Present value assumptions	- Money is always invested and always productive so that returns can be reinvested at a rate equal to RADR. - Yield curve is flat; short term IR = long term IR. - Payments are all equal and either all inflows or all outflows. - Inflation treated consistently.

Cash flow	FCF = EBIT(1-T) + DA - ΔONWC – CAPEX
	- EBIT(1-T): after-tax operating income or net operating profit after tax (NOPAT).
	- ΔONWC: change in operating net working capital.
	  o Operating Net Working Capital = [(Current assets) – (Cash and marketable securities)]-[(Current liabilities) – (Current portion of interest-bearing debt/notes)].
	- CAPEX: capital expenditures for property, plant, and equipment.
	  o Net property, plant, and equipment = difference in accumulated cost of all PPE less accumulated depreciation for those assets.

Equivalent annual cash flows	- When you calculate NPV, you transform future, year-by-year cash flows into a lump-sum value expressed in today's dollars. $\text{Equivalent Annual Cost} = \frac{NPV \times r}{1-(1+r)^{-n}}$ - Equivalent annual cash flow = the cash flow per period with the same present value as the actual cash flow of the project.cfg - Equivalent annual cost (annuity) = present value of cash flows / annuity factor.
Cost of capital (WACC)	- The WACC represents the opportunity cost that investors face for investing their funds in one particular business instead of others with similar risk. - A stock's expected return is driven by three components: the risk-free rate, beta, and the expected market risk premium. o Determinants of ERP: market imperfections, risk aversion, economic risk etc.
Estimation issues – Beta	- Firm's beta represents the sensitivity of its equity returns to variations in the rates of return on the overall market portfolio. - Levered beta is the beta on the equity returns which is a function of the business you are in (operating leverage of firm), and the proportion of debt chosen for your business. - Three major problems with beta estimation: its estimate produces a high standard error, it reflects business mix of firm over regression period (not current mix) and is therefore not appropriate for long term, and it reflects the firms average leverage over the period, not the current.

Cost of debt	- Reflects not only the default risk but also the level of interest rates in the market.
	- Four most widely used approaches:
	  1. Working out/looking up YTM on a straight bond outstanding from firm.
	  2. Looking up rating for firm, and estimating a default spread based upon the rating.
	  3. If company doesn't have debt rating, use scoring model to estimate.
	  4. Interest expense as a proportion of total outstanding interest bearing debt is acceptable (generally not recommended).

Cost of equity	- Estimation approaches: CAPM or DCF. - Systematic risk = variability that contributes to risk of diversified portfolio (market risk). - Non-systematic risk = variability that does not contribute to risk of diversified portfolio.

Required rates of return for projects	- Discount rates should reflect the opportunity cost of capital/risk of investment.
	- Investment project expected returns should be judged in comparison to returns that could be generated from investments in publicly traded stocks and bonds with equivalent risk.
	- What determines asset betas:
	  o Cyclicality: the strength of the relationship between the firm's earnings and the aggregate earnings on all real assets.
	  o Operating leverage: a production facility with high fixed costs relative to variable costs, is said to have high operating leverage, meaning high asset beta. $\beta_{revenue} = \beta_{fixed\ cost}\frac{PV(fixed\ cost)}{PV(revenue)} + \beta_{variable\ cost}\frac{PV(variable\ cost)}{PV(revenue)} + \beta_{asset}\frac{PV(asset)}{PV(revenue)}$

Certainty equivalents	- The use of a single risk-adjusted rate to discount future cash flows assumes the project risk per period remains constant. If risk does not increase steadily, then the project should

	either be broken into segments or certainty-equivalent cash flows should be used (allows separate risk adjustments to each period's cash flow). - $PV = \frac{C_t}{(1+r)^t} = \frac{a_t C_t}{(1+r_f)^t} = \frac{CEQ_t}{(1+r_f)^t}$ where $a = \frac{(1+r_f)^t}{(1+r)^t}$
Project analysis	- Investment decisions take place in a world of uncertain future outcomes, where there are more things that can happen than will happen, which makes investment analysis considerably more complex. - Various approaches are used to analyse risk and deal with uncertainty: sensitivity analysis, scenario analysis, breakeven analysis, and Monte Carlo simulation
Sensitivity analysis	- 6 assumptions used in construction of cash flows: units sold, price, fixed cost, change in working capital, variable cost per unit as percentage of sales, and capital investment. - Sensitivity analysis investigates an investment's value under different situations. - The standard approach evaluates the project using optimistic and pessimistic estimates for the input assumptions. Inputs are changed one at a time, holding all other inputs constant. - The input variables that have the greatest impact on project value are known as the projects value drivers (or risk factors).
Scenario analysis	- Scenario analysis helps analysts explore the sensitivity of an investment's value under different future situations or scenarios.
Break-even analysis	- When we undertake a sensitivity analysis of a project or when we look at alternative possible values for assumed inputs, we are asking how serious it would be if sales/costs turn out worse than forecasted. Managers sometimes prefer to rephrase this question and ask how bad things can get before project NPV turns negative. - In Excel, use Goal Seek function to determine the value of an input that leads to NPV of zero. This is done on each input holding all others constant.
Simulation	Step 1: Modelling the project - Cash flow = operating cash flow – investment in working capital. - Operating cash flow = (revenues – costs – depreciation) x (1 – tax rate) + depreciation. - Revenues = unit sales x unit price. - Costs = (revenue x variable unit as proportion of revenue) + fixed costs. Step 2: Specifying probabilities - In uniform distribution, all values between minimum and maximum are equally likely to occur. - Triangular distribution can be described by minimum, maximum and most likely values. Step 3: Simulate the cash flows and calculate present value - Generate random numbers for each value driver. - Calculate entire spreadsheet to estimate project FCFs for each year. - Save values for key forecast variables: project FCFs for each year. - Summarise simulation results – charts and distributions, summary statistics, probability statements.
Positive NPV projects	- Economic rents = profits that more than cover the cost of capital. - NPV = PV(rents). - Economic rents only come when you have a better product, lower costs, or some other competitive edge. Sooner or later competition is likely to eliminate economic rents.
Structure-conduct-performance framework	- The framework argues that the structure of the industry influences the conduct of the firms within that industry, which in turn determines industry performance. - In its simplest form, the model says that a highly concentrated market structure, dominated by a few large firms, will give rise to little rivalry and excessive prices and profits. On the other hand, a structure consisting of many small firms will produce a high degree of rivalry and low prices and profits.

Perfect competition	- Firm is seen as a production function that transforms inputs into outputs, in accordance with the goal of maximising profits.
	- Assumptions of model:
	  o Many firms, each small, all selling homogenous products.
	  o Firms have perfect information.
	  o No barriers to entry or market imperfections.
	- Firms attempt to maximise profits and do so by setting marginal revenue (product price, taken as given where market supply = market demand) equal to marginal costs.
	- When market is in long-run equilibrium, prices equal marginal costs and average costs so that economic profits are zero. This implies all investments have NPV = 0.

Monopolistic competition	- Firms still maximise profits by setting marginal revenue equal to marginal cost. However, successful profit differentiation gives rise to excess profits, which persist at long-run equilibrium. - Patents, trademarks, customer service, reputation, etc. can all be sources of competitive advantage; these sources of differentiation are considered to be resources in the resource-based view of the firm.
Monopoly	- One firm in the market. This firm is assumed to be knowledgeable about the market demand curve; has information about what price each potential customer is willing to pay for its product. - Monopolist sets price to maximise its profits. - In the basic model of monopoly, strong barriers to entry exist, so that the monopolist's excess profits persist in the long run. - All investments are NPV positive.
Financial options	- Financial option = a contract that gives its owner the right (but not the obligation) to purchase or sell an asset at a fixed price at some future date. - Call option = financial option that gives its owner the right to buy an asset. - Put option = a financial option that gives its owner the right to sell an asset. - Strike price (exercise price) = the price at which an option holder buys or sells a share of stock when the option is exercised. - American option = options that allow their holders to exercise the option on any date up to, and including, the expiration date. - European option = options that allow their holders to exercise the option only on the expiration date.

Option payoffs at expiration	- Long position in an option contract:
	  o The value of a call option on shares at expiration is $C = \max(S - K, 0)$ where S is the stock price at expiration, K is the exercise price, C is the value of the call option, and max is the maximum of the two quantities in the parentheses.
	  o The value of a put option at expiration is $P = \max(K - S, 0)$, where P is the value of the put option.
	- Profit at expiration: although payouts on a long position in an option contract are never negative, the profit from purchasing an option and holding it to expiration could be negative because the payout at expiration might be less than the initial cost of option.

Combining options	- Straddle: a portfolio that is a long call option and a put option on the same stock with the same exercise date and strike price. - This strategy may be used if investors expect the stock to be very volatile and move up or down a large amount but do not necessarily have a view on which direction the stock will move. - Protective put: a long position in a put held on a stock you already own. - Portfolio insurance: a protective put written on a portfolio rather than a single stock. Portfolio insurance can also be achieved by purchasing a bond and a call option.
Put-call parity	- S + P = PV(K) + C. - The relationship between the value of the stock, the bond, and call and put options is known as put-call parity. - Value of put = value of call – share
Factors affecting option prices	- The value of call option increases (decreases) as strike price decreases (increases), ceteris paribus. - The value of a put option increases (decreases) as the strike price increases (decreases), ceteris paribus. - The value of a call option increases (decreases) as the stock price increases (decreases), ceteris paribus. - The value of a put option increases (decreases) as the stock price decreases (increases), ceteris paribus. - For all options, the longer the time until exercise, more valuable option. - The value of an option generally increases with the volatility of the stock. Option holders gain from volatility because the payoffs are not symmetric.
Simple one period valuation of options	- Assume the option expires in one period, the price of stock will end up at one of two possible values, and the value of the option can be computed at each of these values. - The number of shares needed to replicate one call is called the hedge ratio or option delta. - Option delta = spread of possible option prices / spread of possible share prices.