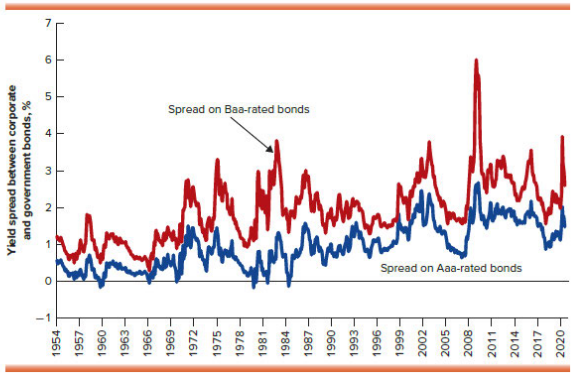
TABLE 6.2 Key to Moody's and Standard & Poor's bond ratings. The highest-quality bonds are rated triple A, then come double-A bonds, and so on.

Moody's	Standard & Poor's	Percent of Bonds Defaulting within 10 Years of Issue	Safety
Investment-Grade Bonds			
Aaa	AAA	0.1%	The strongest rating; ability to repay interest and principal is very strong.
Aa	AA	0.8	Very strong likelihood that interest and principal will be repaid.
A	A	2.2	Strong ability to repay, but some vulnerability to changes in circumstances.
Baa	BBB	3.3	Adequate capacity to repay; more vulnerability to changes in economic circumstances.
High-Yield Bonds			
Ba	BB	15.1	Considerable uncertainty about ability to repay.
B	B	33.6	Likelihood of interest and principal payments over sustained periods is questionable.
Caa Ca	CCC CC	47.7	Bonds that may already be in default or in danger of imminent default.
C	C	—	Little prospect for interest or principal on the debt ever to be repaid.

Source: Moody's Investor Service, "Annual Default Study: Corporate Default and Recovery Rates: 1920–2019," February 28, 2020.

- Baa has a higher credit risk thus also a higher yield to compensate

FIGURE 6.9 Yield spreads between corporate and 10-year Treasury bonds.



- Approx. 50% of CCC rated bonds and below have defaulted within 10 years (Moody's)

Liquidity:

- More liquid bonds are highly prized and offer lower yields, because investors prefer liquid bonds

Protecting against Default Risk:

- Seniority = Senior Claim means that you will be paid of before others (subordinated lenders w. Junior claim). You hold senior claim unless otherwise is stated.

- Security = Companies that borrow set side some assets as security for the loan, a.k.a. collateral (debt is **secured**)

- Protective Covenants = Is some kind of conditions for the loan (not take unreasonable risk). Often lenders restrict the debt a firm can issue, or issue new debt with seniority rights.

Not plain vanilla (corporate bonds)

- Zero-coupon bonds/Strips (repay principal but not coupon payments)

- Floating-rate bonds (Coupon payments that are not fixed but fluctuate with short-term interest rates)

- Convertible bonds (Can be exchanged for a specific number of shares, common stock)

How can one find the market price of a bond given its yield to maturity or find a bond's yield given its price? Why do prices and yields vary inversely? *(LO6-2)*

- Bonds are valued by discounting the coupon payments and the final repayment by the yield to maturity on comparable bonds. The bond payments discounted at the bond's yield to maturity equal the bond price.

- You may also start with the bond price and ask what interest rate the bond offers. The interest rate that equates the present value of bond payments to the bond price is the yield to maturity.

- Because present values are lower when discount rates are higher, price and yield to maturity vary inversely.

Formula:

$$\begin{aligned} Bond\ price &= PV(coupons) + PV(face\ value) \\ &= (coupon \times annuity\ factor) + (face\ value \times discount\ factor) \end{aligned}$$

$$Bond\ rate\ of\ return = \frac{Coupon\ income + price\ change}{investment}$$

Chapter 7 – Valuing Stocks

7.1 Stocks and Stock market

Common Stock = Ownership shares in a publicly held corporation

IPO = Initial Public Offering, which is the first offering of stock to the general public
Primary offering = The corporation sells shares in the firm
Primary market = Market for the sale of new securities by corporations
Secondary market = Market in which previously issued securities are traded among investors
P/E ratio = Is the ratio of stock price to earning per share aka. Price-earning multiple

7.2 Market Values, Book Values, and Liquidation values

Book value = Is the value shown in the firm's balance sheet. It is the difference between the value of the assets and the liabilities

The value of an asset reported on the balance sheet is the original/historical cost less an allowance for depreciation

Liquidation value = Is the net proceeds that could be realized by selling the firm's assets and paying off its creditors.

Going-concern value = is often referred to when talking about the difference between a company's actual value and its book or liquidation value.

- Extra earning power → Ability to earn more than a minimum required rate of return on assets
- Intangible assets → Assets that accountants don't put on the balance sheet
- Value of future investments → Future investments can create growth and thus the value of the stock can increase if investors might believe that this is happening

In general, market price is not the same as book value or liquidation value. Market value, unlike book value and liquidation value treats the firm as a going concert.

Market value = Is what the investors are willing to pay for the shares of the firm, which depends on the earning power today and the expected profitability of future investments.

7.3 Valuing Common Stocks

Valuation by Comparables = Looking at other companies, and how much their investors are willing to pay

- Market-to-Book Value Ratio and Price-Earning ratio are the two most popular ones, but sometimes analysts use others.
- For infant firms they might use price-to-sale instead, because they don't have any earnings

Price and Intrinsic Value
The higher the risk, the higher the discount rate

$$\frac{DIV_1 + P_1}{1 + r}$$

The PV is also called **the intrinsic value**, which is the present value of future cash payoffs from a stock or other security. The intrinsic value is also the "fair" price of the stock

$$Expected\ return = Disocunt\ rate$$

$$Expected\ return = \frac{DIV_1 + P_1 - P_0}{P_0}$$

This comes from two parts, the expected dividend yield and the capital gain:

$$Expected\ rate\ of\ return = Expected\ dividend\ yield + expected\ capital\ gain$$

$$= \frac{DIV_1}{P_0} + \frac{P_1 - P_0}{P_0}$$

Fair price

If a stock is correctly priced, it will offer an expected rate of return equal to that of other equally risky stocks and the price will equal intrinsic value:

$$P_0 = \frac{DIV_1 + P_1}{1 + r}$$

Thus, today's price will equal the PV of dividend payments + the PV of future price

7.4 Dividend Discount Model

This is the model that states that today's stock price equals the present value of all expected future dividends.

$$P_0 = Present\ value\ of\ (DIV_1, DIV_2, DIV_3 \ldots DIV_t)$$
$$= \frac{DIV_1}{1+r} + \frac{DIV_2}{1+r} + \frac{DIV_3}{1+r} + \cdots + \frac{DIV_t}{1+r}$$

The horizon date, H, is the day where the stock is being sold

$$P_0 = \frac{DIV_1}{1+r} + \frac{DIV_2}{(1+r)^2} + \cdots + \frac{DIV_H + P_H}{(1+r)^H}$$

The value of the stock is the PV of the dividends it will pay over the investor's horizon plus the PV of the expected stock price at the end of that horizon.

*** When you move the horizon date, the stock's present value should not change, because as dividends increases the PV (terminal value) decreases) equalising the value per share. However, if the final horizon is infinitely far away, we can forget about it and simply say that Stock price = PV (all future dividends per share)*

1.DDM no growth

$$\text{Value of a no growth stock} = P_0 = \frac{DIV_1}{r}$$

Because the company do not reinvest (and thus does not grow) the dividends and earnings are the same

$$\text{Stock value} = P_0 = \frac{EPS_1}{r}$$

2.DDM with constant growth

$$P_0 = \frac{DIV_1}{r - g}$$

The constant growth dividend discount model is the version of the DDM in which expected dividends grow at a constant rate aka. Gordon growth model

Rearrange to find r

$$r = \frac{DIV_1}{P_0} + g$$
$$= dividend\ yield + growth\ rate$$

Sustainable growth rate is the rate at which the firm can grow by reinvesting earnings, keepin its long-term debt ratio constant. Example:

$$EPS = Book\ value\ per\ share * ROE$$
$$18{,}60 * 0{,}065 = \$1{,}21$$

$$Payout\ ratio = 85\%$$

$$DIV_1 = 0{,}85 * 1{,}21 = \$1{,}03$$

$$Plowback = 1 - 0{,}85 = 0{,}15$$

$$First\ year\ plow\ back = 0{,}15 * 1{,}21 = \$0{,}18\ pr\ share$$

$$So\ the\ book\ value\ will\ increase\ to\ 18{,}78\ (18{,}6 + 0{,}18)$$

$$Growth\ rate\ in\ book\ equity = \frac{Plowed\ back\ earning}{Initial\ equity} = \frac{0{,}18}{18{,}60} = 1\%$$

$$Growth\ rate = \frac{Plowed\ back\ earning}{Initial\ equity} = \frac{Plowed\ back\ earning}{Total\ earning} * \frac{Total\ earning}{Initial\ equity} \rightarrow$$

$$= Plowback\ ratio * ROE = Sustainable\ growht\ rate = g$$

Summed up: If the company earns a constant return on equity and Plows back a constant proportion of earnings, then its growth rate is g, like above.

Plowing earning back into new investments may result in growth in earnings and dividends, but it does not add to the current stock price that that money is expected to earn only the return that investors require. Plowing back does add value if investors believe that the reinvested earnings will earn a higher rate of return.

PVGO = Present value of growth opportunities which is the net present value of a firm's future investments

3.Non constant growth

1. Investment horizon H, calculate PV of dividends
2. Calculate price of stock and discount to get PV of today (using the constant growth model) ** After H day, the growth will be at a sustainable rate
3. Then sum the total PV of dividends + PV of ending stock price

$$P_0 = \underbrace{\frac{DIV_1}{1+r} + \frac{DIV_2}{(1+r)^2} + \cdots + \frac{DIV_H}{(1+r)^H}}_{\text{PV of dividends from year 1 to horizon}} + \underbrace{\frac{P_H}{(1+r)^H}}_{\text{PV of stock price at horizon}}$$

Valuing young companies and stock:
More helpful to think about the value of a stock as the sum of the value of assets in place plus PVGO, the present value of growth opportunities.

7.5 Valuing a business by DCF

Free CF = CF available for distribution to investor after firm pays for new investment or additions to working capital

Value of a business

$$PV(Business) = PV(FCF) + PV(Horizon\ value)$$
$$PV = \frac{FCF_1}{1+r} + \frac{FCF_2}{1+r^2} + \cdots + \frac{FCF_H}{1+r^H} + \frac{PV_H}{1+r^H}$$

Which is the present value of the free cash flows + the forecasted value of the business at the horizon

To find the PV of horizon value we can use the constant-growth formula:

$$\frac{FCF_t}{r-g} = Horizon\ value \rightarrow \frac{Horizon\ value}{Disocunt\ facotr}$$

7.6 Real life – Wall Street

Index mutual funds ETF's = Are exchange-traded funds that track the entire stock market
Efficient market = A market which prices reflect all available information
There is a challenge in consistently outperforming the market.

7.7 Market Anomalies and Behavioural Finance

Efficient Market Hypothesis:

- Weak form → Prices reflect all past trading information
- Semi strong form → Prices reflect all publicly available information
- Strong form → Prices reflect all information, both public and private.

Momentum effect: Stocks that have recently performed well tend to keep performing well in the short term. This is inconsistent with the idea that stock prices follow a random walk.

Book-to-market effect: Stocks with high book-to-market ratios (value stocks) have historically outperformed those with low ratios (growth stocks).

Behavioural finance

- *Investors are not always rational.*

- They may make decisions based on emotions or cognitive errors rather than objective analysis.

- *Systematic behavioural biases can lead to predictable errors.*
  - These include overconfidence, loss aversion, and herding, which can drive prices away from fundamental values.
- *These errors can create stock market anomalies.*
  - Persistent mispricing's, like momentum and the value effect, may arise from collective irrational behavior.
- *Addition*
  - Investors do not always behave rationally.
  - Investor sentiment can influence stock prices.
  - Prices may rise or fall based on mood and emotion, not just information.
  - Sentiment-driven trading helps explain anomalies and speculative bubbles.

Chapter 8 – NPV and Other Investment Criteria

8.1 NPV

Opportunity cost of capital = Is the expected rate of return given up by investing in a project rather than in the capital market.

NPV = Is the net present value and is the present value of project cash flow minus the investment

$$NPV = PV - Required\ investment$$

General rule, the NPV rule states that managers increase shareholder's wealth by accepting projects that are worth more than they cost. Therefore, they should accept all projects with a positive NPV

A risky dollar is worth less than a safe one, this means that the return on a risky project should be higher than the safe one to attract investors.

$$NPV = C_0 + \frac{C_1}{1+r} + \frac{C_2}{1+r^2} + \frac{C_3}{1+r^3}$$

Or

$$PV = CF * Annuity\ factor$$
$$NPV = PV - Initial\ investment$$

8.2 Internal Rate of Return Rule

$$\text{Rate of return} = \frac{\text{Profit}}{\text{Investment}} = \frac{C_1 - Investment}{Investment}$$

When it is a one-year project it is easier to compare the rate of return with the opportunity cost of capital.

TWO rules:

1. NPV should be positive when its CFs are discounted at the opportunity cost of capital
2. Rate of Return shall be higher than the opportunity cost of capital

Internal Rate of return

- The Rate of Return is the discounted rate at which NPV equal zero

- This is known as the project's internal rate of return or IRR, or the DCF rate of return

$$NPV = C_0 + \frac{C_1}{1 + IRR} + \frac{C_2}{1 + IRR^2} + \frac{C_3}{1 + IRR^3} = 0$$

Using IRR comes with pitfalls

- Pitfall 1: Mutually Exclusive Projects

The IRR rule can give misleading results when comparing mutually exclusive projects, especially if they differ in scale or timing of cash flows. The project with the highest IRR is not necessarily the one that adds the most value to the firm.

- Pitfall 1a: Different Outlays

When projects have the same life span but different initial investments, IRR tends to favor smaller projects with higher percentage returns over larger, more profitable projects.

- Pitfall 2: Lending or borrowing?

Some projects have cash flow signs that flip (e.g., +100 now, –150 later). In such cases:
The IRR may suggest high returns even if the project is equivalent to borrowing at a high rate rather than investing.
Whether a high IRR is good or bad depends on whether you're effectively lending or borrowing.

- Pitfall 3: Multiple IRRs

If the cash flows change sign more than once, the project can have **multiple IRRs** (or none at all), making the IRR rule unreliable.

8.3 Profitability index

The profitability index measures the NPV of a project per dollar of investment

$$PI = \frac{NPV}{initial\ investment}$$

It is also known as *Benefit-cost ratio*
A positive PI = a positive NPV

We use the PI whenever we have a limit on spendings, we pick the projects with the highest PI

Capital rationing is the limit set on the amount of funds available for investment (shortage of funds)

- Soft rationing is an internal, self-imposed limit on investment, often used for budgeting discipline.
- Hard rationing occurs when a firm is externally constrained and cannot raise funds, even for profitable projects.

Pitfalls

PI Pitfall – Size Bias:

- PI favours small projects with high ratios, even if bigger ones have higher NPV.

Capital Rationing Use Only:

- PI works best when capital is limited; otherwise, use NPV.

8.4 Payback Rule

The payback rule describes the time until cash flow recovers the initial investment in the project.
General rule → A project should be accepted if its payback period is less than a specified cutoff period
Pitfalls:

- Ignores Time Value: Payback doesn't discount future cash flows, so it overvalues early returns.
- Ignores Cash Flows After Cutoff: It ignores any cash received after the payback period, missing long-term benefits.
- Arbitrary Cutoff: The chosen cutoff is subjective and may not reflect true project risk or value

The payback is most commonly used when the capital investment is small or when the merits of the project are so obvious that more formal analysis is unnecessary

Discounted payback period

- Accounts for time value of money
- Useful for risk control and helps when future cash flows are uncertain
- Simple and quick to apply

- Ignores Late Cash Flows: Like regular payback, it still ignores cash flows after the cutoff date.
- No Value Metric: It doesn't measure profitability or value added—just when investment is recovered.

8.5 Mutually Exclusive Projects

Mutually exclusive project, we always choose the one that offers the highest NPV

Three key investment decisions where projects are mutually exclusive:

- Timing – deciding the best time to invest by comparing NPVs across years.
  - The decision rule for investment timing is to choose the investment date that produces the highest net present value today

- Asset Life – choosing between short- and long-lived assets using equivalent annual cost.
  - Equivalent annual cost is the CF per period with the same PV as the cost of buying and operating a machine

$$Equivalent\ annual\ annuity * annuity\ factor = PV\ of\ costs$$

$$Equivalent\ annual\ annuity = \frac{PV}{Annuity\ factor}$$

  - Rule for comparing assets with different lives → Select the machine that has the lowest equivalent annual annuity

- Replacement – determining when to replace old equipment by comparing costs and savings over time.
  - Calculating both the NPV and the equivalent annual annuity, and as long as the old machines yearly costs are less than the new machines equivalent annual annuity, we should NOT replace it

Criterion	Definition	Investment Rule	Comments
Net present value (NPV)	Present value of cash flows minus initial investment	Accept project if NPV is positive. For mutually exclusive projects, choose the one with the highest (positive) NPV.	The "gold standard" of investment criteria. Only criterion necessarily consistent with maximizing the value of the firm. Provides appropriate rule for choosing between mutually exclusive investments. Only pitfall involves capital rationing, when one cannot accept all positive-NPV projects.
Internal rate of return (IRR)	The discount rate at which project NPV equals zero	Accept project if IRR is greater than opportunity cost of capital.	If used properly, results in same accept-reject decision as NPV in the absence of project interactions. However, beware of the following pitfalls: IRR cannot rank mutually exclusive projects—the project with higher IRR may have lower NPV. The simple IRR rule cannot be used in cases of multiple IRRs or an upward-sloping NPV profile.
Profitability index	Ratio of net present value to initial investment	Accept project if profitability index is greater than 0. In case of capital rationing, accept projects with highest profitability index.	Results in same accept-reject decision as NPV in the absence of project interactions. Useful for ranking projects in case of capital rationing, but potentially misleading in the presence of interactions or in comparing projects of different size.
Payback period	Time until the sum of project cash flows equals the initial investment	Accept project if payback period is less than some specified number of years.	A quick and dirty rule of thumb, with several critical pitfalls. Ignores cash flows beyond the acceptable payback period. Ignores discounting. Tends to improperly reject long-lived projects.

Chapter 9 – Using DCF Analysis to Make Investment Decisions

9.1 Identifying CF

Discount cash flows, not accounting profits: Profits can be misleading due to accounting treatments like depreciation. What matters for NPV is actual cash in and out of the business.

Use **incremental cash flows:** Only include CFs that occur because of the project but..

$$Incremental\ CF = CF\ with\ project - CF\ without\ project$$

- Ignore sunk costs

- Include opportunity costs (benefit or CF forgone as a result of an action)
  - Opportunity cost equals the cash that could be realized from selling the land now, you lose that cash if you rake the projects

- Include all indirect effect

- Recognize the investment in WC (working capital is the current assets minus the current liabilities)
  - Always result in cash outflow, can change over time, but is always recovered at the end if the project

- Include Terminal CF
  - Either inflow like sale of equipment etc.
  - Or outflow like shut down costs

- Be aware of Allocation overhead costs
  - Only count overhead if it is incremental – that is, if the project causes a real change in the total company costs

- **Match cash flows and discount rates:** Real CF must be discounted at a real discount rate, and nominal cash flows should be discounted at a nominal rate. Discounting real cash flows at a nominal rate is a mistake and leads to wrong data due to mixing real and nominal terms.

- **Separate investment and financing**:
  - When evaluating a project's cash flows, you must focus only on the cash flows generated by the project itself—such as revenues, operating costs, taxes, and capital expenditures.
  - You should not include interest payments, loan proceeds, or debt repayments in these cash flows.
  - By doing so, we exclusively focus on the project CF not the CF associated with the financing schemes.

9.2 Corporate Income Tax

- **After-Tax Cash Flows:**
  Use after-tax cash flows for NPV analysis—these represent the actual economic benefit to the firm.

- **Depreciation Tax Shield:**
  Depreciation reduces taxable income, saving taxes:

$$\text{Tax shield} = \text{Depreciation} * \text{Tax rate}$$

- **Bonus Depreciation:**
  The 2017 Tax Cuts and Jobs Act allowed 100% immediate expensing of capital investments (bonus depreciation). This creates larger early tax shields, increasing project NPV. Phased out after 2022.

- **Immediate Expensing vs. Capitalization:**
  - Immediate expensing means the full cost is deducted in the year of purchase—creates a large early tax benefit.
  - Capitalization spreads the cost over time through depreciation—delays tax savings.

- **Capital Cost Recovery:**
  Depreciation is a non-cash accounting expense, used solely for calculating taxable income.

- **Avoid Pretax Discounting:**
  Never discount pretax cash flows using a "pretax rate." Use after-tax flows and an appropriate discount rate

9.3 Example – Blooper industries

$$Total\ CF(Project\ CF) = CF\ from\ capital\ investment + Operating\ CF + CF\ from\ changes\ in\ WC$$

CF from capital investment:

- Up front investment
- Net CF from sale

$$Net\ CF\ from\ sale = Salvage\ value\ - tax\ on\ gain$$

Operating CF:

$$Operaitng\ CF = Revenue - Expenses - Taxes$$

$$\boldsymbol{Or}\ OCF = Aftertax\ profit + depreciations$$

$$\boldsymbol{Or}\ OCF = Net\ profit\ (Revenue - Cash\ expenses) * (1 - tax\ rate) + (Tax\ shield)$$

$$Depreciation\ tax\ shield = tax\ rate * depreciation$$

Changes in WC

In general, an increase in WC is an investment and therefore implies a negative CF. Where a decrease in WC implies a positive CF. The CF is measured by the change and not the level of working capital

Additional notes

- Working Capital Forecasting
  - Projects often require investment in working capital (e.g., inventory, receivables).
  - This is treated as a cash outflow at the start and is usually recovered at the end of the project.
  - Accurate forecasting is crucial, as working capital ties up cash and reduces early project returns.

- Accelerated Depreciation & First-Year Expensing
  - Accelerated depreciation (like MACRS) or bonus depreciation allows larger tax deductions early in a project's life.
  - First-year expensing (e.g., 100% bonus depreciation) lets firms deduct the full cost of assets upfront.
  - These methods increase early tax savings, improving NPV, especially for short-term projects.

- Tax Losses and Offsets
  - If a project generates a taxable loss, it can often be used to offset other income, reducing the firm's total tax bill.
  - These losses carry backs or carry forwards create tax savings, which should be included in project cash flows.
  - Ignoring them can undervalue the project.

- Project Analysis – Final Cash Flow
  - The final year's cash flow includes:
    - Last operating cash flow
    - Salvage value of assets
    - Recovery of working capital
  - These are combined in the terminal year and significantly impact NPV, so must be included.

	A	B	C	D	G	H
1	**A. Inputs**		Spreadsheet Name			
2	Initial investment	150	Investment			
3	Salvage value	20	Salvage			
4	Initial revenue	150	Initial_rev			
5	Initial expenses	100	Initial_exp			
6	Inflation rate	0.05	Inflation			
7	Discount rate	0.12	Disc_rate			
8	Acct receiv. as fraction of sales	= 2/12	A_R			
9	Inven. as fraction of expenses	0.15	Inv_pct			
10	Tax rate	0.21	Tax_rate			
11						
12	**Year:**	**0**	**1**	**2**	**5**	**6**
13	**B. Capital Investment**					
14	Investment in fixed assets	=Investment				
15	Sales of fixed assets					=Salvage*(1−Tax_rate)
16	CF, invest. in fixed assets	=−B14+B15	=−C14+C15	=−D14+D15	=−G14+G15	=−H14+H15
17						
18	**C. Operating Cash Flow**					
19	Revenues		=Initial_rev	=C19*(1+Inflation)	=F19*(1+Inflation)	
20	Expenses		=Initial_exp	=C20*(1+Inflation)	=F20*(1+Inflation)	
21	Depreciation		=Investment/5	=Investment/5	=Investment/5	
22	Pretax profit		=C19−C20−C21	=D19−D20−D21	=G19−G20−G21	
23	Tax		=C22*Tax rate	=D22*Tax rate	=G22*Tax rate	
24	Profit after tax		=C22−C23	=D22−D23	=G22−G23	
25	Operating cash flow		=C21 + C24	=D21 + D24	=G21 + G24	
26						
27	**D. Changes in Working Capital**					
28	Working capital	=Inv_pct*C20+A_R*B19	=Inv_pct*D20+A_R*C19	=Inv_pct*E20+A_R*D19	=Inv_pct*H20+A_R*G19	=Inv_pct*I20+A_R*H19
29	*Change* in working cap	=B28	=C28−B28	=D28−C28	=G28−F28	=H28−G28
30	CF, invest. in wk capital	=−B29	=−C29	=−D29	=−G29	=−H29
31						
32	**E. Project Valuation**					
33	Total project cash flow	=B16+B30+B25	=C16+C30+C25	=D16+D30+D25	=G16+G30+G25	=H16+H30+H25
34	Discount factor	=1/(1+Disc_rate)^B12	=1/(1+Disc_rate)^C12	=1/(1+Disc_rate)^D12	=1/(1+Disc_rate)^G12	=1/(1+Disc_rate)^H12
35	PV of cash flow	=B33*B34	=C33*C34	=D33*D34	=G33*G34	=H33*H34
36	Net present value	=SUM(B35:H35)				

Chapter 10 – Project Analysis

10.2 Sensitivity analysis, Stress test and Scenario analysis

Sensitivity analysis: Is An analysis of the effects on project profitability of changes in sales, costs and so on.

- Varies one input at a time (e.g. sales, costs, investment) to see impact on NPV.
- Identifies critical variables—those with the biggest effect on project value.
- Often visualized using a tornado diagram, which ranks inputs by their influence on NPV (wider bars = more impact).
- Limitation: Assumes each variable changes independently—doesn't account for interaction between variables.

Stress test and Scenario analysis: A stress test is a type of Scenario analysis that examines how a project performs under extreme or adverse conditions.

A scenario analysis → is a project analysis given different combinations of assumptions

- Examines the effect of combined changes in multiple variables under different plausible future scenarios (e.g., best case, base case, recession).
- Reflects realistic, internally consistent outcomes.
- Helps firms explore strategic options and anticipate how projects behave under uncertainty.

Detailed scenario analysis—involving careful construction of multiple, realistic future situations—is time-consuming and complex.

Therefore, it's usually done only for large, high-stakes projects, where the potential risk or investment is big enough to justify the extra effort.

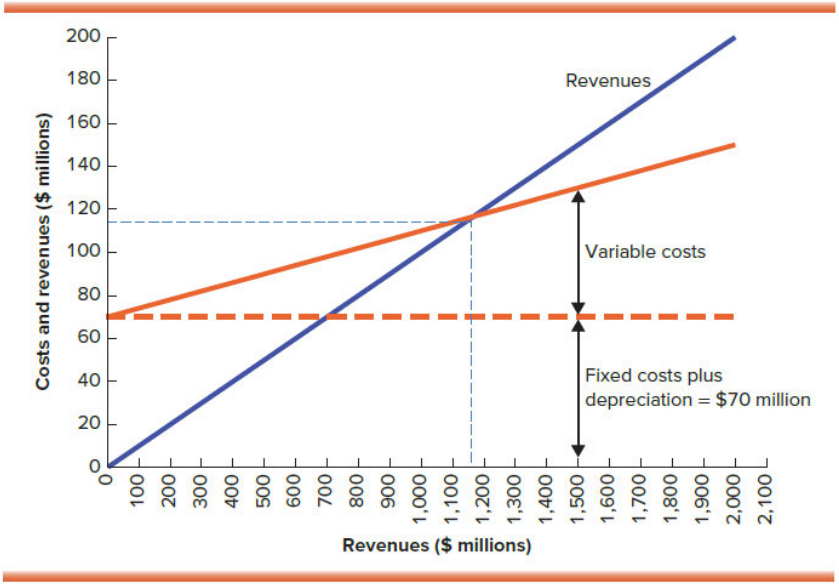
10.3 Break-Even Analysis

Is an analysis that analyses the level of sales at which the project breaks even

Accounting Break even analysis

$$Profit = 0 \ \boldsymbol{or} \ total\ revenue = total\ costs$$

$$Break\ even\ level\ of\ revenue = \frac{Fixed\ costs\ including\ depreciations}{profit\ from\ each\ additional\ dollar\ of\ sales}$$

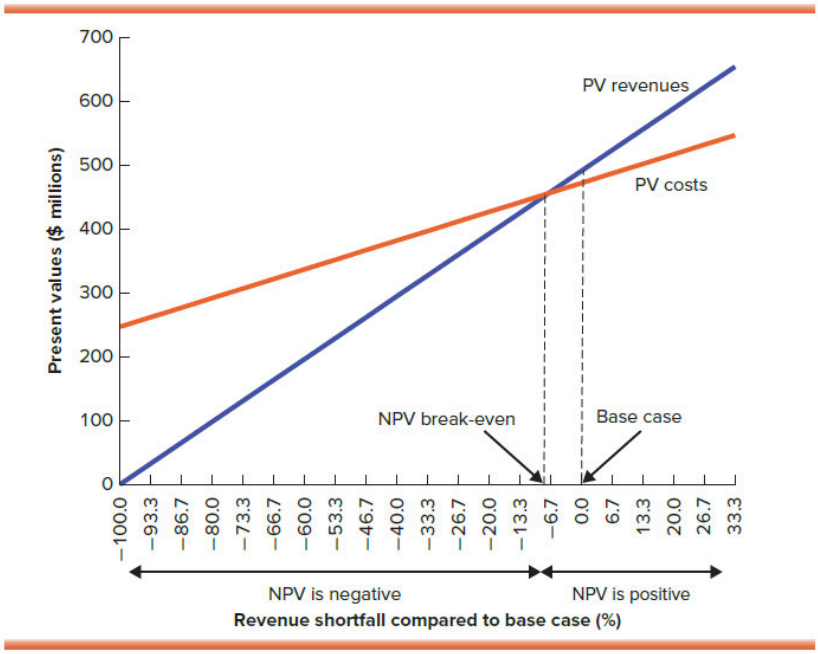


A project that simply breaks even on an accounting basis, gives you your money back but does not cover the opportunity cost of capital tied up in the project. → Will surely have a negative NPV

NPV Break even analysis

This is the minimum level of sales needed to cover all costs including the cost of capital, which is also the point where NPV switches from negative to positive.

- Finds the sales level where NPV = 0 (i.e., just covers cost of capital).
- Expressed as a % as revenue are never constant but expected to increase over time
- More meaningful than accounting break-even because it reflects value creation
- The NPV break-even point is significantly higher than the point at which the project has zero profit (because it includes the opportunity cost of capital)



Operating leverage

Operating leverage measures how a change in sales volume will affect operating profits. A firm with high fixed costs and low variable costs has high operating leverage, meaning small changes in sales lead to large changes in profits.

- DOL = Degree of operating leverage, which is the percentage change in profits given a 1% change in sales.

$$DOL = \frac{Percentage\ change\ in\ profits}{Percentage\ change\ in\ sales}$$

- DOL depends on fixed charges including depreciation:

$$DOL = 1 + \frac{Fixed\ costs}{profits}$$

Risk varies with operating leverage, if a large proportion of costs is fixed, a shortfall in sales has a magnified effect on profits.

This helps us understand how sensitive a firm's operating income is to changes in sales

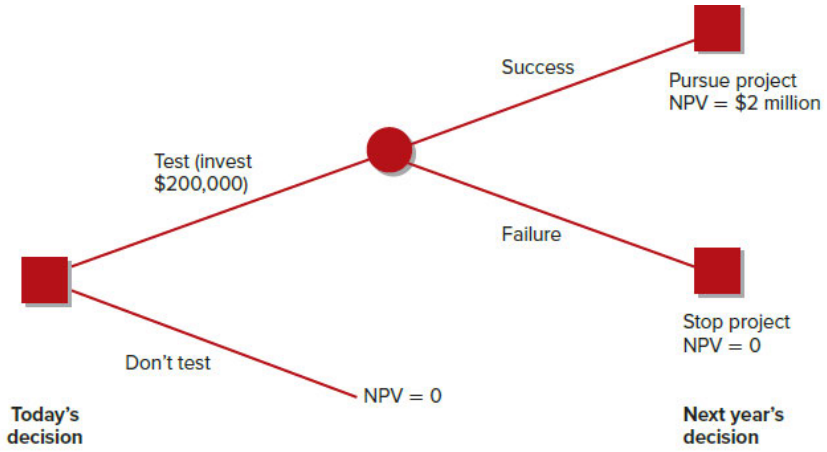
10.4 Real Options and the value of flexibility

Traditional project evaluation methods like NPV assume passive management. In reality, managers actively respond to new information. This ability to adapt creates real options, which add value to projects. These options are not always captured in DCF models.

Real options are options to invest, modify, postpone, or dispose of a capital investment project

Option to Expand

- Allows a company to increase investment if a project proves successful.
- Example: A company builds a pilot plant and expands only if market tests are positive.
  - We use a decision tree, which is a diagram of sequential decision and possible outcomes
- This is similar to a call option on future investment opportunities



Option to Abandon

- Let's the company exit a project if it becomes unprofitable, limiting losses.
- Like a put option where the exercise price is the salvage value of assets.
- Example: Choosing a flexible design that can be sold if the product fails

Option to Delay (Timing Option)

- The firm can defer investment to gather more information.
- Especially useful when outcomes are uncertain and timing is flexible.
- Example: Waiting to drill an oil well until price trends are clearer

Option to Switch or Modify Operations (Flexibility)

- Enables the firm to adjust the production mix or supply chain in response to market conditions.
- Example: Knitwear companies using programmable machines to change styles based on fashion trend

Chapter 11 – Risk, Return and Opportunity Cost of Capital

11.1 Rates of Return: A review

Percentage return on investment:

$$Percentage\ return = \frac{Capital\ gain + Dividend}{Initial\ share\ price}$$

$$Percentage\ dividend\ yield = \frac{Dividend}{Initial\ share\ price}$$

$$Percentage\ capital\ gain = \frac{Capital\ gain}{Initial\ share\ price}$$

11.2 Capital Market History

Market Indexes

- Market indexes are used to summarize movements in financial markets.
- Examples include the Dow Jones Industrial Average (DJIA) and the Standard & Poor's 500 Index (S&P 500).
- The DJIA includes only 30 large companies and is price-weighted, which can distort its representation.
- The S&P 500 is value-weighted (market cap.) and includes 500 firms, making it a more comprehensive measure of U.S. stock market performance.
- Broader indexes like the S&P Total Market Index or Wilshire 5000 provide even more inclusive coverage of publicly traded companies.

Historical Record of Returns

1) Over the past century, U.S. common stocks have earned higher average returns than Treasury bills.
   - Maturity premium is the extra annual return from investing in long- vs. short-term treasury securities
2) For the period from 1900 to 2020, the average real return on common stocks was about 6.5%, compared to around 0.5% for Treasury bills.
3) This historical excess return of stocks over risk-free securities is called the equity risk premium.

$$Rate\ of\ return\ on\ common\ stock = Interest\ rate\ on\ treasury\ bills + market\ risk\ premium$$

4) Historical returns fluctuate significantly from year to year but show a consistent pattern over the long term.

Using historical evidence to estimate today's cost of capital

5) Historical stock returns help estimate the expected market return.
6) Expected market return ≈ current T-bill rate + historical risk premium.
7) Historical averages must be adjusted for current interest rate conditions.
8) High historical premiums may give unrealistic estimates in low-rate environments.
9) Despite limitations, this method is widely used and practical.

11.3 Measuring risk

- Opportunity costs of capital for safe projects must be the rate of return offered by safe Treasury bills
- Opportunity cost of capital for "average risk" project must be the expected return on the market portfolio

Variance and Standard deviation

- Investment risk is defined as the spread of possible outcomes in returns.

- To quantify risk, analysts use variance and standard deviation.

- Variance measures how far outcomes are likely to deviate from the average return.

$$Variance = AVG.of\ squared\ deviations\ around\ the\ average$$
$$Or\ Variance = Sum\ of\ squared\ deviations\ weighted\ by\ probabilites$$

- Standard deviation is the square root of variance and is a commonly used measure of volatility.

$$Standard\ deviation = Square\ root\ of\ variance$$

- A visual tool like a histogram can illustrate the frequency of different return outcomes, showing that stock returns vary much more than bond or bill returns.

- Historical data (e.g., 1900–2020) show that common stocks have the widest distribution of returns, indicating higher risk.

$$Expected\ return = Probability - weighted\ average\ of\ possible\ outcomes$$

Measuring the Variation in Stock Returns:

- The standard deviation of historical returns is used to estimate the risk (volatility) of a stock or the market.
- It is calculated by averaging the squared deviations from the mean return (variance) and then taking the square root (ST.DEV).
- While this method provides a useful measure of risk, estimates based on short time periods (like six years) are not very reliable on their own.

11.4 Risk and Diversification

Diversification

Diversification is a strategy designed to reduce risk by spreading the portfolio across many investments.

- It works because not all stock returns move together (low or imperfect correlation).
- Specific (diversifiable) risk can be eliminated through diversification.
- Market (systematic) risk cannot be eliminated; it affects all investments.
- Diversification is most effective when combining assets with low or negative correlation.

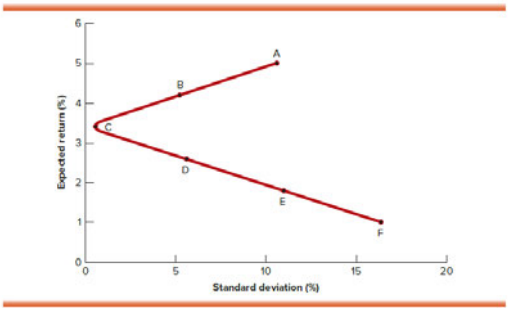
Asset vs portfolio risk

- Individual stocks are risky, as shown by their high standard deviations of return.
- A portfolio of those same stocks can be significantly less risky than the individual stocks.
  - The reason is that returns on different stocks are not perfectly correlated.
- When some stock prices go up while others go down, their movements can partially cancel each other out.
- Therefore, the overall variability (or standard deviation) of a diversified portfolio is lower than that of most individual stocks.

$$Portfolio\ rate\ of\ return = (Fraction\ of\ portfolio\ in\ first\ asset) * (Rate\ of\ return\ on\ first\ asset) + (Fraction\ of\ portfolio\ in\ second\ asset) * (Rate\ of\ return\ on\ second\ asset)$$

Investment opportunity frontier = Plot of the combinations of expected return vs. Standard deviation from various portfolio weights

FIGURE 11.6 The investment opportunity frontier for the gold and auto stocks. Each point on the curve represents a feasible combination of expected return and volatility. The six labeled points correspond to the portfolios in Table 11.9.



The Incremental risk depends on whether the stock's return tends to vary with or against the returns of the other assets in the portfolio.

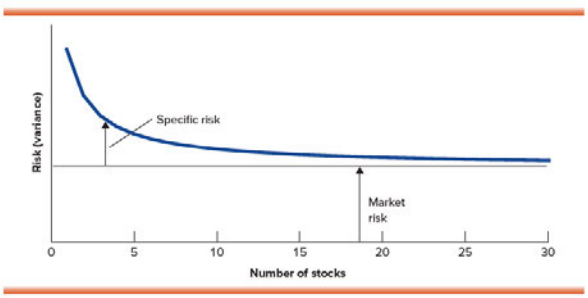
Summarized:

1) Investors care about expected return and risk/volatility of returns (ST. DEV. Or Variance)
2) The contribution of risk when adding a new asset depends on how it varies compared to the rest of the assets
3) A portfolio diversified across industries would benefit more because correlation would be lower.

Market risk vs. Specific risk

- Specific risk can be eliminated by holding a broad portfolio.
- Market risk or systematic risk cannot be eliminated, as it impacts all investments.

FIGURE 11.9 Diversification eliminates specific risk. But there is some risk that diversification cannot eliminate. This is called market risk.



11.5 Thinking about risk

1. **Some risks look big and dangerous but are really diversifiable**
    - Investors may worry about events that affect individual companies, but these specific risks can be reduced or eliminated by holding a diversified portfolio.
2. **Market risks are macro risks**
    - Market risk comes from economy-wide factors (e.g. inflation, interest rates, recessions) that affect all stocks and cannot be avoided through diversification.
    - Investors holding diversified portfolios are mostly concerned with macroeconomic risks, because the firm specific risk washes out in the portfolios (due to diversification)
3. **Risk can be measured**
    - Though future returns are uncertain, the risk of investments can be quantified using tools like variance, standard deviation, and beta. This helps investors make informed decisions about risk and return.

Chapter 12 – Risk, Return and Capital Budgeting

12.1 Measuring Market Risk

Market Portfolio = Portfolio of all assets in the economy. In practice a broad stock market index used to represent the market

- The performance of the market reflect only macro events as firm-specific events has been diversified away

Stock's effect on risk (Beta) = Is measured as the sensitivity of its return to fluctuations in the return of the broad market portfolio. This is also known as the stocks Beta

Defensive stocks are not very sensitive to market fluctuations and have low betas (less than 1)
Aggressive stocks amplify any market movements and have higher betas (greater than 1)
If the market goes up, it is good to have an aggressive stock but if the market goes down it is better to have a defensive stock. ***Average beta of all stocks = 1***

12.2 Beta

Beta reflects only market risk, not firm-specific risk.

- In a well-diversified portfolio, most firm-specific risk (unique to individual companies) is eliminated.
- What remains is market risk, which affects all investments.

Beta measures how much a stock adds to that market risk.

- - So, if you add a stock with high beta to your portfolio, it will increase the portfolio's exposure to market movements more than a stock with low beta

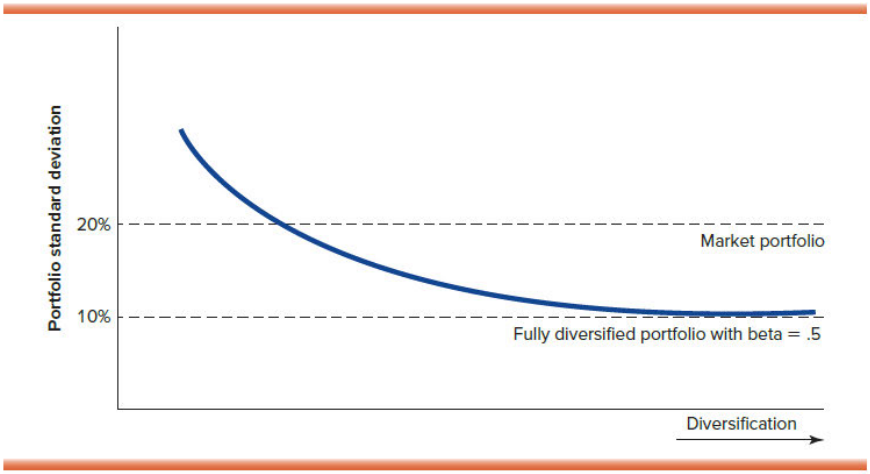
Portfolio Betas is the average of the betas of the individual securities in the portfolio, weighted by the investment in each security

$$Portfolio\ beta = (fraction\ of\ portfolio\ in\ stock\ 1 \times beta\ of\ stock\ 1) + (fraction\ of\ portfolio\ in\ stock\ 2 \times beta\ of\ stock\ 2)$$

The Portfolio Beta Determines the Risk of a Diversified Portfolio

- You can use beta to predict the total risk (standard deviation) of a diversified portfolio
- The beta of the portfolio determines how much market risk remains.
- A portfolio of stocks with beta = 0.5 will have half the market's volatility. If the market's standard deviation is 20%, the portfolio's will be 0.5 × 20% = 10%.
- Similarly, a portfolio with beta = 1.3 would have a standard deviation of 1.3 × 20% = 26%.
- The portfolio beta is the weighted average of the individual betas of the stocks it holds.
- Thus, total risk (standard deviation) in a diversified portfolio is proportional to portfolio beta.
- Investors should judge risk based on a stock's contribution to portfolio beta, not its stand-alone volatility

FIGURE 12.4 The risk of a fully diversified portfolio depends on the portfolio beta. In this example, the portfolio beta is .5 and the standard deviation of the portfolio "bottoms out" at 10%, half the market standard deviation of 20%.



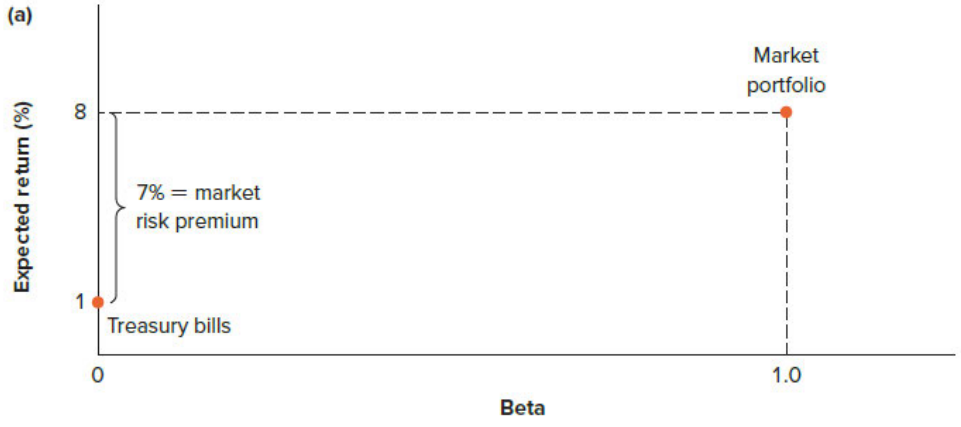
12.3 Risk and Return

Market risk premium is the risk premium of market portfolio. Difference between market return and return on risk-free Treasury bills.

$$Market\ risk\ premium = r_m\ (Expected\ market\ return) - r_f(Treasury\ bill\ rate)$$

Portfolio's expected risk premium:

$$Portfolio's\ expected\ \ risk\ premium = r - f_f = \beta(r_m - r_f)$$



Total expected return:

$$Expected\ return = risk\ free\ rate + expected\ risk\ premium$$

$$r = r_f + \beta(r_m - r_f)$$

Which is also known as the **CAPM model (the capital asset pricing model).**

- *Which is the relationship between risk and return stating that the expected risk premium on any security equals its beta times the market risk premium*

The expected rates of return demanded by investors depend on two things: (1) compensation for the time value of money (the risk-free rate, rf) and (2) a risk premium, which depends on beta and the market risk premium.

- * Expected rate of return on an asset with beta of 1, is just the market return

Why does CAPM model make sense?

CAPM makes sense because most investors today are well-diversified, especially through mutual funds or ETFs. Since diversified investors only face market risk, the beta of their portfolio is what matters. That's why the CAPM focuses on beta as the key measure of risk.

Security Market Line

Is the relationship between expected return and beta (market risk)

- It represents the returns from combining the risk-free asset and the market portfolio.
- It serves as a benchmark: investors will only invest in other securities if they offer returns on or above the SML.
- Therefore, the required risk premium for any security depends on its beta, as shown by the SML.

$$Risk\ premium\ on\ investment = beta * expected\ market\ risk\ premium$$

- If a stock offers <u>less</u> than the return predicted by the CAPM investors will avoid it in favour of a better alternative like a 50/50 mix of T-bills and the market.
  - As a result, the stock's price will fall, raising its expected return until it matches the CAPM prediction.
- If a stock offers more than the CAPM return, investors will buy it, driving the price up and the expected return down.
- This process continues until all stocks offer returns that match what investors require based on their beta.
- Thus, the expected risk premium must be proportional to beta, which is why the CAPM makes sense in a diversified market.

How well does the CAPM work?

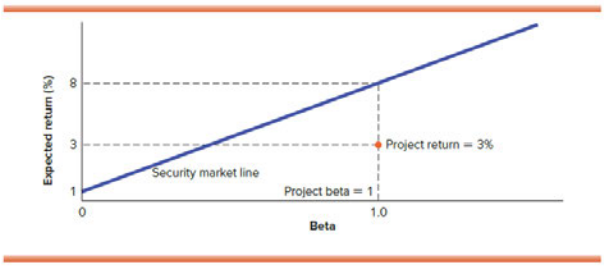
- The CAPM predicts that stocks with higher beta should offer higher average returns, proportionally.
- Historical data show that returns generally increase with beta, but not as steeply as the CAPM predicts.
- In a long-term study (1931–2020), portfolios sorted by beta showed that high-beta portfolios did earn more, but the difference was less than expected.
    - For example, a portfolio with beta = 1.55 earned a return of 14.6% above the risk-free rate, while the CAPM predicted 18.5%.
- Conversely, low-beta portfolios earned more than predicted.
- This suggests the actual relationship between beta and return is flatter than the CAPM's security market line.
- Other patterns (like higher returns for small or value stocks) are not explained by CAPM, which assumes beta is the only source of risk.
- Despite its flaws, CAPM remains widely used because it offers a simple, practical framework for linking risk and return

12.4 CAPM and Opportunity Cost of Capital

Project cost of capital is the minimum acceptable expected rate of return on a project given its risk (using project's beta)

- Discount rate for valuing a capital investment project should be the opportunity cost of capital (expected rate of return if invested themselves)

FIGURE 12.9 The expected return of this project is less than the expected return one could earn on stock market investments with the same market risk (beta). Therefore, the project's expected return lies below the security market line and the project should be rejected.



If the CAPM holds, the security market line defines the opportunity cost of capital. If a project's expected rate of return plots above the security market line, then it offers a higher expected rate of return than investors could get on their own at the same beta.

Company cost of capital

Opportunity cost of capital for investment in the firm as a whole. The company cost of capital is the appropriate discount rate for an average-risk investment project undertaken by the firm.

- Company cost of capital is the return investors expect from the firm's assets and operations.
- If a firm is financed entirely by equity, its company cost of capital equals the cost of equity.
- Most firms use a mix of debt and equity, so the company cost of capital becomes a weighted average of the returns required by debt and equity investors.

Project risk

The company's cost of capital is only appropriate for projects with risk similar to the firm's existing operations.

Two key factors affect project risk:

- Operating leverage: Projects with high fixed costs have more earnings volatility and tend to have higher betas.
- Cyclicality: Projects whose earnings move closely with the overall economy (cyclical) have higher betas and higher costs of capital.
- A project may have high variability in earnings but still have a low beta if its risks are firm-specific (diversifiable) and not tied to the broader market.

In general: Expected cash-flow forecasts should already reflect the probabilities of all possible outcomes, good and bad. If the cash-flow forecasts are prepared properly, the discount rate should reflect only the market risk of the project. It should not be fudged to offset errors or biases in the cash-flow forecast.

Chapter 13 – WACC and Valuation

13.1 Geothermal's Cost of Capital

Capital structure is the mix of long-term debt and equity financing

- If a company is financed only with equity, the cost of capital equals the cost of equity.
- If it uses both equity and debt (as most do), the correct rate is a weighted average: the WACC (Weighted-Average Cost of Capital).
- It also previews how taxes affect WACC, which is further discussed in the next section.

13.2 Weighted Average Cost of Capital

Company cost of capital (Debt and Equity) = The company cost of capital is a weighted average of the returns demanded by debt and equity investors. The weighted average is the expected rate of return investors would demand on a portfolio of all the firm's outstanding securities.

$$Market\ value\ (V) = Debt\ (D) + Equity\ (E) \rightarrow NO\ TAX$$

$$r_{debt} = Debholders\ required\ rate\ of\ return$$

$$r_{equity} = Shareholders\ required\ expected\ return$$

$$r_{assets} = \frac{r_d * D + r_e * E}{V} = \frac{total\ income}{value\ of\ investment} = \frac{D}{V} * r_d \mp \frac{E}{V} * r_e$$

$$Company\ cost\ of\ capital = weighted\ average\ of\ debt\ and\ equity\ returns$$

The cost of capital must be based on what investors are actually willing to pay for the company's outstanding securities - that is, based on the securities' market values.

TAX and WACC

$$After - tax\ cost\ of\ debt = (1 - tax\ rate) * pretax\ cost$$

$$=> (1 - TC) * r_{debt}$$

$$\boldsymbol{WACC}: \left[\frac{D}{V} * (1 - T_c) r_d\right] + \left(\frac{E}{V} * r_e\right)$$

This is the expected rate of return on a portfolio of all the firm's securities, adjust for tax savings due to interest payments. WACC is the correct discount rate for projects that have similar risks to the company's existing business.

3 variables in the WACC

- Including the preferred stocks

$$WACC = \left[\frac{D}{V} * (1 - T_c) r_d\right] + \left(\frac{P}{V} * r_p\right) + (\frac{E}{V} * r_e)$$

If a project has zero NPV when the expected cash flows are discounted at the weighted-average cost of capital, then the project's cash flows are just sufficient to give debtholders and shareholders the returns they require.

13.3 Interpreting the WACC

Strictly speaking, the weighted-average cost of capital is an appropriate discount rate only for a project that is a carbon copy of the firm's existing business.

Common Mistakes:

- A frequent error is applying WACC to projects that are riskier or safer than the firm's average without adjustment. This leads to overvaluing safe projects and undervaluing risky ones.
- Increasing debt doesn't always lower WACC. While debt may have a lower interest rate (explicit cost), it raises the risk to equity holders, who then demand higher returns (implicit cost). Ignoring this can lead to underestimating WACC and approving bad investments.

NO TAX: Changes in Capital structure leave no changes in the WACC – Increase debt = WACC has lower rate of return, however, the increased demand of return from riskiness to the shareholders offsets it.

The **weighted-average cost of capital** is the return the company needs to earn after tax in order to satisfy all its security holders.

13.4 Measuring capital structure

- Book values come from accounting records but may be outdated or irrelevant.
- Instead, use market values, which reflect what investors currently think the debt and equity are worth.

Current market value of debt = If a company's debt isn't traded, you estimate its market value by discounting future payments (interest + principal) using the current market interest rate for similar debt. This gives a more accurate value than book value and ensures the WACC calculation reflects real financing costs.

Total market value of equity = Number of shares * share price

13.5 Estimating Expected Returns

Expected Return on Common Stock

$$\text{Expected return on stock} = \text{riskfree interest rate} + (\text{stocks beta} * \text{expected market risk premium})$$

$$\text{Cost of equity} = \mathrm{r}_{\text{equity}} = r_f + \beta(r_m - r_f)$$

Check:

$$P_0 = \frac{DIV_1}{r_{equity} - g}$$

$$r_{equity} = \frac{DIV_1}{P_0} + g$$

Remember that the constant-growth formula will get you into trouble if you apply it to firms with very high current rates of growth. Such growth cannot be sustained indefinitely. Using the formula in these circumstances will lead to an overestimate of the expected return.

Expected Return on Preferred Stock pay an annual fixed dividend, thus perpetuity formula can be used:

$$\text{Price of preferred} = \frac{\text{dividend}}{\mathrm{r}_{\text{preferred}}}$$

$$\mathrm{r}_{\text{preferred}} = \frac{\text{dividend}}{\text{Price of preferred}}$$

13.6 Valuing Entire Businesses

Free cash flow (FCF) = Cash flow available for distribution to investors after firm pays for new investments or additions to working capital.

Value of the business:

$$\mathrm{PV} = \underbrace{\frac{\mathrm{FCF}_1}{1+\mathrm{WACC}} + \frac{\mathrm{FCF}_2}{(1+\mathrm{WACC})^2} + \cdots + \frac{\mathrm{FCF}_H}{(1+\mathrm{WACC})^H}}_{\text{PV(free cash flows)}} + \underbrace{\frac{\mathrm{PV}_H}{(1+\mathrm{WACC})^H}}_{\text{PV(horizon value)}}$$

Example:

$$\text{Horizon value in year } 5 = \frac{\mathrm{FCF}_6}{\mathrm{r} - \mathrm{g}}$$

$$\mathrm{PV(Business)} = \mathrm{PV(FCF\ year\ 1-5)} + \mathrm{PV\ (Horizon\ value)}$$

Chapter 16 – Debt Policy

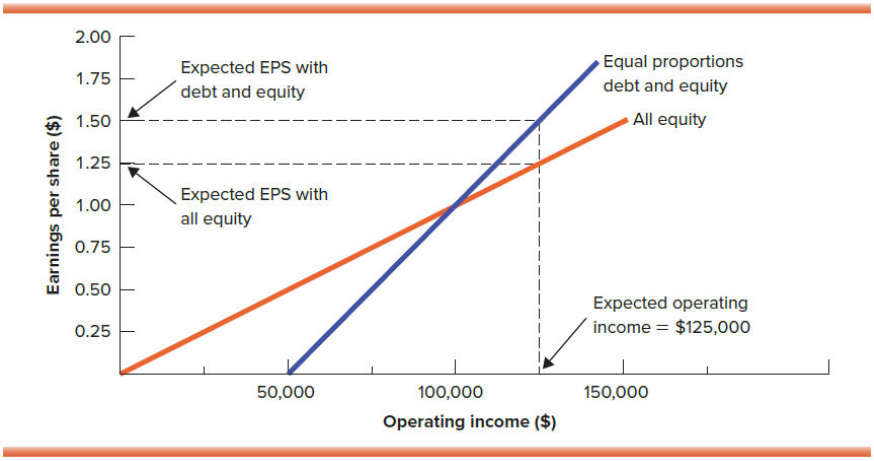
16.1 Borrowing in a Tax-Free economy

Capital structure = The Mix of long-term debt and equity financing

Modigliani and Miller (MM) = When there are no taxes and capital markets function well, the market value of a company does not depend on its capital structure. In other words, financial managers cannot increase value by changing the mix of securities used to finance the company

Restructuring = Process of changing the firm's capital structure without changing its real assets.

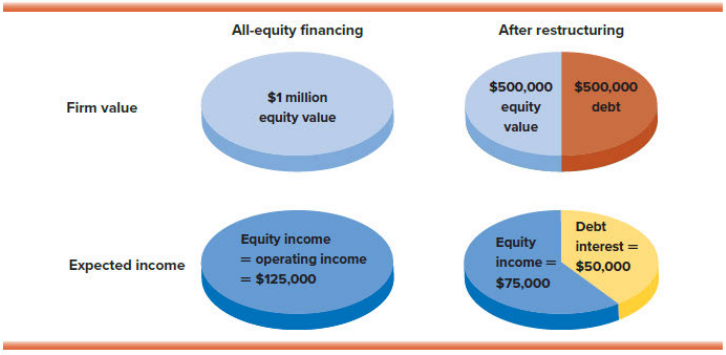
FIGURE 16.1 Borrowing increases River Cruises' earnings per share (EPS) when operating income is greater than $100,000 but reduces it when operating income is less than $100,000. Expected EPS rises from $1.25 to $1.50.



- Orange line shows how earnings per share would vary with operating income under the firm's current all-equity
- Blue = EPS if the company moves to equal proportions of debt and equity
  - At higher operating income (e.g., above $100,000), the blue line (with debt) lies above the orange — meaning higher EPS thanks to leverage.
  - At lower income (e.g., below $100,000), the blue line is below the orange — meaning EPS is reduced by debt.
  - So, debt magnifies EPS in both directions: it increases upside when things go well and intensifies losses during downturns.

MM Proposition 1: Under ideal conditions, the value of a firm does not depend on its capital structure (i.e., how much it uses debt vs. equity). Investors can create their own leverage, so the firm's borrowing adds no extra value. Thus, whether a firm borrows or not shouldn't matter to shareholders.

FIGURE 16.2 "Slicing the pie" for River Cruises. The pies on the left assume the company has no debt. The pies on the right reflect the proposed restructuring. The restructuring splits firm value (top pies) 50–50. Shareholders get more than 50% of expected, or "normal," operating income (bottom pies), but only because they bear financial risk. Note that restructuring does not affect total firm value or operating income.



Slicing the Pie

- Firm value remains the same ($1 million), whether the firm uses all equity or a mix of debt and equity.
- Borrowing doesn't change the size of the pie, just how it's sliced: part to debt holders, part to equity holders.

Financial Leverage and Risk

- Using debt amplifies the effect of changes in operating income on shareholders' returns.
- This is called financial leverage: it increases financial risk but not business risk.
- Example: If income drops, the earnings per share (EPS) fall more sharply with debt than without it.

Risk-Return Trade-off

- While debt increases expected returns to shareholders, it also increases risk.
- Shareholders demand a higher return to compensate, so the value of the firm stays the same.

Key Insight

Debt doesn't change the value of the firm — it just increases shareholder risk and expected return.

16.2 Debt and Cost of Equity

Opportunity cost of capital for firm's assets:

$$r_{assets} = \left(r_{debt} * \frac{D}{V}\right) + \left(r_{equity} * \frac{E}{V}\right)$$

We can re arrange it:

$$r_{equity} = r_{assets} + \frac{D}{E} * (r_{assets} - r_{debt})$$

which in words says that

$$\begin{array}{l}\text{Expected return on equity}\end{array} = \begin{array}{l}\text{expected return on assets}\end{array} + \left[\begin{array}{l}\text{debt-equity ratio}\end{array} \times \left(\begin{array}{l}\text{expected return on assets}\end{array} - \begin{array}{l}\text{expected return on debt}\end{array}\right)\right]$$

MM's Proposition 2

The required rate of return on equity increases as the firm's debt-equity ration increases

"The expected rate of return on the common stock of a levered firm increases in proportion to the debt-equity ratio expressed in market values"

$$r_{equity} = r_{assets} + \frac{D}{E} * (r_{assets} - r_{debt})$$

Debt may look cheaper (lower interest rate), but it adds financial risk, so equity becomes more expensive. Once you factor in this risk, debt is not truly cheaper than equity — the total required return by investors remains the same.

As a firm takes on more debt, risk increases, and both equity and debt holders demand higher returns. Even though r_a stays constant, the shift in risk must be reflected in r_e *and* r_d.

FIGURE 16.3 MM's proposition II with a fixed interest rate on debt. The expected return on River Cruises' equity rises in line with the debt-equity ratio. The weighted average of the expected returns on debt and equity is constant, equal to the expected return on assets.

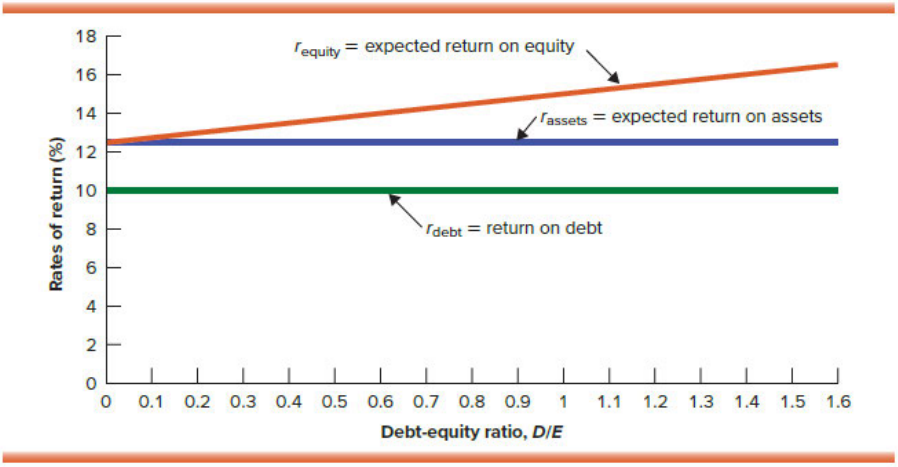
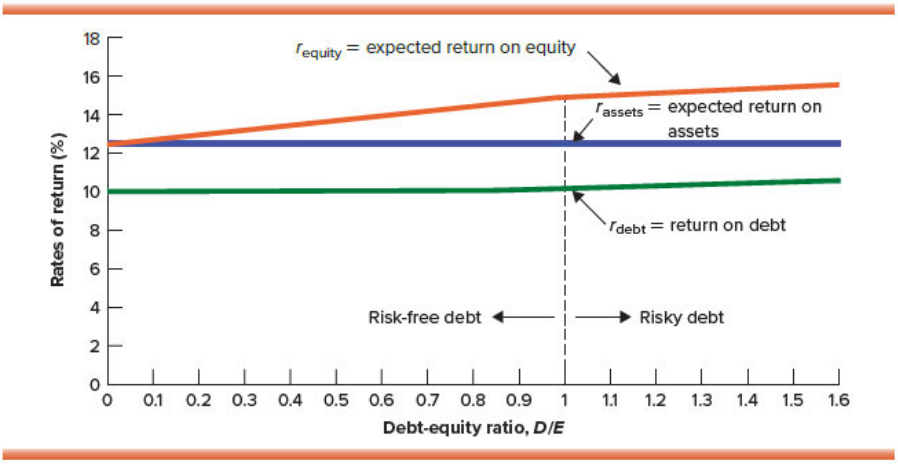


FIGURE 16.4 MM's proposition II when debt is not risk free. As the debt-equity ratio increases, debtholders demand a higher expected rate of return to compensate for the risk of default. The expected return on equity increases more slowly when debt is risky because the debtholders take on part of the risk. The expected return on the package of debt and equity, r_{assets}, remains constant.



- The r_e tapers off as D/E increases, because holders of risky debt begin to bear part of the firm's operating risk.

Financing (debt vs. equity vs. lease) doesn't create value by itself. Value comes from investing in projects that generate returns above their opportunity cost of capital, regardless of how they're funded.

16.3 Debt, Tax, and WACC

Interest tax shield = Tax savings resulting from deductibility of interest payments.
General rule of thumb:

$$\frac{\text{Projected interest tax shield}}{\text{Cost of debt}} = Tax\ Shield\ perpetuity$$

But because the cost of debt changes in period it is better to use the opportunity cost the whole company faces, because it will mimic the rate (risk) of the company.

$$PV(interest\ tax\ shield) = \frac{\text{Projected interest tax shield}}{\text{Investors disocunt rate for operating income}}$$

$$\text{Value of levered firm} = \text{value if all equity financed} + \text{present value of tax shield}$$

16.4 Costs of Financial Distress

Definition: Costs arising from bankruptcy or distorted business decisions before bankruptcy.

$$\text{Overall market value} = \text{value if all equity financed} + \text{PV(tax shield)} - \text{PV(Costs of financial distress)}$$

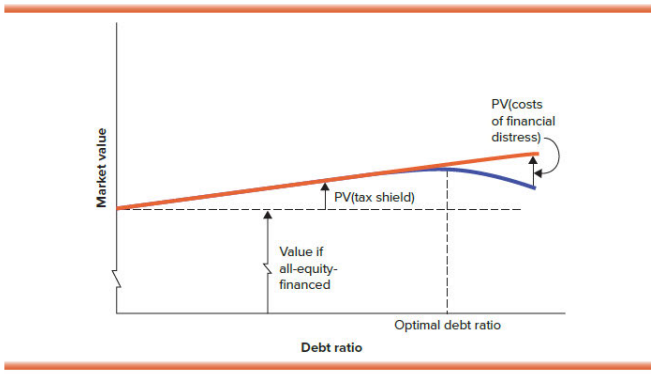


FIGURE 16.7 The trade-off theory of capital structure. The curved blue line shows how the market value of the firm at first increases as the firm borrows but finally decreases as the costs of financial distress become more and more important. The optimal capital structure balances the costs of financial distress against the value of the interest tax shields generated by borrowing.

Trade-off theory:

Managers will try to increase debt levels to the point where the value of additional interest tax shields is exactly offset by the additional costs of financial distress - *The optimal capital structure is reached when both effects balance out*.

- It predicts that firms with tangible, safe assets and high taxable income should use more debt, while firms with risky, intangible assets should rely on equity.
- The theory explains some industry patterns: utilities and hotels borrow more; high-tech firms with intangible assets borrow less.
- However, it fails to explain why highly profitable firms, like Microsoft, often choose to borrow very little despite having strong debt capacity and large tax bills.
- In practice, more profitable firms tend to use less debt, contradicting what the trade-off theory would predict.

Bankruptcy costs

- Bankruptcy is a consequence of declining firm value, not its cause.
- Legal and administrative costs reduce the value left for creditors.
- Higher debt increases default risk and expected distress costs.
- These costs reduce firm value and raise interest rates demanded by creditors.
- Trade-off theory balances tax benefits of debt with financial distress costs.
- Direct bankruptcy costs average about 3% of firm value; higher for small firms.
- Indirect costs (e.g., lost value during prolonged cases) can be substantial.
- Creditors often avoid forcing bankruptcy to minimize overall losses.

Bankruptcy costs vary with type of asset

- Bankruptcy costs vary depending on the type of assets a firm holds.
- Tangible assets like hotels retain value through bankruptcy; losses are minimal and mainly administrative.
- Intangible or human-dependent assets (e.g., R&D teams, skilled labor) lose significant value in bankruptcy.

- Firms with intangible assets, like tech or biotech companies, tend to use less debt to avoid high potential losses.
- When evaluating debt, firms must consider not just the risk of distress, but how much value could be lost if it occurs.

Financial Distress Without Bankruptcy

- Firms can experience financial distress without formally going bankrupt if they continue meeting interest payments.
- Even without bankruptcy, distress creates costs: lost customer trust, supplier concerns, and employee departures.
- Conflicts between stockholders and bondholders grow in distress, often harming business operations.
    - Game 1: Risk shifting – Shareholders may take overly risky bets since losses are mostly the lenders' burden.
    - Game 2: Debt overhang – Shareholders may refuse to fund safe, positive-NPV projects if benefits mostly go to creditors.
- These behaviours reduce firm value and make lenders demand higher interest to protect themselves.
- Loan covenants are used to limit such actions but cannot prevent all conflicts.
- Most firms avoid distress not just out of fairness, but to maintain future borrowing ability.

- **Risk shifting**: Firms threatened with default are tempted to shift to riskier investments because shareholders benefit from upside, while bondholders bear much of the downside.
- **Debt overhang**: Distressed firms may reject positive-NPV projects if shareholders must fund them, but bondholders capture much of the benefit.
- **Loan covenant**: A formal agreement between the firm and its lender that requires the firm to meet certain conditions to protect the lender’s interest.

Pecking Order Theory and Financial Slack

- Pecking Order Theory explains that firms prefer:
    1. Internal finance (retained earnings),
    2. Then debt,
    3. And only issue equity as a last resort.
    - *Definition: Pecking order theory – Firms prefer to issue debt rather than equity if internal finance is insufficient*.
- This order arises from asymmetric information—investors may see equity issues as a sign that the stock is overvalued, driving down prices.
- Most profitable firms borrow less not because they aim for low debt, but because they don’t need external funding.
- The pecking order explains why mature firms tend to use internal funds or debt, while high-growth firms (with valuable investment options) may issue equity more often.

Financial Slack and Capital Structure

- Financial slack is the firm's ability to access funding quickly for good investment opportunities.
  - Definition: Financial slack – Ready access to cash or debt financing.
- Managers prioritize financial slack to retain flexibility and act quickly on positive-NPV projects.
- Too much slack can lead to the free-cash-flow problem—managers may misuse excess cash on unwise investments or perks.
  - Definition: Free-cash-flow problem – Companies with ample cash flow are tempted to overinvest and to operate inefficiently.
- Debt can discipline managers by committing cash to required payments, preventing waste.

No Single Theory Explains All Capital Structures

- There is no universal formula for the optimal debt ratio.
- Different firms apply different theories depending on:
  - Asset type (tangible vs. intangible),
  - Growth stage (startup vs. mature),
  - Need for flexibility or discipline.
- For mature firms, the pecking order is often followed naturally.
- For growth firms, preserving financial slack and managing risk from growth options leads to more conservative, equity-based financing.

These theories help explain real-world financing behavior across industries and firm types.

Chapter 17 – Payout Policy

17.1 Cash Pay Outs to Shareholders

Cash dividend or **repurchase outstanding shares,** are the two options when companies want to pay their investors

Cash dividend:

- Payment of cash by the firm to its shareholders
- DRIP = Dividend reinvestment plan → Dividends are used to buy more shares
- EX dividend = Without the dividend. Buyer of a stock after the ex-dividend date does not receive the most recently declared dividend (When a stock goes ex-dividend the price falls with approx. the same amount of the dividend).

Stock dividend:

- Distributions of additional shares to a firm's stockholders
- E.g., Declare a 10% stock dividend, which gives the stockholder 1 new share for every 10 they own.
- Very much like a stock split

Stock Repurchases:

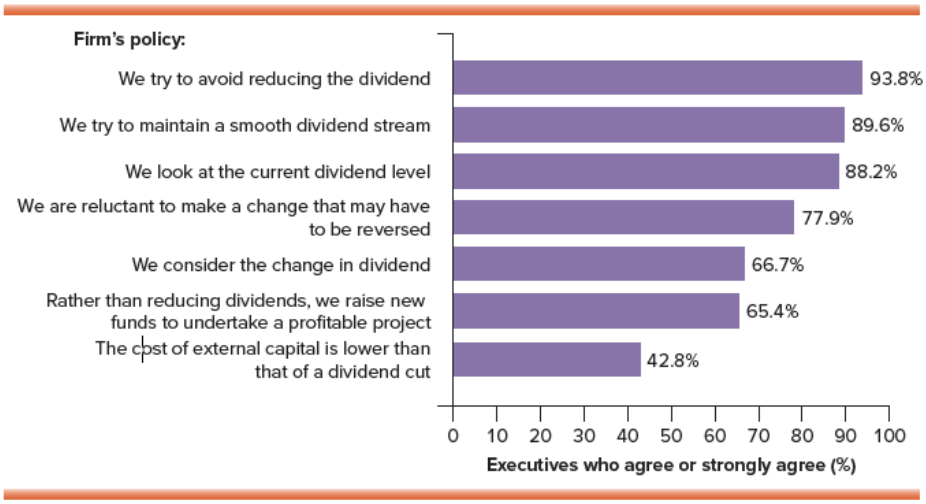
- Firm distributes cash to stockholders by repurchasing shares

- Four different ways:
  - Open market: Most common
  - Tender offer: Buy back a stated amount at a fixed price
  - Auction: Shareholders submit their offers, and the firm calculate the lowest price at which it can buy the desired numbers of shares
  - Direct negotiation: Direct negotiation involves the firm buying back shares directly from a major shareholder. In greenmail, the firm pays a premium to a hostile bidder to prevent a takeover.

4 important dates for dividend payouts:

17.2 Dividends and repurchases

- Managers are reluctant to change dividends unless they are confident the change can be maintained, especially avoiding dividend cuts.
- They tend to smooth dividends over time, adjusting payouts only when long-term earnings justify it.
- Dividend decisions are based more on changes from previous levels than on absolute amounts.
- Investors interpret dividend increases as positive signals of management's confidence in future earnings, while dividend cuts are generally seen as bad news.
  - Because of this, an unexpected dividend increase typically leads to a rise in stock price, while a cut tends to reduce it.
  - This reflects the information content of dividends: changes convey signals about management's outlook and the firm's financial health.



17.3 Payout Controversy

Example:

- Paying dividends reduces the firm's cash and stock price, but shareholders' total wealth remains unchanged.
- Repurchasing shares keeps the stock price stable while reducing the number of shares, also leaving shareholder wealth unchanged.
  - Both methods distribute the same value, supporting the Modigliani-Miller (MM) theory that payout method does not affect shareholder wealth.
- Repurchases avoid the ex-dividend price drop and can slightly boost earnings per share by reducing share count.

Assets		Liabilities and Shareholders' Equity	
A. Original Balance Sheet			
Cash	$ 150,000	Debt	$ 0
Other assets	950,000	Equity	1,100,000
Value of firm	$1,100,000	Value of firm	$1,100,000
Shares outstanding = 100,000			
Price per share = $1,100,000/100,000 = $11			
B. After Cash Dividend of $1 per Share			
Cash	$ 50,000	Debt	$ 0
Other assets	950,000	Equity	1,000,000
Value of firm	$1,000,000	Value of firm	$1,000,000
Shares outstanding = 100,000			
Price per share = $1,000,000/100,000 = $10			
C. After $100,000 Stock Repurchase Program			
Cash	$ 50,000	Debt	$ 0
Other assets	950,000	Equity	1,000,000
Value of firm	$1,000,000	Value of firm	$1,000,000
Shares outstanding = 90,909			
Price per share = $1,000,000/90,909 = $11			

Repurchases and the Dividend Discount Model

1. The Dividend Discount Model (DDM) still works if firms use repurchases, as long as you account for dividends per share, not total dividends.

$$P_0 = \frac{DIV_1}{r - g}$$

2. If a firm pays 50% of earnings as dividends and uses 50% for repurchases, fewer shares will be outstanding, increasing dividends and earnings per share over time.
3. In the example, a $0.50 dividend with a 5% growth rate gives a stock price of $10, the same result as if $1 was paid entirely as a dividend with no growth.
4. The key is that repurchases boost per-share growth, which offsets lower initial dividends in the DDM formula, keeping valuation unchanged.

Dividends and Share Issues

1. Paying dividends funded by issuing new shares does not increase shareholder value; it's simply recycling cash.
2. New investors buying shares replace the cash paid out as dividends, leaving the company's total value unchanged.
3. Shareholders can "create their own dividends" by selling shares—there's no need to raise payouts just to satisfy demand for income.
4. In efficient markets, dividend policy doesn't affect firm value if capital is raised or used wisely, aligning with the theory that dividends are irrelevant in perfect conditions.

17.4 Dividends might increase value

The are natural clienteles for high-payout stocks, but it does not follow that any particular firm can benefit by increasing its dividends. The high-dividend clienteles already have plenty of high-dividend stocks to choose from.

- Most persuasive argument for high-payout policies = Mitigates FCF problems
- Dividends provide more discipline than repurchases because dividends are rarely cut except under great duress (tvang).

17.5 Dividends might reduce value

- Dividends may reduce a firm's value because they are taxed more heavily than capital gains.
- Investors prefer returns through capital gains for better after-tax returns.
- Firms paying dividends must offer lower stock prices to provide the same after-tax return, making stock repurchases a more tax-efficient strategy.

- While dividends and capital gains are now taxed at similar top rates (23.8%), capital gains still have a tax advantage because taxes can be deferred until the shares are sold, reducing their present value (the tax liabilities, which means that the cost of tax is effectively reduced)

- Institutions like pension funds are unaffected by this, but corporations get favorable tax treatment on dividends.
- Although the tax benefit of share repurchases has decreased over time, it still exists and helps explain their growing popularity.

- *However, payout policies vary widely, with many firms mixing dividends, repurchases, or reinvesting profits depending on their situation.*

17.6 Payout policy and Life Cycle of firm

- Payout policy does not affect shareholder value, because it is driven by investment policy, exploitation of growth opportunities and debt policy.
- According to MM, Payout is a byproduct from financing decisions

Life cycle:

1) *First companies save the free cash flow and reinvest in projects (investors don't worry because of a lot of growth potential*

2) *When becoming stablished they save more and have FCF which investors begin to worry about overinvestments (investment in a larger company but not more profitable)*

3) *While share repurchases are tax-efficient, regular cash dividends send a stronger signal of financial stability and discipline. As firms mature and generate sustained free cash flow, they are expected to return cash to shareholders—via dividends, repurchases, or even takeovers.*

Managers can use three questions to decide if payout is appropriate:

a. *Is there positive, sustainable free cash flow?*
b. *Is the firm's debt level safe?*
c. *Is there enough cash for emergencies and opportunities?*

If yes, payout is justified.

4) *Example: In 2012, Apple met all three criteria and began a mix of dividends and buybacks—now a common approach for large, cash-rich firms.*

Chapter 21 – Mergers, Acquisitions, and Corporate Control

21.1 Types of Mergers

- **Horizontal** = Two firms in the same line of business, the merged firms are former competitors
- **Vertical** = Companies in different stages of production (Either toward the source of raw materials or forward in direction of ultimate customers. This acquire gave the company greater control over their supply chain
- **Conglomerate** = Companies in unrelated lines of business

21.2 Motives for Mergers

Economies of scale and scope

- Economies of scale arise when companies increase volume resulting in a proportionately smaller increase in costs.

- Economies of scope arise whenever there is an economic advantage in widening the firm's range of products.
    - To achieve this the merged firm may close overlapping or inefficient operations

Economies of vertical integration

- Vertical mergers occur when a company expands either upstream (toward raw materials) or downstream (toward the end consumer) to gain greater control over its production process, reduce costs and improve coordination.
- Vertical mergers, once valued for improving coordination between tightly linked operations, have declined as outsourcing became more cost-effective.
- Companies like GM found it cheaper to buy parts from external suppliers than produce them in-house, leading to moves like spinning off Delphi in 1998 to gain flexibility and better pricing.

Complementary resources

- Small firms are acquired by larger ones that can supply the resources needed to actually produce and sell the products
- Therefore, the two companies have complementary resources – each has what the other needs.

Changes in corporate control

- Firms with excess cash that are not being distributed to shareholders are often targeted for takeovers
- The acquirers seek to redirect idle cash from low-value projects to more productive use
- Poor mgmt. May also fail to exploit cost-cutting or profit-increasing opportunities making them attractive to takeover targets
- Mergers should be the last resort when other governance mechanisms fail → Board should replace bad mgmt. Instead

Industry consolidation

- Industries with too many firms and excess capacity often present major opportunities for efficiency gains
- These conditions can lead to waves of mergers and acquisitions, because:
    - Mergers help reduce capacity and employment (cost efficiency)
    - Release capital for reinvestment in more productive areas of the economy

Industrial Logic does not guaranty success

- Even when a merger makes economic sense, its success depends heavily on effective integration (aligning different production processes, accounting methods and corporate cultures)
- Human assets (skilled workers and managers) → They will leave if they are unhappy with the merger. Which create a risk of paying to much for talent that walks out the door.

21.3 Uncertain reasons for Mergers

Improved diversification

- Cash-rich firms in stagnant industries may seek diversification through acquisitions.
- Diversification does reduce risk, but using mergers to achieve it is inefficient.
- Shareholders can diversify their own portfolios more easily and cheaply than firms can by merging.
- Therefore, there is little justification for firm A to buy firm B simply to diversify.
- Evidence shows that diversified firms often trade at a discount, not a premium, in the market.

The Bootstrap Game

- A company with a high price-earning (P/E) ratio due to investor expectations of growth acquires a company with a low P/E ratio

- Post acquisition, the combined earnings per share increase, even though no real value is created.
- EPS growth may temporarily impress investors, leading to a higher share price

Problem:

- Long-term growth is actually slowed down by acquiring low-growth firms.
- Eventually, the price-earnings ratio declines, revealing the lack of true value creation.
- The strategy is unsustainable—it relies on a constant stream of new acquisitions.
- When acquisitions slow or stop, earnings growth halts, and the "house of cards" collapses.

Key point: An increase in EPS from buying a low-P/E firm does not justify a higher stock price, because future growth is diluted.

Management Bias

- Some mergers are driven by managerial overconfidence or ambition, not by sound economics
- Overconfident CEOs may believe they can run the target company better than its current management
- Acquisitions are a quick way to inflate size and status, even if they destroy value in the long run.

21.4 Mechanics of a Merger

Merger = Combination of two firms into one, with the acquirer assuming assets and liabilities of target firm

Acquisition = (1) Take over of a firm by purchasing of that firm's common stocks either hostile or planned (2) Takeover of a firm by purchase of that firm's assets (asset ownership).

Mergers can be blocked by federal government if they are thought to be anticompetitive or create to much market power

Economic nationalism = When domestic companies are protected from foreign ownership

21.5 Evaluating Mergers

Mergers financed by cash

$$\text{Economic gain} = \text{PV (extra or increased earnings)}$$

If the extra earrings are permanent, we use the perpetuity formula

$$\begin{aligned}\text{Total value of mered firm} \\ &= \text{original value of both firmts} + \text{economic gain} \\ &- \text{cash paid by the acquire to target company's shareholders}\end{aligned}$$

$$\text{Costs} = \text{Cash paid out} - \text{value of acquired company}$$

$$\text{NPV} = \text{Economic gain} - \text{cost}$$

TABLE 21.4 Financial forecasts after the Cislunar–Targetco merger. The middle column assumes a cash purchase at $19 per Targetco share. The right column assumes Targetco stockholders receive one new Cislunar share for every three Targetco shares.

	Cash Purchase	Exchange of Shares
A. Value of Firms		
Original value of Cislunar	$480	$480
+ Original value of Targetco	40	40
+ Economic gain from merger	20	20
− Cash paid to Targetco shareholders	47.5	0
= Value of Cislunar after merger	$492.5	$540
Cislunar shares outstanding postmerger	10	10.833
Cislunar price per share postmerger	$49.25	$ 49.85
B. Gains from Merger		
Value of original Cislunar shareholders: postmerger	$492.5	$498.5 (= 10 × $49.85)
− Value of Cislunar shares: premerger	480	480
= Cislunar shareholders' gain from merger	$ 12.5	$ 18.5
Value received by Targetco shareholders	$ 47.5 (cash payment)	$ 41.5 (= .833 × $49.85) (value of shares in merged firm)
− Value of Targetco shares premerger	40	40
= Targetco shareholders' gain from merger	$ 7.5	$ 1.5
Sum of gains to Cislunar and Targetco shareholders	12.5 + 7.5 = $20	18.5 + 1.5 = $20

Mergers financed by stock

- Exchange Ratio: 1 Cislunar share for every 3 Targetco shares
- New Shares Issued: 0.833 million Cislunar shares
- Post-Merger Firm Value: $540 million
- Post-Merger Share Price: $49.85
- Cost to Cislunar: $1.5 million (value of shares issued − Targetco's pre-merger value)
- Gain to Targetco Shareholders: $1.5 million
- Gain to Cislunar Shareholders (NPV): $18.5 million
- Cislunar Share Price Increase: $1.85 per share
- Stock Financing Advantage: Lower cost, shared valuation risk, and better if merger synergies are strong

A Warning on Merger Cost

- Merger Cost = Premium Paid Over Standalone Value
- Standalone Value (Public Firm) = Stock Price × Shares Outstanding
- Caution:
    - If acquisition rumors exist, the stock price may already be inflated by investor expectations.
- Risk:
    - This can cause the acquirer to overestimate the target's true independent value and overpay.
- Takeaway:
    - Always assess whether the target's stock price reflects real value or speculative acquisition hype.

Another warning

$$\text{Estimated net gain} = \text{DCF valuation of target including merger benefits} - \text{cash required for acquisition}$$

Always ask why the two firms should be worth more together than apart. Remember, you add value only if you can generate additional economic benefits—some competitive edge that other firms can't match and that the target firm's managers can't achieve on their own.

21.6 Market for Corporate Control

Market for corporate control are the mechanisms by which firms are matched up with management teams and owners who can make the most of the firm's resources

Agency costs = When managers or directors take actions adverse to shareholders' interests.

Four ways to change the management of a firm*:*

1) a successful **proxy contest** in which a group of stockholders votes in a new group of directors, who then pick a new management team.
2) the purchase of one firm by another in a **merger or acquisition**.
3) a **leveraged buyout** of the firm by a private group of investors; and
4) a **divestiture**, in which a firm either sells part of its operations to another company or spins it off as an independent firm.

21.7 Proxy Contests

This is the takeover attempt in which outsiders compete with management for shareholders' votes. Also called the proxy fight

- *Proxy* is the right to vote another shareholder's shares.
- In a proxy contest, the dissident shareholders attempt to obtain enough proxies to elect their own slate to the board of directors

21.8 Takeovers

Tender offer = Takeover offer is in cash: Offer to target firm's shareholders to buy their stock for cash

Exchange offer = Partly in stock: Offer to target firm's shareholders to buy their stock in exchange for the bidding firm's stock

Hostile takeovers = A hostile takeover occurs when one company (the acquirer) attempts to take control of another company (the target) without the consent of the target's management or board of directors. → Acquire a company against its will often through either a tender offer or a proxy fights

Shark repellent = Amendment to a company charter made to forestall takeover attempts.

- SIMPLE: These are rules added to the company's policies to make it harder to be taken over. Example: Changing the rules so a merger needs 80% approval from shareholders instead of just 50%.

Poison pill = Measure taken by potential target firm to make its stock less attractive to the bidder

- SIMPLE: A trick to make the company less attractive to the buyer. If a hostile bidder buys a lot of shares, other shareholders get to buy more shares at a discount — but the bidder doesn't. This makes it very expensive for the bidder to take control.

21.9 Leveraged Buyouts

Leverage Buyout (LBO) = Acquisition of a firm by a private group using substantial borrowed funds (meaning purchase price is debt-financed)

- The equity in the LBO is privately held by a small group of investors, known as private equity

Management buyout (MBO) = Acquisition of the firm by its own management in a leveraged buyout

- Common for unwanted divisions of large companies.
- These divisions were neglected and stuck in corporate bureaucracy.
- When spun off, management had:
  - More freedom
  - Personal financial stake
  - Strong incentive to cut costs and succeed
- Many became more competitive and profitable after the MBO.

Key Highlights – Motives for Leveraged Buyouts (LBOs)

1. **Junk Bond Financing**
   In the 1980s, LBOs were fueled by easy funding from the junk bond market. Investors underestimated the risk of default, leading to a wave of LBOs. When default rates rose between 1989 and 1991, junk bond financing collapsed.
2. **Leverage and Taxes**
   Debt allows for tax savings through interest deductions, but this was not the main driver of LBO value. If it were, companies wouldn't be so eager to pay down debt quickly after the buyout.
3. **Impact on Stakeholders**
   Stockholders often benefit, but bondholders can lose when debt levels spike. However, these losses aren't enough to fully explain the gains to shareholders, suggesting real value creation occurs.
4. **Managerial Incentives**
   In LBOs, managers often become part-owners. With their personal wealth tied to the company's success, they work harder, cut costs, and focus on performance. Studies show improved efficiency and higher operating income after buyouts.
5. **Free Cash Flow Discipline**
   LBOs often target mature companies that generate more cash than they need. Instead of wasting it, debt forces these firms to use cash wisely, often by cutting excessive spending and repaying debt. This supports the theory that LBOs help prevent inefficient capital use.
6. **Not All LBOs Are Successful**
   While many LBOs improve performance, others fail due to excessive debt or poor planning. Still, the idea that LBOs are purely destructive is inaccurate. Many generate value through stronger incentives and operational improvements.

21.10 Divestitures, Spin-Offs, and Carve-Outs

Divestitures = Corporate Fission
While mergers (fusion) get more attention, **divestitures**—selling or separating parts of a business—are equally important in reshaping companies.

Spin-Offs
A **spin-off** happens when a company **separates a business unit** and gives shares in the new company to its existing shareholders.
Example: GE spun off its healthcare unit and exited Baker Hughes to focus on its core business.

Carve-Outs
In a **carve-out**, the parent **sells shares in the subsidiary to the public** via an IPO instead of giving them to current shareholders.
Sometimes companies carve out a small stake first, then spin off the rest later.

Purpose and Benefits

- **Improves focus** by letting the parent company concentrate on its main business
- **Enhances investor clarity** and choice
- **Boosts managerial incentives**, especially if managers get equity in the new firm
- **Avoids cross-subsidization**, where profitable units support weak ones

Investor Reaction
Spin-offs are often **welcomed by investors**, as they typically lead to **better capital allocation** and **stronger performance** in both the parent and new companies. A bad business was not economical supported by a good one

Case Example – DowDuPont
Dow and DuPont merged, then planned to split into three focused companies—agriculture, materials, and specialty products—each with a clear mission and strategy.

21.11 Benefits and Costs of Mergers

1. Who Gains and Loses from Mergers

- Target shareholders typically gain significantly from mergers.
- Acquiring shareholders generally earn little to no return.
- Most merger gains come from operating efficiencies, not tax savings.
- Merger outcomes can vary widely in success or failure.

2. Buyers Versus Sellers

- Buyers earn lower percentage returns because they are usually larger than the targets.
- Bidding wars shift more value to the target company.
- Managerial overconfidence and self-interest can lead to overpaying.

3. Mergers and Society

- Public concern often focuses on job losses and reduced competition.
- Regulatory bodies may block mergers if societal harm outweighs efficiency gains.
- The broader impact of mergers on society is complex and case dependent.

Chapter 22 – International Financial Management

22.1 Foreign Exchange Markets

Exchange rate = Amount of one currency needed to purchase one unit of another

Base currency = First in a currency pair; equals 1 unit.

Quote currency = Second in the pair; shows how much is needed to buy 1 unit of the base.

- Example: In **EUR/USD = 1.10**, EUR is the base, USD is the quote.

Spot rate of exchange = Exchange rate for an immediate transaction

Cross rate = An exchange rate between two currencies other than the e.g., U.S. Dollars

- Cross-rates between any two currencies are locked down by the exchange rate for each currency versus in this case the U.S. Dollar.

Float(ing) = Currencies fluctuates all the time.

- When the currency increases (meaning you need less of the foreign currency to buy 1 dollar) it is said to appreciate.
- When you need more of the currency to buy 1 dollar, the currency is depreciating

Fixed = Fixed exchange rate, seldom last forever

Forward exchange rates: Exchange rate agreed today for a future transaction

- Foreign exchange forward contract **=** An agreement now to the price at which you can sell the currency to in the future

- Exchange Rate Risk = Companies face risk when foreign currency values fluctuate. A weaker foreign currency means lower dollar revenues.

- Forward Contracts = A forward contract locks in an exchange rate today for a currency transaction in the future, eliminating uncertainty.

- Spot vs. Forward Rate
  - Spot rate: Current exchange rate for immediate delivery
  - Forward rate: Agreed rate for future delivery

- If the forward rate gives more foreign currency per dollar than the spot rate, the foreign currency is at a forward discount.

$$\text{Forward rate for year } 1 = \text{Spot rate in year } 0 * \frac{1 + \text{rur interest rate}}{1 + \text{dollar interst rate}}$$

- Custom vs. Standard Contracts
  - Forward contracts are customized deals with a bank for any amount and any date.
  - Futures contracts are standardized and traded on exchanges, available only for major currencies and fixed dates.

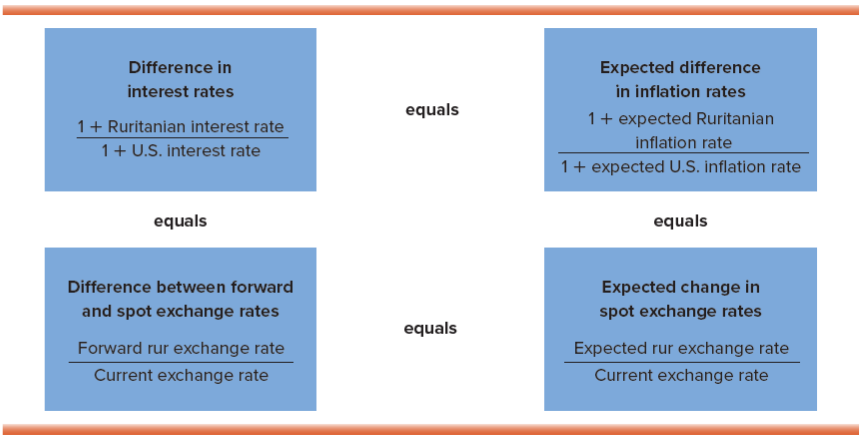
- Purpose
  Forward contracts transfer currency risk to the bank and help companies plan cash flows more reliably.

22.2 Basic relationship

Exchange rates and inflation = The core idea is, if one country suffers a higher rate of inflation than another, then that country's currency will depreciate

Law of one price = Theory that prices of goods in all countries should be equal when translated to a common currency, or, more generally, that two assets providing the same cash flows cannot sell for different prices (Good for commodities where transport costs are small)

FIGURE 22.1 Some simple theories linking spot and forward exchange rates, interest rates, and inflation rates.



Purchasing power parity (PPP) = The weaker version of "One price law". This theory is abut that the costs of living in different countries is equal and exchange rates adjust to offset inflation differentials across countries.

Expected difference in inflation rates

$$\frac{1 + \text{expected Ruritanian inflation rate}}{1 + \text{expected U.S. inflation rate}} = \frac{1.06}{1.01} = 1.05$$

equals

Expected change in spot exchange rates

$$\frac{\text{Expected rur exchange rate}}{\text{Current exchange rate}} = \frac{105}{100} = 1.05$$

Real and nominal exchange rates

1) Nominal Exchange Rate: Shows how much foreign currency you get per dollar (e.g., euros, yen, etc.).

2) Real Exchange Rate: Reflects the purchasing power of your dollar abroad—how many goods you can actually buy.

3) Effect of Inflation: A weaker foreign currency (nominal drop) may not increase real buying power if that country has higher inflation.

4) Purchasing Power Parity (PPP): Suggests that over time, exchange rates adjust to offset inflation differences, keeping real exchange rates stable.

5) Short vs. Long Term:
   - Short-term real exchange rates can shift significantly.
   - Long-term, PPP suggests nominal changes will mirror inflation differences.

Inflation and interest rate (International Fisher Effect)

International Fisher Effect: Theory that real interest rates in all countries should be equal, with differences in nominal rates reflecting differences in expected inflation

Difference in interest rates

$$\frac{1 + \text{Ruritanian interest rate}}{1 + \text{U.S. interest rate}} = \frac{1.081}{1.03} = 1.05$$

equals

Expected difference in inflation rates

$$\frac{1 + \text{expected Ruritanian inflation rate}}{1 + \text{expected U.S. inflation rate}} = \frac{1.06}{1.01} = 1.05$$

Forward exchange rate and expected spot rate (Expectations theory of exchange rates)

Expectations theory of exchange rates: Theory that the expected spot exchange rate equals the forward rate (The percentage difference between the forward rate and spot rate is equal to the expected percentage change in the spot rate)

Difference between forward and spot exchange rates

$$\frac{\text{Forward rur exchange rate}}{\text{Current exchange rate}} = \frac{105}{100} = 1.05$$

equals

Expected change in spot exchange rate

$$\frac{\text{Expected rur exchange rate}}{\text{Current exchange rate}} = \frac{105}{100} = 1.05$$

Interest rates and exchange rates (Interest rate parity)

Interest rate parity: Theory that forward premium equals the interest rate differential. Example: you invest in the US with a interest rate of 3% and then you invest in Ruritania to 8,1%. After one year when you have to exchange back to the USD, the exchange rate you convert to will give you the same amount of USD, as if you had just invested in the U.S (if this did not hold there would be opportunities for riskless arbitrage profits)

Difference in interest rates

$$\frac{1 + \text{Ruritanian interest rate}}{1 + \text{U.S. interest rate}} = \frac{1.081}{1.03} = 1.05$$

equals

Difference between forward and spot exchange rates

$$\frac{\text{Forward rur exchange rate}}{\text{Current exchange rate}} = \frac{105}{100} = 1.05$$

22.3 Hedging Currency Risk

Transaction Risk = Transaction risk happens when a company is due to pay or receive a fixed amount in a foreign currency. If the exchange rate moves, the dollar value changes — possibly causing a loss.

- Example: If a company is expecting RUR 100 million in 12 months, and the rur weakens, it will receive fewer dollars.

- Solution (Hedge): Use a forward contract to lock in the exchange rate today. This eliminates the risk of currency depreciation but also gives up any gain from favourable movements.

- Alternative Hedge: Borrow in the foreign currency now, convert it to dollars, and invest the dollars. This approach gives the same result as using a forward contract, according to interest rate parity.

- Cost of hedging: the difference between the forward rate and the expected future spot rate

Economic Risk (Operating exposure) = Affects a company's competitive position due to exchange rate changes, even if it doesn't directly deal in foreign currency.

- Example: A sudden rise in a home currency (like the Swiss franc) can make a company's exports more expensive and less competitive abroad.

- Operational Hedging: Firms like Nestlé reduce risk by matching revenues and costs in the same currency — e.g., producing and selling in the eurozone.

- Financial Hedging: Companies like Swatch and Richemont use tools like:
    - Borrowing in foreign currencies to reduce exchange rate impact
    - Currency forward contracts to lock in future exchange rates

- Goal: Limit profit volatility and protect international competitiveness in the face of currency swings.

22.4 International Capital Budgeting

NPV for Foreign Investments

You cannot compare the project's return measured in one currency with the return that you require from investing in another currency. If the opportunity cost of capital is measured as a dollar-denominated return, cash flows should also be forecast in dollars.

- When calculating the NPV the firm does not need to guess future exchange rates, instead it can use forward exchange rates based on interest rate differentials (interest rate parity)
- Projects must be evaluating based on hedged CF not speculative forecast (appreciations)

Cost of capital for Foreign Investments

- The appropriate discount rate for a foreign project depends on its specific risk, not a universal rule.
- There is no standard method for determining the cost of capital internationally, as risk and investor expectations vary by country and project.

Avoiding Fudge Factors

- Managers must not manipulate assumptions (like discount rates or risk premiums) to make foreign projects look better – or account for risk of operating abroad
- The proper way is to reduce the expected cash flow instead

Political Risk

- Political risk is the chance a government changes rules after an investment is made.
- Foreign companies are more exposed, especially to actions like expropriation or new taxes.
- Political risk can be reduced by making local operations dependent on the parent company.
- Spreading production across countries adds flexibility and lowers risk.
- Financing projects with international bank loans can pressure governments to honor agreements.
- Adjust future cash flows for political risk instead of changing the discount rate.
- Recalculating NPV with adjusted cash flows allows clearer analysis of risk impacts.

Summary question: *What is the difference between spot and forward exchange rates?*

- ·· The **exchange rate** is the amount of the quoted currency needed to purchase one unit of another (base) currency.

- ·· The **spot rate of exchange** is the exchange rate for an immediate transaction. The **forward rate** is an exchange rate agreed upon today for a transaction at a specified future date.

Chapter 23 –

23.1 Calls and Puts

Call option = Right to buy an asset at a specified exercise (strike) price on or before the expiration date

- We only exercise the option if the share price exceeds the exercise price. E.g. share price is 3,600 but we have the right to buy it for 3,100

More generally, when the stock price is greater than the exercise price, the payoff from your call option is equal to the difference between the stock price and the exercise price (Payoff is not profit – We need to deduct the option premium (price of option) from the payoff to find profit).

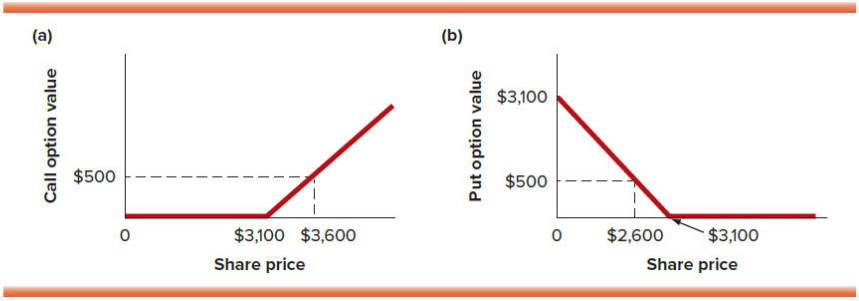
Stock Price at Expiration	Value of Call at Expiration
Greater than exercise price	Stock price – exercise price
Less than exercise price	Zero

Put option = Right to sell an asset at a specified exercise (strike) price on or before the expiration date

- If the stock price is higher than the exercise price → the option is not used and expires worthless.
- If the stock price is lower than the exercise price → the option is profitable, and its value is the difference between the exercise price and the stock price.

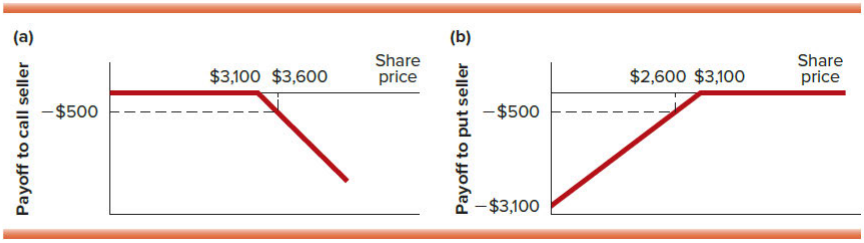
Stock Price at Expiration	Value of Put at Expiration
Greater than exercise price	Zero
Less than exercise price	Exercise price – stock price

FIGURE 23.1 Values of call options and put options on Amazon stock on option expiration date (exercise price = $3,100).



Selling Calls and Puts

FIGURE 23.2 Payoffs to sellers of call and put options on Amazon stock (exercise price = $3,100).



Selling options involves earning a premium but taking on obligations:

- Selling Calls: You receive a premium but must sell the stock at the strike price if exercised. If the stock rises above the strike (e.g., $3,600 vs. $3,100), you incur a loss.
- Selling Puts: You must buy the stock at the strike price if exercised. If the stock falls below this price or becomes worthless, you face losses up to the strike amount.
- Risk: Sellers have limited profit (the premium) but potentially large losses. Their payoff is the inverse of the buyer's.
- Key Point: Option buyers have rights; sellers have obligations and bear more risk.

Rights and obligations of various option positions

	Buyer	Seller
Call option	Right to buy asset	Obligation to sell asset
Put option	Right to sell asset	Obligation to buy asset

Payoff diagrams

FIGURE 23.3 Payoff and profit for a purchaser of a January 2021 expiration call option on Amazon stock with exercise price of $3,100.

FIGURE 23.4 Payoff and profit for a seller of a January 2021 put option on Amazon with exercise price of $3,100.

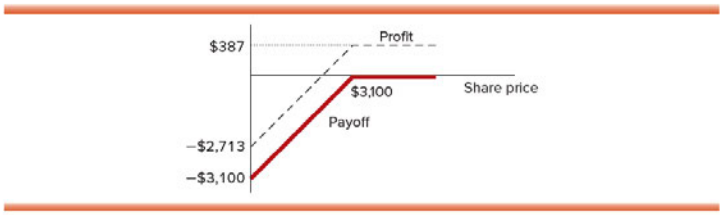


Figure 23.3 – Call Option Buyer

- Position: Bought a call option (pays $395 premium).
- Breakeven: $3,495 (strike price + premium).
- Profit if stock rises above $3,495: Unlimited upside.
- Loss if stock ≤ $3,100: Limited to the $395 premium.

Figure 23.4 – Put Option Seller

- Position: Sold a put option (receives $387 premium).
- Breakeven: $2,713 (strike price – premium).
- Profit if stock ≥ $3,100: Keeps full premium ($387).
- Loss if stock < $3,100: Can be large, up to $3,100 if stock becomes worthless.

Protective put

	Stock Price < $3,100	Stock Price ≥ $3,100
Value of stock	Stock price	Stock price
Value of put option	$3,100 – stock price	0
Total value	$3,100	Stock price

FIGURE 23.5 Payoff to protective put strategy. If the ultimate stock price exceeds $3,100, the put is valueless but you own the stock. If it is less than $3,100, you can sell the stock for the exercise price.

- Strategy: Buy the stock and a put option with a $3,100 strike.
- Downside protection: If the stock price falls below $3,100, the put limits your losses—you can still sell at $3,100.
- Upside potential: If the stock rises above $3,100, the put expires worthless, but your stock gains in value.
- Minimum portfolio value: $3,100 (stock + put), no matter how far the stock price falls.
- Cost: You pay a premium (e.g., $387 in this case) for the put, like "insurance."

Put-Call parity

	Payoffs at Expiration	
	Stock price ≤ $3,100	**Stock price > $3,100**
Call option	0	Stock price – $3,100
Bank deposit paying $3,100	$3,100	$3,100
Total value	$3,100	Stock price

$$\text{Price of stock} + \text{Price of put} = \text{Price of call} + \text{Present value of exercise price}$$

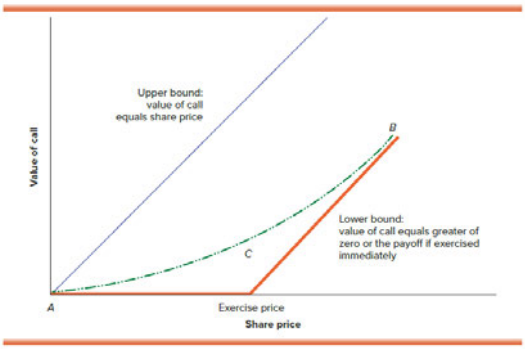
Put-call parity means that owning stock + a put is financially equivalent to owning a call + cash. It's a cornerstone of modern options pricing.

23.2 Option Values

Upper and lower limits on option values

A call option can never be worth more than the current stock price (blue line). This is because the option gives the right—but not the obligation—to buy the stock. You wouldn't pay more for the option than the stock itself.

FIGURE 23.6 Value of a call before its expiration date (dashed line). The value depends on the stock price. The call is always worth more than its value if exercised now (heavy orange line). It is never worth more than the stock price itself (blue line).



Upper Limit:

- The maximum value of a call option is the current stock price (since you can never make more than owning the stock directly).
- This is shown as the blue diagonal line in the graph.

Lower Limit:

- The minimum value of a call option is the greater of:
  - Zero
  - Stock price – Exercise price (the intrinsic value if exercised immediately)
- This is shown as the heavy orange line in the graph

Payoff to holding the stock rather than the option:

Stock Price at Expiration	Stock Payoff	Option Payoff	Extra Payoff from Holding Stock Rather than Option
Greater than exercise price	Stock price	Stock price – exercise price	Exercise price
Less than or equal to exercise price	Stock price	$0	Stock price

Determine option value

- Point A: When the stock price is zero, the call option is worthless. There is no chance of profit, so its value is zero. (Out of the money)

- Point B: When the stock price is very high, the option is almost certain to be exercised. Its value approaches the stock price minus the present value of the exercise price. (In the money)

- Point C: When the stock price equals the exercise price, the option is at the money. It still has value because there is a chance the stock price will rise before expiration.

Outcome	Payoff
Stock price rises	Stock price – exercise price (option is exercised)
Stock price falls	Zero (option expires worthless)

-

Summed up

TABLE 23.4 What the price of a call option depends on.

If the following variables increase, . . .	. . . the value of a call option will
Stock price	Increase
Exercise price	Decrease
Interest rate	Increase
Time to expiration	Increase
Volatility of stock price	Increase

Option-Valuation Models (Black-Scholes Formula)

To value options precisely, we use models like the Black-Scholes formula, which replicates the option's payoff using stock and borrowing. It assumes continuous price changes and is widely used in finance. More advanced models build on it. Option prices can also reveal expected future volatility, known as the "fear index."

Black-Scholes formula in excel:

You may like to try your hand at using the Black-Scholes option-pricing formula to value the Amazon option. You can use the spreadsheet provided in Connect, but it takes only a few moments to construct your own Excel program to calculate Black-Scholes values. The following spreadsheet shows how you do it. First, type in the formulas shown on the right side of the spreadsheet in cells E2 to E8. Now enter the data for the Amazon January 2021 call in cells B2 to B6. Notice that the values for the standard deviation and interest rate are entered as decimals.* In the middle of the Covid pandemic in 2020, share prices were unusually variable, and the standard deviation of Amazon's annual returns was about 45%. So we enter the standard deviation in cell B2 as .45. The last two lines of the output column show that the Black-Scholes formula gives a value of $405.46 for the Amazon call option, a little bit higher than its market price in July 2020. (Don't worry about the other lines of output.)

BEYOND THE PAGE

The Black-Scholes model

www.mhhe.com/brealey11e

Spreadsheet Questions

1. Use the option-pricing spreadsheet to calculate the value of the Amazon call option at stock prices ranging from $1,600 to $4,600 at intervals of $200. (Use an annual interest rate of 2.01%, equivalent to 1% per six months.)
2. Plot the values as a function of the stock price. How does your graph compare to the plot in Figure 23.6?

	A	B	C	D	E	F	G	H	I	J
1	**Inputs**			**Outputs**			**Formula for Output in Column E**			
2	Standard deviation (annual)	0.45		PV(Ex. Price)	3,069.31		= B6/(1+B4)^B3			
3	Maturity (in years)	0.5		d1	0.1904		= LN(B5/E2)/(B2*B3^0.5)+B2*B3^0.5/2			
4	Risk-free rate (effective annual rate)	0.0201		d2	–0.1278		= E3–B2*B3^0.5			
5	Stock price	$3,100		N(d1)	0.5755		= NORMSDIST(E3)			
6	Exercise price	$3,100		N(d2)	0.4491		= NORMSDIST(E4)			
7				B/S call value	405.46		= B5*E5–E2*E6			
8				B/S put value	374.77		= E7+E2–B5			

* Notice that in cell E2, we compute the present value of the exercise price by treating the interest rate as an effective annual yield. You should be aware, however, that many Black-Scholes calculators require that the interest rate be expressed as a continuously compounded rate. See Chapter 5, Table 5.7, if you need a review of continuous compounding.

23.3 Spotting the Option

Options on Real Assets

Real options = Options to invest in, modify, postpone, or dispose of a capital investment project – Project with real options are said to be flexible or have the ability to generate new opportunities

Option to expand = If demand increases, some companies might have the ability to scale up operations

Option to abandon = Think of this as a put option. The exercise price of the put is the amount that you could recover if you abandon the project. The option to abandon the project and not invest everything up front makes this project more attractive (limiting downside exposure, and the more uncertain the project is, the more value the option has)

Options on Financial Assets

Executive stock options = Receiving stock options as salary for executives

Warrants = Right to buy shares from a company at a stipulated price before a set date. They are long-term call options issued by a company, often used in deals or as incentives. They give holders the right to buy stock at a set price, creating potential future dilution.

Convertible Bonds = Bonds that can be exchanged for a set number of shares. They act like a bond plus a call option. Unlike warrants, conversion requires giving up the bond. Their value is always at least the bond value and often more, due to the flexibility to convert when it's most profitable.

Callable Bonds = Bond that may be repurchased by the issuing firm before maturity at a specified call price. Unlike the two above (which gives the investor an option) this gives the issuer an option. A package of a straight bond and a call option held by issuer.

Chapter 24 – Risk Management

24.1 Hedge

- Hedging doesn’t add value by itself because it just shifts risk to others (zero-sum game).
- Investors can often hedge on their own, so companies don't need to do it for them.
- Hedging makes financial planning easier by reducing cash flow volatility and risk of financial distress.
- It can prevent missed investments or bankruptcy by smoothing cash needs.
- Improves risk management, which increases debt capacity.
- Helps managers focus by removing uncontrollable risks from their concerns.
- Good risk strategy requires identifying major risks, assessing their impact, and hedging only unrewarded risks.

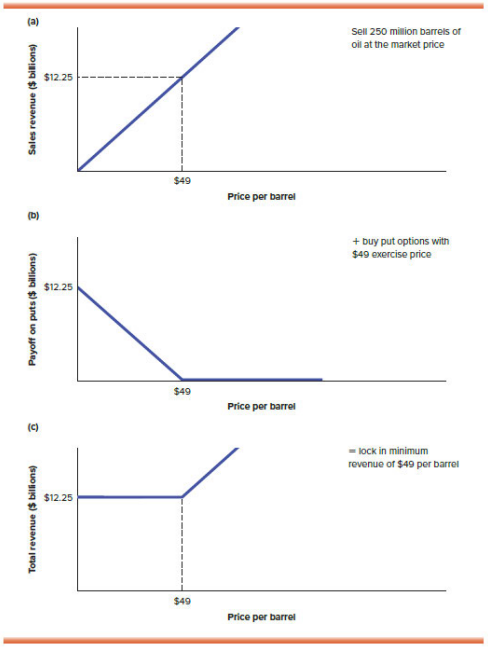
24.2 Reducing Risk with Options

Mexico hedged against falling oil prices by buying **put options** with a **$49 exercise price** for 250 million barrels of oil. This protects government revenues if oil prices drop.

Figure 24.1 Breakdown:

- **Panel (a):** Shows normal oil sales revenue rising with the price per barrel. If oil price = $49, total revenue = $12.25 billion.
- **Panel (b):** Shows the **payoff from put options**. If oil price drops below $49, the options gain value, compensating for lost sales revenue.
- **Panel (c):** Shows the **combined result**: total revenue is never below $12.25 billion. If oil rises, Mexico benefits; if it falls, the put options cover the shortfall.

FIGURE 24.1 How options protected Mexico against a sharp fall in oil prices.



Conclusion:
This protective put strategy ensured **minimum revenue**, effectively setting a floor of $49 per barrel, though it came at a cost (about $1 billion for the options).

- *Just remember, no money changes hands when a futures contract is entered into. The contract is a binding obligation to buy or sell at a fixed price at contract maturity.*

Profits on the futures contracts:

$$\text{Profit to seller} = \text{Initial futures price} - \text{ultimate market price}$$
$$\text{Profit to buyer} = \text{ultimate market price} - \text{initial future price}$$

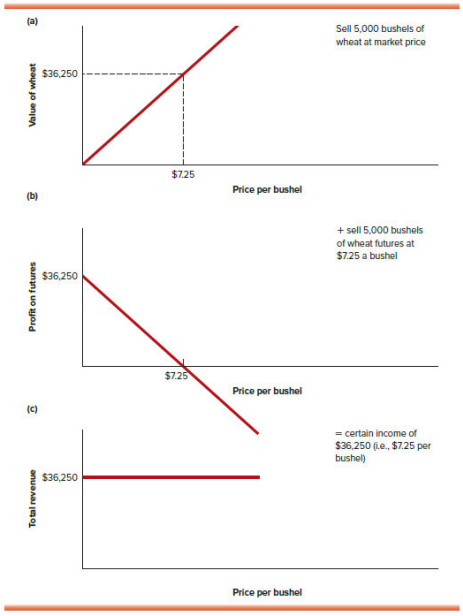
Farmers CF

	Cash Flow
Sale of wheat	Ultimate price of wheat
Futures profit	Futures price – ultimate price of wheat
Total	Futures price

Farmer's futures hedge:

- The farmer sells 5,000 bushels of wheat at the market price (Panel a), which varies with price.
- He also enters a futures contract to sell at $7.25 per bushel (Panel b). If the market price drops, futures profits offset the loss on wheat sales.
- Combined (Panel c), total revenue is fixed at $36,250 regardless of wheat price.

FIGURE 24.2 The farmer can use wheat futures to hedge the value of the crop. See Example 24.1.



Key idea:
By selling futures, the farmer locks in a certain price ($7.25/bushel) and eliminates revenue risk from price changes.

The Mechanics of Futures Trading

- Futures contracts are traded on exchanges (like CME), not face-to-face.
- Contracts are standardized (amount, quality, delivery terms).
- Prices vary by delivery date
- Marked to market: Gains/losses are settled daily as prices change.
- Margin is required to enter a contract, ensuring ability to cover losses.
- Spot price is for immediate delivery; futures price is for future delivery.
- As delivery nears, futures prices converge with the spot price.

Commodity and Financial futures

- Some companies might be able to increase their debt capacity by promising hedging, because it can limit the company's risk of encountering financial distress.

- Financial futures are similar to commodity futures, but instead of placing an order to buy or sell a commodity at a future date, you place an order to buy or sell a financial asset at a future date. You can use financial futures to protect yourself against fluctuations in short- and long-term interest rates, exchange rates, and the level of share prices.

Forward Contracts
Agreement to buy or sell an asset in the future at an agreed price.

- Future contracts are standardized and mature on a limited number of dates each year. Therefore, if the futures contract do not suit your needs, you might be able to sell or buy a forward contract

Forward contracts are custom-tailored futures contracts. You can write a forward contract with any maturity date for delivery of any quantity of goods

- Most common in foreign currencies pr fix interest rate at which they borrow or lend at

24.4 Forwards and Futures Contracts

If you buy forward, you don't pay up front so you can continue to earn interest:

$$\text{Futures price} = \text{spot price} * (1 + \text{interest rate})^{t}$$

Disadvantage to buying forward and not immediately delivery = Missing out of dividends or coupons:

$$\text{Futures price} = \text{spot price} * (1 + \text{interest rate} - \text{dividend yield})^{t}$$

Commodity futures differ from owning the physical good because you don't get the convenience of using or accessing the actual item.

- Net convenience yield is the benefit of holding the physical commodity (e.g., for use or to avoid shortages), minus storage costs.

- When commodities are scarce, the net convenience yield is high.
- If futures prices are below spot prices, it signals high convenience yield due to supply tightness.

$$\text{PV future} = \text{spot price} * (1 + \text{interest rate} - \text{net convinience yield})^{t}$$

- Net convenience yield in commodities plays the same role as dividend yield in financial futures.

24.5 Swaps

Arrangement by two counterparties to exchange one stream of cash flows for another

Interest rate swaps let firms exchange floating-rate payments for fixed-rate payments (or vice versa).

FIGURE 24.3 Interest rate swap. Computer Parts currently pays the SOFR rate on its outstanding debt (the arrow on the left). If the firm enters a swap to pay a fixed rate of 5% and receive a floating rate of SOFR, its exposure to SOFR will cancel out and its net cash outflow will be a fixed rate of 5%.

- Useful when a firm wants to hedge interest rate risk without refinancing its debt.
- In the example, Computer Parts has $100 million in floating-rate debt (SOFR-based) and enters a swap to pay 5% fixed and receive SOFR.
- This swap locks in a fixed interest cost, stabilizing cash flows.
- The swap transforms floating-rate debt into synthetic fixed-rate debt.
- Swaps are a cheaper and flexible way to manage exposure to changing interest rates.

Currency swaps (example)

- Possum Company wants to borrow in Swiss francs (CHF) for European operations but gets better terms on a U.S. dollar loan.
- It borrows $10 million at 5% interest in dollars.
- To hedge currency risk, it enters a currency swap: it swaps dollar payments for CHF payments with a dealer.
- The dealer covers Possum's dollar loan payments, while Possum makes CHF payments as if it had borrowed CHF 20 million at 6%.
- Result: Possum's net position is the same as if it had taken a CHF loan at 6%, without actually borrowing in Swiss francs.

Purpose: The currency swap allows Possum to benefit from better U.S. rates while effectively creating a synthetic CHF loan.

24.6/7 Derivatives Market

New derivatives are created often to manage emerging risks, exchanges adopt useful contracts, but their success is hard to predicts.

If derivatives are used correctly, they can hedge risk. Used without offsetting exposure, they become speculations. Speculators are vital for market function but can cause big losses.

Speculation is foolish unless you have reason to believe that the odds are stacked in your favour. If you are not better informed than the highly paid professionals in banks and other institutions, you should use derivatives for hedging, not for speculatio