

## QUANTITATIVE METHODS

### THE TIME VALUE OF MONEY

#### Required Rate of Return

interest rate = real risk-free rate  
 + inflation premium  
 + default risk premium  
 + liquidity premium  
 + maturity premium

#### Future Value (FV) and Present Value (PV)

$$FV = PV(1 + r)^N$$

#### Effective Annual Rates

$$EAR = \left(1 + \frac{r_{\text{stated}}}{m}\right)^m - 1$$

$$EAR_{\text{continuous}} = e^{r_{\text{stated}}} - 1$$

#### Annuities

**Annuity:** Finite set of level sequential cash flows, valued using calculator's TVM function  
**Ordinary Annuity:** 1<sup>st</sup> cash flow received in one year  
**Annuity Due:** 1<sup>st</sup> cash flow received immediately  
**Perpetuity:** Ordinary annuity with payments that continue forever,  $PV_{\text{perpetuity}} = \frac{PMT}{r}$

### ORGANIZING, VISUALIZING, AND DESCRIBING DATA

#### Data Visualization

- Histogram and frequency polygon
- Bar chart (and Pareto chart)
- Tree-map
- Word cloud/tag cloud
- Line chart (and bubble line chart)
- Scatter plot (and scatter plot matrix)
- Heat map

#### Arithmetic Mean Return

Sample mean,  $\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$ ;  $n$  = sample size

#### Geometric Mean Return

$$R_G = \sqrt[n]{\prod_{i=1}^n (1 + R_i)} - 1$$

#### Harmonic Mean Return (Cost Averaging)

$$\bar{X}_H = \frac{n}{\sum_{i=1}^n \frac{1}{X_i}}, \text{ where } X > 0 \text{ for } i = 1, 2, \dots, n$$

If returns are volatile,  $\bar{X}_{\text{Arith.}} > \bar{X}_{\text{Geo.}} > \bar{X}_{\text{Har.}}$

#### Quantiles

Location of  $y^{\text{th}}$  percentile,  $L_y = (n + 1) \frac{y}{100}$

If  $L_y$  is not an integer, use linear interpolation.

Distributions may be divided into quarters (*Quartiles*), fifths (*Quintiles*), or tenths (*Deciles*)

E.g., 50<sup>th</sup> percentile = 2<sup>nd</sup> quartile = 5<sup>th</sup> decile

#### Mean Absolute Deviation

$$MAD = \frac{1}{n} \sum_{i=1}^n |X_i - \bar{X}|$$

#### Variance and Standard Deviation

$$\text{Sample variance, } s^2 = \frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2$$

Standard deviation is square root of variance

#### Target Downside Deviation

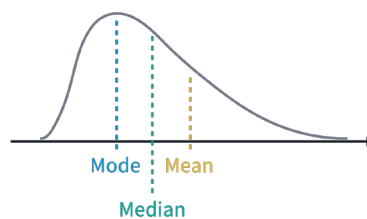
$$\text{Sample target semideviation, } s_{\text{Target}} = \sqrt{\frac{\sum_{X_i \leq B} (X_i - B)^2}{n-1}}$$

#### Coefficient of Variation

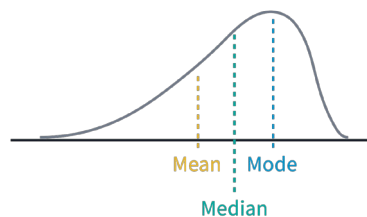
$CV = s/\bar{X}$ ; measures dispersion relative to mean

#### Skewness

Distribution Skewed to the Right  
(Positively Skewed)



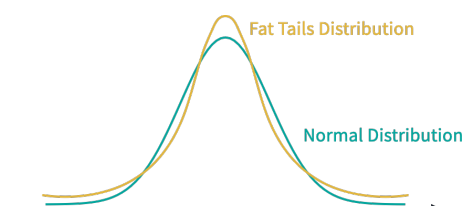
Distribution Skewed to the Left  
(Negatively Skewed)



$$\text{Skewness} \approx \left(\frac{1}{n}\right) \frac{\sum_{i=1}^n (X_i - \bar{X})^3}{s^3}$$

#### Kurtosis (Excess Kurtosis = Kurtosis - 3)

Distribution	Tails	Peaked	Kurtosis
Leptokurtic	Fatter	More	>3
Mesokurtic	Normal	Normal	3
Platykurtic	Thinner	Less	<3



$$\text{Excess kurtosis, } K_E \approx \left(\frac{1}{n}\right) \frac{\sum_{i=1}^n (X_i - \bar{X})^4}{s^4} - 3$$

#### Sample Covariance

$$s_{XY} = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{n-1}$$

#### Sample Correlation Coefficient

$$r_{XY} = \frac{s_{XY}}{s_X s_Y}$$

### PROBABILITY CONCEPTS

#### Odds

$$\text{Odds of E} = \frac{P(E)}{1 - P(E)}$$

#### Probabilities

**Unconditional:**  $P(A)$ , probability of A

**Conditional:**  $P(A|B)$ , probability of A given B

**Joint:**  $P(AB)$ , probability of A and B

#### Probability Rules

**Conditional:**  $P(A|B) = P(AB)/P(B)$

**Multiplication:**  $P(AB) = P(A|B) \times P(B)$

**Addition:**  $P(A \text{ or } B) = P(A) + P(B) - P(AB)$

**Total:**  $P(A) = P(A|S_1)P(S_1) + \dots + P(A|S_n)P(S_n)$   
 where  $S_1, S_2, \dots, S_n$  is an exhaustive set of mutually exclusive probabilities

#### Independence

If A and B are independent events,

$$P(AB) = P(A) \times P(B)$$

#### Expected Value

$$E(X) = \sum_{i=1}^n P(X_i)X_i$$

$$E(X) = E(X|S_1)P(S_1) + \dots + E(X|S_n)P(S_n)$$

#### Variance

$$\sigma^2(X) = \sum_{i=1}^n P(X_i)[X_i - E(X)]^2$$

#### Covariance

$$\text{Cov}(X, Y) = \sum_{i=1}^n \sum_{j=1}^n P(X_i, Y_j)[X_i - E(X)][Y_j - E(Y)]$$

An asset's covariance with itself is its variance

#### Expected Value & Variance of Portfolio Return

$$E(R_p) = \sum_{i=1}^n w_i E[R_i]$$

$$\sigma^2(R_p) = \sum_{i=1}^n \sum_{j=1}^n w_i w_j \text{Cov}(R_i, R_j)$$

$$w_i = \frac{\text{Market value of investment } i}{\text{Market value of portfolio}}$$

For portfolio with 2 investments:

$$E(R_p) = w_A R_A + w_B R_B$$

$$\text{Cov}(R_A, R_B) = \sigma(R_A)\sigma(R_B)\rho(R_A, R_B)$$

$$\sigma^2(R_p) = w_A^2 \sigma^2(R_A) + w_B^2 \sigma^2(R_B) + 2w_A w_B \text{Cov}(R_A, R_B)$$

### Correlation

$$\rho_{ij} = \text{Corr}(R_i, R_j) = \frac{\text{Cov}(R_i, R_j)}{\sigma(R_i)\sigma(R_j)}; \min -1, \max 1$$

### Bayes' Formula

$$P(\text{Event}|\text{Info}) = \frac{P(\text{Info}|\text{Event}) \times P(\text{Event})}{P(\text{Info})}$$

Updates prior probabilities to give posterior probabilities based on new information

### Counting Rules

**Factorial:**  $n! = n(n-1)(n-2) \dots 1$

$$\text{Multinomial: } \frac{n!}{n_1! n_2! \dots n_k!}$$

Counts ways to label n items with k labels

$$\text{Combination: } {}_n C_r = \binom{n}{r} = \frac{n!}{(n-r)! r!}$$

Counts ways to choose r items from n if order does NOT matter

$$\text{Permutation: } {}_n P_r = \frac{n!}{(n-r)!}$$

Counts ways to choose r items from n if order does matter

## COMMON PROBABILITY DISTRIBUTIONS

### Discrete Uniform Distribution

$$p(x) = \frac{1}{n}, \quad x = x_1, x_2, \dots, x_n$$

### Continuous Uniform Distribution

$$f(x) = \frac{1}{b-a}; \quad a \leq x \leq b$$

$$F(x) = \frac{x-a}{b-a}; \quad a \leq x \leq b$$

### Binomial Distribution

$$p(x) = \binom{n}{x} p^x (1-p)^{n-x}, \text{ where}$$

$n$  = number of Bernoulli trials

$p$  = probability of success

$$E(X) = np$$

$$\sigma^2(X) = np(1-p)$$

### Normal Distribution ( $\mu$ = mean, $\sigma$ = SD)

~50% of observations are within  $\pm \frac{2}{3}\sigma$  of  $\mu$

~68% of observations are within  $\pm \sigma$  of  $\mu$

~95% of observations are within  $\pm 2\sigma$  of  $\mu$

~99% of observations are within  $\pm 3\sigma$  of  $\mu$

$$Z = \frac{\text{Observed value} - \text{Population mean}}{\text{Standard deviation}} = \frac{X - \mu}{\sigma}$$

$$\text{Shortfall Ratio} = \frac{E(R_p) - \text{shortfall level}}{\sigma_p}$$

### Lognormal Distribution

-  $e^X$  where  $X$  is normally distributed

- Used to model asset prices

- Positively skewed

Continuously compounded return from  $t$  to  $t+1$ :

$$r_{t,t+1} = \ln\left(\frac{S_{t+1}}{S_t}\right) = \ln(1 + R_{t,t+1})$$

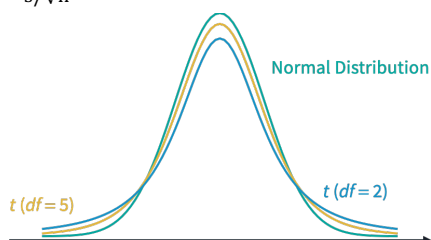
where  $R_{t,t+1}$  is the effective annual rate

### Student's t-Distribution

Parameters: degrees of freedom (df)

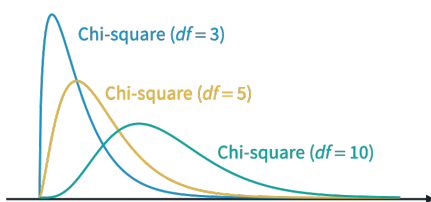
The ratio below is t-distributed with  $df = n - 1$ :

$$t = \frac{\bar{X} - \mu}{s/\sqrt{n}}$$



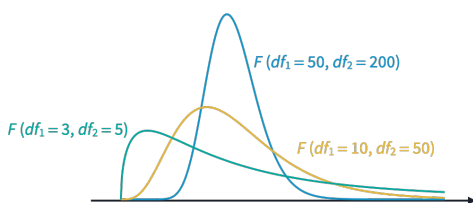
### Chi-Square Distribution

Definition: Sum of squares of independent normal random variables. It cannot be negative.



### F-Distribution

Definition: A ratio of two chi-square random variables (two df's). It cannot be negative.



### Simulation Techniques

**Monte Carlo simulation:** Generate many random samples to produce a distribution of outcomes

**Historical simulation:** Sample from a historical record of returns to simulate a process

## SAMPLING AND ESTIMATION

### Sampling

**Simple random sampling:** Subset of population is chosen at random

**Systematic sampling:** Every  $k^{\text{th}}$  observation is chosen until desired sample size is achieved

**Stratified sampling:** Simple random samples are drawn from each subpopulation (strata)

**Cluster sampling:** Sample set is divided into mini-representations of the population (cluster)

**Convenience sampling:** Samples are selected based on accessibility

**Judgmental sampling:** Samples are selected based on researchers' knowledge and expertise

Sampling error = Sample mean - Population mean

### Central Limit Theorem (CLT)

For a sample of size  $n \geq 30$  from a population with mean  $\mu$  and variance  $\sigma^2$ , the sample mean  $\bar{X}$  approximately follows a normal distribution with mean  $\mu$  and variance  $\sigma^2/n$

### Standard Error of Sample Mean

Population variance is known:  $\sigma_{\bar{x}} = \sigma/\sqrt{n}$

Population variance is not known:  $s_{\bar{x}} = s/\sqrt{n}$

### Properties of Estimators

A point estimator is:

- **Unbiased** if its value matches the value of the parameter it estimates

- **Efficient** if it has the lowest variance of all unbiased estimators

- **Consistent** if its value approaches the parameter as the sample size increases

### Confidence Interval

Point estimate  $\pm$  Reliability factor  $\times$  Std error

**Point estimate:** Estimate of population parameter

**Reliability factor:** Value from distribution of point estimate, such as normal or t-distribution

$$\text{E.g., } \bar{X} \pm z_{\alpha/2} \times \sigma/\sqrt{n}$$

### Reliability factors for normal distributions

Significance level	Confidence interval	$z_{\alpha/2}$
10%	90%	1.645
5%	95%	1.960
1%	99%	2.575

If the population is not normally distributed and/or variance is unknown, the t- or z-distributions may be used to get reliability factors.

Normally Distributed?	Variance known?	Small Sample	Large Sample
Yes	Yes	z	z
Yes	No	t	t or z
No	Yes	n/a	z
No	No	n/a	t or z

### Resampling

**Bootstrap:** Replace each drawn sample with an identical element for the next draw

**Jackknife:** Draw each sample by leaving out one observation at a time without replacement

## Biases

**Data snooping bias:** "Drilling" data to find any statistically significant relationship

**Sample selection bias:** Excluding unavailable data

**Survivorship bias:** Excluding the impact of failed funds or companies that no longer exist

**Look-ahead bias:** Information needed is not known on the date the observation was recorded

**Time-period bias:** Using data from an era that makes the results time-period specific

## HYPOTHESIS TESTING

### Steps in Hypothesis Testing

1. State hypotheses (null and alternative)
2. Identify test statistic
3. Specify significance level
4. State decision rule
5. Collect data; calculate test statistic
6. Make decision regarding hypothesis

### Test Statistic (General)

$$\frac{\text{Sample statistic} - \text{Hypothesized value}}{\text{Standard error of sample statistic}}$$

### Hypothesis Test Results

Type	Hypotheses	Reject $H_0$ if test statistic is
One-tailed (upper)	$H_0: \mu \leq \mu_0$ $H_a: \mu > \mu_0$	> critical value
One-tailed (lower)	$H_0: \mu \geq \mu_0$ $H_a: \mu < \mu_0$	< critical value
Two-tailed	$H_0: \mu = \mu_0$ $H_a: \mu \neq \mu_0$	< lower critical value or > upper critical value

### Hypothesis Testing Decision Errors

Decision	$H_0$ is True	$H_0$ is False
Do not reject $H_0$	Correct	Type II ( $\beta$ )
Reject $H_0$	Type I ( $\alpha$ )	Correct

Power of a test =  $1 - P(\text{Type II error}) = 1 - \beta$

**p-value:** smallest value of  $\alpha$  at which  $H_0$  is rejected

### Tests Concerning a Single Mean

**Population is normal with known variance:**

$$z\text{-statistic} = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$$

**Large sample from any population with unknown variance (2 choices):**

$$t\text{-statistic} = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}, df = n - 1$$

$$z\text{-statistic} = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$$

**Small sample from normal population with unknown population variance:**

$$t\text{-statistic} = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}, df = n - 1$$

## Tests Concerning Differences between Means

**Normal populations with unknown variances that are assumed equal:**

$$t\text{-statistic} = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\left(\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}\right)^{1/2}}$$

$$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$$

$$df = n_1 + n_2 - 2$$

### Tests Concerning Mean Differences

**Normal populations with unknown variances:**

$$t\text{-statistic} = \frac{\bar{d} - \mu_{d0}}{s_d}, df = n - 1$$

### Tests Concerning a Single Variance

**Normal population ( $df = n - 1$ ):**

$$\chi^2 = \frac{(n - 1)s^2}{\sigma_0^2}, \quad s^2 = \frac{1}{n - 1} \sum_{i=1}^n (X_i - \bar{x})^2$$

### Tests Concerning Two Variances

**Normal populations:**

$$F = \frac{s_1^2}{s_2^2}, \quad s_j^2 = \frac{1}{n_j - 1} \sum_{i=1}^{n_j} (x_{ij} - \bar{x}_j)^2 \text{ for } j = 1, 2$$

$$df_1 = n_1 - 1; df_2 = n_2 - 1$$

### Nonparametric Tests

Test that is not concerned with parameter and is implemented in situations such as:

- Data do not meet distributional assumptions
- Data are subject to outliers
- Data are given in ranks
- Hypothesis does not concern a parameter

### Tests Concerning Correlation

$$t\text{-statistic} = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}, df = n - 2$$

To use the Spearman rank correlation coefficient, substitute the following value into the t-statistic calculation:

$$r_s = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n(n^2 - 1)}$$

## INTRODUCTION TO LINEAR REGRESSION

### Simple Linear Regression

**Y:** Dependent variable/explained variable

**X:** Independent variable/explanatory variable

$$Y = b_0 + b_1X + \epsilon$$

where  $b_0$  is the intercept,  $b_1$  is the slope coefficient, and  $\epsilon$  is the error term

The parameters can be estimated by:

$$\hat{b}_1 = \frac{\text{Cov}[Y, X]}{\text{Var}[X]} = \frac{\sum_{i=1}^n (Y_i - \bar{Y})(X_i - \bar{X})}{\sum_{i=1}^n (X_i - \bar{X})^2}$$

$$\hat{b}_0 = \bar{Y} - \hat{b}_1\bar{X}$$

$$r = \frac{\text{Cov}[Y, X]}{\sqrt{\text{Var}[Y]}\sqrt{\text{Var}[X]}}$$

## Assumptions of Simple Linear Regression Model

- Linear relationship between X and Y
- Homoscedasticity (i.e., constant variance of residuals)
- Independence between X and Y
- Normality of the residuals

### Analysis of Variance

**Sum of squares error (SSE):** Unexplained variation in Y

$$SSE = \sum_{i=1}^n (Y_i - \hat{Y}_i)^2$$

**Sum of squares regression (SSR):** Explained variation in Y

$$SSR = \sum_{i=1}^n (\hat{Y}_i - \bar{Y})^2$$

**Sum of squares total (SST):** Total variation in Y

$$SST = SSE + SSR = \sum_{i=1}^n (Y_i - \bar{Y})^2$$

**Coefficient of determination:**

$$R^2 = \frac{SSR}{SST} = r^2 \text{ (if there is only one independent variable)}$$

**F-statistic:**

$$F = \frac{MSR}{MSE} = \frac{SSR/k}{SSE/(n - [k + 1])}$$

**Standard error of regression:**

$$s_e = \sqrt{MSE} = \sqrt{\frac{\sum_{i=1}^n (Y_i - \hat{Y}_i)^2}{n - 2}}$$

## Hypothesis Testing of Linear Regression

### Coefficients

To test a hypothesis about the slope:

$$t = \frac{\hat{b}_1 - b_1}{s_{\hat{b}_1}}$$

$$s_{\hat{b}_1} = \frac{s_e}{\sqrt{\sum_{i=1}^n (X_i - \bar{X})^2}}$$

To test a hypothesis about the intercept:

$$t = \frac{\hat{b}_0 - b_0}{s_{\hat{b}_0}}$$

$$s_{\hat{b}_0} = \sqrt{MSE \left( \frac{1}{n} + \frac{(\bar{X})^2}{\sum_{i=1}^n (X_i - \bar{X})^2} \right)}$$

Estimated variance of the prediction error for Y:

$$s_f^2 = s_e^2 \left[ 1 + \frac{1}{n} + \frac{(X - \bar{X})^2}{(n - 1)s_x^2} \right]$$

## ECONOMICS

### TOPICS IN DEMAND AND SUPPLY ANALYSIS

#### Own-Price Elasticity of Demand

$$E_{p_x}^d = \frac{\% \Delta Q_x^d}{\% \Delta P_x} = \left( \frac{\Delta Q_x^d}{\Delta P_x} \right) \left( \frac{P_x}{Q_x^d} \right)$$

$Q_x^d$  = quantity demanded,  $P_x$  = price per unit

$|E_{p_x}^d| > 1$ : elastic

$|E_{p_x}^d| < 1$ : inelastic

$|E_{p_x}^d| = \infty$ : perfectly elastic

$E_{p_x}^d = 0$ : perfectly inelastic

$E_{p_x}^d = -1$ : unit elastic

#### Income Elasticity of Demand

$$E_I^d = \frac{\% \Delta Q_x^d}{\% \Delta I} = \left( \frac{\Delta Q_x^d}{\Delta I} \right) \left( \frac{I}{Q_x^d} \right)$$

where  $I$  = consumers' income

$E_I^d > 0$ : normal good;  $E_I^d < 0$ : inferior good

#### Cross-Price Elasticity of Demand

$$E_{p_y}^d = \frac{\% \Delta Q_x^d}{\% \Delta P_y} = \left( \frac{\Delta Q_x^d}{\Delta P_y} \right) \left( \frac{P_y}{Q_x^d} \right)$$

where  $P_y$  is the price per unit of another good  $Y$

$E_{p_y}^d > 0$ : substitutes;  $E_{p_y}^d < 0$ : complements

#### Income and Substitution Effects

Impacts of a reduction in a good's price:

Type of good	Income effect	Substitution effect
Normal	Buy more	Buy more
Inferior	Buy less	Buy more

Goods with positively sloped demand curves:

- *Giffen goods*: Negative income effect is greater than positive substitution effect if good's price falls
- *Veblen goods*: Demand for a status symbol good falls if its price is reduced

#### Revenue Terms

Total revenue (TR): Price times quantity;  $P \times Q$

Average revenue (AR):  $TR/Q$

Marginal revenue (MR):  $\Delta TR/\Delta Q$

#### Cost Terms

Total fixed cost (TFC): Sum of fixed costs

Total variable cost (TVC): Sum of variable costs

Total costs (TC):  $TFC + TVC$

Average fixed cost (AFC):  $TFC/Q$

Average variable cost (AVC):  $TVC/Q$

Average total cost (ATC):  $AFC + AVC$  or  $TC/Q$

Marginal cost (MC):  $\Delta TC/\Delta Q$

#### Profit Measures

Accounting profit = Revenue – Accounting costs

Economic costs = Accounting costs + Implicit costs

Economic profit = Revenue – Economic costs

= Accounting profit – Implicit costs

Normal profit = Zero economic profit

Profits maximized if  $MR = MC$  and  $MC$  isn't falling

#### Breakeven Analysis

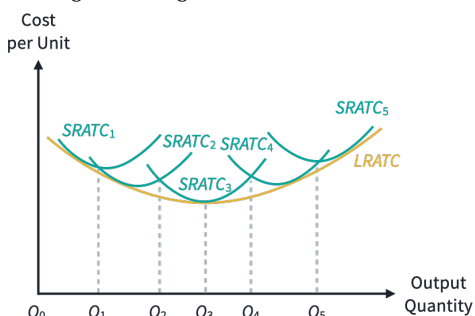
Economic breakeven occurs if a firm's accounting profit is enough to cover its implicit opportunity costs (i.e., normal profit). In the long run, firms cannot earn positive economic profits.

#### Shutdown Decision (Short-term vs. Long-term)

	Short-Term	Long-Term
$TR \geq TC$	Stay in	Stay in
$TVC < TR < TC$	Stay in	Exit market
$TR < TVC$	Shut down	Exit market

#### Economies of Scale

Each stage of expansion has its own short-run ATC curve. Minimum efficient scale is the low point on the long-run average total cost curve.



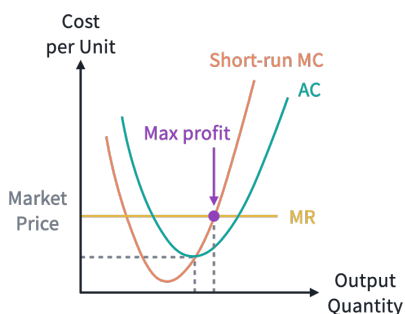
### THE FIRM AND MARKET STRUCTURES

#### Perfect Competition

- Firms: Many
- Products: Identical
- Barriers to entry: Very low
- Pricing power of firms: None

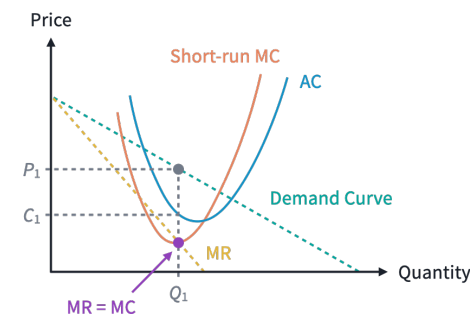
Profit maximization:

- $P = MR = MC$
- $P > ATC$  economic profit,  $P < ATC$  economic loss



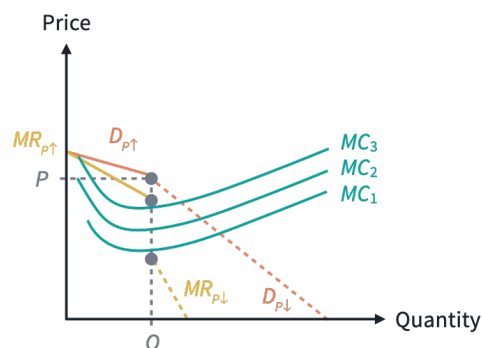
#### Monopolistic Competition

- Firms: Many
  - Products: Differentiated (via advertising)
  - Barriers to entry: Low
  - Pricing power of firms: Some
- Profit maximization:  $MR = MC$



#### Oligopoly

- Firms: Few
  - Products: Similar (close substitutes)
  - Barriers to entry: High
  - Pricing power: Some or considerable
- Profit maximization:  $MR = MC$



Kinked demand curve: A price increase will impact sales more than an equivalent price decrease

Cournot assumption: Competitors will maintain current output levels if one firm changes its price  
Game theory: If one firm changes its prices, competitors will adjust to maximize their profits, resulting in a Nash equilibrium

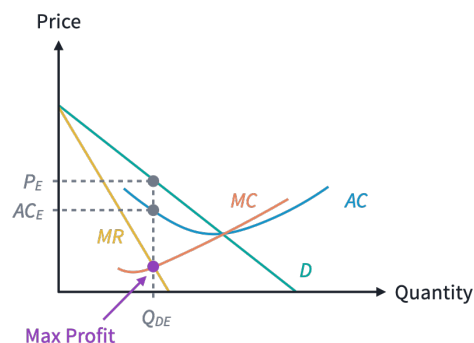
Price collusion is more likely to happen if:

- Few firms or one dominant firm
- Products are relatively similar
- Firms have similar cost structures
- Orders are frequent and relatively small
- Credible threat of retaliation for breaking pact
- The threat of external competition is high

## Monopoly

- Firm: One
- Products: Unique (no close substitutes)
- Barriers to entry: Very high
- Pricing power of firm: Considerable (price discrimination possible)

Profit maximization:  $MR = MC$



Price discrimination by monopolists:

- 1<sup>st</sup> degree: Different price for each customer
- 2<sup>nd</sup> degree: Quantity-based menu options
- 3<sup>rd</sup> degree: Pricing for demographic groups

## Market Power Measures

*N*-firm concentration ratio: Sum of market share of the *N* largest firms in the industry

Herfindahl-Hirschman Index (HHI): Sum of squared market share of the *N* largest firms

## AGGREGATE OUTPUT, PRICES, AND ECONOMIC GROWTH

### Gross Domestic Product (GDP)

Nominal GDP: GDP in terms of current prices

Real GDP: GDP in terms of base-year prices

GDP deflator:  $(\text{Nominal GDP} / \text{Real GDP}) \times 100$

$GDP = C + I + G + (X - M)$

C = consumption

I = investment

G = government spending

X = exports; M = imports

GDI

= Net domestic income

+ Consumption of fixed capital

+ Statistical discrepancy

GDI

= Compensation of employees

+ Gross operating surplus + Gross mixed income

+ Taxes (net of subsidies) on production

+ Taxes (net of subsidies) on products and imports

Personal household income

= Compensation of employees

+ Net mixed income from

unincorporated businesses

+ Net property income

## Relationship among Saving, Investment, the Fiscal Balance, and the Trade Balance

$$(G - T) = (S - I) - (X - M)$$

$G - T$  = fiscal balance

$S - I$  = savings minus domestic investment

$X - M$  = trade balance

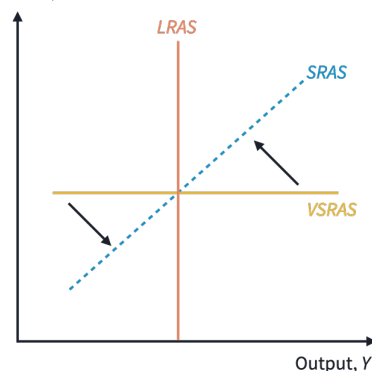
## Aggregate Demand (AD)

The downward slope of the AD curve results from:

- *Wealth effect*: Price level ↑, real wealth ↓, quantity demanded ↓
- *Interest rate effect*: Price level ↑, interest rate ↑, investment and consumption expenditures ↓
- *Real exchange rate effect*: Price level ↑, real exchange rate ↑, exports ↓ and imports ↑

## Aggregate Supply (AS)

Price Level, *P*

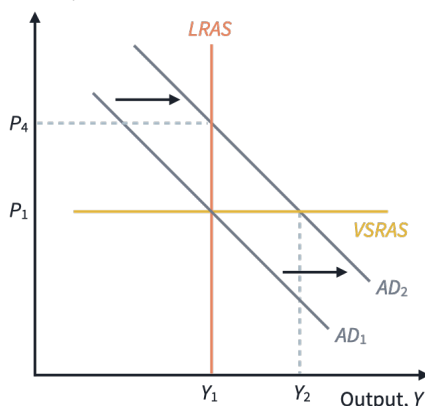


Full employment level of output: Long-run equilibrium level of output

## Factors Increasing Aggregate Demand (AD)

- Higher household wealth
- Higher business and consumer confidence
- Higher capacity utilization
- Expansionary monetary and fiscal policies
- Depreciating domestic currency value
- Faster global economic growth

Price Level, *P*

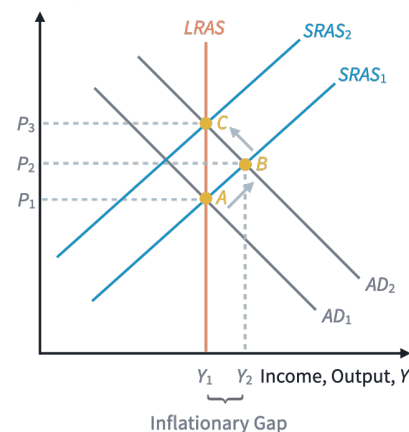


## Shifts in Aggregate Supply (SRAS and LRAS)

Increase in	SRAS Shift	LRAS Shift
Labor supply	Right	Right
Natural resources	Right	Right
Human capital	Right	Right
Physical capital	Right	Right
Productivity/Tech	Right	Right
Nominal wages	Left	None
Input prices	Left	None
Price expectations	Right	None
Business taxes	Left	None
Business subsidies	Right	None
Foreign currency values	Right	None

## Inflationary Gap

Price Level, *P*



## Effect of Combined Changes in AS and AD

Changes in AS and AD	Real GDP	Prices
AS ↑, AD ↑	Increase	Unclear
AS ↓, AD ↓	Decrease	Unclear
AS ↑, AD ↓	Unclear	Decrease
AS ↓, AD ↑	Unclear	Increase

## UNDERSTANDING BUSINESS CYCLES

### Business Cycle Phases

Recovery

- *Economy*: Going through a trough
  - *Activity level*: Below potential but start to increase
  - *Employment*: Layoffs slow, but firms prefer extending overtime to rehiring full-time
  - *Inflation*: Moderate
  - *Capital spending*: Low but increasing, with a focus on efficiency rather than capacity
- Expansion
- *Economy*: Enjoying an upswing
  - *Activity level*: Above-average growth rates
  - *Employment*: Full-time rehiring, more overtime
  - *Inflation*: Moderate, but increasing
  - *Capital spending*: Focused on capacity expansion



## Slowdown

- *Economy*: Going through a peak
- *Activity level*: Decelerating
- *Employment*: Hiring slows
- *Inflation*: Accelerating
- *Capital spending*: Strong capital spending, but inventory starts building up as sales growth slows

## Contraction

- *Economy*: Weakens and may go into a recession
- *Activity levels*: Below potential
- *Employment*: Hiring freezes, then layoffs
- *Inflation*: Decelerating, but with a lag
- *Capital spending*: New orders halted and existing orders canceled, scale back on maintenance

## Business Cycle Theories

- *Neoclassical*: "Invisible hand" lets markets reach a natural equilibrium; government should not intervene
- *Austrian*: Like Neoclassical, focus on loose monetary policy causing credit-fueled booms
- *Keynesian*: Countercyclical fiscal policy should be used to support aggregate demand
- *Monetarist*: Oppose Keynesian fiscal focus, call for steady growth of money

## Unemployment

- *Unemployed*: Jobless people who are seeking jobs
- *Labor force*: People with a job or unemployed
- *Unemployment rate*: Unemployed/Labor force

Type	Result of
Frictional	Temporary transitions
Structural	Long-run changes in economy
Cyclical	Changes in economic activity

## Inflation

- *Deflation*: Negative inflation rate
- *Disinflation*: Declining inflation rate
- *Hyperinflation*: Extremely high inflation rate
- *Cost-push*: From decrease in aggregate supply
- *Demand-pull*: From increase in aggregate demand
- *Laspeyres index*: Use base consumption basket
- *Paasche index*: Use current consumption basket
- *Fisher index*:  $\sqrt{\text{Laspeyres} \times \text{Paasche}}$

## Economic Indicators

- *Leading*: Stock indexes, building permits
- *Coincident*: Real income, industrial production
- *Lagging*: Unemployment rate, prime lending rate

## MONETARY AND FISCAL POLICY

### Monetary Policy

$$\text{Required reserve ratio} = \frac{\text{Required reserves}}{\text{Total deposits}}$$
$$\text{Money multiplier} = 1/\text{Reserve requirement}$$
$$\text{Fisher effect: } R_{\text{nominal}} = R_{\text{real}} + \pi^e$$

### Central Bank Roles

- Sole currency supplier
- Lender of last resort
- Bank for commercial banks and government
- Regulate and supervise payments system
- Gold and foreign exchange reserves holder
- Oversee monetary policy

### Monetary Policy Tools

- *Expansionary monetary policy measures*:
  - *Policy rate*: Set policy rate below neutral level
  - *Reserve requirement*: Reduce reserves for commercial banks
  - *Open market operations*: Buy bonds from commercial banks

### Fiscal Policy: Spending Tools

- *Transfer payments*: Redistribution of wealth (e.g., unemployment benefits)
- *Current spending*: Spending on goods and services
- *Capital spending*: Spending on infrastructure

### Fiscal Policy: Revenue Tools

- *Direct taxes*: Tax on income (e.g., income taxes, corporate taxes, capital gains taxes)
- *Indirect taxes*: Tax on goods and services

### Fiscal Multiplier

$$= \frac{1}{1 - \text{MPC}(1 - t)}$$

where MPC = marginal propensity to consume; t = tax rate

### Difficulties Executing Fiscal Policy

- *Recognition lag*: Government must see need
- *Action lag*: Time needed to choose policy
- *Impact lag*: Policies do not have immediate impact

## INTRODUCTION TO GEOPOLITICS

### National Governments and Political Cooperation

*State actors* possesses the authority to deploy a country's national security resources

### Non-State Actors and the Forces of Globalization

*Non-state actors* participate in global political, economic, or financial affairs but do not control a country's national security resources

### Assessing Geopolitical Actors and Risk



### The Tools of Geopolitics

- *National security tool*: Military force, espionage
- *Economic tools*: Currency union, nationalization
- *Financial tools*: Currency markets, sanctions, capital controls

### Incorporating Geopolitical Risk into the Investment Process

Types of geopolitical risk:

- Event risk
- Exogenous risk
- Thematic risk

### Assessing Geopolitical Threats

To assess geopolitical risk, consider:

- The likelihood of occurrence
- The velocity (speed) of impact
- The size and nature of impact

## INTERNATIONAL TRADE & CAPITAL FLOWS

### Basics of International Trade

- *Terms of trade*: Price of exports/Price of imports
- *Autarky*: No trade with other countries
- *Absolute advantage*: Lower total cost of production
- *Comparative advantage*: Lower opportunity cost

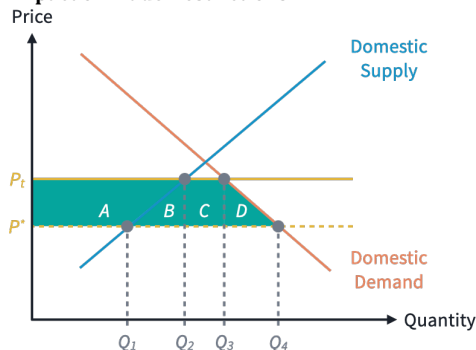
### International Trade Models

- *Ricardian*: Labor is the only factor of production, comparative advantage due to labor productivity
- *Heckscher-Ohlin*: Both labor and capital are factors, income redistribution is possible through trade

### Trade Restrictions

- *Tariffs*: Taxes on imported goods
- *Quotas*: Limits on quantity of imported goods
- *Export subsidies*: Payments to exporters
- *Minimum domestic content requirements*
- *Voluntary export restraints*: Self-imposed limitations by foreign producers

## Impact of Trade Restrictions



- Price increases from  $P^*$  to  $P_t$
- Domestic production increases from  $Q_1$  to  $Q_2$
- Domestic consumption falls from  $Q_4$  to  $Q_3$
- Imports fall from  $(Q_4 - Q_1)$  to  $(Q_3 - Q_2)$
- Loss of consumer surplus =  $(A + B + C + D)$
- National welfare loss =  $(B + D)$
- Increase in producer surplus =  $A$
- Tariff revenue/Quota rent =  $C$

## Regional Trading Blocs

**Free trade area (FTA):** Free trade among members

**Customs union (CU):** FTA + common trade policy

**Common market (CM):** CU + free movement of factors of production within bloc

**Economic union (EU):** CM + common economic institutions and coordination of economic policies

**Monetary union (MU):** EU + common currency

## Balance of Payments Components

**Current account:** Merchandise and services, income receipts, unilateral transfers

**Capital account:** Capital transfers, non-financial assets sales/purchases

**Financial account:** Government-owned assets abroad, foreign-owned assets in the country

## CURRENCY EXCHANGE RATES

### Exchange Rate Calculations

$$\text{Real ex. rate}_{d/f} = \text{Nominal ex. rate}_{d/f} \times \left( \frac{\text{CPI}_f}{\text{CPI}_d} \right)$$

$$\frac{\text{Forward exchange rate}_{d/f}}{\text{Spot exchange rate}_{d/f}} = \frac{1 + i_d}{1 + i_f}$$

$$\text{Cross rate: } S_{A/B} = S_{A/C} \times S_{C/B}$$

**Forward exchange rates in points:**

- Unit of points is last decimal place in the rate quote (e.g., 1.5301 to 1.5302 is a 1-point increase)

### Ideal Currency Regime

1. Exchange rates are credibly fixed
  2. Fully convertible currencies, free capital flows
  3. Countries pursue independent monetary policies
- Such an ideal currency regime is NOT possible

## Exchange Rate Regimes

**Dollarization:** Adopt another country's currency

**Monetary union:** Adopt a common currency

**Currency board:** Commitment to exchange

domestic currency at fixed exchange rate

**Fixed peg:** Currency is pegged to foreign currency (or basket of currencies) within  $\pm 1\%$  margin

**Target zone:** Fixed peg with wider margin

**Crawling peg:** Peg rate is periodically adjusted

**Crawling bands:** Margin increases over time, usually to transition from fixed peg to floating

**Managed floating:** Monetary authority intervenes, but no official target exchange rate

**Independently floating:** Market sets exchange rate

## Marshall-Lerner Condition

Currency devaluation can improve a country's trade balance if demand elasticities cause export receipts to increase more than import expenditures

## FINANCIAL STATEMENT ANALYSIS

### FINANCIAL REPORTING STANDARDS

#### FASB, IASB, and IOSCO

**FASB:** Sets forth US GAAP

**IASB:** Establishes IFRS

**IOSCO:** International body of regulatory authorities

**SEC:** US capital markets regulator

#### Fundamental Qualities of Financial Reports

1. Relevance
2. Faithful Representation

#### Enhancing Characteristics

1. Comparability
2. Verifiability
3. Timeliness
4. Understandability

### UNDERSTANDING INCOME STATEMENTS

#### Revenue Recognition

Revenue must not be recognized unless:

- Risks of ownership have been transferred
- Amount of revenue can be reliably measured
- Customer is likely to pay
- Transaction is unlikely to be reversed

Service revenue may be recognized as earned

**Allowance for doubtful accounts:** Contra-asset account, estimated based on historical experience

#### Expense Recognition

**Matching principle:** Expenses must be recognized in the same period as associated revenue

## Income Statement Line Items

Revenue
- Cost of goods sold (COGS)
Gross Profit
- Selling, General & Admin. (SG&A)
EBITDA
- Depreciation and Amortization
EBIT (Operating profit)
- Interest
EBT (Earnings before taxes)
- Taxes
Net Income (NI)

## Separately Reported Items

- Discontinued operations
- Unusual or infrequent items (US GAAP only)
- Non-operating items

## Basic Earnings per Share

Net income - Preferred dividends  
Weighted average of shares outstanding

## Diluted Earnings per Share

Net income	- Preferred dividends	+ Convertible preferred dividends	+ Convertible debt interest	(1 - t)
Weighted average shares	Shares from preferred shares	Shares from convertible debt	Shares from stock options	Shares issuable from stock options

Must be equal to or less than basic EPS

## UNDERSTANDING BALANCE SHEETS

### Classified Balance Sheet

**Current Assets:** To be used within one year

- Cash and equivalents
- Marketable securities
- Accounts receivable, net of bad debt expense
- Inventories
- Other (e.g., prepaid expenses)

**Non-Current Assets**

- Property, Plant, and Equipment (PP&E)
- Investment property
- Intangible assets
- Goodwill
- Financial assets

**Current Liabilities:** To be settled within one year

- Accounts payable
- Notes payable
- Accrued expenses
- Deferred income (Unearned revenue)

**Long-term Liabilities**

- Long-term debt
- Deferred tax liabilities

**Equity**

- Contributed capital
- Preferred shares
- Treasury shares
- Retained earnings
- Accumulated other comprehensive income (OCI)
- Non-controlling (minority) interest

## UNDERSTANDING CASH FLOW STATEMENTS

### Cash Flow Statement Classifications

CFO: Cash flows from regular operations

CFI: Cash flows for buying/selling long-term assets

CCF: Financial transactions with capital providers

Item	US GAAP	IFRS
Dividends paid	CFF	CFO/CFF
Interest paid	CFO	CFO/CFF
Dividends received	CFO	CFO/CFI
Interest received	CFO	CFO/CFI
Tax expenses	CFO	CFO*

\*IFRS treat tax expenses for investing or financing transactions as CFI or CFF

### CFO Direct Method

- Convert each accrual-based item in the income statement to cash inflow/outflow
- CFO is net of cash inflows and outflows

### CFO Indirect Method

- Start with net income
- Add noncash expenses (e.g., Depreciation)
- Subtract gains/add losses
- Add increases in current liabilities
- Subtract increases in (non-cash) current assets

Beginning accounts receivable

+ Revenue

– Ending accounts receivable

#### Cash collected from customers

Cost of goods sold

+ Increase in inventory

Purchases from suppliers

– Increase in accounts payable

#### Cash paid to suppliers

### Free Cash Flow (FCF)

Free cash flow to the firm (FCFF): Cash available to equity owners and debt holders.

$$FCFF = NI + NCC + I \times (1 - t) - FCI - WCI$$

$$= CFO + I \times (1 - t) - FCI$$

Free cash flow to equity (FCFE): Cash flow available to common shareholders

$$FCFE = CFO - FCI + \text{Net Borrowing}$$

## FINANCIAL ANALYSIS TECHNIQUES

### Common-Size Analysis

Vertical:

- State income statement items as % of revenue
- State balance sheet items as a % of total assets
- State each cash flow statement item as a % of total cash inflows/outflows

Horizontal (Trend) Analysis:

- State each item relative to its base-year value

### Activity Ratios

$$\text{Receivables turnover} = \frac{\text{Annual sales}}{\text{Average receivables}}$$

$$\text{Days of sales outstanding} = \frac{365}{\text{Receivables turnover}}$$

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

$$\text{Days of inventory on hand} = \frac{365}{\text{Inventory turnover}}$$

$$\text{Payables turnover} = \frac{\text{Purchases}}{\text{Average trade payables}}$$

$$\text{Number of days of payables} = \frac{365}{\text{Payables turnover}}$$

$$\text{Total asset turnover} = \frac{\text{Revenue}}{\text{Average total assets}}$$

$$\text{Fixed asset turnover} = \frac{\text{Revenue}}{\text{Average net fixed assets}}$$

$$\text{Working capital turnover} = \frac{\text{Revenue}}{\text{Average working capital}}$$

### Liquidity Ratios

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$\text{Quick ratio} = \frac{\text{Cash} + \frac{\text{Marketable securities}}{\text{Current liabilities}} + \text{Receivables}}{\text{Current liabilities}}$$

$$\text{Cash ratio} = \frac{\text{Cash} + \text{Marketable securities}}{\text{Current liabilities}}$$

$$\text{Defensive interval} = \frac{\text{Cash} + \frac{\text{Marketable securities}}{\text{Average daily expenditures}} + \text{Receivables}}{\text{Average daily expenditures}}$$

$$\text{Cash conversion cycle} = \frac{\text{Days of sales outstanding}}{\text{Days of sales outstanding}} + \frac{\text{Days of inventory on hand}}{\text{Days of inventory on hand}} - \frac{\text{Number of days payables}}{\text{Number of days payables}}$$

### Solvency Ratios

$$\text{Debt-to-equity} = \frac{\text{Total debt}}{\text{Total shareholders' equity}}$$

$$\text{Debt-to-capital} = \frac{\text{Total debt}}{\text{Total debt} + \frac{\text{Total shareholders' equity}}{\text{Total shareholders' equity}}}$$

$$\text{Debt-to-assets} = \frac{\text{Total debt}}{\text{Total assets}}$$

$$\text{Financial leverage} = \frac{\text{Average total assets}}{\text{Average total equity}}$$

$$\text{Interest coverage} = \frac{\text{EBIT}}{\text{Interest payments}}$$

$$\text{Fixed charge coverage} = \frac{\text{EBIT} + \text{Lease payments}}{\text{Interest payments} + \text{Lease pmts}}$$

### Profitability Ratios

$$\text{Net profit margin} = \frac{\text{Net income}}{\text{Revenue}}$$

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Revenue}}$$

$$\text{Operating profit margin} = \frac{\text{EBIT}}{\text{Revenue}}$$

$$\text{Pretax margin} = \frac{\text{EBT}}{\text{Revenue}}$$

$$\text{Return on assets (ROA)} = \frac{\text{Net income}}{\text{Average total assets}}$$

$$\text{Return on total capital} = \frac{\text{EBIT}}{\text{Average total capital}}$$

$$\text{Return on equity (ROE)} = \frac{\text{Net income}}{\text{Average total equity}}$$

### Valuation Ratios

$$\text{Dividend payout ratio} = \frac{\text{Dividends declared}}{\text{NI available to common}}$$

$$\text{Retention rate (RR)} = 1 - \text{Dividend payout ratio}$$

$$\text{Sustainable growth rate (g)} = \text{RR} \times \text{ROE}$$

$$\text{P/E Ratio} = \frac{\text{Price per share}}{\text{Earnings per share}}$$

### DuPont Analysis

$$\begin{aligned} \text{ROE} &= \left( \frac{\text{Net income}}{\text{Assets}} \right) \left( \frac{\text{Assets}}{\text{Book Value of Equity}} \right) \\ &= (\text{ROA}) \left( \frac{\text{Leverage}}{\text{ratio}} \right) \\ &= \left( \frac{\text{NI}}{\text{Revenue}} \right) \left( \frac{\text{Revenue}}{\text{Assets}} \right) \left( \frac{\text{Assets}}{\text{Equity}} \right) \\ &= \left( \frac{\text{Net profit}}{\text{margin}} \right) \left( \frac{\text{Asset}}{\text{turnover}} \right) \left( \frac{\text{Leverage}}{\text{ratio}} \right) \\ &= \left( \frac{\text{NI}}{\text{EBT}} \right) \left( \frac{\text{EBT}}{\text{EBIT}} \right) \left( \frac{\text{EBIT}}{\text{Revenue}} \right) \left( \frac{\text{Revenue}}{\text{Assets}} \right) \left( \frac{\text{Assets}}{\text{Equity}} \right) \\ &= \left( \frac{\text{Tax}}{\text{burden}} \right) \left( \frac{\text{Interest}}{\text{burden}} \right) \left( \frac{\text{EBIT}}{\text{margin}} \right) \left( \frac{\text{Asset}}{\text{turnover}} \right) \left( \frac{\text{Financial}}{\text{leverage}} \right) \end{aligned}$$



## INVENTORIES

### Inventory Valuation Requirements

IFRS: Lower of cost or net realizable value

US GAAP: Lower of cost or market value

Reversals of inventory write-downs are allowed under IFRS, but not under US GAAP

### Inventory Valuation Methods and Systems

	US GAAP	IFRS
FIFO	Allowed	Allowed
LIFO	Allowed	N/A
Weighted average	Allowed	Allowed
Specific Identification	Allowed	Allowed

### Impact of Inventory Valuation Method

If prices are rising	FIFO	LIFO
Ending Inventory	Higher	Lower
COGS	Lower	Higher
Net income	Higher	Lower
Income Tax Expense	Higher	Lower
Operating cash flow	Lower	Higher

*Perpetual vs. periodic inventory system:*

- Periodic system matches total units sold for the period with total purchases for the same period
- Perpetual system updates after each transaction
- Under FIFO, ending inventory and COGS are the same for periodic or perpetual
- Weighted average and LIFO will show differences

### LIFO Reserve

Used to adjust LIFO COGS and ending inventory (EI) to FIFO-equivalent values

$$EI_{FIFO} = EI_{LIFO} + \text{LIFO Reserve}$$

$$COGS_{FIFO} = COGS_{LIFO} - \Delta \text{LIFO Reserve}$$

$$Tax_{FIFO} = Tax_{LIFO} + \Delta \text{LIFO Reserve} \times t$$

### LIFO Liquidations

- Happen when units sold exceed units purchased
- May result in higher gross profit than otherwise

## LONG-LIVED ASSETS

### Long-Term Assets

*Property, plant, and equipment (PP&E):*

#### IFRS

- Both cost model and revaluation model allowed
- Recoverable amount is greater of:
  - (1) fair value less selling costs, and
  - (2) value in use (PV of asset's future cash flows)
- Loss recoveries are allowed

#### US GAAP

- Only cost model is allowed
- Loss recoveries not allowed

## Depreciation Methods

$$\text{Straight-line:} = \frac{\text{Cost} - \text{Salvage value}}{\text{Depreciable life}}$$

*Double-declining balance (DDB):*

$$\text{Depreciation}_t = \left( \frac{\text{Book value}_t}{\text{Depreciable life}} \right) \times 2$$

*Units-of-production:*

$$\text{Depreciation}_t = \frac{\text{Cost} - \text{Salvage}}{\text{Total output}} \times \text{Output units}_t$$

### Intangible Assets

*Purchased:* Record at fair value (purchase price)

*Developed internally:*

#### IFRS

- Research expenditures are expensed
- Development expenditures are capitalized

#### US GAAP

- Generally, both R&D costs are expensed

*Acquired in business combination:*

Purchase price is allocated to each asset on fair value basis; excess recorded as goodwill

### Capitalizing vs. Expensing

- Capitalizing increases assets on the balance sheet and investing cash outflows
- Expensing reduces net income by the after-tax expenditure amount in the period it is incurred

### Impairment of PP&E and Intangible Assets

#### US GAAP

- Asset tested for impairment only when firm may not recover carrying value through future use
- Asset is impaired when carrying value exceeds asset's future undiscounted cash flows
- Impaired asset's value is written down to fair value and a loss is recognized and cannot be subsequently reversed

#### IFRS

- Assets are tested annually for impairment
- Impaired if carrying value > recoverable amount
- Impaired asset's value is written down to recoverable amount and a loss is recognized
- Loss can be reversed if asset value recovers, but only up to pre-impairment carrying value

## INCOME TAXES

### Temporary Taxable Differences

*Deferred tax assets (DTA):* Created when taxes payable exceeds income tax expense

*Deferred tax liabilities (DTL):* Created when taxes payable is less than income tax expense

*Tax base of assets:* Amount that will be deducted on the tax return as asset's benefits are realized

*Tax base of liabilities:* Carrying value of liability minus amount that will be deductible

Asset carrying amount > Tax base	DTL
Asset carrying amount < Tax base	DTA
Liability carrying amount > Tax base	DTA
Liability carrying amount < Tax base	DTL

*Impact of tax rate changes*

If tax rate increases, DTA and DTL will increase

If tax rate decreases, DTA and DTL will decrease

$$\text{Income tax exp.} = \text{Taxes payable} + \Delta \text{DTL} - \Delta \text{DTA}$$

### Valuation Allowance

Contra account used if it is unlikely that future profits will be sufficient to use DTAs and credits

### Deferred Tax Charges Directly to Equity

- Revaluation of PP&E (IFRS only)
- Impact of changes in accounting policies
- Impact of exchange rate fluctuations
- Changes in fair value of certain investments

## NON-CURRENT (LONG-TERM) LIABILITIES

### Long-Term Liabilities

*Premium bond:* Coupon rate > yield at issuance

*Discount bond:* Coupon rate < yield at issuance

*Issuance costs:*

US GAAP – capitalized as an asset

IFRS – reduces initial bond liability

*Derecognition of debt:* If an issuer redeems a bond before maturity, a gain/loss (book value minus redemption price) is recognized

*Debt covenants:* Affirmative – borrower promises to do certain things; negative – borrower promises to refrain from certain things

### Lessee Accounting

#### US GAAP

*Finance lease:*

- Lessee purchases the asset, financed by the lessor
- Lessee's periodic lease payments have separate depreciation and interest components

*Operating lease (like a rental agreement):*

- Single lease expense, not separated into different components for depreciation and interest
- The value of an operating lease payment is calculated as a straight-line allocation of total payments over the term of the lease



Conditions requiring a lease to be a finance lease:

- Ownership of the leased asset is transferred to the lessee
- Lessee has the option to purchase the asset and will likely do so
- Lease term covers most of asset's useful life
- The present value of lease payments at inception is close to the asset's fair value
- The leased asset is so specialized that only the lessee can use it without modification

IFRS require all leases to be treated in the manner that is prescribed by US GAAP for finance leases.

### Lessor Accounting

- For operating leases (under both IFRS and US GAAP), the lessor retains the leased asset on its balance sheet and incurs the associated depreciation expense. Lease income from the lessor is recorded as revenue.
- For finance leases (under both IFRS and US GAAP), the lessor removes the leased asset from its balance sheet and creates an asset with a value equal to the lease receivable and any residual value.
- Lease payments are recognized as an operating inflow on the lessor's cash flow statement (for both operating leases and finance leases)

### Pensions

**Defined benefit (DB):** Firm makes periodic payments to employee after retirement.  
Overfunded (underfunded) plan is recognized as an asset (liability).

## CORPORATE ISSUERS

### CORPORATE STRUCTURES AND OWNERSHIP

#### Sole Proprietorship

- Extension of owner
- Operated by owner
- Business liability is retained by owner
- Business profits are owned by owner and taxed as personal income
- Owner is the main source of capital
- Owner's capital and risk appetite limit business growth

#### General Partnership

- Set by partnership agreement
- Operated by partner
- Business liability is retained and shared by partners
- Business profits are shared by partners and taxed as personal income
- Partners are the main source of capital
- Partners' resources and risk appetite limit business growth

### Limited Partnership

- Set by partnership agreement
- Operated by GP
- Business liability is limited by LPs and unlimited for GP
- Business profits are shared by partners and taxed as personal income
- Partners are the main source of income
- Partners' resources, risk appetite, and GP's competence/integrity limit business growth

### Corporations (Limited Companies)

- Legal identity is separated from owners
- Operated by management team voted by shareholders
- Limited business liability for shareholders
- Financed by equity and debt
- Profits are taxed directly; double taxation occurs when shareholders are taxed on their dividend income

### Public and Private Corporations

**Market capitalization:** Product of the current share price and the number of outstanding shares

**Enterprise value** =  $MV_{\text{Shares}} + MV_{\text{Debt}} - \text{Cash}$

**Private placement memorandum (PPM)** is used by private companies to raise capital in primary market

Private companies can go public by:

- Initial public offering (IPO)
- Direct listing (DL)
- Acquisition

Public companies can go private by:

- Leveraged buyout (LBO)
- Management buyout (MBO)

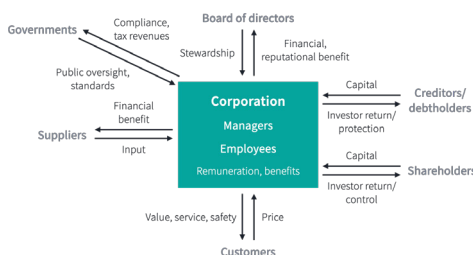
### Lenders and Owners

Risk vs return characteristics of equity and debt:

	Equity	Debt
Upside potential	Unlimited	Limited to payments
Maximum loss	Cannot be more than the investment value	
Investment risk	Higher	Lower
Investment interest	Maximize company value	Timely repayment

### INTRODUCTION TO CORPORATE GOVERNANCE AND OTHER ESG CONSIDERATIONS

#### Stakeholder Groups



### Principal-Agent and Other Relationships

Shareholder vs. manager/director

- **Entrenchment:** Managers avoid justifiable risks to avoid losing their positions
- **Empire building:** Making unjustified acquisitions to increase company size and compensation
- **Excessive risk taking:** Taking unjustifiable risks to maximize returns on stock-based compensation
- **Agency costs** reduce the potential for exploitation in an agency relationship

Controlling shareholder vs. minority shareholder

- **Dispersed ownership:** Controlled by many minority shareholders
- **Concentrated ownership:** Controlled by a single shareholder
- **Multiple-class share structures:** Disproportionate voting power to certain shareholder classes

Shareholder vs. creditor

- Equity owners prefer growth and have a higher risk tolerance
- Creditors prefer stability and limited downside risk

**Corporate governance** can be described as:

- A system of internal controls and procedures for managing organizational business
- A framework for defining the rights and responsibilities of individuals and groups within the organization
- An arrangement of checks, balances, and incentives to minimize and manage conflicts between the interests of insiders and external stakeholders

### Stakeholder Mechanisms

Shareholder:

- Corporate reporting and transparency
- Shareholder meetings (cumulative voting, proxy voting)
- Shareholder activism
- Derivative lawsuits
- Corporate takeovers (proxy contests, tender offers, hostile takeovers)

Creditor:

- Bond indentures, collateral, and trustees
- Corporate reporting
- Creditor committees

Board of director and management:

- Audit committee
- Governance committee
- Remuneration/Compensation committee
- Nomination committee
- Risk committee
- Investment committee

Employee:

- Labor laws
- Code of ethics and compliance department
- Whistleblower protections
- Employee contracts

Customer and supplier:

- Commercial contracts
- Public reputation and social media

Government:

- Laws and regulations
- Corporate governance codes
- Common law and civil law systems

### Risks and Benefits of Corporate Governance and Stakeholder Management

Operational risks of poor stakeholder governance:

- Weak control systems that do not treat all stakeholders fairly
- Ineffective decision-making process
- Inadequate board scrutiny
- Diminished operating performance

Financial risks of poor stakeholder governance:

- Higher default and bankruptcy risks
- Higher borrowing costs
- Poor equity returns

### Factors Relevant to Corporate Governance and Stakeholder Management Analysis

- Economic ownership and voting control
- Board of directors representation
- Remuneration and company performance
- Investors in the company
- Strength of shareholders' rights
- Management of long-term risks

### ESG Considerations for Investors and Analysts

ESG investment approaches:

- Responsible investing
- Sustainable investing
- Socially responsible investing (SRI)
- Value-based and values-based approaches

ESG investment styles:

- Negative screening
- Positive screening
- ESG integration
- Thematic investing
- Engagement/active ownership
- Impact investing

*Green finance:* Use financial instruments to support economic growth while minimizing environmental impact

## BUSINESS MODELS & RISKS

### Value Proposition

- Target customers
- Product/service offering
- Channel strategy
- Pricing strategy

Channel strategy:

- Traditional channel
- Direct sales
- Drop shipping
- Omnichannel strategy

Pricing model:

- Cost-based
- Value-based

Price discrimination:

- Tiered pricing
- Dynamic pricing
- Auction/reverse auction models

Pricing for multiple products:

- Bundling
- Razors-and-blades pricing
- Optional product pricing

Pricing for rapid growth:

- Penetration pricing
- Freemium pricing
- Hidden revenue business model

Alternatives to ownership:

- Subscription pricing
- Fractionalization
- Leasing
- Licensing
- Franchising

### Value Chain

*Value chain:* Systems and functions within the firm that create value for its customers

*Supply chain:* Series of steps and processes needed to prepare a product to be sold to the consumer

### Profitability and Unit Economics

*Unit economics:* The quantitative analysis of a company's revenues and costs on a per unit basis

$$\text{Breakeven point} = \frac{\text{Fixed costs}}{\text{Contribution margin}}$$
$$= \frac{\text{Fixed costs}}{\text{Unit price} - \text{Variable cost per unit}}$$

### Business Model Types

- Private label manufacturers
- Licensing arrangements
- Value added resellers
- Franchises
- Network effects
- Crowdsourcing
- Hybrid business models

E-commerce business models:

- Affiliate marketing
- Marketplace businesses
- Aggregators

## Business Models: Financial Implications

External factors:

- Economic conditions
- Demographics
- Sector demand
- Industry cost characteristics
- Social and political trends

Firm-specific factors:

- Firm maturity
- Competitive position
- Business model

### Business Models: Risks

Macro risk:

- Exchange rates
- Interest rates
- Political instability
- Legal and regulatory changes
- Country-level risks

Business risk:

- Industry risks
- Company-specific risks

Financial risk:

$$\text{Total leverage} = \text{Operating leverage} \times \text{Financial leverage}$$
$$= \frac{\text{Contribution margin}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{EBT}}$$
$$= \frac{\text{Contribution margin}}{\text{EBT}}$$

## CAPITAL INVESTMENTS

### Types of Capital Investments

Business maintenance:

- Going concern projects
- Regulatory/compliance projects

Business growth:

- Expansion projects
- Pet projects/high-risk investments

### Principles of Capital Budgeting

Key assumptions of capital allocation:

- Decisions are based on cash flows instead of accounting concepts
- Cash flows are not equivalent to accounting income or economic income
- Cash flows must account for opportunity costs
- Analysis is done on an after-tax basis
- Timing of cash flows is important
- Financing costs are ignored

Other important considerations:

- Sunk costs are ignored
- Opportunity cost is the value of a resource's next-best use
- Incremental cash flows reflect the cash flows realized from a decision
- Externalities (e.g., cannibalization) may have unexpected negative impact the company
- Conventional cash flow pattern only has one sign change



### Net Present Value (NPV)

Sum of present values of expected future cash inflows, net of initial cash outlay

$$NPV = \sum_{t=1}^n \frac{CF_t}{(1+r)^t} - \text{Outlay}$$

Accept a project if  $NPV > 0$

### Internal Rate of Return (IRR)

IRR is  $r$  such that  $NPV = 0$

Accept a project if its  $IRR >$  required return

### BA II Plus NPV Worksheet Function

- Cash inflows are positive; outflows are negative
- F01, F02, etc. refer to cash flow frequencies
- CPT + NPV to compute NPV; CPT + IRR for IRR

### Common Capital Budgeting Pitfalls

- Inertia
- Source of capital bias
- Failing to consider alternatives
- Pet projects
- Basing decisions on earnings metrics
- Internal forecasting errors

### Corporate Usage of Capital Allocation Methods

Return on invested capital (ROIC):

$$ROIC = \frac{\text{After-Tax Net Profit}}{\text{Average BV of Invested Capital}}$$

### Real Options

- *Timing option*: Option to delay the investment
- *Sizing option*: Option to expand, grow, or abandon
- *Flexibility option*: Option to alter operations, such as changing prices or substituting inputs
- *Fundamental option*: Option to alter decisions based on future events (e.g., drill based on price of oil, continue R&D depending on initial results)

### Analyzing Projects with Real Options

- Use the discounted cash flow (DCF) analysis without considering real options
- Adjust the stand-alone DCF analysis by including the present value of the expected costs and benefits options
- Use option pricing models
- Use decision trees

## WORKING CAPITAL & LIQUIDITY

### Internal Financing

- Increasing after-tax operating cash flows
- Improving working capital efficiency
- Converting liquid assets to cash

### External Financing: Financial Intermediaries

- Uncommitted lines of credit
- Committed lines of credit
- Revolving credit agreements
- Secured (asset-based) loans
- Factoring
- Others (web-based lenders and non-bank lenders)

### External Financing: Capital Markets

- Short-term commercial paper
- Long-term debt
- Common equity

### Conservative Working Capital Management

Advantages:

- Low rollover risk
- Greater cash flow certainty
- Low risk of inventory shortages
- Flexibility to adapt to adverse market conditions

Disadvantages:

- High borrowing costs
- High cost of equity and shareholder dilution
- Less flexibility to borrow on an as-needed basis
- Longer lead times
- More covenants
- High risk of obsolete inventory

### Aggressive Working Capital Management

Advantages:

- Low financing costs under an upward-sloping yield curve
- Great flexibility to borrow only as needed
- Short-term borrowing involves less rigorous credit analysis

Disadvantages:

- Risk of having to refinance at higher short-term rates
- Potential difficulty rolling over short-term debt with market turmoil
- Possible need to rely on expensive trade credit
- Tight customer credit terms

### Liquidity and Short-Term Funding Needs

*Primary sources of liquidity:*

- Free cash flows
- Ready cash balances (bank accounts)
- Short-term funds (lines of credit)
- Cash flow management (centralized collection)

*Secondary sources of liquidity:*

- Negotiating debt contracts
- Liquidating assets
- Filing for bankruptcy

*Drag on liquidity:* Delayed cash inflows, such as uncollected receivables and obsolete inventory

*Pull on liquidity:* Accelerated cash outflows, such as settling payables earlier

Net operating cycle (a.k.a. cash conversion cycle) =  
# days of inventory + # days of receivable - # days of payable

### Evaluating Short-Term Financing Choices

Factors influencing a company's short-term borrowing strategy:

- Size and creditworthiness
- Legal and regulatory considerations
- Sufficient access
- Flexibility of borrowing options

## COST OF CAPITAL - FOUNDATIONAL TOPIC

### Weighted Average Cost of Capital (WACC)

$$WACC = w_d r_d (1 - t) + w_p r_p + w_e r_e$$

$w_d$  = percentage of debt in capital structure

$w_p$  = percentage of preferred stock

$w_e$  = percentage of common stock

$t$  = tax rate

$r_d$  = cost of debt

$r_p$  = cost of preferred stock =  $D_p/P$

$r_e$  = cost of common stock

$$= R_F + \beta[E(R_m) - R_F] \\ (\text{CAPM})$$

$$= r_d + \text{Risk Premium}$$

$$(\text{Bond Yield plus Risk Premium})$$

### Costs of the Various Sources of Capital

Cost of debt:

- Yield-to-maturity approach

$$P_0 = \left[ \sum_{t=1}^n \frac{PMT_t}{(1+r_d)^t} \right] + \frac{FV}{(1+r_d)^n}$$

- Debt rating approach (e.g., matrix pricing)

Cost of preferred stock:

$$r_p = D_p/P$$

Cost of common stock:

- Yield-to-maturity approach

$$r_e = r_f + \beta[r_m - r_f]$$

- Multifactor model

$$r_e = r_f + \beta_1(\text{Factor}_1) + \beta_2(\text{Factor}_2) + \dots + \beta_j(\text{Factor}_j)$$

- Bond yield plus risk premium approach

$$r_e = r_d + \text{Risk Premium}$$

### Estimating Beta

Blume's beta adjustment formula:

$$\text{Adjusted } \beta = \left( \frac{2}{3} \right) (\text{Unadjusted } \beta) + \left( \frac{1}{3} \right) (1.0)$$

Asset beta/unlevered beta for comparable company:

$$\beta_U = \beta_E \left[ \frac{1}{(1-t) \frac{D}{E} + 1} \right]$$

Levered project beta for subject firm:

$$\beta'_E = \beta_U \left[ (1-t) \frac{D'}{E'} + 1 \right]$$

### Flotation Costs

$r_e$  adjusted for flotation costs (amount):

$$r_e = \frac{D_1}{P_0 - F} + g$$

$r_e$  adjusted for flotation costs (percentage):

$$r_e = \frac{D_1}{P_0[1-f]} + g$$

## CAPITAL STRUCTURE

### Internal Factors Affecting Capital Structure

#### Business model characteristics:

- Revenue, earnings, and cash flow sensitivity
- Asset type
- Asset ownership

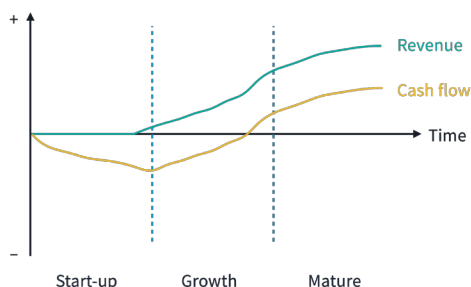
#### Existing leverage:

- Liquidity
- Profitability
- Interest coverage
- Leverage

**Corporate tax rate:** The higher the tax rate, the more benefit of using debt

**Capital structure policies/guidelines:** Firm-specific policies and debt covenants

#### Company life stage:



### External Factors Affecting Capital Structure

- Market conditions/business cycles
- Regulatory constraints
- Industry/peer firm leverage

### Modigliani and Miller Propositions

**MM Proposition I:** A firm's capital structure would have no effect on its value, assuming:

1. Investors have homogeneous expectations
2. No market frictions (e.g., transaction costs, taxes, or costs of financial distress)
3. No agency costs
4. Investors can borrow and lend at risk-free rate
5. Investing/financing decisions are independent

**MM Proposition II:** Cost of equity increases with the debt-to-equity ratio.

#### Without Taxes

Firm value	$V_L = V_U$
Cost of Equity	$r_e = r_0 + (r_0 - r_d) \left( \frac{D}{E} \right)$

#### With Taxes

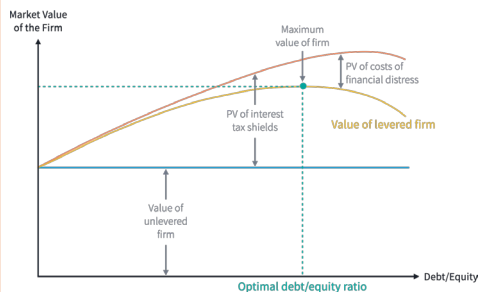
Firm value	$V_L = V_U + tD$
Cost of Equity	$r_e = r_0 + (r_0 - r_d)(1 - t) \left( \frac{D}{E} \right)$

$r_0$  = cost of capital for a firm financed only by equity

### Optimal and Target Capital Structure

Static trade-off theory balances costs of financial distress with tax shield benefits from using debt:

$$V_L = V_U + tD - PV(\text{costs of financial distress})$$



To estimate a company's target capital structure:

- Assume the company will main its current capital structure
- Infer target weights the company is moving toward
- Use the industrial average

**Pecking order theory:** Since managers have an asymmetric information advantage, they prefer capital sources that reveal the least amount of information:

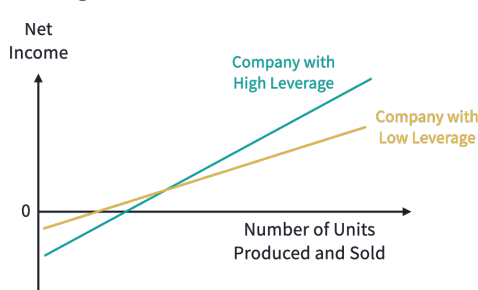
1. Internally generated earnings (best option)
2. New debt
3. New equity (least attractive for managers)

### Stakeholder Interests

Agency costs arise from conflicts between managers and owners. The interests of managers, shareholders, and bondholders are not always aligned.

## MEASURES OF LEVERAGE

### Leverage



### Business Risk

Two components of business risk are:

- Sales risk: determined by the elasticity of demand for products and services
- Operating risk: determined by the share of fixed costs as a share of total operating costs

### Measures of Leverage

#### Degree of operating leverage (DOL):

$$DOL = \frac{\% \Delta \text{ Operating income}}{\% \Delta \text{ Units sold}} = \frac{Q(P - V)}{Q(P - V) - F}$$

#### Degree of financial leverage (DFL):

$$DFL = \frac{\% \Delta \text{ Net income}}{\% \Delta \text{ Operating income}} = \frac{Q(P - V) - F}{Q(P - V) - F - C}$$

#### Degree of total leverage (DTL):

$$DTL = \frac{\% \Delta \text{ Net income}}{\% \Delta \text{ Units sold}} = \frac{Q(P - V)}{Q(P - V) - F - C}$$

$$DTL = DOL \times DFL$$

### Breakeven

$$\text{Breakeven: } Q_{BE} = \frac{F + C}{P - V}$$

$$\text{Operating breakeven: } Q_{OBE} = \frac{F}{P - V}$$

Q = quantity; P = price; V = variable cost/unit  
F = fixed operating cost; C = fixed financial cost

## EQUITY

## MARKET ORGANIZATION AND STRUCTURE

### Functions of the Financial System

- Saving
- Borrowing
- Raising Equity Capital
- Managing Risks
- Exchanging Assets
- Information-Motivated Trading

### Securities Markets

- **Spot vs. Forward Markets:** Spot market trades are settled within 3 days.
- **Primary vs. Secondary Markets:** Primary market transactions are done directly with the issuer, while secondary market trades take place on organized exchanges.
- **Capital vs. Money Markets:** Money markets are used for securities with maturities of less than one year, while longer-dated securities are traded in capital markets.

### Positions

**Long positions:** Benefit from price appreciation

**Short positions:** Benefit from price depreciation

### Leveraged Positions

$$\text{Leverage ratio} = \frac{\text{Position}}{\text{Equity}}$$

$$\text{Maximum initial leverage ratio} = \frac{1}{\text{Initial margin}}$$

**Maintenance margin:** minimum amount of equity required

**Margin call** is triggered if the equity falls below the maintenance margin. Additional equity will be requested to bring the account balance back to the initial margin.

### Execution Instructions (How to fill)

- **Market:** Fill immediately at market price
- **Limit:** Buy below maximum price or sell above minimum price specified in order
- **All-or-nothing:** Cancel order if not fully filled
- **Hidden:** Visible to brokers and exchanges, but invisible to other traders
- **Iceberg:** Only a fraction of order amount is visible

### Validity Instructions (When to fill)

- **Day orders:** Cancelled if unfilled at end of day
- **Good-till-cancelled:** No set expiry date
- **Good-on-close:** Filled at end of day
- **Stop-loss:** Sell if prices fall below specified level





## Clearing Instructions

Settlement/clearing typically done by brokers for retail trades; brokers or custodians for institutional trades

## Primary Market Transactions

- *Initial Public Offerings* (IPOs)
- *Private placements*
- *Shelf registrations*: Part of issue is held back to be sold directly to secondary market investors later
- *Dividend reinvestment plans* (DRIPs): Investors can roll over dividend payments to purchase new shares, possibly at a discount
- *Rights offerings*: Current shareholders gain right to purchase additional shares at below-market price; dilutes value of existing shares

## Market Structure

*Quote-driven*: Investors trade with dealers

*Order-driven*: Exchanges use order matching rules

*Brokered*: Trades arranged by brokers

*Call markets*: Conduct periodic single price auctions, otherwise completely illiquid

*Continuous Trading markets*: Allow trades whenever market is open, may use call market auction at beginning and/or end of each day

## Trade Pricing Rules

*Uniform pricing rules*: Used by call markets, all trades executed at the price that maximizes total quantity traded

*Discriminatory pricing rules*: Used by continuous markets, fills most aggressively priced orders first

*Derivative pricing rules*: Used by crossing networks to trade at midpoint of quotes from other markets

## Complete Markets

- Facilitate savings/investment
  - Facilitate lending to creditworthy borrowers
  - Allow risk exposures to be hedged
  - Facilitate exchange of currencies/commodities
- An ideal financial system is *complete* (see above), *operationally efficient* (low transaction costs), and *informationally efficient* (prices reflect all info.)

## SECURITY MARKET INDEXES

### Price Return over Single Period

$$PR_i = \frac{P_{i1} - P_{i0}}{P_{i0}} \quad PR_i = \sum_{i=1}^N w_i PR_i$$

### Total Return over Single Period

$$TR_i = \frac{P_{i1} - P_{i0} + Inc_i}{P_{i0}} \quad TR_i = \sum_{i=1}^N w_i TR_i$$

### Price Return Index over Multiple Periods

$$V_{PRIT} = V_{PRIO}(1 + PR_{I1})(1 + PR_{I2}) \dots (1 + PR_{IT})$$

### Total Return Index over Multiple Periods

$$V_{TRIT} = V_{TRIO}(1 + TR_{I1})(1 + TR_{I2}) \dots (1 + TR_{IT})$$

## Price-Weighted Indexes

$$w_i^P = \frac{P_i}{\sum_{j=1}^N P_j}$$

- Like buying one share of each stock
- Advantage is simplicity
- Disadvantage is arbitrary weights
- A stock's weight is halved due to a stock split, requiring an adjustment to the divisor

## Equally Weighted Indexes

$$w_i^E = \frac{1}{N}$$

- Like investing the same amount in each stock
- Advantage is simplicity
- Disadvantages are that the impact of large companies is underrepresented and frequent rebalancing is required

## Capitalization-Weighted Indexes

$$w_i^M = \frac{Q_i P_i}{\sum_{j=1}^N Q_j P_j}$$

- Like holding all stocks in proportion to their market values
- Float adjustment may be used to reflect the number of shares that may be actively traded
- Advantage is that the asset classes' performance is well-represented
- Disadvantage is that returns are heavily driven by large-cap (possibly overvalued) firms

## Fundamentally Weighted Indexes

- Built like price-weighted indexes, but using a fundamental measure such as sales or cash flows
- Contrarian effect of rebalancing by selling off top performers and buying underperforming stocks produces a value tilt

## Types of Equity Market Indexes

- *Broad market indexes*: Covers one equity market
- *Multi-market indexes*: Covers equity markets in multiple countries
- *Sector indexes*: Important for assessing a manager's performance (selection vs. allocation)
- *Style indexes*: Large/small cap; Value/growth

## MARKET EFFICIENCY

### Forms of Efficient Market Hypothesis (EMH)

Form	Market Prices Reflect:		
	Past market data	Public info	Private info
Weak	✓		
Semi-strong	✓	✓	
Strong	✓	✓	✓

## Implications of EMH

- If weak form holds, investors will not earn abnormal profits from technical analysis
- If markets are semi-strong efficient, investors must have a comparative advantage to earn abnormal profits from fundamental analysis

## Market Anomalies

Changes in a security's price that are not attributable to known information

## Selected Behavioral Biases

- *Loss aversion*: Disliking losses more than liking equivalent gains
- *Information Cascades*: Those who act first will convey information that influences others
- *Representativeness*: Rely too much on current state when assessing probabilities
- *Mental accounting*: Keep track of gains and losses separately for different investments/goals
- *Conservatism*: Failing to incorporate new information in a timely manner
- *Narrow framing*: Focusing on certain issues in isolation

## OVERVIEW OF EQUITY SECURITIES

### Common Share Voting Methods

*Statutory*: One vote per share

*Cumulative*: Votes can be bundled

Example: 10 board positions

Statutory: 1 share votes for 10 different candidates

Cumulative: 10 votes may go to 1 candidate

Cumulative method advantages small shareholder

### Preference Shares

- *Cumulative*: Accrue dividends if payments missed
- *Non-cumulative*: Missed dividends do not accrue, but no common dividends allowed if preferred shareholders do not receive their dividend
- *Participating*: May receive additional dividend if firm is profitable or in the event of liquidation
- *Non-participating*: No compensation beyond dividends and face value in a liquidation

### Private Equity Securities

- *Venture capital* (VC): Start-up, early-stage, or mezzanine financing with IPO as exit strategy
- *Leveraged buyouts* (LBO): Debt-financed deals to take undervalued listed companies private
- *Private investment in public equity* (PIPE): Companies can raise new capital quickly, investors can negotiate discounts

## Depository Receipts (DRs)

**Sponsored DRs:** Issued directly by foreign company; Investors receive same voting rights and dividends as other common shareholders

**Unsponsored DRs:** Foreign company not involved; Depository bank purchases shares, issues DRs, and retains voting rights

**Global DRs:** Issued outside company's home country to avoid limits on capital flows; May be denominated in any currency, but USD is common; Cannot be listed on US exchanges, but US investors can purchase them via private placements

**American DRs:** USD-denominated GDRs that can be traded on US exchanges; Underlying securities, American depository shares, trade in issuer's domestic market

**Global Registered Shares:** Traded on multiple exchanges, including issuer's domestic market; Denominated in multiple local currencies; Unlike DRs, GRS represent an actual ownership interest

## INTRODUCTION TO INDUSTRY AND COMPANY ANALYSIS

### Porter's Five Forces Framework

- Threat of substitute products
- Bargaining power of customers
- Bargaining power of suppliers
- Threat of new entrants
- Intensity of rivalry

### Industry Life Cycle Stages

- **Embryonic:** Slow growth, high prices, high failure risk, significant investment required
- **Growth:** Rapidly increasing demand, improving profitability, falling prices, low competition
- **Shakeout:** Slowing growth, intense competition, declining profitability
- **Mature:** Little or no growth, industry consolidation, high entry barriers
- **Decline:** Negative growth, excess capacity, high competition

### Key Competitive Strategies

- **Low-cost leadership:** To hold/gain market share
- **Product differentiation:** To charge premium prices

## EQUITY VALUATION: CONCEPTS AND BASIC TOOLS

### Dividend Discount Model (DDM)

$$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} = \sum_{t=1}^n \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$$

*Perpetual preferred stock; constant dividend:*

$$V_0 = \frac{D_0}{r}$$

*Gordon constant growth model (GGM):*

$$V_0 = \sum_{t=1}^{\infty} \frac{D_0(1+g)^t}{(1+r)^t} = \frac{D_0(1+g)}{r-g} = \frac{D_1}{r-g}$$

$$g = (\text{Retention rate}) \times \text{ROE} = (1 - D/E) \times \text{ROE}$$

*Multistage DDM:*

$$V_0 = \sum_{t=1}^n \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$$

$$P_n = \frac{D_{n+1}}{r - g_L}$$

$$D_{n+1} = D_0(1+g_S)^n(1+g_L)$$

### Price Multiples

$$\frac{P_0}{E_1} = \frac{D_1/E_1}{r - g}$$

P/B = Price per share/Book value per share

P/CF = Price per share/Cash flow per share

P/S = Price per share/Sales per share

### Asset-Based Valuation Models

Useful for companies with natural resource or a large share of current assets/liabilities; Not useful if company has a large share of PP&E/intangibles

### Enterprise Value (EV)

$$= \text{MV}(\text{Common equity}) + \text{MV}(\text{Preferred stock}) + \text{MV}(\text{Debt}) - (\text{Cash} + \text{Short term investments})$$

## FIXED INCOME

### FIXED-INCOME SECURITIES: DEFINING ELEMENTS

#### Types of Bonds

- **Collateral Trust Bonds:** Backed by financial assets
- **Equipment Trust Bonds:** Backed by physical assets
- **Covered Bonds:** Backed by a segregated pool of loans that are replaced if they stop performing

#### Principal Repayment Structures

- **Bullet Bonds:** Full principal repaid at maturity
- **Fully Amortizing:** Equal annuity-like payments contain a mix of interest and principal
- **Partially Amortizing:** Some principal is amortized, remainder repaid as a lump sum at maturity
- **Sinking Funds:** Certain percentage of principal retired each year

#### Coupon Structures

- **Fixed-rate bonds:** Set percentage of principal
- **Floating-rate (FRNs):** Reference rate + spread
- **Step-up:** Coupon rate increases on schedule
- **Credit-Linked:** Coupon rate is increased if issuer is downgraded, reduced if upgraded
- **Payment-in-kind:** Coupons may be paid with more bonds rather than cash
- **Deferred (Split) Coupon:** No coupons in early years, high coupons in later years

#### Inflation-Indexed Bonds

- **Zero-coupon:** Principal amount is adjusted
- **Interest-indexed:** Coupons are adjusted
- **Capital-indexed:** Fixed rate, adjusted principal
- **Indexed-annuity:** Amortizing bonds with annuity payments adjusted for inflation

## Credit Enhancements

**Internal:** Subordination, over-collateralization, reserve accounts

**External:** Surety bonds, letters of credit, guarantees from financial institutions

### Bonds with Contingency Provisions

**Callable Bonds**

May be recalled by issuer if rates fall

$$V_{\text{Callable bond}} = V_{\text{Non-callable bond}} - V_{\text{Call}}$$

**Putable Bonds**

May be sold back to issuer if rates rise

$$V_{\text{Putable bond}} = V_{\text{Non-putable bond}} + V_{\text{Put}}$$

### Convertible Bonds

**Conversion price:** Price per share at which bond can be converted into shares

**Conversion ratio:** Number of common shares each bond can be converted into

**Conversion value:**

Current share price  $\times$  Conversion ratio

**Conversion premium:**

Convertible bond's price  $-$  Conversion value

**Warrants:** Options to buy equity, lowers debt costs

### Convertible Contingent Bonds (CoCos)

- Automatically convert to equity if a condition is met (e.g., capitalization ratio falls)
- Lender does not control if option is exercised
- Primarily issued by financial institutions

## FIXED-INCOME MARKETS: ISSUANCE, TRADING, AND FUNDING

### Bond Markets

- **Primary bond markets:** Markets in which issuers initially sell bonds to investors to raise capital
- **Secondary bond markets:** Markets in which bonds are subsequently traded among investors; Most trading is OTC rather than on organized exchanges
- **Grey market:** Informal forward market to gauge interest in upcoming bond issues and set prices for the primary market

### Sovereign Debt

- Issued by national governments, zero default risk
- Bills mature  $< 1$  year; Bonds mature  $> 1$  year
- **On-the-run:** Most recent issues of a given maturity; more liquid than off-the-run issues

### Non-Sovereign Debt

- Municipal bonds (sub-national issuers)
- Quasi-government bonds (gov't-backed agencies)
- Supranational bonds (i.e., IMF, World Bank)

### Corporate Debt

- Commercial paper (CP) used for  $< 1$  year, but carries rollover risk
- Long-term bonds  $\sim 12+$  years
- Bilateral/syndicated bank loans are also used

## Medium-Term Notes (MTNs)

- Used to bridge gap between CP and L/T bonds
- Offered to investors through an agent in a range of maturities
- Lower registration/underwriting costs than bonds, but relatively illiquid

## USCP vs. Eurocommercial Paper

	USCP	ECP
Currency	US dollar	Any currency
Maturity	Overnight to 270 days	Overnight to 364 days
Interest calculation	Discount basis	Interest-bearing or discount basis
Settlement	T + 0	T + 2
Negotiable	Can be sold	Can be sold

## Structured Financial Instruments

- **Guarantee certificate:** Zero-coupon bond with a call option on the issuer's equity
- **Credit-linked note:** Seller earns a premium for providing credit protection on underlying bond
- **Participation Instruments:** Coupon payments based on underlying rate (e.g., FRNs)
- **Leveraged Instruments:** Modify returns
- Leveraged floater:  $2 \times (\text{Reference rate})$
- Deleveraged floater:  $0.5 \times (\text{Reference rate})$
- Leveraged inverse floater:  $\text{Max coupon} - 2 \times (\text{RR})$

## Factors Increasing Repurchase (Repo) Rates

- Higher Collateral risk
- Longer term
- Delivery requirement
- Low quality collateral
- Higher rates for alternative sources of funds

## INTRODUCTION TO FIXED-INCOME VALUATION

### Bond Pricing with Spot Rates

$$PV = \frac{PMT}{(1+z_1)^1} + \frac{PMT}{(1+z_2)^2} + \dots + \frac{PMT + FV}{(1+z_N)^N}$$

CR: Coupon Rate; MDR: Market Discount Rate

CR = MDR	Price = Par Value	Par
CR < MDR	Price < Par Value	Discount
CR > MDR	Price > Par Value	Premium

### Bond Pricing Relationships

- **Inverse effect:** Price moves opposite to yield
- **Convexity effect:** Falling yield has greater price impact than equivalent increase in yield
- **Coupon effect:** Yield changes have greater impact on lower coupon bonds
- **Maturity effect:** Yield changes have greater impact on longer-term bonds (may not apply to low-coupon bonds trading at very deep discounts)

### Flat Price, Accrued Interest, and Full Price

$$PV^{\text{Full}} = PV^{\text{Flat}} + AI = (PV)(1+r)^{t/T}$$

$$AI = (t/T) \times PMT$$

## Yield Measures

$$\text{Current yield} = \frac{\text{Annual cash coupon payment}}{\text{Flat price}}$$

$$\text{Simple yield} = \frac{\text{Annual cash coupon payment} + \frac{\text{Amortized gain/loss}}{\text{Flat price}}}{\text{Flat price}}$$

Yield-to-call (YTC) = IRR assuming bond is called

Yield-to-worse =  $\min[YTC, YTM]$

### Yield Measures for FRNs

Quoted margin (QM): Spread paid by FRN

Discount margin (DM): Spread required by market

If  $QM > DM$ , FRN will trade above par

FRN pricing formula:

$$= \frac{\frac{(\text{Ref} + QM)(FV)}{m}}{\left(1 + \frac{(\text{Ref} + DM)}{m}\right)^1} \dots + \frac{\frac{(\text{Ref} + QM)(FV)}{m} + FV}{\left(1 + \frac{(\text{Ref} + DM)}{m}\right)^N}$$

### Yield Measures for Money Market Instrument

Discount Rate (DR) Basis

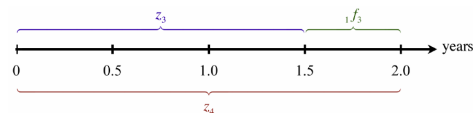
$$PV = FV \times \left(1 - \frac{\text{Days}}{\text{Year}} \times DR\right)$$

Add-on Rate (AOR) Basis

$$PV = FV / \left(1 + \frac{\text{Days}}{\text{Year}} \times AOR\right)$$

### Implied Forward Rate (IFR)

$$(1+z_A)^A \times (1 + IFR_{A,B-A})^{B-A} = (1+z_B)^B$$



### Yield Spreads over Benchmark Yield Curve

G-spread = YTM - Government bond yield

I-spread = YTM - Swap rate

Z-spread

$$PV = \frac{PMT}{(1+z_1+Z)^1} + \frac{PMT}{(1+z_2+Z)^2} + \dots + \frac{PMT + FV}{(1+z_N+Z)^N}$$

(Can only be calculated by trial-and-error)

Option-adjusted spread (OAS)

OAS = Z-spread - Option value (in basis points)

## INTRODUCTION TO ASSET-BACKED SECURITIES

### Parties to a Securitization

- **Seller/Depositor:** Originates loans (assets)
- **Issuer:** Special purpose vehicle (SPV) established to create asset-backed securities (ABS)
- **Servicer:** Collects payments on underlying loans

### ABS Tranching

- **Credit tranching:** Certain tranches absorb credit losses before others
- **Absolute priority rule:** Senior claims outrank subordinated claims in the event of a liquidation
- **Time tranching:** Certain tranches are exposed to prepayment risk

## Securitization Example

- Firm sells equipment on credit
- Firm creates bankruptcy-remote SPV
- SPV issues debt to purchase loans from firm
- SPV creates securities backed by loans
- Investors purchase securities from SPV
- SPV collects loan payments from firm's customers
- SPV distributes cash flows to investors

### Residential Mortgage Loans

- Interest: fixed, adjustable, convertible
- Amortization: full, partial, interest-only
- Prepayment: penalty, no penalty
- Foreclosure: non-recourse, recourse

### Residential Mortgage-Backed Securities

- **Agency RMBS:** Issued by government agencies; must have conforming loans
- **Non-agency RMBS:** Issued by private companies and may have non-conforming loans
- **Pass-through rate:** MBS coupon rate
- **Prepayment risk:** Contraction (faster-than-expected); extension (slower-than-expected)
- Prepayment rates are relative to PSA benchmark

### Collateralized Mortgage Obligations (CMO)

- Unlike pass-through securities, CMOs have tranches to redistribute cash flows and risks
- **Sequential-pay CMOs** have principal and prepayments paid to the tranches sequentially
- **Planned amortization class (PAC) CMOs** have support tranches to absorb prepayment risk

### Non-Mortgage ABS

- **Amortizing:** E.g., auto loan ABS
- **Non-amortizing:** E.g., credit card receivable ABS

### Collateralized Debt Obligations (CDO)

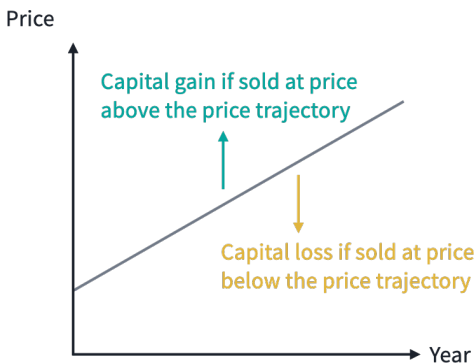
Securities backed by pool of debt obligations, such as corporate bonds, leveraged bank loans, or credit default swap on securities

### Covered Bonds

- Dual recourse against the issuing financial institution and the cover pool
- One bond class per cover pool
- Issuer must replace non-performing asset with performing asset

## UNDERSTANDING FIXED-INCOME RISK AND RETURNS

### Constant Yield Price Trajectory



### Yield Duration vs. Curve Duration

**Yield duration:** Sensitivity to YTM

Measures: Macaulay duration, modified duration, money duration, price value of basis point (PVBP)

**Curve duration:** Sensitivity to benchmark yields (e.g., effective duration); for bonds with options

### Macaulay Duration

$$D_{\text{Mac}} = \left( \frac{1+r}{r} - \frac{1+r+N(c-r)}{c[(1+r)^N - 1] + r} \right) - \frac{t}{T}$$

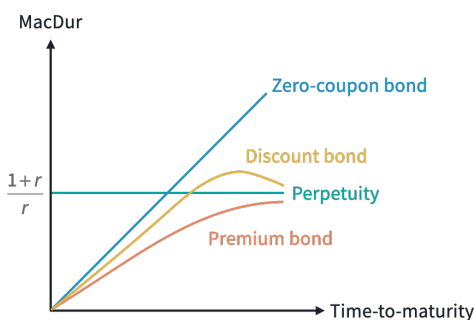
r: YTM

c: Coupon rate

N: Number of periods to maturity

t: Number of days since last coupon payment

T: Number of days in each coupon period



### Modified Duration

$$\text{ModDur} = \frac{D_{\text{Mac}}}{1+r}$$

$$\% \Delta PV^{\text{Full}} = -\text{AnnModDur} \times \Delta \text{Yield}$$

$$\text{ApproxModDur} = \frac{(PV_-) - (PV_+)}{2(\Delta \text{Yield})(PV_0)}$$

### Money Duration and PVBP

$$\text{MoneyDur} = \text{AnnModDur} \times PV^{\text{Full}}$$

$$\Delta PV^{\text{Full}} \approx -\text{MoneyDur} \times \Delta \text{Yield}$$

$$\text{Price value of a basis point} = \frac{(PV_-) - (PV_+)}{2}$$

$$\text{Basis point value} = D_{\text{Mod}} \times 0.0001$$

### Effective Duration

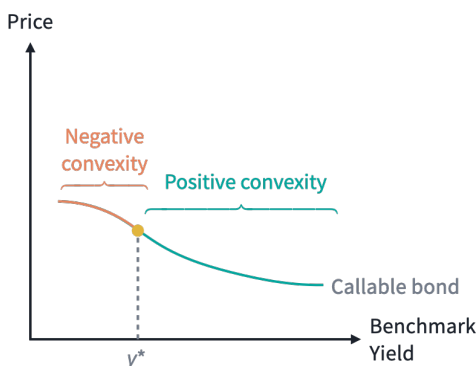
$$\text{EffDur} = \frac{(PV_-) - (PV_+)}{2(\Delta \text{Curve})(PV_0)}$$

### Convexity

$$\text{ApproxCon} = \frac{(PV_-) + (PV_+) - [2 \times (PV_0)]}{(\Delta \text{Yield})^2 (PV_0)}$$

$$\% \Delta PV^{\text{Full}} = -D_{\text{Mod}} \times \Delta \text{YTM} + \frac{1}{2} (\text{Conv}) (\Delta \text{YTM})^2$$

$$\text{EffConv} = \frac{(PV_-) + (PV_+) - 2(PV_0)}{(\Delta \text{Curve})^2 (PV_0)}$$



### Duration Gap

$$\text{Duration gap} = D_{\text{Mac}} - \text{Investment horizon}$$

- If positive: Price risk > Reinvestment risk

- If negative: Reinvestment risk > Price risk

## FUNDAMENTALS OF CREDIT ANALYSIS

### Credit Risk

- Default risk: Probability of default

- Loss severity: Loss given default

$$E[\text{Loss}] = \text{Pr}(\text{Default}) \times \text{Loss severity}$$

$$\text{Loss severity} = 1 - \text{Recovery rate}$$

### Spread Risk

- Credit migration risk: Possibility of downgrade

- Market liquidity risk: Need to sell at a discount

### Seniority Ranking

- First Lien Loan – Senior Secured

- Second Lien Loan – Secured

- Senior Unsecured

- Senior Subordinated

- Subordinated

- Junior Subordinated

*Pari passu:* All creditors in the same ranking, regardless of maturity, have the same priority

### Credit Ratings

*Investment grade:* Baa3/BBB- and above

*Non-investment grade:* Ba1/BB+ and below

### Four C's of Credit Analysis

- Capacity

- Collateral

- Covenants

- Character

### Corporate Bond Yield Components

- Real risk-free interest rate

- Expected inflation rate

- Maturity premium

- Liquidity premium

- Credit spread

} Yield spread

## DERIVATIVES

### DERIVATIVE INSTRUMENT AND DERIVATIVE MARKET FEATURES

#### Derivative Underlyings

- Equities
- Fixed-income instruments and interest rates
- Currencies
- Commodities
- Credit
- Other (e.g., weather, crypto, longevity risk)

#### Derivatives Markets

	OTC Market	ETD Market
Liquidity	Lower	Higher
Trading costs	Higher	Lower
Transparency	Less	Greater
Standardization	Lower	Higher
Flexibility/customization	Higher	Lower
Counterparty credit risk	Higher	Lower

### FORWARD COMMITMENT AND CONTINGENT CLAIM FEATURES AND INSTRUMENTS

#### Types of Derivatives

*Forward commitments:* Obligation to trade on a specified date at a previously agreed price

*Contingent claims:* Trade may or may not occur depending on market conditions

Forward Commitments	Contingent Claims
Forward contract	Options
Futures contracts	Credit derivatives
Swaps	

### DERIVATIVE BENEFITS, RISKS, AND ISSUER AND INVESTOR USES

#### Derivative Benefits and Risks

Benefits:

- Risk allocation, transfer, and management
- Information discovery
- Operational advantages
- Market efficiency

Risks:

- Potential for speculative use
- Lack of transparency
- Basis risk
- Liquidity risk
- Counterparty credit risk
- Destabilization and systemic risk

#### Derivative Benefits and Risks

Issuers use derivatives to perform:

- Cash flow hedge
- Fair value hedge
- Net investment hedge



Investors use derivatives to hedge their risk exposures and take speculative positions

## ARBITRAGE, REPLICATION, AND THE COST OF CARRY IN PRICING DERIVATIVES

### No-Arbitrage Forward Price with

#### Benefits/Income and Costs

Annual compounding:

$$F_0(T) = [S_0 + PV_0(C) - PV_0(I)](1+r)^T$$

Continuous compounding:

$$F_0(T) = S_0 e^{(r+c-i)T}$$

### No-Arbitrage Currency Forward Price

$$F_{0,f/d}(T) = S_{0,f/d} e^{(r_f - r_d)T}$$

## PRICING AND VALUATION OF FORWARD CONTRACTS

### Pricing and Valuation of Forward

#### Commitments

Valuation at initiation:

$$F_0(T) = S_0(1+r)^T$$

Valuation at maturity:

- Long party:

$$V_T(T) = S_T - F_0(T)$$

- Short party:

$$V_T(T) = -[S_T - F_0(T)]$$

Valuation during the life of the contract:

$$V_t(T) = S_t - F_0(T)(1+r)^{-(T-t)}$$

### Pricing and Valuation of Currency Forward Contracts

Valuation at initiation:

$$F_{0,f/d}(T) = S_{0,f/d} e^{(r_f - r_d)T}$$

Valuation during the life of the contract:

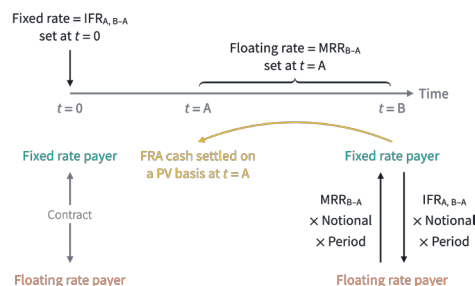
$$V_t(T) = S_{t,f/d} - F_{0,f/d}(T) e^{-(r_f - r_d)(T-t)}$$

### Pricing and Valuation of Interest Rate Forward Contracts

Implied forward rate:

$$IFR_{A,B-A} = \left[ \frac{(1+z_B)^B}{(1+z_A)^A} \right]^{1/(B-A)} - 1$$

Forward rate agreements:



Net payment received by the FRA buyer:

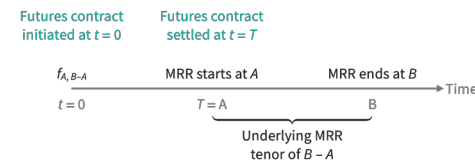
$$(MRR - \text{Fixed IFR}) \times \text{Notional principal} \times \text{Period}$$

## PRICING AND VALUATION OF FUTURE CONTRACTS

### Pricing of Futures and Forward Contracts

Price of interest rate futures contract:

$$f_{A,B-A} = 100 - (100 \times MRR_{A,B-A})$$



Type	Gains from Rising MRR	Gains from Falling MRR
Interest rate futures	Short futures contract	Long futures contract
Forward rate agreement	Long FRA: Fixed-rate payer	Short FRA: Floating-rate payer

Futures Contract Value

$$= \text{Notional Principal} \times \left[ 1 + \left( \frac{MRR}{M} \right) \right]$$

Futures Contract BPV

$$= \text{Notional Principal} \times 0.0001 \times \text{Period}$$

### Forward Price vs. Futures Price

The relationship between forward prices and futures prices depends on the correlation between futures prices and interest rates:

Correlation	Relationship
None	Futures price = Forward price
Positive	Futures price > Forward price
Negative	Futures price < Forward price

## PRICING AND VALUATION OF INTEREST RATES AND OTHER SWAPS

### Swap Values and Prices

Periodic settlements:

Periodic Settlement Value

$$= \text{Notional Principal} \times 0.0001 \times \text{Period}$$

## PRICING AND VALUATION OF OPTIONS

### Option Moneyness

Option Moneyness	Call	Put
In-the-money	$S_t > X$	$S_t < X$
At-the-money	$S_t = X$	$S_t = X$
Out-of-the-money	$S_t < X$	$S_t > X$

### Option Values

$$C_T = \max[0, S_T - X]$$

$$P_T = \max[0, X - S_T]$$

$$C_t = \max[0, S_t - X/(1+r)^{T-t}] + \text{Time value}$$

$$P_t = \max[0, X/(1+r)^{T-t} - S_t] + \text{Time value}$$

### Arbitrage and Replication for Options

Call option:

$$\text{Lower bound } (C_t) = \max[0, S_t - X/(1+r)^{T-t}]$$

$$\text{Upper bound } (C_t) = S_t$$

Put option:

$$\text{Lower bound } (P_t) = \max[0, X/(1+r)^{T-t} - S_t]$$

$$\text{Upper bound } (C_t) = X$$

## Factors Impacting Option Values

Increase in	Call	Put
Value of underlying	↑	↓
Exercise price	↓	↑
Time to expiration	↑	↑*
Risk-free rate	↑	↓
Volatility of underlying	↑	↑
Payments on underlying	↓	↑
Cost of carry	↑	↓

\*Except for some deep-in-the-money put options

## OPTION REPLICATION USING PUT-CALL PARITY

### Put-Call Parity

$$C_0 + X/(1+r)^T = S_0 + P_0$$

Fiduciary call = Protective put

### Put-Call-Forward Parity

$$C_0 + X/(1+r)^T = F_0(T)/(1+r)^T + P_0$$

Fiduciary call = Protective put w. forward contract

### Put-Call Parity Applications: Firm Value

$$V_0 + P_0 = C_0 + PV(D)$$

## VALUING A DERIVATIVE USING A ONE-PERIOD BINOMIAL MODEL

### Binomial Valuation

Hedging portfolio:

$$V_0 = hS_0 - C_0$$

Hedge ratio:

$$h = \frac{C_1^u - C_1^d}{S_1^u - S_1^d}$$

### Risk Neutrality

Risk-neutral probabilities:

$$\pi = \frac{1+r-d}{u-d}$$

Risk-neutral probability-weighted call price:

$$C_0 = \frac{\pi C_1^u + (1-\pi)C_1^d}{1+r}$$

## ALTERNATIVE INVESTMENTS

### CATEGORIES, CHARACTERISTICS, AND COMPENSATION STRUCTURES OF ALTERNATIVE INVESTMENTS

#### Qualities of Alternatives vs. Traditional Assets

- Narrow manager specialization
- Low correlation with traditional investments
- Less regulation and lower transparency
- Limited historical risk and return data
- Unique legal and tax considerations
- High fees
- High use of leverage
- Restrictions on redemptions

#### Investment Methods

- *Fund Investing*: Indirect investing
- *Co-Investing*: Hybrid between direct investing and indirect investing
- *Direct investing*: Without the use of intermediary



## Compensation Structures

- **Soft hurdle rate:** Incentive fee applies to entire return if hurdle rate is cleared
- **Hard hurdle rate:** Incentive fee is only paid on return in excess of hurdle rate

## Common Clauses and Provisions

- **Catch-up clause:** Allows the GP to receive 100% of the return in excess of the hurdle rate until the GP catches up with their cumulative performance fee
- **High-water mark clause:** Reflects the highest value used to calculate an incentive fee
- **Waterfall:** Distribution method that defines the order of allocations to the LPs and GPs
- **Clawback provision:** Allows the LPs to get back incentive fees that have been paid if gains are subsequently reversed

## PERFORMANCE CALCULATION AND APPRAISAL OF ALTERNATIVE INVESTMENTS

### Common Approaches and Application Challenges

$$\text{Sharpe ratio} = \frac{r_p - r_f}{\sigma_p}$$

- Easy to calculate
- Fails to capture tail-risk and treat volatility equally

$$\text{Sortino ratio} = \frac{r_p - r_f}{\sigma_d}$$

- Does not penalize upside volatility
- More difficult to calculate than Sharpe ratio, but is more appropriate with non-normal returns

$$\text{MAR ratio} = \frac{\text{Average compounded annual return (since inception)}}{\text{Max. drawdown (since inception)}}$$

$$\text{Calmar ratio} = \frac{\text{Average compounded annual return (period)}}{\text{Max. drawdown (period)}}$$

- Appropriate for assets with long left-tail distributions

### Performance Evaluation: Private Equity and Real Estate

- Internal rate of return (IRR)
- Multiple of invested capital (MOIC)  
$$= \frac{\text{Realized value of investment} + \text{Unrealized value of investment}}{\text{Total amount of investment}}$$

- Quartile ranking
- Cap rate

### Performance Evaluation: Hedge Funds

- Leverage
- Illiquidity and asset valuations
- Potential redemption pressures (notice periods, lockup periods, liquidity gates)

## PRIVATE CAPITAL, REAL ESTATE, INFRASTRUCTURE, NATURAL RESOURCES, AND HEDGE FUNDS

### Private Equity: Leveraged Buyouts

- **Management buyouts:** Current management team is involved in the acquisition
- **Management buy-ins:** Current management team is being replaced by the acquiring team

### Private Equity: Venture capital

- **Formative-stage financing:** Angel investing, seed-stage financing, early-stage financing
- **Later-stage financing:** After commercial production and sales have begun but before IPO
- **Mezzanine-stage financing:** Prepare to go public
- **Exit strategies:** Trade sale (best price), IPO, recapitalization, secondary sale, liquidation

### Private Debt

- **Direct lending:** Direct capital in the form of senior and secured loans
- **Mezzanine debt:** Debt subordinated to senior secured debt but senior to equity
- **Venture debt:** To complement existing equity financing of start-up or early-stage companies
- **Distressed debt:** Funding provided to mature companies facing financial distress

### Forms of Real Estate Investing

	Debt	Equity
Private	Mortgages, Construction lending	Direct ownership, Real estate funds, Private REITs
Public	MBS, CMOs, Mortgage REITs	Shares in RE corps., REITs

### Infrastructure Investments

- New (greenfield) or existing (brownfield) assets
- Economic (roads) or social (healthcare facilities)
- Direct ownership or indirect (via LP or ETF)
- Private vehicles or public securities (uncommon)

### Commodities

*Futures price:*

$$S_0(1 + r) + \text{Storage costs} - \text{Convenience yield}$$

	Contango	Backwardation
Price curve slope	Upward	Downward
Convenience yield	Low	High

### Timberland and Farmland

Sources of return:

- Biological growth
- Prices of timber/crops
- Land price changes

### Hedge Fund Strategies

- **Equity hedge:** Long and short positions in equity and equity derivative securities; Bottom-up
- **Event-driven:** Seek to profit from short-term events (e.g., Mergers); Bottom-up
- **Relative value:** Seek to profit from pricing discrepancies between related securities
- **Macro:** Emphasize top-down approach to identifying global economic trends

## PORTFOLIO MANAGEMENT

### PORTFOLIO MANAGEMENT: AN OVERVIEW

#### Portfolio Management Process

*Planning:* List objectives and constraints in IPS

*Execution:* Asset allocation, security analysis, portfolio construction

*Feedback:* Monitoring and rebalancing, performance measurement and reporting

#### Institutional Investor Clients

- **DB pension plans:** Younger beneficiaries increase time horizon and risk tolerance
- **Endowments/Foundations:** Generally longer time horizon, low liquidity needs, high risk tolerance
- **Banks:** Short time horizon, high liquidity need, very low risk tolerance
- **Insurers:** Short time horizon (longer for Life than P&C), high liquidity needs, low risk tolerance
- **Investment companies:** Time horizon and risk tolerance vary by mandate, liquidity needs are usually high due to potential redemptions
- **Sovereign Wealth Funds:** Vary by mandate

#### Robo-Advisors

- Cater to underserved segments, "mass affluent"
- Lower fees compared to traditional managers
- Relatively low barriers to entry

#### Mutual Funds

- **Open-end:** Accept new investors after launch
- **Closed-end:** No new shares created after launch, may trade at a premium/discount to NAV
- **No-Load:** No investing/redemption fees, funds charge a percentage of NAV

#### Exchange Traded Funds (ETFs)

- Mutual funds only trade at the end of each day, ETFs can be traded at any time during the day
- Investors can sell ETFs short or buy on margin
- ETFs do not trade at discount/premium to NAV
- ETFs distribute dividends to investors, mutual funds reinvest dividends
- ETFs have lower minimum investment levels

### PORTFOLIO RISK AND RETURN: PART I

#### Money-Weighted Return (MWR)

- IRR derived from all cash inflows and returns
- Can be skewed by timing/value of cash flows
- Appropriate if manager controls timing of CFs

#### Time-Weighted Return (TWR)

- Geometric mean of sub-period returns
- Compound growth for an initial \$1 investment
- Unaffected by timing/value of cash flows



## Risk Aversion

Combination of ability and willingness to take risk

*Risk averse*: Requires a premium to take more risk

*Risk neutral*: Only concerned with expected return, indifferent to level of risk

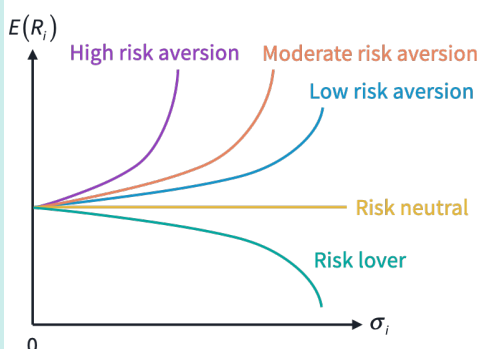
*Risk seeking*: Will pay a premium to take more risk

## Utility Function

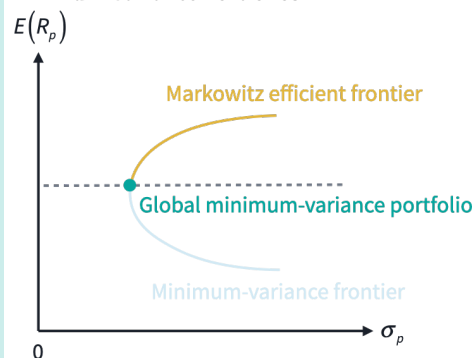
$$U = E(r) - \frac{1}{2}A\sigma^2$$

A is the degree of risk aversion, it is >0 for risk-averse, 0 for risk-neutral, and <0 for risk-seeking

## Indifference Curves



## Minimum-Variance Portfolios

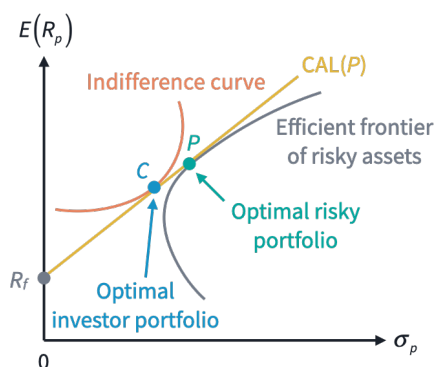


## Capital Allocation Line (CAL)

Line representing possible combinations of risk-free assets and optimal risky asset portfolio

$$E[R_p] = R_f + \left( \frac{E[R_i] - R_f}{\sigma_i} \right) \sigma_p$$

## Investor's Optimal Portfolio



## PORTFOLIO RISK AND RETURN: PART II

### Capital Market Line (CML)

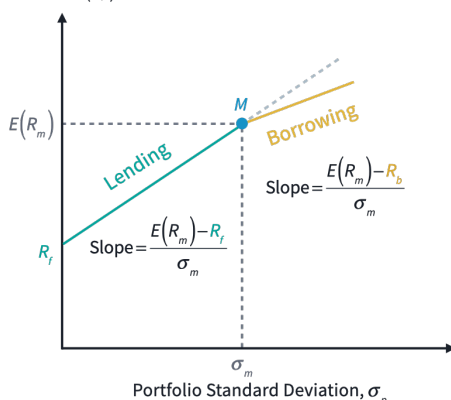
CAL with risky portfolio being market portfolio

$$E[R_p] = R_f + \left( \frac{E[R_m] - R_f}{\sigma_m} \right) \sigma_p$$

### Borrowing vs. Lending

Expected Portfolio

Return,  $E(R_p)$



### Beta

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\sigma_m^2} = \frac{\rho_{i,m} \sigma_i}{\sigma_m}$$

Systematic risk = Non-diversifiable (market) risk

Nonsystematic risk = Diversifiable risk

Total risk = Systematic risk + Nonsystematic risk

### Capital Asset Pricing Model (CAPM)

Assumptions:

- Investors are risk-averse, utility-maximizing, rational individuals
- Markets are frictionless
- All investors plan for same single holding period
- Investors have homogeneous expectations
- Investments are infinitely divisible
- Investors are price takers

$$E[R_p] = R_f + \beta_i [E[R_m] - R_f]$$

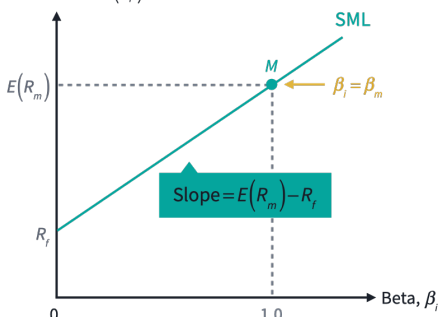
Limitations:

- Single-factor: Only accounts for systematic risk
- Single-period: Does not consider multiple periods
- Inclusion of assets that are not investable, such as human capital and assets in closed economies

### Security Market Line (SML)

Graphical representation of CAPM:

Expected Return,  $E(R_p)$



## Identifying Mispriced Stocks

Stocks that plot above the SML are underpriced; stocks that plot below the SML are overpriced

### Ratios

Total risk	Sharpe ratio	$\frac{R_p - R_f}{\sigma_p}$
	M-squared	$(R_p - R_f) \frac{\sigma_m}{\sigma_p} + R_f$
Systematic risk	Treynor ratio	$\frac{R_p - R_f}{\beta_p}$
	Jensen's alpha	$R_p - [R_f + \beta_p (R_m - R_f)]$

## BASICS OF PORTFOLIO PLANNING AND CONSTRUCTION

### Investment Policy Statements (IPS)

*Investment objectives*: Risk/return objectives

*Constraints*: Liquidity, time horizon, tax concerns, legal and regulatory factors, unique circumstances

### Asset Allocation

*Strategic asset allocation*: Set of exposures to IPS-permissible asset classes in weights that are consistent with the client's long-term objectives

*Tactical asset allocation*: Deliberate deviations from policy weights based on forecasts of asset class returns over the near term

## THE BEHAVIORAL BIASES OF INDIVIDUALS

### Cognitive Errors

- *Conservatism bias*: People fail to incorporate new information that conflicts with their opinions
- *Confirmation bias*: People seek "evidence" that confirms their prior beliefs
- *Representativeness bias*: People inappropriately classify new information based on past similar situations
- *Illusion of control bias*: People overestimate their ability to control or predict events
- *Hindsight bias*: People believe past events would have been predictable
- *Anchoring and adjustment bias*: People rely too much on initial information in their estimation
- *Mental accounting bias*: People put money in separate mental buckets
- *Framing bias*: People answer the same question differently based on how it is framed
- *Availability bias*: People assume outcomes that are easier to remember are more likely

## Emotional Biases

- *Loss-aversion bias*: People strongly prefer avoiding losses more than achieving gains
- *Overconfidence bias*: People overestimate their own abilities
- *Self-control bias*: People lack self-discipline to make decisions based on their long-term goals
- *Status quo bias*: People are more inclined to do nothing rather than make changes
- *Endowment bias*: People value an asset more when they hold the rights to it
- *Regret-aversion bias*: People avoid making decisions that could potentially turn out badly

## Market Anomalies

Factors that cause anomalies misclassifications:

- Inappropriate asset pricing model
- Statistical issues due to small samples
- Temporary disequilibria

## AN INTRODUCTION TO RISK MANAGEMENT

### Risk Management

*Risk management framework:*

- Risk governance
- Risk identification and measurement
- Risk infrastructure
- Defined policies and processes
- Risk monitoring, mitigation, and management
- Communications
- Strategic analysis or integration

*Risk tolerance*: Which risks are acceptable and how much risk should be taken

*Risk budgeting*: How the risks should be taken

*Financial risks*: Arise from financial market activities (e.g., market, credit, liquidity risk)

*Non-financial risks*: Arise from within entity or from external (e.g., operational, legal, regulatory, political, model, tail risk)

*Risk measures*: Standard deviation, beta, duration, delta, gamma, VaR, CVaR, etc.

*Risk modification*: By prevention and avoidance, transfer (insurance), or shifting (derivatives)

## TECHNICAL ANALYSIS

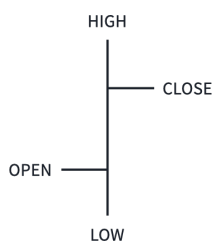
### Technical Analysis: Principles

- The market discounts everything
- Prices move in trends and countertrends
- Price action is repetitive with reoccurring patterns

### Technical Analysis: Charts

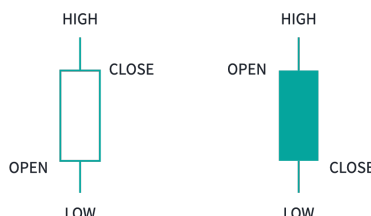
*Line chart*: A plot of price data, typically closing prices, with a line connecting the points

### Bar chart



### Candlestick chart

White body: close > open; Dark body: close < open



### Trends

*Uptrend*: Price reaches higher highs/lows

*Downtrend*: Price reaches lower highs/lows

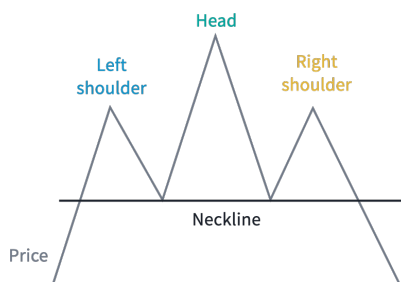
*Support*: Buying is sufficient to stop further decline

*Resistance*: Selling pressure stops further increase

### Reversal Patterns

*Head and shoulders (H&S)*: Indicate an upcoming downtrend following a preceding uptrend

*Inverse H&S*: Indicate an upcoming uptrend following a preceding downtrend



Price target = Neckline – (Head – Neckline)

*Double tops*: When an uptrend reverses twice at about the same high

Price target = Valley – (Top – Valley)

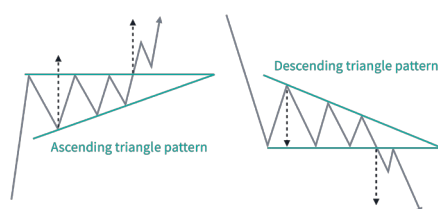
*Double bottoms*: When a downtrend reverses twice at about the same low

Price target = Top + (Top – Valley)

*Triple Tops/Bottoms*: More significant indicators than double tops/bottoms

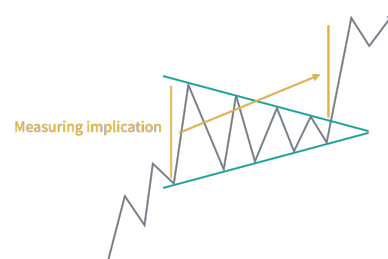
### Continuation Patterns

*Triangles (Ascending and Descending)*

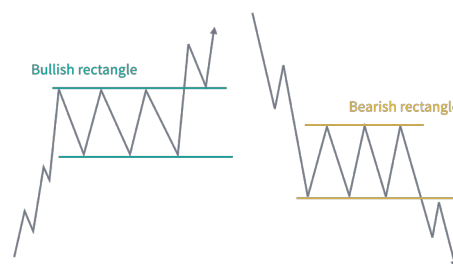


### Triangle (Symmetrical)

Narrowing = bullish; Widening = bearish



### Rectangles (Bullish and Bearish)



*Flag*: Parallel trend lines over short period

*Pennant*: Converging trend lines over short period

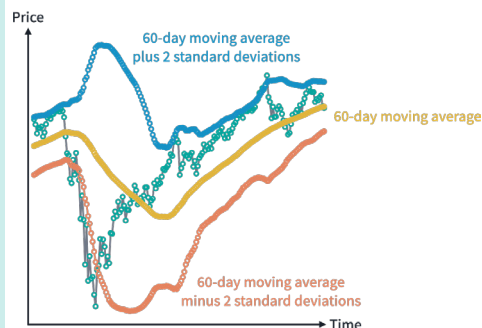
### Price-Based Indicators

*Moving average (MA)*: Average closing price over a specified number of periods (e.g., 7-day, 60-day)

*Golden cross*: Short-term MA crosses long-term MA from below; bullish indicator

*Dead cross*: Short-term MA crosses long-term MA from above; bearish indicator

*Bollinger bands*: Lines representing MA +/- X standard deviations; Bullish if MA reaches lower bound, bearish if MA reaches upper bound



## Momentum Oscillators

*Rate of Change (ROC) Oscillator:*

$$M = (V - V_x) \times 100$$

V = last closing price

V<sub>x</sub> = closing price x days ago, typically 10

ROC oscillator crossing 0 in the same direction as the trend direction is buy/sell signal

*Relative Strength Index:*

$$RSI = 100 - \frac{100}{1 + RS}, \quad RS = \frac{\Sigma(\text{Up changes})}{\Sigma(|\text{Down changes}|)}$$

*Stochastic Oscillator:*

$$\%K = 100 \left( \frac{\text{Last closing price} - \text{Low in past 14}}{\text{High in past 14} - \text{Low in past 14}} \right)$$

%D = average of last 3 daily %K values

*MA convergence/divergence (MACD) oscillator:*

Consists of MACD line and signal line: MACD line is the difference between two exponentially smoothed moving averages (12 and 26 days); Signal line is the exponentially smoothed average of MACD line (9 days)

## Sentiment Indicators

*Put/call ratio:* Volume of put options traded divided by volume of call options traded

*CBOE Volatility Index (VIX):* Measures near-term market volatility calculated by the CBOE

## Intermarket Analysis

The combined analysis of major categories of securities (equities, bonds, etc.) to identify patterns and inflection points

- *Top-down approach:* Focus on global equity markets, then narrow down to specific companies
- *Bottom-up approach:* Select stocks based on a set of predefined criteria regardless of economy and sector

## FINTECH IN INVESTMENT MANAGEMENT

### Machine Learning

*Supervised learning:* Algorithm finds relationships among labeled training data

*Unsupervised learning:* Algorithm works with unlabeled data to create clusters/groupings

### Data Processing Methods

*Data capture:* Collecting data, transforming into usable format

*Data curation:* Cleaning data to ensure high quality

*Data storage:* Recording, archiving, accessing data

*Search:* Finding specific information in datasets

*Transfer:* Moving data from source or storage location to the analytical tool

### Uses of Fintech in Investment Management

Text Analytics: Analysis of unstructured data  
Natural Language Processing: Interpreting human language (e.g., speech recognition)

### Distributed Ledger Technology (DTL)

Ownership of assets is created and exchanged on a peer-to-peer network

*Smart contracts:* Programmed to execute if specified conditions are met

*Blockchain:* Digital ledger for blocks of linked transactions validated through user consensus

*Permissionless networks:* No centralized authority needed to validate transactions

*Permissioned networks:* Members are restricted from participating in certain activities

### Uses of DTL in Investment Management

*Cryptocurrencies:* Allow transactions without intermediaries, such as banks

*Tokenization:* Represents ownership of physical assets on a blockchain or distributed ledger

*Clearing/Settlement:* DTL allows near real-time trade verification and reconciliation

*Compliance:* Allows regulators to conduct near real-time review of all transactions

## ETHICAL AND PROFESSIONAL STANDARDS

### I(A) Knowledge of the Law

Obey strictest applicable law. Disassociate immediately from any illegal or unethical activity.

### I(B) Independence and Objectivity

Do not offer or accept gifts that might impair independence and objectivity. Gifts from clients may be permissible.

### I(C) Misrepresentation

Cite sources. Do not plagiarize or omit important information. Act quickly to correct any errors.

### I(D) Misconduct

Does not apply to personal behavior unless it reflects poorly on the investment profession.

### II(A) Material Nonpublic Information

Do not act or cause others to act on material nonpublic information. Seek public dissemination.

### II(B) Market Manipulation

Do not take any actions that distort prices or trading volume. Market making and legitimate trading strategies are allowed.

### III(A) Loyalty, Prudence, and Care

Place clients' interest above yours. Disclose policies on proxy voting and soft commissions.

### III(B) Fair Dealing

Treat all clients fairly. Treat non-immediate family like other clients. Communicate investment recommendations and changes simultaneously.

### III(C) Suitability

Use a regularly updated IPS during investment decisions. Evaluate decisions in a portfolio context.

### III(D) Performance Presentation

Performance data should be fair, accurate, and complete. Do not promise returns for risky assets.

### III(E) Preservation of Confidentiality

Keep all client information confidential unless: client is involved in illegal activity, you are legally required, or you have the client's permission.

### IV(A) Loyalty

Get permission before taking outside work (even unpaid) that competes with employer. Abide by non-compete agreement (if applicable) and do not take employer's property.

### IV(B) Additional Compensation Arrangements

Obtain written permission from all parties before receiving any compensation for outside work.

### IV(C) Responsibilities of Supervisors

Supervisors must adequately train and monitor subordinates. Responsibilities may be delegated.

### V(A) Diligence and Reasonable Basis

Exercise diligence and thoroughness. Support actions with research and investigation.

### V(B) Communication with Clients and Prospective Clients

Make appropriate disclosures. Distinguish between fact and opinion in analysis and recommendations.

### V(C) Record Retention

Maintain records to support recommendations and decisions. 7-year retention period recommended.

### VI(A) Disclosure of Conflicts

Disclose any matters that may impair independence and objectivity, prominently and in plain language.

### VI(B) Priority of Transactions

Execute clients' transactions before accounts in which you have a beneficial interest.

### VI(C) Referral Fees

Disclose referral fees to clients and employer, including non-monetary arrangements.

### VII(A) Conduct as Participants in CFA Institute Program

Do not share confidential exam details. Expressing opinions about CFAI policies is permissible.

### VII(B) Reference to CFA Institute, the CFA Designation, and the CFA Program

Do not misrepresent the meaning of CFA Institute membership, designation, or candidacy.

## BA II PLUS CALCULATOR TIPS

### Basic Operations

**2ND**: Access secondary functions (in yellow)

**ENTER**: Send value to a variable

**2ND** + **ENTER**: Toggle between options

**↑** **↓**: Navigate between variables/options

**STO** + **0 - 9**: Store current value into memory

**RCL** + **0 - 9**: Recall value from memory

### Time Value of Money (TVM)

*For annuity, loan, and bond calculations*

**N**: Number of periods

**I/Y**: Effective interest rate per period (in %)

**PV**: Present value

**PMT**: Payment/coupon amount

**FV**: Future value/redemption value

**CPT** + **one of the above**: Solve for unknown

**2ND** + **BGN**: Toggle between ordinary annuity and annuity due

**2ND** + **CLR TVM**: Clear TVM worksheet

*Note:*

- Always clear the TVM worksheet before starting a new calculation
- For bonds, PMT and FV should have the same sign, and opposite signs to PV

### Cash Flow Worksheet ( **CF**, **NPV**, **IRR** )

*For non-level payments*

Input ( **CF** )

CF0: Initial cash flow

C01: 1<sup>st</sup> distinct cash flow after initial cash flow

F01: Frequency of C01

C0n: n<sup>th</sup> distinct cash flow

F0n: Frequency of C0n

*Note:*

- Always clear the CF worksheet before starting a new calculation
- The use of F0n is optional. You can leave them as 1 and input repeating cash flows multiple times. If you do so, C01 will be the cash flow at time 1, C02 will be the cash flow at time 2, and so on.

Output ( **NPV**, **IRR** )

I: Effective interest rate per period (in %)

**NPV** + **CPT**: Solve for net present value

**IRR** + **CPT**: Solve for internal rate of return