ECON 2B03 Summary

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Math objects made using [MathType](); graphs made using [Winplot]().

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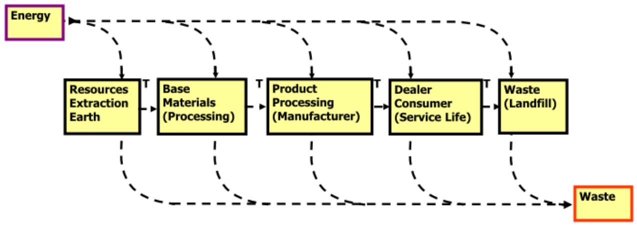
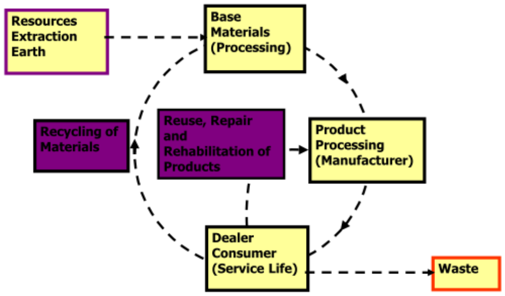
Chapter 1 – Sustainability

model: an simplification of reality that captures information useful and appropriate for a specific purpose

linear product lifecycle: energy in and out at every stage



closed-loop product lifecycle: recycling, re-use, energy only lost at consumer level



Ingenuity Gap: the gap between requirements and solutions, which is caused by an increasing complexity (?)

Triple-Bottom Line

Focuses on:

- **Social sustainability**: productive service to society
- **Environmental sustainability**: resources/land
- **Economic sustainability**: cost efficient

Seven Revolutions

1. Markets: compliance to competition
2. Values: hard to soft
3. Transparency: closed to open
4. Life-cycle Technology: product to function
    a. Companies responsible for entire product life-cycle
5. Partnership: subversion to symbiosis
    a. Companies cooperate
6. Time: wider to longer
    a.

Chapter 2

Cash-flow period: time over which you are calculating effective interest rate

Interest [*I*]: compensation for giving up the money

Annual interest rate [*r*]: nominal interest rate over one year

Present worth [*P*]: the amount of money that is currently being dealt with (whether being loaned, or an annuity); before initiating a time period exchange, the present worth is known as the **principle amount**

Future Worth [F]: the future value of the time period exchange

Interest period [*m*]: interest compounds per year (not cashflow periods)

Cashflow period: or *payment period* is how long it is between your payments

Don't forget that there are 4 quarters in a year and 3 months in a quarter-year.

Interest rate per time period [i]: interest for each interest period $i = \frac{r}{m}$

Number of periods per cash flow period [k]: should never be a fraction

Effective Interest rate [i_e]: rate that takes compounding and payment periods into consideration
$i_e = \left[\left(1+\frac{r}{m}\right)^m - 1\right]$

Effective interest per cash flow[$i_{e/k}$]: $i_{\frac{e}{k}} = \left(1+\frac{r}{m}\right)^k - 1$

Your effective interest rate should be close to nominal interest rate/cash-flow periods per year.

Methods of Interest Calculation

- Lump Sum
- Simple Interest
- Compound interest

Lump Sum

Lump sum: one payment at the end of the time period exchange covers all the funds borrowed, so there is only one interest calculation. The interest on a lump sum does not change over time, but simply the amount paid.

$I = Pi$

$F = P(1+i)$

Simple Interest

Simple interest: a method of calculating interest that is based off the time it takes to pay off the loan and the principle amount

$I = PiN; F = (1+iN)P$

Compound Interest

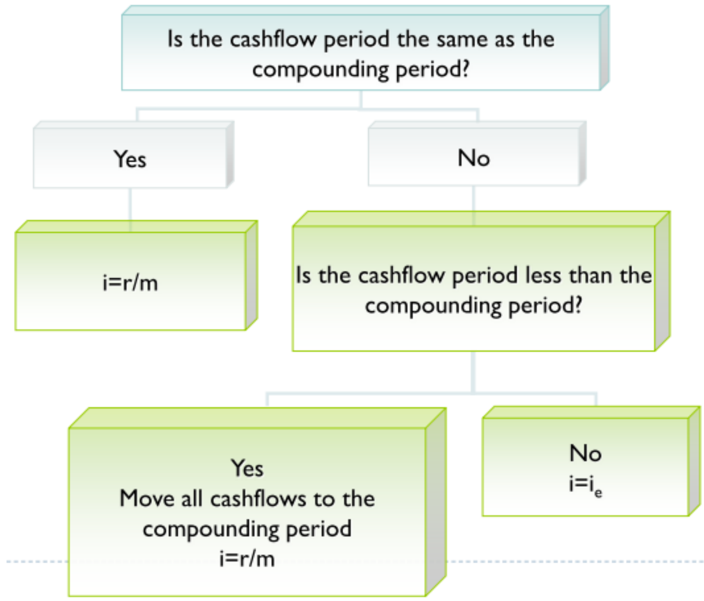
Compound interest: a method of calculating interest that charges interest on the principle as well as unpaid interest each "compound"

$$F = P(1+i)^N$$

$$P = \frac{F}{(1+i)^N}$$

$$I = P(1+i)^N - P$$

With compound interest comes a **compound period**, which is the amount of times when interest begins to be charged on unpaid previous interest



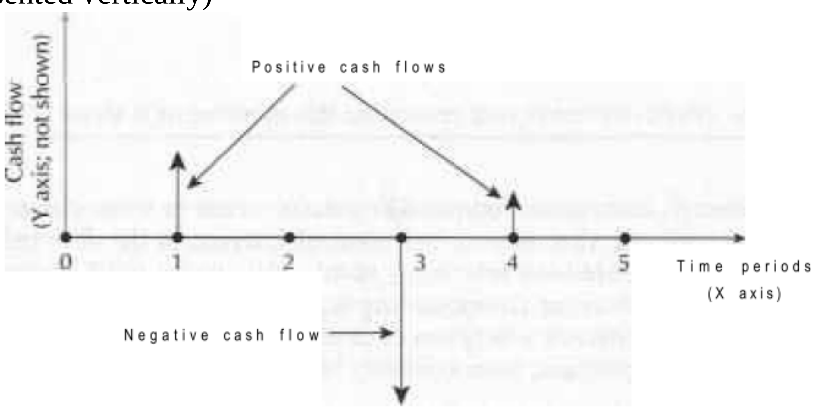
Continuous Compound

$$i_e = \lim_{m\to\infty}\left(1+\tfrac{r}{m}\right)^m - 1$$
$$= \mathrm{e}^r - 1$$

Cash Flow Diagrams

Cash flow diagrams are graphical representations of a system that aid in analysis of cash flows

Since each cash flow is paid as an impulse, instead of continuous outflow from an account, the cash flows are represented by arrows, which can be positive (up) or negative (down) on a chart where time is along the y-axis (represented horizontally) and the cash flow is represented along the x-axis (represented vertically)



Chapter 3

Equivalence:
Decisional Equivalence:

Present Cost: trying to bring all arrows on cash flow diagram to 0 (one period before the first payment)

A/B: A given B; A is unknown, B is known

Percentage Increase of an Annuity [g]
Nominal increase of an annuity [G]

Base payment of Annuity [A]

Growth-adjusted interest rate [i_0]: $i_0 = \frac{1+i}{1+g} - 1$

$$(A,g,i) = \frac{(A,i)}{1+g}$$

Number of payments [N]: Years total − first payment + 1[interest begins from day one, payment does not]

$$(P/A,g,i,N) = \frac{(1+i_0)^N - 1}{i_0(1+i_0)^N}\left(\frac{1}{1+g}\right)$$

Chapter 4

Coupon rate: amount the investor received as interest payment
Fixed rate: fixed as a percentage of par value
Floating rate: adjustable interest payments

The coupon rate is stated for the year, but you need to cut that by how many times (multiply by face value/times received) you get the coupon, just as you need to cut down your nominal interest by number of compounds for any other interest

Bond: default is 6 months

Par/Face Value: amount bond can be returned for at maturity

Comparison Methods:

- PW Method: examine present worth of all project cash flows
- AW method: convert all cash flows to annuities

Assumptions:

1. Costs & benefits are always measurable by money
2. Future cash flows are known with certainty
3. Cash flows are unaffected by inflation/deflation
4. Sufficient funds are available
5. Taxes are not applicable
6. Down payments $\leq$ proceeding cash flows