

L2 PRIMER

A REVIEW OF L1 ESSENTIALS

Level 2 CFA

Standards of Professional Conduct

There are seven Standards, within which there are a total 22 sub-standards

Standard 1: Professionalism

STANDARD SUMMARY	GUIDANCE	RECOMMENDED PROCEDURES
1A: Knowledge of the law: Member must comply with all laws, comply with the stricter law, and dissociate from any violation	- Follow all laws - Follow stricter of local law and CFAI Standards - If member suspects illegal activity he must: ✓ Disassociate from activity ✓ Report to Supervisor - May confront wrongdoer	- Keep informed, maintain files - Seek legal advice when in doubt Encourage firms to adopt code of ethics - Distribute information internally on applicable laws - Have written procedures for reporting suspected violations
1B: Independence and Objectivity - Use reasonable care, judgment to achieve, maintain independence in professional activities - Do not offer, solicit, accept any compensation that could compromise independence, objectivity	Modest gifts okay - Distinguish between gifts from clients and gifts from entities trying to influence - May accept gift from clients – must disclose to employer – must get permission if gift is for future performance - Investment banking relationships – do not bow to pressure - Firewalls between IB and research - For issuer paid research, flat fee preferred	- Create a restricted list; only factual info on companies Restrict special cost arrangements Limit gifts- token items OK Restrict staff investments in IPO + private placements
1C: Misrepresentation Do not make misrepresentations relating to investment analysis, recommendations, actions, or other professional activities	- Do not misrepresent qualifications, services of self or firm, performance record, or characteristics of an investment - Do not guarantee a certain return - No plagiarism (copying without giving credit)	- Firms should provide written list of services and a description of the firm's qualifications - Maintain records of materials used to prepare research reports, and quote source, except for "recognized financial and statistical reporting services"

1D Misconduct: Do not engage in any professional conduct involving dishonesty, fraud, deceit, or commit any act that reflects adversely on professional reputation, integrity, or competence	- Covers conduct that may not be illegal, but could adversely affect a member's ability to perform duties - Do not abuse the CFAI's PCP to settle personal or political disputes	- Adopt code of ethics to which every employee must adhere to - Disseminate list of potential violations and associated disciplinary sanctions - Background checks on potential employees
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Standard 2: Integrity of capital markets

STANDARD	GUIDANCE	RECOMMENDED PROCEDURES
2A Material non-public information: Members in possession of nonpublic information that could affect an investment's value must not act or cause someone else to act on the information	- Material – if investors would want the information before making an investment decision - If price effect ambiguous, information not material - If out of date or source is unreliable, not material "Nonpublic"- Information is public if made available to investors in general/the market (not just given to analysts) Mosaic Theory – No violation when an analyst reaches an investment conclusion through analysis of public information, together with non-material nonpublic information	- Firewall to control interdepartmental communications - Review employee trades - Increase review of or restrict proprietary trading while firm is in possession of material nonpublic information
2B Market Manipulation: Do not engage in practices that distort prices or artificially inflate trading volume with intent to mislead market participants	- Do not give false impression of activity/price movement - Do not distribute false, misleading information	

Standard 3: Duties to Clients

STANDARD	GUIDANCE	RECOMMENDED PROCEDURES
3A Loyalty, Prudence and Care: - Duty of loyalty to clients – act with reasonable care and exercise prudent judgment - Act for benefit of clients and place their interests before employer's or own interests - Comply with any applicable fiduciary duty	- Manage client assets according to IPS - Make investment decisions in context of total portfolio - Vote proxies responsibly. - Disclose proxy voting policies to clients "Soft dollars" must benefit the client	- Set the investment objectives of client - Diversify - Disclose conflicts - Vote proxies in best interest of clients and ultimate beneficiaries - Submit at least quarterly statements of account to client - Maintain confidentiality - Seek best execution - Always place client interest first
3B: Fair dealing Deal fairly, objectively with all clients when providing investment analysis, making investment recommendations, taking investment action or engaging in other professional activities	- No discrimination against any clients - Fair" does not mean "equal" - Different levels of service okay if disclosed, and does not disadvantage any clients - If client is unaware of recommendation change, advise before accepting trade order - Treat clients fairly considering IPS & circumstances - Disclose allocation procedures "Hot issues" for clients only	- Limit number of people aware of upcoming changes - Shorten time frame – decision to dissemination - Simultaneous dissemination - Maintain list of clients and holdings - Disclose trade allocation procedures - Client account review
3C: Suitability When in advisory relationship with a client: - Enquire into client's investment experience, objectives, constraints AND ensure investment is suitable as per these before making any recommendation/ taking investment action - Update information regularly - Look at suitability in a portfolio context When managing a portfolio to a mandate/strategy/style, only	- Only for advisory relationships - Prepare an IPS at the beginning of relationship - In cases of unsolicited trade requests that a member knows is unsuitable for the client, the member should refrain from making the trade or seek an affirmative statement from the client that suitability is not a consideration. - If clients withhold information about their	Consider: - Objectives (risk and return) - Constraints (Time horizon, liquidity, tax, legal and unique circumstances) - Investor's circumstances periodically to review both the above - Performance benchmarks

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make recommendations/ take investment actions that are consistent with portfolio objectives and constraints	portfolio, the suitability analysis must be done on the information provided • No responsibility in case of managing pooled assets to enquire into suitability for individual investors	
3D Performance Presentation: When communicating investment performance, ensure that it is fair, accurate, and complete	• Do not misstate performance or mislead clients • Do not misrepresent past performance • Provide fair and complete information • Do not state or imply ability to achieve returns similar to those achieved in the past	• Consider audience sophistication • Use performance of the weighted composite of similar portfolios • Include terminated accounts as part of historical performance
3E Preservation of Confidentiality: Keep past, current and prospective client information confidential, unless: • Illegal activities are suspected • Disclosure is required by law • Client or prospect allows disclosure of the information	• Can provide information to CFAI for PCP enquiry into member's conduct • If the law insists on confidentiality then should not disclose	• Avoid discussing any information received from a client except with colleagues working on the same project

Standard 4: Duties to Employers

STANDARD	GUIDANCE	RECOMMENDED PROCEDURES
4A Loyalty: Act for benefit of employer and do not deprive employer of the advantage of skills/abilities, divulge confidential information, or otherwise cause harm to employer	Independent practice • Competition with employer • Notify employer of services, duration, and compensation • Do not proceed without consent from employer Leaving an employer • Don't solicit employer's clients before leaving • Do not take records or files without permission • Simple knowledge of names of clients is okay Whistleblowing: • Only if it protects client or integrity of capital markets • Have to comply even if an independent contractor	
4B: Additional compensation arrangements Do not accept gifts, benefits, compensation, consideration that competes with, or creates a conflict of interest with employer's interest unless written consent is obtained from all parties involved	• Covers direct compensation by the client and other benefits received from third parties • For written consent email is acceptable	• Make written report to employer specifying details of additional compensation • Include nature of compensation, amount, and duration of agreement

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4C Responsibilities of Supervisors: Detect and prevent violations of applicable laws, rules, regulations, and Code and Standards by anyone subject to your supervision or authority	• Take steps to prevent employees from violating laws, rules, regulations, or the Code and Standards • Detect violations Once violation has occurred: ✓ Respond promptly ✓ Conduct an investigation ✓ Place limitations on the wrongdoer till investigation is complete • If the member cannot discharge supervisory responsibilities because of absence/inadequacy of a compliance system, the member should decline in writing to accept supervisory responsibility until the firm adopts procedures to allow them to exercise such responsibility	• Compliance procedures should be clear and understandable • Designate a compliance officer • List permitted conduct • Have procedures for reporting violations • Separate code of ethics from compliance procedures <u>Supervisor and compliance officer should:</u> • Distribute procedures, • Continually educate staff • Review employee actions
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Standard 5: Investment Analysis, Recommendations, and Actions

STANDARD	GUIDANCE	RECOMMENDED PROCEDURES
5A Diligence and Reasonable Basis: • Exercise diligence, independence, thoroughness in analyzing investments etc. • Have a reasonable and adequate basis, supported by research, for analysis, recommendation, or action	<u>Using third-party research:</u> • Review assumptions, rigor, timeliness, and independence <u>Group research and decision making:</u> • If there is reasonable basis for opinion, member does not have to disassociate but should document the difference of opinion	• Review/approve research reports and recommendations prior to external circulation • Develop measurable criteria for assessing the quality of the research

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5B Communication with clients and prospective clients Disclose: - Principles/processes used to select securities and construct portfolios - Material changes to these processes - Factors important (to analyses, recommendations, or actions) to clients Distinguish between fact and opinion	- Include basic characteristics of the security - Suitability of investment – portfolio context - All communication covered, not just reports - Brief communications must be supported by background data that can be made available to interested parties on request	Maintain records showing nature of research
5C Record Retention: Maintain records to support investment analyses, recommendations, actions, and other investment-related communications with clients and prospective clients	- Records are firm's property and cannot be taken without firm's consent - Hard copy or electronic form - If no regulatory requirement, CFA Institute recommends retention period of 7 years	Responsibility to maintain records generally falls with the firm

Standard 6: Conflicts of interest

STANDARD	GUIDANCE	RECOMMENDED PROCEDURES
6A Disclosure of conflicts: Make full, fair disclosure of all matters that could be expected to impair independence/objectivity, or interfere with duties to clients, prospects, or employer	Best practice: avoid conflicts <u>When not avoidable, disclose to clients, prospective clients, employer (as applicable):</u> - Ownership of stock - Board service - Broker/dealer/market making activities - Investment banking relationships	- Disclose compensation arrangements with employer that conflict with clients' interests - If firm does not permit disclosure, consider dissociating from the activity - Firms are encouraged to include compensation information in promotional materials - Disclose details of options given as compensation for CF activities

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6B Priority of Transactions: Investment transactions for clients and employers must have priority over investment transactions in which a Member is the beneficial owner	• “Beneficial owner” – Member has direct/indirect personal interest in the securities • Client, employer transactions take priority over personal transactions • Family member accounts that are client accounts must be treated at par with other client accounts	• Limit participation in equity IPOs • Restrict employee investment in private placements • Establish blackout periods – no “front-running” • Employees should report trades, disclose holdings and get prior clearance • Disclose policies on personal investing to clients and prospective clients, upon request
6C Referral Fees Disclose to employer, clients, and prospective clients any benefit received by, or paid to, others for the recommendation of products or services	• Disclosure to be made before entering into any agreement for services • Disclose nature of the consideration • All types of compensation covered (cash/kind)	

Standard 7: Responsibilities as a CFA Institute member or CFA candidate

STANDARD	GUIDANCE	RECOMMENDED PROCEDURES
7A: Conduct as Members and Candidates in CFA Program: Do not engage in any conduct that compromises the reputation or integrity of CFA Institute or CFA designation, or the integrity, validity, or security of the CFA examinations	<u>Conduct includes:</u> • Cheating on the exam • Disregarding exam admin rules • Giving confidential information to candidates or public • Using association with CFAI to further personal or professional objectives • Misrepresenting on PCS or the CFA Institute PCP	Read the exam guidelines carefully

7B Reference to CFA Institute, the CFA Designation, and the CFA Program: When referring to CFA Institute, membership, designation, or candidacy, do not misrepresent or exaggerate the meaning or implications of membership in CFA Institute, holding the CFA designation, or candidacy in the CFA program	• Don't exaggerate individual competence • Don't claim superiority due to passing exams quickly • There is no partial designation • Proper usage of the term "CFA" - It's an adjective, NOT a noun • Sign PCS and pay fees to keep membership live	Make sure that your employer is aware of the proper references to the CFA designation and CFA candidacy
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Time Value of Money

Time Value of Money (TVM) Calculations

FUTURE VALUE OF LUMP SUM	Example: A company offers you the following terms for a contract: For an investment of \$1,500,000, the company promises to pay you a lump sum 4 years from now at a 10% annual interest rate. What future amount can you expect? Solution PV = -\$1,500,000; I/Y = 10%; N = 4; PMT = 0; CPT → FV FV = \$2,196,150
PRESENT VALUE OF LUMP SUM	Example: A bank has issued a financial plan that promises to pay \$50,000 in five years with a 10% return rate. What amount of money must the insurer invest today at 10% for five years to make the promised payment? Solution FV = \$50,000; I/Y = 10%; N = 5; PMT = 0; CPT → PV PV = -\$31,046
PRESENT VALUE OF ORDINARY ANNUITY	Example Suppose you are considering buying a financial asset that promises to pay \$3,000 per year for four years, with the first payment one year from now. The required rate of return is 8% per year. How much should you pay for this asset? Solution PMT = 3,000; N = 4; I/Y = 8; FV = 0; CPT → PV = -\$9,936.38

FUTURE VALUE OF ORDINARY ANNUITY	Example Suppose ABC Co's pension plan allows investing up to \$10,000 per year. An employee plans to invest \$10,000 per year at the end of each year in a stock index fund for the next 20 years. Historically, this fund has earned 11% per year on average. Assuming that he can actually earn 11% per year, how much money will he have available for retirement after making the last payment? Solution PMT = -10,000; N = 20; I/Y = 11; PV = 0; CPT → FV FV = \$642,028.32
PRESENT VALUE OF ANNUITY DUE	Example What is the present value of \$300 to be received at the start of each year for three years when the interest rate is 12%? Solution Put calculator in BGN mode: N = 3; I/Y = 12; PMT = 300; FV = 0; CPT → PV = -\$807.02
PRESENT VALUE OF UNEQUAL CASH FLOWS	Example Suppose you are going to receive \$3,000 one year from now, \$5,000 two years from now, \$7,000 three years from now, \$8,000 four years from now and \$9,000 five years. What is the present value today at an annual interest rate of 7%? Solution 2nd, CF (to enter the cash flow mode) CFo = 0 C01 = 3,000 → ENTER ↓ F01 = 1 → ENTER ↓ C02 = 5,000 → ENTER ↓ F02 = 1 → ENTER ↓ C05 = 9,000 → ENTER ↓ F05 = 1 → ENTER ↓ NPV Type 7 when I is displayed; ENTER; ↓; CPT when NPV appears. \$25,405.05

PERPETUITY	Example The UK government once issued a type of security, which promised to pay a level cash flow indefinitely. If that security paid £300 per year in perpetuity, what would it be worth today if the required rate of return were 7%? Solution $PV = A/r$ $PV = 300/0.07$ $PV = £4,285.71$
NON-ANNUAL COMPOUNDING PERIODS	Example Suppose your bank offers you a Certificate of Deposit (“CD”) with a three-year maturity, a stated annual interest rate of 10% compounded quarterly, and a feature allowing reinvestment of the interest at the same interest rate. You decide to invest \$8,000. What will the CD be worth at maturity? Solution $PV = -\\$8,000$; $I/Y = 10/4 = 2.5$; $N = 3 * 4 = 12$; $PMT = 0$; $CPT \rightarrow FV=10,759$
CONTINUOUS COMPOUNDING	Future Value = Present Value $\times e^{r \times n}$ Example Suppose a \$10,000 investment will earn 8% compounded continuously for two years. What is the future value? Solution $FV = PVe^{rn}$ $FV = 10,000e^{0.08 \times 2}$ $FV = \\$11,735.11$

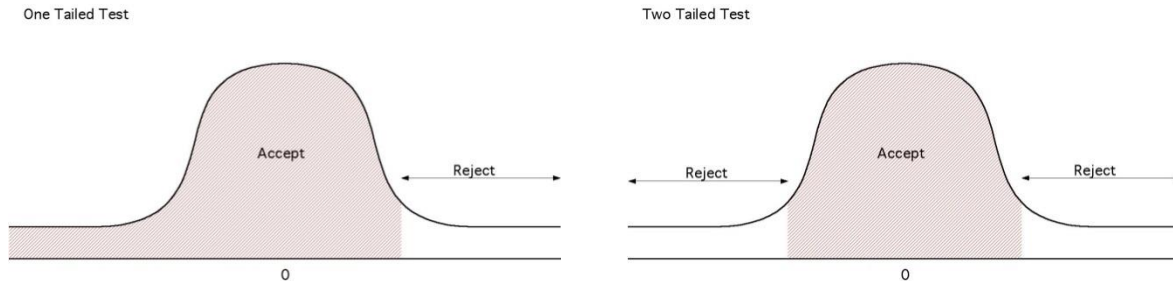
Hypothesis Testing

Seven steps of hypothesis testing

1. State the hypotheses
2. Identify the appropriate test statistic
3. Specify the significance level and get the critical value of the test statistic (e.g $Z_{critical}$)
4. State the decision rule: if calculated value > critical value, reject H_0
5. Collect the data and find out the calculated value of the test statistic (e.g Z_{calc})
6. Compare the critical value with the calculated value and make the statistical decision
7. Make the economic or investment decision

Step # 1: Stating the Hypothesis

- The null hypothesis (H_0) is what the researcher wants to reject.
- The alternative hypothesis (H_a) is what the researcher believes in/hopes for, and we fail to reject this when the null hypothesis is rejected.
- H_a will never have the equal to sign; always “less than”, “more than” or “not equal to”



Step # 2: Identify the test statistic

- There are 4 test statistics available and each is used in a different situation and each has its own unique table values
- **Test of means**
 - One population: use z test or t test
 - Two populations: Use only t test
- **Test of variances**
 - One population: use only Chi square test
 - Two populations: use only F test

Step # 3: State the level of significance and get the critical value

This will be given in the exam question. Use this to find the table (ie critical) value of the test statistic. E.g. a 90%, two tailed z test will have a critical value of 1.65

Step # 4: State the decision rule

- If the calculated value > critical value, we reject the null (and fail to reject the alternative)
- If the calculated value < critical value, we fail to reject the null (and reject the alternative)

Step # 5: Find out the calculated value of the test statistic

- Computed by using a formula
- Different for each type of hypothesis test

Step # 6: Make the statistical decision

Compare the critical and calculated values

Step #7: Statistical vs Economic Result

- A statistically significant result **does not always** translate into an economically meaningful result, due to three reasons:
 - Transaction costs (buying & selling)
 - Taxes
 - Risk

Type of Test	Condition	Test Statistic	Formula
Mean of a population	Population Variance is Known	z - statistic	$z \text{ statistic} = \frac{(x - \mu)}{\frac{\sigma}{\sqrt{n}}}$
Mean of a population	Population Variance is unknown	t – statistic, with (n-1) degrees of freedom	$t \text{ statistic} = \frac{(x - \mu)}{\frac{s}{\sqrt{n}}}$
Means of two different populations	2 samples drawn from each population are independent of each other - The populations are normally distributed	- t – statistic with $(n_1 + n_2 - 2)$ degrees of freedom when variances of two populations are unknown but equal - t – statistic when variances of two populations are unknown and not equal	

Type of Test	Condition	Test Statistic	Formula
Mean Difference of paired observations	If observations on two samples are dependent on some other factors	t statistic using paired comparison test, to test whether the mean of differences between observations for two samples are different $t \text{ statistic} = \frac{d - \mu}{\text{standard error of mean difference}}$	
Variance of a population	When testing variance of a single population	- Chi square with (n-1) degrees of freedom - Distribution is asymmetrical with lower limit of 0, so it does not take on negative values	$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2}$
Variances of two different populations	Used when testing variance of two different independent samples	- F – statistic, $(n_1 - 1), (n_2 - 1)$ degrees of freedom - F statistic is always greater than 1 - F distribution is asymmetrical	$F = \frac{\sigma_1^2}{\sigma_2^2}$ Here, σ_1^2 is always greater than σ_2^2

Type I and Type II Errors

ONE OF FOUR OUTCOMES WHILE TESTING A HYPOTHESIS		
Decision	Ho True	Ho False
Do not reject Ho	Correct Decision	Type II Error
Reject Ho	Type I Error	Correct Decision

- Probability of a Type 1 error is the level of significance for that test (alpha)
- Power of a Test = $1 - P(\text{Type II Error})$
- Probabilities of Type 1 and Type II errors are inversely related

p-value

- p-value is the area under the curve between the calculated value and infinity
- Significance level is actually the area under the curve between the critical value and infinity
- Compare p value to α
 - if p-value $< \alpha$, reject the null (as calc $>$ critical)
 - if p-value $> \alpha$, do not reject the null (as calc $<$ critical)

Currency Exchange Rates

Exchange rate:

- Number of units of currency A (price currency) that could buy 1 unit of another currency (base currency)
- A USD/EUR exchange rate of 1.2875 means that 1.2875 U.S. Dollars will buy 1 Euro where Euro is the base currency and U.S. Dollar price currency

TERM	EXPLANATION
Spot Exchange Rate	Present market exchange rate used for spot transactions where exchange of currency takes place immediately
Cross Rate	• Exchange rate between two currencies implied by their exchange rate with a common third currency • Given USD/EUR and JPY/EUR rate, we can calculate JPY/USD cross rate
Real Exchange Rate	<i>Real Exchange Rate</i> (d/f) = Spot Rate (d/f) $\times$ (1 + Inf foreign / 1 + Inf Domestic)
Forward Exchange Rate	• Used for forward contracts where exchange of currency takes place at a future date • Forward Rate = Spot Rate $\pm$ (Forward Premium/Discount) • Forward premium or discount is expressed in terms of pips
Forward Premium	Forward rate $>$ Spot rate and Pips are positive
Forward Discount	Forward rate $<$ Spot rate and Pips are negative
Forward Exchange	Forward Rate = Spot Rate $\times$ $\frac{(1 + \text{interest rate of price currency})}{(1 + \text{interest rate of base currency})}$ In a USD/EUR quote: USD interest rates will be in the numerator and Euro interest rates will be in the denominator.

Ratios

Techniques of common size analysis

Vertical analysis: divide each item by revenue or sometimes by total assets

Cross Sectional Analysis: Compares a specific metric for one company with the same metric for another

Trend Analysis: Provides important information regarding historical performance and growth

Activity Ratios

Activity ratios measure that how efficiently current and non-current assets have been utilized in generating revenue.

RATIO	NUMERATOR	DENOMINATOR
Inventory turnover	Cost of goods sold	Average inventory
Days of inventory on hand (DOH)	Number of days in period	Inventory turnover
Receivables turnover	Revenue	Average receivables
Days of sales outstanding (DSO)	Number of days in period	Receivables turnover
Payables turnover	Purchases	Average trade payables
Number of days of payables	Number of days in period	Payables turnover
Working capital turnover	Revenue	Average working capital
Fixed asset turnover	Revenue	Average net fixed assets
Total asset turnover	Revenue	Average total assets

Liquidity Ratios

Liquidity ratios measure the liquidity situation of the company i.e. ability of the company to meet its day to day liabilities.

RATIO	NUMERATOR	DENOMINATOR
Current ratio	Current assets	Current liabilities
Quick ratio	Cash + short-term marketable investments + Receivables	Current liabilities
Cash ratio	Cash + Short-term marketable investments	Current liabilities

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Defensive interval ratio	Cash + short-term marketable investments + Receivables	Daily cash expenditures
Cash conversion cycle (net operating cycle)	DOH + DSO – Number of days of payables	

Solvency Ratios

Solvency ratios measure ability of the company to meet its long-term liabilities.

RATIO	NUMERATOR	DENOMINATOR
Debt-to-assets ratio*	Total debt **	Total assets
Debt-to-capital ratio	Total debt **	Total debt b + total shareholders' equity
Debt-to-equity ratio	Total debt **	Total shareholders' equity
Financial leverage ratio	Average total assets	Average total equity
Interest coverage	EBIT	Interest payments
Fixed charge coverage	EBIT + Lease payments	Interest payments + Lease payments
* Total debt ratio is another name sometimes used for this ratio ** total debt is the sum of interest-bearing short-term and long-term debt		

Profitability Ratios

Profitability ratios measures the relative profitability of the company in terms of generating, gross, operating and net profit.

	RATIO	NUMERATOR	DENOMINATOR
Return on sales	Gross profit margin	Gross profit	Revenue
	Operating profit margin	Operating income	Revenue
	Pretax margin	Earnings Before Tax	Revenue
	Net profit margin	Net income	Revenue

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Return on investment	Operating ROA	Operating income	Average total assets
	ROA	Net income	Average total assets
	Return on total capital	EBIT	Short- and long-term debt + equity
	ROE	Net income	Average total equity
	Return on common equity	Net income – Preferred dividends	Average common equity

DuPont Analysis

DuPont Model is useful in understanding the factors affecting the return on equity of the company.

FORMULA	ELEMENT 1	ELEMENT 2	ELEMENT 3	ELEMENT 4	ELEMENT 5
1	Net Income / Shareholder's equity				
2	Net Income/ Total Assets i.e. ROA	Total Assets/Sharehold er's Equity i.e. Financial Leverage			
3	Net Income/Revenue i.e. Net Profit Margin	Revenue/Total Assets i.e. Asset Turnover	Total Assets/Shareholder' s Equity i.e. Financial Leverage		
4	Net Income/EBT i.e Tax Burden	EBT/EBIT i.e Interest Burden	EBIT/Revenue i.e Operating Margin	Revenue/Total Assets i.e Asset Turnover	Total Assets/Share holders Equity i.e Financial Leverage

Valuation Ratios

Valuation ratios are typically share price multiples which are used to calculate fair value of a company's stock.

RATIO	NUMERATOR	DENOMINATOR
Price to Earnings	Price per share	Earnings per share
Price to cash Flow	Price per share	Cash flow per share
Price to Sales	Price per share	Sales per share
Price to Book Value	Price per share	Book value per share
Cash flow per share	Cash flow from operations	Average no. of shares outstanding
EBITDA per share	EBITDA	Average no. of shares outstanding

Rules in ratio analysis

- If the formula includes any amount taken from the balance sheet, this should (generally) be an average i.e. (opening + closing)/2
- If the formula includes any "Debt" this are only the interest paying liabilities. Both short and long term debt must be included
- Check whether they are asking for ratio under IFRS or US GAAP. Formula is the same, but amounts can differ

Corporate Governance & ESG: An Introduction

Introduction

- Corporate Governance is the system of internal controls and procedures for managing a company.
- Shareholder Theory: Primary focus is on interests of company's owners i.e. shareholders.
- Stakeholder Theory: Focus is on managing conflicts among interests of stakeholder groups.

Stakeholder Groups

- **Shareholders:** Have residual interest in the company and are interested in growth and profitability
- **Board of Directors:** Responsible for protecting interests of shareholders.
- **Senior managers:** Interested in maximizing value of their compensation.
- **Employees:** Interested in continuation and sustainability of the company.
- **Creditors:** Make loans to the company, interested in ensuring their payment is honored.
- **Suppliers, Customers, Government / Regulators**

Principal-Agent relationships

- Shareholders are principals who appoint board of directors and senior management as their agents
- Conflicts of interest may arise between principals and agents

Stakeholder management

- It is based on four types of infrastructure: Legal, Contractual, Organizational and Governmental.
- Companies hold annual general meetings and extraordinary general meetings to get resolutions passed by the shareholders.
- Shareholders can vote in person or by proxy

Board of directors:

- Can be structured as one-tier or two-tier board
- Have responsibilities such as
 - Setting strategic direction for the company
 - Selecting and evaluating senior managers
 - Selecting management compensation
 - Approving large investments, mergers etc.
 - Establishing and monitoring internal controls
 - Ensuring quality of financial reporting through internal and external auditors
- Board operates through various committees such as Audit, Governance, Nominations, Investment, Compensation, Risk

Factors affecting stakeholder relationships:

- Market factors: Activist shareholders, Hostile Takeovers
- Non-market factors: Legal environment, Communication channels, Third-party ratings of corporate governance

Risks of poor Corporate Governance:

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Poor corporate governance may result into: weak controls, poor accounting, lax oversight of management, legal and reputational effects.

Analysis of Corporate Governance: Following factors will help analyze corporate governance

- Ownership structure, Board Composition, Management compensation, Shareholder rights

Environmental and Social Considerations: These can be included in investment analysis by

- Negative Screening
- Positive Screening
- Impact Investing
- Thematic Investing

Capital Budgeting

Capital budgeting is the process of evaluating capital projects, with cash flows over more than one year.

Principles of Capital Budgeting

INCLUDE	EXCLUDE
1. After-tax incremental cash flows and timing is crucial	1. Financing costs
2. Opportunity Costs	2. Sunk Cost
3. Externalities- Cannibalization	3. Accounting net income

PROJECT INTERACTIONS	EXPLANATION
Independent Projects	Projects are independent – accept as many projects as resources permit
Mutually Exclusive Projects	Projects directly compete with each other – accept one and reject the other
Unlimited Funds	Company can raise funds for all profitable projects
Capital Rationing	Company has fixed amount of funds to invest – must allocate funds appropriately to achieve max. shareholder value
Project Sequencing	Projects sequenced through time – e.g. invest in project today, if results positive, invest in subsequent project; otherwise do not invest in second project

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METRIC	EXPLANATION
Net Present Value	- Sum of the present values of a project's expected cash flows net of the project cost - Represents the increase in firm value from undertaking a project - Positive NPV projects should be undertaken
Internal Rate of Return	- Discount rate that equates the present values of the project's expected cash inflows and outflows. Discount rate for which the NPV of a project is zero - A project for which the IRR is greater (less) than the discount rate will have an NPV that is positive (negative) and should be accepted (not be accepted)
Payback Period	- The payback (discounted payback) period is the number of years required to recover the original cost of the project (original cost of the project in present value terms). - Merit: Good measure of liquidity - Demerit: Ignores time value of money. Ignores the total profitability of the project
Discounted payback period	- Payback period based on discounted cash flows - Merit: Considers time value of money and liquidity - Demerit: Poor measure of profitability
Profitability Index	Calculated as: $PI = \frac{PV \text{ of future cash flows}}{\text{Initial Investment}} = 1 + \frac{NPV}{\text{Initial Investment}}$ When NPV = positive → PI > 1 → Invest in project and vice- versa

NPV vs IRR

- Projects with unconventional cash flow patterns can produce multiple IRRs or no IRR
- Timing or amount of cash flows amongst different projects can lead of ranking conflicts
- Given a conflict between NPV and IRR for mutually exclusive projects, NPV is always preferred

NPV and Stock Price

- A firm's stock price maybe affected to the extent that engaging in a project with that NPV was previously unanticipated by investors
- Change in stock price can be calculated as NPV divided by number of shares outstanding

Cost of Capital

Weighted Average Cost of Capital

- Computed as: $WACC = w_d r_d (1 - t) + w_p r_p + w_e r_e$
- Target capital structure should be used to find out the weights of debt, preferred stock and equity
- Before-tax cost of debt (r_d) adjusted for tax benefit ($1 - t$)

Role of Marginal Cost of Capital in NPV

- If company's WACC = cost of capital for a project, the project has same risk as the avg. risk of company
- If project risk above or below avg. – upward or downward adjustment made to WACC to estimate cost of capital
- Discount rate used also depends on the kind of cash flows:
 - FCFF – use WACC as cost of capital
 - FCFE / Dividends – use cost of equity capital

Cost of fixed rate debt

- **Yield to Maturity (YTM) approach:** Annual return an investor earns on a bond if he purchases bond today and holds it till maturity
- **Debt Rating Approach:**
 - Can be used when current market price for company's debt unavailable
 - Yield of comparably-rated bonds for maturities that closely match that of company's debt used

Cost of Preferred Stock

- Non-convertible, non-callable preferred stock has a fixed dividend rate and no maturity date i.e. a fixed rate perpetual preferred stock
- $r = \frac{D}{P}$

Cost of Common Equity

- The cost of equity capital (k_e) is the required rate of return on the firm's common stock
 - **CAPM approach:** $k_e = RFR + \beta[E(R_{mkt}) - RFR]$
 - **Dividend discount model approach:** $k_e = (D_1 / P_0) + g$
 - **Bond yield plus risk premium approach:** add a risk premium of 3% to 5% to the market yield on the firm's long-term debt

Pure-play Method: To estimate Beta for a company that is not publicly traded

- Identify a “comparable” publicly traded company (i.e. it has a similar *business risk*, same industry and in that single line of business)
- Estimate β_{equity} (levered β) of comparable
- Calculate β_{asset} (unlevered β) of comparable:

$$\beta_{asset} = \beta_{equity} / \left[1 + \left(\frac{(1-t)D}{E} \right) \right]$$

- Consider financial leverage of project / company and calculate equity risk:

$$\beta_{L,project} = \beta_{asset} \left[1 + \left(\frac{(1-t)D_{project}}{E_{project}} \right) \right]$$

Country Risk Premium

- Adjust cost of equity (derived through CAPM) by adding **country spread** to market risk premium:

$$\text{Country equity premium} = \text{Sovereign yield spread} \left[\frac{\text{Annualised std. deviation of equity index}}{\text{Annualised std. deviation of the sovereign bond market in terms of the developed market currency}} \right]$$

$$\begin{aligned} \text{Sovereign Yield spread} \\ &= (\text{yield on developing country's govt. bond}) \\ &\quad - (\text{yield on similar maturity, developed country bond}) \end{aligned}$$

$$\text{Cost of equity (k}_e\text{)} = \text{RFR} + \beta[\text{E(R}_{\text{mkt}}) - \text{RFR} + \text{CRP}]$$

Marginal Cost of Capital

- MCC – cost of additional capital raised by firm, if a firm requires no additional external capital, the MCC may be the same as WACC
- As more capital raised, MCC increases and WACC changes, because as the firm issues more expensive new equity or new debt
- Break points (increases) in the marginal cost of capital schedule occur at amounts of total capital raised equal to the amount of each source of capital at which the component cost of capital increases, divided by the target weight for that source of capital

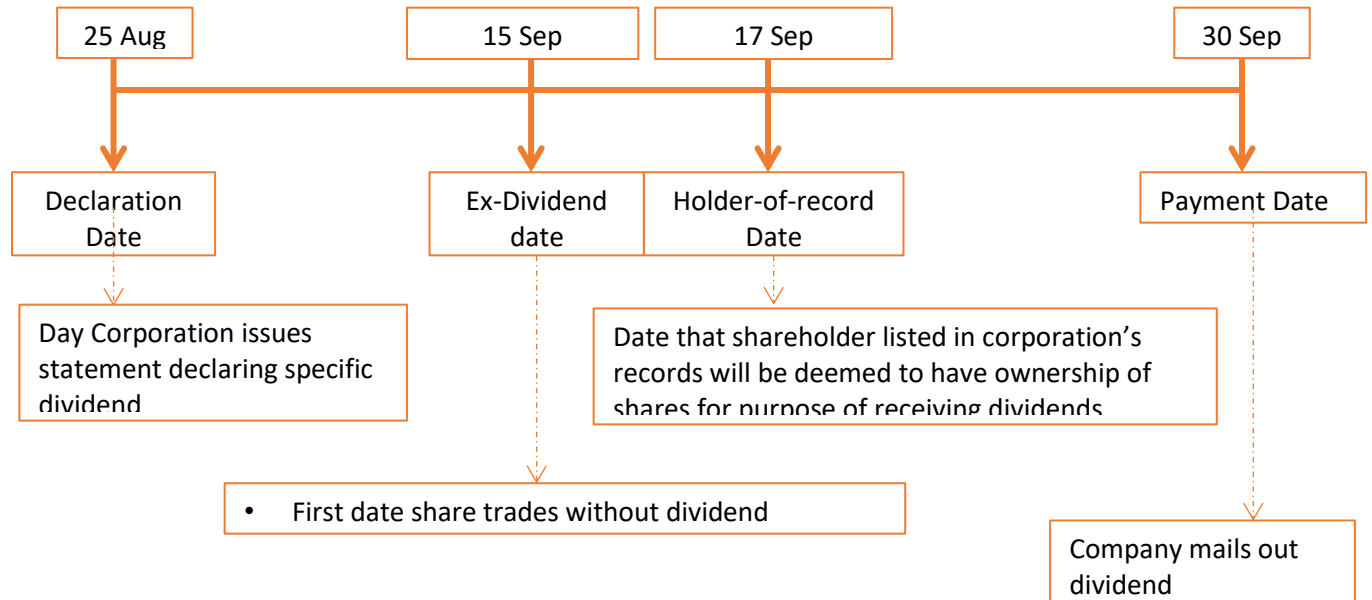
Flotation Cost

- Correct method: Increase a project's initial cash outflow by the flotation cost attributable to the project when calculating the project's NPV
- Incorrect method: Deduct flotation cost from issue proceeds, thereby increasing cost of equity

Dividend and Share Repurchases: Basics

TYPES OF DIVIDENDS	DESCRIPTION
Regular Cash Dividend	- Record of consistent dividends interpreted as evidence of continued profitability. - Management use dividend announcements to communicate confidence in company's future. - Increase in regular dividend (especially if unexpected) often has positive effect on share price.
Extra dividends	- Also called – special (irregular) dividend - Dividend paid by company that does not pay regular dividends or one that supplements regular cash dividends with extra payment
Liquidating Dividends	Dividend paid when a company: - Goes out of business and net assets of company are distributed to shareholders - Sells portion of its business for cash and proceeds distributed to shareholders - Pays dividend that exceeds its accumulated retained earnings (impairs stated capital)
Stock dividends	- Bonus issue of shares – company distributes additional shares (usually 2 – 10% of shares outstanding) of common stock to shareholders. - Doesn't affect shareholder's proportionate ownership or its total value: merely divides market value of shareholders' equity into smaller pieces. - Unlike cash dividends, it doesn't affect company's capital structure.
Stock splits	2-for-1 stock split: each shareholder issued an additional share for each share currently owned - No economic effect on company and shareholders' total cost basis does not change – similar to stock dividend - Typically announced after period in which stock price has risen in order to return stock to lower marketable price range
Reverse stock splits	- Increases share prices and reduces no. of shares outstanding with no effect on MV of equity or on shareholders' total cost basis. - Low stock price may lead company to consider reverse stock split in order to move stock to higher marketable price range

Dividend Payment Chronology



Share Repurchase Methods

METHOD	DESCRIPTION
Buy in open market	- Gives company max. flexibility as there's no legal obligation to complete repurchase program after announcement - Merit: Relatively cost effective if timed right to minimize price impact and exploit perceived undervaluation in market
Buy back fixed no. of shares at fixed price	Fixed price tender offer typically at a premium to current market price
Dutch auction	Company stipulates range of acceptable prices to buy back shares and uncovers minimum price at which investors would sell
Repurchase by direct negotiation	Company negotiates with major shareholders to buy back its shares

Effect of Share Repurchase

- Using Borrowed Funds on EPS
 - If the company's Earnings Yield (EPS/Price per share) is equal to the after-tax cost of borrowing, no effect on EPS
 - If the company's E/P is greater than the after-tax cost of borrowing, EPS will increase
 - If the company's E/P is less than the after-tax cost of borrowing, EPS will decrease

L1 Refresher: Key Concepts for L2

- **On Book Value Per Share**
 - BVPS will decrease when if market price per share(repurchase price) > initial BVPS
 - BVPS will increase when if market price per share(repurchase price) < initial BVPS
- An investor would be indifferent between share repurchase and cash dividend of the same amount (given the tax treatments are same)

Portfolio Risk and Return: Part I

Return Measures

- **Holding period return (HPR)** - The total return earned from holding an asset over a given period

$$HPR = \frac{\text{Ending Value} - \text{Beginning Value} + \text{Income}}{\text{Beginning Value}}$$

- **Arithmetic or Mean Return** - The average return calculated by adding the returns of over different periods and dividing it by the total number of periods
- **Geometric Mean Return** – A more accurate return measure that calculates the *compounded* average of returns of over different periods

$$\text{Geometric Mean} = \sqrt[n]{[(1 + HPR_1) \times (1 + HPR_2)]} - 1$$

Other Return Measures

- **Gross return** is the return from an investment *before* deductions of any operating costs (such as management fees, commissions and other expenses)
- **Net return** is return *after* deductions of operating expenses (fees, administration costs, etc.)
- **Pre-tax nominal returns** are returns from an investment without any adjustment for taxes or inflation
- **After-Tax nominal returns** are returns after deduction of the applicable tax rate and before adjustment for inflation
- When nominal returns are adjusted for changes in purchasing power (caused by the prevailing inflation), the result is **Real return**

Risk Aversion

- Risk aversion means investors prefer less risk to more risk
 - When two investments have the same expected return, investors **prefer the lower risk investment**
 - When two investments have the same risk, investors prefer the investment with the **higher expected return**

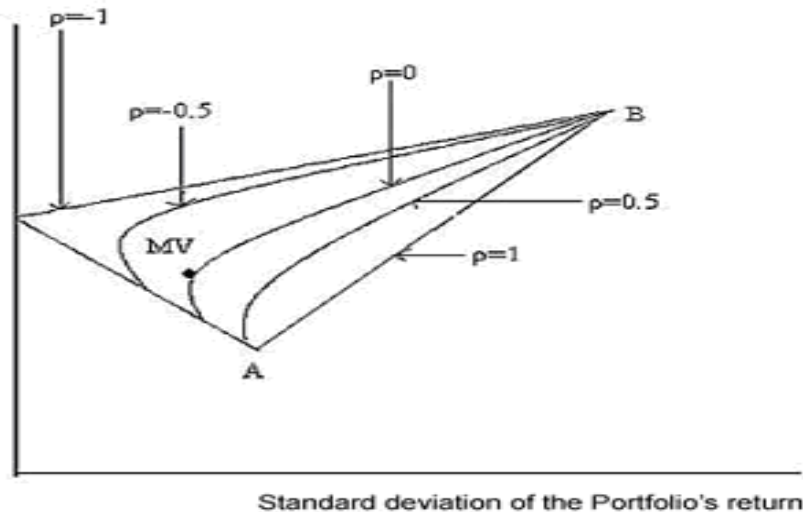
Mean Variance Portfolio

- **Expected return (Mean)** of portfolio of assets is the sum of weighted returns of the individual assets in the portfolio
 - $E(R_p) = w_1E(R_1) + w_2E(R_2) + w_3E(R_3) + \dots + w_NE(R_N)$
 - where, ' w_i ' is weight of individual asset
- **Variance** of a portfolio is the sum of two main components;
 - the weighted average of variance of individual securities, and
 - the co-variance between securities based on their individual weights
 - So for a 2 asset portfolio, risk of the portfolio is:
 - $Var(R_p) = \sigma_A^2 w_A^2 + \sigma_B^2 w_B^2 + 2w_A w_B Cov_{AB}$
 - OR
 - $Var(R_p) = \sigma_A^2 w_A^2 + \sigma_B^2 w_B^2 + 2w_A w_B \rho_{AB} \sigma_A \sigma_B$
- **Covariance** measures the degree to which returns on two assets move together.

- *Positive covariance* implies returns move in the same direction.
- *Negative covariance* implies the returns of the assets are inversely related.
- *Zero covariance* implies there is no relation between the returns of the assets.
- **Correlation coefficient** addresses the limitation of covariance. It measures the *strength of dependence*, i.e. how much the dependence of one asset's return is on the other asset. Correlation co-efficient ranges from -1 to +1.

Portfolio Risks – Correlation between Assets

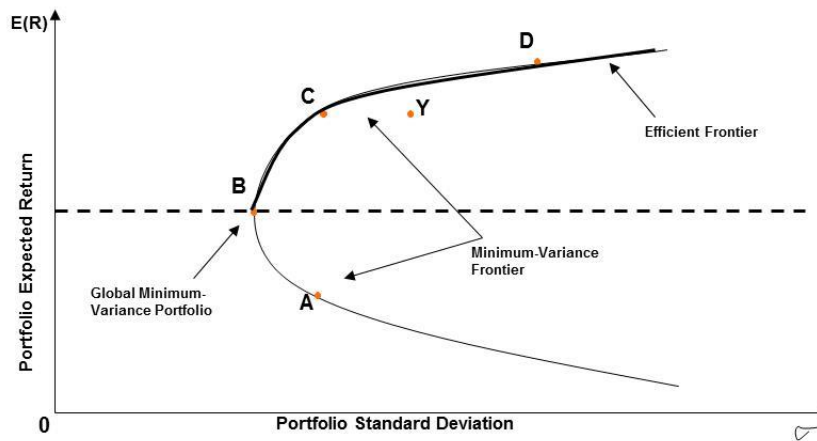
Expected return on Portfolio



As correlation between assets ↓ benefits of diversification ↑

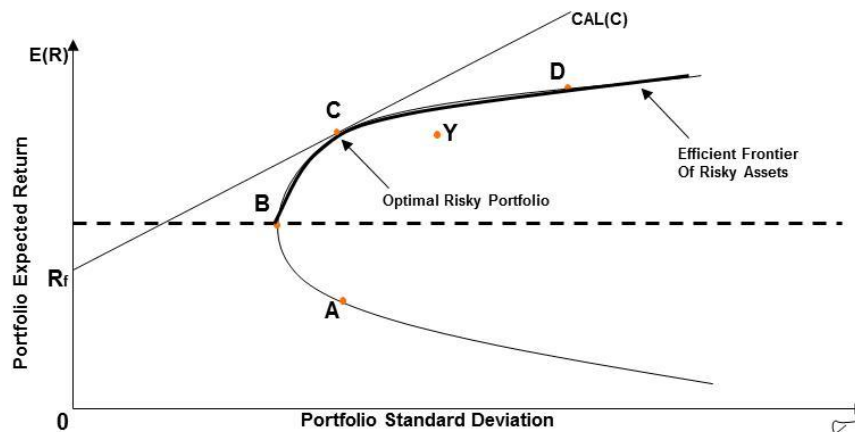
Minimum Variance and Efficient Frontier

- As the number of available assets increases, investors have more possibilities for combination of the assets. If we select the combinations that result in minimum-variance portfolios, we achieve what is known as the minimum-variance frontier
- **Minimum-variance frontier** is a graph that represents the minimum-variance portfolios, i.e. portfolio of risky assets with lowest variance (A, B, C, D)
- The portfolio (B) of the left-most corner of the frontier, with the least variance or risk is termed as the **Global minimum-variance portfolio**
- All portfolios that lie above and to the right of global minimum-variance portfolio make up the **Markowitz efficient frontier**. Efficient frontier may be defined as a graphical representation of a set of feasible portfolios (B, C, D) that have the maximum return for a given level of risk



Optimal Risky Portfolio for an Investor

- When risk-free asset is combined with the risky assets on the efficient frontier, we obtain a linear relationship, i.e. a straight line. This line is called the **capital allocation line (CAL)** and is **tangent** to the efficient frontier
- The point of tangency (C) is termed as the **optimal risky portfolio**



Portfolio Choices Based On Indifference Curve

- The ideal portfolio for an investor, who prefers to keep a mix of both risky and risk free assets, will lie between optimal risky portfolio and R_f .

Portfolio Risk and Return: Part II

Combining Portfolios with Risk Free Asset

- The availability of a risk-free asset allows investors to build portfolios with superior risk-return properties.
- By combining a risk-free asset with a portfolio of risky assets, the overall risk and return can be adjusted to appeal to investors with various degrees of risk aversion

Capital Allocation Line (CAL)

- A graph that displays the return that can be achieved by investors by taking on a certain level of risk
- Graph is based on the formula: $E(R_p) = R_f + \left(\frac{E(R_a) - R_f}{\sigma_a} \right) \times \sigma_p$
 - where 'a' is the risky portfolio; and

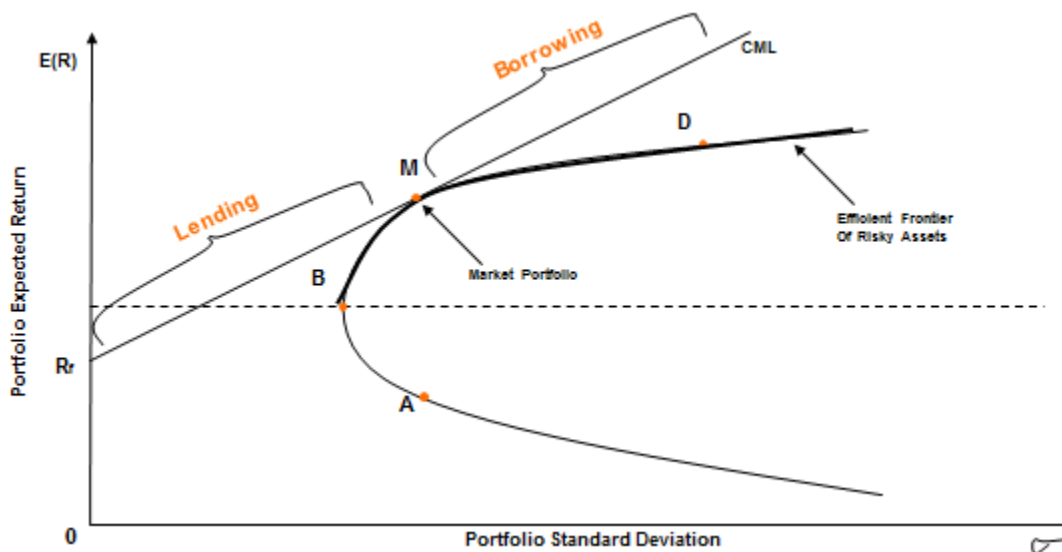
- 'p' is the combination of risk free and risky portfolio
- If each investor has different expectations about expected return, standard deviation or correlation, so each investor will have a different optimal risky portfolio and a different CAL

Capital Market Theory

- The **capital market theory** builds upon the Markowitz portfolio model
- Following are the *assumptions* of the capital market theory are;
 - Investors choose efficient portfolios
 - Investors borrow/lend money at a risk-free rate
 - All investors have the same time horizon
 - All assets are infinitely divisible; i.e. shares can be purchased in various fractions
 - There are no taxes and transaction costs
 - Investors have same probability for Expected return
 - There is no inflation in the market
 - Markets are efficient and no mispricing within the markets exist

Capital Market Line (CML)

- When risk-free asset is combined with the market portfolio on the efficient frontier, we obtain **Capital market line (CML)**
- CML computes expected return as: $E(R_p) = R_f + \left(\frac{E(R_m) - R_f}{\sigma_m} \right) \times \sigma_p$ where 'm' is the market portfolio
- The CML is derived by drawing a tangent line from the intercept point on the efficient frontier to the point where the expected return equals the risk-free rate of return.
- The CML is considered to be superior to the efficient frontier since it takes into account the inclusion of a risk-free asset in the portfolio.



CML vs CAL

CML	CAL
Developed assuming homogeneous expectations	Developed assuming heterogeneous expectation
There is only one CML	Unlimited number of CALs
There is only one market portfolio	Tangency portfolio of CAL can differ

Systematic and Unsystematic Risk

- Total risk = Systematic risk + Unsystematic risk
- **Systematic risk** – also known as *market risk*, or *non-diversifiable risk*. It is virtually impossible to protect against or avoid this type of risk. This type of risk which includes market factors such as interest rates, recession, etc. cannot even be avoided through diversification.
- **Unsystematic risk** – also known as *specific risk*, or *diversifiable risk*. This type of risk is unique to a specific asset, company or industry. Diversification is the only way to protect against this type of risk.

Return Generation Models

SINGLE INDEX MODEL	MULTI FACTOR MODEL
• Assumes that there is only 1 macroeconomic factor of systematic risk that explains stock returns, and this factor can be represented by the rate of return on a market index (like S&P 500) • $r_i = r_f + \beta_i(r_m - r_f) + e_i$	• Assume multiple factors explain market behaviour and asset prices • Common examples include Fama French three factor model • $E(R_i) = \alpha_i + \beta_{i,MKT}MKT + \beta_{i,SMB}SMB + \beta_{i,HML}HML$ ○ Where α_i is the intercept, the expected return of stock 'i' if market's excess return is zero ○ MKT is the excess return on the market portfolio ○ SMB is the difference in return between small-cap and large-cap stocks ○ HML is the difference in return high-book-to-market and low-book-to-market stocks

Calculation and Interpretation of Beta

- Beta measures the volatility of an asset against a market as a benchmark
- Beta is the asset's systematic or non-diversifiable risk
- Calculated as: $\beta_i = \frac{Cov(R_i, R_m)}{\sigma_m^2}$
- $\beta = 1$ indicates asset price fluctuation is equal to the market fluctuation
- $\beta > 1$ indicates that the asset price is more volatile than the overall market
- $\beta < 1$ indicates that the asset price is less volatile than the overall market

Capital Asset Pricing Model (CAPM)

- States that the return on an asset equals the risk-free rate plus a premium proportional to the amount of systematic risk the asset possesses
- CAPM takes into account the asset's sensitivity to its beta (systematic risk), as well as the expected return of the market and the risk-free asset
- $E(R_i) = r_f + \beta_i [E(R_m) - R_f]$
- **Assumptions of CAPM**
 - Investors are rational and risk averse, i.e. all else equal, they prefer more return for given a level of risk
 - Markets are perfectly efficient. There are no taxes and no transaction costs
 - Investors are price takers, i.e. they do not have the power to influence prices
 - Investors have homogeneous expectations; i.e. they have the same expectations for mean and variance
 - Investments are infinitely divisible, i.e. investors can invest in small or big fractions in a particular asset
 - Investors can borrow and lend unlimited amounts at the risk-free rate (R_f)

Security Market Line

- Graphical representation of the capital asset pricing model (CAPM)
- Securities that lie on the SML are all the *correctly* priced securities
- Securities plotted above the SML are *undervalued* because as compared to other securities, they generate higher returns for a given amount of risk
- Securities plotted below the SML are *overvalued* because as compared to other securities, they generate lower returns for a given amount of risk

SML vs CML

SML	CML
Uses systematic risk	Uses total risk
Used to determine expected return for securities	Used to determine appropriate asset allocation
Graph of CAPM	Graph of efficient frontier
Slope = Market risk premium	Slope = Market portfolio Sharpe ratio

Risk Adjusted Return Measures

- **M-Squared** measure produces the same portfolio rankings as the Sharpe Ratio but is stated in percentage terms.
 - The M^2 measure for P2 is $(R_{P2} - R_f) (\sigma_M / \sigma_{P2}) - (R_M - R_f)$
- **Treynor measure:** Same as Sharpe ratio except the risk is measured by Beta
 - $(R_P - R_f) / \beta_P$
- **Jensen's Alpha:** Excess return between realized return and required return
 - $R_P - [R_f + \beta_P (R_M - R_f)]$

Equity Valuation: Concepts and basic tools

Intrinsic Value vs Market Value

- estimated value of a security based on an analysis of investment fundamentals and characteristics
- Estimated Value vs. Market Price --> Security is *undervalued*, *overvalued* or *fairly valued*

Valuation Models

CATEGORIES	DESCRIPTION	EXAMPLES
Discounted Cash Flow (DCF) Models	Value=present value of the future benefits (dividends, cash flows)	Dividend discount models, Free-cash-flow-to equity models
Market Multiple Models	Value based on price or enterprise value multiples	P/E, EV/EBITDA
Asset Based Valuation Models	Value=value of assets less liabilities and preferred shares	Adjustments to the book or carrying value

Dividend Discount Model

- Based on the rationale that a corporation has an indefinite life, and a stock's value is the present value of its future cash dividends
- Basic formula is:

$$V_0 = \sum \frac{D_t}{(1 + k_e)^t}$$

- **Free cash flow to equity (FCFE)** can be used instead of dividends
- FCFE is the cash remaining after a firm meets all of its debt obligations and provides for the necessary capital and operational investment

Preferred Stock Valuation

- Value of a non-callable, non-convertible perpetual preferred share paying a fixed dividend and assuming a constant rate of return ($g = 0$)

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

Gordon (Constant) Growth Model

- Model assumes that dividends grow indefinitely at a constant rate
- Most suited for valuing equity of dividend paying companies that are relatively insensitive to the business cycle and are in a mature growth phase

- $V_0 = \frac{D_0(1+g)}{r-g}$

- **Assumptions:**

- Dividends are the correct metric to use for valuation purposes
- Dividend growth rate is perpetual and never changes
- The required rate of return is constant over time
- The dividend growth rate is less than the required rate of return
- Applying the DDM to a company that is not paying dividend is difficult

Multistage Dividend Discount Model

- Used for rapidly growing companies
- Two-stage DDM assumes:
- Company will begin to pay dividends that grow at a constant rate at some time
- But prior to that, the company will pay dividends that are growing at a higher rate than can be sustained in the long run

$$V_0 = \sum \frac{D_0(1 + g_s)^t}{(1 + r)^t} + \frac{V_n}{(1 + r)^n}$$

Appropriate Models

COMPANY FEATURES	APPROPRIATE MODEL	MODEL ASSUMPTIONS
Mature company	Gordon (Constant) DDM	Dividends grow at a constant rate into perpetuity
Older company that has moved through its growth phase and is currently in the transition phase before moving into the maturity phase	Two-stage DDM	High growth rate for an initial finite period, followed by a lower, sustainable growth rate into perpetuity
Fairly young company where growth is assumed to fall into 3 stages: growth, transition and maturity	Three-stage DDM	High growth rate for an initial finite period, followed by a lower growth rate for a finite second period, followed by a lower, sustainable growth rate into perpetuity

Price Multiple Valuation

- Uses a ratio that compares the share price with some sort of monetary flow or value to allow evaluation of the *relative* worth of a company's stock

PRICE MULTIPLES	DESCRIPTION
Price-to-earnings ratio (P/E)	Ratio of stock price to earnings per share
Price-to-book ratio (P/B)	Ratio of stock price to book value per share
Price-to-sales ratio	Ratio of stock price to sales per share
Price-to-cash-flow ratio	Ratio of stock price to cash flow per share

Justified P/E Multiple

- Value justified on the basis of fundamentals
- $\frac{P_0}{E_1} = \frac{D_1/E_1}{r-g} = \frac{p}{r-g}$; where p is dividend payout ratio

Enterprise Value Model

- Calculates the price multiple as Enterprise Value (EV) / EBITDA
- EV = market value of common and preferred stock + market value of debt - cash and short-term investments

Asset Based Models

- Asset-based models value equity as the market or fair value of assets minus liabilities
- These models are most appropriate when a firm's assets are largely tangible and have fair values that can be established easily

Introduction to Fixed Income Valuation

Bond Valuation

Bond Valuation is a three step process

- Estimate the expected cash flows (Coupon & Principal)
- Determine the appropriate interest rate for discounting the cash flows (YTM)
- Discount the cash flows to their present values

Bond Value and Discount Rate

- Higher the discount rate, lower the bond price
 - Bond will trade at premium if market interest rate < coupon rate
 - Bond will trade at discount if market interest rate > coupon rate
 - Bond will trade at par if market interest rate = coupon rate
- Bond price will always converge to par at maturity irrespective of the premium or discount it was trading at during its life

Spot Rates

- A zero rate (or spot rate), for maturity T is the rate of interest earned on an investment that provides a payoff only at time T
- Spot rates are used by the market to value bonds
 - The yield to maturity is calculated only after learning the bond price
 - The yield to maturity is an average of the various spot rates over a security's life
- The formula, to calculate the price using the spot rates is

$$\text{Price} = CF_1/(1+S_1)^1 + CF_2/(1+S_2)^2 + CF_3/(1+S_3)^3 + CF_4/(1+S_4)^4$$

Accounting for Accrued Interest

- The purchaser must pay the seller the accrued interest on the bond in addition to the quoted price

$$\text{Dirty/Full Price (invoice price)} = \text{Clean Price (or Flat/Quoted Price)} + \text{Accrued Interest}$$

Matrix Pricing

- Method of estimating the required YTM (or price) of bonds that are not traded or illiquid
- Use average YTM's (or spreads) of listed and liquid bonds with credit quality very close to the bond that is to be valued AND are very similar in maturity and coupons

Yield to Call, Yield to Put, Yield to Worst

Yield to Call	• Yield to Call is callable bond yield calculated the same way as YTM just that: • Call price instead of par value (as FV) is used, and • Number of years to call instead of number of year to maturity is used as N • Yield to first call is calculated when the bond has a call protection period (i.e. not callable during that specific period) • Yield to next call is calculated during the period when the bond is callable
Yield to Put	Yield to put is calculated in addition to YTM for puttable bonds
Yield to Worst	Yield to worst is the lowest of all the yields calculated for a callable/puttable bond

Yield Curves

- **Yield curve**
 - Shows yields by maturity
 - Term structure of interest rates refers to the yield at different maturities for like securities of interest rates
- **Spot rate yield curve**
 - Plotted for US Treasury bonds (aka zero curve or stripped curve)
 - Quoted on semi-annual basis
- **Yield curve for coupon bonds**
 - Shows YTM's for bonds at various maturities
 - Uses linear interpolation
 - Quoted on semi-annual basis
- **Par bond yield curve**
 - Not calculated from yields on actual bonds; constructed from the spot curve
 - Yields reflect the coupon rate that hypothetical bonds would need to have to be priced at par
 - Therefore aka par curve (represent YTM of a par bond at different maturities)
- **Forward curve**
 - Plots the future rates for the same maturities for annual periods in the future
 - Typically, it shows the yields of 1-year securities for each future year
 - Quoted on semi-annual basis

Forward Rates

- Forward rate is the rate today that will be paid on money to be
 - Borrowed at some specific future date; and
 - Repaid at a specific more distant future date
- Convention
 - 1y1y: rate for 1-year loan, to be made 1 year from now
 - 2y1y: rate for 1-year loan, to be made 2 years from now
 - 2y3y: rate for 3-year loan, to be made 2 years from now
- The forward rate is the future spot rate implied by today's spot curve – also called the implied forward rate

$$1+2y1y = (1 + S_3)^3 / (1 + S_1) (1 + 1y1y)$$

$$(1 + S_1) (1 + 1y1y) = (1 + S_2)^2$$

Yield Spreads

SPREAD	EXPLANATION
Nominal Spread	• Difference between YTM of non-treasury bond and YTM of a treasury bond of the same tenor • Measures the compensation for additional risk inherent in the non-treasury security • Nominal spread has following drawbacks ○ Fails to take into account the term structure of spot rates ○ Does not take into account the effect of interest rate volatility for non-treasury securities with embedded options

Zero Volatility Spread	• Spread that when added to the Treasury Spot rate for each period will make the present value of the non-treasury bond's cash flows equal to the price of the non-treasury security • Measures the compensation for additional risk inherent in the non-treasury security • Z spread does not take into account the effect of interest rate volatility for non-treasury securities with embedded options
Option Adjusted Spread	• OAS measures the compensation for additional risk, adjusting for the effect of embedded options OAS = Z spread – Option Cost Option Cost = Z spread – OAS • When investors have sold an option to the issuer (e.g. callable bonds), OAS is less than the z spread – option cost is positive • When investors have bought an option from the issuer (e.g. puttable bonds), OAS is greater than the z spread – option cost is negative • For callable bonds, higher Volatility → lower OAS • For puttable bonds, higher volatility → higher the OAS

Understanding Fixed Income Risk and Return

Sources of Bond Return

- Bond return comes from
 - Coupon and principal payments
 - Capital gains or loss
 - Reinvestment income

Realized Return

When market interest rates have not changed:

- I. **If Held till maturity:** YTM at purchase
- II. **If sold prior to maturity:** YTM at purchase

When market interest rates (YTM and reinvestment rate) increase after bond purchase but before first coupon:

- I. **If held till maturity (or for long period):** realized return will be higher than YTM at purchase
- II. **If held for short period:** realized return will be lower than YTM at purchase

Interest Rate Risk

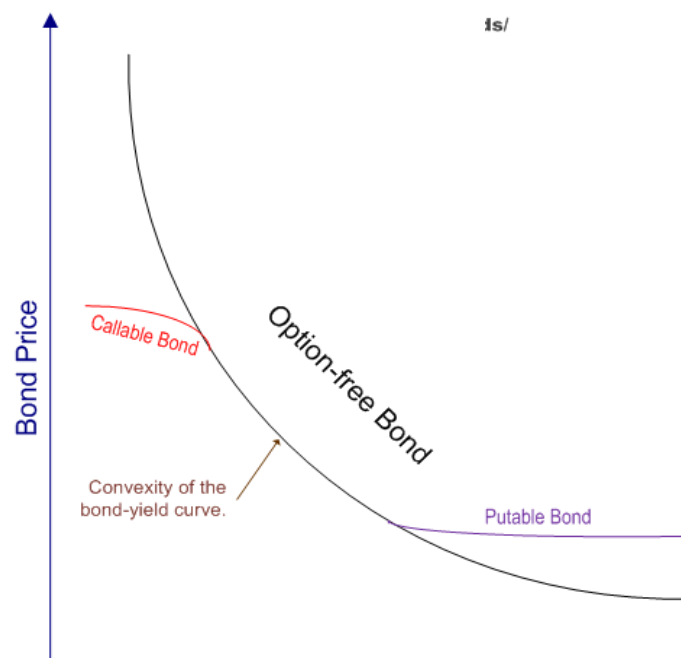
- Interest rates and bond prices move in opposite directions
 - When interest rates rise, bond prices fall and vice versa
- Interest rate risk is high when
 - Term to maturity is longer
 - Coupon rate is lower (zero coupon bonds have max interest rate risk)
 - YTM is lower (due to convexity of P-Y graph)

Approach to Measure Interest Rate Risk

MEASURE OF INTEREST RATE RISK	DESCRIPTION
Macaulay Duration	• Macaulay is the weighted average number of years necessary to recover the initial cost of the bond
Modified Duration	• Macaulay duration can be used to calculate Modified Duration • Modified Duration = Macaulay Duration / (1+YTM) • Modified duration can be approximated by: $\frac{\text{Price with Yield decline} - \text{Price with Yield rise}}{2 * \text{Initial Price} * \text{Change in yield}}$
Effective Duration	• For calculating the duration of bonds with options, a better measure is Effective duration, which takes into account the change in expected cash flows with interest rate changes $\frac{\text{Price with Yield decline} - \text{Price with Yield rise}}{2 * \text{Initial Price} * \text{Change in curve}}$

Price-Yield Function

- The P-Y function is positively convex for option free bonds.
- Price decline is smaller when yield increases than the price rise when the yield decreases
- The P-Y function is negatively convex for callable bonds at low yields.



Convexity

- Price change calculated using the bond duration measure is not accurate due to convexity
 - Duration overestimates price declines and underestimates price increases
- Convexity is the second derivative of $P - Y$ function
 - Option free bonds have positive convexity (price decline is smaller when yield increases than the price rise when the yield decreases)
 - Callable bonds have negative convexity at lower interest rates (the absolute change in price is less as interest rates decline than when they rise)
- Approximate convexity:

$$\frac{\text{Price with Yield decline} + \text{Price with Yield rise} - 2 * \text{Initial Price}}{\text{Initial Price} * (\text{Change in yield})^2}$$

- Convexity adjustment to approximate price change =
 $(1/2) * \text{Convexity} * (\Delta \text{Yield})^2 * 100$
- Approximate price change given Duration and Convexity =
 $-\text{Duration} * \Delta \text{Yield} * 100 + (1/2) * \text{Convexity} * (\Delta \text{Yield})^2 * 100$

Fundamentals of Credit Analysis

Credit Risk

- Credit risk is normally categorized into the following
 - Default risk- Likelihood that the firm will be unable to pay principal and interest on a bond
 - Loss severity = $1 - \text{Recovery Rate}$ (bond value investor receives in case of a default)
- Expected loss = default risk x loss severity
- Credit spread risk refers to change in required credit spread on a bond
- BBB and above are investment grade bonds
- Notching – a term used when agencies assign different ratings to bonds of same issuer

FACTORS AFFECTING CREDIT SPREAD	EXPLANATION
Yield Spread	Yield Spread = Liquidity Premium + Credit Spread
Credit Cycle	At the top of cycle spreads narrow, in bear markets spreads widen
Economic environment	Narrow when economy strengthens, wide when economy weakens
Market Demand & Supply	Higher the demand narrower the spread

TYPE OF EVALUATION	EXPLANATION
High Yield Bond	1. High leverage, Poor Performance, etc→ Rating below BBB 2. Focus on liquidity, CFO, Working Capital 3. Debt structure typically include a large of bank debt besides second lien, unsecured and subordinated debt 4. Calculate leverage for each level of debt separately 5. Analysis of covenants can provide useful insights into credit risk.
Sovereign Bond	Monetary policy, Fiscal Discipline, Economic growth, BOP Reserves, currency, policy decision making, etc are factors analysts keep in mind while assigning rating. Rating agencies usually assign different ratings for local and foreign currency debt.
Non-Sovereign Government bonds	Municipal debt are issued in two forms: 1. General Obligation Bonds: Tax receipts are major source of repayment. 2. Revenue Bonds: Repaid from revenues from the project. May be insured and prefunded.

Derivative Markets & Instruments

A **derivative** is an instrument whose value depends on the values of other underlying variables

Exchange traded derivatives

- Contracts are standard and pricing information is public
- Settlement is through the central clearing house - Virtually no credit risk
- E.g. Futures and options (selective)

Over-the-Counter (OTC)

- Contracts are either tailor made or standard
- Privately settled and there is credit risk
- E.g. Forwards, swaps and options

Dealer is normally a financial institution who creates the contract and quotes a two way price

Open Interest: number of futures contracts of a specific kind outstanding at a given point

Basics of Derivative Pricing and Valuation

Forward Contracts

Privately negotiated contracts to buy/sell the underlying asset at an agreed price on a specific future date

- Long (short) position buys (sells) the underlying
- Settlement is either cash or by physical delivery
- Involves credit risk as one party's gain is other party's loss

Future Contracts

- An exchange traded, standard contract to buy/sell the underlying asset at a specified price on a future date
- Contract specifications are clearly defined

Margin Arrangements in Future Contracts

- Trading in futures contract requires deposit of margin with the exchange
- Margins are settled daily and minimize the possibility of a loss through a default on a contract
- **Initial Margin:** Amount of cash to be deposited before trading
- **Maintenance Margin:** Minimum margin to be maintained at all times
- **Variation Margin:** Amount deposited once the balance falls below the Maintenance Margin level, to bring the account back to the Initial Margin level

Convenience yield: non-monetary benefits of holding an asset (eg ability to sell an asset when its shortage in the market drives up the prices temporarily)

Cost of carry: cost of holding an asset (eg storage cost)

Derivative Pricing: No arbitrage condition

Asset position at T_0 + short position in forward at T_0 =
(payoff on the asset at time T + payoff on the short forward position at time T) / $(1 + R_f)^T$

- Aka known as **risk-neutral pricing**
- The payoff at time T is certain and known as the position is fully hedged
- By **replication**:
(Long) Risky asset + (Short) derivative contract = risk-free asset

Forwards and Futures: Value and Price

	FOR ASSETS WITH NO STORAGE COSTS AND NO BENEFITS TO HOLDING	FOR ASSETS WITH STORAGE COSTS
Forward Price	Example: Equity security that does not pay dividends $F_0(T) = S_0 (1 + R_f)^T$	Example: oil $F_0(T) = S_0 (1 + R_f)^T + FV_0(\text{cost}) - FV_0(\text{benefit})$ Or $F_0(T) = [S_0 + PV_0(\text{cost}) - PV_0(\text{benefit})] \times (1 + R_f)^T$
Value of forward at initiation (time = 0)	$V_0(T) = S_0 - F_0(T) / (1 + R_f)^T = 0$ [because $S_0 = F_0(T) / (1 + R_f)^T$]	$V_0(T) = S_0 + PV_0(\text{cost}) - PV_0(\text{benefit}) - [F_0(T) / (1 + R_f)^T] = 0$ or $[S_0 + PV_0(\text{cost}) - PV_0(\text{benefit})] (1 + R_f)^T = F_0(T)$
During the life of forward (time < T)	$V_t(T) = S_t - F_0(T) / (1 + R_f)^{T-t}$	$V_t(T) = S_t + PV_t(\text{cost}) - PV_t(\text{benefit}) - [F_0(T) / (1 + R_f)^{T-t}]$

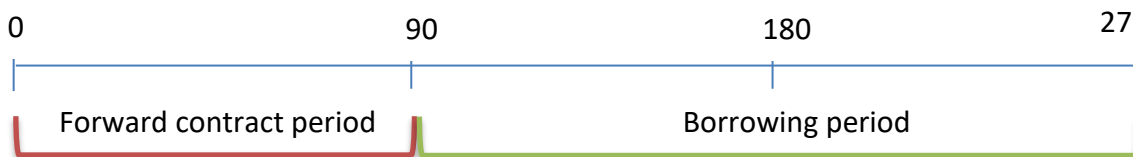
At expiration of forward (time = T)	$(1 + R_f)^0 = 1$ Hence: $V_T(T) = S_T - F_0(T)$	$(1 + R_f)^0 = 1$ and cost or benefits of holding the asset = 0 Hence: $V_T(T) = S_T - F_0(T)$
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Forward Rate Agreement (FRA)

- Forward contract on an interest rate where the underlying market interest rate is LIBOR for \$ denominated notional
- Long position commits to borrow the notional amount at the forward rate on the FRA maturity date and vice versa
- Swaps can be viewed as a series of FRA's, each with a forward contract rate equivalent to swap fixed rate

LIBOR	LONG	SHORT
↑	Gains	Looses
↓	Looses	Gains

Example: A company that plans to borrow for 180 days, starting 90 days from now, may take a long position in an FRA and lock in a rate of borrowing as follows.

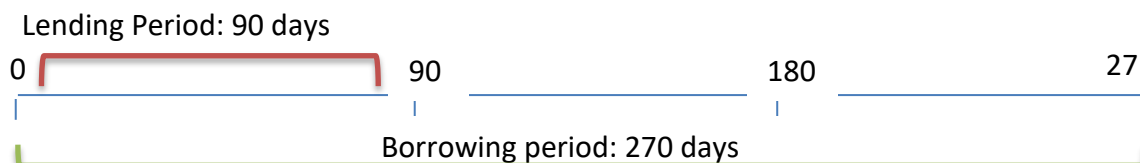


Synthetic FRA

Creating the payment structure of FRA with 2 Libor based loans.

Example: A company that plans to borrow for 180 days, starting 90 days from now, may create a synthetic FRA as follows.

- Borrow for 270 days
- Lend that amount for 90 days
- At the end of 90 days: receive back the funds (from retirement of 90 days loan) and use them



Effect of interest rates on Forward and Futures prices

If interest rates are constant or uncorrelated with futures prices:

- Futures and forwards that have the same terms have the same price and value

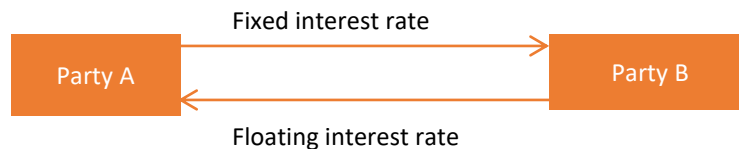
If interest rates are positively correlated with futures prices (eg FRA):

- Daily settlement in Futures provides funds that can be invested at higher interest rates AND requires excess funds when rates are low.
- Hence futures prices will be higher than that of forwards

Swap Contracts

- Private contracts to exchange a series of future cash flows at specified future dates according to certain specified terms
- Normally used by the counterparties to change the profile of their existing assets/liabilities
- They are largely unregulated with counterparty credit risk
- Zero value at initiation (except Currency swaps)
- P/L settled on settlement dates, called netting

Plain Vanilla (Interest rate) swap



- Pay fixed swap: pay fixed interest rate and receive floating interest rate
- Principal is not exchanged and periodic payments are netted
- Previous period interest rate (LIBOR_{t-1}) is used for the net settlement at t

Swaps: Value and Price

- No arbitrage principal is used to find the swap rate; such that it gives the swap zero value at initiation
- The value will however change later as the market interest rates change
 - If interest rates increase: value will increase for the fixed rate payer and vice versa
- The **price** of the swap: fixed rate of interest (F) specified in the swap contract

Option Contracts

A contract to buy/sell a certain asset by/on a certain date for a certain price

- A Call is an option to buy the underlying
- A Put is an option to sell the underlying
- Long or Option holder/buyer has the right to exercise the option
- Short or Option writer/seller has the obligation to settle in case the option is exercised
- Options involve payment of fee by the option buyer to the seller, called the Option Premium/Price or just Premium
- Exercise/Strike Price: Fixed price at which option buyer can buy/sell the underlying
- American option can be exercised any time during its life
- European option can be exercised only at maturity

Options: Value and Price

Call Option	Final Price > Strike Price	In the Money
	Final Price = Strike Price	At the Money
	Final Price < Strike Price	Out of the Money
Put Option	Final Price < Strike Price	In the Money
	Final Price = Strike Price	At the Money
	Final Price > Strike Price	Out of the Money

- **Intrinsic Value:** option pay-off at expiration
 - Call Option = $\text{Max}(0, S - X)$
 - Put Option = $\text{Max}(0, X - S)$
 - where, X = Exercise Price and S = Underlying asset's spot price
- **Option Price (premium)** = Intrinsic value + Time value

Option values are affected by:

	CALL OPTION PRICE	PUT OPTION PRICE
Higher price of underlying asset	Higher	Lower
Higher Exercise Price	Lower	Higher
Higher risk free rate	Higher	Lower
Higher Volatility	Higher	Higher
Longer Time to Expiry	Higher	Higher*
Higher Benefits of holding the asset	Lower	Higher
Higher Costs of holding the asset	Higher	Lower

* Longer term European put will be worth more when volatility is high and interest rates are lower.

Put Call Parity

- Portfolio A (**Fiduciary call**): European call on a stock + PV of the strike price in a bond
- Portfolio B (**Protective Put**): European put on the stock + the stock

$$\text{Put-Call Parity: } c + X/(1+r)^T = p + S_0$$

Put Call Forward Parity

- Replace S_0 with:
 - long position in forward contract on the asset and
 - long position in a discount bond
- Put-Call Forward Parity: $c + X/(1+r)^T = p + F_0(T) / (1 + R_f)^T$

One Period Binomial Model

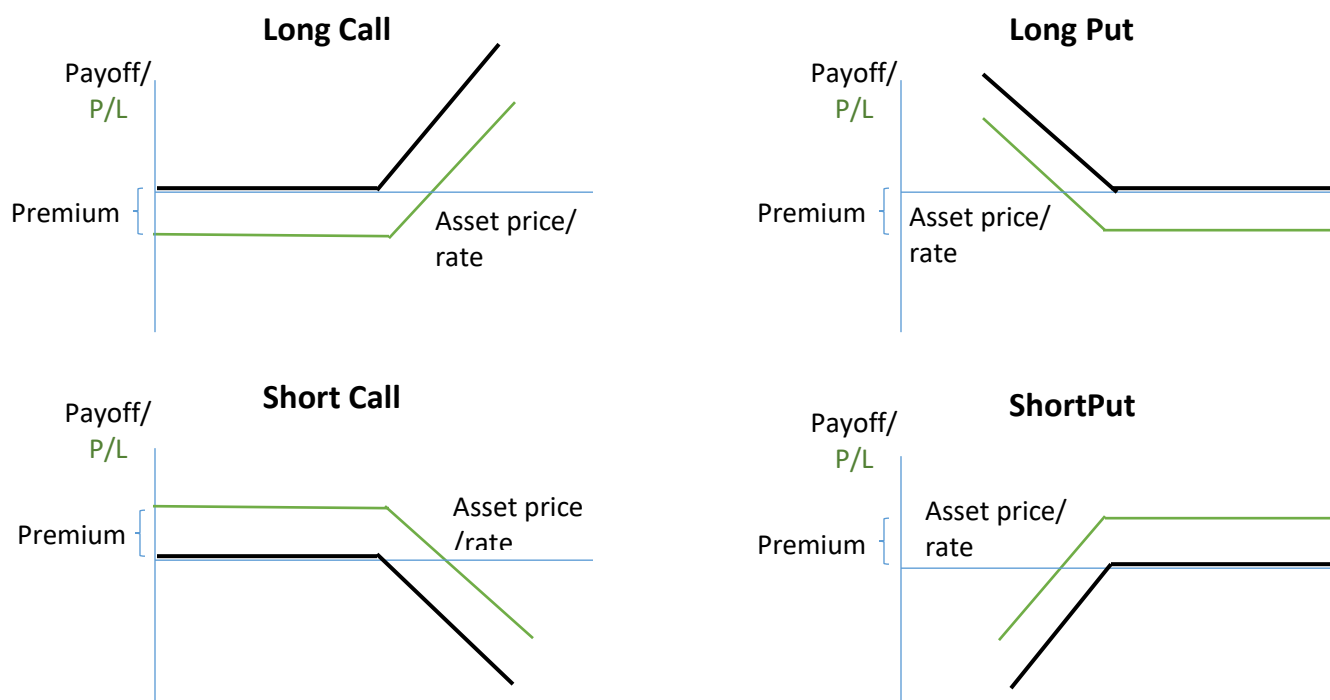
- Over the next period, some value will change to one of the two possible values
 - U = up move
 - D = down move = $(1 / U)$
 - πU = risk-neutral probability of an up-move = $(1 + R_f - D) / (U - D)$
 - πD = risk-neutral probability of a down-move = $1 - \pi U$
- Steps to calculate value of the option:
 - Calculate payoff of the option at maturity; in both up and down move states
 - Calculate expected value of option at maturity: weight the two pay-offs by their expected probabilities
 - Discount the expected payoffs to today at R_f

Option Values: European vs American

The prices of European and American options should be equal *unless the right to exercise earlier is valuable*.

OPTIONS	VALUES (AMERICAN VS EUROPEAN)	RATIONALE
Call options on assets with no interim cash flows	Both options valued the same	No advantage to exercise early
Call options on assets with interim cash flows	American call option value > European call option value	Early exercise can be valuable (options are not adjusted for dividends/coupons)
Put options (with or without interim cash flows)	For deep in the money: American call option value > European call option value	Exercising instantly will entitle the long to get the payoff immediately

Risk Management Application of Option Strategies



Covered Call

- Own the stock and sell a call on the stock to earn premium
- Reduces the loss on the stock by the amount of premium earned
- Upside on the stock is foregone

Protective Put

- Own the stock and buy a put on the stock
- Reduces the gain on the stock by the amount of premium paid
- Portfolio insurance: Downside on the stock is protected

Credit Derivatives

- A contract which protects the bondholder against any default or downgrade
- In a Credit Default Swap, bondholder pays series of cash flows to the protection seller in return for a payoff in the event of default.
 - Credit Spread Option is a call option based on bond's yield spread against a benchmark. As credit quality of bond declines, the yield goes up, thereby increasing the value of credit spread option.