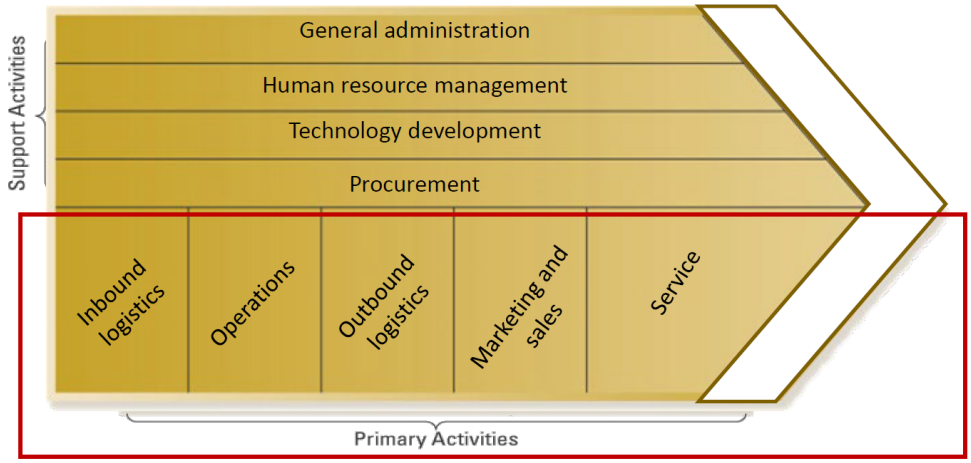
# Value Chain

### Porter's Value Chain Analysis

- Framework to understand the sequence of processes of value creating activities
- Helps organisations understand:
  - How a product moves from raw material state to the end customer
  - Total costs involved in creating products and services
  - Which activities create value, and which do not
- Primary Activities: Activities involved in the creation and delivery of products or services, including any after sales support




### Primary Activities

***Inbound Logistics***

- Associated with receiving, storing and distributing raw materials or inputs of the product
  - E.g. Apple: distributing iPhones from the warehouse to Apple Stores
- Evaluation of value creating potential:
  - Efficiency of inbound logistic activities
  - Proximity of distribution centres to minimise shipping times
  - Warehouse layout to ensure distribution efficiency

***Operations***

- Associated with transforming inputs into the final product form
  - E.g. Apple: managing Apple online – provide a one-stop shop for all Apple products and access to specialist assistance
- Evaluation of value creating potential:
  - Efficiency of operations to minimise costs
  - Do operations activities increase quality of products/services?

***Outbound Logistics***

- Associated with collecting, storing and distributing the product or service to customers
- Evaluation of value creating potential:
  - Efficiency of shipping processes to minimise transportation costs
  - Effectiveness of delivery processes to customers

***Marketing and Sales***

- Associated with promoting the sales of products and services to end users
- Evaluation of value creating potential:
    - Innovative approaches to promotion and advertising
    - Selection of most appropriate distribution channels
    - Proper identification of customer segments and needs

***Service***

- Providing after sales services to enhance or maintain the value of products and services provided to customers
- Evaluation of value creating potential:
    - Efficiency of response to customer help requests
    - Effective management of parts and equipment inventory

## Support Activities

- Provide support necessary for primary activities to take place.
- These activities are not directly involved in producing goods/services for customers

***Procurement***

- Purchasing inputs (including input materials and fixed assets) used by the organisation to create value
- Evaluation of value creation:
    - Selecting appropriate suppliers
    - Procurement of quality input material
    - Development of collaborative relationships with suppliers

***Technological Development***

- The development of new knowledge that enable product and process innovation
- Evaluation of value creation:
    - Effective R&D activities for product and process innovation initiatives
    - Ensuring positive collaborative relationships between R&D and other departments

***Human Resource Management***

- Recruiting, hiring, training, development and compensation of all types of personnel
    - E.g. Apple: recruitment of Bluetooth technology developers
- Evaluation of value creating potential:
    - Effective recruiting, development and retention of employees
    - Quality work environment to maximise overall employee performance and minimise absenteeism
    - Rewards and incentives to motivate employees

***General Administration***

- The coordination of the entire value chain and not individual activities
    - E.g. Apple: Planning and managing a multi-channel platform that integrates contents (software, media) and hardware (MacBooks, iPhone)
- Evaluation of value creating potential:
    - Effective planning systems to attain overall goals and objectives
    - Manage relationships with diverse stakeholders
    - Effective integration of value-creating activities

## Managing Value-Chain Activities

- Value chain is not a collection of independent activities
- Need to understand:
    - Interrelationships among activities within the firm
    - Relationships among activities within the firm and with stakeholders
    - Resource implications of activities

## Perspective of the CFO

- Financial Management enables a company to achieve its financial, operational and strategic goals and thus drive shareholder value through appropriate resource utilisation and decision making

### *Management Accounting Tools and Value Creation*

- Decision facilitating:
    - Ensure decision makers have the right information to make decisions
    - Pricing and Cost volume Profit (CVP) analysis – provide information to decision makers to manage value creation
- Decision Influencing
    - Ensure decision makers make the right decisions
    - Performance measures provide information to motivate decision makers
    - Develop performance measures to assess value creation

### *Managing Value Creation*

- Determining the appropriate measures of value:
    - **Financial**: Focuses on financial outcomes of organisations' actions (e.g. Sales, profits, ROE)
    - **Non-financial**: Focuses on inputs, processes and outcomes to organisations' activities (e.g. customer retention, employee turnover)
- Balanced set of stakeholder value measures
    - Diversity and potential conflicting stakeholder expectations
    - Conflicting stakeholder expectations and inappropriate measurement practices may lead to unethical firm behaviour

### *How Financial Tools Create Value*

- Financial Tools allow the CFO to:
    - Estimate the value of future, potential projects
    - Make optimal investment decisions
    - Choose the best mix of equity and debt financing
    - Optimise the return of capital to investors
- Outside the firm, financial tools allow investors to:
    - Correctly measure fair value of financial assets
    - Make markets more efficient
    - Improves capital allocation across the economy

## Perspective of the CIO

### *IS vs IT vs Digital*

- Information technology (IT) – Hardware, software, telecommunications

- Information Systems (IS) – The means by which people and organisation gather, process, store, use and disseminate information
- IT is used to facilitate /support information systems
    - We see that IT has no inherent business value on its own
- Info Sys is concerned with the purposeful utilisation of information technology, not the technology per se

## Perspective of the CMO

### *Role of Marketing*

- Marketing is the process by which organisations engage customers, build customer relations and create customer value in order to capture value from customers in return
- By creating value for customers, marketers gain value in exchange.
    - This creates value for the other stakeholders of an organisation

## Corporate Social Responsibility

- Guiding Principle: Do no harm (very unpractical in practice)
- Unfocused, no guidance
- Attempts at definition:
    - Legal: Use company resources to benefit non-shareholders
    - Economic: Addressing a market failure, firms impose externalities on outside parties, CSR potentially provides relief
    - Best working definition: international private business self-regulation of harms and public good

### *Why do CSR?*

- Intrinsic Motivation:
    - Moral obligation – ethical, law-abiding
    - Sustainability – meets the needs of the present without compromising the ability of future generations to meet their own needs
- Extrinsic Motivation:
    - License to operate – corporations exist at the mercy of governments under laws and regulations. Charters can be revoked
    - Reputation: external perception affects the business

### *Dimensions and Degrees of CSR*

1. Intent – Superficial vs Genuine
2. Motivation – Extrinsic (risk management) vs Intrinsic (want to do good)
3. Relevance – Directly related vs Unrelated/ancillary to business (e.g. volunteering, charity)
4. Reactive – Reactive (e.g. after protests/getting caught) vs Proactive
5. Origin – Top-down (management decides) vs Ground-up (engagement from employees/stakeholders)
6. Value proposition – Redistributing value from shareholders to other stakeholder's vs genuinely creating additional value for all

## Creating Shared Value

- Corporate purpose: Expanding the total pool of economic and social value, rather than redistribution.
- Guiding principles:
    - Reconceiving products and markets
    - Redefining productivity in the value chain
    - Building supportive industry clusters on location

***Grow the Pie/Pieconomics***

- Aim to create value for society first, then profits will naturally follow
- A company needs a meaningful purpose (More than a mission statement)
- Pieconomics requires 3 principles to be fulfilled:
    - **Multiplication** in social benefits: Does $1 spent by the firm create >$1 in future social benefits?
    - **Comparative advantage**: Does $1 spent by the firm create more future social benefits than $1 spent by someone else?
    - **Materiality**: Does the activity benefit a material group of stakeholders?

***Shareholder Value Maximisation vs Grow the Pie***

- SVM:
    - Profit is quantifiable
    - Easy to understand, basis for compensation
    - Leads to errors of omission (i.e. do not take action because its effects on profits can't be quantified)
    - Impossible for more projects & actions to forecast profits
- Growing the Pie:
    - Objective social value is hard to quantify, many dimensions
    - Uses judgements rather than over-exact math
    - Allows to judge and decide on many more projects

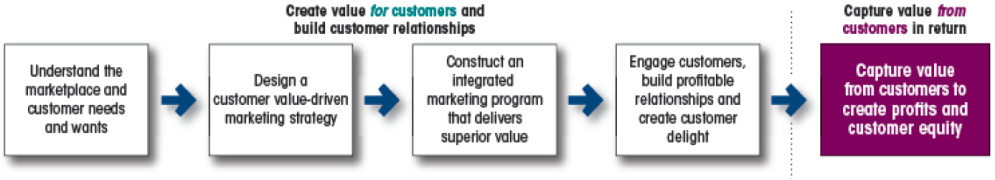
## Overview of Value Creation Frameworks

| | Shareholder Value | CSR | Triple Bottom Line | CSV & Pieconomics |
|---|---|---|---|---|
| **Motivation to "do good"** | none | Compensatory, after the fact | Instrumental in practice | Intrinsic by design |
| **Key Objective** | Profits | Address externalities | Profit & Social value | Social value |
| **Mindset** | Split the pie in the short-run, grow the pie in the long-run | Operates under "split the pie" | Split the pie, Trade-off mentality | Grow the pie, actively do good |
| **Activities affected** | Core | Ancillary, add-on | Typically non-core | Core |
| **Account for externalities** | Only when those measurably affect productivity | one at a time | Yes, measures it | Explicitly, try to internalize |
| **Accounts for other stakeholders** | Only through the lens of profits | Some at the expense of others | Explicitly | Explicitly |
| **Problems:** | Can be ruthless; short-term incentives; errors of omission; avoidance of not quantifiable actions | Band-aid solutions, green washing, no comparative advantage | Used as an accounting framework rather than moral imperative | Viewed with scepticism by shareholders & managers; possibly contrary to legal theory of the firm |

# Value from Market Opportunities

## What is Marketing?

- The process by which organisation engage customers, build strong customer relationships and create customer value in order to capture value from customers in return.
- Behind marketing is a massive network of people, technologies and activities competing for customer attention
- In a broader sense, marketing is:
    - A social and managerial process by which organisation obtain what they want through creating and exchanging value with others
- Marketing is about finding out what customers need, then giving it to them in a way that is valuable
- A simple model of marketing:




### *Types of Value that can be Created*

- **Functional/Instrumental** Value – Product has desired characteristics, is useful, or performs a desired function
- **Experimental/Hedonic** Value – The extent to which a product creates appropriate experiences, feelings and emotions for the customer
- **Symbolic/Expressive** Value – The extent to which customer attach or associate psychological meaning to a product
- **Cost/Sacrifice** Value – Minimising transaction costs

### *Role of Marketing in an Organisation*


- Traditionally a business function
- Now a set of values and processes that all functions participate in implanting
- Link between organisation and stakeholders
- The revenue generator

## What is a Market?

- The set of current and potential customers for an organisation
- Types of markets:
    - B2C – Business to Consumer
    - B2B – Business to Business
    - C2C – Consumer to Consumer

- B2G – Business to Government

| | Consumer Goods Marketing | Business Goods Marketing |
|---|---|---|
| **Customers** | Numerous, widely dispersed geographically | Few, concentrated geographically |
| **Buying Behaviour** | Individual decisions | Group decisions<br>Many buying influences |
| **Buyer/Seller** | Very little close contact | Very close working relationships. Interact in product design and problem solving |
| **Product** | Standardised | Complex; technical; detailed specifications<br>Accompanying bundle of services important |
| **Price** | Fixed | Negotiated, bidding process<br>List price for standardised items |
| **Promotion** | Heavily oriented to mass advertising | Primary role given to personal selling |
| **Channels** | Indirect, many intermediaries at each level | Direct, fewer intermediaries at each level |

***Comparing B2C & B2B Markets***

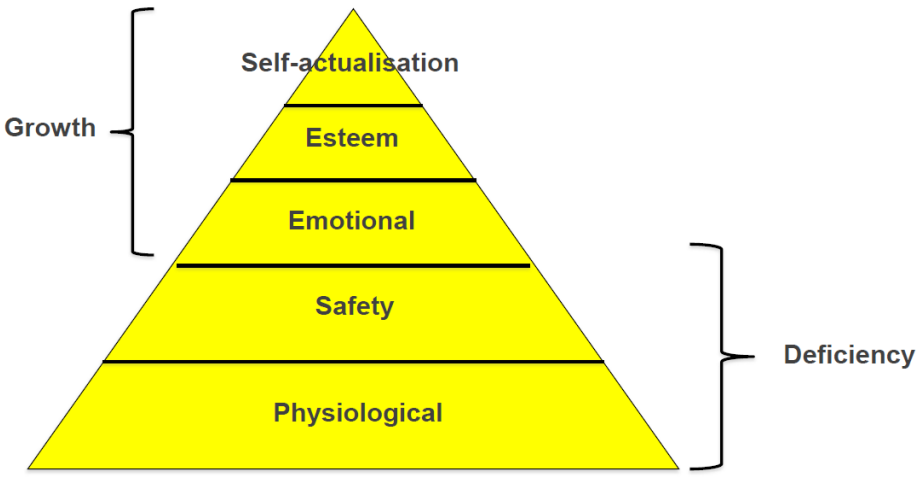
## Creating Value

### *Creating Value for Customers*

- Understanding the customer:
  - Current customers & potential customers
  - Needs, wants, behaviours
- Create value through:
  - Segmentation, targeting and positioning strategies
  - Identify the value proposition

### *Understanding Customers*

- Explore:
  - Demographics
  - Geographic locations
  - Behavioural factors
  - Psychographics
- Hierarchy of Needs:



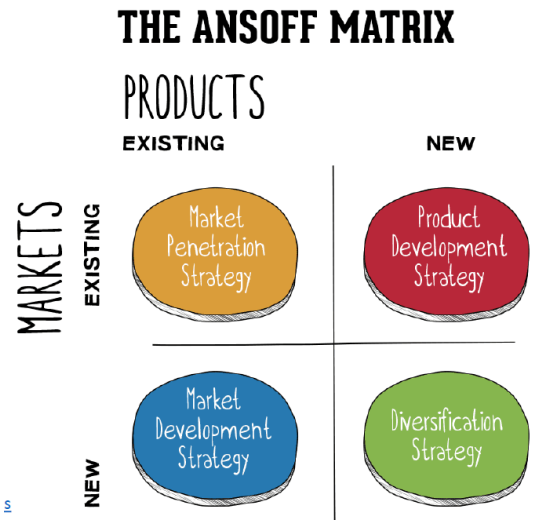
***Segmentation, Targeting, Positioning***

- Segmentation:
    - Based on groups of customers with different needs
    - Which needs can the organisation fulfil?
- Targeting:
    - Which segment is priority for the marketer
    - Greatest value creation potential
- Positioning:
    - The image of the brand in the customers minds

***The Value Proposition***

- The set of benefits or value the organisation promises to deliver to consumers to satisfy their needs
- Allows the organisation to differentiate itself in the marketplace.
- Competitive advantage:
    - What makes an entity's goods or services superior to all of a customer's other choices

***Strategic Options for Marketing Opportunities***




***Value from Product/Service Design***

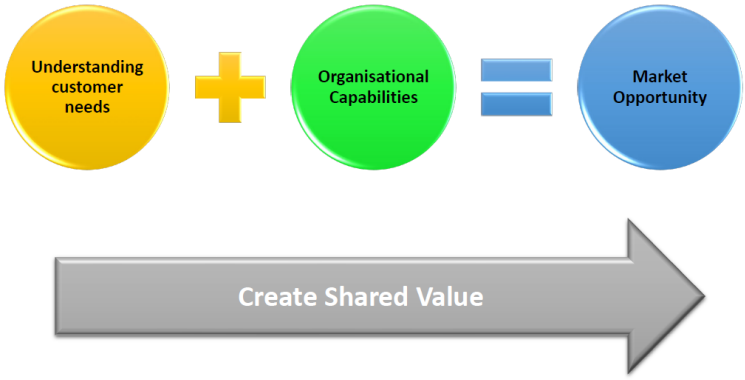
- Design is the fundamental determinant of both the speed and cost with which new and improved products are brought to market
- Design excellence leads to increased profitability and competitiveness
- The challenge: Designing what customers value most
    - 'Creeping elegance' – product designers implement complex and costly features that not necessarily being paid for by customers
    - Rising commodity prices, consolidating supply markets and persisting economic pressures are making it difficult for companies to maintain margins
    - Reducing product cost is crucial and up to 80% of product costs are set during the design stage
- **Value engineering** looks are the capital cost of a project and determines whether the function and quality of the results is equal to the perceived value

***Value from Customer Experience***

- "Customer experience is a multidimensional construct focusing on a customer's cognitive, emotional, behavioural, sensorial and social responses to a firm's offerings during the customer's entire purchase journey."

- "It's not just the customer service – its every interaction, from the point at which they discover you to the moment of purchase to each of the touchpoints in the ongoing relationship"

## Creating Shared Value (CSV)




- Pursuing financial success in a way that also yields societal benefits
- Look beyond immediate needs of customer

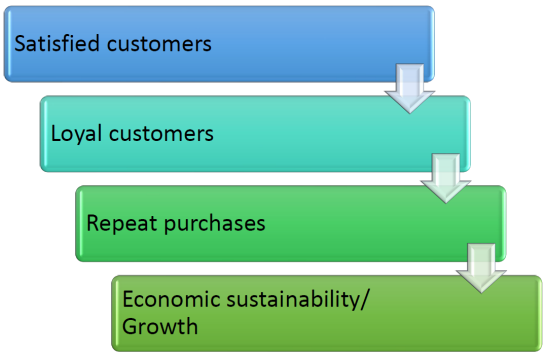
### *Communicating about Value*

- Customers can't purchase a product they don't know about
- Marketers communicate about their brand and product
    - Solution to a customer need
    - Superior benefits than competitors
    - Value to stakeholders
- Two-way communication channels

### *Delivering Value*

- Ensuring that customers receive the benefits they seek from your brand.
- Focus on:
    - Quality control – consistency
    - Clear communication – expectations vs reality
    - Appropriate pricing

### *Sustaining Value*




### *Capturing Value*

- Forms of value:
    - Price – money
    - Information
    - Acquisition and retention of customers – customer equity
    - Partnerships or affiliations
    - Reputational value

- Brand value – brand equity
- Acquisition and retention of human capital

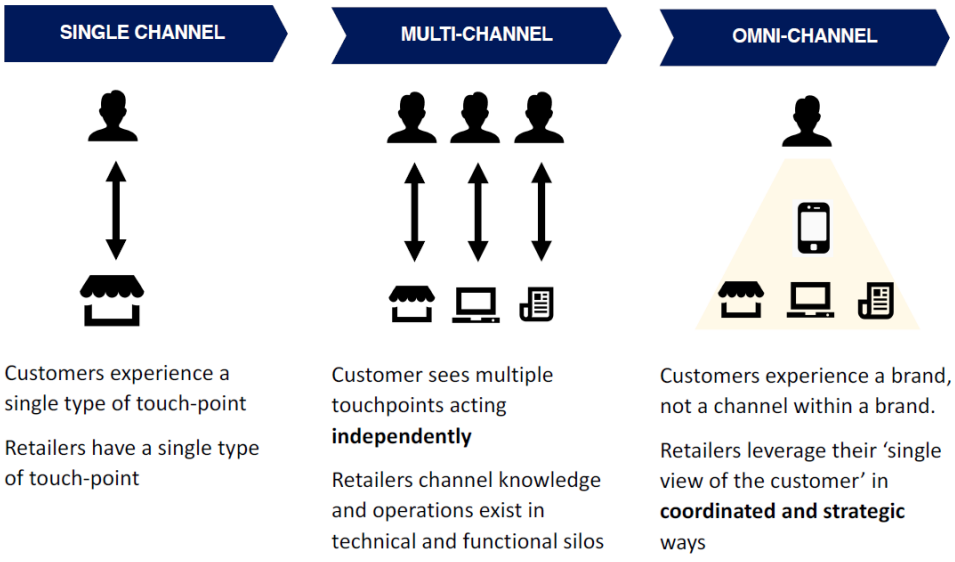
***Technology and Marketing Value***

- Value for customers:
  - Increased choice and accessibility to products and services
  - Downward price pressure
  - Greater control of customer experience
  - Convenience
  - Automation is time-saving and consistent

# Value from IS/IT

## Omni-channel Retailing

- Omni-channel retailing is a fully-integrated approach to marketing, selling and serving customers that provides shoppers a unified customer experience across all online and offline channels.
  - Seamless experience is the key
  - The primary omni-channel goal is to let customers experience the brand rather than the channel. The channel is the means to the goal, not the goal itself
- Extends from in person locations to mobile-browsing, ecommerce marketplaces, onsite storefronts, social media, retargeting, etc
- Integration is the key. All omni-channel experiences will use multiple channels, but not all multi-channel experiences are omni-channel.




## E-Business Modes

- Pure-play:
  - Companies that operate solely on the internet (no physical stores)
  - E.g. ASOS, Hellofresh
- Clicks-and-mortar:
  - Companies that operate both virtually and physically
  - E.g. Coles, Uniqlo, Sephora

## Digital Transformation

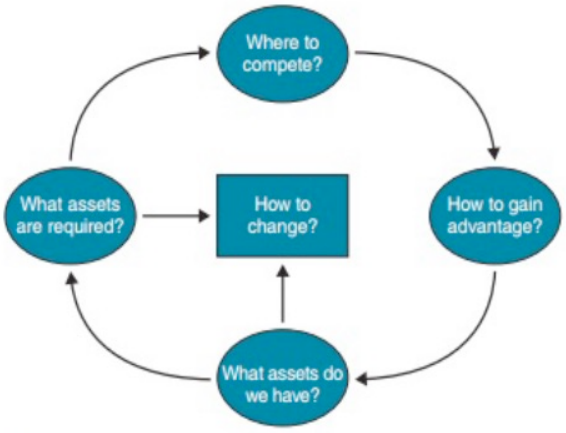
- **Digital Transformation**: A process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication and connectivity technologies.
- **Why digital transformation?**: The potential power and impacts on competition (five forces model)
    - Change the industry structure thereby altering the rules of competition
    - Creates new competitive advantage by giving new ways to outperform rivals
    - Spawns whole new business

## Effectiveness vs Competitiveness

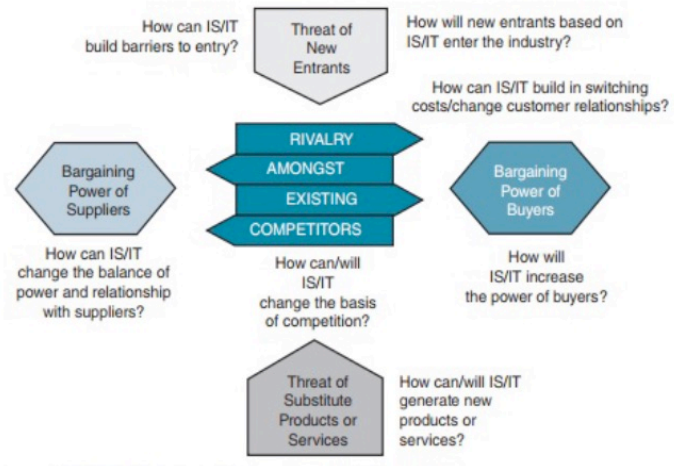
### *Digital Strategy*

- The foundation from all else logically follows if they are to compete in a digital world
- Necessary, but not sufficient for value creation

### *A framework for strategy formation*




### *IS/IT Implications across the Five Forces*



## How to Gain Competitive Advantage

### *Porter's Four Competitive Strategies*

| | Cost | Differentiation |
|---|---|---|
| Industry-wide | Lowest cost across the industry | Better product/service across the industry |
| Focus | Lowest cost within an industry segment | Better product/service within an industry segment |

## Required and Acquired Assets

- Resource Based View (RBV) helps us understand why some organisations are competitively more successful than others, and what assets we have
    - Resources refer to a bundle of firm-specific assets and organisational capabilities
    - The way in which an organisation accumulates and deploys its resources leads to increases in proprietary resources and capabilities.
- Resources can be sources of competitive advantage:
    - Valuable
    - Rare
    - Inimitable
    - Non-substitutable

### *IS Resources*

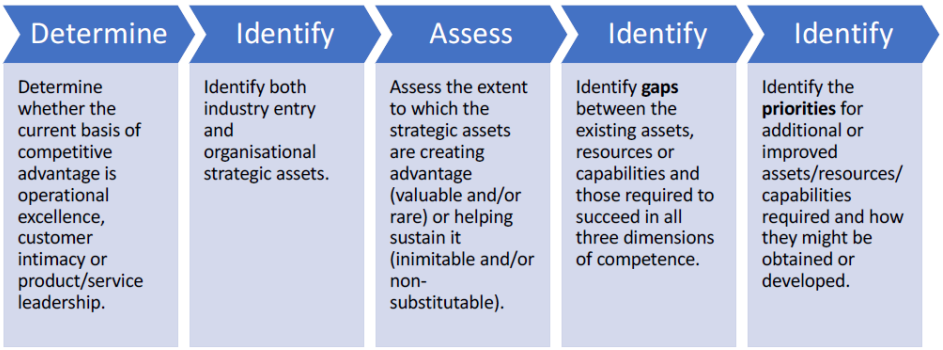
- IS Resources:
    - IT Resources: tradable and nonspecific firm assets
    - Capabilities: capacity to deploy assets using organisation processes: non-tradable, firm specific assets
- IS resources are at the center of business value of IS/IT
- IS resources are difficult to imitate because:
    - Firms are unaware of their competitors resource allocations and how they contribute to performance
    - Capability development and learning opportunities are tied to firms' specific asset positions; organisational embeddedness
- Resources and capabilities may have different utility in stable versus dynamic environments

### *Generating Competitive Advantage Competencies*

- Operational Excellence:
    - Focus on business processes to outperform others and can deliver both low costs and consistent quality of customer satisfaction
    - Company IS investments are a critical component, enabling business simplification and efficient processes that are highly integrated throughout the core activities of the business
- Customer Intimacy:
    - Target markets very precisely and tailoring products and services to the needs of particular customer groups
    - Not just understanding, but anticipating customer needs
    - IS should focus on collecting and analysing customer information
- Product/service leadership

- Continue product innovation and meeting customer needs
- Deliver a continuous stream of new products and/or services

***Identifying IS/IT Assets for Competitive Advantage***




## Challenges faced in Leveraging Value from IS/IT

- It isn't easy to leverage value from IS/IT
- These resources are essential, but not sufficient for value creation
- We see that IT has no inherent business value on its own
- Business value is generated contingent on other factors, such as:
  - Resources complementary: How one resource may influence another, and how the relationship between them affects competitive position or performance. Can be compensatory, enhancing or destroying
  - Other organisational factors: top management commitment, organisational culture, structure, size, type, etc.
  - Competitive environment: industry characteristics and trading partner resources and business processes
  - Environmental dynamism
    - Stable: Gain SCA by developing a fit between resources and the market
    - Dynamic: Needs dynamic capabilities to monitor the market, learn new knowledge, and engage in actions to respond to the environmental shock more quickly
- IS/IT is not a sure salvation

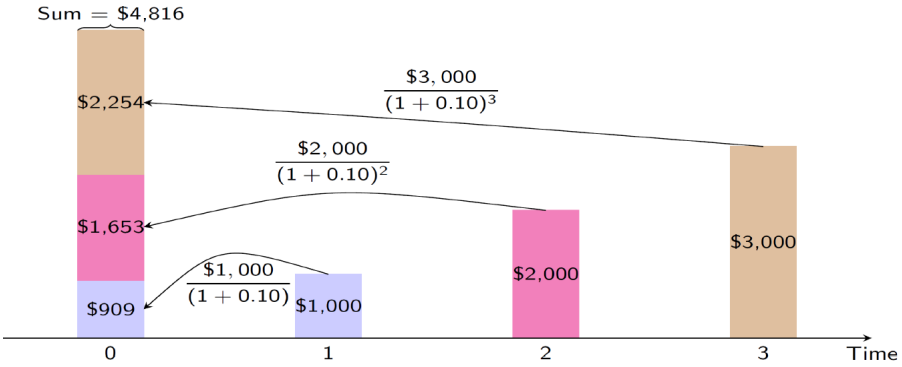
***Key Drivers of Digital Transformation***

- Digital Strategy:
  - A clear strategy with a focus on reconfiguring your business to take advantage of the information these technologies enable
  - Bringing together a variety of digital technologies integrated across people, processes and functions to achieve an important business advantage
  - Work backward, not forward as new capabilities make new solutions possible
- Organisational culture:
  - Willingness to experiment and take risks
  - From siloed to enterprise-wide culture to foster collaboration and creativity
  - Strong leadership champion
- Talent development
- Employee satisfaction

# Time Value of Money

## Present Value of Multiple Cash Flows

- Example: You are offered to invest in a project that is expected to generate $1000 at the end of year one, $2000 in the second and $3000 in the third year. You consider a discount rate of 10% as commensurate with the risk involved. What is the value of this project today?
- Approach:
  - Consider sketching a timeline
  - Solve separately for each future payment
  - Add up the translated present values
- Solution:




$$PV = \frac{\$1{,}000}{(1+0.10)^1} + \frac{\$2{,}000}{(1+0.10)^2} + \frac{\$3{,}000}{(1+0.10)^3} = \$4{,}816$$

## The Fundamental Principle of Financial Valuation

- Price $P_0$ today is equal to the sum of all present values of those future cash flows:

$$P_0 = \sum_{t=1}^{n} PV(CF_t) = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t}$$

Present value, i.e. today's value of $1 in the future

sum from time 1 to time n

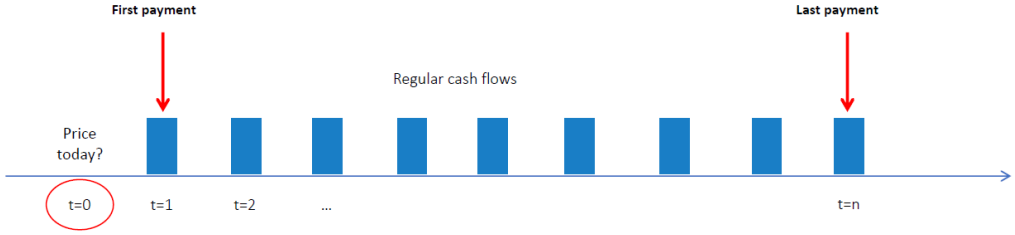


- Special cases of multi-period cash flows:
  - Irregular cash flows: discount every payment individually
  - Regular cash flows: very common in finance, easier math (e.g. annuities, saving plans, amortized loans, perpetuities)

## Annuity

- A series of regular payments for a specific time period:
  - Lifetime annuity until death
  - Term certain annuity: guaranteed payments (regardless of death) up to a fixed horizon

- Cash Flows of an annuity:




$$P_0 = \sum_{t=1}^{n} PV(CF_t) = \frac{C}{1+r} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \cdots + \frac{C}{(1+r)^n}$$
$$= C \sum_{t=1}^{n} \frac{1}{(1+r)^t}$$

***Ordinary Annuity***

- Every period for the next *n* periods, a payment *C* is made. In an ordinary annuity, each payment happens at the end of the period.
  - The present value is:

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

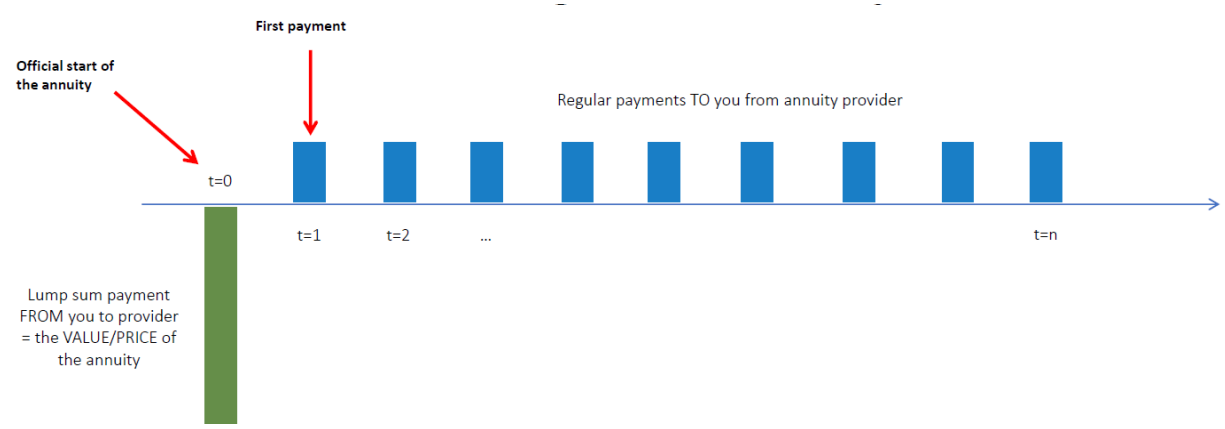
  - The future value is:

$$FV = C\left(\frac{(1+r)^n - 1}{r}\right)$$

- It is important that:
  - The interest rate *r* is the per period interest rate
  - *n* is the number of those periods
  - *C* is the cash flow per period

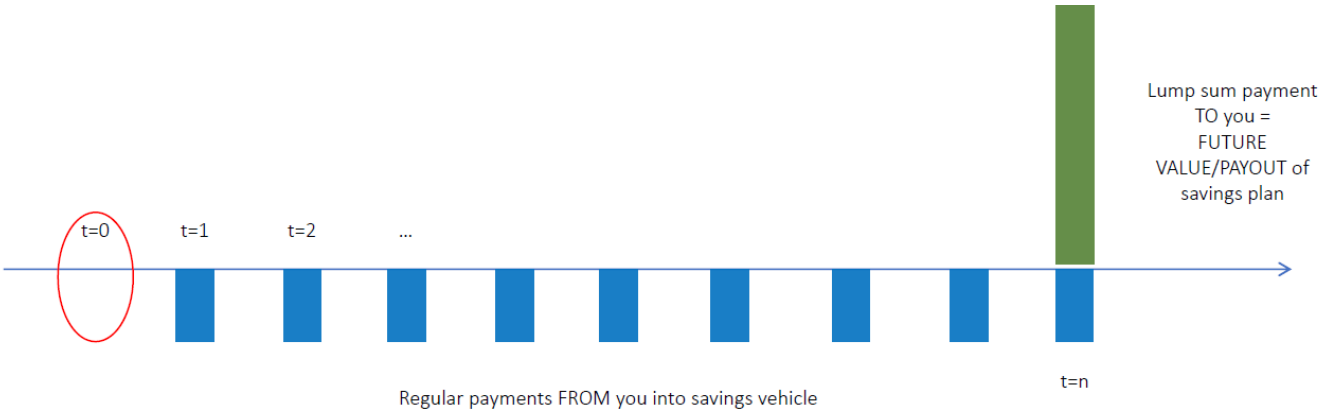
***Case 1: Receiving an Annuity***

- You are the recipient of an annuity from an insurance company.
- You are interested in the present value, as this is the price that you should be paying today.




***Case 2: Saving for retirement***

- You are depositing money every period into a savings vehicle.
- You are interested in the future value as this is the payout you will receive once you retire.




Example: Saving for a down payment

- Your daily avocado toast addiction will cost you $500 per month every month. You want to know how much money you can look forward to after 10 years by foregoing this habit. Assume you invest the savings each month in an investment account that will deliver 7% p.a.

$$C=\$100,\ r=7\%/12=0.5833\%;\ 10\ years \Rightarrow n=10*12=120$$

$$FV = C\left(\frac{(1+r)^n-1}{r}\right) = \$500\left(\frac{(1.005833)^{120}-1}{0.005833}\right) = \$86{,}542.40$$

- There are several problems with this calculation:
  - Inflation
  - Riskiness of investment accounts in the short-term, need to invest more safely
  - Taxes on investment income

***Case 3: Amortizing a Loan/Mortgage***

- You borrow some money today and pay it back in instalments until the principal is paid back in full.
- You are interested in the present value of your loan payments because you want to know how much money you can borrow today.


- A loan is a liability to you, but an asset to someone else.

***Calculating Annuity Payments and Loan Instalments***

- Given the present value, we can calculate the per-period payment. The following formula assumes an ordinary annuity setup:

$$C = \frac{PV}{\left[\frac{1-(1+r)^{-n}}{r}\right]}$$

### Special Cases

#### *Changing the Timing of Cash Flows*

- If we are shifting the cash flows into the future by *k* periods, there will be more discounting:

$$PV = C\left(\frac{1-(1+r)^{-n}}{r}\right)(1+r)^{-k}$$

#### *Perpetuity*

- A never ending annuity
- Payments *C* continue indefinitely
    - $PV = \frac{C}{r}$

# Equity Valuation

### Types of Equity

- Corporations issue equity or shares to investors as part of their financing.
- Companies do not need to be publicly listed in order to issue shares
- Two types of equity:
    - Common shares (also called ordinary shares)
    - Preferred shares (also called preference shares)

#### *Common Equity*

- All corporations issue common shares in some form. Some key features are:
    - Common equity makes you a part-owner of the company
    - Shareholders have the right to vote at annual meetings on major items (e.g. mergers, elections of board members)
    - You are entitled to the residual cash flows of whatever is left after all the bills (salaries, suppliers, debt, taxes etc) are paid
    - Shareholders have limited liability. Shares can only sink to $0. There is no obligation to pour in extra money, unlike in partnerships

#### *Dividends*

- Companies may decide to pay dividends to their common shares, but there is no obligation
- Once dividends are declared by the board, they MUST be paid
- Dividends are not tax-deductible, they are paid out of after-tax profits

#### *Share repurchases (buybacks)*

- An alternative use of company cash, rather than paying a dividend to all shareholders, is to “buyback” some share from investors at market prices.
- Consequences:
    - The total number of shares outstanding (held by investors) shrinks
    - Even if total earnings do not change from year to year, earnings per share will increase. This tends to increase share price
    - Executives like this because compensation is often tied to share price rather than aggregate performance

***Preferred Shares***

- Preferred shares are a hybrid class of securities in the sense that they have characteristics of both debt and equity.
- The payments to preferred shares are typically called dividends
- They rank ahead of common equity, but behind all other forms of debt in case of bankruptcy
- They are similar to debt in that:
    - Dividend payments are fixed (as a % of par value of shares)
    - They usually have a stated maturity date
    - They do not participate in the upside of the firm
    - They have no voting rights
- They are similar to equity in that:
    - Sometimes there is no maturity date at all
    - In bad times, the company can suspend the preferred dividends without triggering default
    - For all types of preferred shares: common dividends cannot be paid until all owed preferred dividends have been paid (hence the name)
    - Cumulative preferred shares: All missed payments need to be made up
    - Non-cumulative preferred shares: previously missed payments are just "forgotten"

Example

Bulk Ships Inc. has issued perpetual preferred shares that entitle investors to an annual 8% dividend on the face value of $25 per share. What will be the share price when the discount rate is 6%?

**Answer**: These shares are like perpetuities and the annual coupon is *C = 8% * $25 = $2*. The price per share is:

$$P_0 = \frac{\$2}{0.06} = \$33.33$$

## Asset Pricing 101

- "What is the fair price of a share?"

***Stylized one-period model***

- You are invested in shares of BHP. Assume you know that you will sell those shares for a price $P_1$ exactly one year from now. You will also receive a known dividend of $D_1$ at that time. What price $P_0$ should you be willing to pay for the shares today?
    - We discount the two cash flows one year from now to the present to compute the fair price today:

$$\underbrace{P_0}_{\text{Price paid today}} = \underbrace{\frac{D_1 + P_1}{1 + r_e}}_{\text{Present value of all future cash flows}}$$

- This is called the price equation of a simple, one period asset pricing model.
- The discount rate $r_e$ is called the **required rate of return**, **expected rate of return** or the equity's **cost of capital**.
- It reflects investors assumptions about the risk of the shares relative to the risk of other investment opportunities.

***Total Return Decomposition***

- Let us solve the above pricing equation for the required return $r_e$:

$$\underbrace{r_e}_{\text{Total Expected Return}} = \underbrace{\frac{D_1}{P_0}}_{\substack{\text{(Forward)} \\ \text{Dividend yield}}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gains Rate}}$$

- If we want to compute this return at time 0, we know today's price $P_0$, but we need to form expectations about $P_1$.
- We can gain 2 insights from this return decomposition:
    - The expected return will be a function of the beliefs and actions of many investors working towards a market equilibrium, which are enacted via changes in today's share price $P_0$.
    - Absent taxes and many other frictions, investors will not care whether their return comes from dividends or capital gains. An extra dollar paid out is a dollar less inside the firm, reducing $P_1$ by an equivalent.

***Two-Period Model***

- The equilibrium condition that covers 2 periods and determines what a two-period investor should be willing to pay at time 0 given future prices. All 3 prices need to be consistent with each other:

$$P_0 = \frac{D_1 + P_2}{1 + r_e} = \frac{D_1 + \frac{D_2 + P_2}{1 + r_e}}{1 + r_e} = \frac{D_1}{1 + r_e} + \frac{D_2 + P_2}{(1 + r_e)^2}$$

- We will call these models "Dividend Discount Models".

***Dividend Discount Model with many periods***

- As we increase the number of periods that the investor plans on holding the shares, the importance of the final sale price declines:

$$P_0 = \frac{D_1}{1 + r_e} + \frac{D_2}{(1 + r_e)^2} + \frac{D_3}{(1 + r_e)^3} + \ldots + \frac{D_n}{(1 + r_e)^n} + \frac{P_n}{(1 + r_e)^n}$$

- The pricing equation still contain some future price, which can be hard to form expectations on.
- In contrast, dividends are easier to forecast.
- To avoid predicting some $P_n$ we assume an infinite holding horizon, so we only care about dividends

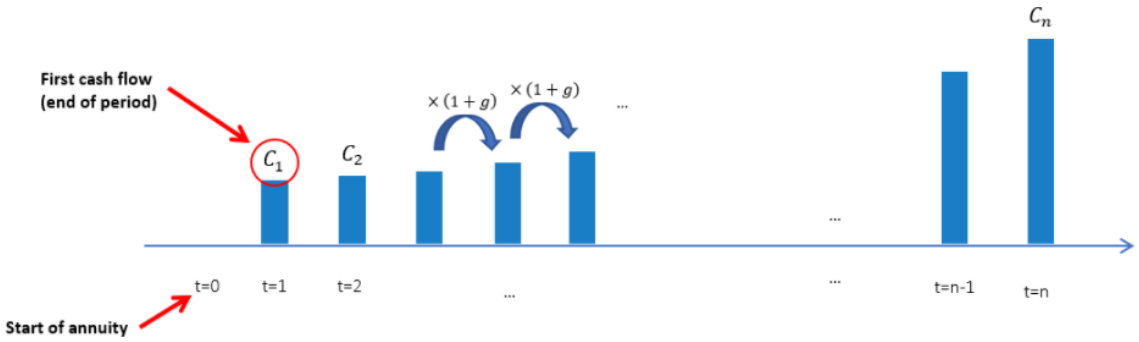
$$P_0 = \frac{D_1}{1 + r_e} + \frac{D_2}{(1 + r_e)^2} + \frac{D_3}{(1 + r_e)^3} + \ldots = \sum_{t=1}^{\infty} \frac{D_t}{(1 + r_e)^t}$$

## Growing Cash Flows

- Examples of real-life situations with growing cash flows:
    - The world over, health care costs are rising much faster than inflation.
    - Australian superannuation contributions are a fixed percentage of your gross salary. If your salary grows by 3% each year, so will your super contributions
    - When you invest in shares, you hope to receive dividends from it. Dividends should increase as the company grows its scale
- Key assumption: We will assume that cash flows grow at a constant rate $g$ from one period to the next, from one payment to the next. i.e.

$$C_n = C_1(1 + g)^{n-1}$$

### *Growing Ordinary Annuity*




- Recall that an ordinary annuity starts at time t = 0, but payments occur from times t = 1 all the way to t = n.
- Then present value and future value of the growing ordinary annuity can be computed as:

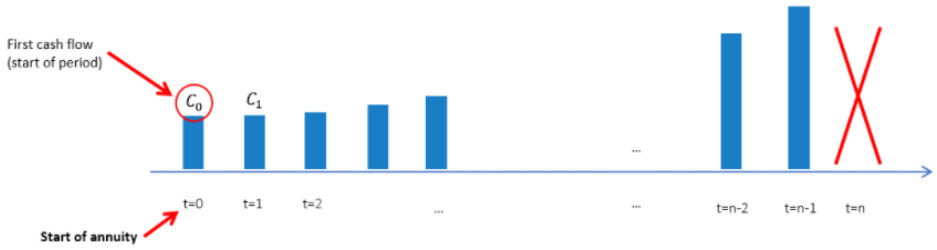
$$PV_0 = C_1 \frac{1 - \left[\frac{1+g}{1+r}\right]^n}{r-g}$$

$$FV_n = C_1 \frac{(1+r)^n - (1+g)^n}{r-g}$$

- As payments differ now from period to period, it becomes important to get the first payment $C_1$ right.

### *Growing Annuity Due*

- Recall that an annuity due starts at time t = 0, and payments occur from times t = 0 to t = n-1.




- Present value and future value of the growing annuity due:

$$PV_0 = C_0 \frac{1 - \left[\frac{1+g}{1+r}\right]^n}{r-g}(1+r)$$

$$FV_n = C_0 \frac{(1+r)^n - (1+g)^n}{r-g}(1+r)$$

### *Growing Perpetuity*

- For a growing perpetuity to have finite present value, the growth rate must be less than the discount rate (g < r).
- An ordinary perpetuity has present value:

$$PV_0 = \frac{C_1}{r-g}$$

- A perpetuity due has present value:

$$PV_0 = \frac{C_0(1+g)}{r-g}$$

## Introduction to Bonds

- A bond is a security issued by sovereign entities or corporations to raise money now in return for repayments in the future.

- They are like loans but because bonds can be bought and traded in smaller pieces by many investors, there is a lot more regulation involved regarding bonds
- Bonds are also called fixed income securities because they pay a regular fixed coupon. There are exceptions:
    - Zero-coupon bonds pay no coupons
    - Floating rate notes (FRN): the coupon payment resets periodically to reflect changes in market interest rates over time
- The coupons represent the interest payments that the issuer owes to the creditors at regular intervals, as written in the bond indenture
- Non-payments of a coupon will trigger default, which the borrower will usually want to avoid at all costs

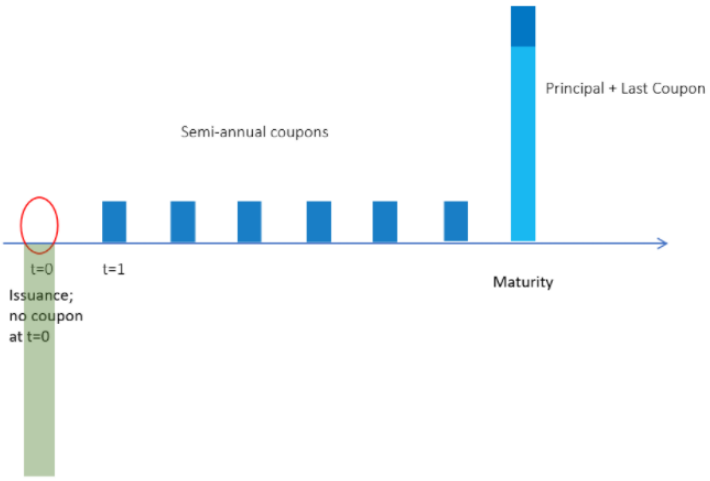
***Zero coupon Bonds***

- There is no intermittent interest, rather there is just one big payment *F*, the face value or par value at maturity. The price of the bond is given by:

$$P_0 = \frac{F}{(1+r)^n}$$

***Coupon Bonds***

- The coupon of a coupon bond is paid in 2 equal instalments per year.
- The last payment coincides with the repayment of the face value to investors.
- A typical face value for a bond is $1000, but some are $250,000 or even $1m.
- The annual coupon rate is given as a percentage of face value *F*.




- The price of a coupon paying bond:

$$P_0 = C\frac{1-(1+r)^{-n}}{r} + F\frac{1}{(1+r)^n}$$

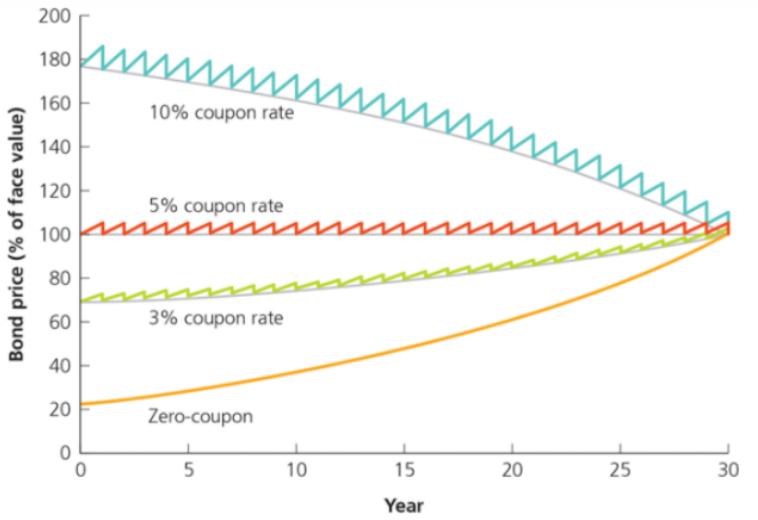
- Hints:
    - You can assume that any interest rate given is already semi-annually compounded. Thus the periodic rate is simply half of that.
    - To compute the coupon amount *C*, you multiply the face value *F* and the coupon rate *c*, i.e. *C = F * c%/2*

## Yield to Maturity

- The term yield refers to the interest rate that is used to discount cash flows.
- The bond yield is a good measure of the future expected return from holding a bond to maturity
- The unique interest rate that makes the present value of future cash flows equal to its price is called the **yield to maturity** (YTM)

***Par, Premium and Discount***

- When the YTM is equal to the coupon rate, the bond is priced at 'par', i.e. $P_0 = F$.
- For any yield below coupon rate, we say the bond trades "at a discount (to par)"
- For any yield above par, the bond trades "at a premium (to par)"




- **Accrued Interest**: As a bond holder, you accrue interest every day but only get paid the accumulated amount every 6 months.

## Valuation

- **Absolute valuation techniques**: Very bottom-up; forecast/model individual cash flows of the firm into the future and derive today's intrinsic value, while accounting for risk
  - Dividend Discount Models (DDM)
  - Discounted Cash Flow Models (DCF) and Free Cash Flow (FCF) analysis
- **Relative Valuation techniques**: Value/price companies by comparing them to other companies based on accounting information, especially financial ratios
  - Comparable Company Analysis: compare a target firm to set of similar firms using so-called multiples
  - Precedent Analysis: In mergers, price target firms based on recent transactions
  - Quantitative strategies that use financial ratios to form portfolios in the hopes of outperforming the market

***Dividend Discount Models***

- DDM is an intrinsic valuation approach
- We assume that the company pays regular dividends.
  - As such, this method may only apply to large, established companies that are no longer absorbing investor capital and instead distributing earnings back to investors

### Case 1 – Constant DDM

Assume $D_0 = D_1 = D_2 = \cdots$
Then:

$$P_0 = \sum_{t=1}^{\infty} \frac{\boldsymbol{D_1}}{(1 + r_e)^t}$$

You might recognize this as an ordinary perpetuity, thus: $P_0 = \frac{D_1}{r_e}$.

Solving this for $r_e$, we get $r_e = \frac{D_1}{P_0}$.

- Note:
  - The expected return is equal to the dividend yield.

- There are no expectations for capital gains

Example

Energex Ltd. Is a tightly regulated utility company with a monopoly in its region. The government sees to it that it achieves a commensurate return but no more, while also maintaining its power and gas infrastructure.

It most recently paid a dividend of $D_0$ = \$2 and does not foresee any changes to that. Regulators have calculated a required rate of return of 7.5%. What should its share trade for?

**Solution**:

$$P_0 = \frac{D_1}{r_e} = \frac{\$2}{7.5\%} = \$26.67$$

## Case 2 – Constant Dividend Growth Model

Assume $D_1 = D_0(1+g)$; $D_2 = D_1(1+g)$; $D_3 = D_2(1+g)\ldots$
Then:

$$P_0 = \sum_{t=1}^{\infty} \frac{D_1(1+g)^{t-1}}{(1+r_e)^t}$$

You should recognize this as an ordinary, growing perpetuity. The return is the sum of dividend yield and growth rate:

$$P_0 = \frac{D_1}{r_e - g} \quad \text{and} \quad r_e = \frac{D_1}{P_0} + g$$

Another name for this formula is the **Gordon Growth Model**. Note that this formula is only sensible for $r_e > g$.

- Share price appreciation in the growth model:
  - Earlier, we found the following decomposition of expected returns:

$$r_e = \frac{D_1}{P_0} + \frac{P_1 - P_0}{P_0}$$

  - In the growth model, our expected return is a combination of dividend yield and earning/dividends growth

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

  - Comparing these two, we learn that share prices will appreciate at the same rate as earnings and dividends:

$$\frac{P_1 - P_0}{P_0} = g$$

***Example*: (Gordon Growth Model)**

Simon Property Group just paid an \$8 dividend. It is expected to reliably grow its earnings (and dividends) by 4% per year. Cost of capital is 8%. What should its shares trade for? How large is the dividend at the end of year 3? What should the share price be at the end of year 3?

**Solution**:

$$P_0 = \frac{D_1}{r_e - g} = \frac{D_0(1+g)}{r_e - g} = \frac{\$8(1.04)}{8\% - 4\%} = \$208$$

$$D_3 = D_0(1+g)^3 = \$9.00$$

$$P_3 = \frac{D_4}{r_e - g} = \frac{D_3(1+g)}{r_e - g} = \frac{\$9(1.04)}{8\% - 4\%} = \$234$$

***Investments and Payout Policy***

- Follow-up questions:
  - Where does this growth come from?
  - What does it cost the firm?
  - What does it cost investors if anything?

***The trade-offs in payout policy***

- A sustainable dividend must come from earnings.
- **Dividend Payout ratio**: share of earnings distributed to shareholders
- **Retention rate**: share of earnings retained

$$D_t = \frac{\text{Total Earnings}_t}{\text{Shares Outstanding}_t} \times \text{Payout Ratio}_t$$

- Ways to increase $D_t$:
  - Grow earnings
  - Increase payout ratio
  - Decrease shares outstanding

***Growing Earnings Long-Term***

- **Step 1** – Retain earnings at the end of year *t – 1*, to have funds available to re-invest at the start of year *t*:

$$\textbf{New Investment}_{\$,t} = \textbf{Total Earnings}_{\$,t-1} \times \textbf{Retention Rate}_{\%,t-1}$$

- **Step 2** – Grow Earnings during year *t*, through on new investment:

$$\textbf{Change in Total Earnings}_{\$,t} = \textbf{New Investment}_{\$,t} \times \textbf{Return on New Investments}_{\%,t}$$

- How fast can earnings grow?

$$\textbf{Earnings Growth Rate}_{\%,t} = \textbf{Retention Rate}_{\%,t-1} \times \textbf{Return on New Investments}_{\%,t}$$

- If the firm keeps their retention rate constant, the dividend growth rate *g* and the annual price appreciation will be equal to the growth rate in earnings.

***Payout or Invest?***

- Under the previous assumptions:

$$g_t = \text{Earnings growth rate}_{\%,t} = \text{Retention Rate}_{\%,t-1} \times \text{Return on new investments}_{\%,t} = RR_{t-1} \times ROI_t$$

- However, this doesn't mean the firm should always retain this period's earnings in order to grow all future earnings with the purpose of maximising share price.
- This should be a trade-off. Relative to $P_0$, we are giving up a portion of each payout:

$$P_0 = \frac{D_1}{r_e - g} = \frac{EPS_1(1 - RR)}{r_e - g}$$

Example:

It is the start of the fiscal year. Juice Stands Inc. earned $6 per share last year like every year and paid all of it as dividend. The CEO proposes to continue a 100% payout policy indefinitely. The firms cost of capital is 10%.

Thus, under that proposal the share price at the start of year 1 (t = 0) should be:

$$P_0 = \frac{D_1}{r_e} = \frac{\$6}{10\%} = \$60$$

The dividend yield:

$$y = \frac{D_1}{P_0} = \frac{\$6}{\$60} = 10\%$$

The CFO of Juice Stands Inc. makes an alternative proposal: Retain 25% of all future earnings and invest them into new juice stands. He projects the return on new juice stands to be 12%. Let's assume that the cost of capital is not affected by this decision.

Thus, the dividend **at the end of this year** will be

$$D_1 = EPS_1 \times \text{Payout Ratio}_1 = \$6 \times 75\% = \$4.50$$

The firm's growth rate (of earnings and dividends) will be $g = \text{Retention Rate}_{\%} \times \text{Return on new investments}_{\%} = 25\% \times 12\% = 3\%$. Thus, the share price should be

$$P_0 = \frac{D_1}{r_e - g} = \frac{EPS_1 \times \text{Payout Ratio}_1}{r_e - g} = \frac{\$4.50}{10\% - 3\%} = \$64.29 > \$60$$

And the dividend yield is …

$$y = \frac{D_1}{P_0} = \frac{\$4.50}{\$64.29} = 7\%$$

It is now the start of year 5 (t = 4). The firm has been successfully following the CFO's proposal. Lots of new juice stands have been built. Earnings have been growing, and so has the share price! Internal financial modelling predicts a continuation of this trend in year 5.

However, an investment analyst published a research note suggesting that due to saturation in the market for juice, new stands can only be expected to earn 8% ROI this year, and all future years. What does this mean for the future growth and tomorrow's share price?

We are at the start of year 5 (t=4). The first 4 years have gone according to projections. Going forward, the firm's new growth rate (of earnings and dividends) will be $g_{5+} = \text{Retention Rate}_{\%} \times \text{Return on new investments}_{\%} = 25\% \times 8\% = 2\%$.

Year 4 earnings were \$6.56, of which 25% were retained for year 5 investment. Given lower growth, end of year earnings and dividends will now be:

$$EPS_5 = EPS_4 \times (1 + g_5) = \$6.56 \times 1.02 = \$6.69$$
$$D_5 = EPS_5 \times \text{Payout Ratio}_5 = \$6.69 \times 75\% = \$5.02$$

Thus, the updated share price would be …

$$P_4 = \frac{D_5}{r_e - g} = \frac{\$5.02}{10\% - 2\%} = \$62.70$$

What should the firm do? What will be the effect on the share price?

No more retention in future years: $P_4 = \frac{EPS_5}{r_e} = \frac{\$6.69}{10\%} = \$66.90$ (rounding)

- So should firms always retain and invest?
  - For high ROI (12%), retaining some earnings increases $P_t$ relative to 100% payout because large future earnings growth will make up for the foregone dividends.
  - For low ROI (8%), retaining some earnings decreases $P_t$ relative to 100% payout because foregone dividends are too costly compared to the small future earnings growth.
- Whether retain and invest increases the share price depends on whether ROI > $r_e$

***Life cycle of the Firm***

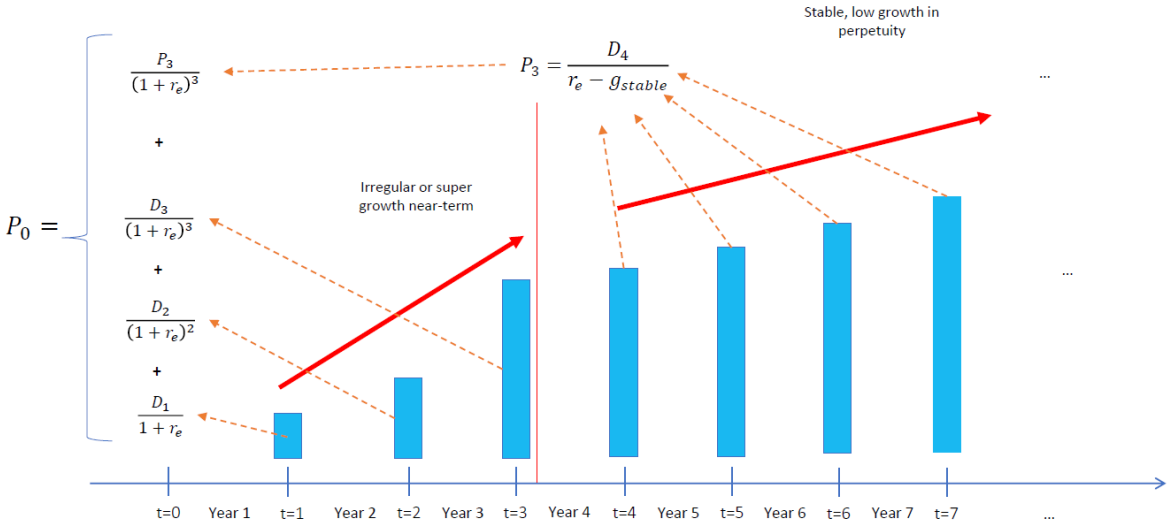
- When a firm is relatively young, they often encounter investments opportunities with very high ROI (100%+).
- As the firm becomes larger and starts saturating its market, opportunities become relatively smaller and less profitable.
- Eventually ROI converges towards the cost of capital and can only exceed it for small enough projects.
- Thus, firms should change their payout policy over their lifetime:
    - Young firms should retain all earnings and invest heavily
    - Mature firms should increase their payout ratio and only invest if ROI > *r*

## Case 3 – 2 stage growth models

- The optimal payout policy depends on the growth stage of the company
- 2-stage growth model: the company grows dividends at one rate for the first *n* years and then transitions to a steady state or at least a slower growth.

$$P_0 = \underbrace{\frac{D_1}{1+r_e} + \cdots + \frac{D_n}{(1+r_e)^{\boldsymbol{n}}}}_{\text{Stage 1}} + \underbrace{\frac{D_{n+1}}{(1+r_e)^{n+1}} + \cdots}_{=\text{PV(Stage 2)} = \frac{\boldsymbol{P_n}}{(1+r_e)^{\boldsymbol{n}}}}$$

- We will often compute $P_n$ first, then discount to the present and add Stage 1 (e.g. a growing annuity)




## Total Payout Model

- In recent years, share repurchases have become more common as a way of distributing cash back to investors (comparative to dividends)
- The presence of repurchases requires a modified approach to valuation called the **total payout model**:
    - Value firm equity (all shares) by applying annuity/perpetuity formulas to total payouts $TP_1$ (instead of a per share basis)

$$MV_0(\text{Equity}) = \frac{TP_1}{r_e - g_{TE}}$$

    - To get share price $P_0$, divide by current number of shares outstanding ($\#_0$)

$$P_0 = \frac{\frac{TP_1}{r_e - g_{TE}}}{\#_0}$$

- Note: $g_{TE}$ is the growth rate in total earnings (not earnings per share)

***Applying the Total Payout Model***

AAPL grows total earnings by $g_{TE} = 3\%$ per year and pays out 100% of it – 20% in dividends and 80% through buybacks.$\#_0 = 16.667b;\ TE_1 = \$60b; r_E = 6\%$. What is AAPL's valuation at time 0?

$$MV_0(\text{Equity}) = \frac{TP_1}{r_e - g_{TE}} = \frac{\$60b}{0.06 - 0.03} = \$2{,}000b$$

$$P_0 = \frac{MV_0(\text{Equity})}{\#_0} = \frac{\$2{,}000b}{16.67b} = \$120 \text{ per share}$$

What is AAPL's valuation at time 1?

$$MV_1(\text{Equity}) = \frac{TP_2}{r_e - g_{TE}} = \frac{\$60b(1.03)}{0.06 - 0.03} = \$2{,}060b$$

$$MV_{1,ADBB} = MV_1 + TP_1 \cdot BB_{\%} = \$2{,}060b + \$60\text{b}(0.8) = \$2{,}108\text{b}$$

Buy back at what price? $$P_{ADBB} = \frac{MV_{1,ADBB}}{\#_0} = \frac{\$2{,}108b}{16.667b} = \$126.48$$

$$D_1 = \frac{TP_1 \cdot Div_{\%}}{\#_0} = \frac{\$60b(0.2)}{16.667b} = \$0.72$$

Buy back how many shares? $$\#_{BB} = \frac{\$60b(0.8)}{\$126.48} = 379.5m \qquad \#_1 = 16.287\text{b}$$

$$P_1 = \frac{MV_1}{\#_1} = P_{ADAB} = P_{ADBB} = \$126.48 \ \checkmark$$

- Note:
  - ADAB – After Dividend, After Buyback

    $$MV_{1,ADAB} = MV_1(\text{E}) = \frac{TP_2}{r_e - g_{TE}} = \frac{TP_1 \cdot (1 + g_{TE})}{r_e - g_{TE}}$$
  - ADBB – After Dividend, Before Buyback

    $$MV_{1,ADBB} = TP_1 \cdot BB_{\%} + MV_1(\text{E})$$
    $$P_{1,ADBB} = \frac{MV_{1,ADBB}}{\#_0}$$

    Number of shares to be bought back:
    $$\#_{BB} = \frac{TP_1 \cdot BB_{\%}}{P_{ADBB}}$$
    New number of shares:
    $$\#_1 = \#_0 - \#_{BB}$$

# Value Capture

## Cost-Volume Profit (CVP) Analysis

- CVP examines changes in profits in response to changes in sales volumes, costs and prices
- Managers use it to help plan future levels of operating activity and provide information about:
  - Products or services to emphasise
  - Volume of sales needed to achieve target profit
  - Revenue required to avoid losses
  - Whether to increase fixed costs
  - Budgets for discretionary expenditures
- Sales price – reflects customer value

**Profit = Total revenue – Total costs**

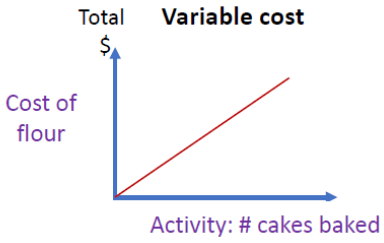
**Profit = [Sales price * Sales quantity] – Total costs**

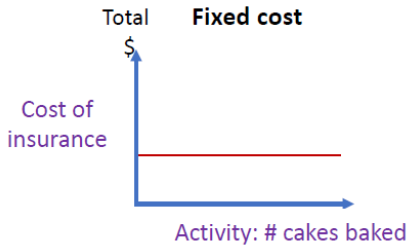
***Cost Concepts***

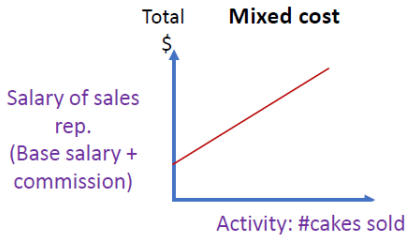
- Costs:
  - Something that is given, needed, or lost in order to get a particular thing
  - Resources given up achieving a particular objective
  - Measured in monetary terms
- Value creation:
  - Customer value – Do product costs accurately reflect the value created for customers?
  - Shareholder value – Do resources consumed generate returns to shareholders?

***Cost Behaviour***

- Cost behaviour is the relationship between a cost and the level of an organisation's activity
- Uses:
  - Predicting costs – forecasting, budgeting, planning and CVP analysis
  - Managing costs – ensure costs reflect value creation and increase profitability
- To understand cost behaviour, consider:
  - Cost drivers – activity or factors that drive costs
  - Cost object – items that management wants a separate measure of cost for
- Cost Behaviour Patterns:
  - Variable costs – changes proportionally with an activity level
  - Fixed cost – does not vary with changes to an activity level
  - Mixed cost – combination of variable and fixed




## Breakeven Point (BEP)

- **Breakeven Point**: The volume of sales at which the total revenue and costs are equal
  - At this level, there is no profit or loss
  - TO calculate BEP, set profit in an CVP formula to zero
- BEP can be calculated in:
  - Total sale quantity
  - Total sales revenue

$$Profit = \left\{ \left( \begin{matrix} Sales\ price \\ per\ unit \end{matrix} - \begin{matrix} Variable\ cost \\ per\ unit \end{matrix} \right) \times \begin{matrix} Sales \\ quantity \end{matrix} \right\} - \begin{matrix} Total \\ fixed\ costs \end{matrix}$$

$$\text{Breakeven point} \Rightarrow \begin{matrix} Sales \\ quantity \end{matrix} = \frac{Total\ fixed\ costs}{\begin{matrix} Sales\ price \\ per\ unit \end{matrix} - \begin{matrix} Variable\ cost \\ per\ unit \end{matrix}}$$

## Pricing Strategy

- Pricing Tripod:
  - 1. Pricing and Customer Value
  - 2. Competition Pricing
  - 3. Cost-Volume Profit Analysis (Cost based pricing)

### *Value Based Pricing (1)*

- The method of setting a price by which a company calculates and tries to earn the differentiated worth of its product for a particular consumer segment when compared to its competitor
- $Perceived\ Value - Price\ Paid = Customer's\ Incentive\ to\ Buy$
- $Price\ Paid - COGS = Organisation's\ incentive\ to\ Buy$
- Understanding customer value:
  - Function Value – Buy/Don't buy?
  - Social Value – Brand A or Brand B?
  - Emotional Value – Which product of Brand X?
- $Actual\ Price + Time\ and\ Effort + Perceived\ Risks = Customer\ Cost$

### *Competition Based Pricing (2)*

- The influence of competitors:
  - Increased competitors
  - Increased substituting offers
  - Wide distribution of competitor and/or substitution offers
  - Increased surplus capacity in the industry

## Cost Based Pricing (3)

### *Breakeven Point – Multiple Products*

- Organisations often sell different products or services
- The sales mix is the proportion of different products and services
- For CVP, a constant sales mix is assumed:
  - When an organisation produces and sells a number of different products/services, the weighted average contribution margin per unit is used to determine the breakeven point of targeted profit
  - Weighted average refers to the expected sales mix
  - The weighted average contribution margin per unit is calculated as the combined total contribution margin for all products divided by the total number of units expected to be sold
- BEP for multiple products:

$$\text{Breakeven point} => \text{Sales quantity} = \frac{Total\ fixed\ costs}{Weighted\ Average\ Contribution\ Margin\ per\ unit}$$

- Weighted Average Contribution Margin per Unit example:

| | Dogs | Cats | Total |
|---|---|---|---|
| Expected sales mix | 40% | 60% | 100% |
| Sales price per room | 90.00 | 70.00 | |
| Less: Variable cost per room | 40.00 | 24.00 | |
| Contribution margin | 50.00 | 46.00 | |
| Weighted Average CM per room | $20.00 | $27.60 | $47.60 |

CM (per room) * Sales mix

***CVP Analysis: Targeted After Tax Profit***

- We can use the breakeven point formula to determine the sales quantity or sales revenue required to achieve a target net profit.

$$\text{Target pre-tax profit} = \frac{\textbf{Target after-tax profit}}{1 - Tax\ Rate}$$

$$\text{Target Sales quantity} = \frac{Total\ fixed\ costs + \textbf{Target pre-tax profit}}{Weighted\ Av.\ Contribution\ Margin\ per\ room}$$

***Margin of Safety and Degree of Operating Leverage***

- Information from CVP analysis can help manage operational risk
- Operational risk relates to risk of loss resulting from inadequate or failed internal processes, people, systems or external events
- The margin of safety is the excess of an organisation's expected future sales above the breakeven point.

$$\text{Margin of safety in units} = \text{Actual or expected units of activity} - \text{Units at breakeven point}$$

$$\text{Margin of safety in revenue} = \text{Actual or expected revenue} - \text{Revenue at breakeven point}$$

***CVP Analysis for Multiple Products***

- Discretionary expenditure decision: CVP analysis can help managers make decisions as to whether to increase/decrease discretionary expenditures
- Used to determine whether profits would increase as a result of an action by managers, for example:
  - Increasing advertising
  - Changes in sales mix
  - Changes in selling price

## Value Analysis

- If an organisation cannot breakeven or meet profit targets:
  - Increase prices – Will customers accept pricing decision?
  - Decrease costs – What are cost saving opportunities?
  - Reject Proposal
- Value analysis
  - Method of identifying value adding and non-value adding activities
  - Improve the value of products by minimising non-value adding activities/costs

***Value Adding vs Non-value Adding Activities***

- Value-adding (VA) activity – necessary to remain in business
  - Moves the product one step closer to completion
  - Increase service potential to customer and they are willing to pay for it
  - The activity needs to be done right the first time
  - Essential to the functioning of the business
- Non-value adding (NVA) activities:
  - Activities that fail to satisfy the above criteria
  - Inefficient performance of value creating activities

- Resource/cost implications:
    - NVA activities unnecessarily consumer resources and increase business costs
    - Should reduce or eliminate NVA activities

***Assumptions and Limitations of CVP Analysis***

- Relies on forecasts of expected revenues and costs
- Assumptions rule out fluctuations in revenues or costs that might be caused by common business factors such as:
    - Supplier volume discounts
    - Learning curves
    - Changes in production efficiency
    - Special customer discounts
- Many uncertainties arise about whether CVP assumptions will be violated:
    - Can volume of operating activity be achieved?
    - Will selling prices change?
    - Will sales mix remain constant?
    - Will fixed or variable costs change as operations move into new relevant range?
    - Will costs change due to unforeseen events?
    - Are revenue and cost estimates biased?

# Investment Decision Rules

## Capital Budgeting

- The CFO, along with the corporate function of the firm is responsible for making investment decisions.
- These decisions decide what the firm becomes, what it produces, how risky it is and what its financing needs will be.
- The investment decision process is part of capital budgeting which is concerned with:
    - Generation, evaluation and selection of investment proposals
    - Management of capital expenditures during the implementation
    - Control and audit functions later on
- Evaluation and selection of projects:
    - Identify and forecast relevant cash flows
    - Establish investment decision rules
    - Apply Investment decision rules to select the best project
- Independent project – Project that does not affect the cash flows of another project.
    - For simplicity, we often think of projects this way
    - There is limited capital for all projects at once. Thus, projects may need to be ranked and chosen jointly to maximise overall wealth creation given the budget
- A special case of interdependence are mutually exclusive projects
    - Accepting one requires rejection of all others

## Net Present Value

- This is the basis for the most important rule in investment decisions
- NPV is the sum of the present values of all simple cash flows that arise from the project over time

$$NPV = \sum_{i=0}^{\infty} \frac{CF_i}{(1+r)^i}$$

- Simple projects and most financial investments incur one negative cash flow at time 0. This is called having "standard" cash flows:
    - Note: the starting index is now *i = 1*.
- Given a NPV number, the decision rule is:

$$NPV = \sum_{i=1}^{\infty} \frac{CF_i}{(1+r)^i} + CF_0 = \sum_{i=1}^{\infty} \frac{CF_i}{(1+r)^i} - Cost$$

    - Accept proposals with NPV > 0
    - Reject proposals with NPV < 0
    - When choosing among several projects, choose the highest NPV

***Choice of Discount Rate***

- **Choice 1**: Use the company wide average cost of capital (i.e. required rate of return by all investors). It represents the cost of the next dollar of financing assuming the relative capital structure is maintained.
- **Choice 2**: The discount rate should adequately reflect the risk involved in executing the project on a stand-alone basis, regardless of the cost of capital of the firm. It could be inferred by looking at opportunities with similar risk.

## Internal Rate of Return

- "Which discount rate makes the NPV of the project equal to zero?"
    - I.e. how large can the discount rate be before the project makes a loss

$$0 = NPV = \sum_{i=0}^{n} \frac{CF_i}{(1+\tilde{r})^i} \qquad Cost = \sum_{i=1}^{n} \frac{CF_i}{(1+\tilde{r})^i}$$

- The rate that solves the above equations is called the internal rate of return (IRR).
- It does not need or reference any project or company specific discount rate.

***IRR Decision Rule***

- For projects with standard cash flows, the IRR decision rule is:
    - Accept the project if IRR > required rate of return
    - Reject if IRR < required rate of return
- It is generally a bad idea to use the IRR rule in the following situations:
    - Projects with non-standard cash flows (e.g. intermittent or late negative cash flows)
    - Choose the best among mutually exclusive projects, projects with different scales or under budget constraints

## Accounting Rate of Return

- The accounting rate of return (ARR) is an accounting-based measure that relates the initial investment to subsequent incremental accounting profits that occur due to a project under consideration.

$$r_{ARR} = \frac{\text{Avg. Acc. Profit}}{\text{Initial Investment}}$$

- The ARR decision rule simply says to accept any project with an ARR exceeding a certain required accounting rate of return, which is similar to the IRR rule
- When choosing between two mutually exclusive projects, the ARR rule recommends choosing the one with a higher ARR
- Accounting profits can be quite different from free cash flow measures due to the difference in timing of the recognition of revenue and costs.
    - The other major difference is the treatment of capital expenses and depreciation

- In simple terms:

$$EBIT = \text{Revenue} - \text{Costs} - \text{Depreciation}$$

$$\text{Net Income} = EBIT \cdot (1 - T_c)$$

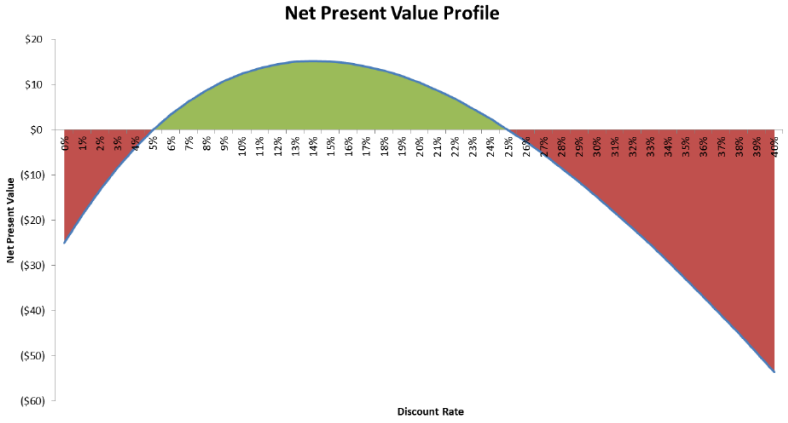
$$FCFF = EBIT \cdot (1 - T_c) + \text{Depreciation} - \text{CapEx}$$

- ARR uses net income, which is based on EBIT, which deducts the depreciation expense (before tax).
- By contrast, NPV is based on FCF measures, which explicitly deduct the upfront expenses at time 0 but add back the depreciation expenses over the lifetime of the asset.
- This leads ARRs to often be quite low relative to other return measures such as the IRR.
- ARR does not account for the time value of money, similar to the payback period measure.

## Special Cases

### *Non-standard Cash Flows*

- Example: A mining project requires $2m upfront investment, pays $4.6m at the end of year 1 and then requires a $2.656m clean up at the end of year 2. For which discount rates is the project NPV-positive? What is the IRR?
- **Solution**:
  - There are 2 IRRs: 5% and 25%. All discount rates between will give a positive NPV.



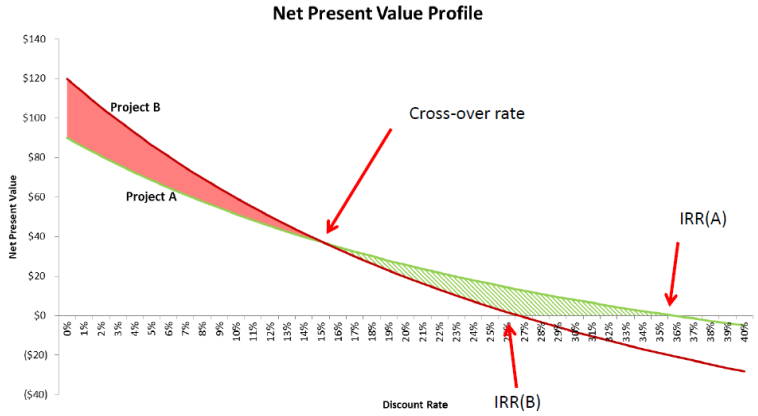

  - However, changing the sign on all cash flows would leave IRRs unchanged, but NPVs would switch.
  - Knowing the IRRs on their own is not useful.
  - Every additional switch from positive to negative cash flows leads to an additional solution for the IRR.
  - Only a complete NPV profile can show the true relationship

### *Mutually Exclusive Projects*

| | Periods | | | | | |
|---|---|---|---|---|---|---|
| | **0** | **1** | **2** | **3** | **4** | **5** |
| **Project A** | ($70) | $32 | $32 | $32 | $32 | $32 |
| **Project B** | ($130) | $50 | $50 | $50 | $50 | $50 |

- Consider the two projects above, only one of which can be implemented

- The NPV profile reveals that:

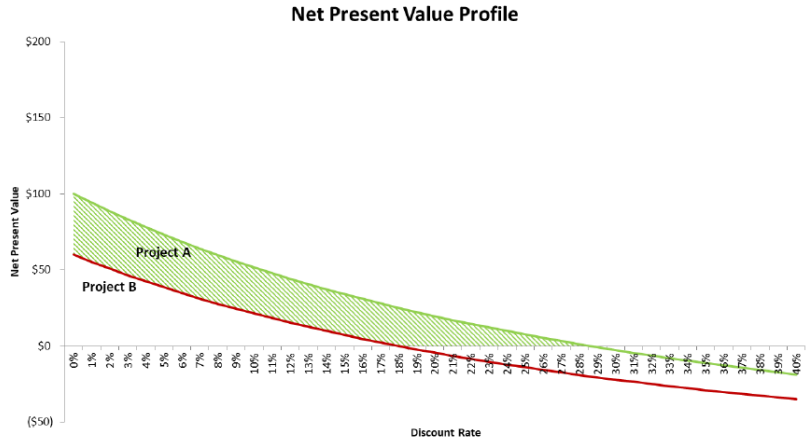



  - There is a switch/cross-over somewhere around $r* = 15\%$
  - For $r < r*$ choose B
  - For $r* < r < IRR(A)$ choose A
  - Above $IRR(A)$ choose neither
- Finding the cross-over rate:
  - To find the cross-over, we need to realise that choosing project B means foregoing project A. Create a synthetic project called "B minus A".

| | Periods | | | | | | IRR |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| **Project A** | ($70) | $32 | $32 | $32 | $32 | $32 | 35.8% |
| **Project B** | ($130) | $50 | $50 | $50 | $50 | $50 | 26.7% |
| **Project B-A** | ($60) | $18 | $18 | $18 | $18 | $18 | 15.2% |

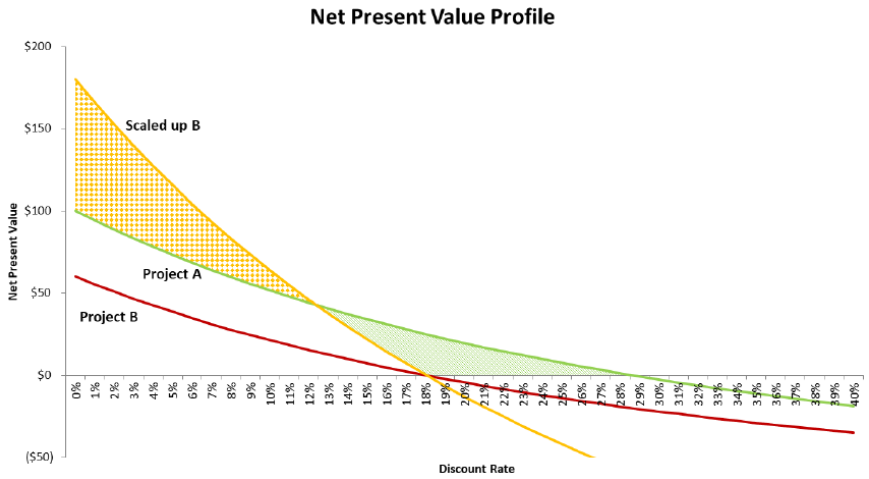
- The IRR of one project minus the other is equal to the cross-over rate.

***Scalability***




- Considering projects A and B, clearly A offers higher NPVs at all discount rates and its IRR is higher

- However, project A is limited to its proposed size while project B can easily be scaled




- In this case, we need to consider: would you rather invest in a large NPV at IRR = 10% or a tiny NVP at IRR = 100%?

## Is the IRR Rule a Good Decision Rule?

| Pros | Cons |
|---|---|
| • In standard cases, IRR and NPV rules give the same answer<br>• Meaning of IRR intuitively appealing, easy to communicate<br>• IRR provides a margin of error: If IRR is high, we don't know the required rate exactly | • Non-standard cash flows make the IRR rule unusable<br>• IRR may not correctly rank competing projects<br>• IRR focuses on return and cannot capture differences in scale of projects |

## Comparing Repeated Projects

- Projects that require repeated investments cannot be looked at on a one-off basis (e.g. IT upgrades, fleet purchases)

### *Equivalent Annual Annuity*

- EAA – The level annual cash flow that has the same present value as the cash flows of a project over the same horizon (including time-0 cost)

$$C_{EAA} = \frac{NPV}{AF_n} = \frac{NPV}{\frac{1-(1+r)^{-n}}{r}}$$

- Essentially:
  - Compute the NPV
  - Compute the constant annuity payment over the same horizon with the same NPV using the same discount rate, but no cash flow at time 0.
- Depending on the sign of the cash flow C, this framework may also be called equivalent annual benefit (EAB) or equivalent annual cost (EAC).

***EAA for Standard Cash Flows***

- Assume a project with one-time upfront costs followed by constant cash flows for the duration of the project of *n* years. Then we have:

$$C_{EAA} = \frac{NPV}{AF_n} = \frac{CF\left[\frac{1-(1+r)^{-n}}{r}\right] - Cost}{AF_n} = CF - \frac{Cost}{AF_n}$$

- EAA amortizes the initial cost (at time 0) over the useful lifetime of the project/purchase, very similar to linear depreciation in accounting

***EAA Analysis***

- The implicit assumption under EAA analysis is that you will eternally be able to replace your investment/product with an identical item at the same cost.
- In practice, some of the following considerations may affect the optimal choice:
    - Required life: How long do you need the item for?
    - Replacement cost: What are the chances that a new better product will be available soon?
    - Technological obsolescence/speed of innovation

**Comparison of NPV, IRR and EAA**

- NPV measures total benefit – favours large-scale, long-lasting investment
- IRR favours high average returns relative to the initial cost, even if those returns only occur for a short time period
    - Neither measure considers an average $ benefit per year
    - Neither measure is able to incorporate the cost from frequently having to replace the investment
- EAA has these characteristics by assuming that you will repeatedly invest in the same project again after the last one ends.

# Risk, Return & Cost of Capital

**Returns**

- Historical returns:
    - Lie in the past
    - Also called actual or realised returns
    - Can be measured with certainty
    - Can be used to compute historical averages
- Expected returns:
    - Lie in the future
    - Are uncertain and hoped for
    - Are random variables
    - Require assumptions about probabilities of possible future outcomes

***Holding Period Returns (HPR)***

- HPR is the return that has been achieved over some period of time during which the investor held an asset.

- For assets that simply grow in value:

$$HPR_{\text{simple}} = \frac{P_{t+1} - P_t}{P_t} = \frac{P_{t+1}}{P_t} - 1$$

- For an asset with dividend returns, we can calculate returns between ex-dividend dates:

$$Ret_{t+1} = \frac{P_{t+1} + Div_{t+1} - P_t}{P_t} = \frac{P_{t+1} + Div_{t+1}}{P_t} - 1$$

***HPR Calculations***

Example: You bought shares of BHP for $28 last year and just received a $2 dividend and the share is trading at $33 at the end of year 1. At the end of year 2, the share trades for $34 right after paying you a $1 dividend. Assumption: The year 1 dividend is immediately reinvested in the asset from where it originated. This subdivides the holding period into sub-periods, and we have to consider two separate period returns:

$$Ret_1 = \frac{\$33 + \$2 - \$28}{\$28} = \frac{\$33 + \$2}{\$28} - 1 = 25\%$$

And starting at $33 after the year-1 dividend, we have

$$Ret_2 = \frac{\$34 + \$1 - \$33}{\$33} = \frac{\$34 + \$1}{\$33} - 1 = 6.06\%$$

To calculate the holding period return, we need to chain these period returns together:

$$HPR_{0,2} = (1 + Ret_1) \cdot (1 + Ret_2) - 1 = (1.25) \cdot (1.0606) - 1 = 32.58\%$$

## Average Returns

***Geometric Average Returns***

- A geometric average return signifies the annual compound rate that is necessary for an investment to grow from an initial balance into its final balance some periods later:

$$FV_n = PV_0 \cdot (1 + \bar{R}_{geo})^n$$

- Solving for that rate we get:

$$\bar{R}_{geo} = \left[\frac{FV_n}{PV_0}\right]^{1/n} - 1$$

***Arithmetic Average Returns***

- The arithmetic average return will consider the actual year-by-year sequence of annual returns and compute the simple average over this sequence. Formally,

$$\bar{R}_{arith} = \frac{1}{n}[R_1 + R_2 + \ldots + R_n]$$

***Two Averages for Two Purposes***

- Geometric:
  - The geometric average return reflects the experience that a '**buy-and-hold**' investor would have had
  - Whatever increase or decrease in wealth occurred in period 1 will be compounded by the change in period 2 and so on, no intervention necessary.
- Arithmetic:
  - The arithmetic mean, by contrast, is the return that an '**actively rebalancing**' investor would experience: Invest $1 in period 1. At the start of period 2 adjust your investment back to $1 (by selling some of your investment and cashing out if it has grown or by adding money and buying additional shares if your balance has declined in the previous period) and so on.

- Every period you start with $1, and at the end of each period, you either take your gains or replenish your losses.

## Measures of Risk

### *Historical Variance and Volatility*

- The historical variance of return of an asset *i* over *n* periods is defined as the sum of the squared deviations from the mean, divided by *n – 1*:

$$Var(R) = \sigma^2 = \frac{(R_1 - \overline{R})^2 + (R_2 - \overline{R})^2 + \ldots + (R_n - \overline{R})^2}{n-1}$$

- Volatility is the square root of variance:

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

  - Note: Volatility is given in % and variance is given in %-squared. Thus we prefer volatility.

### *The Normal Distribution*

- Expected returns are unknown but typically we can make some assumptions about the likelihood of possible future realizations.
- In statistics, we call such an assumption a probability distribution from which realization will be drawn.
- The most useful distribution is the normal distribution.
- The bell curve is a fairly good representation of the distribution of returns of portfolios of stocks at monthly or annual frequencies.
  - Predictions tend to get worse for assets like individual stocks as well as for shorter time horizons
- Note: Using **Empirical Rule**

Assuming that some historical data analysis tells us that we should expect annual returns of the ASX to have a volatility of $\sigma = 15\%$ and a mean of $8\%$, then we can reasonably expect that next year's (12-month) return will fall into the interval

$$I = (8\% - 2 \cdot 15\%, 8\% + 2 \cdot 15\%) = (-22\%, +38\%)$$

with a probability of 95% (leaving another 5% for even more extreme outcomes). This a rather wide interval, but that is kind of the point: this is the amount of variation you should be willing to endure when investing in the equiy market.

### *Frequency of Returns*

- Adjusting from annual to monthly:

$$\overline{R}_{\text{monthly}} = \frac{1}{12}\overline{R}_{\text{annual}}$$

$$\sigma^2_{\text{monthly}} = \frac{1}{12}\sigma^2_{\text{annual}}$$

$$\sigma_{\text{monthly}} = \frac{1}{\sqrt{12}}\sigma_{\text{annual}}$$

## Risk-Return Trade off

- For investment portfolios, risk and return are positively correlated. The more risk a portfolio carries, the higher the expected return must be to compensate for the risk.

$$RP_{port} = R_{port} - R_f$$

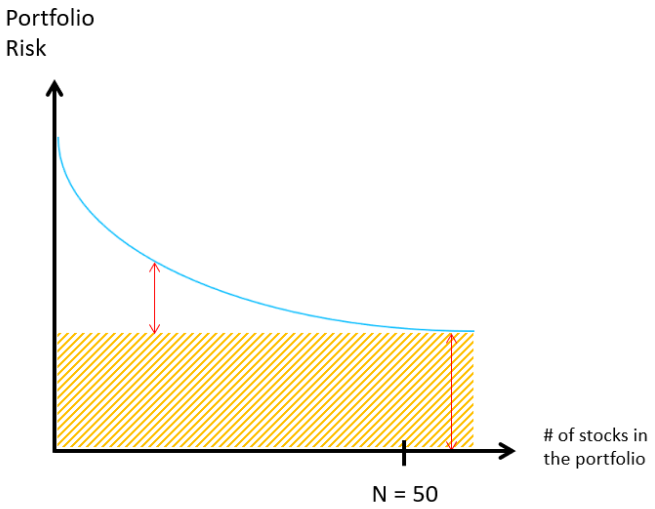
- This is called the risk premium (RP) over the risk-free asset:
- The market risk premium (MRP) will be a central input into figuring out what returns to expect for the market and for individual stocks

***Systemic vs Idiosyncratic Risk***

- For individual stocks the relationship between volatility and return is less clear cut compared to long term portfolios.
- The reason for this disconnect at the individual asset level stems from the fact that not all risks are equal. The business prospects of a stock are affected by all kinds of influences. Some examples:
    - Interest rates might rise.
    - Business travellers might switch to Zoom calls in the long-term
    - One of BHP's mines might flood or shut down production.
    - One of the CEOs might get caught saying something embarrassing on tape.
    - Accounting fraud is discovered at one of the companies.
    - Ongoing tensions with China depress economic growth.
- If you parse the list above you might notice a clear distinction: Some risks are very company specific.
    - We call these risks **idiosyncratic** which means individual or distinct
- Others are global or macro-economic risks. They will affect multiple companies at the same time and usually in the same direction, albeit possibly to a different degree.
    - These risks we call **systematic**.

## Diversification

- Mixing multiple company's stocks in a portfolio reduces the chance of idiosyncratic risks reducing your returns.
- If certain companies have above average years and certain companies have below average years, these effects will cancel out thus reducing risk.
- However, not all risks can be diversified.
    - If you combine all the stocks in a given universe (e.g., all Australian equities), your portfolio becomes "the market". "The market" obviously still has a good amount of risk.




- Investors who hold the market are exposed to systematic risk that they cannot avoid. Thus, they will demand compensation for this risk. This is the market risk premium we encountered earlier.
    - More compensation means a higher discount rate, which means a lower price in the present.
- An undiversified portfolio is exposed to systematic risk plus idiosyncratic risk.

- You might be tempted to apply a higher discount rate to the pricing of individual company shares, but every investor with a diversified portfolio would outbid you as their required return is lower because they only require the systematic part to be compensated
- In equilibrium this means that only systematic risk will be compensated.
    - This is a fundamental insight in finance and is sometimes called the **systematic risk principle**.

## Portfolios

### *Portfolio Returns*

- Assume you are building a portfolio of *n* individual assets, and each asset is allocated a dollar amount $A_i$.
- It is easier to formulate everything in terms of relative portfolio weights.
- The weight allocated to asset *i* is:

$$w_i = \frac{A_i}{\sum_{j=1}^{n} A_j}$$

- Each member of the portfolio is expected to experience returns $R_i$ over some period. Then the corresponding portfolio return for that period is:

$$R_{\text{Port}} = \sum_{i=1}^{n} w_i R_i$$

### *Correlations*

- Correlation is the measure that expresses the degree of co-movement in returns between financial assets.
- It is denoted by $\rho$ and is a number between -1 and 1.
    - $\rho = +1$ means perfect correlation. The two assets co-move perfectly.
    - $\rho = 0$ means no correlation. The two assets move completely to their own tunes and are affected by disjoint sets of risks.
    - $\rho = -1$ means perfect negative correlation. The two assets move perfecly in opposite directions. The risk drivers are the same, but for whateve reason they have opposite effects.
- Most pairs of assets in the real world have some modest positive correlation
- Negative correlations are rarer in practice, but they do exist between major asset classes.

### *Portfolio Risk*

- In a 2 asset portfolio, portfolio variance is as follows:

$$\sigma_{Port}^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{1,2}\sigma_1\sigma_2$$

    - Note: Perfect correlation makes this term maximally positive and leads to zero diversification

### *A Measure of Systematic Risk*

- If an investor already has a well-diversified portfolio and we want to convince them to add another stock, they will want to know how much systematic risk this new stock adds to his portfolio.
- A famous measure for this is called β (beta).
    - The beta of a market portfolio is 1. (For a +1% movement in the market, the systematic risk of any asset will make it move by β*1%)
    - This says nothing about the idiosyncratic risk of the asset (should be ignored in a diversified portfolio anyway)
    - The beta of an asset *i* can be computed as:

$$\beta_i = \rho_{i,M}\frac{\sigma_i}{\sigma_M}$$

where $\rho_{i,M}$ is the return correlation of asset i with the market, and the other two parts are asset and market volatility.

***Expected Returns in Equilibrium***

- Risk-return trade off – The market portfolio earns the so-called market risk premium in excess of the risk-free rate:

$$E[MRP] = E[R_M] - r_f$$

- Investors will evaluate every investment in comparison to the return they can earn in the market portfolio.
- Under certain theoretical assumptions about how investors evaluate risks, this leads to what one might call the reward-to-risk ratio, which for some asset *A* is:

$$\frac{E[R_A] - r_f}{\beta_A}$$

- The collective actions of all investors adjusts asset prices until they reach equilibrium. That is, for any assets A, B as well as the market itself, it must be that:

$$\frac{E[R_A] - r_f}{\beta_A} = \frac{E[R_A] - r_f}{\beta_A} = \frac{E[R_M] - r_f}{\beta_M}$$

Given that $\beta_M$ = 1, we can solve for the expected return of any asset A:

$$E[R_A] - r_f = \beta_A[E[R_M] - r_f] = \beta_A E[MRP]$$

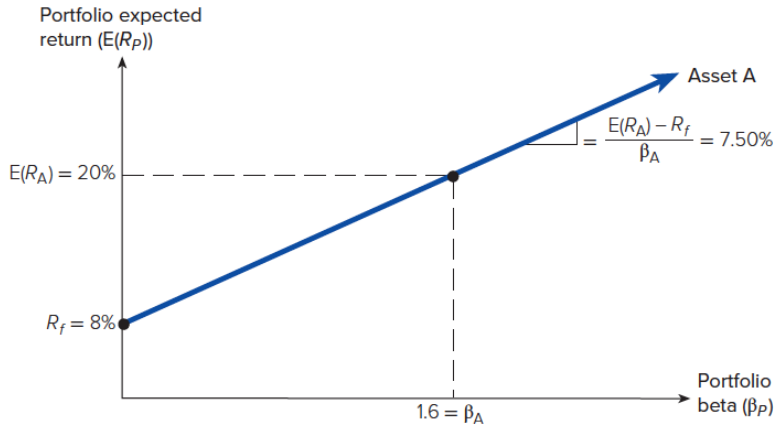
Or, equivalently,

$$E[R_A] = r_f + \beta_A[E[R_M] - r_f]$$

- This result is called the capital asset pricing model (CAPM).
- It allows investors to assign fair expectations to the returns of all assets as a function of only 3 things:
    - The risk free rate (time value of money)
    - Reward for bearing systematic risk, i.e. the market risk premium
    - The assets exposure to systematic risk, measured by beta.

***Adjusting Overall Portfolio Risk***

- Recall that the risk-reward ratio must be the same for all assets and portfolios.
- In a risk-reward plot ($E[R_i]\ against\ \beta$), every asset must lie on the blue line that starts at the risk-free asset and rises with a slope equal to the risk-reward ratio:



- To lower overall risk, you choose weight $w_p$ for risky portfolio *P* and the rest, $1 - w_p$, for the risk free asset. The new portfolio's beta and expected return:

## Cost of Capital

- Expected/required returns by investors = cost of capital for the firm.
- We can apply this to three sources of financing:
  - Equity
  - Preferred Shares
  - Debt

### *Cost of Equity*

$$\beta_{new} = w_P\beta_P + (1 - w_P)\beta_{rf} = w_P\beta_P$$

$$\mathrm{E}[R_{new}] = w_P\mathrm{E}[R_P] + (1 - w_P)R_f$$

- Cost of equity – return that equity investors require on their investment in the firm
- Two methods:
  - Dividend growth model approach – Use historical growth rates or forecasts of earnings and dividends
  - SML or CAPM approach – Use estimates of the firm's beta and the market risk premium

### *Dividend Growth Model Method*

- The required rate of return based on the dividend growth model into forward dividend yield and earnings growth rate:

$$R_E = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$$

Example: ASX Ltd. just paid an annual dividend of $2.40 and is priced at $83 today. Forecasts call for 4% growth in dividends. What is ASX's cost of equity?

**Solution**:

$$R_E = \frac{D_1}{P_0} + g = \frac{\$2.40(1+4\%)}{\$83} + 4\% = 7.01\%$$

- Pros and Cons of the dividend growth model:

| Advantages | Disadvantages |
|---|---|
| • Easy to understand and use | • Only applicable to companies currently paying dividends<br>• Not applicable if dividends aren't growing at a reasonably constant rate<br>• Sensitive to the estimated growth rate |

### *The SML/CAPM Method*

- We require the following inputs:
  - Risk-free rate, $R_f$
  - Market risk premium (MRP), $E[R_m] - R_f$
  - Systematic risk of the asset, $\beta$

- Then, the SML approach (CAPM) suggests:

$$R_E = R_f + \beta\big(E[R_M] - R_f\big)$$

Example: ASX Ltd. has a risk-free rate of 0.25% and a market risk premium of 8%. What does this imply for the cost of equity of ASX's β is 0.34?

$$R_E = R_f + \beta\big(E[R_M] - R_f\big) = 0.25\% + (0.34)(8\%) \ = 2.97\%$$

- Pros and Cons of the SML model:

| Advantages | Disadvantages |
|---|---|
| • Explicitly adjusts for systematic risk<br>• Is applicable to all companies as long as beta is available | • Must estimate the expected market risk premium, which varies over time<br>• Must estimate beta, which also varies over time<br>• Uses the past to predict the future, which is not always reliable |

***Cost of Debt***

- Cost of debt – return that lenders would demand if the firm issued new debt today
- Focus on long-term debt or bonds to get yields:
  - Method 1 – Compute the yield to maturity (YTM) on existing debt of the firm
  - Method 2 – Use estimates of current rates based on bond rating expected for new debt
- Interest expenses are tax-deductible. If before-tax cost is $R_D$ and the corporate tax rate is $T_C$, then the after tax cost of debt is:

$$\mathrm{R_{D,after}} = \mathrm{R_D}(1 - \mathrm{T_C}).$$

- Every dollar paid in interest reduces the firm's tax liability by $T_C$.

***Cost of Preferred Equity***

- Preference shares generally pay a constant dividend every period and are often issued without maturity date.
- Under these assumptions, preference shares can be valued as a perpetuity:

$$\mathrm{R_P} = \frac{D}{P_0}$$

- Alternatives:
  - If preferred shares have a maturity date, you could also value them like bonds, i.e. infer the YTM
  - If preferred shares have a call date (and you think they will be called), use the yield to call (YTC)
- Note: Dividends to preferred shares are NOT tax-deductible.

***Weighted Average Cost of Capital***

- Firm value equals the sum of all sources of financing:

$$V = E + P + D$$

- Compute (market-based) weights of each class, e.g. share of equity $w_e = \frac{E}{V}$
- Estimate the costs of each type of capital: $R_E$, $R_P$ and $R_D$.
- The WACC is:

$$\mathrm{R_{WACC}} = \frac{E}{V}\mathrm{R_E} + \frac{P}{V}\mathrm{R_P} + \frac{D}{V}\mathrm{R_D}(1 - T_C) = \mathrm{w_E R_E} + \mathrm{w_P R_P} + \mathrm{w_D R_D}(1 - T_C)$$

Example:

**Solution**:

Bulk Shippers Inc. has 10m common shares outstanding with a price of \$12.50 ($R_f = 1\%, \beta = 1.3$, MRP=8%), as well as 3.75m preferred shares at \$20 paying \$2 per year in dividends. Its long-term debt has a face value of \$250m and currently trades at 80% with a

$$E = 10m \times \$12.50 = \$125m$$
$$P = 3.75m \times \$20 = \$75m$$
$$D = \$250m \times 0.8 = \$200m$$

$$V = E + P + D = 400m$$

$$w_E = \frac{\$125m}{400m} = 0.3125$$
$$w_P = \frac{\$75m}{400m} = 0.1875$$
$$w_D = \frac{\$200m}{400m} = 0.5000$$

$$R_E = R_f + \beta\big(E[R_M] - R_f\big) = 1\% + 1.3(8\%) = 11.4\%$$
$$R_P = \frac{\$2}{\$20} = 10\%$$
$$R_D = YTM = 6.5\% \text{ (not coupon!)}$$

$$R_{WACC} = w_E R_E + w_P R_P + w_D R_D (1 - T_C)$$
$$= (0.3125)(11.4\%) + (0.1875)(10\%) + (0.5)\underbrace{(6.5\%)(1 - 30\%)}_{4.55\%} = 7.71\%$$

***What Affects the WACC?***

- Market Conditions – Market risk premium, risk-free rates, tax rates
- Firm's capital structure
- The average riskiness of the firm's assets:
    - Different divisions/projects may have different risks
    - The divisions or projects WACC should be adjusted to reflect the appropriate risk and capital structure
    - Adding a new project of different risk will change the WACC

***Cost of Capital for Projects***

- When it comes to the choice of a new project:
    - The cost of capital depends on use of funds, not source
    - NPV calculation requires cost of capital appropriate for project
    - The required rate for a new project can be different from the cost of capital of the firm
- We should evaluate the required rate of return for projects according to its own risk, not that of the company. Using WACC indiscriminately will lead to errors:
    - Low-risk (low beta) projects will be wrongly rejected even if their IRR lies below the WACC but above the SML
    - High-risk (high beta) projects will be wrongly accepted of their IRR lies above the WACC but below the SML

***Alternative Ways to Find Project Cost of Capital***

- Pure play approach:
    - Find one or more companies that specialise in the product or service being considered for the project
    - Compute an average beta across peer firms and use it to compute the cost of capital
    - Pure play companies are difficult to find
- Subjective Approach:
    - Make some adjustment to the cost of capital relative to the existing firm
    - This at least reduces the error rate

***Company Valuation with WACC***

- Discounted cash flow model
- We can value the whole company using the free cash flow to the firm (FCFF) and the WACC.
- By definition, WACC = overall cost of capital = compensation for riskiness of all firm assets

$$V_0 = \frac{FCFF_1}{1+WACC} + \frac{FCFF_2}{(1+WACC)^2} + \cdots + \frac{FCFF_t + V_t}{(1+WACC)^t}$$

Where $V_0$ is the enterprise value of the firm: $V_0 = E_0 + D_0 - Cash_0$

- In this valuation, the interest tax shield is included in the WACC.
- Recall:

FCFF = EBIT x (1 – Tax Rate) + Depreciation
LESS change in net working capital
LESS net capital spending

Example:

A company achieved annual FCFF of $10m last year, expected to grow at 3% indefinitely. WACC = 8%. Cash = $14m. Market value of debt = $50m. Shares outstanding = 8.5m. Compute firm value and share price.

**Solution**:

$$V_0 = \frac{FCFF_0(1+g)}{WACC - \mathrm{g}} = \frac{\$10m(1.03)}{0.08 - 0.03} = \$206m$$

$$E_0 = V_0 - D_0 + Cash_0 = \$206\mathrm{m} - \$50\mathrm{m} + \$14\mathrm{m} = \$170\mathrm{m}$$

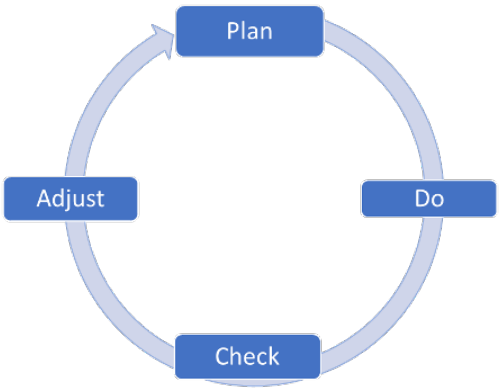
$$P_0 = \frac{E_0}{\#_0} = \frac{\$170m}{8.5m} = \$20$$

# Performance Measurement

- A measure is the quantification of the dimension, size, or capacity of any object of interest based on comparing it to a standard or defined scale or measurement system
- Performance measures are used to keep track and monitor different aspects of performance to assess the achievement of organisational goals
- Measuring performance is important for a number of reasons:
    - Communication Externally – performance measures help communicate organisational performance to external stakeholders such as shareholders, customers, and business partners.
    - Communication Internally – performance measures help communicate the strategy and business plans and align employee's goals with organisational goals.
- Tracking performance against targets
- Evaluate employee performance and use as the basis of rewards
- Guide and develop future strategies and performance

### How to Develop Good Performance Measures

- Performance measures should reflect an organisations strategy
    - Strategies are how organisations plan to compete in their chosen markets to create value and achieve competitive advantage
- An organisation must define their critical success factors
    - **Critical success factors** (CSF) are key strategic or operational goal or objective that captures an aspect of performance vital to the organisation's success
    - A limited set of CSF should be identified to emphasise the activities and processes required to achieve an organisation's strategic goals
- Key performance indicators (KPI) are then developed to make these CSF more concrete and quantifiable.
- KPIs are simple and accurate measures of an employee's or business unit's progress or results against an organisation's CSF.
- When we design performance measures we need to bear in mind that these measures should facilitate the management process and different measures are for different purposes.
- The diagram below illustrates the management process:




### Developing Performance Measures

- Types of Performance measures
    - Financial measures & Non-financial Measures
    - Quantitative measures & Qualitative Measures
    - External Measures & Internal Measures

#### *Financial Measures*

- Measures performance in dollars or ratio of dollars
    - E.g. sales revenue, after tax profits, return on investments
- Measures the financial outcomes of a firm's actions

| Benefits | Limitations |
|---|---|
| • Communicates financial consequences/outcomes of actions<br>• Measure of performance from shareholders perspective | • Emphasise only one aspect of performance<br>• Focus on consequences and no causes<br>• May encourage short term action – can be detrimental to shareholder and stakeholder value |

***Non-financial Measures***

- Operational measures that considers various aspects of firm performance
    - E.g. customer retention, no. of on time deliveries, no. of accidents

| Benefits | Limitations |
|---|---|
| • Measures multiple perspectives of performance<br>• More actionable and understandable<br>• Easily linked to firm's goals | • Wide choice of non-financial measures available<br>• Non-financial measure may be subjective (how were they measured?) |

***Qualitative and Quantitative Measures***

- Quantitative Measures:
    - Measures stated in numbers, e.g. sales revenue, no. new customers
    - Measures can be added, divided and manipulated mathematically
- Qualitative Measures:
    - Measures stated in words, e.g. customer satisfaction rating on online ordering services, ranging from "very satisfied" to "very dissatisfied"
    - Measures cannot be mathematically manipulated
- Implications for designing measures
    - Quantitative are more objective and precise
    - Qualitative is less precise and provides only directional information

***External and Internal Measures***

- External Measures:
    - Measures performance from stakeholders' point of view, e.g. customer satisfaction rating, Green House Gas emissions, ROE
    - Monitors organisation's ability to create stakeholder value
- Internal measures:
    - Measures performance from an internal or operational process point of view, e.g. delivery times, product costs
    - Monitor process required to deliver stakeholder value
    - Consider value chain activities
- Implications for designing measures:
    - Need to develop matching external measure and internal measures because internal measures are early indicators of external performance
    - Internal measures are early feedback on organisations ability to create stakeholder value

## Characteristics of Effective Performance Measures

- Objectivity:
    - The measure is not biased and not subjective. It provides the same reading regardless of who or what is being measured.
- Reliability:
    - The measure provides the same information or signal every time a specific event takes place

- Accuracy:
    - The measure is clear, precise and consistent. Does the measure reflect actual performance?
- Lack of ambiguity:
    - The measure is unambiguous and free of distortion. What is being measured is explicitly and uniquely defined
- Cost effective:
    - The measure should provide more value to its user than the cost of developing or collecting the measure
- Consistency
    - The measure is conducive to most forms of linear transformation
    - E.g. one millilitre is always 1/1000 of a litre
- Sensitivity
    - The measure signals changes in key conditions
    - A small amount of change can be detected by the measure
- Functionality:
    - Are the measures linked to the organisation's critical success factors?
    - Will the measures create desired or dysfunctional behaviour?

## Integrated Reporting Framework

- IR Definition: Value created, preserved or eroded by organisations over time manifests itself in increases, decreases or transformations of the capitals caused by the organisations business activities and outputs.
- These capitals are:
    - Financial capital
    - Manufactured capital
    - Intellectual capital
    - Human capital
    - Social and relational capital
    - Natural capital
- Not all capitals are equally relevant to all organisations
- Indicators of value creation can be financial and non-financial; quantitative and qualitative

### *IR – Measure of Value*

- Financial Capital
    - Funds available to organisations to use to produce goods and services
- Manufactured capital
    - Manufactured physical objects that are available for organisations to use to produce goods and services
    - E.g. plant, properties, equipment, inventory
- Intellectual capital
    - Organisational capital (tactic knowledge, systems, procedures, etc)
    - Intellectual property (patents, copyrights, software, etc)
- Human capital
    - People's competencies, capabilities and experience, and their motivations to innovate
- Social and relational capital
    - Relationships within and between stakeholders and the ability to share information to enhance individual and collective well being
- Natural capital
    - All renewable and non-renewable environmental resources and processes that provide goods and services that support the prosperity of an organisation

## Performance Measures and Value Creation

- External Communication
    - Performance measures communicate organisational performance to external stakeholders
- Internal Communication
    - Facilitates decision making – provide information to motivate individuals to make organisationally desirable decisions
    - Communicate strategy and business plans and align employee goals

### *Developing External Measures of Value Creation*

- Identify organisation's stakeholder value propositions
- Identify critical success factors (CSF) – key strategic or operational goals or objectives that captures an aspect of performance vital to the organisation's success
- Develop measures that will gauge the achievement of CSF results
    - Ensure that the right type of measures will be used
    - Ensure that the measures are effective

### *Developing Internal Measures of Value Creation*

- Identify the CSF and external measure
- Identify activities the organisation can perform to achieve the CSF and external performance measure. Consider using the value chain framework
- Develop a measure of the activity identified

### *Potential Consequences of Performance Measures*

- Behavioural Displacement:
    - When measures encourage employees to do things that are not consistent with the firm's objectives
    - Result of an incorrect or incomplete definition of the firm's goals or of expected behaviour
- Gamesmanship
    - When employees take actions that are intended to improve their measured performance, but is not necessarily in the best interest of the organisation
    - E.g. data manipulation – when employees distort their reported performance results
- Operational Delays
    - When performance measures or management controls in place prevents the completion of a key task or activity
    - The measure makes it difficult for employees to get their work done
    - E.g. measuring customer satisfaction after each sales transaction
- Negative Attitudes
    - When measures cause employees to display negative attitudes
    - Measures may be views as unfair
    - Negative attitudes can result in inefficiencies and potential sabotage
    - E.g. Employees feel that they cannot control all aspects of customer satisfaction