

CVEN3101 Study Notes

Trimester 3, 2019

INTRODUCTION TO ENGINEERING ECONOMICS

- **Economic appraisal** provides a framework for deciding upon the most favourable economic choice amongst various alternatives
- The ultimate goal of management is to attain:
 - Maximise profit for company and stakeholders
 - Maximise cost effectiveness
- Engineering economics involves identifying costs and benefits before converting these into a dollar amount in order to assess economic decisions
- **Time value of money** is the concept where money in the present is worth more than money received in the future
 - This is because the earning capacity of present capital is greater than future capital
 - The equivalent present value of money is simply equal to the compounded future value of that money at a given interest rate
- **Inflation** is the decreasing value of a unit of currency and a corresponding increase in prices
 - The **Consumer Price Index (CPI)** is a measure of the price of a fixed bucket of good in order to indicate inflation in the overall economy
- Inflation can be a result of increasing economic activity, yet excessive inflation can result in instability and leads to a drastic decrease in growth
- **Interest rates** are a function of:
 - State of the economy
 - Administrative costs
 - Risk associated with investment
- **Cash flow** during a single finite period is simply the income minus the expenses incurred during that period
 - The cash flow diagram can be used to illustrate cash flow (vertical) throughout time (horizontal)
- When considering the interest returns on investment, the quoted interest rate and the compounding period come together to produce a **nominal (effective) interest rate**
- For an annuity with uniform regular payments (A), we can calculate the annuity payment in terms of the original sum for a given interest rate
 - The same can be calculated with a uniform gradient (G) of annuity payments
- **Net Present Value** is the equivalent value of a future sum of money due to compound interest accrued over time
- For an investment to result in profit, it must have a positive NPV
- **Net Future Value** is the future value of a set of cash flows
- **Net Annual Value** is the annuity value of cash flows in the future
- The (P/A) formula is used when finding the annuity value or the present value of an annuity, whereas (P/F) is used when calculating the present value of a given future value or vice versa

ECONOMIC APPRAISALS

- Economic appraisal can be used for product expansion, cost reduction or even efficiency improvement
- Equipment and process selection involves selecting the best production process in order to minimize costs, which may involve equipment replacement
- **Economic appraisal** is simply a numerical evaluation for a financial decision between usages of capital
- The procedure of an economic appraisal is as follows:
 - Construct the cash flow diagram from each option
 - Evaluate the cash flow diagrams in terms of NPV
 - Compare the results and select the most effective alternative
- Two methods of economic appraisal:
 - **Equivalence method** – determine the equivalent future value (Net Present Value) of a cash flow diagram
 - **Rate of return method** – determining a return rate produced by the cash flow diagram
- The choice between receiving an upfront lump sum versus a continual annuity can be determined by calculating the NPV of the annuity (which decreases as the expected rate of return increases) and then comparing this to the value of the lump sum
- The **minimum acceptable rate of return** (MARR) is the lowest limit of return that is acceptable to an individual or company, which is equal to the return from the current choice of investment
 - The MARR for a property development project is typically 25-30%
 - The MARR is used for or all NPV, NFV and NAV calculations
- There are generally two types of investments:
 - Income-producing (cash flow)
 - Service-producing (capital)
- Service-producing investments have a **salvage value**, which is the estimated value of the asset at the end of its service life, which can then be sold off as a positive cash flow
- For service-producing investments, select the alternative with the lowest **Net Present Cost** (opposite of NPV)
- Economic appraisals are made more complex when the project lifespans are differing
- In some circumstances, the project lifespan is greater than the analysis period (common in construction projects)
 - When the machinery has a longer lifespan than the length of the project, the salvage value of the equipment must be factored into the calculation
 - **Replacement projects** could also be considered to last out the remainder of the machinery lifespan
 - The machinery could be **leased** out for the remainder of its lifespan at the expense of its salvage value
- When the lifespans of alternative options differ, we must consider a **common service period** to compare the projects on an equal-time basis
 - We select the lowest common multiple of the two project lives as the new analysis period