Investment Management & Corporate Finance

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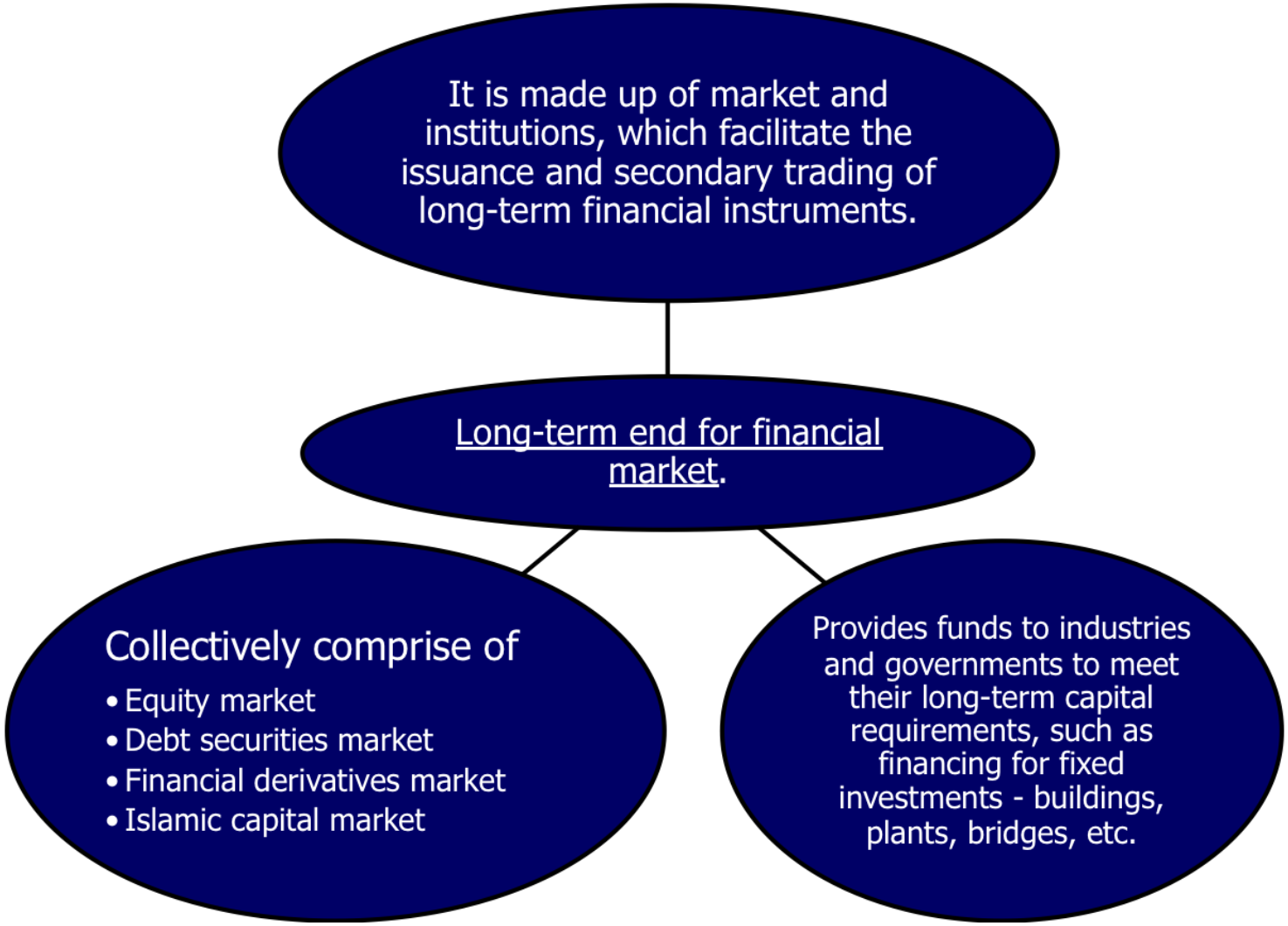
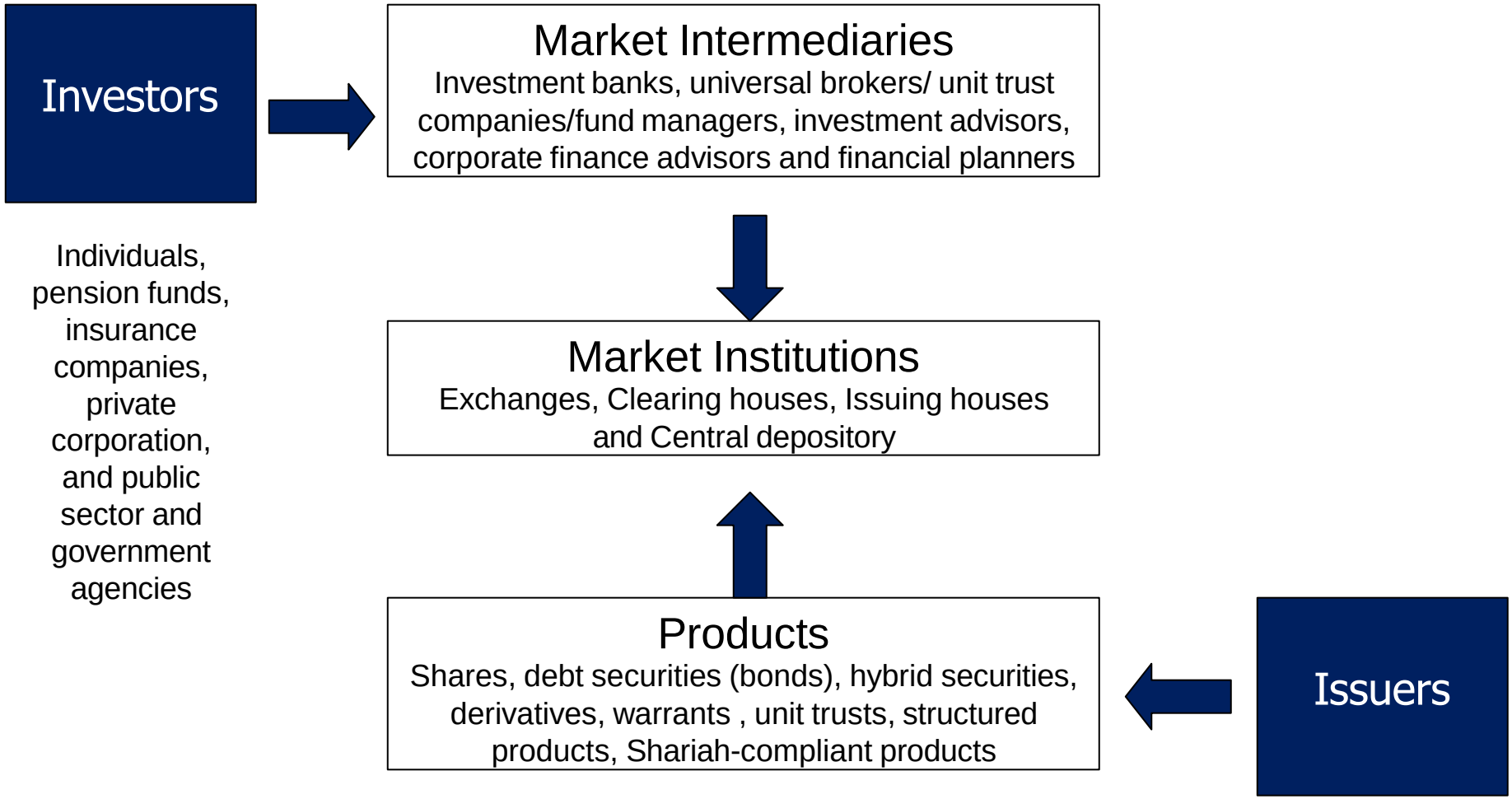
Topic 1: Overview of the Investment Environment

Capital Market



Capital Market

Structure of Capital Market



Shariah-Screening

Shariah Stock Screening

- A methodology to undertake Shariah screening process for listed companies
- Comprises quantitative and qualitative assessments
- Adopts a 2-tier approach to the quantitative assessment which applies the business activity benchmarks and the newly-introduced financial ratio benchmarks

Business Activity Benchmarks	
5%	• Conventional banking • Conventional insurance • Gambling • Liquor and liquor-related activities • Pork- and pork-related • Interest income from conventional accounts/instruments • Tobacco and tobacco-related activities
20%	• share trading; • stockbroking business; and • rental received from Shariah non-compliant activities

Financial Ratio Benchmarks		
	Cash / Total Assets	Debt / Total Assets
<33%	• Only include cash in conventional accounts/instruments • Cash in Islamic accounts/instruments excluded from calculation	• Only include interest-bearing debt whereas Islamic debt/financing or sukuk will be excluded from the calculation

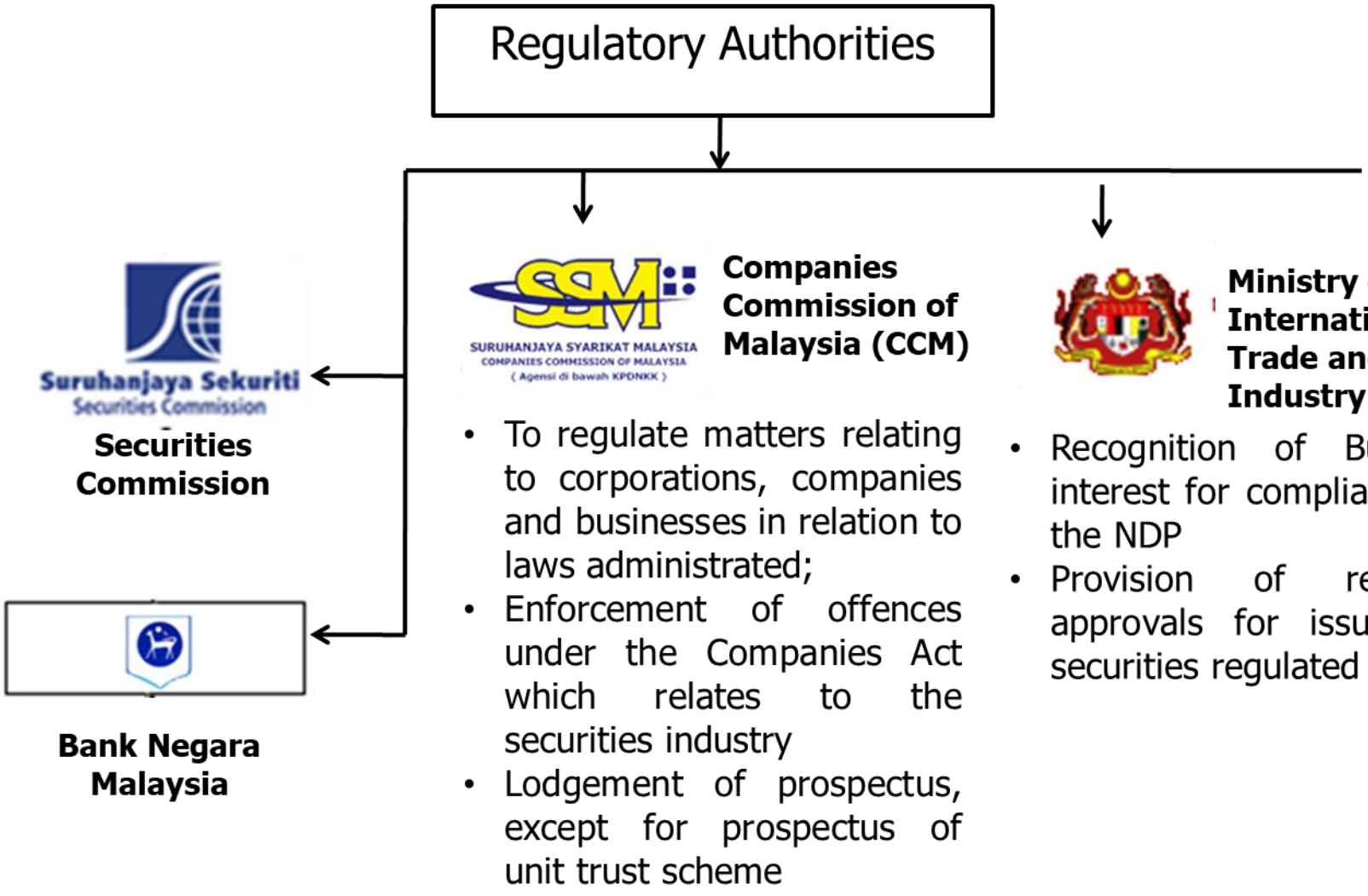
Islamic Concepts and Principles for Capital Market Instruments (1)

Ijarah	A contract whereby a lessor (owner) leases out an asset to a lessee at an agreed lease rental for a predetermined lease period. The ownership of the leased asset shall always remain with the lessor **(Leasing).**
Istisna`	A purchase order contract where a buyer requires a seller or a contractor to deliver or construct the asset to be completed in the future according to the specifications given in the sale and purchase contract. The payment term can be as agreed by both parties in the contract **(Purchase order).**
Mudharabah	A contract made between two parties to enter into a business venture. The parties consist of the rabb al-mal (capital provider) who shall contribute capital to finance the venture, and the mudharib (entrepreneur) who will manage the venture **(Profit sharing)**.

Islamic Concepts and Principles for Capital Market Instruments (2)

Murabahah	A contract that refers to the sale and purchase of assets whereby the cost and profit margin (mark-up) are made known **(Cost-plus sale)**.
Musharakah	A partnership arrangement between two or more parties to finance a business venture whereby all parties contribute capital either in the form of cash or in kind for the purpose of financing the said venture **(Profit and loss sharing)**.
Wakalah	A contract where a party authorises another party to act on behalf of the former based on the agreed terms and conditions as long as he is alive **(Agency)**.
Bai` salam	A sale and purchase contract whereby the payment is made in cash at the point of contract but the delivery of the asset purchased will be deferred to a pre-determined date **(Advance purchase).**
Bai` 'inah	A contract which involves the sale and buy back transaction of an asset by a seller **(Sale with immediate repurchase)**.

Regulatory Framework



The Regulator

Securities Commission (SC)

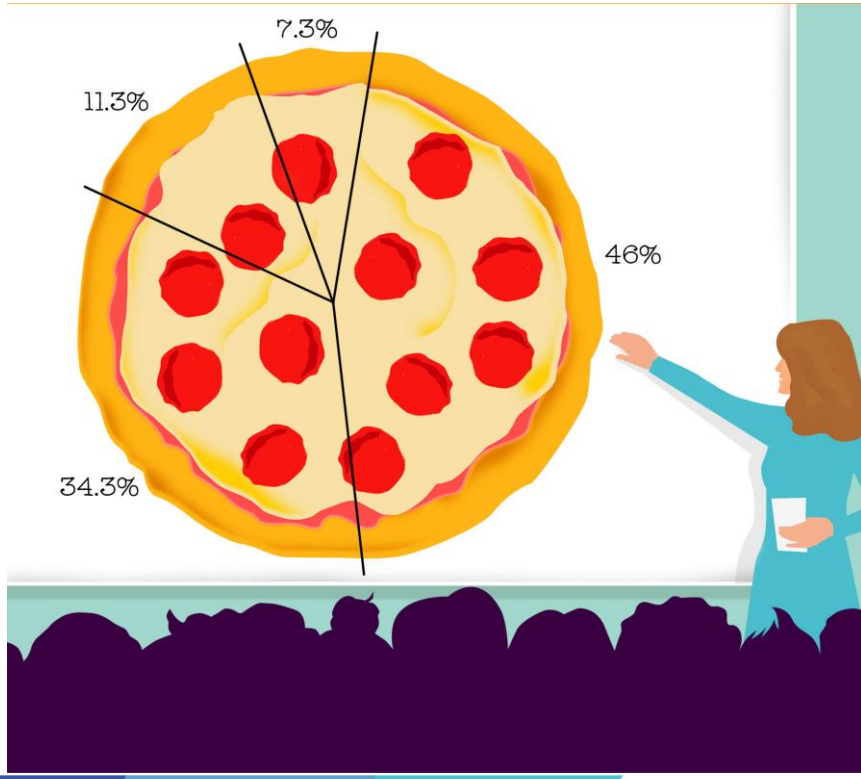
Suruhanjaya Sekuriti
Securities Commission
Malaysia

- Regulates all matters relating to:
  - securities and derivatives contracts
  - take-overs and mergers of companies
  - unit trust schemes.
- Responsible for licensing and supervising
  - licensed persons
  - exchanges, clearing houses and central depositories (Bursa Securities)
- Encouraging self-regulation and ensuring proper conduct of market institutions and licensed persons.

Bank Negara Malaysia (BNM)

- **Principal Objectives:**
  - To formulate and conduct monetary policy in Malaysia.
  - To issue currency in Malaysia.
  - To provide oversight over money and foreign exchange markets.
  - To promote a sound, progressive and inclusive financial system.
  - To promote an exchange rate regime consistent with the fundamentals of the economy.
  - To regulate and supervise financial institutions which are subject to the laws enforced by BNM.
  - To exercise oversight over payment systems.
  - To hold and manage the foreign reserves of Malaysia.
  - To act as financial adviser, banker and financial agent of the Government.

Topic 2: Fundamentals of Economics

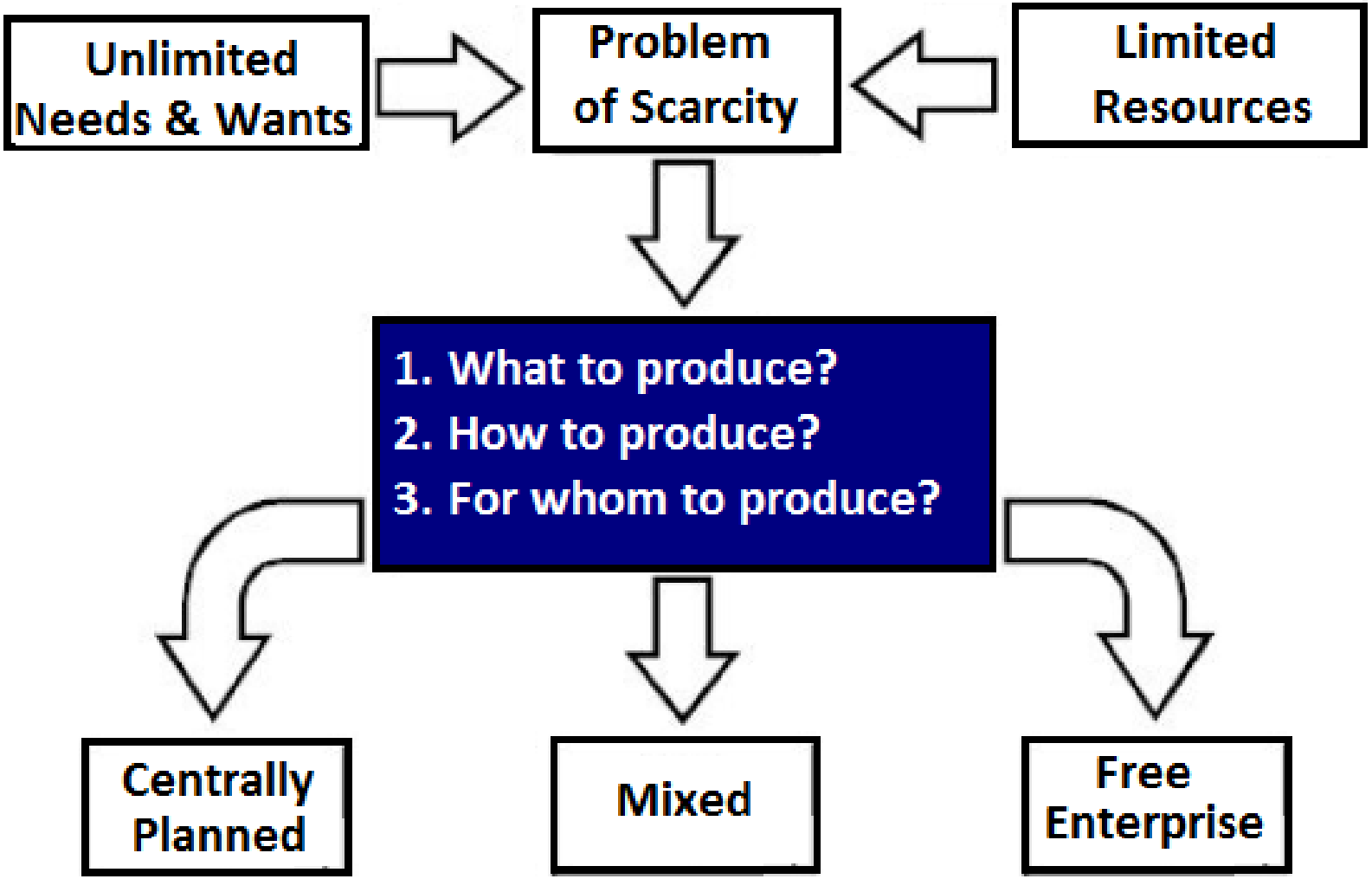


Economics

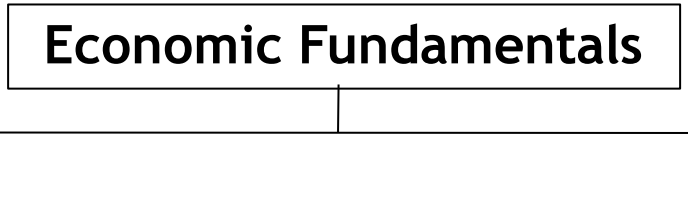
- A social science, which examines people behaving according to their self-interests

- How, in a given society,
  - choices are made in the allocation of resources to produce goods and services for consumption, and
  - the mechanisms and principles that govern this process.

Concepts of Economics



Economic Fundamentals



Macroeconomics

Examines changes in

- Unemployment
- national income
- rate of growth
- gross domestic product
- Inflation
- price levels.

Microeconomics

Narrower scope and focuses more on

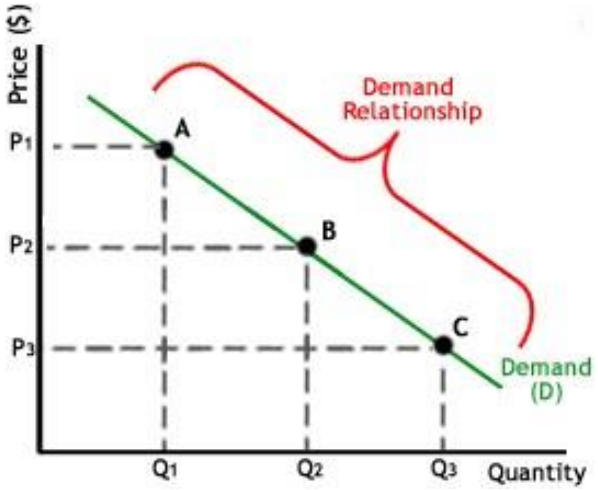
- basic theories of supply and demand, and
- how businesses make production and pricing decisions.

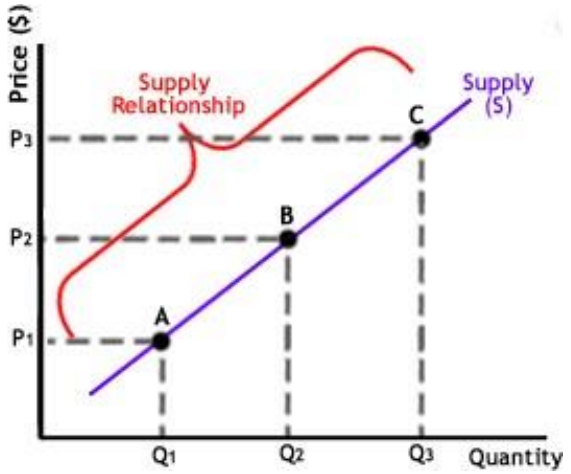
Real Economy

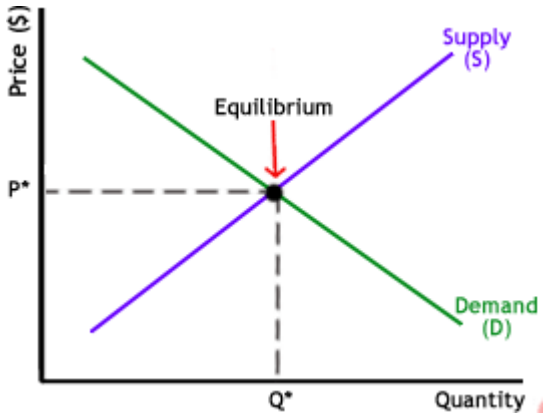
- The part of a country's economy that produces goods and services, rather than the part that consists of financial services such as banks, stock markets, etc., and
- The value of the economy after adjusting for inflation

The Circular Flow

Demand & Supply (Output & Price)







Difference – GDP vs. GNP

GDP	GNP
An estimated value of the total worth of a country's production and services, within its boundary, by its nationals and foreigners, calculated over the course of 1 year	An estimated value of the total worth of production and services, by citizens of a country, on its land or on foreign land, calculated over the course on one year
Total value of Products & Services produced within the territorial boundary of a country.	Total value of Goods and Services produced by all nationals of a country (whether within or outside the country).
Consumption + Investment + Government Spending + (Exports − Imports)	GDP + NR (Net income inflow from assets abroad or Net Income Receipts) - NP (Net payment outflow to foreign assets).
To see the strength of a country's local economy.	To see how the nationals of a country are doing economically.

Measure of National Income

Gross National Product (GNP) - ownership

Value of all final goods and services produced in a country in 1 year

Private consumption + gross investment + government spending + (net income receipts less payments)

Citizens wherever located

Gross Domestic Product (GDP) - location

Market value of all goods and services produced in one year by labour and property supplied by the residents of a country

Private consumption + gross investment + government spending

National Income - Example

	Period Ending		20X1 (RM'Billion)
A	**Gross domestic product**		**11,008.1**
B	Net country's income receipts from rest of the world (C-D)		+55.2
	C Country's income receipts	+329.1	
	D Country's income payments	-273.9	
E	**Gross national product (A + B)**		**11,063.3**

Inflation

To measure changes in price level (inflation/deflation) in an economy, two statistics can be used.

1. **Consumer price index (CPI)** – an index number calculated using a specific set, or basket, of retail goods and services. The CPI indicates the change in prices of the basket from the base year (which is normalized to 100) to the given year: a CPI of 98 indicates that price levels have decreased 2% from the base year.

$$\text{CPI} = [\text{CPI Basket Cost @ Current Prices} / \text{CPI Basket Cost @ Base Prices}] \times 100$$

2. **GDP deflator** - an index number that compares the nominal GDP to real GDP for a given year. It is more comprehensive than CPI since it includes all domestically produced goods and services in a country.

$$GDP\ Deflator = [Nominal\ GDP / Real\ GDP] \times 100$$

The Public Sector

That part of business activity that is organised and controlled by the government or its agencies on behalf of the nation as a whole, comprising :

1. **Central Government**
   - Parliament
   - Government Departments

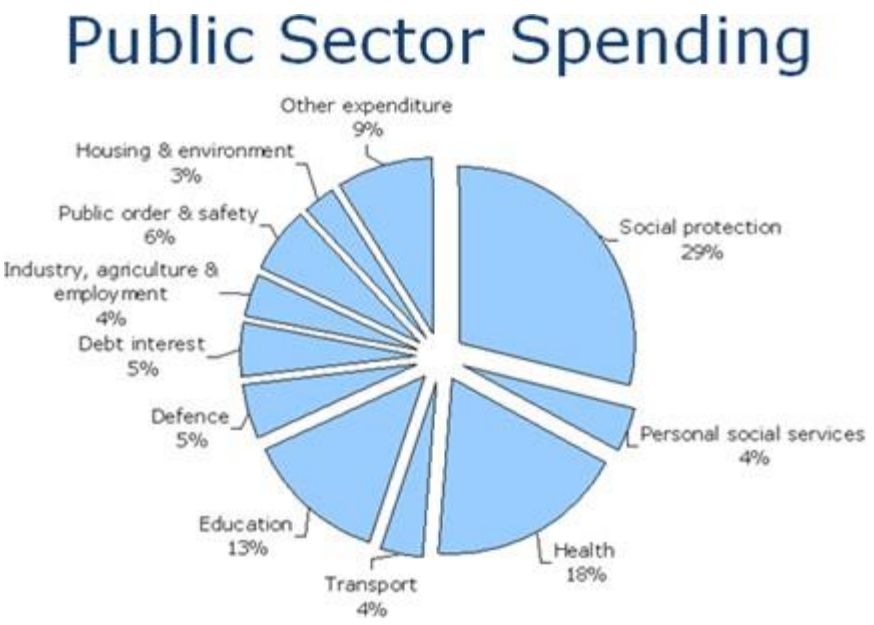
2. **Local Governments**

3. **Public Corporations**

Public Sector Roles & Spending

The Public Sector has a pivotal role:

- To enable a conducive and vibrant economic environment;
- To facilitate growth and competitiveness of the industry and the Private Sector;
- To support the country's manpower needs; an
- To enhance the quality of life of Malaysian citizens.



Fiscal Policy

- Government policies to influence the level of aggregate demand in the economy – deliberate change in revenue and expenditure to influence the level of national outputs and price.

- Objectives
  - Removal of unemployment
  - Maintenance of economic development
  - Maintenance of price stability
  - Reduction in economic equality

- Main instruments
  - (Positive/Negative) Budget
  - Taxation

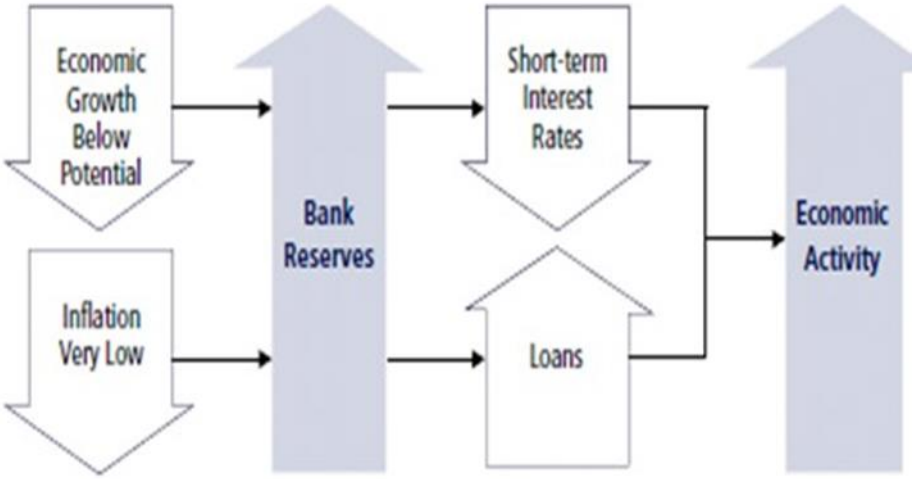
Monetary Policy

- The regulation of the money supply and interest rates by a central bank with objectives of:
  - Control inflation
  - Stablilise exchange rate

- Tight monetary policy – A policy designed to curb inflation by increasing the reserves of commercial banks

- Easy monetary policy – A policy designed to stimulate economic growth by lowering short term interest rates, making money less expensive.

BNM and Interest Rates



- Influencing rates/managing liquidity through:
  - Direct intervention – borrowing and lending through OPR
  - Open market operations
  - Statutory reserve requirements
  - Selective credit and administrative measures

International Economics

- Assesses the implications of international trade in goods and services and international investment.
- Two broad sub-fields:

International trade

- Applies microeconomic models to international economy.
- Describes economic relationships between consumers, firms, factor owners, and the government.

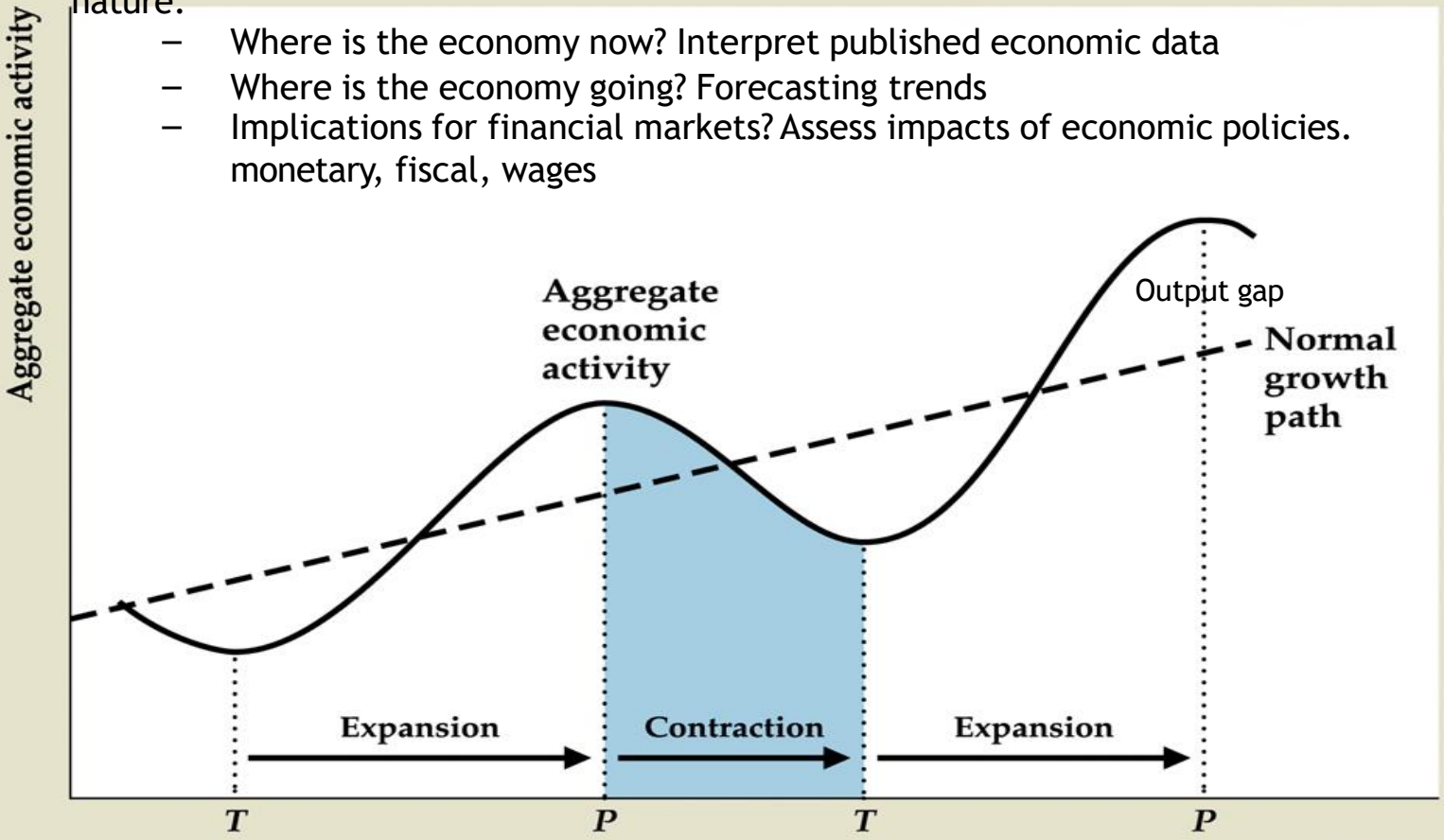
International finance

- Focus on macroeconomic issues and the interrelationships between aggregate economic variables - GDP, unemployment rates, inflation rates, trade balances, exchange rates, interest rates, etc.
- Addresses the pros and cons of fixed versus floating exchange rate systems.

Economic Analysis/Cycles

Study and understanding of trends, phenomena, and information that are economic in nature.

- Where is the economy now? Interpret published economic data
- Where is the economy going? Forecasting trends
- Implications for financial markets? Assess impacts of economic policies. monetary, fiscal, wages



Essence –role of market forces (demand & supply)

Key Macroeconomic Variables

Variable	Direction	Timing
Production		
Industrial production	Procyclical	Coincident
Durable goods industries are more volatile than nondurable goods and services		
Expenditure		
Consumption	Procyclical	Coincident
Business fixed investment	Procyclical	Coincident
Residential investment	Procyclical	Leading
Inventory investment	Procyclical	Leading
Government purchases	Procyclical	—[a]
Investment is more volatile than consumption		
Labor Market Variables		
Employment	Procyclical	Coincident
Unemployment	Countercyclical	Unclassified[b]
Average labor productivity	Procyclical	Leading[a]
Real wage	Procyclical	—[a]
Money Supply and Inflation		
Money supply	Procyclical	Leading
Inflation	Procyclical	Lagging
Financial Variables		
Stock prices	Procyclical	Leading
Nominal interest rates	Procyclical	Lagging
Real interest rates	Acyclical	—[a]

Impact on Financial Markets

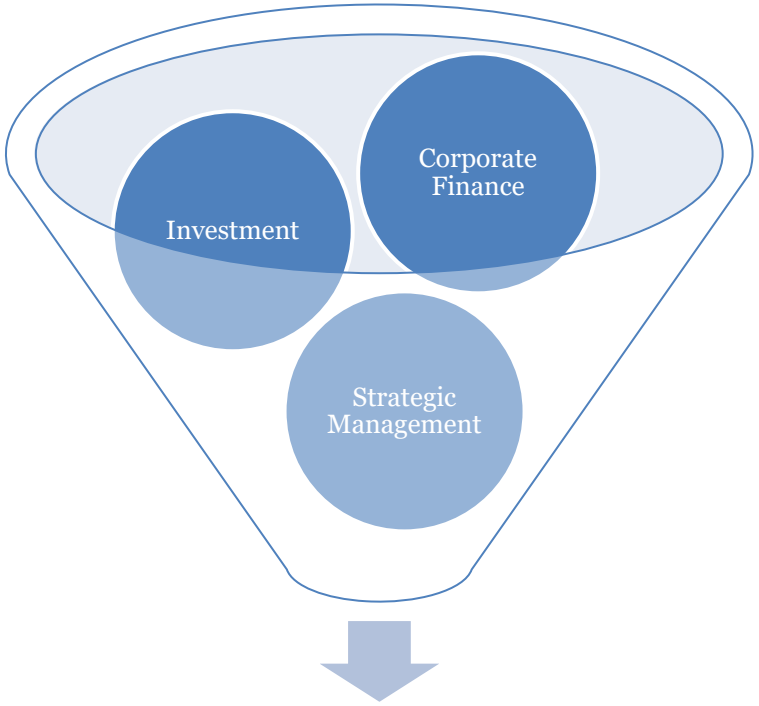
Market	Strong Economy	High Inflation	Low Interest Rate
Stock Market	Up	Down	Up
Bond Market	Down	Down	Up
Forex Market	Up	Down	Up

Topic 3 :Strategic Management

Introduction

- **Corporate Finance** helps corporation make 2 major decisions:
  - Investment Decision – what assets to invest in?
  - Financing Decision – How to raise funds for the investment?

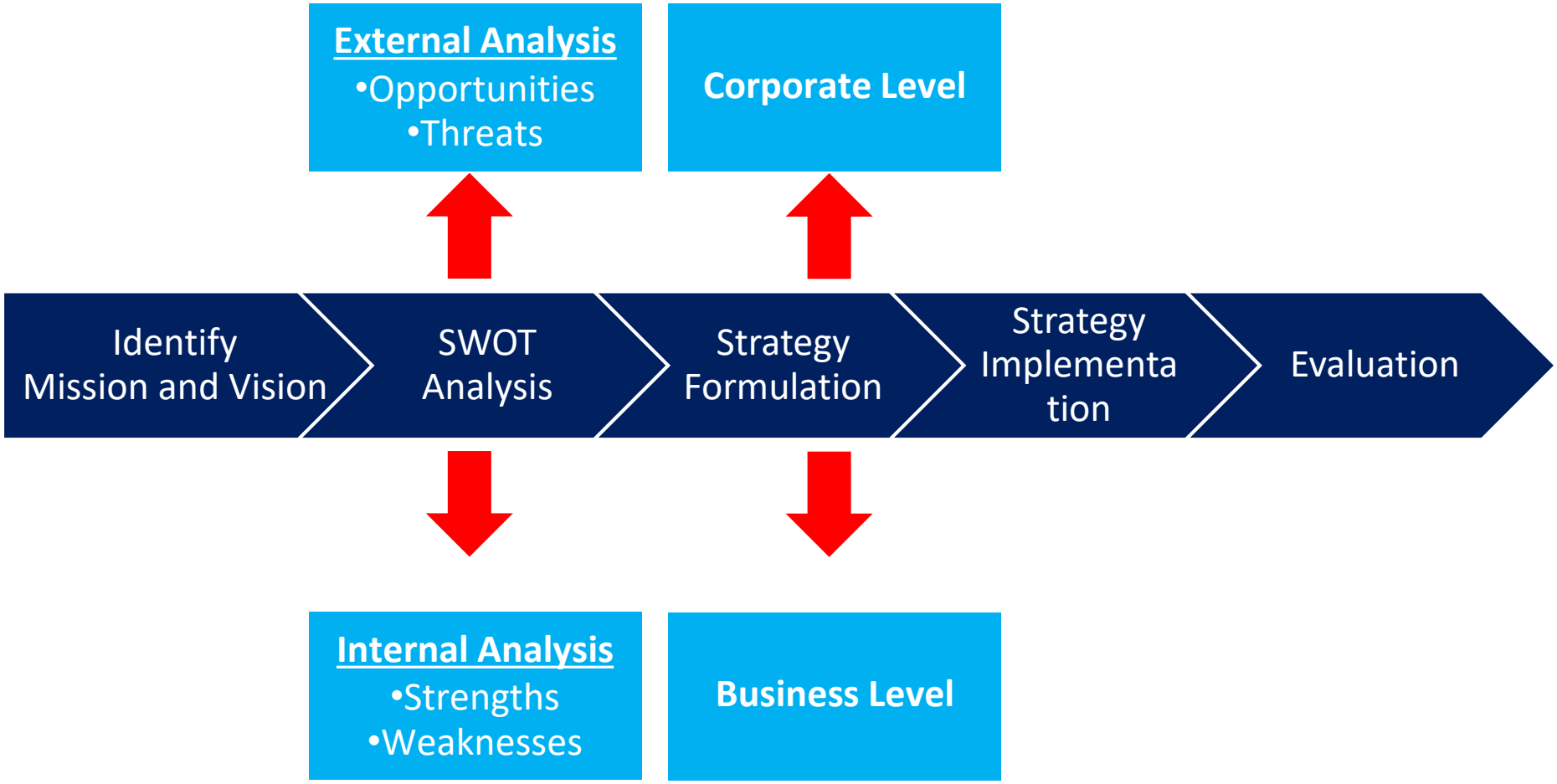
- Understand the relationship



Strategic Management Process

Process of making and implementing major decisions involving the whole organization, to enhance the performance of the organization

- Steps of a Strategic Management Process:



STEP 1: Identify Organisation's Current Mission and Vision

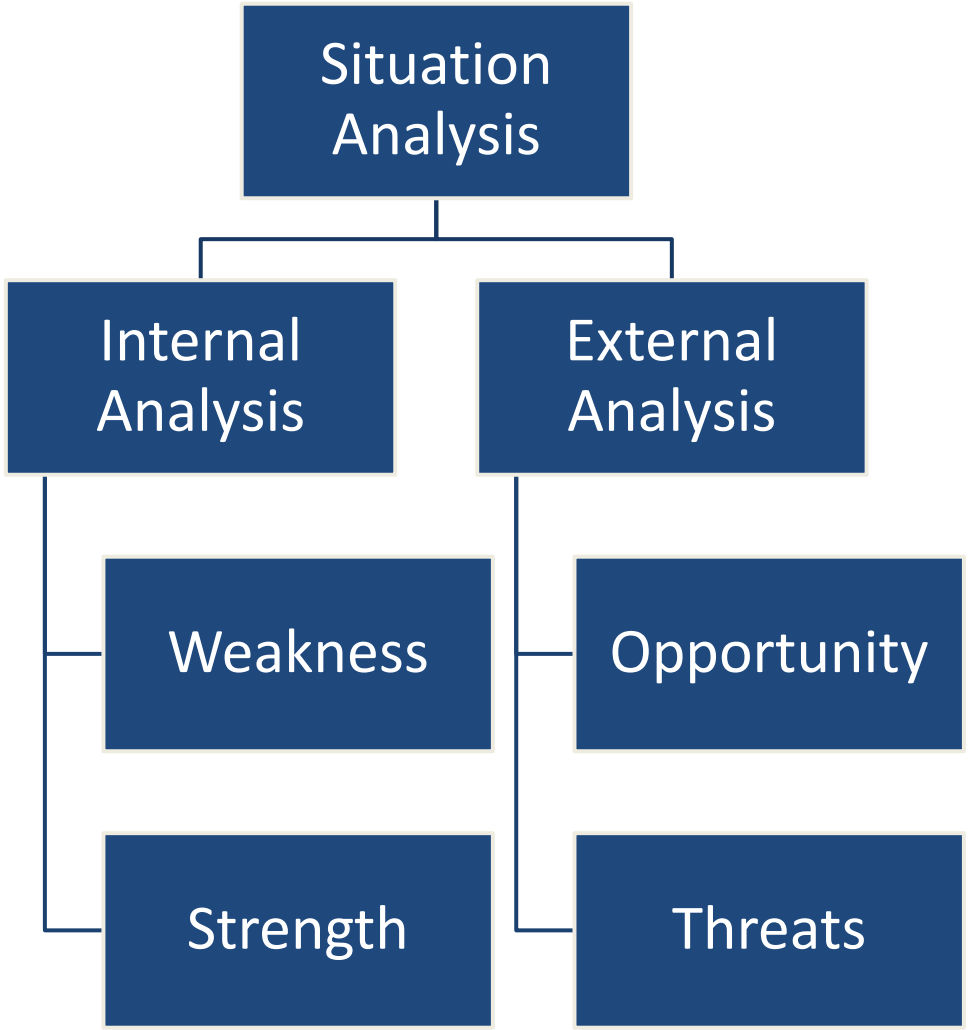
- Examples:
  - **L'Oreal mission** is "The right to be beautiful day after day."
  - **Facebook mission** is "a social utility that connects you with the people around you."

- Components of a Mission Statement
  - **Customers:** Who are the firm's customers?
  - **Markets:** Where does the firm compete geographically?
  - **Products or services:** What are the firm's major products or services?
  - **Technology:** Is the firm technologically current?
  - Concern for survival, growth, and profitability: Is the firm committed to **growth and financial stability**?

- Vision statement: Long term direction of the organisation

STEP 2: Strategic Analysis using SWOT

Analyse Internal & External Environment

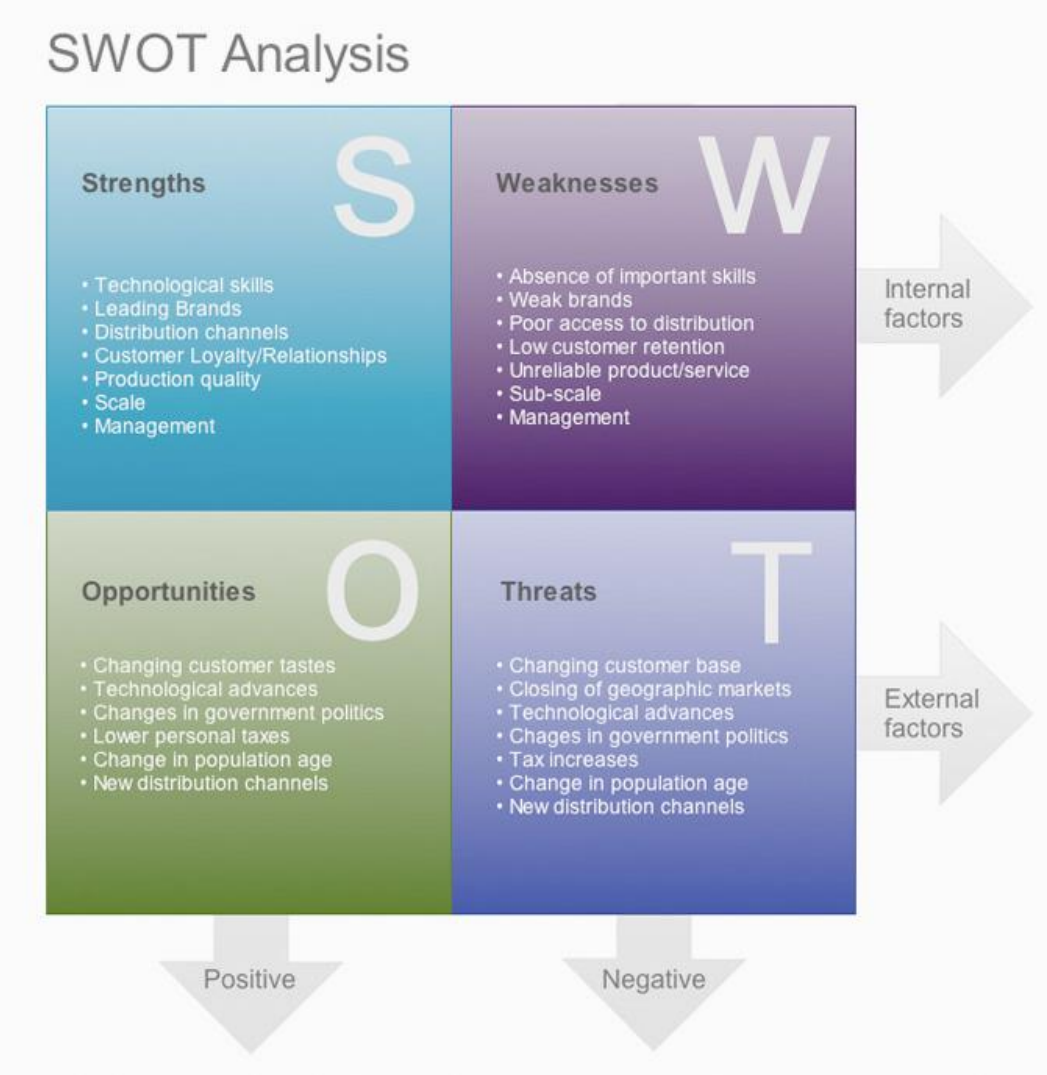


- Financial position
- Human Resources
- Marketing
- Operations

- Political environment
- Economic factors
- Social environment
- Technological factors

STEP 2: Strategic Analysis using SWOT

Analyse Internal & External Environment



Exercise

Conduct a SWOT Analysis for McDonalds

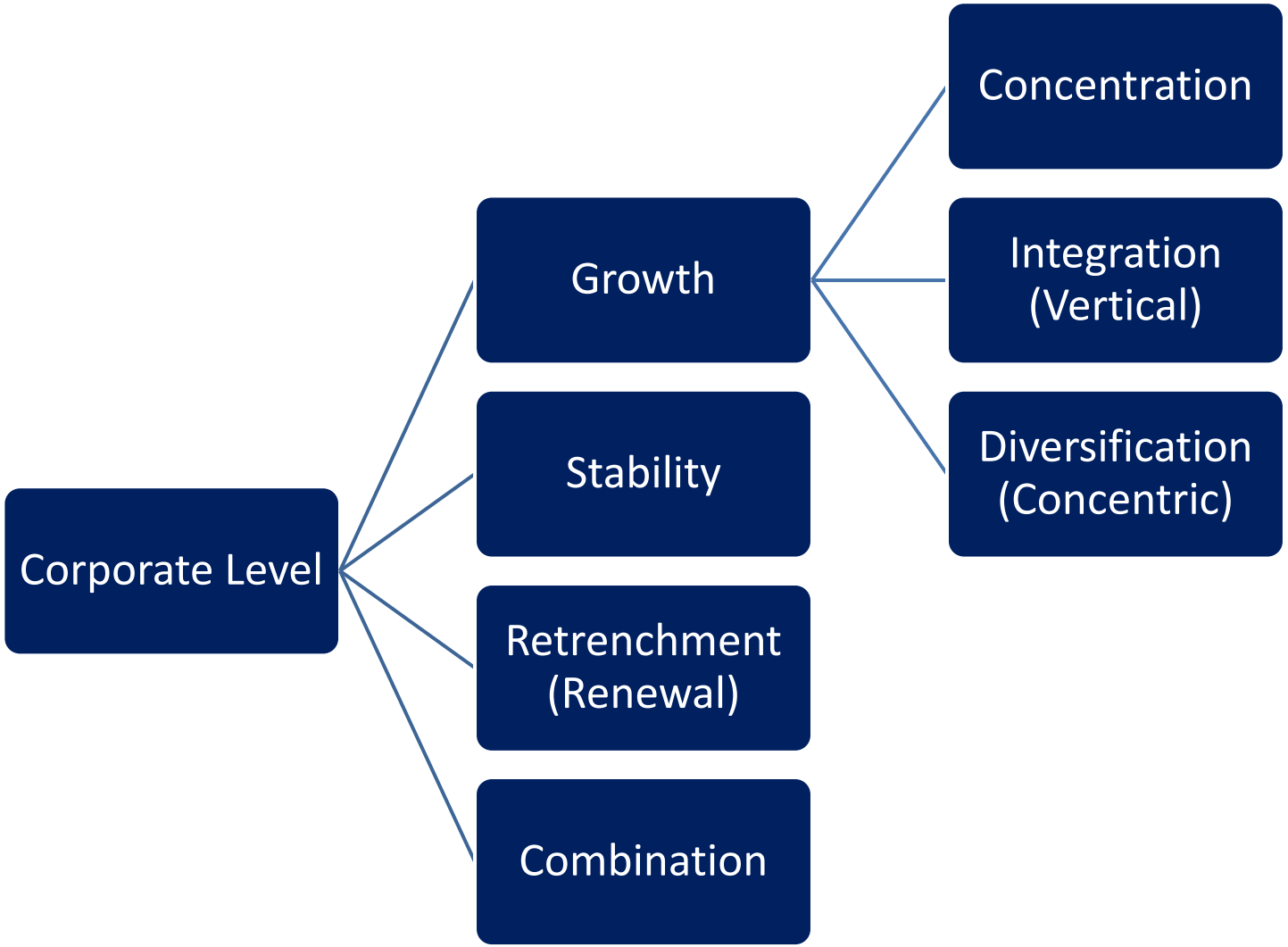
STEP 3: Formulate Strategies
Corporate-Level Strategy vs Business Level Strategy

- Managers need to consider the realities of external environment , their available resources , capabilities, and design strategies that will help the organization achieve its goals

- **Corporate level strategy:**
  - Addresses type of businesses in which the company should invest its resources
  - It is more concerned with the allocation of the company's resources among various businesses so that the overall value of the portfolio is enhanced

- **Business level strategy:**
  - Strategy for how organisation will compete in its business(es).
  - Org. can formulate different types of strategy such as cost leadership, differentiation, or focus.

STEP 3: Formulate Strategies
Corporate-Level Strategy



Summary of Corporate Level Strategy

1. **Growth Strategy:** It can
   - Improve an existing product or service to attract more buyers
   - Increase its promotion and marketing efforts to try to expand its market share.
   - Expand its operations (taking over distribution or manufacturing of another co)
   - Expand into new products or services.
   - Acquire similar businesses.
   - Merge with another company to form a larger company.

2. **Stability Strategy:** It can go for
   - **No-change strategy** (if, for example, it has found that too fast growth leads to foul-ups (misdoing) with orders and customer complaints)
   - **Little-change strategy** (if, for example, the company is growing at breakneck (very fast & dangerous) speed and feels it needs a period of consolidation)

3. **Retrenchment Strategy:** It can
   - Reduce costs, as by freezing hiring or tightening expenses.
   - Sell off (liquidate) assets—land, buildings, inventories etc.
   - Gradually phase out product lines or services.
   - Divest part of its business, as in selling off entire divisions or subsidiaries.
   - Declare bankruptcy.
   - Attempt a turnaround—retrenching, with a view toward restoring profitability.

STEP 3: Formulate Strategies
Business-Level (Competitive) Strategy

- It is a strategy for how organisation will compete in its business(es):
  - **Org. that has 1 main line of business** => strategy describes on how it will compete in its primary or main market
  - **Org. that has >1 line of business** => strategy defines its competitive advantage, offered products or services, target customers, etc.

- According to Michael Porter, to achieve a sustainable competitive advantage and long-term success, a firm must formulate a business strategy that incorporates:
  - **Cost leadership:** keeping costs & prices low for a market such as Dell computer, Timex watch, Home Depot hardware retailer
  - **Differentiation:** offering unique & superior value for a wide market such as Ritz-Carlton hotels, Lexus automobiles
  - **Focus:** offering unique & superior value for a narrow market such as Rolls-Royce, Ferrari, Lamborghini, Cartier jewelry

STEP 4: Implementing Strategies

- No matter how great the organization's strategies are planned, performance will suffer if those strategies are not implemented properly

STEP 5: Evaluate Results

- Managers need to evaluate on:
  - How effective have strategies been at helping organization reach its goals?
  - What adjustments are necessary?

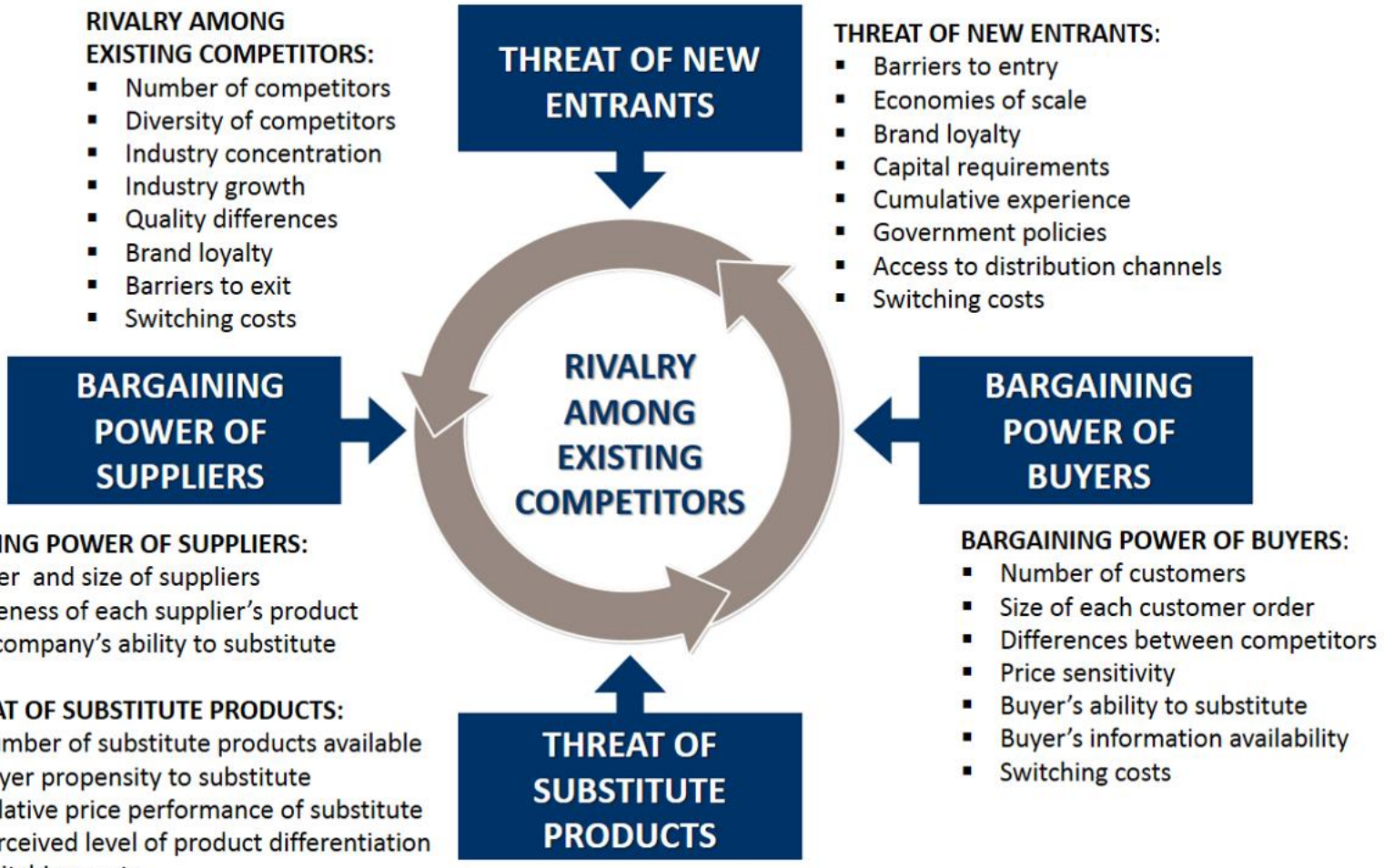
- Example:
  - Anne Mulcahy, Xerox's CEO, made strategic adjustments to regain market share and improve her company bottom line by cutting jobs, sold assets, and reorganized management

Analytical Tools in Strategic Management

1. 5 Forces Analysis
2. BCG Growth-Share Matrix

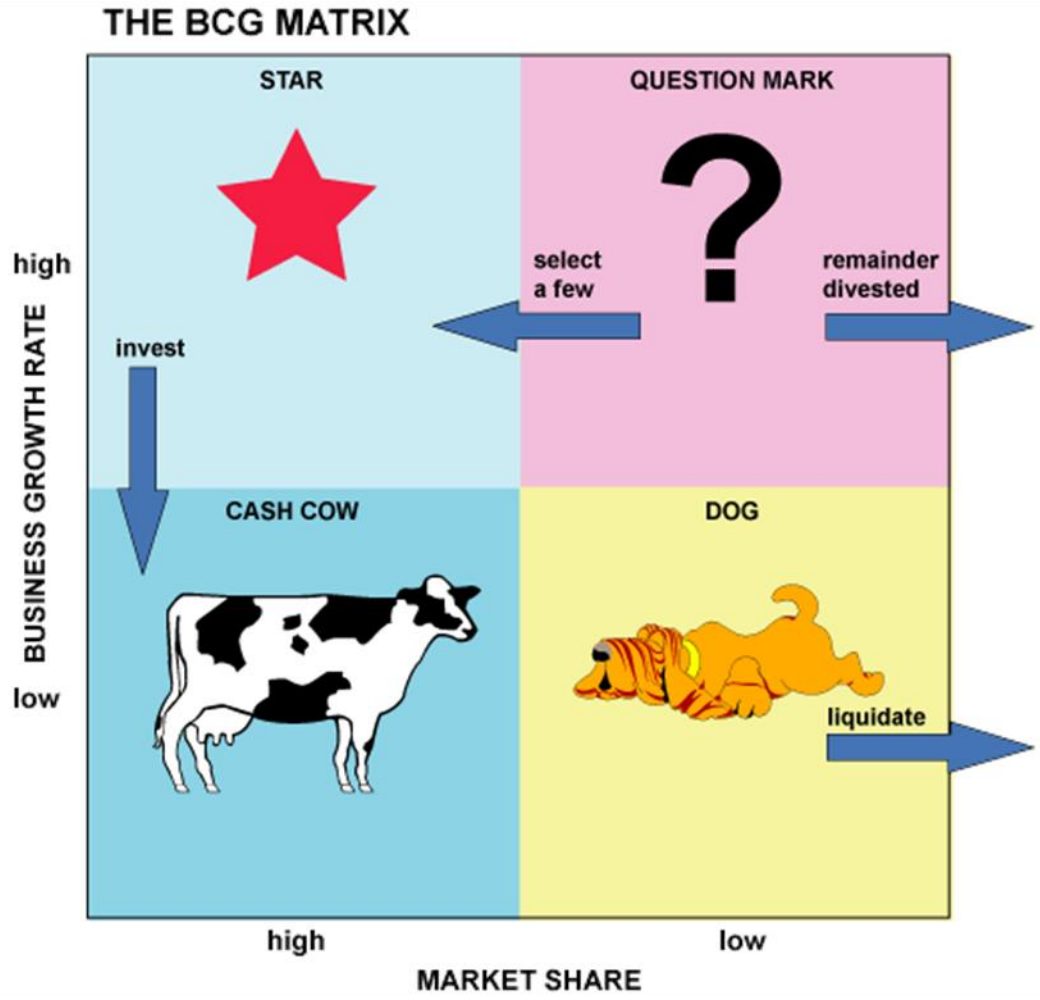
Porter's 5 forces

Determines business attractiveness and profitability



BCG Growth-Share Matrix

Strategy tool used to guide resource allocation decisions on basis of growth potential and market share of strategic business units



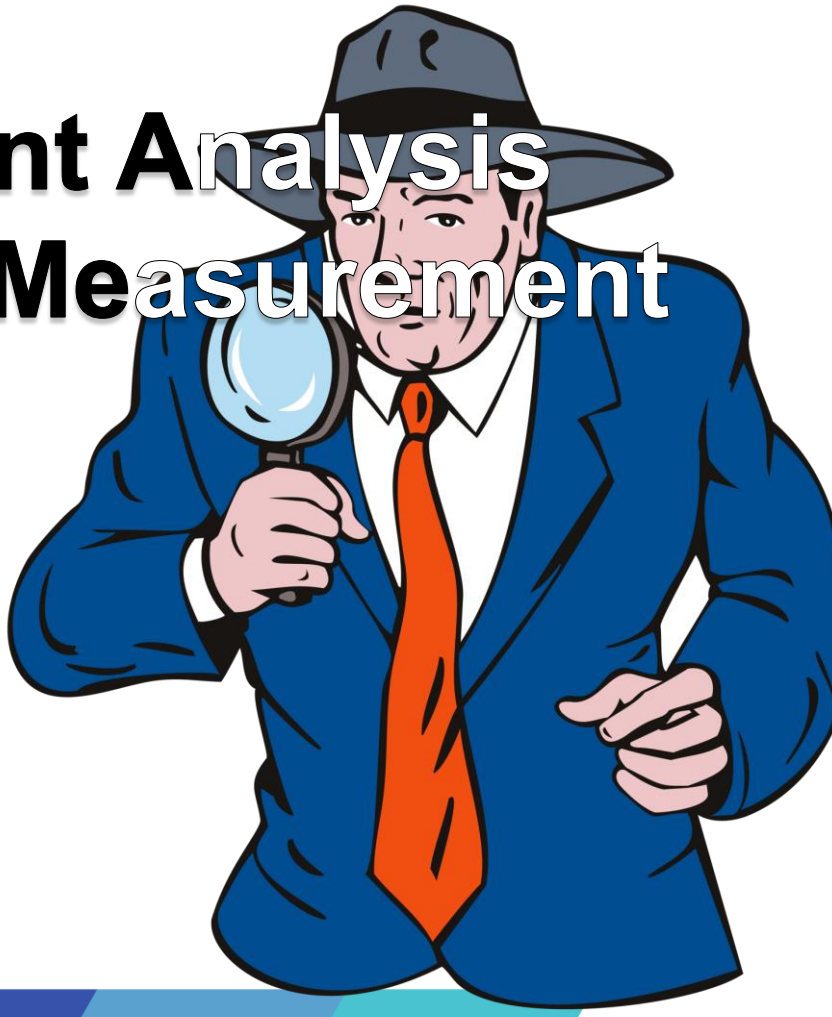
Linking Corporate Finance with Strategic Management

BCG Position	Stage of Development	Corporate Finance Solution
?	Launch	Raise Capital via VC Development Funding
Stars	Growth	Equity financing via IPO Acquisitions Working Capital Management Private Placements
Cash Cows	Maturity	Debt Financing Stock market repositioning M&A
Dogs	Decline	Debt Financing Risk Management Strategies Cash flow management Asset reductions/Refinancings

Shareholder Value

- Ultimate objective of corporate strategy is to **create shareholder value**
- **Corporate Value = Debt + Equity**
- **Share Value = Corporate Value - Debt**
- In summary:
  - Corporate Value = PV of CF from operations during the forecast period
    + Residual Value
    + Value of Marketable Securities and other investments

Topic 4:
Financial Statement Analysis and Performance Measurement



Classification of Business Activities: Operating, Investing, Financing

Activities

- Operating
  - Day-to-day business functioning of an entity
  - Restaurant:- Food sales. Airlines:- Ticket sale
- Investing
  - Acquisition and disposal of **long-term assets**
  - Purchase of bottling equipment by drink manufacturer, Sale of office building/ factory
- Financing
  - Get/Repay capital
  - 2 primary sources:- owners (shareholders) & Creditors
  - Issue Shares, Bank Loan, Bonds

Basics of Accounts and Financial Statements: The Law of Double Entry

5 elements:- Assets, Liabilities, Owners' Equity, Revenue, Expenses

A = L + OE

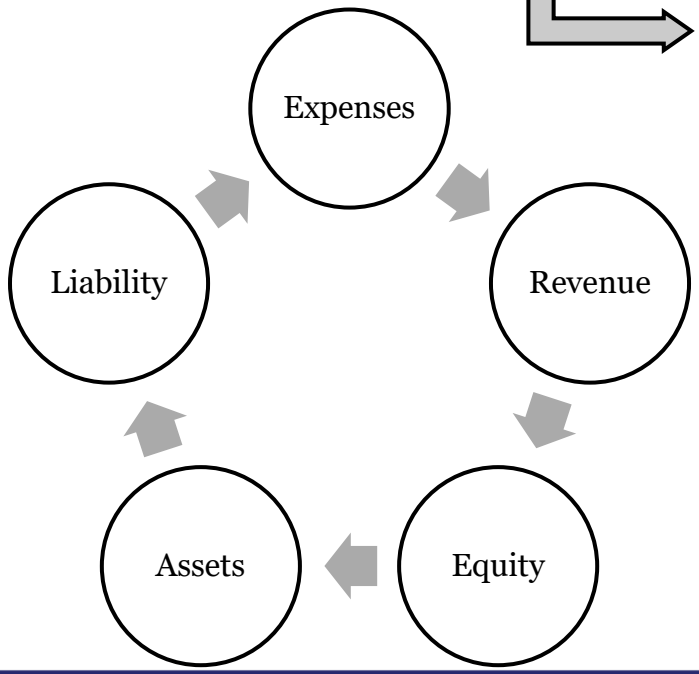
OE = CC + End RE

OE = CC + Begn RE + Profit - Dividend

OE = CC + Begn RE + (R – E) - D

A = L + CC + Begn RE + (R – E) - D

A + E + D = L + C + R



Debit

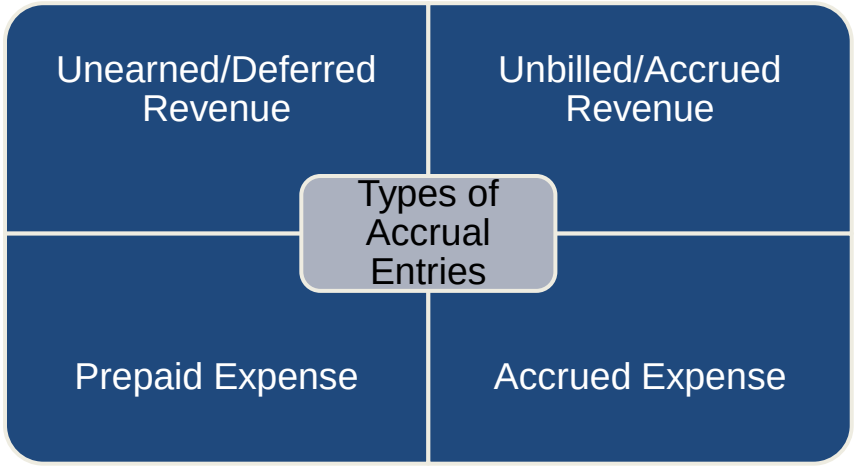
Credit

Accruals and Valuation Adjustments

When cash receipt / disbursements occur in a different period than the related revenue/expense

Accruals

- Accrual accounting: that **revenue** recorded **when earned** and **expenses** be recorded when **incurred**, irrespective of when the related cash movements occur.
- Purpose:- Report revenue and expense in the proper accounting period.

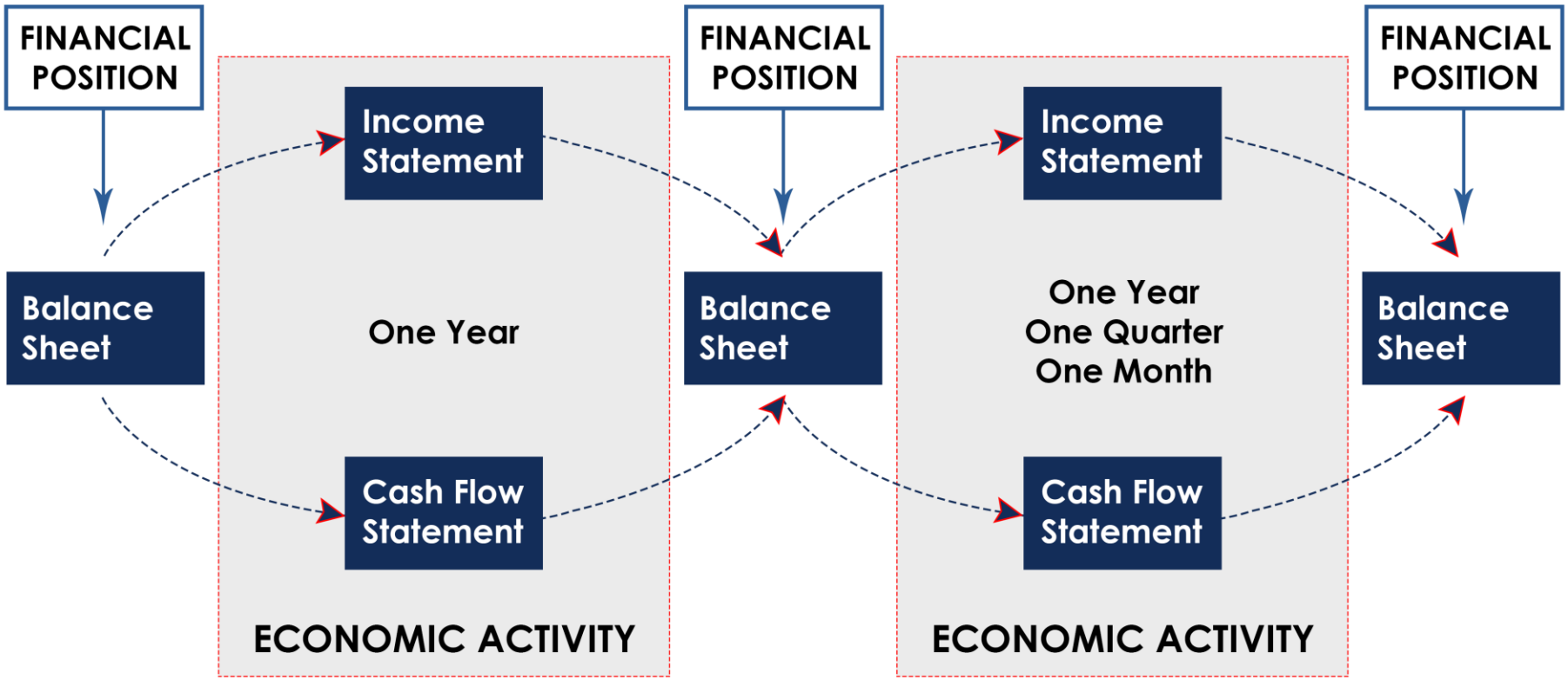


Valuation Adjustments

- Valuation adjustments: Made to Assets/Liabilities so accounting records reflect current market value (not historical cost)
- Not all types of assets to be reported at their current market value.
- Current market value –
  - trading securities - changes in that market value are reported in the income statement.
  - Particular class of investment securities - changes in market value bypass the income statement and are recorded directly into shareholders' equity under "OCI."
- Historical cost - e.g. HTM
- Impact of Valuation adjustment:

Asset ↑ = income statement ↑ or OCI ↑

Summary of Financial Statements



Summary of Financial Statements

- **Income Statement.** This statement provides information about a company's profitability over a period of time. It shows the amount of revenue, expense, and resulting net income or loss for a company during a period of time. Again, less significant accounts can be grouped into a single line item.

- **Balance Sheet.** This statement provides information about a company's financial position at a point in time. It shows an entity's assets, liabilities, and owners' equity at a particular date. Two years are usually presented so that comparisons can be made. Less significant accounts can be grouped into a single line item.

- **Statement of Cash Flows.** This statement provides information about a company's cash flows over a period of time. It shows a company's cash inflows (receipts) and outflows (payments) during the period. These flows are categorized according to the three groups of business activities: operating, financing, and investing.

- **Statement of Owners' Equity.** This statement provides information about the composition and changes in owners' equity during a period of time. A **Statement of Retained Earnings** would report the changes in a company's retained earnings during a period of time.

Components and Format: Income Statement

Net Income = Revenue – Ord Expenses + other Income – other Expenses + (Gains – Losses)

Income Statement
(Statement of Comprehensive Income)

Revenue
- Cost of Goods Sold
Gross Profit

- S,G,A expenses
- Depreciation & Amortization
- Losses / Gains on business
Operating Income

- Finance Cost
Profit before Tax
- Income Tax
Profit from continuing operations before minority interests

- Minority Interests in Earnings
Earnings from Continuing operations

- Earnings from Discontinued Operations
Net Income

- The income statement presents information on the financial results of a company's business activities **over a period of time**.

- **Key items:**
  - **Revenue** = amounts charged (and expected to be received) for the delivery of goods or services in the *ordinary activities* of a business. **Net revenue** = revenue after adjustments.

  - **Expenses** = outflows, depletions of assets, and incurrences of liabilities in the course of the activities of a business.

Components and Format: Balance Sheet

Assets = Liabilities + Equity

Balance Sheet
(Statement of Financial Position)

Assets
- Current Assets
- Non-Current Assets

Liabilities
- Current Liabilities
- Non-Current Liabilities

Equity
- Capital contributed by owners
- Preferred Shares
- Treasury Shares
- Retained Earnings
- Accumulated Other Comprehensive Income
- Non-controlling Interest

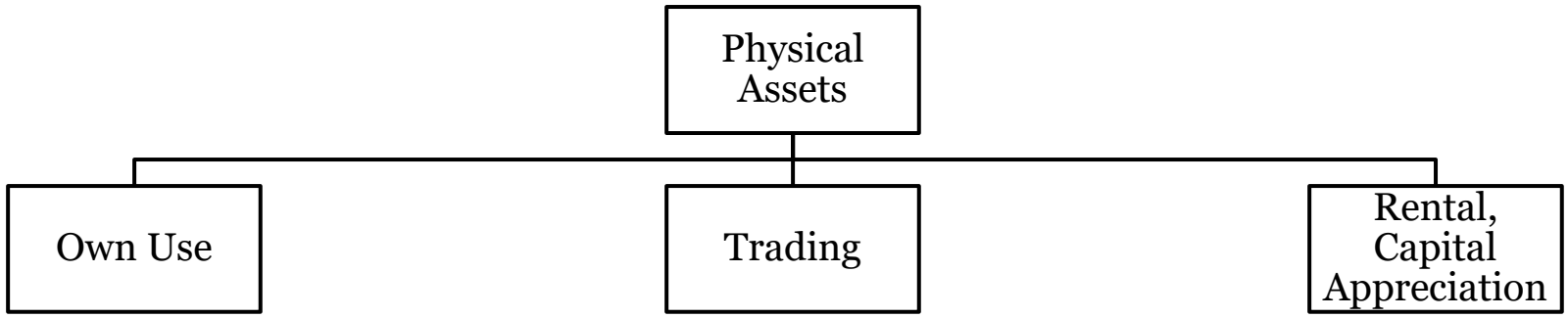
- The balance sheet discloses what an entity **owns (or controls)**, what it **owes**, and what the owners' **claims** are at a **specific point in time**.

- **Key components:**
  - **Assets** = resources controlled by the company as a result of past events and from which future economic benefits are expected to flow *to* the entity.
  - **Liabilities** = obligations of a company arising from past events, the settlement of which is expected to result in an outflow of economic benefits *from* the entity..
  - **Equity** = owners' residual interest in the company's assets after deducting its liabilities.

- The balance sheet amounts of equity (assets - liabilities) is **not** measure of either the market or intrinsic value of a company's equity.

Assets

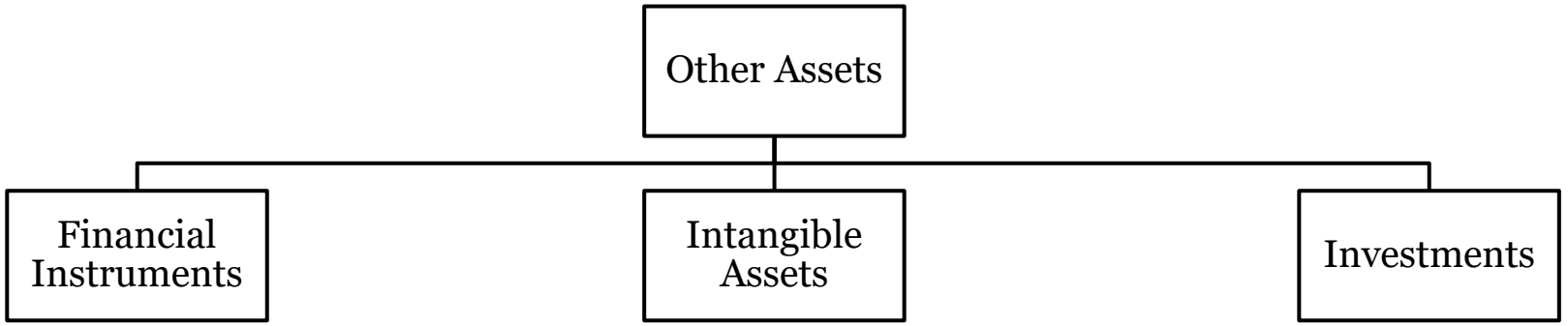
Classification of Assets



Property, Plant, Equipment (PPE) – held at historic cost and be depreciated

Inventory – held at lower of market value or cost

Investment property – held at fair value and not depreciated.



Held at either held-to-maturity (HTM), trading or Available-for-Sale (AFS)

Capitalized and Amortized

Subsidiaries and Associates

Classification: Current / Non Current

Current Assets & Current Liabilities / Non-Current Assets & Non-Current Liabilities

Current Assets

- **Cash and Cash Equivalents**
- **Trade Receivables**
  - amounts owed to a company by its customers for products and services already delivered
- **Inventories**
  - physical products that will eventually be sold to the company's customers, either as finished goods or raw materials and work-in-process.
- **Other Current Assets**

Current Liabilities

- **Trade payables**
  - Amounts that a company owes its vendors for purchases of goods and services
- **Accrued expenses**
  - expenses that have been recognized on a company's income statement but which have not yet been paid as of the balance sheet date
- **Deferred revenue / unearned revenue**
  - When company receives payment in advance of delivery of the goods and services associated with the payment

Non-Current Assets

- Property, Plant and Equipment
- Investment property
- Intangible assets
- Goodwill
- Financial assets

Non-Current Liabilities

- Long-term Financial Liabilities
- Deferred Tax Liabilities

Components and Format: Equity

Components of Equity

Balance Sheet
(Statement of Financial Position)

Equity

Attributable to owners of parent
- Capital contributed by owners
- Preferred Shares
- Treasury Shares
- Retained Earnings
- Accumulated Other Comprehensive Income

Attributable to non-controlling interests
- Non-controlling Interest

- Equity is the owners' residual claim on a company's assets after subtracting its liabilities.

- **Key components:**
  - **Capital contributed by owners** = Amount contributed to the company by owners..
  - **Preferred shares** = Classified as equity or financial liabilities based upon their characteristics rather than legal form.
  - **Treasury shares** = Shares in the company that have been repurchased by the company and are held, not cancelled.
  - **Retained earnings** = Cumulative amount of earnings recognized in the company's income statements which have not been paid to the owners of the company as dividends.
  - **Accumulated other comprehensive income (or other reserves)** = Cumulative amount of other comprehensive income or loss. Comprehensive income includes both **a) net income**, and **b) other comprehensive income**
  - **Non-controlling interest / minority interest** = Equity interests of minority shareholders in the subsidiary companies that have been consolidated by the parent (controlling) company but not wholly owned by the parent company.

Components and Format: Cash Flow

3 components = CFO, CFI, CFF

XYZ co. Ltd. Cash Flow Statement (all numbers in millions of Rs.)	
Period ending	*03/31/2010*
Net income	**21,538**
Operating activities, cash flows provided by or used in:	
Depreciation and amortization	2,790
Adjustments to net income	4,617
Decrease (increase) in accounts receivable	12,503
Increase (decrease) in liabilities (A/P, taxes payable)	131,622
Decrease (increase) in inventories	--
Increase (decrease) in other operating activities	(173,057)
Net cash flow from operating activities	13
Investing activities, cash flows provided by or used in:	
Capital expenditures	(4,035)
Investments	(201,777)
Other cash flows from investing activities	1,606
Net cash flows from investing activities	(204,206)
Financing activities, cash flows provided by or used in:	
Dividends paid	(9,826)
Sale (repurchase) of stock	(5,327)
Increase (decrease) in debt	101,122
Other cash flows from financing activities	120,461
Net cash flows from financing activities	206,430
Effect of exchange rate changes	645
Net increase (decrease) in cash and cash equivalents	2,882

- The cash flow statement reconciles the **cash-based information** provided by the cash flow statement with the **accrual-based information** from the income statement.

- **Key components:**
  - **Operating activities** = company's day-to-day activities that create revenues, with regards to the core business of the company. E.g manufacturing inventory, interest expense/income, **dealing/trading securities**
  - **Investing Activities** = purchasing and selling long-term assets and other investments.
  - **Financing Activities** = obtaining or repaying capital (equity and long term debt).

Format
CFO: Direct Method

XYZ Company
Cash Flow from Operating Activities
Direct Method

	Sales	$ 300,000
+	Decrease in Account Receivable	10,000
	Cash Collections	**310,000**
	Less	
	Cost of goods sold	167,000
+	Increase in inventories	25,000
-	Increase in Accounts Payable	(10,000)
	Cash Payment for Purchases	**182,000**
	SG&A	30,000
	Cash expenses related to R&D	1,500
+	Increase in Prepaid expenses	2,000
	Cash Payment for Operations	**33,500**
	Interest expense	5,000
-	Increase in interest payable	(2,500)
	Cash Interest	**2,500**
	Income taxes	28,150
	Increase in income tax payable	(1,500)
	Cash payment for income taxes	**26,650**
	Net cash flow from operating activities	**65,350**

- The direct method starts with sales and the first subtotal is the cash received from customers, which is

Sales ± Δ Accounts Receivable

- Next, is cash paid to supplier, which is

Cost of Goods Sold ± Δ Inventory
Accounts ± Δ Accounts Payable

- Then, calculate cash from other expenses.

Format
CFO: Indirect Method

XYZ Company Cash Flow from Operating Activities Indirect Method	
Net income	$ 66,800
Adjustments:	
Depreciation and amortization	2,000
Deferred taxes	50
Decrease in accounts receivable	200
Increase in inventories	(4,000)
Increase in accounts payable	1,150
Increase in accrued interest receivable	(350)
Increase in accrued interest payable	100
Gain on sale of property	(600)
Net cash flow from operating activities	65,350

- The indirect method **starts with net income**. By assuming that everything is cash based, adjustments to non cash items are then made.
- **Noncash expenses or gains** are adjusted out. Remember to add back depreciation and minus out gains.
- **Changes in net working capital**. Remember to minus any increase in asset or reduction in liability. To add any decline in asset and increase in liability.

Cash Flow from Investment Activities

		2011
Investing activities:		
Purchases of marketable securities	$	(102,317)
Proceeds from maturities of marketable securities	$	20,437
Proceeds from sales of marketable securities	$	49,416
Payments made in connection with business acquisitions, net of cash acquired	$	(244)
Payments for acquisition of property, plant and equipment	$	(4,260)
Payments for acquisition of intangible assets	$	(3,192)
Other	$	(259)
Cash used in investing activities	$	(40,419)

- Determine investing cash flows by examining changes in long-term assets. **Main focus is on new acquisitions and proceeds from disposal.**

- **New Acquisition**:
  Examine Changes in gross PPE
  Beginning Balance of PPE + New Acquisition – Disposal = Ending Balance of PPE

- **Proceed from Disposal**:
  Will be reflected in P&L – as gain/(loss) from disposal
  Proceeds from Disposal – Carrying Amount (Book Value – Accumulated Depreciation) = Gains/(Loss) from Disposal.

- Examples of cash flow arising from investing activities:
  1. Cash payments or receipts to acquire or dispose PPE, intangibles and other long term assets.
  2. Cash payments to acquire debt or eequity instruments of other companies and interests in joint ventures (other than payments for those considered cash equivalents and those held for dealing or trading purposes)
  3. Cash advances or loans made to other parties (other than advances and loans made by a financial institution

Cash Flow from Investment Activities

XYZ Company
Cash Flow from Financing Activities
Indirect Method

Sale of Bonds	5,000
Stock Repurchase	(6,000)
Cash Dividend	(3,500)
Issue of Preferred shares	80,000
Cash Flow from Financing Activities	**75,500**

- **Long-Term Debt and Common Stock**
  - Retiring long-term debt is a cash outflow relating to financing activities
  - Repurchase of common stock is also a cash outflow related to financing activity.
  - Ensure that changes are cash based and not from corporate action such as conversion of a convertible bond!

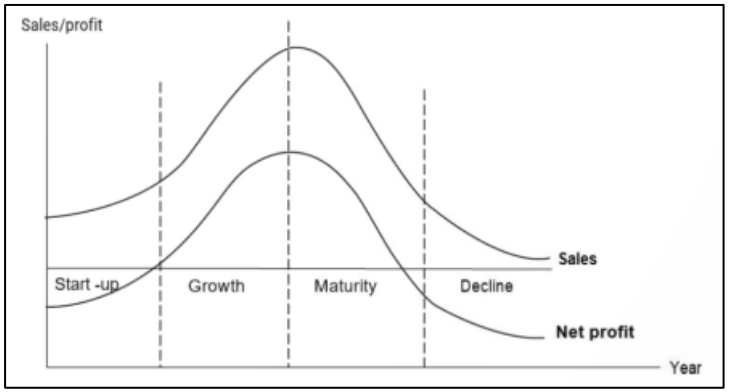
- **Dividends Paid**
  - $RE_{END} - Re_{BEG} = NI - \text{Dividend Declared}$
  - Dividend Paid = Div Declared ± Δ Dividend Payable

Financial Analysis Techniques

Evaluations require comparisons, against itself, other companies, and over time

- **Common-size analysis**
  - "*normalize*" balance sheet and income statement items to allow easier comparison of different size firms.
  - Gives insight into **structure** of firm's financial statements (% of assets – liquid, % of liabilities – short term obligations, or % of sales – cost)
  - ❖ **Cross-Sectional Analysis/Relative Analysis** – to compare between companies
    - Compare specific metric for one company across other companies/ group of companies
  - ❖ **Trend Analysis** – over time

- **Cash Flow Analysis**



- **Ratio Analysis**
  - *Indicator* of some aspect of a company's performance (tells what but not *why*)
  - Not all ratios are relevant
  - Interpretation of result is essential, judgment needed

Liquidity Ratios

Liquidity ratios measures company's ability to meet its short-term obligations.

Liquidity ratios	Formulas	Explanation
Ability to pay CL		
Current Ratio	$\frac{Current\ Assets}{Current\ Liabilities}$	Measures company's ability to pay current liabilities
Quick Ratio	$\frac{Cash + ST\ Mkt.Inv + Acc\ Rec.}{Current\ Liabilities}$	Measures company's ability to pay current liabilities
Cash Ratio	$\frac{Cash + ST\ Mkt.Inv.}{Current\ Liabilities}$	Measures company's ability to pay current liabilities

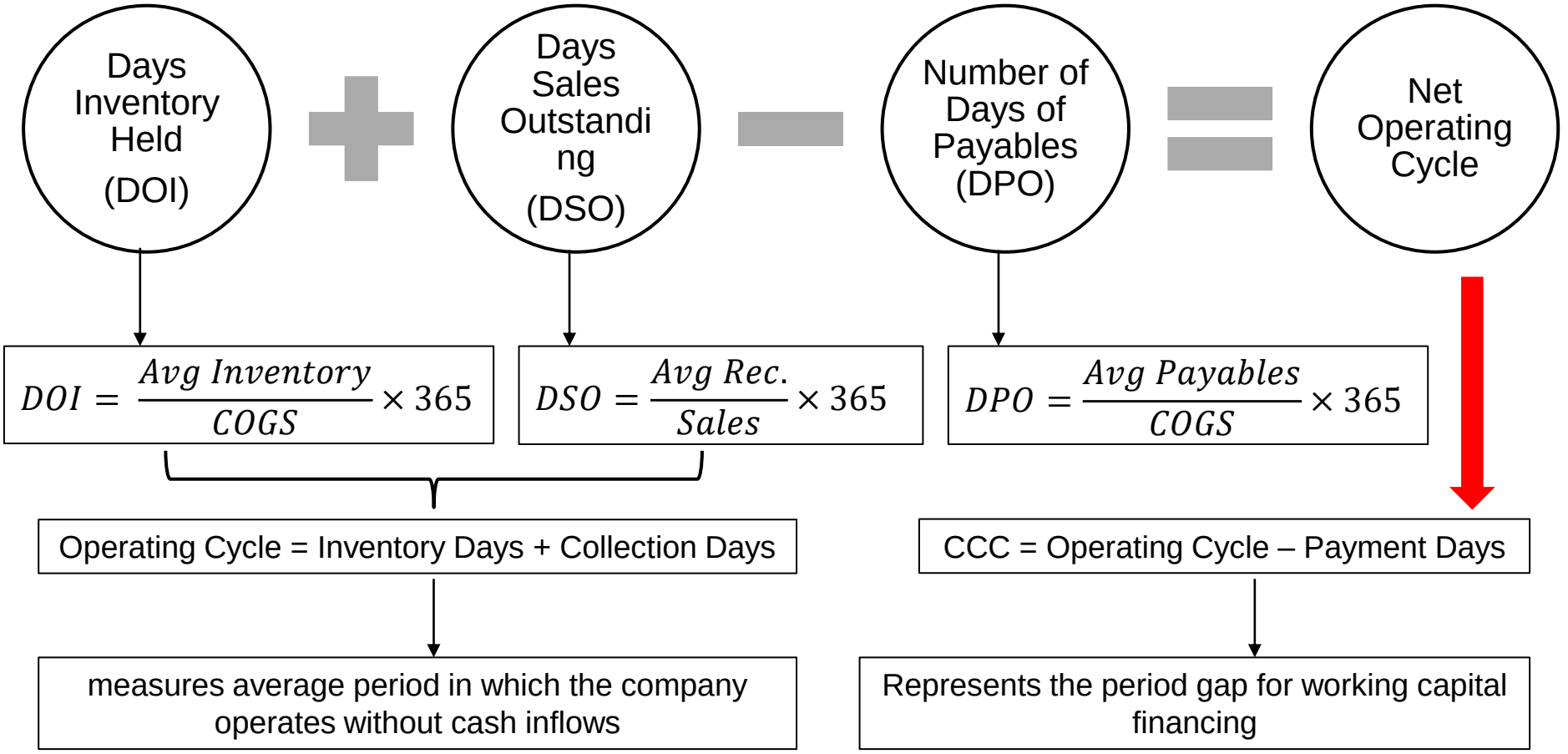
Activity Ratios

Activity ratios measures operational efficiency using a combination of income statement and balance sheet items.

Activity ratios	Formulas	Explanation
Asset utilization ratios		
Fixed asset turnover	$\frac{Revenue}{Average\ net\ Fixed\ Assets}$	Measures effectiveness of the company's use of fixed assets in generating sales
Total asset turnover	$\frac{Revenue}{Average\ Total\ Assets}$	Measures effectiveness of the company's use of its fixed assets in generating sales
Equity turnover	$\frac{Revenue}{Average\ Shareholder's\ Equity}$	Differs from Total Asset Turnover as it excludes Current liabilities, LT Debt and Preference shares
Cash Conversion Cycle		
Days of inventory on hand (DOI)	$\frac{Avg\ Inventory}{COGS} \times 365$	Days required to sell inventory / Average number of days held in storage
Days of sales outstanding (DSO)	$\frac{Avg\ Receivables}{Sales} \times 365$	Days required to convert receivables to cash
Number of days of payables (DPO)	$\frac{Avg\ Payables}{COGS} \times 365$	Average number of days to pay suppliers

Activity -> Liquidity Ratios

Cash Conversion Cycle: amount of time between the outlay of cash and the collection of cash.



Profitability Ratios
Key Formulas

Return on Sales

- $Gross\ Profit\ Margin = \frac{Gross\ Profit}{Revenue}$
  - Indicator of Pricing and Cost Structure
- $Operating\ Profit\ Margin\ = \frac{Operating\ Income}{Revenue}$
  - Indicator of ability to control operating costs.
- $Net\ Profit\ Margin\ (\%) = \frac{Net\ Income}{Revenue}$

Return on Investment

- $Operating\ ROA = \frac{Operating\ Income}{Average\ Total\ Assets}$
  - Reflects return on all assets whether financed by liabilities, debt or equity
- $ROA\ = \frac{Net\ Income + Interest\ expense(1 - Tax\ rate)}{Average\ Total\ Assets}$
  - Measures return earned by company on its assets
- $RO\ Tot\ capital = \frac{EBIT}{Short\ and\ Long\ term\ Debt\ and\ Equity}$
  - Measures profits on all of the capital employed (ST and LT debt, and income)
- $ROE = \frac{Net\ Income}{Average\ Total\ Equity}$
  - Measures return earned by a company on its equity capital (common, minority, preferred)
- $RO\ Common\ Equity = \frac{NI - PD}{Average\ Common\ Equity}$

Profitability Ratios

DuPont Analysis: The Decomposition of ROE

$$ROE = \frac{\text{Net income}}{\text{Average equity}}$$

$$= \frac{\text{Net income}}{\text{Average assets}} \times \frac{\text{Average assets}}{\text{Average equity}}$$

$$= \frac{\text{Net income}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Average assets}} \times \frac{\text{Average assets}}{\text{Average equity}}$$

$$= \frac{\text{Net income}}{\text{EBT}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Average assets}} \times \frac{\text{Average assets}}{\text{Average equity}}$$

EBT → Tax Burden

EBIT → Interest Burden

Revenue → EBIT Margin

Average assets → Total Asset Turnover

Average equity → Leverage

Solvency Ratios

Solvency refers to a company's ability to fulfill its long-term debt obligations, which gives rise to leverage.

Solvency ratios	Formulas	Explanation
Debt ratios		
Debt-to-capital ratio	$\frac{Total\ Debt}{Total\ Debt + Total\ SE}$	Measures the % of a company's capital (D+E) represented by debt
Debt-to-equity ratio	$\frac{Total\ Debt}{Total\ SE}$	Measures the amount of debt capital relative to equity capital
Financial leverage ratio	$\frac{Average\ Total\ Assets}{Average\ Total\ Equity}$	Measures the amount of total assets supported for each one money unit of equity
Coverage ratios		
Interest coverage	$\frac{EBIT}{Interest\ Payments}$	Measures the number of times a company's EBIT could cover its interest payments
Fixed charge coverage	$\frac{EBIT + Lease\ Pmt}{Interest\ Pmt + Lease\ Pmt}$	Relates fixed charges, or obligations, to the cash flow generated by the company
Cash flow / Interest Expense	$\frac{PAT + Dep + Tax\ - Cash\ taxes}{Cash\ Interest\ Pmt}$	Alternative to earnings coverage ratios

Valuation Ratios

Dividend Related Quantities: Payout Ratio, Retention Rate, Sustainable Growth Rate

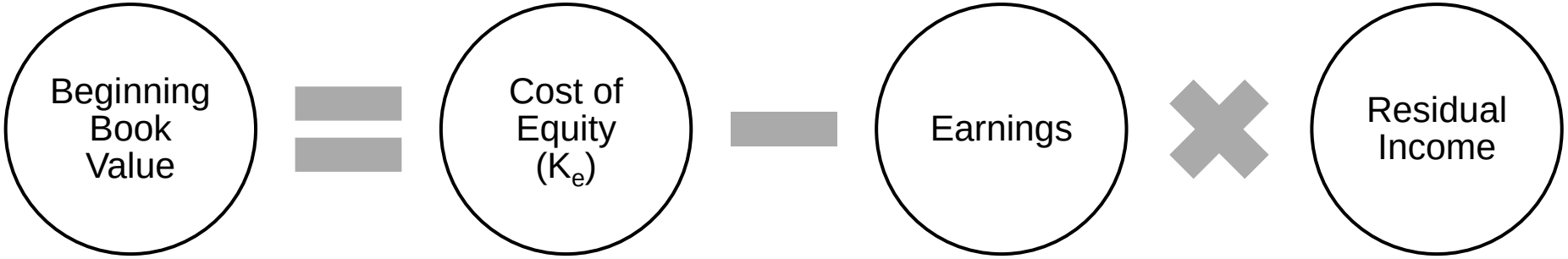
Valuation ratios	Formulas	Explanation
Dividend Related Ratios		
Dividend Payout Ratio	$\frac{Dividend\ per\ share}{Earnings\ per\ share}$	Reflects a company's dividend policy
Retention Rate (b)	$1 - Payout\ Ratio$	Percentage of earnings that a company retains
Dividend Yield	$\frac{Dividend\ per\ share}{Price}$	Dividends as a percentage of share price
Sustainable Growth Rate	$b\ x\ ROE$	A function of profitability (ROE) and its ability to finance itself from internally generated funds (retention rate, b)
Earnings Related Ratios		
Price Earnings Ratio	$\frac{Price\ per\ share}{Earnings\ per\ share}$	Represents price investors willing to pay for every ringgit of earnings

Residual Income

Economic Value Added (EVA) and Market Value Added (MVA)

Residual Income

$$Residual\ Income\ = E_t\ - r_e B_{t\_1}$$



Economic Value Added (EVA)

- measures values added to shareholders by management.

$$EVA\ =\ Net\ Operating\ Profit\ after\ Taxes\ (NOPAT)\ -\ Dollar\ Cost\ of\ Capital$$

- Where Dollar Cost of Capital = (Cost of capital %) x (Total Capital)

Market Value Added (MVA)

- This measures the effect on value of management's decisions since the firm's inception.

$$MVA\ =\ Market\ Value\ of\ Company\ (MV)\ -\ Total\ Capital$$

- EVA and MVA are related concepts: in theory MVA can be thought of as a sum of capitalized future EVA.
- Residual income models are used for equity valuation and also to measure internal corporate performance and to determine management compensation.

Topic 5: Risk and Return

What Determines The Growth of $1 Over T Years?

- $1 today should be worth more than $1 in the future (why?)
- Supply and demand
- Opportunity cost of capital r

$$\$1 \text{ in Year } 0 = \$1 \times (1 + r) \text{ in Year } 1$$
$$\$1 \text{ in Year } 0 = \$1 \times (1 + r)^2 \text{ in Year } 2$$
$$\vdots$$
$$\$1 \text{ in Year } 0 = \$1 \times (1 + r)^T \text{ in Year } T$$

- Equivalence of $1 today and any other single choice above
- Other choices are **future values** of $1 today

What Determines The Value Today of $1 In Year-T?

- $1 in Year-T should be worth less than $1 today (why?)
- Supply and demand
- Opportunity cost of capital r

$$\$1/(1+r) \text{ in Year } 0 = \$1 \text{ in Year } 1$$
$$\$1/(1+r)^2 \text{ in Year } 0 = \$1 \text{ in Year } 2$$
$$\vdots$$
$$\$1/(1+r)^T \text{ in Year } 0 = \$1 \text{ in Year } T$$

- These are our “exchange rates” ($t/$0) or **discount factors**

Example

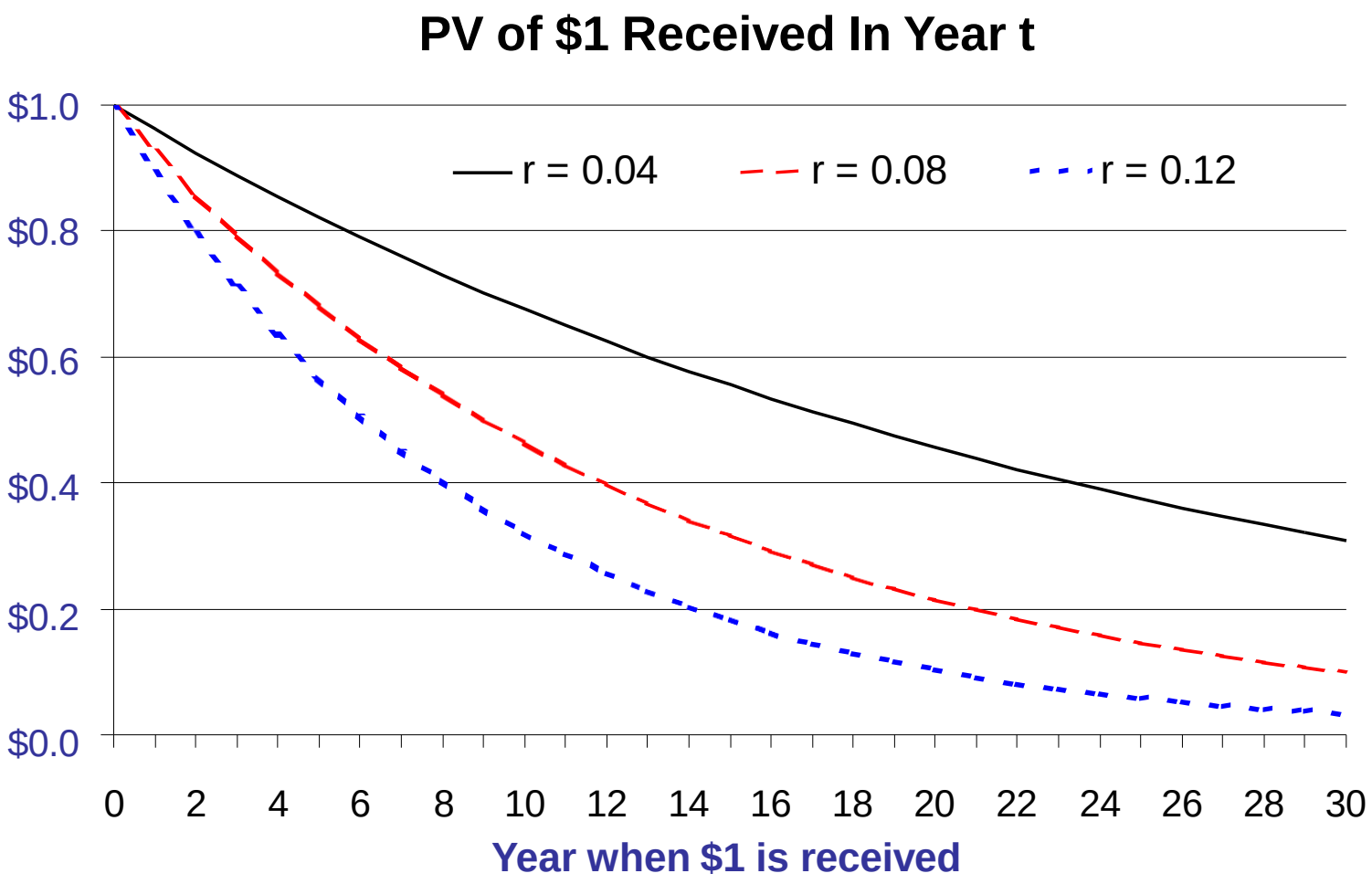
- Suppose you have $1 today and the interest rate is 5%.
- How much will you have in …

1 year …	$\$1 \times 1.05 = \$1.05$
2 years …	$\$1 \times 1.05 \times 1.05 = \$1.103$
3 years …	$\$1 \times 1.05 \times 1.05 \times 1.05 = \$1.158$

- $1 today is equivalent to $\$1 \times (1+r)^t$ in t years
- $1 in t years is equivalent to $\$ \frac{1}{(1+r)^t}$ today

1. The Time Value of Money

Example



2. Cost of Capital

Weighted Average Cost of Capital (WACC)

Definition: The overall opportunity cost of the firm's capital is a weighted average of the opportunity costs of capital from Debt, Preferred Equity and Common Equity.

A project should be undertaken only if

Return on Invested Capital > Opportunity Cost

WACC is given by:

$$WACC = (w_d)[k_d(1 - t)] + (w_{ps})(k_{ps}) + (w_{ce})(k_{ce})$$

Where:

- k_d = Pretax cost of debt.
- $k_d(1 - t)$ = After-tax cost of debt. t is firm's marginal tax rate.
- k_{ps} = The cost of preferred stock.
- k_e = The cost of common equity / required rate of return on common stock
- w_d , w_{ps} , w_{ce} = % of capital component in the capital structure

2. Cost of Capital

Cost of Debt (k_d), Cost of Preferred Stock (k_{ps}), Cost of Common Equity (k_e)

1. Cost of Debt (k_d)

$$\text{After-tax cost of debt} = k_d(1 - t)$$

2. Cost of Preferred Stock (k_{ps})

$$k_{ps} = \frac{preferred\ dividend}{market\ price\ of\ preferred}$$

2. Cost of Capital

Cost of Debt (k_d), Cost of Preferred Stock (k_{ps}), Cost of Common Equity (k_e)

3. Cost of Common Equity (k_e)

i. The capital asset pricing model (CAPM) approach

$$k_{ce} = R_f + \beta[E(R_{mkt}) - R_f]$$

- Step 1: Estimate the risk-free rate, R_f.
- Step 2: Estimate the stock's beta, β. This is the stock's risk measure.
- Step 3: Estimate the expected rate of return on the market, $E(R_{mkt})$.
- Step 4: Use the CAPM equation to estimate the required rate of return

ii. The dividend discount model approach

$$k_{ce} = \frac{D_1}{P_0} + g$$

- Rearranged from

$$P_0 = \frac{D_1}{k_{ce} - g}$$

where:

D_1 = next year's dividend

k_{ce} = required rate of return on common equity

g = firm's expected constant growth rate

2. Cost of Capital
Examples

i. Dexter Berhad, is planning to issue new debt at an interest rate of 7.5%. Dexter has a 40% marginal federal-plus-state tax rate. What is Dexter's cost of debt capital?

ii. Suppose Dexter Berhad, has preferred stock that pays an $8.50 dividend per share and sells for $100 per share. What is Dexter's cost of preferred stock?

iii. Suppose R_f = 5%, R_{mkt} = 11%, and Dexter has a beta of 1.1. Estimate Dexter's cost of equity.

3. Capital Budgeting

- **Evaluation of capital investments**
  - i.e. should a capital investment be undertaken?

- **Techniques**
  - Widely used
    - Net present value (NPV)
    - Internal rate of return (IRR)

- **Others**
  - Payback Period
  - MIRR

3. Capital Budgeting

Net present value (NPV)

Definition

- Net present value (NPV) is the sum of the present values of all the expected incremental cash flows if a project is undertaken.

$$NPV = CF_0 + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n} = \sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}$$

where:

CF_0 = initial investment outlay (a negative cash flow)

CF_t = after-tax cash flow at time t

k = required rate of return for project

- The discount rate used is the firm's cost of capital, adjusted for the risk level of the project.
- For a normal project, with an initial cash outflow followed by a series of expected after-tax cash inflows, the NPV is the PV of the **expected inflows - initial cost of the project**.
- For *independent projects*, the NPV decision rule: *Accept* any project NPV > 0

3. Capital Budgeting

Internal Rate of Return (IRR)

Definition

- IRR is the **Discount Rate** that makes the PV of the expected incremental after-tax cash inflows = initial cost of the project, i.e. the discount rate that makes the following relationship hold:

$$\text{PV (inflows)} = \text{PV (outflows)}$$

$$\text{NPV} = 0 = \text{CF}_0 + \frac{\text{CF}_1}{(1+\text{IRR})^1} + \frac{\text{CF}_2}{(1+\text{IRR})^2} + \ldots + \frac{\text{CF}_n}{(1+\text{IRR})^n} = \sum_{t=0}^{n} \frac{\text{CF}_t}{(1+\text{IRR})^t}$$

- the IRR decision rule: *Accept* any project if IRR > required rate of return

3. Capital Budgeting

NPV vs IRR

Example

Using the project cash flows presented in Table 1, determine if it should be accepted or rejected. Assume that the cost of capital is 9%.

Year	**0**	**1**	**2**	**3**
Cashflow	**-$100**	**25**	**50**	**75**

1. Calculate NPV of the project

2. Calculate IRR of the project

3. Capital Budgeting
NPV vs IRR Project Rankings

- For **independent projects**, IRR and NPV give same accept/reject decisions

- For **mutually exclusive projects**, IRR and NPV project rankings may differ when:
  - The projects have different timing of CFs
  - The projects are different sizes (CF_0)

- **Different reinvestment rate assumptions:**
  - IRR assumes CF reinvestment at project's IRR, while NPV assumes CF reinvestment at cost of capital (more conservative)

3. Capital Budgeting

Payback Period (PBP) and Discounted Payback Period (Discounted PBP)

- The **payback period (PBP)** = the number of years it takes to recover the initial cost of an investment.
- The **discounted payback period (discounted PBP)** = uses the PV of the project's estimated cash flows.
  - It is the number of years it takes a project to recover its initial investment in present value terms and, therefore, **must be > than the payback period without discounting**.

- **Example:**

Year	**0**	**1**	**2**	**3**
Cashflow	**-$100**	**25**	**50**	**75**

4. Risk

Sample Variance and Sample Standard Deviation

Definition:

- **Variance** = average of the squared deviations around the mean.

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

where $\bar{x}$ is the sample mean and n is the number of observations in the sample

- **Standard deviation =** positive square root of the variance

$$s = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}}$$

where $\bar{x}$ is the sample mean and n is the number of observations in the sample

- **Coefficient of Variation =** ratio of the standard deviation of a set of observations to their mean value

$$\mathrm{CV} = s/\bar{X}$$

4. Risk

Covariance and Correlation Coefficient

Definition:

- **Covariance** (s_{XY}) = measure of how two variables in a sample move together.

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

- **Correlation =** a standardized measure of how two variables in a sample move together

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

4. Risk

Example: Mean Return, Variance of Returns, Covariance of Returns, and Correlation

An analyst gathered the following information regarding the returns on two stocks.

Calculate the **mean return, sample variance, sample covariance,** and **correlation of returns** for these two stocks.

Year	Stock 1 Return	Stock 2 Return	R_t-R_1	R_t-R_2	$(R_t$-$R_1)(R_t$-$R_2)$
2006	0.200	0.100	0.183	0.008	0.002
2007	0.100	0.150	0.083	0.058	0.005
2008	–0.150	–0.050	–0.167	–0.142	0.024
2009	–0.200	0.100	–0.217	0.008	–0.002
2010	0.050	0.050	0.033	–0.042	–0.001
2011	0.100	0.200	0.083	0.108	0.009
Sum	**0.100**	**0.550**			**0.036**

4. Return

Arithmetic Return and Geometric Return

Definition:

- **Arithmetic Mean** ($\bar{x}$) = sum of the values of the observations divided by the number of observations

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

- **Geometric Mean Return Formula =** the average rate of return of a set of values calculated using the products of the terms (CAGR)

$$R_G = \left[\prod_{t=1}^{T}(1 + R_t)\right]^{\frac{1}{T}} - 1$$

4. Return

Example: Arithmetic Return and Geometric Return

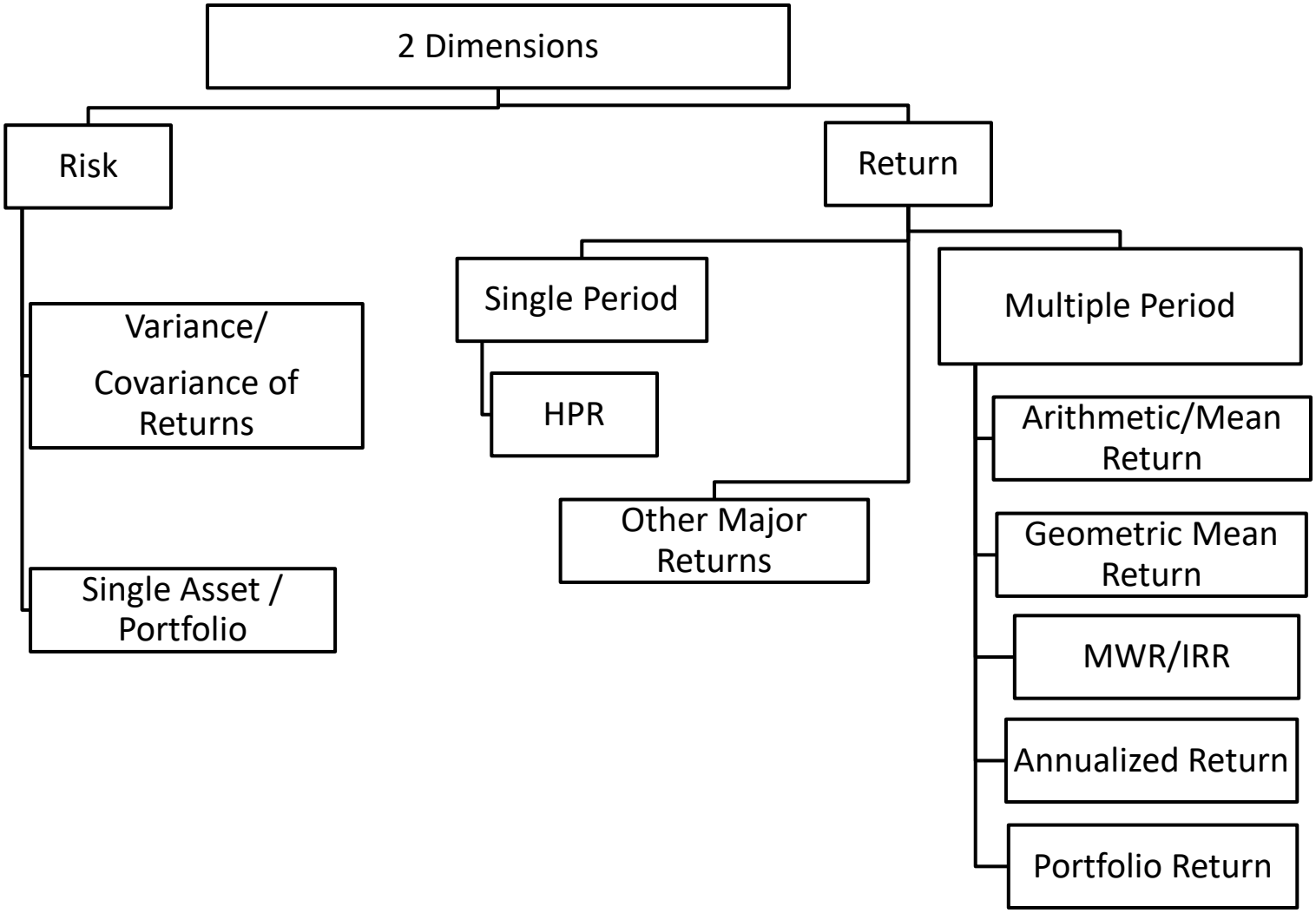
Example:

An analyst gathered the following information. Calculate the **arithmetic and geometric mean return.**

	52- week return		
Index	**Year 1**	**Year 2**	**Year 3**
Country A	-2.4	-3.1	6.2
Country B	-4.0	-3.0	3.0
Country C	5.4	5.2	-1.0

Topic 6: Portfolio Theory

Investment Characteristics of Assets



Returns: Measuring Returns

- Single Period Return
  - Holding Period Return

$$R = \frac{P_t - P_{t-1} + D_t}{P_{t-1}} = \frac{P_t - P_{t-1}}{P_{t-1}} + \frac{D_t}{P_{t-1}} = \text{Capital gain} + \text{Dividend yield}$$

$$R = [(1 + R1) \times (1 + R2) \times (1 + R3)] - 1$$

- Multiple Period Return/ Average Returns
  - Arithmetic or Mean Return

$$\overline{R}_i = \frac{R_{i1} + R_{i2} + \cdots + R_{iT-1} + R_{iT}}{T} = \frac{1}{T}\sum_{t=1}^{T} R_{it}$$

  - Geometric Mean Return

$$\overline{R}_{Gi} = \sqrt[T]{(1+R_{i1}) \times (1+R_{i2}) \times \cdots \times (1+R_{iT-1}) \times (1+R_{iT})} - 1 = \sqrt[T]{\prod_{t=1}^{T}(1+R_{it})} - 1$$

  - Money Weighted Return or Internal Rate of Return

$$\frac{CF_0}{(1+IRR)^0} + \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \frac{CF_3}{(1+IRR)^3} = 0$$

- Annualized Returns

$$r_{annual} = (1 + r_{period})^c - 1$$
$$c : \text{number of periods in a year}$$

- Portfolio Return

$$R_{portfolio} = \sum_{i=1}^{N} w_i R_i$$
$$\text{where} \sum_{i=1}^{N} w_i = 1$$

Other Major Returns

- Effect of **Fees**
  - Expenses = Management Expenses, Custodial Fees, Taxes
  - Trading expenses?
  - When to use each type?

$$Net\text{Returns} = Gross\text{Returns} - Expenses$$

- Effect of **Taxes**
  - Pre-tax and After-tax Nominal returns
  - The 2 types of Returns are taxed differently

- Effect of **Inflation**
  - Nominal Return: 3 components
  - Real Returns are useful in comparing returns across time, countries and as a benchmark.

$$(1+r) = (1+r_{rF}) \times (1+\pi) \times (1+RP)$$
$$(1+r_{real}) = (1+r_{rF}) \times (1+RP)$$

- Effect of **Leverage**
  - 2 ways of leveraging:
    - Borrowing money
    - Derivatives

Risk: Measuring Risk

- Single Asset
  - Population Variance
  - Sample variance

$$\sigma^2 = \frac{\sum_{t=1}^{T}(R_t - \mu)^2}{T}$$

$$\sigma = \sqrt{\sigma^2}$$

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

$$s = \sqrt{s^2}$$

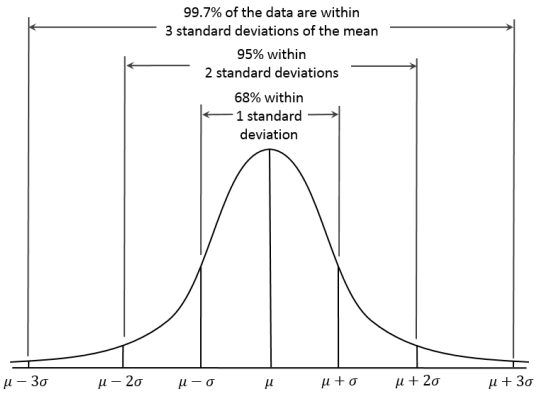
- Portfolio of Assets

$$\sigma_P^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2Cov(R_1, R_2)$$

$$\sigma_P = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2Cov(R_1, R_2)}$$

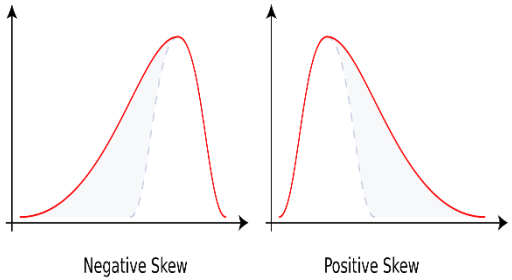
Other Investment Characteristics

- Distributional Characteristics
  - Normal Distribution

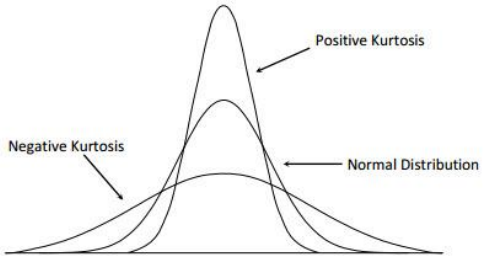


Deviations from Normality

Skewness



Kurtosis



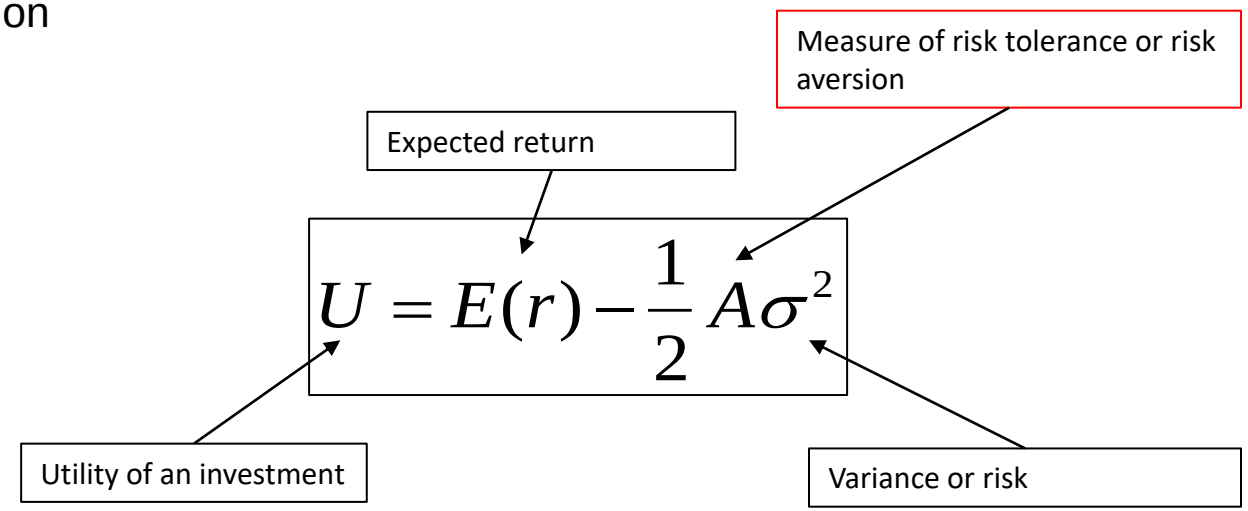
- Market Characteristics
  - Liquidity:- Affects Bid-Ask Spread, Price Impact
  - Analyst coverage, availability of information, firm size, etc

Utility Theory: Rational Man

- Utility is a measure of **relative satisfaction** from consumption of various goods and services or in the case of investments, the satisfaction that an investor derives from different portfolios.

- 4 axioms of Economic Utility Theory:
  - Completeness (A>B or B>A or A=B)
  - Transitivity (if A>B, and B>C, therefore A>C)
  - Independence (if A>B, tA + (1-t)C > tB + (1-t)C)
  - Continuity (if A>B>C, then B = pA + (1-p)C

- Utility Function

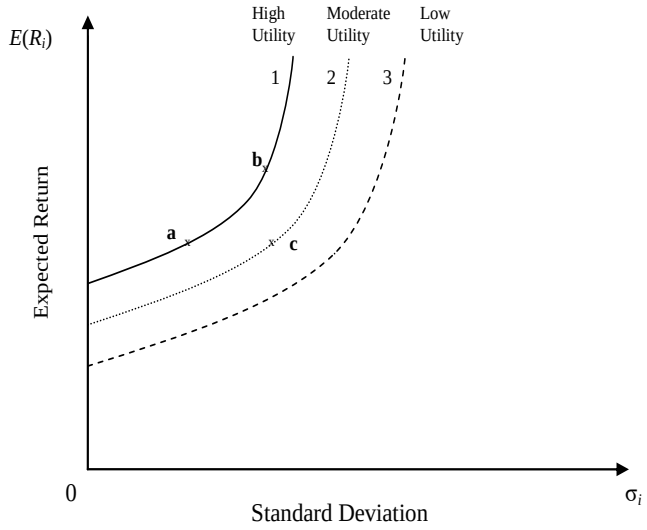


Utility Theory: Risk Aversion

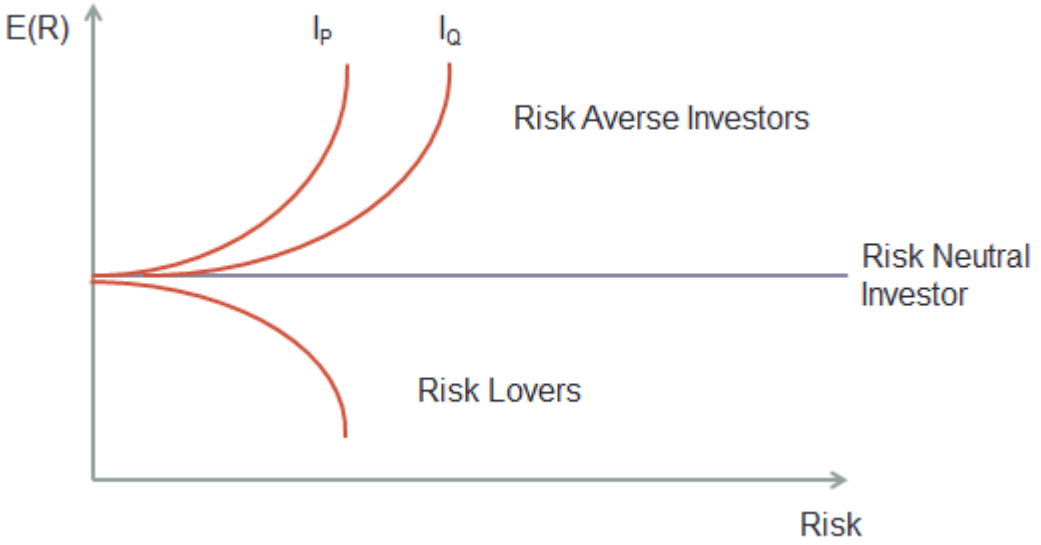
- Utility is a measure of **relative satisfaction** from consumption of various goods and services or in the case of investments, the satisfaction that an investor derives from different portfolios.
- The concept of risk aversion is related to the behaviour of individuals under uncertainty.
- Assume that an individual is offered two alternatives:
  1) He gets RM50 for sure
  2) A gamble with a 50 percent chance that he gets RM100 and 50 percent chance that he gets nothing.
  The expected value in both cases is RM50, one with certainty and the other with uncertainty.
- 3 choices:
  - Investor chooses the gamble,
  - The investor chooses RM50 with certainty, or
  - The investor is indifferent
- What would the investor choose if he is:
  - Risk Loving / Seeking?
  - Risk Neutral?
  - Risk Averse?
- What about Risk Tolerance?

Utility Theory: Indifference Curves

- An indifference curve plots the combination of risk-return pairs that an investor would accept to maintain a given level of utility.



Risk Averse Investor



Different Levels of Risk Aversion

Portfolio Theory: Capital Allocation Line

- Consider a portfolio of 2 assets, a risk-free asset and a risky asset.
- Expected return and risk for that portfolio can be determined using the following formulas:

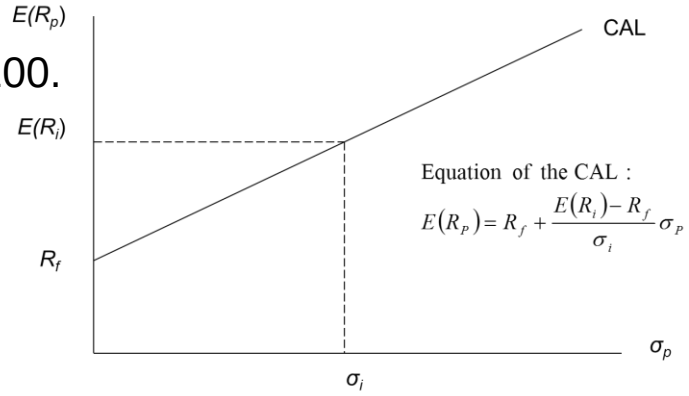
$$E(R_P) = w_1 R_f + (1 - w_1) E(R_i)$$

$$\sigma_P^2 = w_1^2 \sigma_f^2 + (1 - w_1)^2 \sigma_i^2 + 2 w_1 (1 - w_1) \rho_{fi} \sigma_f \sigma_i$$

$$= (1 - w_1)^2 \sigma_i^2$$

$$\sigma_P = \sqrt{(1 - w_1)^2 \sigma_i^2} = (1 - w_1) \sigma_i$$

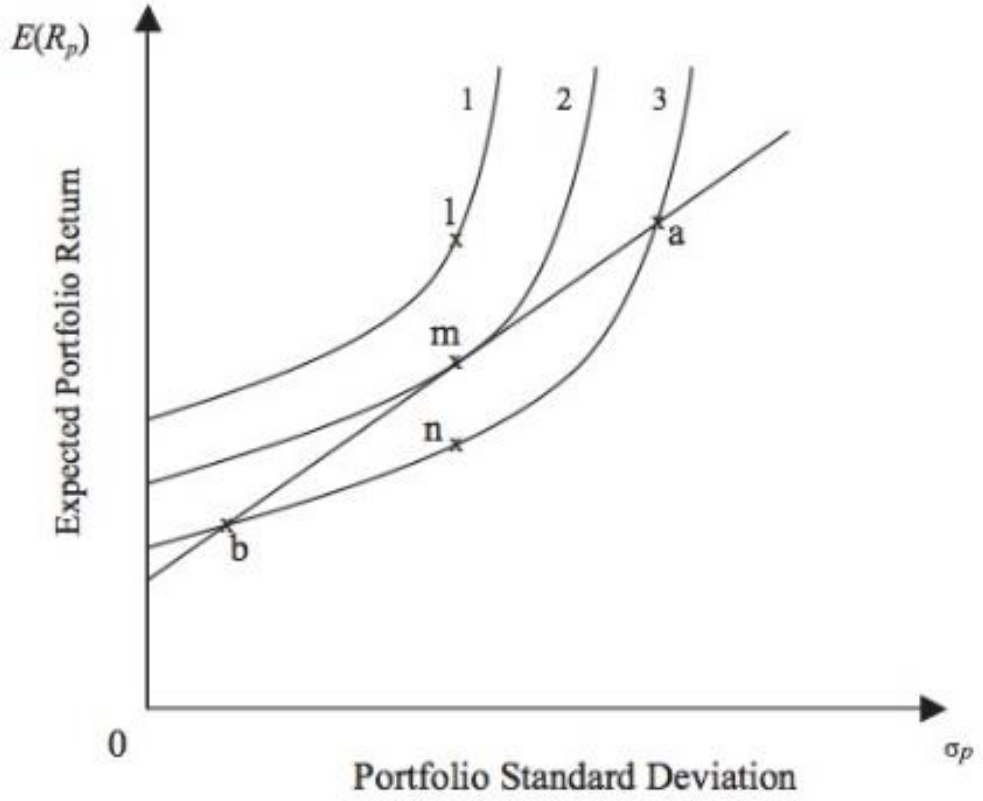
- The 2 asset portfolio is drawn by varying W_1 from 0->100.



- If only these 2 assets are available, with the risky asset representing the market, the line is called **capital allocation line (CAL).**
- The CAL represents an unlimited number of risk-return portfolios available to an investor. Which will an investor choose?

Portfolio Selection

- Combine Utility Theory and Portfolio Theory



- How will the indifference curves look like for investors with different levels risk aversion?

Portfolio Risk: Reducing Risk Without Reducing Return?

- Review the computation of Return and Risk

Return

$$R_{portfolio} = \sum_{i=1}^{N} w_i R_i$$

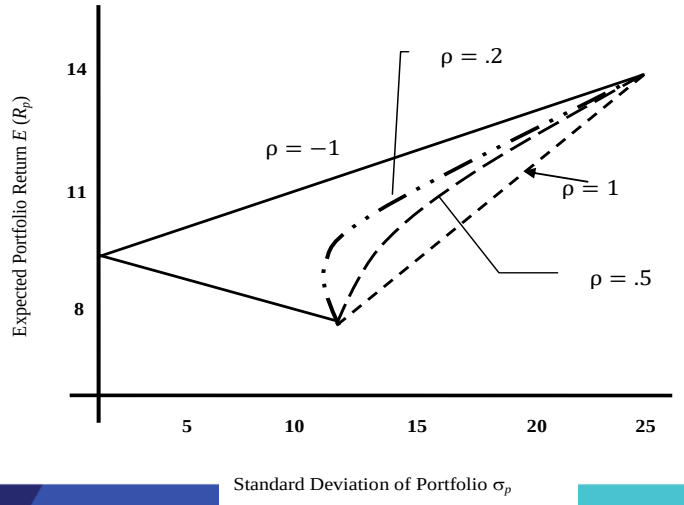
$$\text{where} \sum_{i=1}^{N} w_i = 1$$

Risk

$$\sigma_P^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2Cov(R_1, R_2)$$

$$\sigma_P = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2Cov(R_1, R_2)}$$

$$Correlation = \rho = \frac{\text{cov}(X,Y)}{\sigma_X\sigma_Y}$$



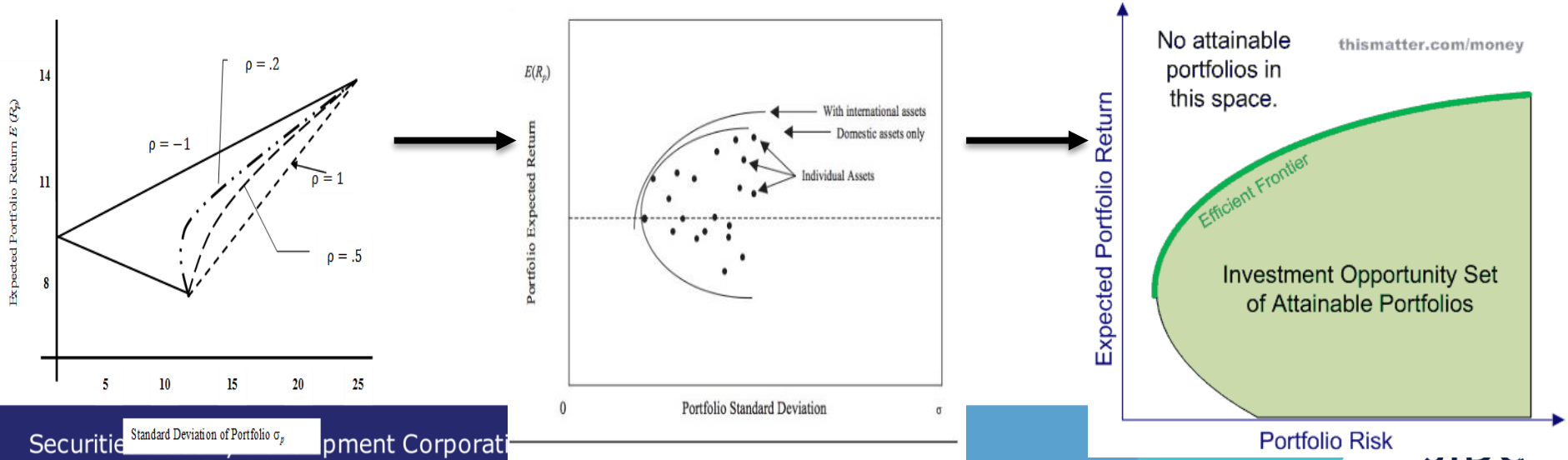
Correlation: Key To Diversification

- Diversification is one of the most important and powerful concepts in investments.
- **Correlation is the key in diversification of risk**. Adding assets that do not behave like other assets in your portfolio is good and can reduce risk.
- Even when we expand the portfolio to many assets, correlation among assets remains the primary determinant of portfolio risk. **Lower correlations are associated with lower risk**.
- Avenues for diversification:
  - Asset Classes
  - Index Funds
  - Countries
  - Decision to add asset class

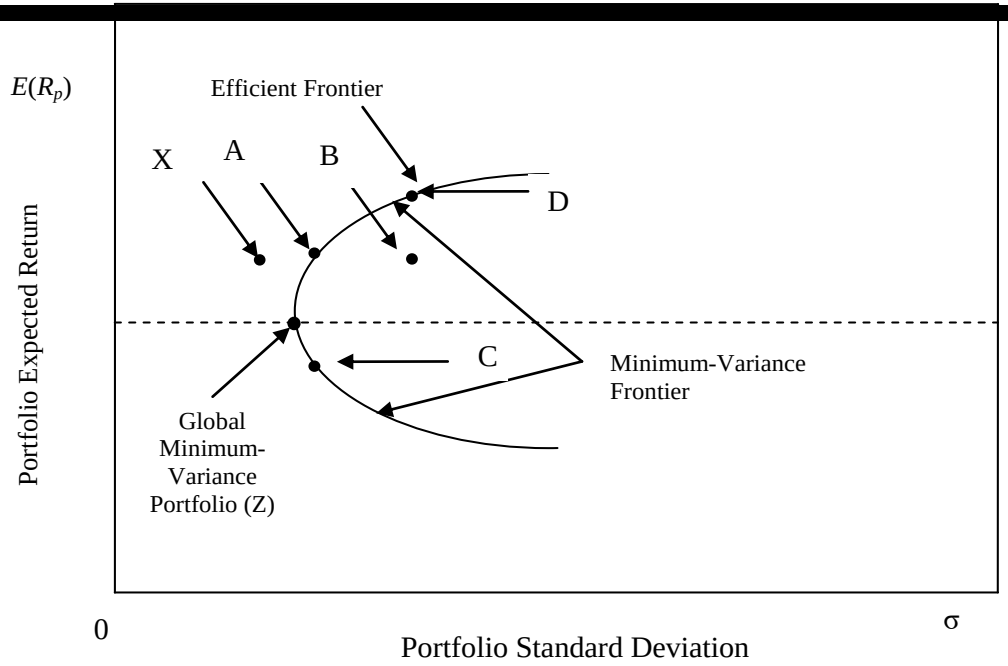
$$\frac{E(R_{new}) - R_f}{\sigma_{new}} > \frac{E(R_p) - R_f}{\sigma_p} \times \rho_{new,p}$$

Diversification leads to Formation of Efficient Frontier and Investor's Optimal Portfolio

- If two assets are perfectly correlated (ρ =1), the risk–return opportunity set is represented by a straight line connecting those two assets.
- If p≠1, the portfolio's risk is < weighted average risk of the components, and the portfolio formed from the two assets bulges on the left
- All of the points connecting the two assets are feasible. The addition of new assets to this portfolio creates more and more portfolios that are combinations of the existing portfolio and the new asset.
- When **all** investable assets are considered, we can construct an opportunity set of investments.
- **Investment Opportunity Set**: set of portfolio expected return and portfolio standard deviation values for all possible portfolios whose weights sum to one

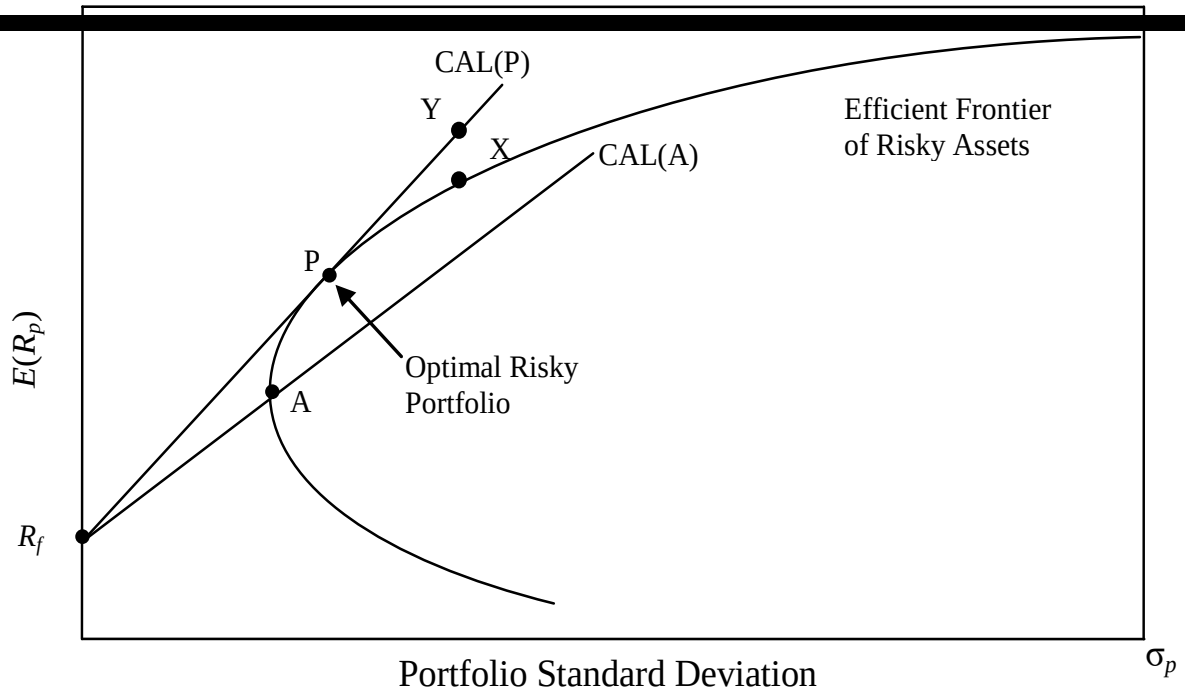


Minimum Variance Frontier, GMV Portfolio and Efficient Frontier



- Minimum- variance frontier: The smaller set of portfolios in which investors would want to invest.
- No risk-averse investor will choose to invest in a portfolio to the right of the minimum-variance frontier because a portfolio on the minimum-variance frontier can give the same return but at a lower risk.
- **Global Minimum-Variance portfolio**: The left-most point on the minimum-variance frontier
- **Markowitz efficient frontier**: The curve that lies above and to the right of the global minimum-variance portfolio

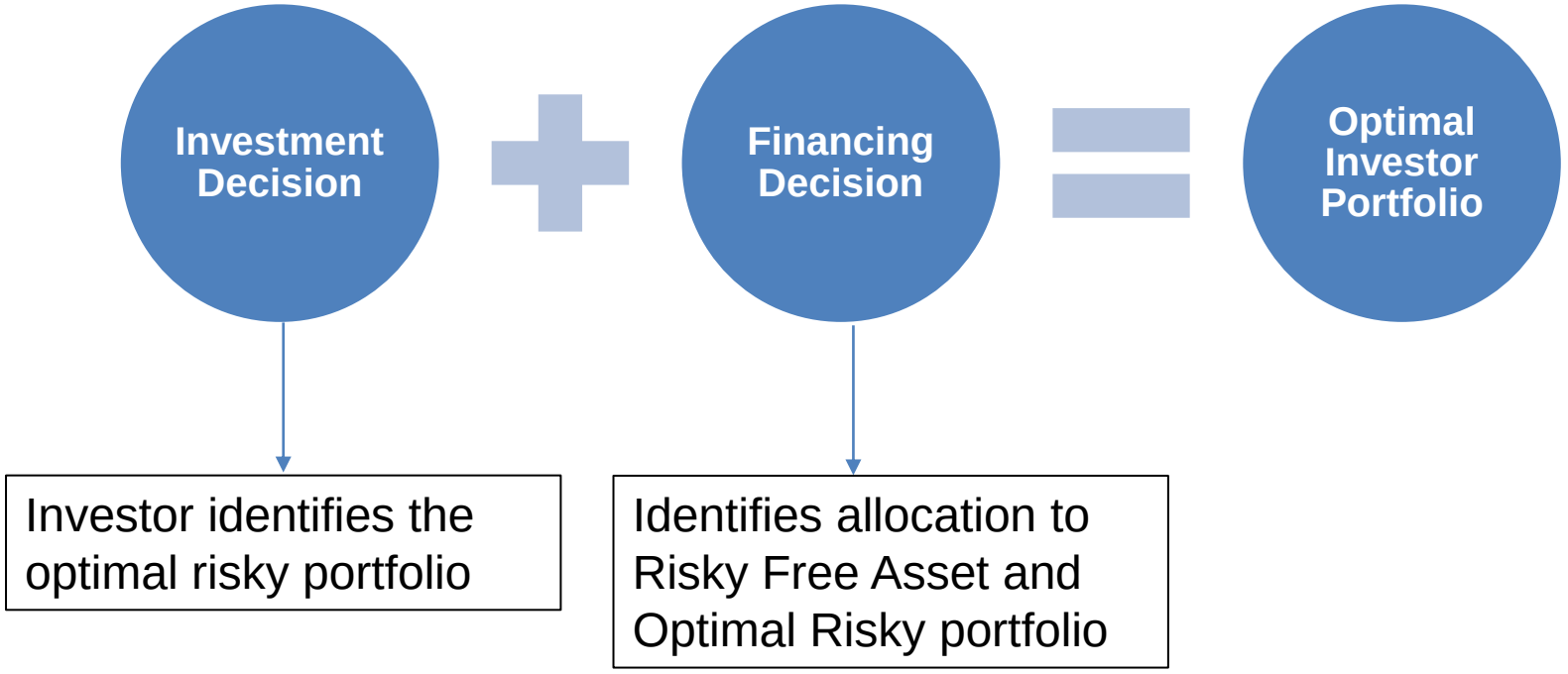
Capital Allocation Line (CAL)



- **Capital Allocation Line (CAL)**: Combination of Risk Free Asset and Portfolio on Efficient frontier
- Portfolios on CAL(P) dominate the portfolios on CAL(A) and Markowitz efficient frontier of risky assets.
- **CAL(P) is the optimal capital allocation line and portfolio P is the optimal risky portfolio (market portfolio)**

Selection of Optimal Portfolio

- Two-fund separation theorem: all investors will hold a combination of two portfolios i.e a risk-free asset and an optimal portfolio of risky assets.

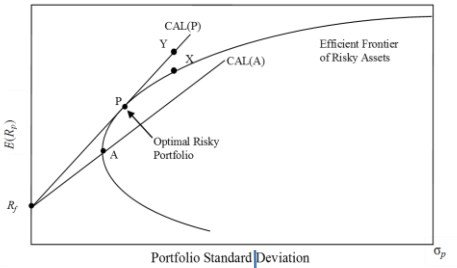


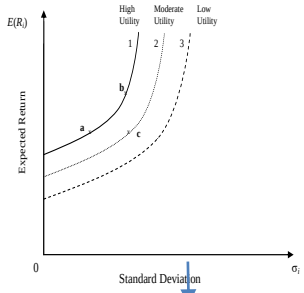
Selection of Optimal Portfolio

Investment Problem

Investment Decision

Optimal Risk Portfolio



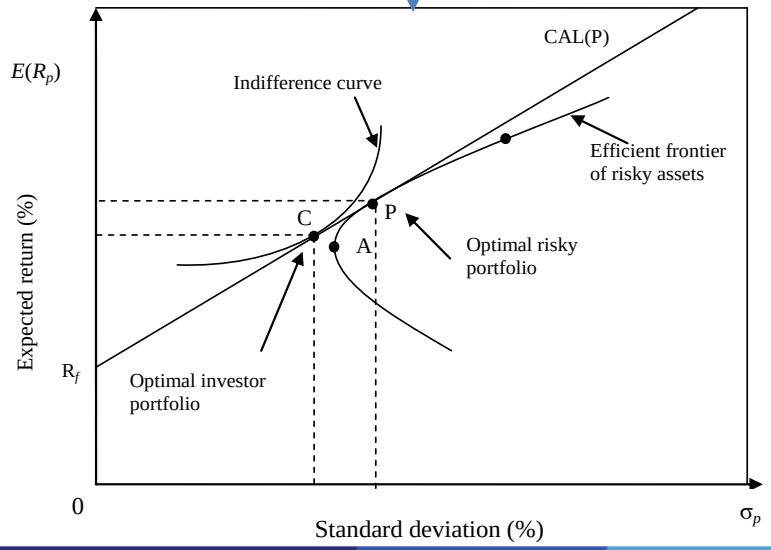


Financing Decision

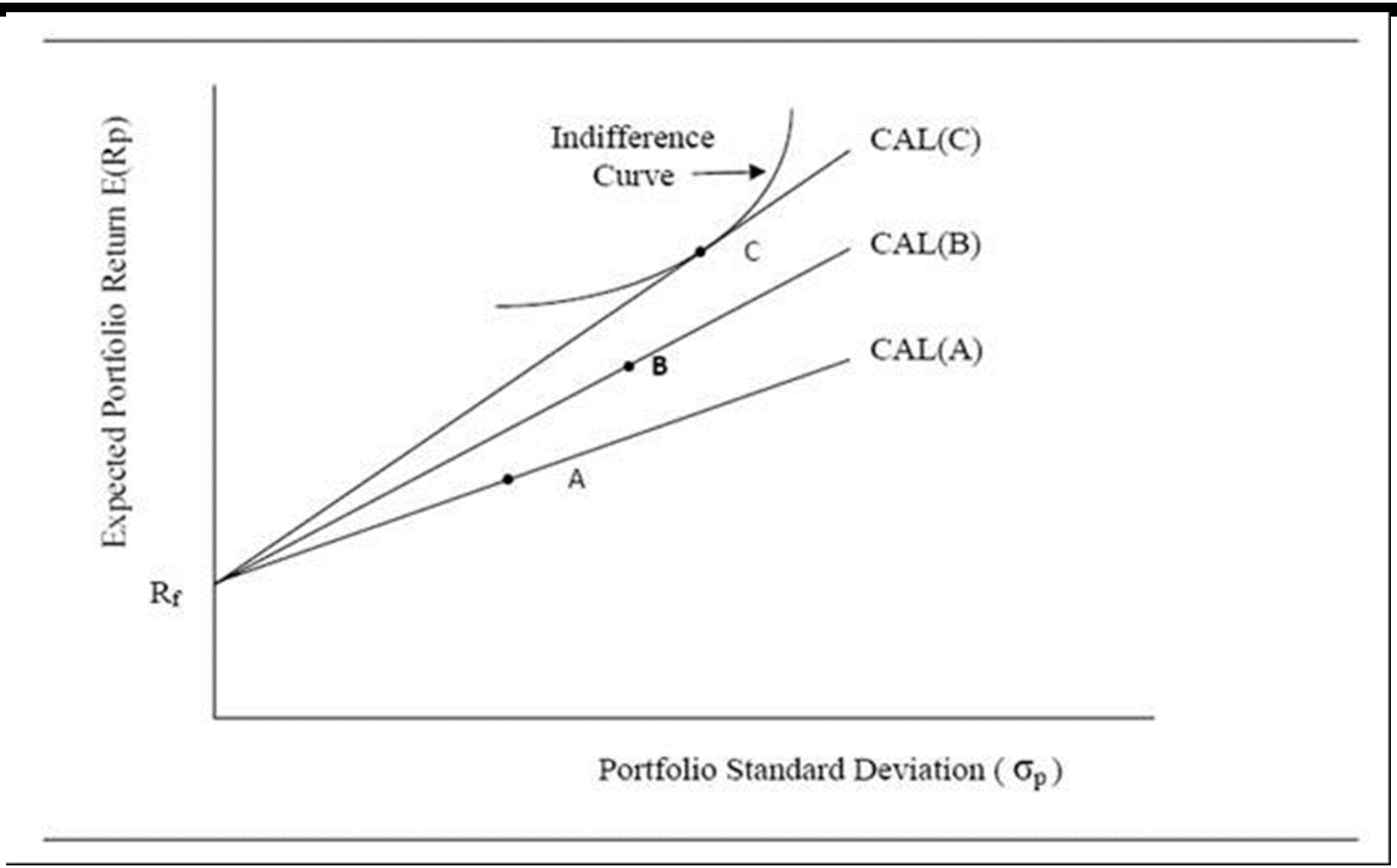
Investor's Preferences

Borrow

Lend



Selection of Optimal Portfolio



Capital Market Line (CML): A special case of CAL

$$E(R_P) = w_1 R_f + (1 - w_1) E(R_i)$$

$$\sigma_P^2 = w_1^2 \sigma_f^2 + (1 - w_1)^2 \sigma_i^2 + 2 w_1 (1 - w_1) \rho_{fi} \sigma_f \sigma_i$$

$$= (1 - w_1)^2 \sigma_i^2$$

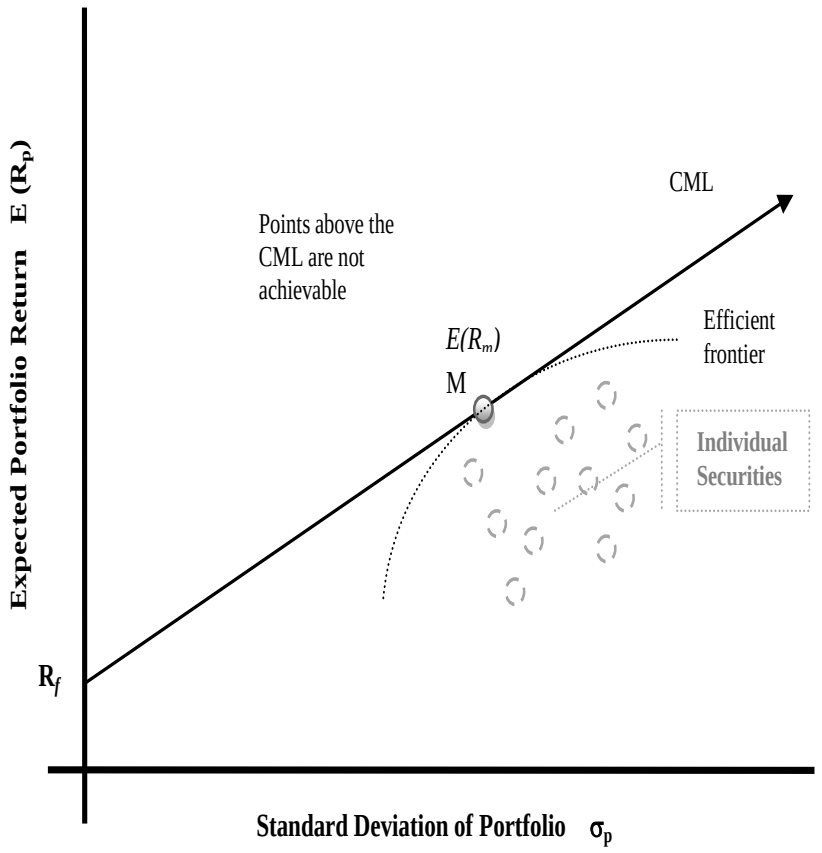
$$\sigma_P = \sqrt{(1 - w_1)^2 \sigma_i^2} = (1 - w_1) \sigma_i$$

$$E(R_p) = w_1 R_f + (1 - w_1) E(R_m)$$

$$\sigma_p = (1 - w_1) \sigma_m$$

By substitution, $E(R_p)$ can be expressed in terms of σ_p, and this yields the equation for the CML

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

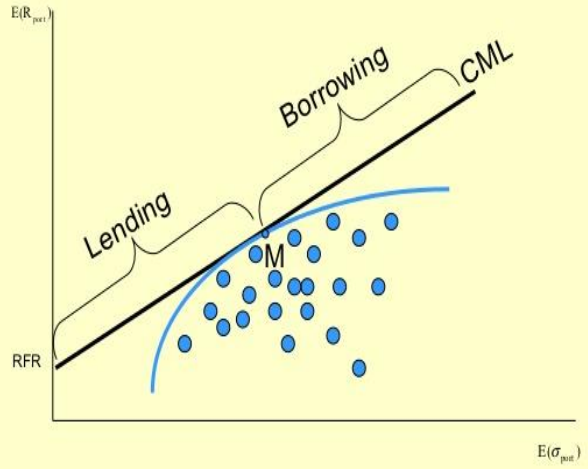


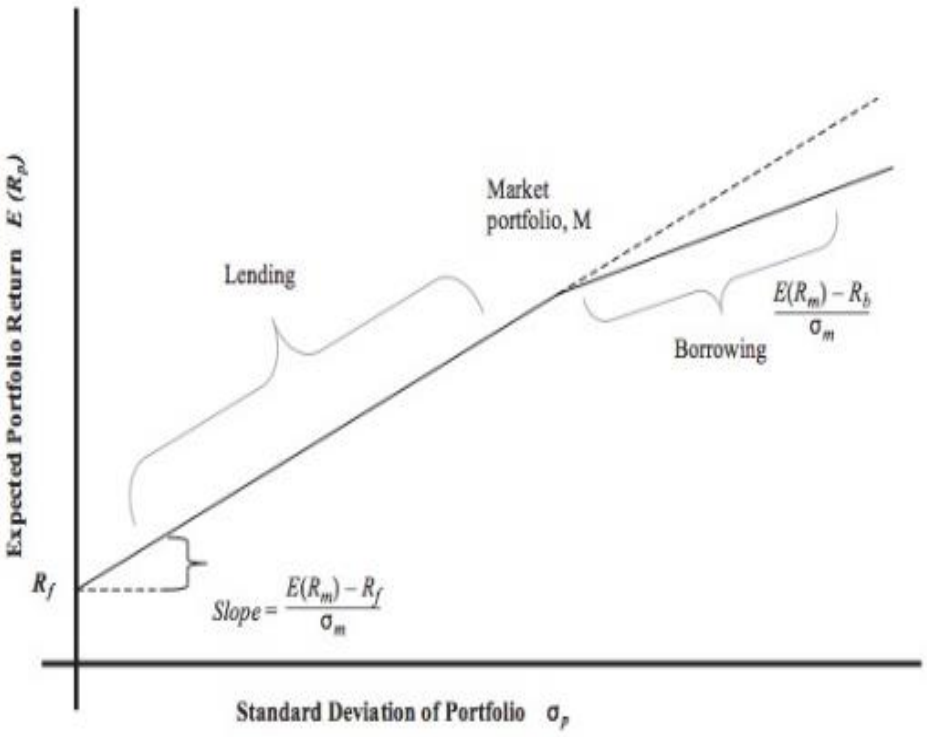
Capital Market Line (CML): Leveraged Portfolios

Equal Lending and Borrowing Rates

Different Lending and Borrowing Rates

Borrowing And Lending At Riskfee Rate Rf And Investing In The Risky Portfolio Dominant Portfolio "M"



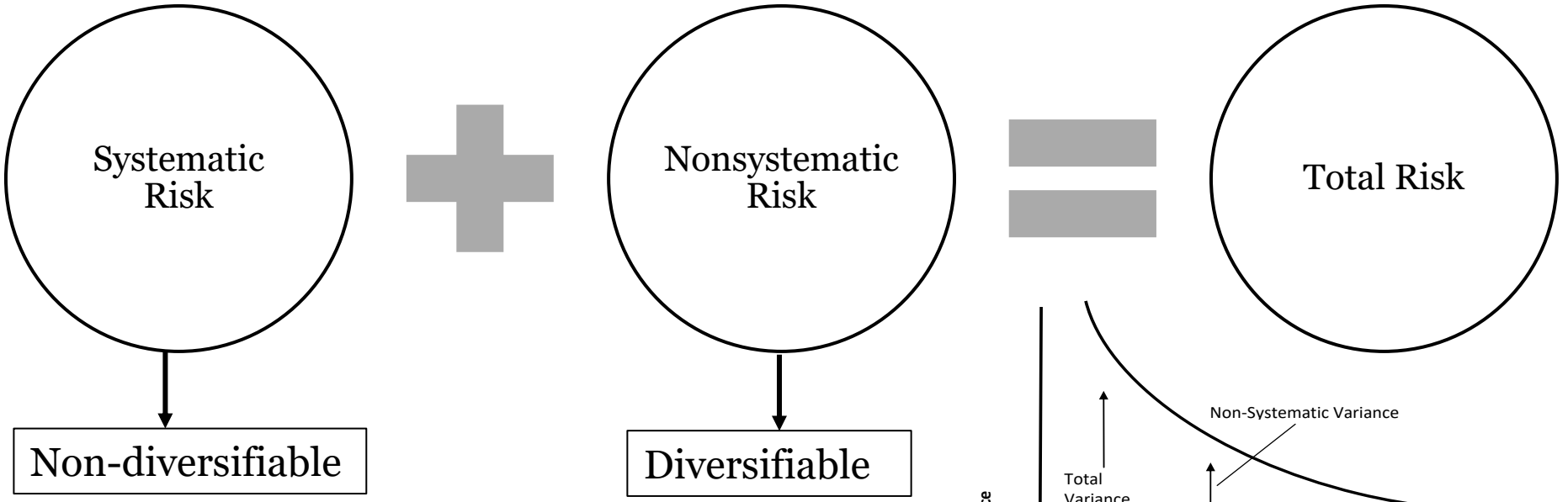


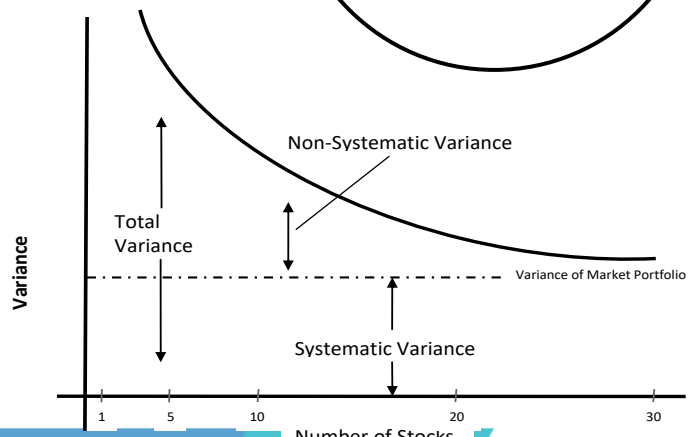
Capital Asset Pricing Model (CAPM): Risk

Beta is the primary determinant of expected return

$$E(R_i) = R_f + \beta_i\left[E(R_m) - R_f\right]$$

- But what is Beta (β)? Must first understand concept of Risk and How to price Risk





Capital Asset Pricing Model (CAPM): Derivation of Beta

- Return Generating Model: General Form

Factor weights or factor loadings

All models contain return on the market portfolio as a key factor

$$E(R_i) - R_f = \sum_{j=1}^{k} \beta_{ij} E(F_j) = \beta_{i1}\left[E(R_m) - R_f\right] + \sum_{j=2}^{k} \beta_{ij} E(F_j)$$

Risk factors

- The Single-Index Model: Simplest form of Return Generating Models

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

$$E(R_i) - R_f = \left(\frac{\sigma_i}{\sigma_m}\right)[E(R_m) - R_f]$$

$$\sigma_i = \beta_i \sigma_m$$

$$E(R_i) - R_f = \beta_i\left[E(R_m) - R_f\right]$$

Capital Asset Pricing Model (CAPM): Interpretation of Beta

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

- **Beta (β)**: a measure of how sensitive an asset's return is to the return on the market portfolio.
- **B >0:** return of an asset moves in the same direction as the market
- **B<0**: return of an asset moves in the opposite direction of the market.
- A risk-free asset's beta is 0 because its covariance with other assets is 0. Any asset's correlation with itself is +1, so the beta of the market is 1.0.

Capital Asset Pricing Model (CAPM): Assumptions and Limitations

Assumptions

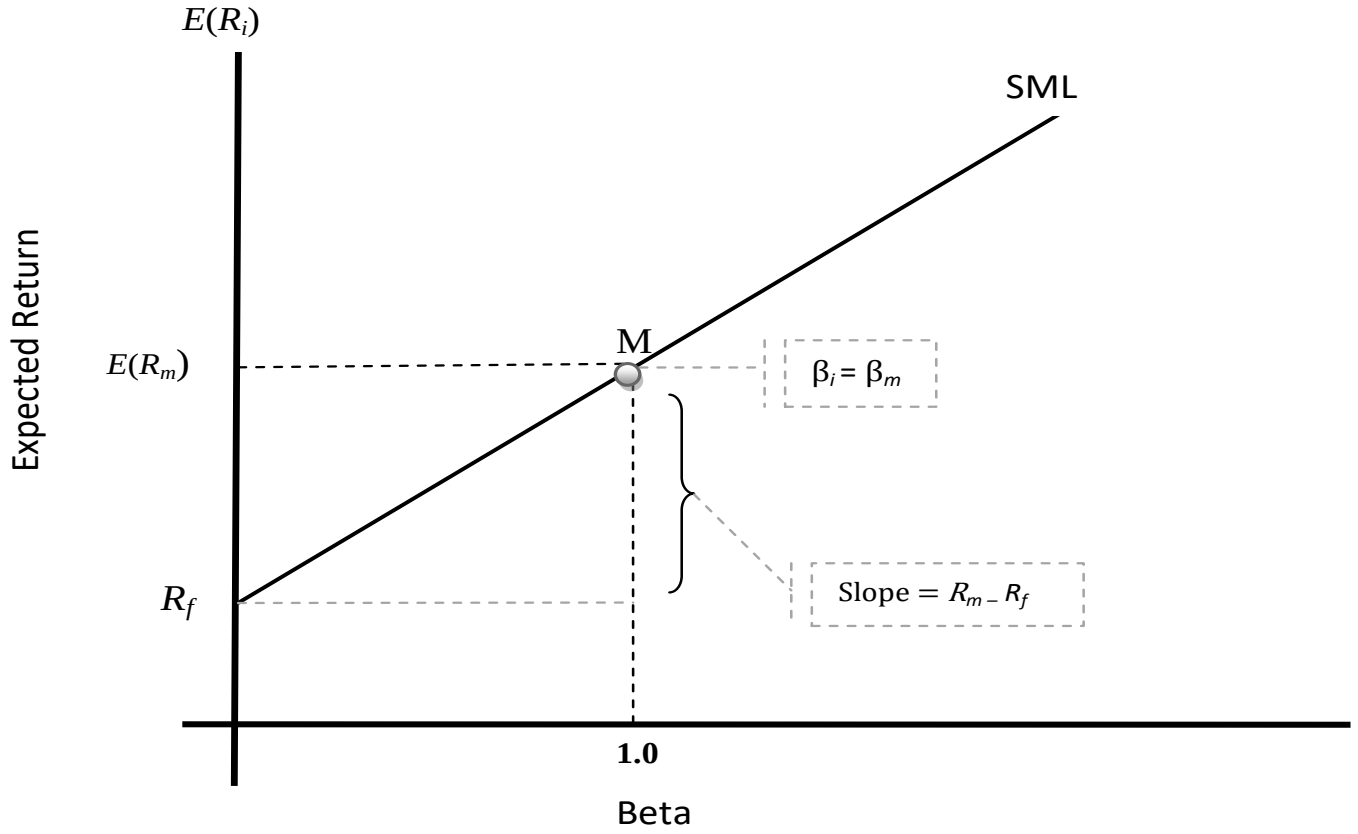
- Investors are risk-averse, utility-maximizing, rational individuals.
- Markets are frictionless, including no transaction costs or taxes.
- Investors plan for the same single holding period.
- Investors have homogeneous expectations or beliefs.
- All investments are infinitely divisible.
- Investors are price takers.

Limitations

- Theoretical
  - Single-factor model
  - Single-period model
- Practical
  - Market portfolio
  - Proxy for a market portfolio
  - Estimation of beta
  - Poor predictor of returns
  - Homogeneity in investor expectations

Capital Asset Pricing Model (CAPM): Security Market Line (SML)

- SML is a graphical representation of the CAPM



Topic 7: Portfolio Management

Efficiency Market Hypothesis (EMH)

EMH divides efficient market into 3 levels depending on the information set available

	Forms of market efficiency		
	Weak-form	**Semi-strong form**	**Strong-form**
Prices reflect…	All **past** information	All **public information** quickly and accurately	All **public and private information** and even insiders are not able to earn abnormal returns
Tests	No serial correlation in historical return on a security	How quickly prices and volumes reflect specific events (lawsuit, M&A, earnings etc)	Test if different inv groups that have access to important private information can outperform

Share Pricing Theories

Why share prices go up and down?

Fundamental Analysis	Technical Analysis
• Top-down or Bottom-up • In short-term, prices fluctuate due to: - Supply/demand - Investor's confidence/sentiments - Market interest rates - Macro and micro economic environment • FA may not be able to explain sudden bullish/bearish behavior of the market i.e. Oct 87 crash…& 2008, 9/11 etc	• Also known as Charting • Greatest believer of history repeats itself • Predicts price movements with past price patterns • No theoretical explanation

Share Pricing Theories
Fundamental vs Technical Analysis

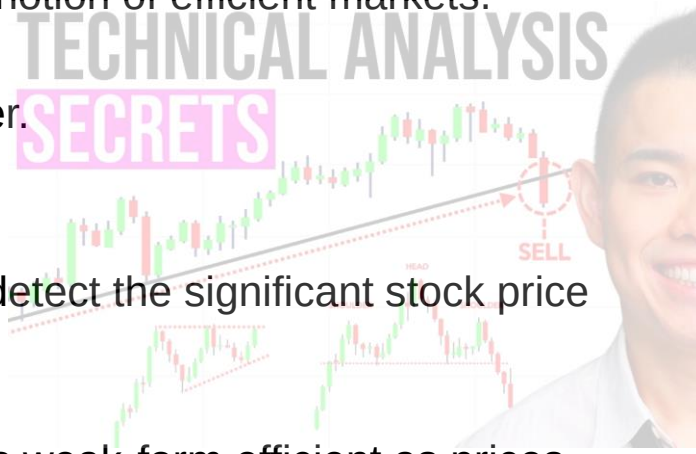
a	Fundamental Analysis	Technical Analysis
Definition	Calculates share value using economic factors, known as fundamentals	Uses price movement of shares to predict future price movements
Data gathered from..	Financial statements	Charts
Share bought when..	Price falls below intrinsic value	Believes can sell it for a higher price
Time horizon	Long-term approach	Short-term approach
Function	Investing	Trading
Concepts used	Return on Equity (ROE), Return on Assets (ROA), Price Earnings (P/E) etc	Dow Theory, Price Data

Efficiency Market Hypothesis (EMH)

Implications of EMH: Technical Analysis

Technical Analysis

- The assumptions of technical analysis **directly oppose** the notion of efficient markets.
  - The process of disseminating new information takes time.
  - Stock prices move to new equilibriums in a gradual manner.
  - Hence, stock prices move in trends that persist.



- Therefore, technical analysts believe that good traders can detect the significant stock price changes before others do.

- However, as confirmed by most studies, the capital market is weak-form efficient as prices fully reflect all market information as soon as the information becomes public.

- Though prices may not be adjusted perfectly in an efficient market, it is unpredictable whether the market will over-adjust or under-adjust at any time. Therefore, **technical analysts should not generate abnormal returns** and **no technical trading system should have any value**.

Efficiency Market Hypothesis (EMH)

Implications of EMH: Fundamental Analysis

Fundamental analysts believe that:

- There is a **basic intrinsic value** for the aggregate stock market, various industries, or individual securities;
- These values depend on underlying economic factors such as cash flows and risk variables;
- Though market price and the intrinsic value may differ over time, the **discrepancy will get corrected** as new information arrives.

- Therefore, by accurately estimating the intrinsic value, a fundamental analyst can **achieve abnormal returns by making superior market timing decisions or acquiring undervalued securities**.

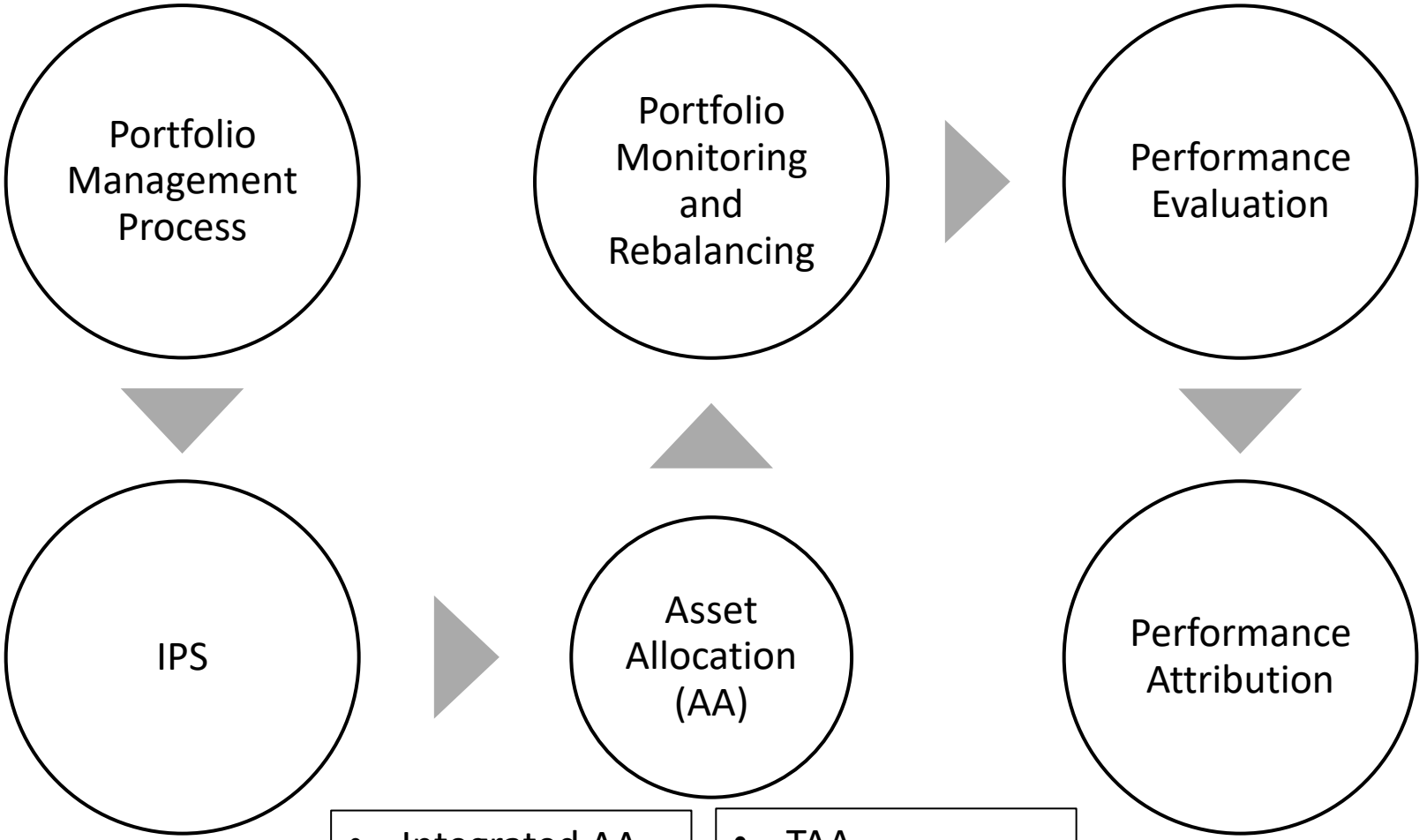
- Fundamental analysis involves aggregate market analysis, industry analysis, company analysis, and portfolio management.

  - ***Market analysis.*** Estimate the relevant variables that cause **long-run trends** of market movements.

  - ***Industry and company analysis.*** Estimates must differ from the consensus. Focus on areas where the market is inefficient, eg non covered stocks, stocks with low P/B, and small cap stocks

Portfolio Management Process

Portfolio Management Process



Portfolio Planning: Investment Policy Statement (IPS)

- **Portfolio Planning**: a program developed before constructing a portfolio to satisfy the client's investment objectives

- **Investment Policy Statement (IPS)**: written document governing this process

- Investment Objectives:
  - Risk Objectives
  - Return Objectives

- Constraints: L-L-T-T-U
  - Liquidity
  - Legal
  - Time Horizon
  - Tax
  - Unique

Portfolio Planning: Investment Policy Statement (IPS)

Major Components of Investment Policy Statement

- Introduction
- Statement of Purpose
- Statement of Duties and Responsibilities
- Procedures
- Investment Objectives
- Investment Guidelines
- Evaluation and Review
- Appendices

Portfolio Planning: Investment Policy Statement (IPS)

Risk: Objectives and Tolerance

Risk Objectives

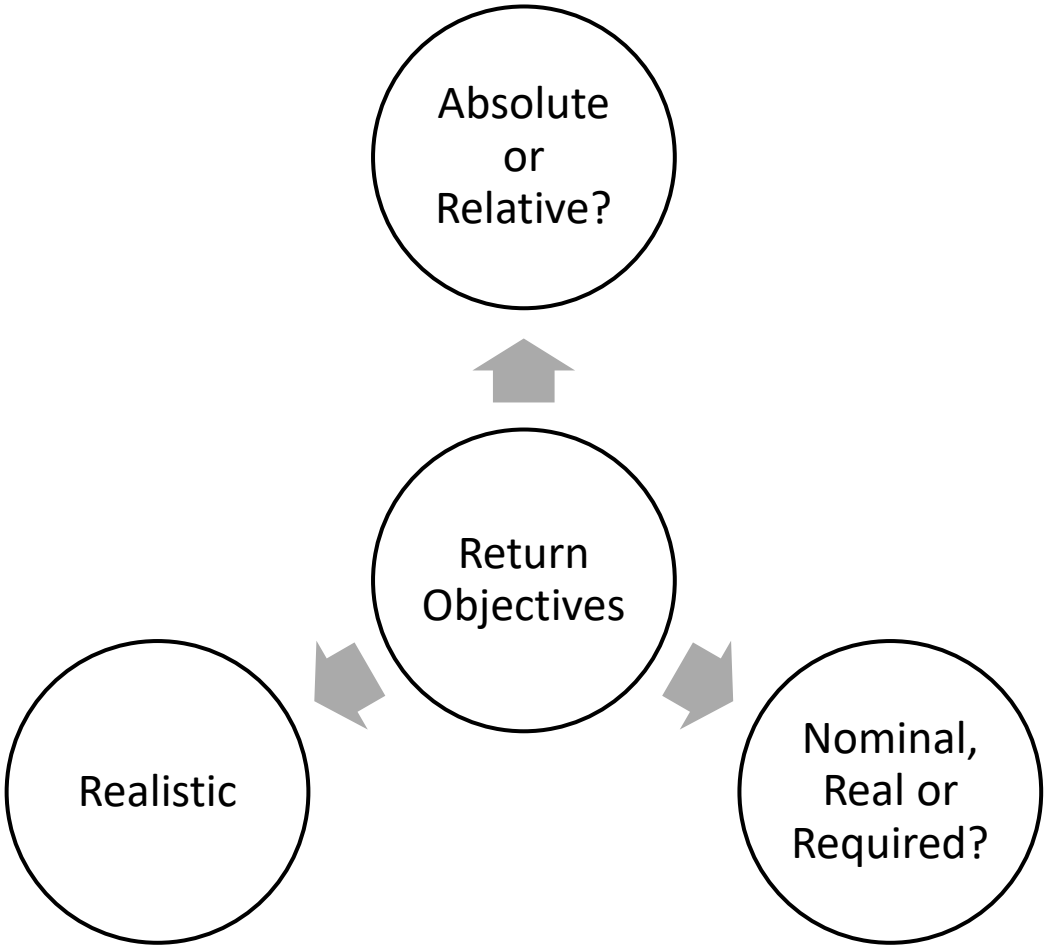
- Absolute
  - The 12-month 95% value at risk (VAR) of the portfolio must not be more than RM1 billion
- Relative
  - Achieving a return within 4% of the KLCI return approximately 95% of the time

Risk Tolerance

- Ability to take risk
  - Objective factor
- Willingness to take risk
  - Subjective factor

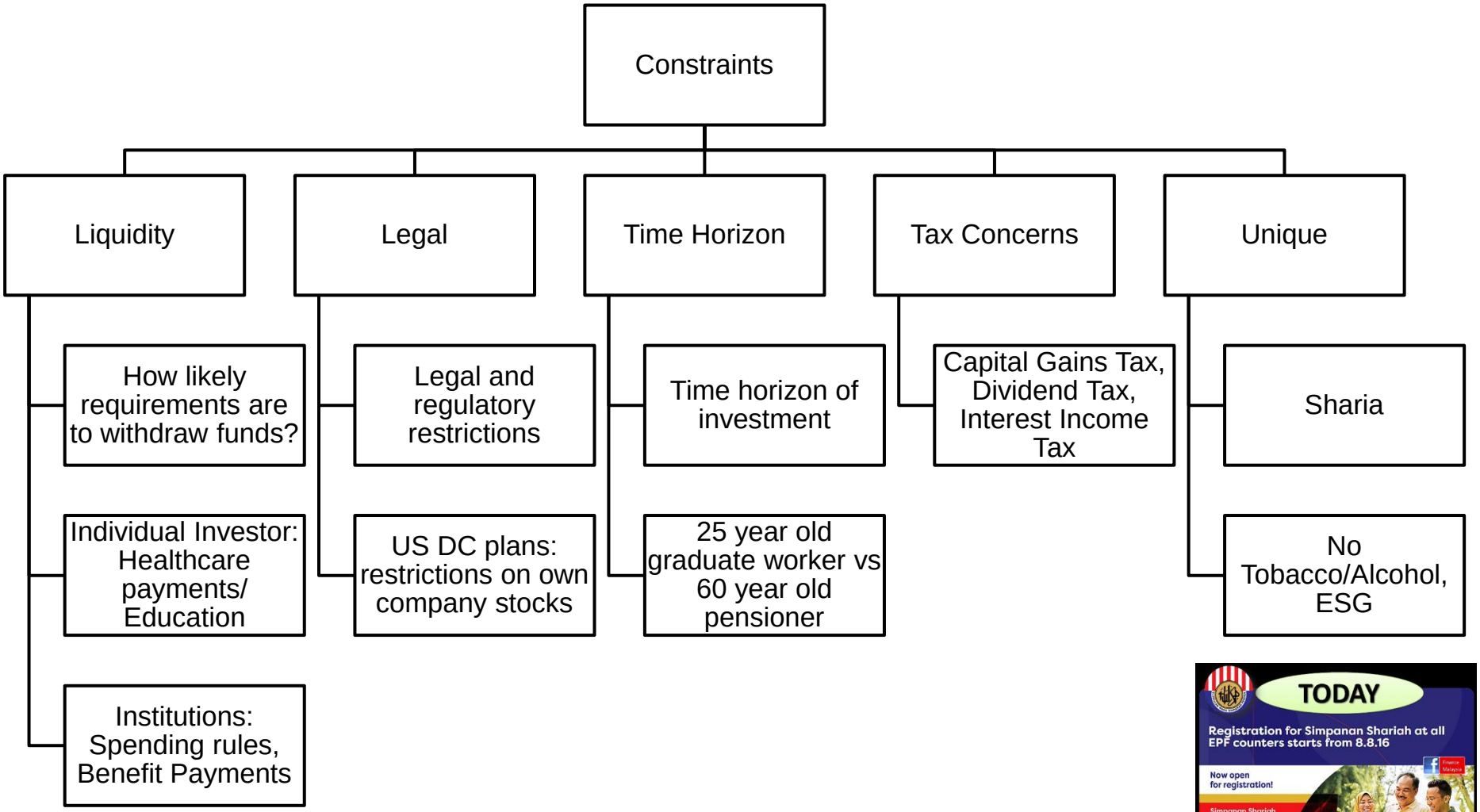
Portfolio Planning: Investment Policy Statement (IPS)

Return Objectives



Portfolio Planning: Investment Policy Statement (IPS)

Constraints: L-L-T-T-U



Portfolio Construction: Asset Allocation

Strategic Asset Allocation and Tactical Asset Allocation

- **Strategic asset allocation (SAA):** means to provide the investor with exposure to the systematic risks of asset classes in proportions consistent with the IPS.

- 2 important investment principles:
  - A portfolio's systematic risk accounts for most of its change in value over the long term.
  - Returns to groups of similar assets (e.g., long-term debt claims) predictably reflect exposures to certain sets of systematic factors (e.g., for the debt claims, unexpected changes in the inflation rate).

- Asset Class: category of assets that have similar characteristics, attributes, and risk–return relationships

- Traditional asset classes: Cash, Equities, Bonds, and Real Estate as the major asset classes.

- Alternative asset classes: Private equity, Hedge funds, Commodities, Art etc.

- **Tactical Asset Allocation (TAA)**: decision to deliberately deviate from the policy exposures to systematic risk factors with the intent to add value based on forecasts of the near-term returns of those asset classes.

Investment Performance Measures

1. Difference between TWR and MWR
2. Risk-adjusted return ratios
3. Attribution

Performance Returns

Money-weighted return (MWR/$WR)	Time-weighted return (TWR)
• Returns are weighted by the amount invested in each investment • Similar to IRR, considering the cash flow from or to investment	• Not weighted by investment amount • Equal weighting • Considers actual period by period portfolio returns • No size bias - inflows and outflows could affect results

Investment Performance Measures

Money-Weighted Returns: Example

Example:

Ali Lokman and his wife, Suzana Periannan, are planning for retirement and want to compare the past performance of a few mutual funds they are considering for investment. They are given the following information about the Attin Mutual Fund that they are considering.

Year	Assets Under Management at the Beginning of Year (RM)	Net Return (%)
1	30 million	15
2	45 million	-5
3	20 million	10
4	25 million	15
5	35 million	3

Questions:

1. Compute the holding period return for the five-year period.
2. Compute the arithmetic mean annual return.
3. Compute the geometric mean annual return. How does it compare with the arithmetic mean annual return?
4. They want to earn a minimum annual return of 5 percent. Is the money-weighted annual return greater than 5 percent?

Investment Performance Measures

Time-Weighted Returns: Example

Example:

As chief investment officer of Strubeck Asset Management, you want to review the performance of the in-house and Super Trust portfolios over the last 4 quarters.

You have arranged for outflows and inflows to the portfolios to be made at the very beginning of the quarter.

The table summarizes the inflows and outflows as well as the two portfolios' valuations. In the table, the ending value is the portfolio's value just prior to the cash inflow or outflow at the beginning of the quarter. The amount invested is the amount each portfolio manager is responsible for investing.

	Quarter			
	1	2	3	4
In-House Account				
Beginning value	4,000,000	6,000,000	5,775,000	6,720,000
Beginning of period inflow (outflow)	1,000,000	-500,000	225,000	-600,000
Amount invested	5,000,000	5,500,000	6,000,000	6,120,000
Ending value	6,000,000	5,775,000	6,720,000	5,508,000
Super Trust Account				
Beginning value	10,000,000	13,200,000	12,240,000	5,659,200
Beginning of period inflow (outflow)	2,000,000	-1,200,000	-7,000,000	-400,000
Amount invested	12,000,000	12,000,000	5,240,000	5,259,200
Ending value	13,200,000	12,240,000	5,659,200	5,469,568

Questions:

1. Calculate the time-weighted rate of return for the in-house account.
2. Calculate the time-weighted rate of return for the Super Trust account.

Approaches to Return Attribution

Equity Return Attribution—the Brinson Model

- Built on assumption that the total portfolio and benchmark returns are calculated by summing the weights and returns of the sectors (1) within the portfolio and (2) the benchmark

$$\text{portfolio return } R = \sum_{i=1}^{i=n} w_i R_i$$

$$\text{benchmark return } B = \sum_{i=1}^{i=n} W_i B_i$$

- where:
- w_i = portfolio weight of the ith sector
- R_i = portfolio return in the ith sector
- W_i = benchmark weight of the ith sector
- B_i = benchmark return in the ith sector
- n = number of sectors

- Allocation effect $A_i = (w_i - W_i)B_i$
- Security selection effect $S_i = W_i(R_i - B_i)$
- Interaction effect $I_i = (w_i - W_i)(R_i - B_i)$

Approaches to Return Attribution

Equity Return Attribution—the Brinson Model

- Example

Sector	Portfolio Weight	Benchmark Weight	Portfolio Return	Benchmark Return
Energy	50%	50%	18%	10%
Health care	30%	20%	–3%	–2%
Financials	20%	30%	10%	12%
Total	**100%**	**100%**	**10.1%**	**8.2%**

- Find the **1) Allocation effect**, **2) Security Selection effect** and the **3) Interaction effect**

Performance evaluation

An application of the Capital Asset Pricing Model (CAPM)

4 appraisal measures

1. Sharpe ratio.

$$S_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\sigma}_A}$$

2. Treynor ratio.

$$T_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\beta}_A}$$

3. Information ratio.

$$IR = \frac{E(r_p) - E(r_B)}{\sigma(r_p - r_B)}$$

4. Jensen's alpha.

$$\alpha_p = R_p - \left[R_f + \beta_p \left(R_m - R_f \right) \right]$$

Where:

R_A = Return of portfolio

R_f = risk free rate

σ = standard deviation

β = beta of portfolio

α = alpha

Capital Asset Pricing Model (CAPM): Applications
Examples

Portfolio Performance Evaluation

A Malaysian pension fund is evaluating an investment manager. Information about the manager is given below:

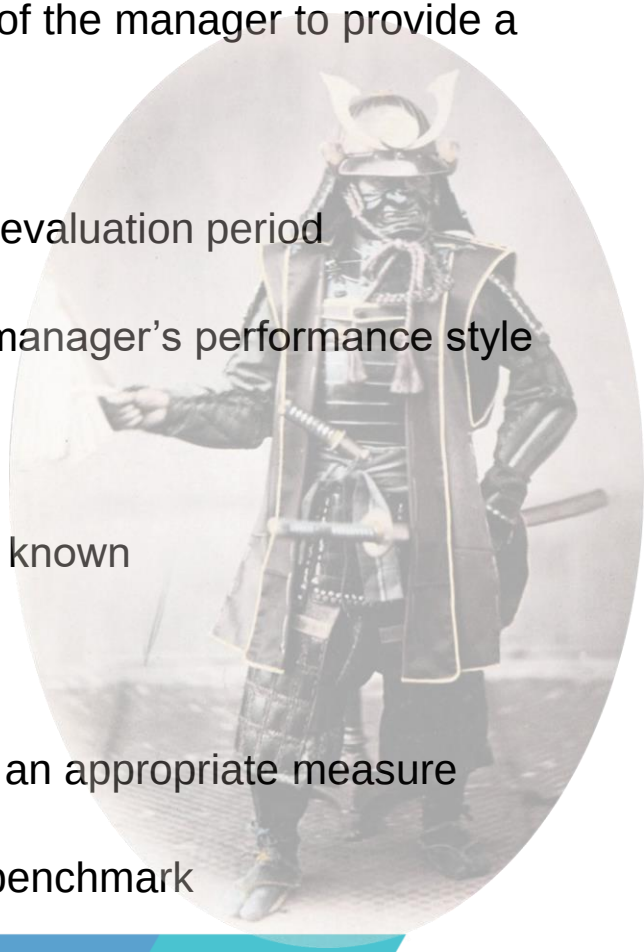
Manager	Average Return	σ	β
X	10%	20%	1.1
Market (M)	9	19	
Risk-free rate (R_f)	3		

1. Calculate the expected return for the manager, based on using the average market return and the CAPM.
2. Calculate the manager's (ex post) Sharpe ratio, Treynor ratio and Jensen's alpha.

Benchmarking Investments and Managers

Benchmarks

- It is very important to select an appropriate benchmark against which the performance of a portfolio will be measured against
- It has to take into account the investment focus and strategies of the manager to provide a meaningful basis for comparison.
- 7 properties of a valid benchmark:
  1. ***S**pecified in advance*: Benchmark is known to all at start of evaluation period
  2. ***A**ppropriate*: The benchmark should accurately reflect the manager's performance style
  3. ***M**easurable*: You must be able to measure the results
  4. ***U**nambiguous*: A good benchmark's components should be known
  5. ***R**eflective* of manager's current investment expertise
  6. ***A**ccountable*: Manager should agree that the benchmark is an appropriate measure
  7. ***I**nvestable*: You should be able to replicate and invest in a benchmark

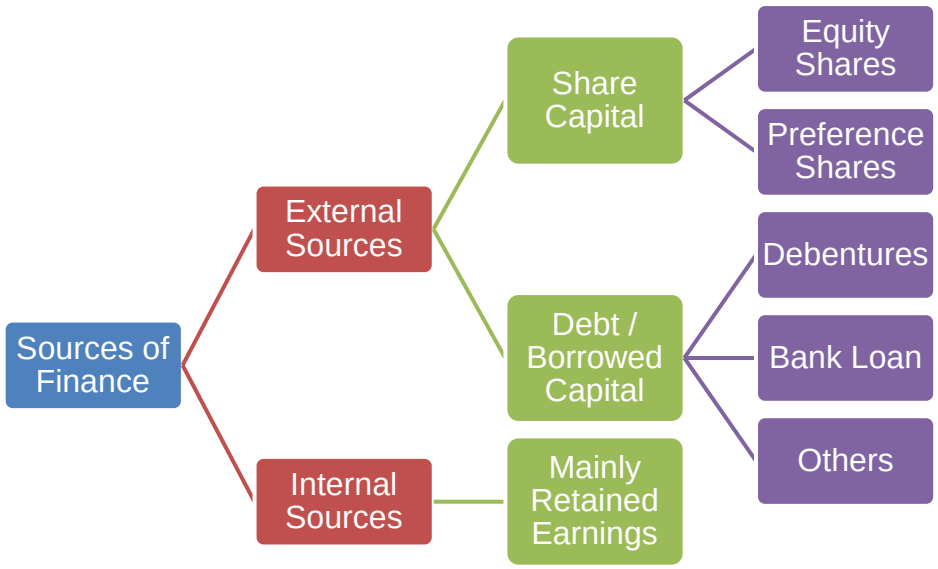


Topic 8: Financing Decisions

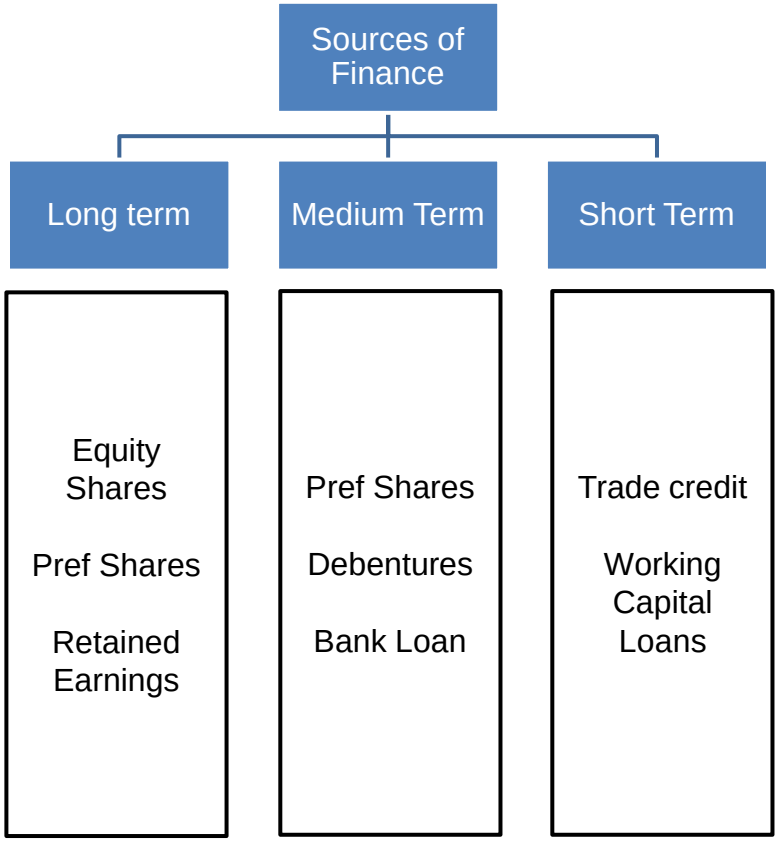
Sources of Finance

Based on Basic Sources and by Maturity of Payment

- Based on Basic Sources of Finance:



- Based on Maturity of Payment



Leverage

Type of Leverage

A firm is said to be *leveraged* if it has fixed costs.

1) Operating leverage:

- refers to fixed costs associated with running the firm.
- Operating fixed costs include depreciation or rent.

2) Financial leverage:

- refers to fixed costs associated with financing the firm.
- Financial fixed costs include interest expense.

Greater a company's leverage -> greater the risk, higher the discount rate used to estimate its value

Cost Structure

Affects the risk of future earnings and cash flows of a company:

1) Variable costs:

- costs that change with the change in level of production and sales

2) Fixed costs:

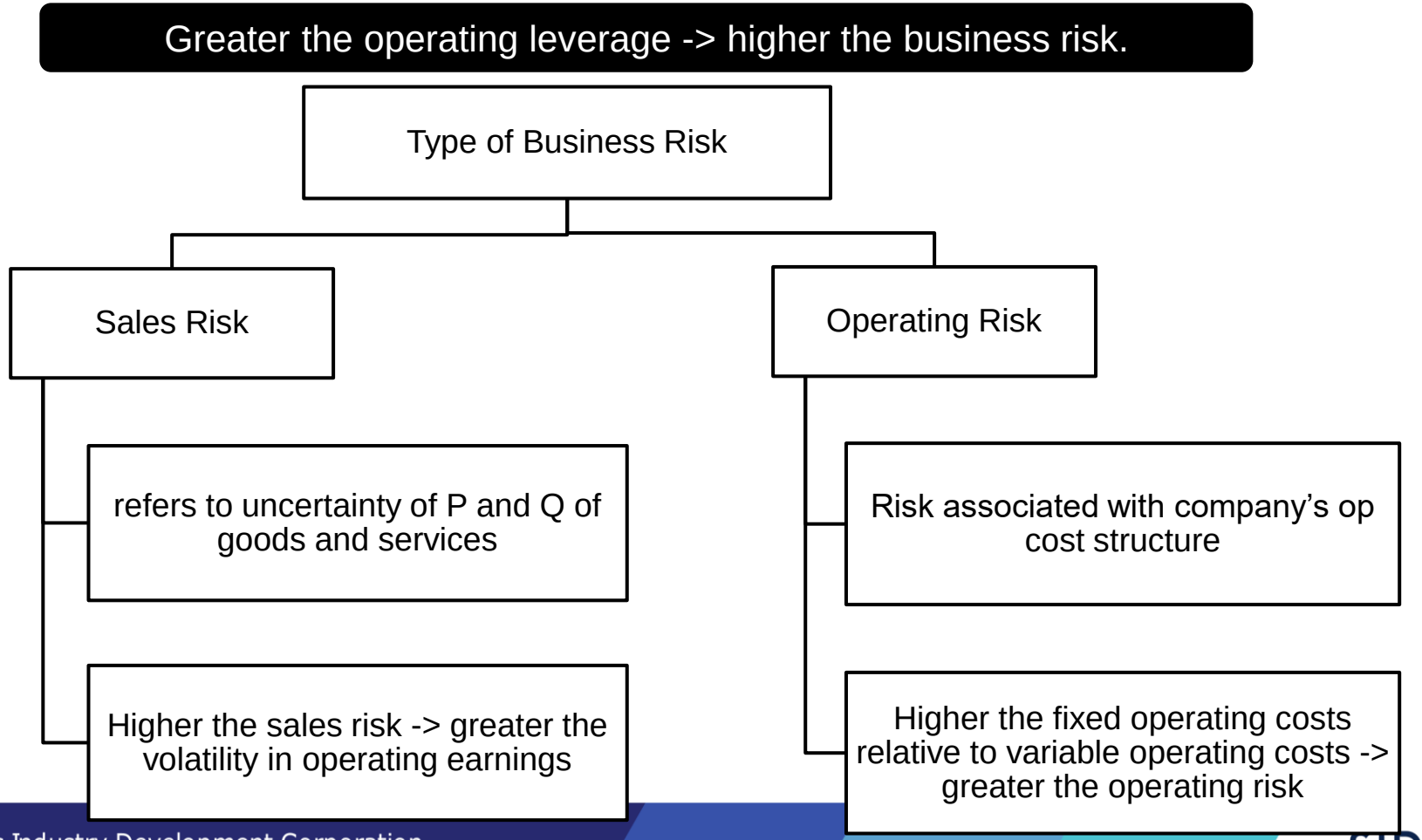
- costs that remain fixed regardless of production and sales level of the company

- **Higher the fixed costs (both op and fin) vs variable costs -> greater the volatility in net income and thus higher the risk.**

Business Risk and Financial Risk

Business Risk and Its Components

Business risk is the risk associated with operating earnings (EBIT). Business risk results from variability in sales and expenses.



Operating Risk and Financial Risk

Degree of operating leverage (DOL):

- Measure of sensitivity of a firm's operating income to a change in the firm's sales (i.e. operating income elasticity)
- Greater the DOL -> greater the sensitivity to a change in sales

$$DOL = \frac{\%\ \Delta \text{ in operating income}}{\%\ \Delta \text{ in units sold}}$$

$$DOL = \frac{\%\Delta\ EBIT}{\%\Delta\ Sales}$$

- **Operating income** = (# of units sold) × [(price per unit) – (variable cost per unit)] – [Fixed operating costs]
- **Operating income** = Contribution margin – Fixed operating costs
- **Per unit contribution margin** = Price per unit – Variable cost per unit
- **Contribution margin** = Per unit contribution margin × number of units sold
  = Revenue - variable costs

$$DOL = \frac{Q(P-V)}{Q(P-V)-F}$$

Degree of financial leverage (DFL)

- Measure sensitivity of the cash flows available to owners to changes in operating income.

$$DFL = \frac{\%\ \Delta \text{ in net income}}{\%\ \Delta \text{ in operating income}}$$

$$DFL = \frac{[\mathrm{Q(P-V)-F}](1-\mathrm{t})}{[\mathrm{Q(P-V)-F-C}](1-\mathrm{t})} = \frac{[Q(P-V)-F]}{[Q(P-V)-F-C]}$$

1) Greater the use of debt financing -> higher the fixed costs and consequently greater the sensitivity of net income to changes in operating income

2) Note that DFL is not affected by tax rate.

Total Leverage

- Degree of total leverage DTL: It is a measure of the sensitivity of the cash flows to owners to changes in the number of units produced and sold.

- It is a measure of total leverage (both operating and financial leverage) used by a company.

$$DTL = \frac{\%\ \Delta\ in\ net\ income}{\%\ \Delta\ in\ \#\ of\ units\ sold}$$

Or

DTL = DOL × DFL

$$DTL = \frac{Q(P-V)}{[Q(P-V)-F]} \times \frac{[Q(P-V)-F]}{[Q(P-V)-F-C]}$$

$$DTL = \frac{Q(P-V)}{Q(P-V)-F-C}$$

Example

Exhibit 2 Sales, Cost, and Expense Data for 4G, Inc. (At Unit Sales of 1,000,000)	
Number of units produced and sold	1,000,000
Sales price per unit	¥108
Variable cost per unit	¥72
Fixed operating cost	¥22,500,000
Fixed financing expense	¥9,000,000

1. Based on the information in Exhibit 2, what is the degree of operating leverage (DOL) of 4G, Inc., at unit sales of 1,000,000?

2. Based on the information in Exhibit 2, what is 4G, Inc.'s degree of financial leverage (DFL), at unit sales of 1,000,000?

Example

Exhibit 1 Benn's Unit Sales Estimates for 4G, Inc. and Qphone Corp.

Company	2009 Unit Sales	Standard Deviation of Unit Sales	2010 Expected Unit Sales Growth Rate (%)
4G, Inc.	1,000,000	25,000	15
Qphone Corp.	1,500,000	10,000	15

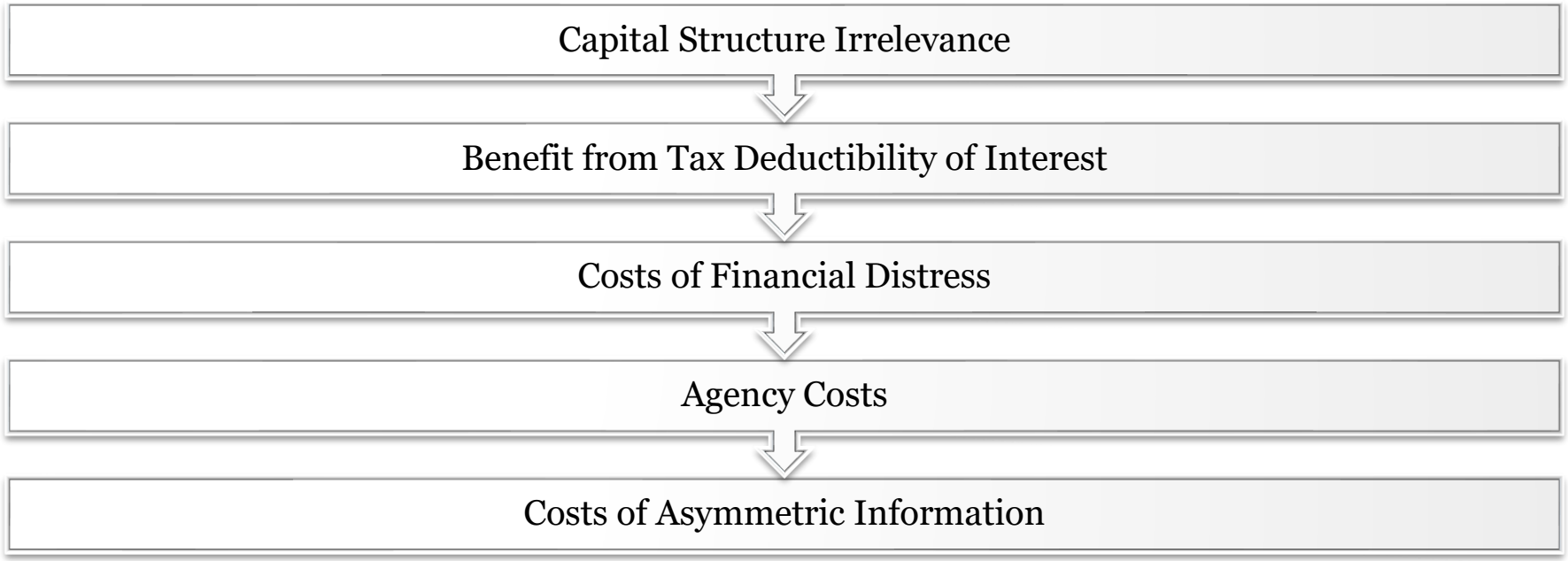
Exhibit 3 Benn's Analysis of Qphone (At Unit Sales of 1,500,000)

Degree of operating leverage	1.40
Degree of financial leverage	1.15
Breakeven quantity (units)	571,429

3. Based on the information in Exhibit 1 and Exhibit 3, what is Qphone's expected percentage change in operating income for 2010?

Capital Structure
Introduction

- The capital structure decision affects financial risk and, hence, the value of the company.
- The capital structure theory helps us understand the factors most important in the relationship between capital structure and the value of the company.
- Development of the theory of capital structure, beginning with the capital structure theory of Miller and Modigliani:



Recap: The Weighted Average Cost of Capital (WACC)

- The **weighted average cost of capital (WACC)** is the marginal cost of raising additional capital and is affected by the costs of capital and the proportion of each source of capital:

$$\text{WACC} = r_{WACC} = \left[\frac{D}{V} K_d (1 - t)\right] + \left[\frac{E}{V} K_e\right]$$

where

r_d is the before-tax marginal cost of debt
r_e is the marginal cost of equity
t is the marginal tax rate
D is the market value of debt
E is the market value of equity

$V = D + E$

Proposition I without Taxes: Capital Structure Irrelevance
Key Assumptions

- Franco Modigliani and Merton Miller (MM) developed a theory that helps us understand how taxes and financial distress affect a company's capital structure decision.

- The assumptions of their model are unrealistic, but they help us work through the effects of the capital structure decision:
  1. **Investors have homogeneous expectations regarding future cash flows.**
  2. **Bonds and stocks trade in perfect markets.**
  3. **Investors can borrow and lend at the same rate.**
  4. **There are no agency costs** (managers always act to maximize shareholder wealth).
  5. **Investment and financing decisions are independent of one another.**

Proposition I without Taxes: Capital Structure Irrelevance

MM Proposition I: The Value of a Firm
The market value of a company is not affected by the capital structure of the company.

- Based on the assumptions that there are no taxes, costs of financial distress, or agency costs, so investors would value firms with the same cash flows as the same, regardless of how the firms are financed.

- Reasoning: There is no benefit to borrowing at the firm level because there is no interest deductibility. Firms would be indifferent to the source of capital and investors could use financial leverage if they wish.

Proposition II without Taxes: Higher Financial Leverage

MM Proposition II: WACC
The cost of equity is a linear function of the company's debt/equity ratio.

- Because creditors have a claim to income and assets that has preference over equity, the cost of debt will be less than the cost of equity.

- As the company uses more debt in its capital structure, the cost of equity increases because of the seniority of debt:

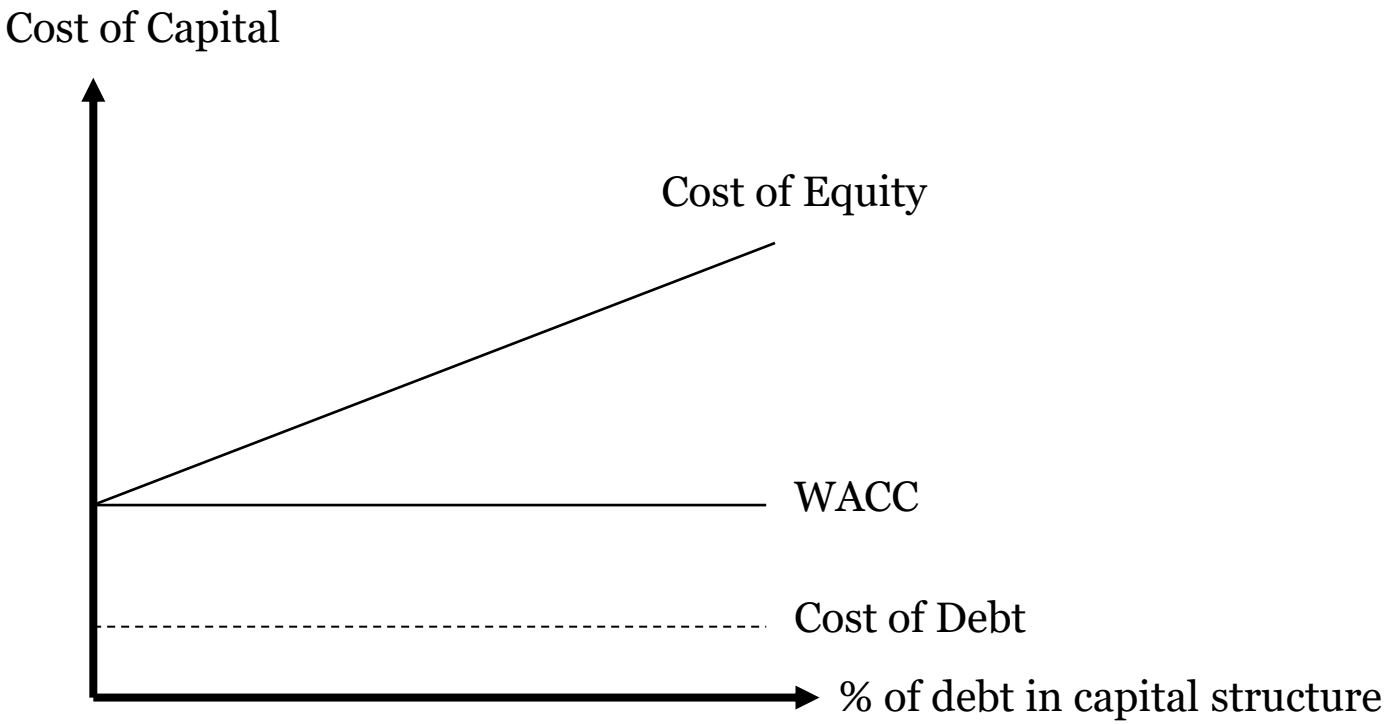
$$r_e = r_0 + (r_0 - r_d)\left(\frac{D}{E}\right)$$

where r_0 is the cost of equity if there is no debt financing.

- The WACC is constant because as more of the cheaper source of capital is used (that is, debt), the cost of equity increases.

Proposition II without Taxes: Higher Financial Leverage (Cont'd)

- Cost of equity increases linearly as company increases proportion of debt financing
- WACC unaffected by capital structure or leverage



Introducing Taxes into the MM Theory

When taxes are introduced (specifically, the tax deductibility of interest by the firm), the value of the firm is enhanced by the tax shield provided by this interest deduction. The tax shield:

- Lowers the cost of debt.
- Lowers the WACC as more debt is used.
- Increases the value of the firm by *tD* (that is, marginal tax rate times debt)

In other words, Debt creates a tax shield which increases the size of the pie.

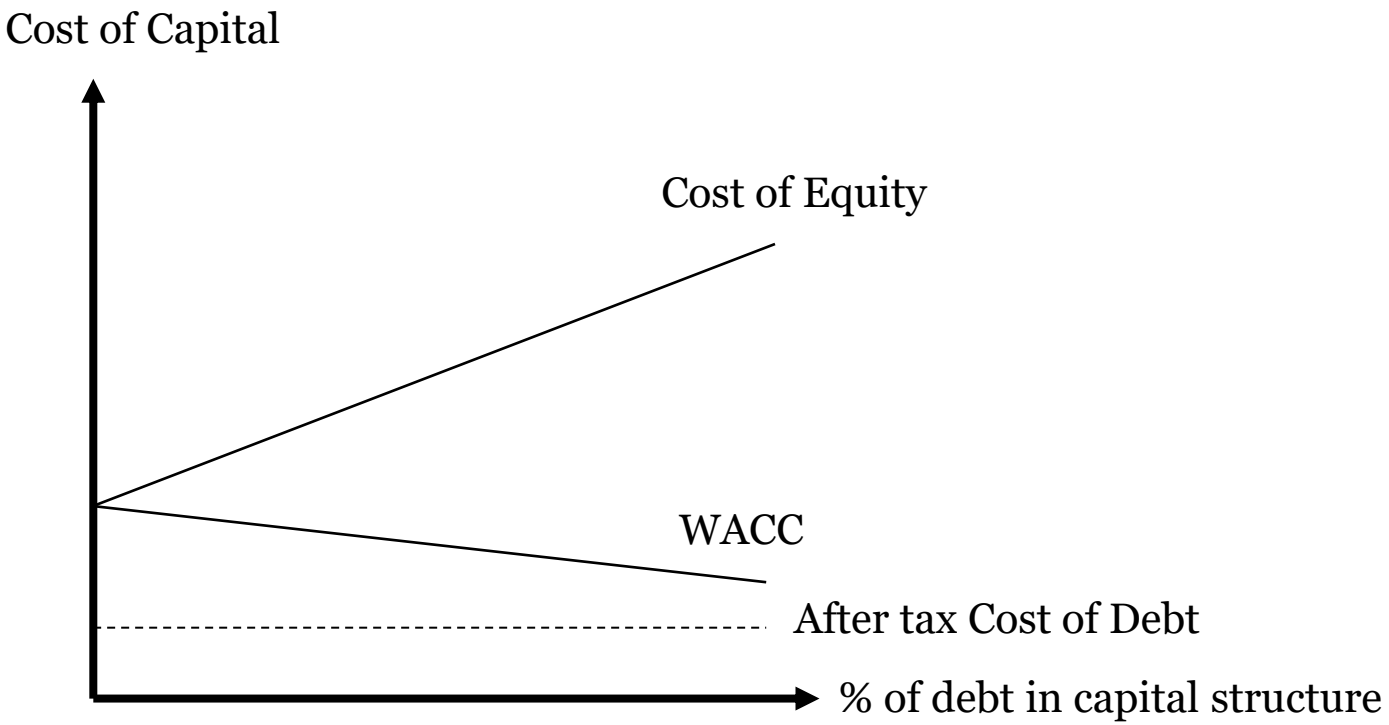
	Without Taxes	With Taxes
Value of the Firm	$V_L = V_U$	$V_L = V_U + tD$
WACC	$r_{WACC} = \left[\frac{D}{V} r_d\right] + \left[\frac{E}{V} r_e\right]$	$r_{WACC} = \left[\frac{D}{V} r_d(1-t)\right] + \left[\frac{E}{V} r_e\right]$
Cost of Equity	$r_e = r_0 + (r_0 - r_d)\left(\frac{D}{E}\right)$	$r_e = r_0 + (r_0 - r_d)(1-t)\left(\frac{D}{E}\right)$

Bottom line: The optimal capital structure is 99.99% debt.

Proposition II with Taxes:

The tax shield:

- Lowers the cost of debt because the cost is now multiplied by 1 minus the marginal tax rate.
- Lowers the cost of equity as more debt is used
- Increases the value of the firm by tD (that is, marginal tax rate times debt)—the interest tax shield.



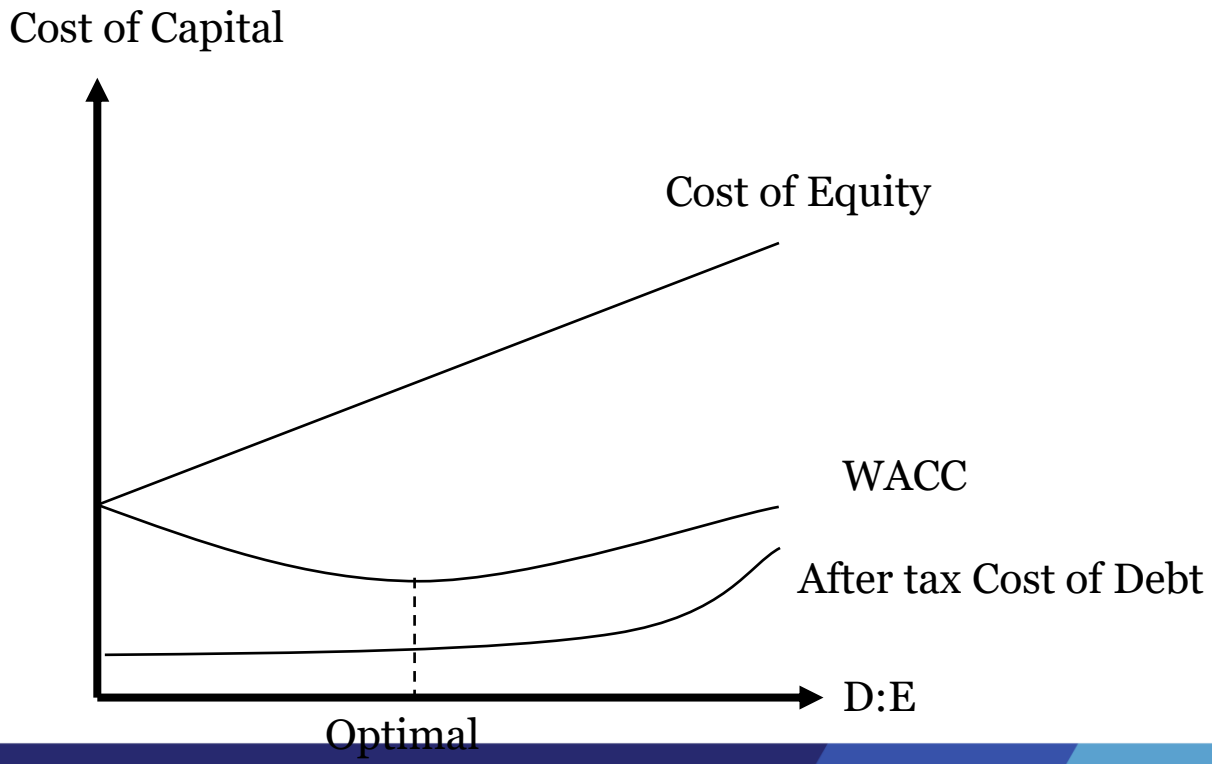
Introducing costs of financial distress

- **Costs of financial distress** are costs associated with a company that is having difficulty meeting its obligations.
- Costs of financial distress include the following:
  - Direct costs: Bankruptcy expenses
  - Indirect costs: Inability to negotiate long-term supply contracts, Loss of customers.
- The expected cost of financial distress increases as the relative use of debt financing increases.
  - This expected cost reduces the value of the firm, offsetting, in part, the benefit from interest deductibility.
  - The expected cost of distress affects the cost of debt and equity.

Bottom line: There is an optimal capital structure at which the value of the firm is maximized and the cost of capital is minimized.

Proposition II with Taxes and Financial Distress:

- There appears that the cost of capital declines resulting from tax savings but traded-off subsequently with increasing potential financial distress costs.



Agency Costs

- Agency costs are the costs associated with the separation of owners and management ie costs of conflict of interest between managers and owners.

- Types of agency costs:
  - Monitoring costs – Better corporate governance lower agency costs
  - Bonding costs – eg non-compete agreement
  - Residual losses – cant eliminate

- Agency costs increase the cost of equity and reduce the value of the firm.

- The higher the use of debt relative to equity, the greater the monitoring of the firm and, therefore, the lower the cost of equity, ie **Greater financial leverage reduces agency costs** because managers have less FCF to squander

Costs of Asymmetric Information & Pecking Order Theory

- **Asymmetric information** is the situation in which different parties have different information.
  - In a corporation, managers will have a better information set than investors.
  - The degree of asymmetric information varies among companies and industries.

- Costs higher if complex products or poor financial statements.

- Valuation implications:
  - **Stock Offering** -> Negative signal (offering to sell overvalued stock)
  - **Debt Offering** -> Positive signal (avoid selling undervalued stock; management confident can make payments)

- The **pecking order theory** argues that the capital structure decision is affected by management's choice of a source of capital that gives higher priority to sources that reveal the least amount of information.
  - Internally generated funds (most favored)
  - Debt
  - Newly issued Equity (least favored)

- Management send signals based on their financing choices.

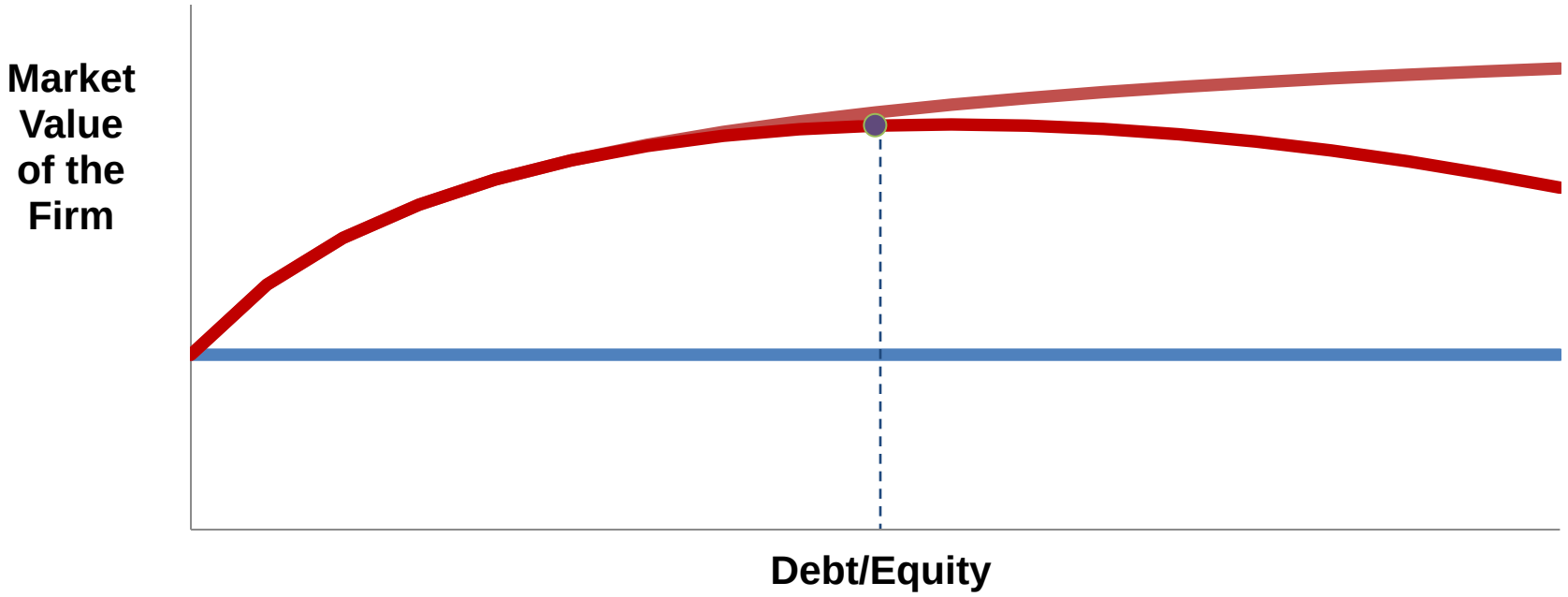
The Optimal Capital Structure

Taxes	Costs to Financial Distress	Optimal Capital Structure?
No	No	No
Yes	No	Yes, 99.99% debt
Yes	Yes	Yes, benefits of interest deductibility are offset by the expected costs of financial distress

We cannot determine the optimal capital structure for a given company, but we know that it depends on the following:

- The business risk of the company.
- The tax situation of the company.
- The degree to which the company's assets are tangible.
- The company's corporate governance.
- The transparency of the financial information.

Static Trade-off Theory: Value of the Firm



Topic 9: Debt Financing

What is a Fixed Income Security?

- A fixed-income security is a financial obligation of an entity (the issuer) that promises to pay a specified sum of money at specified future dates.
- A fixed-income security is an instrument that allow governments, companies, and other types of issuers to borrow money from investors.
  - Any borrowing of money is debt.
- The terms “fixed-income securities,” “debt securities,” and “bonds” are often used interchangeably.

Types of Bank Financing

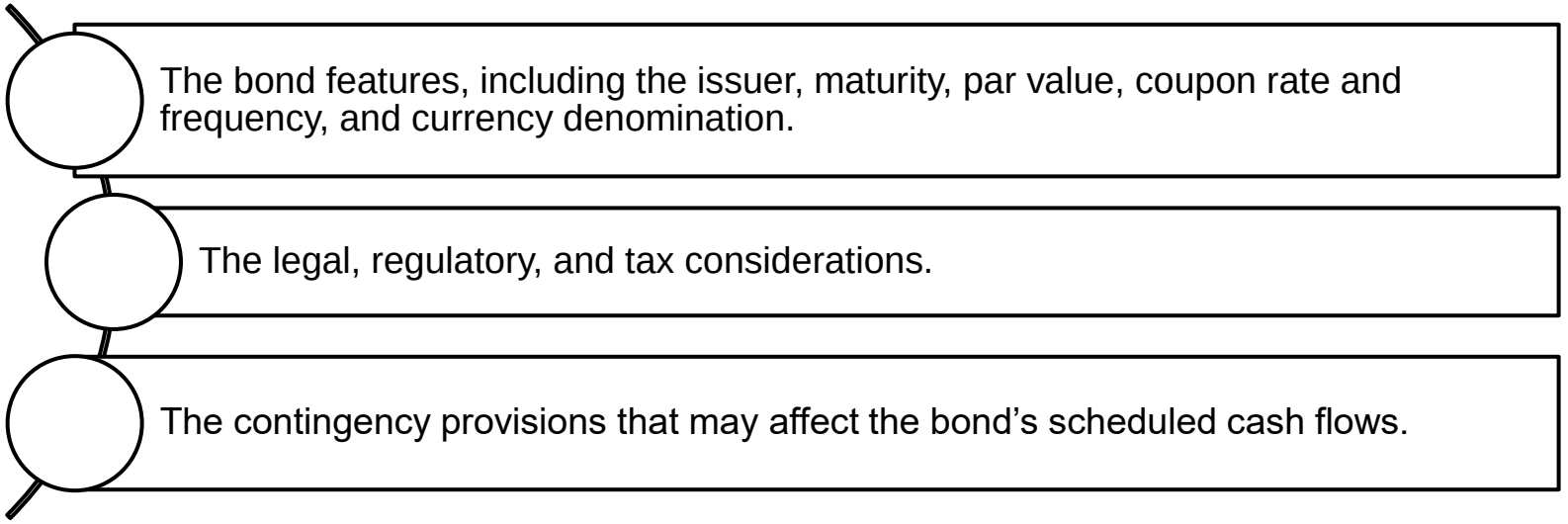
- Bank Loans
  - Term loan
  - Trade loan
    - Documentary Bill for Collection
    - Documentary credit – LC
    - Trust Receipts (TR)
    - Banker's Acceptance (BA)
    - Export Credit Refinancing (ECR)
  - Working Capital – OD, RC
- Leases
  - Operating Lease
  - Finance Lease
- Debt Securities

Examples of Debt Securities

Issuer	Long-Term	Short-Term
Government/ BNM	• MGS • GII	• MTB • BNM Notes
Private Corporations	• Corporate Bonds • MTN • Sukuk	• Commercial Paper • NIF
Cagamas	• Cagabonds	• Caganotes

Overview of a Fixed Income Security

- There are three important elements when investing in a fixed-income securities:



- All bonds, whether they are traditional or securitised bonds, are characterised by the same basic features.
- Based on creditworthiness, bonds can be investment-grade or non-investment-grade (high yield, speculative).
- Malaysia has 2 local credit rating agencies

RAM

MARC

Basic Features of a Bond (1)

Maturity

- The maturity date is the date when the issuer is obligated to redeem the bond.
- The tenor, also known as term to maturity, is the time remaining until the bond's maturity date.
  - Money market securities are fixed-income securities with maturity up to one year.
  - Capital market securities are fixed-income securities with maturity longer than one year.

Par value (principal) of a bond

- The par value of a bond is the amount the issuer agrees to repay the bondholders on the maturity date.

Coupon rate and frequency

- The coupon or nominal rate (yield) of a bond is the interest rate that the issuer agrees to pay each year until the maturity date.
- The coupon is the annual amount of interest payments and is determined by multiplying the coupon rate by the par value of the bond.
  - Plain vanilla bonds pay a fixed rate of interest.
  - Floating-rate notes (FRNs) or floaters pay a floating rate: a reference rate plus a spread.
  - Bonds that do not pay interest are called "**zero-coupon bonds**."

Basic Features of a Bond (2)

Bond indenture

- The trust deed is the legal contract that describes the form of the bond, the obligations of the issuer, and the rights of the bondholders.
- This legal contract is often called the “bond indenture.”
- The indenture is written in the name of the issuer and references features of the bond issue, such as par value, coupon rate and frequency, maturity date, and the funding sources for the interest and principal repayments, as well as any collaterals, covenants, and credit enhancements.

Covenants

- **Affirmative covenants** state what issuers are required to do.
  - Eg what the issuer will do with the proceeds from the bond issue and the promise of making the contractual payments, promise to comply with all laws and regulations, maintain its current lines of business, insure and maintain its assets, and pay taxes as they come due.
- **Negative covenants** enumerate what issuers are prohibited from doing.
  - Eg include restrictions on debt, negative pledges, restrictions on prior claims, restrictions on distributions to shareholders, restrictions on asset disposals, restrictions on investments, and restrictions on mergers and acquisitions.

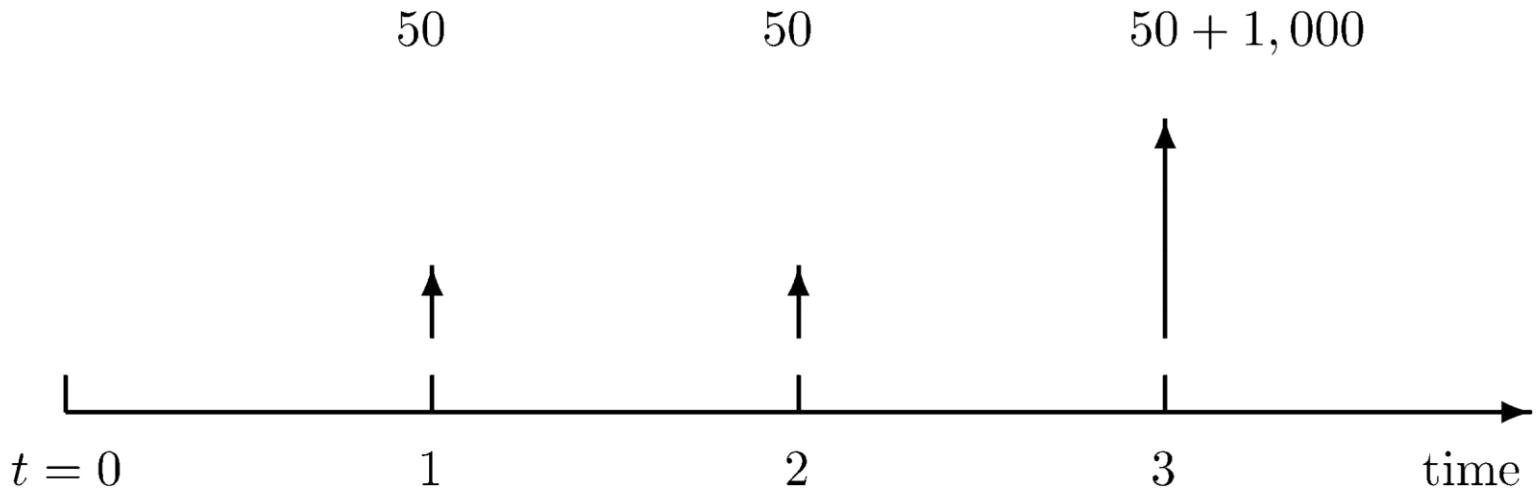
Structure of a bond's cash flows

- The most common payment structure by far is that of a plain vanilla bond, as depicted below.
- Plain vanilla bonds make periodic, fixed coupon payments and a lump-sum payment of principal at maturity.

Cashflow:

- Maturity
- Coupon
- Principal

Example. A 3-year bond with principal of \$1,000 and annual coupon payment of 5% has the following cashflow:



Bonds with contingency provisions

- A contingency provision is a clause in a legal document that allows for some action if the event or circumstance does occur (i.e., embedded option).
- Some common types of bonds with embedded options include callable bonds, putable bonds, and convertible bonds.
- The options embedded in these bonds grant either the issuer or the bondholders certain rights affecting the disposal or redemption of the bond.

Callable bonds	• Callable bonds give the issuer the right to redeem all or part of the bond before the specified maturity date. • The primary reason why issuers choose to issue callable bonds rather than non-callable bonds is to protect themselves against a decline in interest rates.
Putable bonds	• The bondholder has the right to sell the bond back to the issuer at a pre-determined price on specified dates. • Putable bonds are beneficial for the bondholder by guaranteeing a pre-specified selling price at the redemption dates.

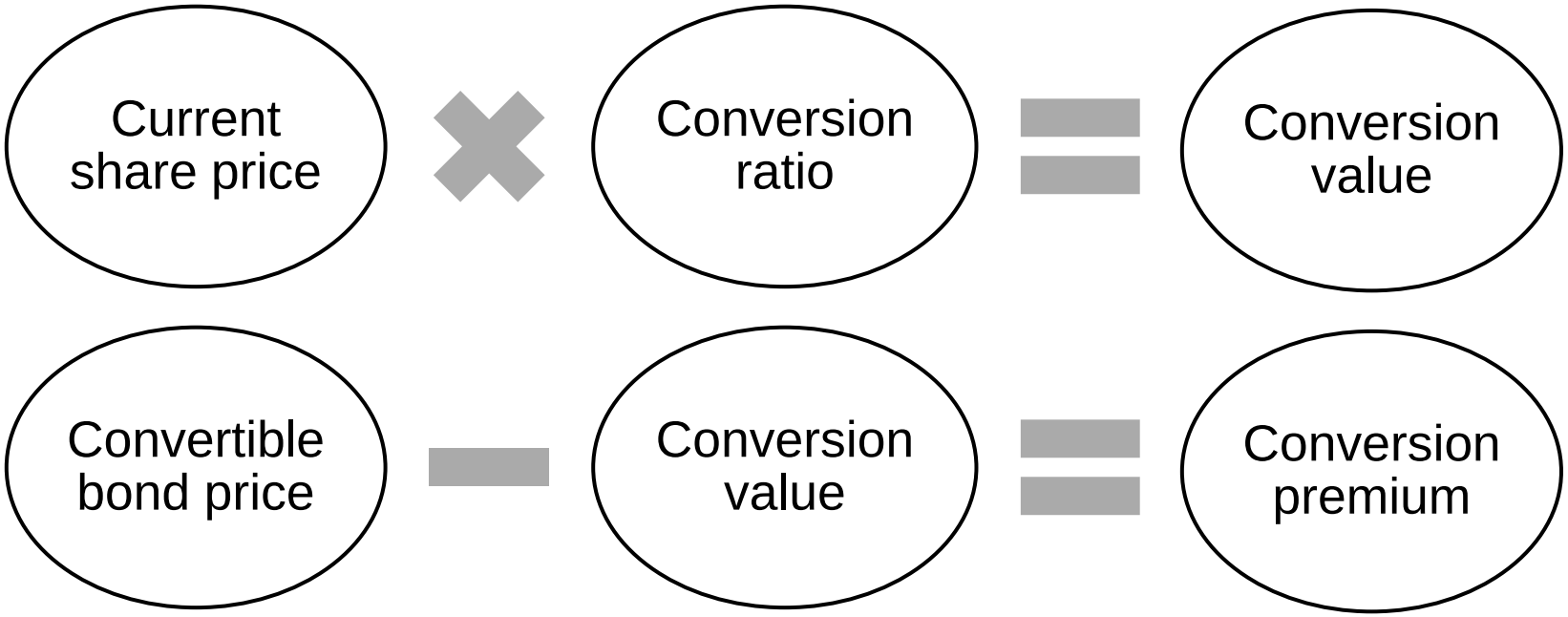
Bonds with contingency provisions

Convertible bonds

- They are a hybrid security with both debt and equity features.
- The bondholder has the right to exchange the bond for a specified number of common shares in the issuing company.
- They are beneficial to bondholders.
- The bondholder has the ability to convert bonds into equity in case of share price appreciation and thus participate in the equity up side.
- At the same time, the bondholder receives downside protection; if the share price does not appreciate, the convertible bond offers the comfort of regular coupon payments and the promise of principal repayment at maturity.

Bonds with contingency provisions

- The conversion price is the price per share at which the convertible bond can be converted into shares.
- The conversion ratio is the number of common shares that each bond can be converted into.



Introduction to Fixed Income Valuation

Bond Prices and Time Value of Money

- Bond pricing is an application of discounted cash flow analysis.

  ↳ **Bond price** should be equal to the value of all discounted future cash flows.

- On an option-free fixed-rate bond, the promised future cash flows are a series of coupon interest payments and repayment of the full principal at maturity.
- The market discount rate is used to obtain the present value.

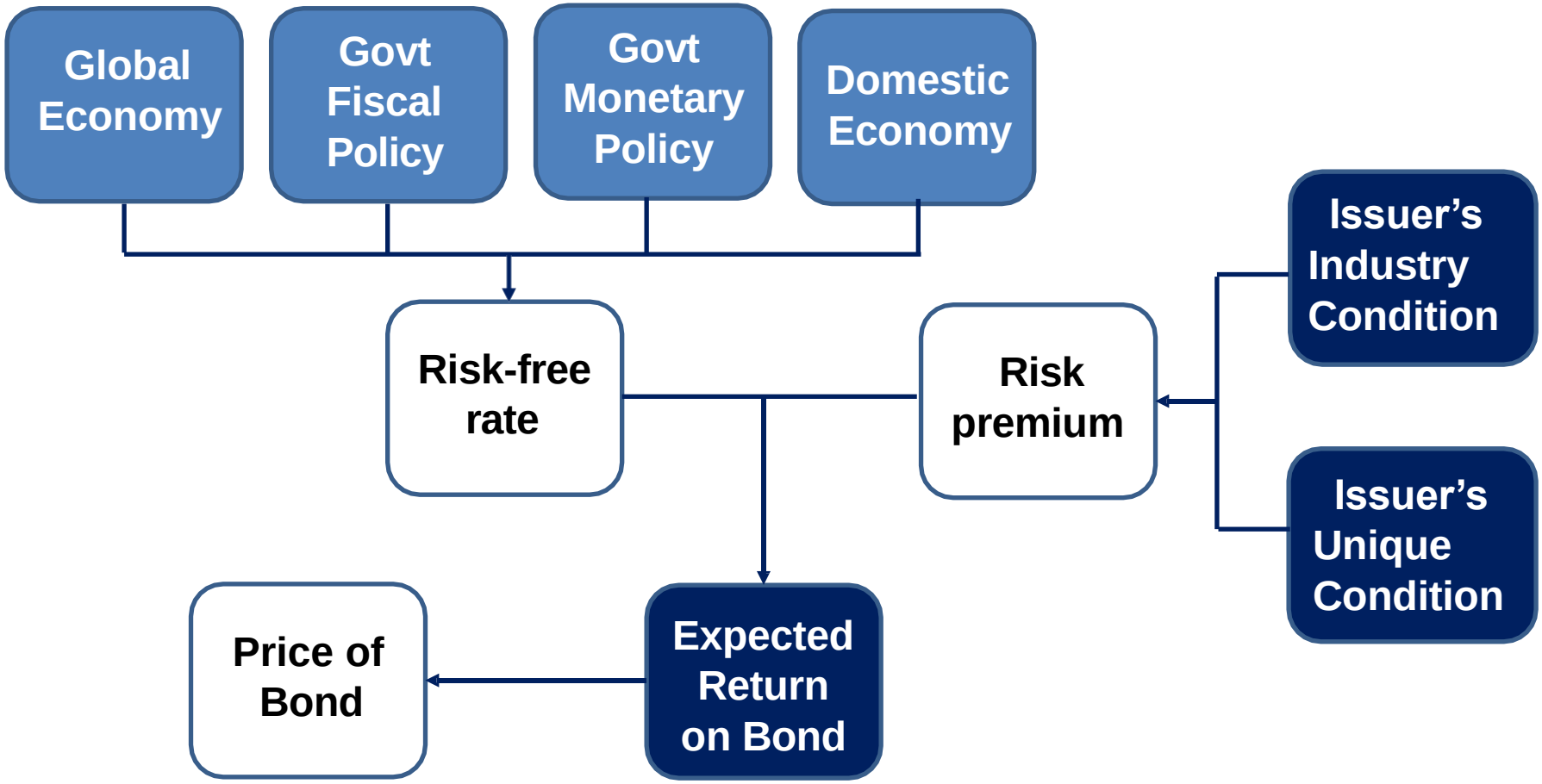
  ↳ The **market discount rate** is the rate of return required by investors given the risk of the investment in the bond.

- **Formula for calculating the bond price given the market discount rate:**

$$\text{PV} = \frac{\text{PMT}}{(1+r)^1} + \frac{\text{PMT}}{(1+r)^2} + \cdots + \frac{\text{PMT} + \text{FV}}{(1+r)^N}$$

Introduction to Fixed Income Valuation

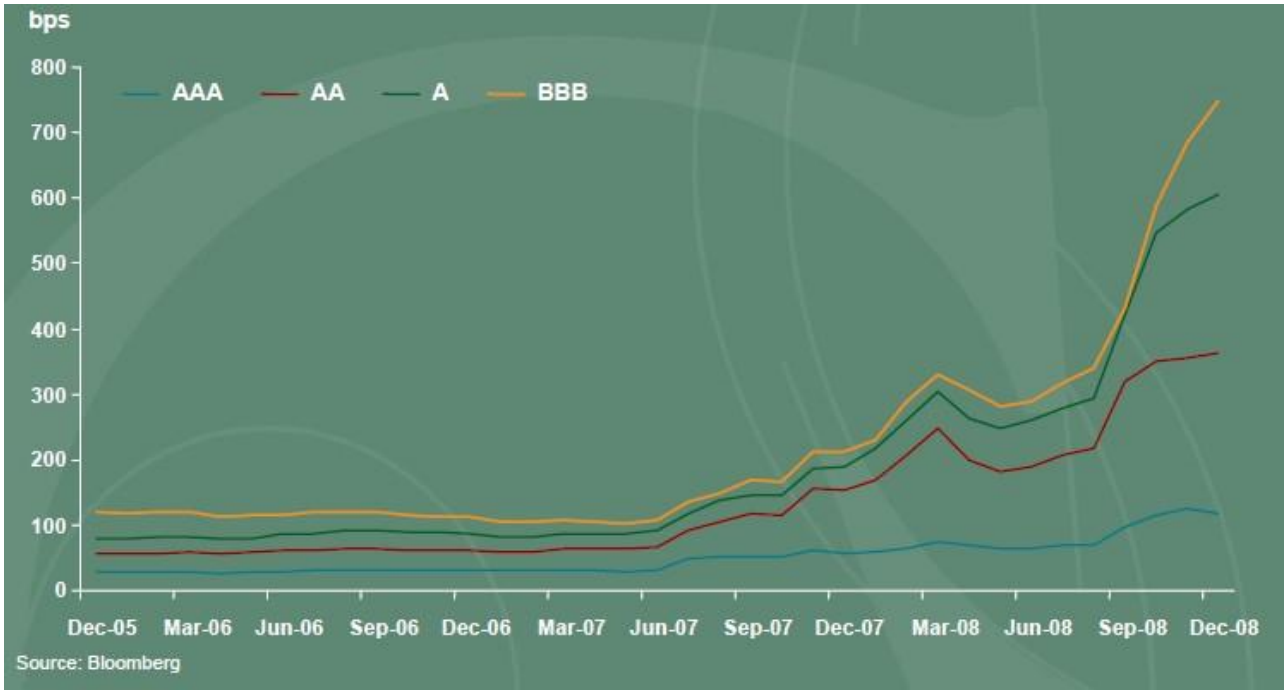
Factors Affecting Rates/Bond Price



Introduction to Fixed Income Valuation

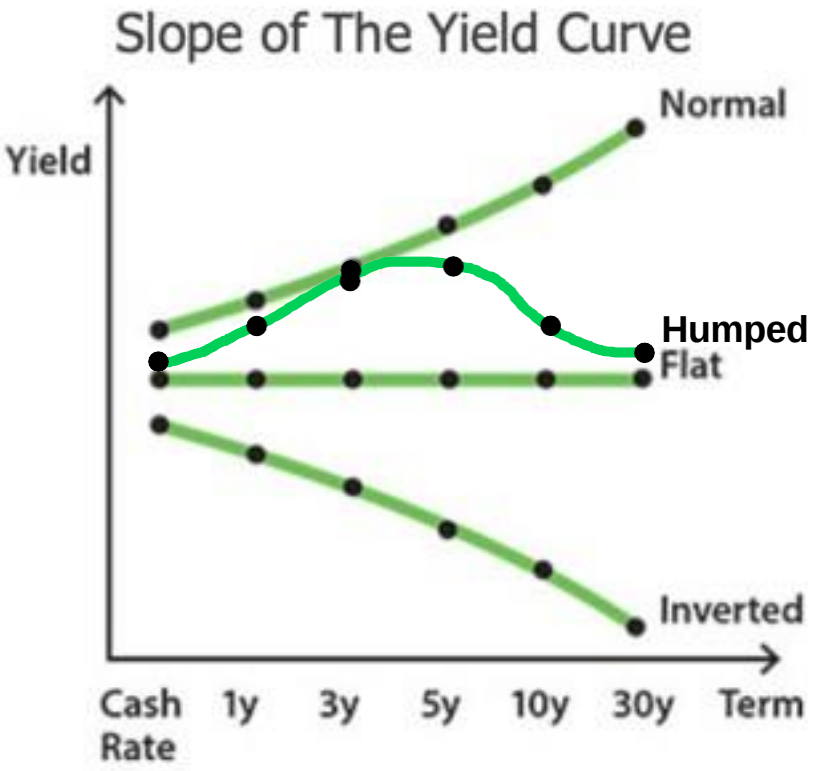
Yield Curve

- Explains the relationship between the yields on fixed- income securities and the time to maturity
- Also referred to as “the term structure of interest rates”



Introduction to Fixed Income Valuation

Types of Yield Curve



Normal Yield Curve

- Market expects the economy to function at normal growth rate – no significant changes in inflation or available capital.
- Higher yields in long-term

Inverted Yield Curve

- Market expects the economy to slow down and interest rates to drop in the future
- Higher yields in short-term

Flat Yield Curve

- Market is at the point of inflection, preceding either a recession or an economic pick-up
- Long-term and short-term interest at same level

Humped yield curve

- Market is indicating that some period of uncertainty or volatility may be expected in the economy.
- Intermediate-term rate is higher than long and short-term rates

Introduction to Fixed Income Valuation

Yield Curve Theories

Pure Expectation Theory	• Based on the concept of future interest rates being equal to the market expectations of future short-term interest rates. • According to the theory, long-term rates should be equal to the average of the short-term rates that are expected to apply over the longer period.
Liquidity Preference Theory	• Investors **prefer short-term securities** due to their shorter period of exposure to changes in interest rates compared with long-term securities. • This preference results from the risk aversion characteristic among investors. • To induce investors to hold longer-term maturities, a sufficient yield premium must be offered to compensate for the greater risk.
Market Segmentation Theory	• Also known as **preferred habitat theory**. • Risk aversion can lead to a preference for shorts and longs. • This preference causes the supply and demand for funds to be segmented into different maturity sectors • The level of interest rates is therefore determined by the supply and demand for securities of different maturities.

Examples

Calculate the value of a 10-year, $1,000 par value, 10% coupon, annual-pay bond using a

a) **Discount rate of 10%**

b) **Discount rate of 8%**

c) **Discount rate of 12%**

7. Bond Valuation and Yield to Maturity

Calculating the Value of a Semiannual Coupon Bond and a Zero Coupon Bond

Examples

a) Calculate the value of a 10-year, $1,000 par value, 10% coupon, **semiannual-pay** bond using a discount rate of 8%

b) Calculate the value of a $100 par value, zero coupon bond which matures in 2.5 years, at a n annualized discount rate (YTM) of 6%

7. Bond Valuation and Yield to Maturity

The relationships between bond price, coupon rate, maturity & market discount rate (YTM).

Examples: Calculate the **Market Discount Rate** for a

a) **3-year, 8% annual coupon bond that is priced at 90.393**

N = 3; PMT = 8, FV = 100; PV = -90.393; **I/Y = 12%**

b) 5-year, 7% annual coupon bond that is priced at 102.078

This is the **Yield-to-Maturity (YTM)** and assumes:

1. Held-to-maturity
2. All payments made
3. Coupon payments reinvested at YTM

7. Bond Valuation and Yield to Maturity

The relationships between bond price, coupon rate, maturity & market discount rate (YTM).

Relationships

1. **Yield up $\Rightarrow$ Price down;** Price down $\Rightarrow$ Yield up

2. **Yield down $\Rightarrow$ Price up;** Price up $\Rightarrow$ Yield down

3. **Coupon rate > YTM $\Rightarrow$ price > par (premium)**

4. **Coupon < YTM $\Rightarrow$ price < par (discount)**

7. Bond Valuation and Yield to Maturity

The relationships between bond price, coupon rate, maturity & market discount rate (YTM).

Relationships

1. **Convexity:** Price increase from decrease in yield is larger than price decrease from increase in yield

2. **Maturity Effect:** Values of bonds with longer maturities are more sensitive to changes in YTM

3. **Coupon Effect:** Values of bonds with lower coupons are more sensitive to a change in YTM

Price-Yield Relationship

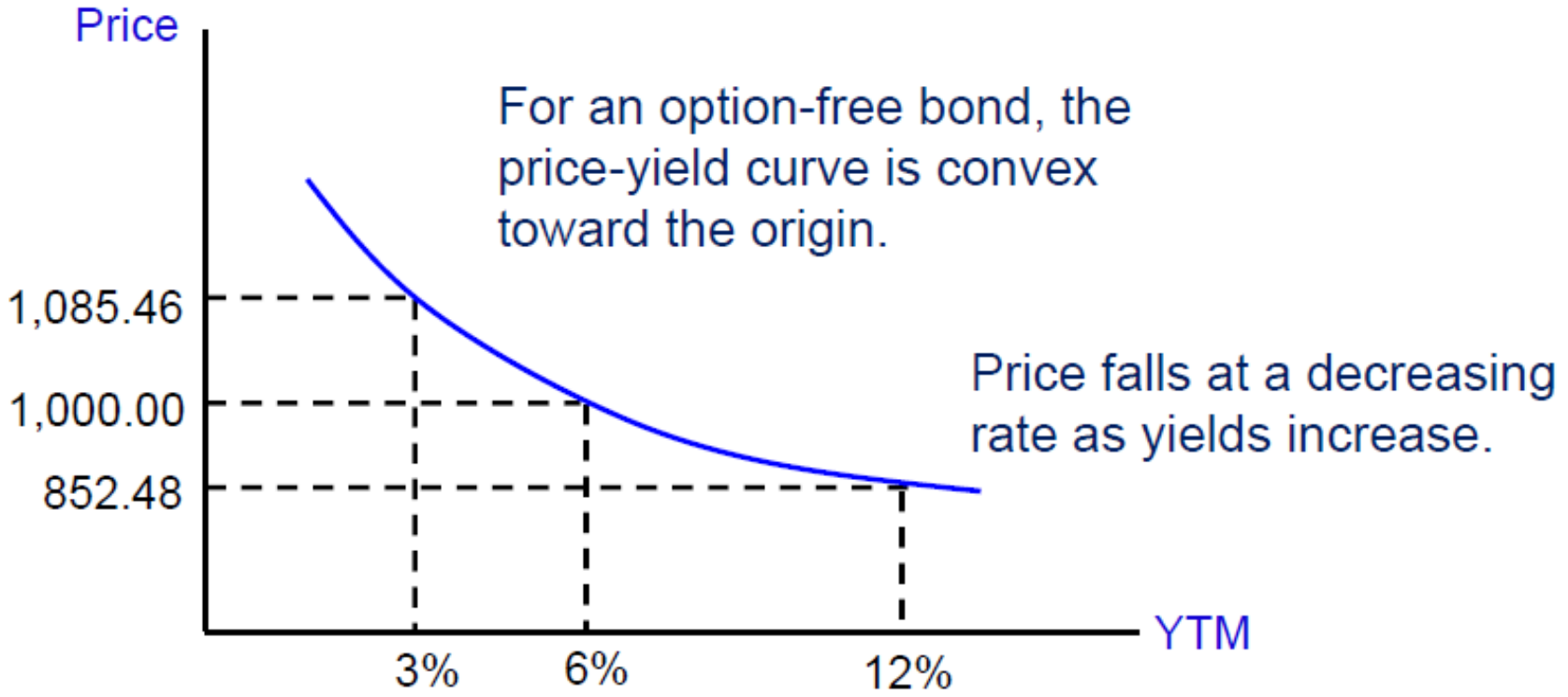
Consider a bond with $1,000 par value and a 3-year life paying 6% semiannual coupons. The bond values corresponding to required yields of 3%, 6%, and 12% as the bond approaches maturity are

Time to Maturity (in years)	YTM = 3%	YTM = 6%	YTM = 12%
3.0	$1,085.46	$1,000	$852.48
2.5	1,071.74	1,000	873.63
2.0	1,057.82	1,000	896.05
1.5	1,043.68	1,000	919.81
1.0	1,029.34	1,000	945.00
0.5	1,014.78	1,000	971.69
0.0	1,000	1,000	1,000

7. Bond Valuation and Yield to Maturity

The relationships between bond price, coupon rate, maturity & market discount rate (YTM).

Option-Free Bond Price-Yield Curve



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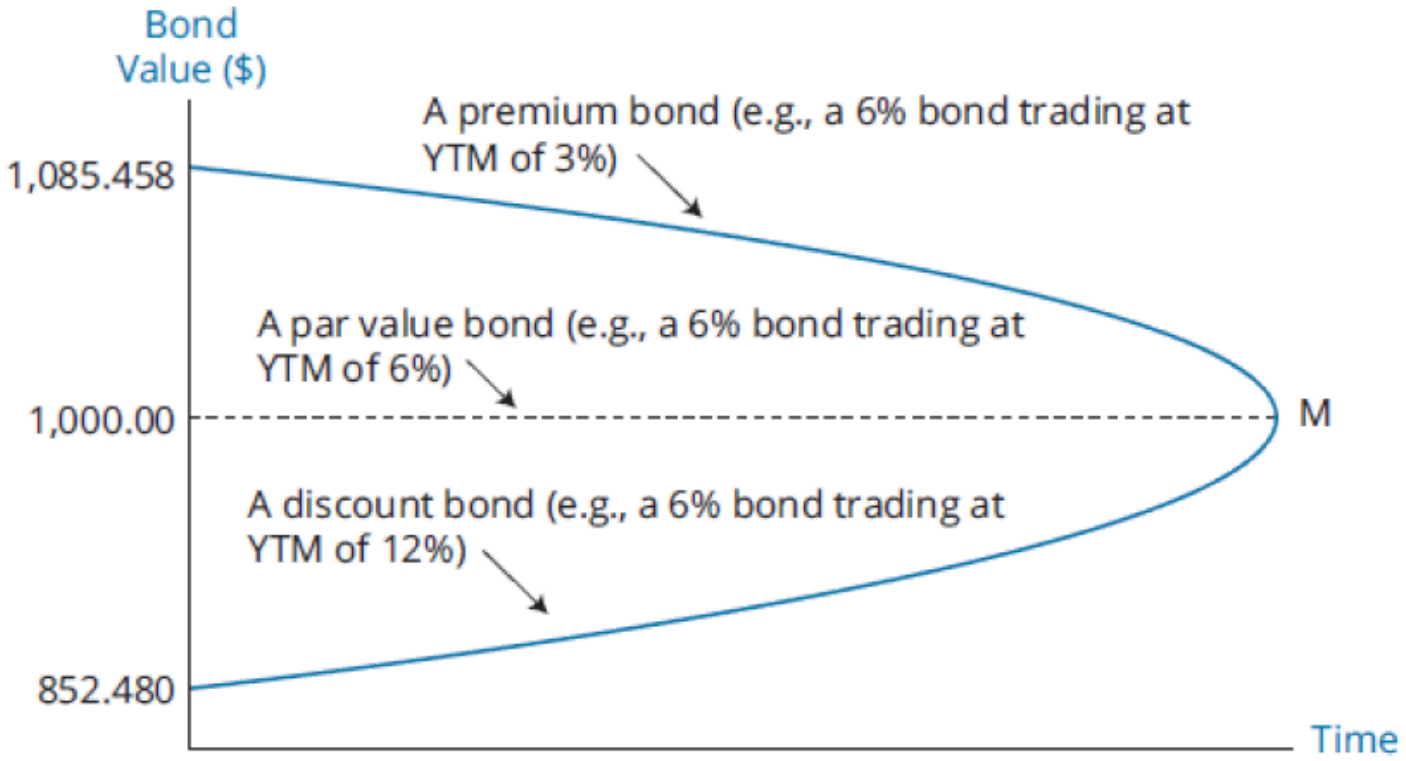
7. Bond Valuation and Yield to Maturity

The relationships between bond price, coupon rate, maturity & market discount rate (YTM).

Constant-Yield Price Trajectory



Bond Prices given a market discount rate

The price of a fixed-rate bond, relative to par value, depends on the relationship of the coupon rate to the market discount rate.

If the bond price is higher than par value, the bond is said to be traded **at a premium.**	• This happens when the coupon rate is greater than the market discount rate.
If the bond price is lower than par value, the bond is said to be traded **at a discount.**	• This happens when the coupon rate is less than the market discount rate.
If the bond price is equal to par value, the bond is said to be traded **at par.**	• This happens when the coupon rate is equal to the market discount rate.

Yield to Maturity

- If the market price of a bond is known, the equation on the previous slide can be used to calculate its **yield-to-maturity**.
- The **yield-to-maturity** is the internal rate of return on a bond's cash flows. It is the implied market discount rate.
- The **yield-to-maturity (YTM)** is the rate of return on the bond to an investor provided three conditions are met:
  1. The investor holds the bond to maturity.
  2. The issuer does not default on coupon or principal payments.
  3. The investor is able to reinvest coupon payments at that same yield.
- Therefore, the yield-to-maturity is the **promised yield.**

Example. Suppose that a four-year, 5% annual coupon paying bond is priced at 105 per 100 of par value. The yield-to-maturity is the solution for the rate, *r*, in this equation:

$$105 = \frac{5}{(1+r)^1} + \frac{5}{(1+r)^2} + \frac{5}{(1+r)^3} + \frac{105}{(1+r)^4}$$

where $r = 0.03634$, or 3.634%.

The bond is traded at a premium because its coupon rate is greater than the yield required by investors.

Relationships between Bond Prices and Bond Characteristics

4 Relationships

Bond	Coupon Rate	Maturity	Price at 20%	Discount Rates Go Down		Discount Rates Go Up	
				Price at 19%	% Change	Price at 21%	% Change
A	10%	10	58.075	60.950	4.95%	55.405	–4.60%
B	20%	10	100.000	104.339	4.34%	95.946	–4.05%
C	30%	10	141.925	147.728	4.09%	136.487	–3.83%
D	10%	20	51.304	54.092	5.43%	48.776	–4.93%
E	20%	20	100.000	105.101	5.10%	95.343	–4.66%
F	30%	20	148.696	156.109	4.99%	141.910	–4.56%

Relationships between Bond Prices and Bond Characteristics

- The price of a fixed-rate bond will change whenever the market discount rate changes.

1. The Inverse Effect
   - **The bond price is inversely related to the market discount rate.** When the market discount rate increases, the bond price decreases.
2. The Convexity Effect
   - For the same coupon rate and time-to-maturity, the **percentage price change is greater when the market discount rate goes down** than when it goes up.
3. The Coupon Effect
   - For the same time-to-maturity, a **lower-coupon bond has a greater percentage price change** than a higher-coupon bond when their market discount rates change by the same amount
4. The Maturity Effect
   - For the same coupon rate, a **longer-term bond has a greater percentage price change** than a shorter-term bond when their market discount rates change by the same amount.

Understanding Fixed-Income Risk and Return

Sources of Return

- The total return is the future value of reinvested coupon interest payments and the sale price (or redemption of principal if the bond is held to maturity). The horizon yield (or holding period rate of return) is the internal rate of return between the total return and purchase price of the bond.

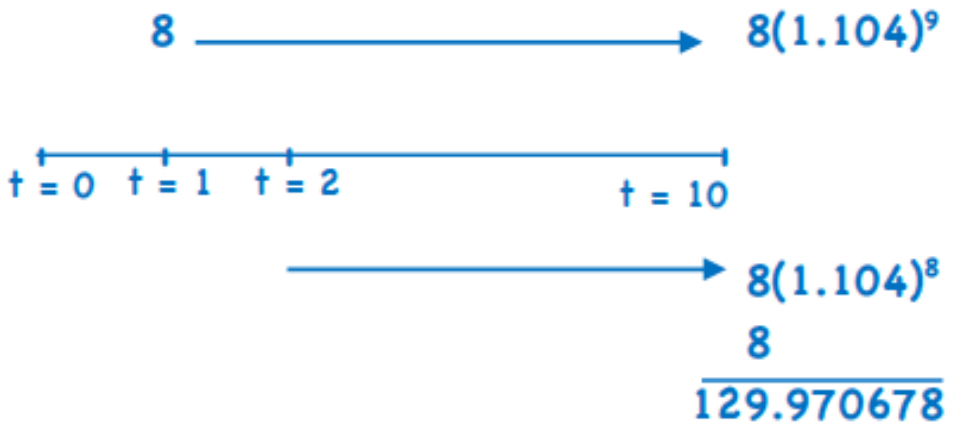
- <u>Sources of Return:</u>

1. **Coupon payments + principal** payments on the scheduled dates — Credit Risk
2. **Reinvestment of coupon payments** — Interest Rate Risk
3. **Capital gains/losses** on the sale of the bond prior to maturity — Interest Rate Risk

Example 1

- A “buy-and- hold” investor purchases a 10-year, 8% annual coupon payment bond at 85.503075 per 100 of par value and holds it until maturity.

(PV) $$85.503075 = \frac{8}{(1+r)} + \frac{8}{(1+r)^2} + \cdots + \frac{108}{(1+r)^{10}} \qquad r = 0.104$$



Total coupons	$80
Interest-on interest	49.970678
Principal	100
	229.970678

$$85.503075 = \frac{229.970678}{(1.104)^{10}}$$

YTM assumes

1. Held to maturity
2. No default
3. Coupons reinvested at same rate of interest

Now assume same bond -> But sold after 4 years

FV (coupons) = $8(1.104)^3 + 8(1.104)^2 + 8(1.104) + 8 = 37.347111$

PV of 6-year, 8% annual with YTM = 10.40% = 89.668770

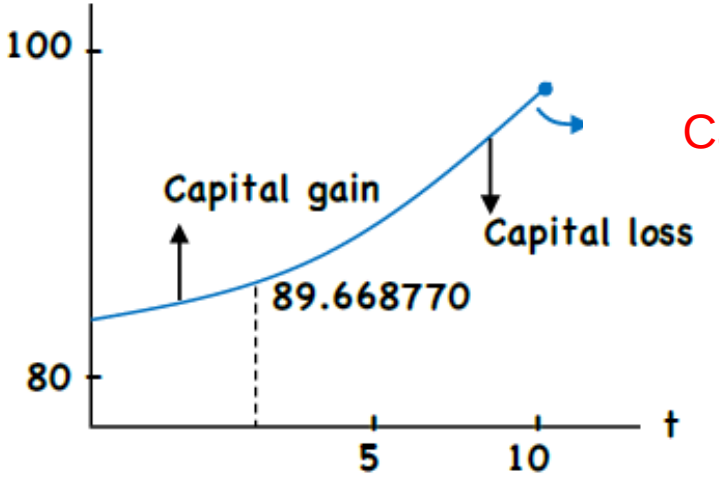
Total Return = $\frac{127.015881}{(1 + r)^4} = 85.503075$

r = 10.40%
· horizon yield

Assumes ① coupons re-invested at 10.40%
② Bond is sold on the constant-yield price curve

Understanding Fixed-Income Risk and Return

Sources of Return



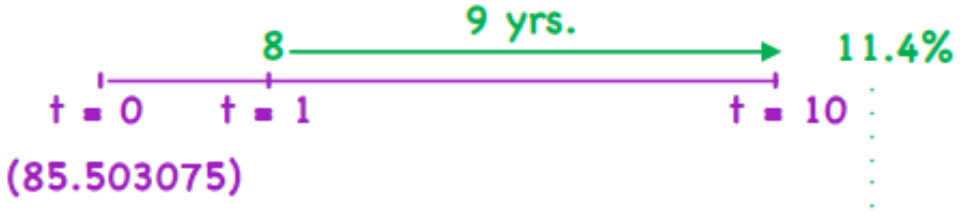
Carrying value of Bond =>

Purchase Price
(85.503075)

+

Amortized amt of the
DISCOUNT/ PREMIUM

Now: Assume interest rates rise 100 bps (10.4% => 11.4%)



$$85.503075 - \frac{136.380195 + 100}{(1+r)^{10}} = \frac{236.380195}{(1+r)^{10}}$$

r = 10.7%

Now: Assume interest rates rise 100 bps (10.4% => 11.4%)

Sold after 4 years

FV of coupons at t = 4 37.899724 (+)

PV of 6-yr. bond at t = 4 85.780408 (-)

123.680132

$$85.503075 = \frac{123.680132}{(1+r)^4} = 0.0967$$

89.668770 - 85.780408 = 3.888362

Capital loss

Now: Assume interest rates FALL 100 bps (10.4% => 9.4%)

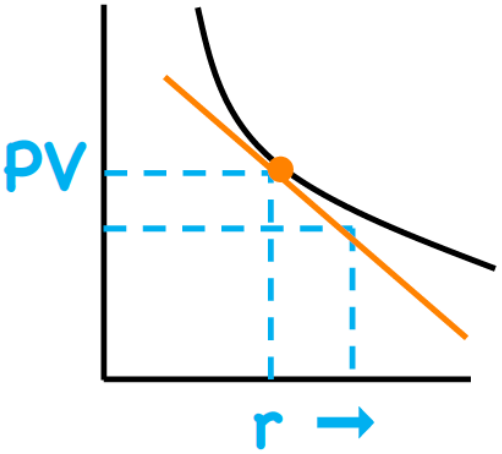
Buy-and-Hold	Sold after 4-years
r = 10.10%	r = 0.1117
· lower re-investment of coupon	· lower re-investment of coupon · Capital gain on sale of bond
interest rate risk	interest rate risk

Understanding Fixed-Income Risk and Return

Interest Rate Risk: Duration

- **Duration= measures the sensitivity of the bond's full price (including accrued interest) to changes in the bond's own yield or more generally, changes in interest rates.**

- Assumes all other variables are held constant



⇒ Represents approx. amount of time a bond would have to be held for the market discount rate to be realized

⇒ Eg 10-yr, 8% annual @ 85.503075, YTM=10.4%

⇒ Duration = 7.0029 => if rates ↑ (+) reinvestment of coupon
(-) capital loss
= 0 if held for 7.0029 years

Interest Rate Risk
Types of Duration

Yield Duration	Curve Duration
- Sensitivity of price to own YTM **Measures:** ▪ Macauley Duration ▪ Modified Duration ▪ Money Duration ▪ PVBP	- Sensitivity of price to benchmark yield - Used with complex bonds and also with financial assets/liabilities that have interest rate risk but are not bonds **Measures:** ▪ Effective Duration

Interest Rate Risk
Macaulay Duration

- **Macaulay duration** is a weighted average of the time to receipt of the bond's promised payments, where the weights are the shares of the full price that correspond to each of the bond's promised future payments.

- Formula

$$\text{Duration} = \frac{\sum_{t=1}^{n} (t)\,(C_t/(1+r)^t)}{\sum_{t=1}^{n} (C_t/(1+r)^t)}$$

$$= \sum (t)\,(\text{Present value of cash flow})/\text{bond price}$$

Where:

t	–	time/year
C_t	–	cash flow of the bond
r	–	required rate of return used to discount the cash flows

Interest Rate Risk

Macaulay Duration: Example

- Nominal value of bond is RM1,000 per bond and coupons are paid semi annually.

Example 1: Regular bond

Coupon rate = 12% p.a.; Term to maturity = 4 years; Yield = 10% p.a.

Period(t)	Cash flow	PV factor@5% = $1/(1+R)^t$	PV cash flow	PV Cash flow x (t)	PV Cash flow x (t)/ PV Bond
1	60	0.9524	57.14	57.14	0.054
2	60	0.9070	54.42	108.84	0.102
3	60	0.8638	51.83	155.49	0.146
4	60	0.8227	49.36	197.44	0.185
5	60	0.7835	47.01	235.05	0.221
6	60	0.7462	44.77	268.62	0.252
7	60	0.7107	42.64	298.48	0.280
8	1,060	0.6768	717.41	5,739.28	5.391
Total		PV of Bond = 1,064.58		**Duration = 6.631**	

Duration (in years) = 6.63/2 = 3.32 years

Example 2: Zero coupon bond

Coupon rate = zero; Term to maturity = 4 years; Yield = 10% p.a.

Period(t)	Cash flow	PV factor@5% = $1/(1+R)^t$	PV cash flow	PV Cash flow x (t)	PV Cash flow x (t)/ PV Bond
1	0	0.9524	0	0	0
2	0	0.9070	0	0	0
3	0	0.8638	0	0	0
4	0	0.8227	0	0	0
5	0	0.7835	0	0	0
6	0	0.7462	0	0	0
7	0	0.7107	0	0	0
8	1,000	0.6768	676.8	5,414.4	8
Total		PV of Bond = 676.8		**Duration = 8**	

Duration (in years) = 8.0/2 = 4 years

Interest Rate Risk
Macaulay Duration: Example

- Nominal value of bond is RM1,000 per bond and coupons are paid semi annually.

Example 3: Same term to maturity, Same coupon rate but yield 12% (from 10%)

Period(t)	Cash flow	PV factor@6 % = 1/(1+R)^t	PV cash flow	PV Cash flow x (t)	PV Cash flow x (t)/ PV Bond
1	60	0.9434	56.60	56.60	0.0566
2	60	0.8900	53.40	106.80	0.1068
3	60	0.8396	50.38	151.14	0.1511
4	60	0.7921	47.53	190.12	0.1901
5	60	0.7473	44.84	224.20	0.2242
6	60	0.7050	42.30	253.80	0.2538
7	60	0.6651	39.91	279.37	0.2794
8	1,060	0.6274	665.04	5,320.32	5.3203
Total		PV of Bond = 1,000.00		**Duration = 6.582**	

Duration (in years) = 6.582/2 = 3.3 years

Interest Rate Risk
Macaulay Duration

Key takeaways:

1. **The lower the coupon rate, the greater the bond's duration**
   - The lower coupon bonds will have greater price volatility than higher coupon bonds

2. **The longer the bond's maturity, the longer the duration**
   - Long maturity bonds have greater price volatility than shorter-maturity bonds

3. **For coupon bonds, the bond's duration will be shorter than the maturity**
   - Zero-coupon bonds will have a duration that is same as the maturity

4. **The higher the yield, the lower the duration**

Interest Rate Risk
Modified Duration

- **Modified duration =** $ModDur = \frac{MacDur}{1+r}$

- provides an estimate of the percentage price change for a bond given a change in its yield-to-maturity (liner estimate)
- $\%\Delta PV^{Full} \approx -AnnModDur \times \Delta yield$ <- annual yield

- **E.g if r = 11.4% instead of 10.4%**
  - $\%\Delta PV^{Full} \approx -6.3432 \times 0.0100 = -6.3432\%$
- **if r = 9.4% instead of 10.4%**
  - $\%\Delta PV^{Full} \approx -6.3432 \times 0.0100 = -6.3432\%$

Requires a convexity adjustment

Interest Rate Characteristic of a Callable / Putable Bond

- **Modified duration =** $ModDur = \frac{MacDur}{1+r}$

- provides an estimate of the percentage price change for a bond given a change in its yield-to-maturity (liner estimate)
- $\%\Delta PV^{Full} \approx -AnnModDur \times \Delta yield$ <- annual yield

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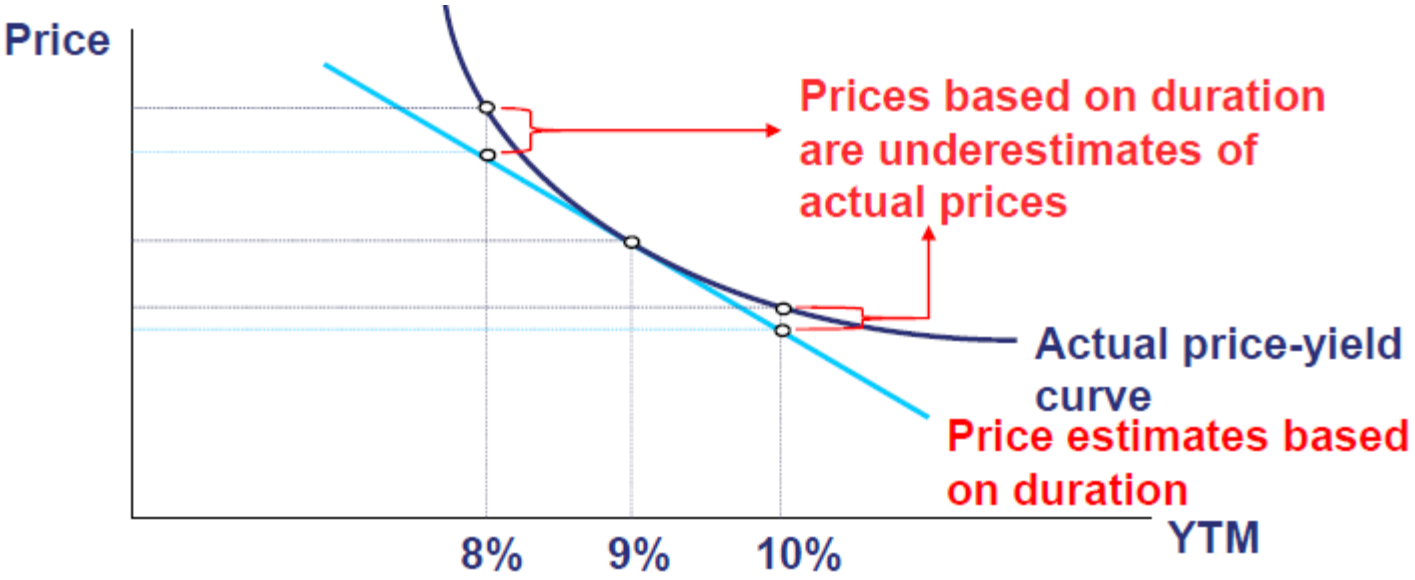
- **if r = 9.4% instead of 10.4%**
  - $\%\Delta PV^{Full} \approx -6.3432 \times 0.0100 = -6.3432\%$

Requires a convexity adjustment

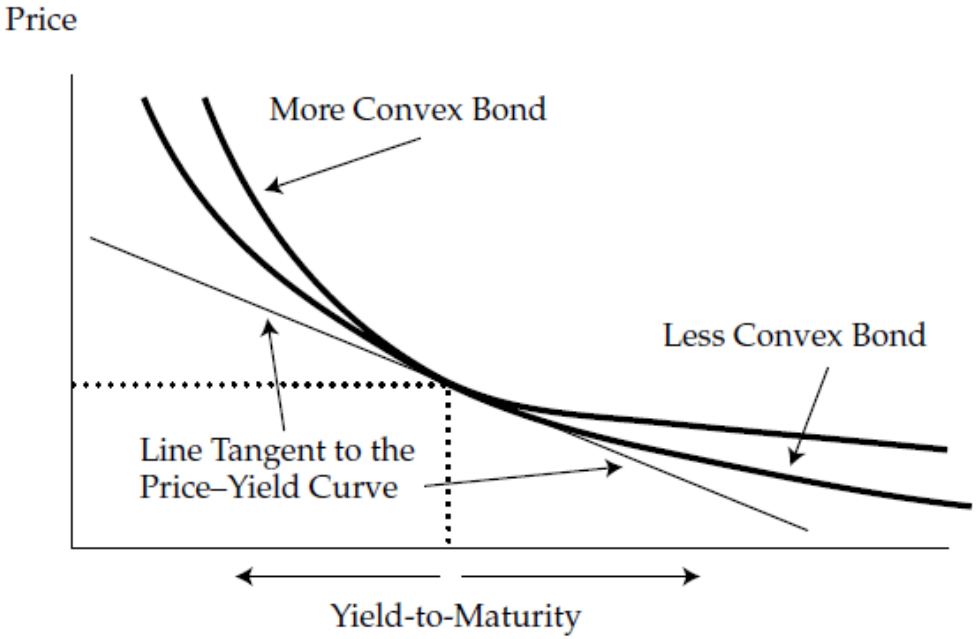
The Convexity Adjustment

- Duration based estimates of bond prices are below actual prices for option-free bonds



The Convexity Adjustment
Convexity is good

- Bondholders prefer more convexity, other things equal



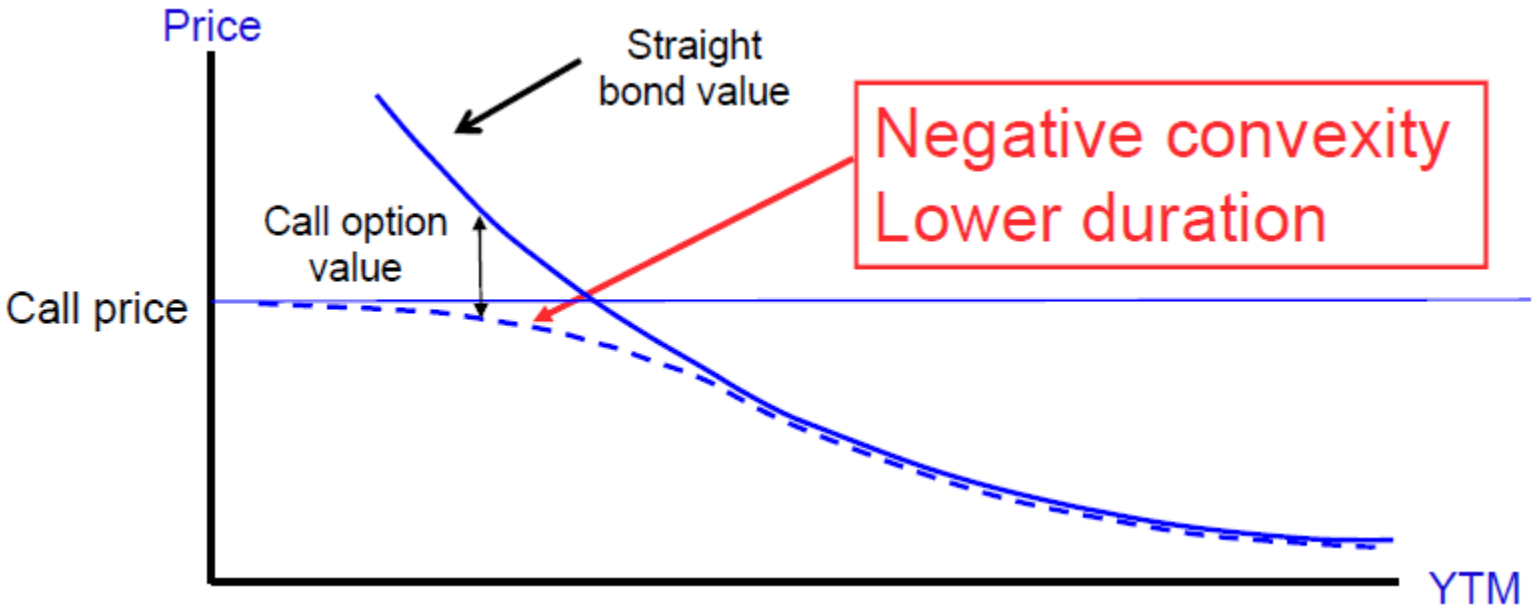
Convexity impacted by:

1. Time to maturity
2. Coupon rate
3. Yield to maturity
4. Dispersion of cash flows

The Convexity Adjustment

Price-yield for Callable bond

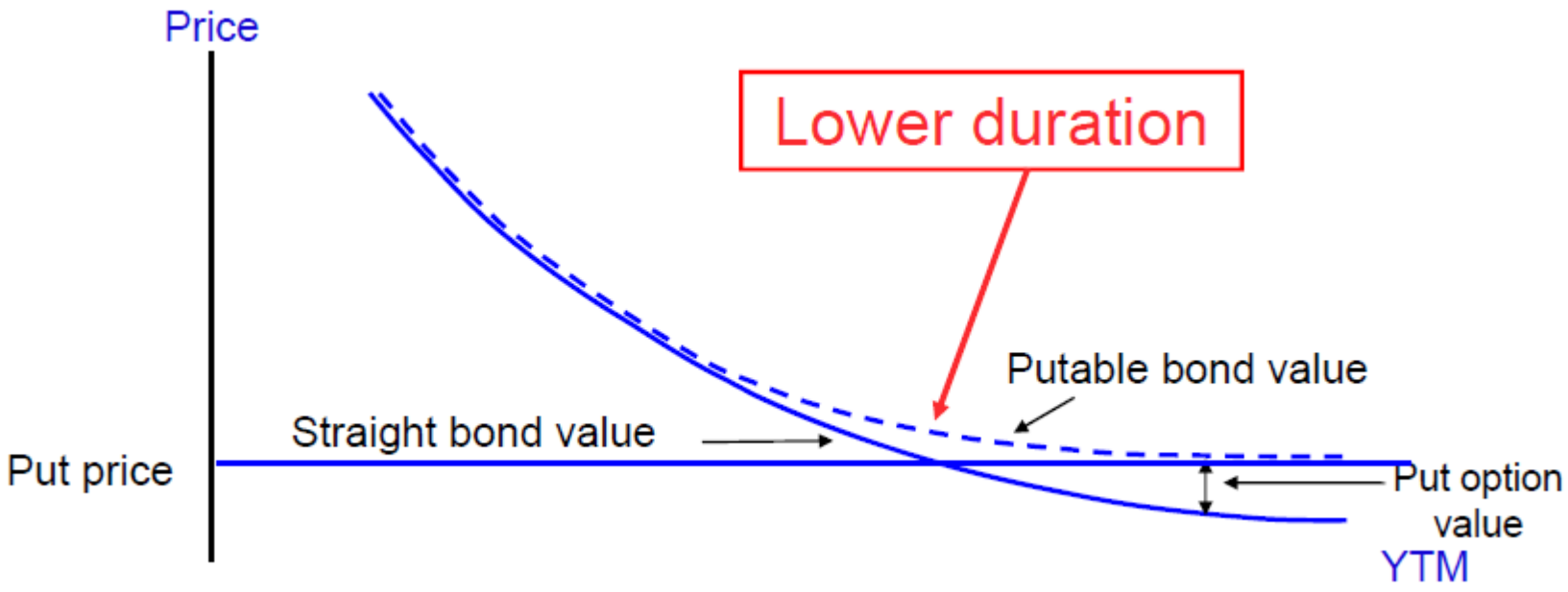
Callable Bond



The Convexity Adjustment

Price-yield for Putable bond

Putable Bond



The End (Day 1)