FINC2012

SUMMARY FORMULAS

Simple Interest Rate	$FV = PV(1 + rt)$
Compound Interest Rate	$FV = PV\ (1 + r)^t$ $FV = PV\left(1 + \frac{r_{nom}}{m}\right)^{m \times n}$ Where m = compounding frequency & n=total time period
Present Value	$PV = \frac{C_n}{(1 + r_n)^n}$
Continuously Compounding Interest Rate	$FV = PVe^{rt}$ (sometimes question describes as rate evenly spread out)
Effective Rate	$Effective\ Rate\ (annual) = \left(1 + \frac{r_{nom}}{m}\right)^m - 1$ $Effective\ Rate\ (per\ period) = \left(1 + \frac{r_{nom}}{m}\right)^{m/n} - 1$
Constant Growth Perpetuity	$PV_t = \frac{C_{t+1}}{r - g}$
Perpetuity	$PV_t = \frac{C_{t+1}}{r}$
Ordinary Annuity (first payment occurs at T)	$PV = C\left[\frac{1}{r} - \frac{1}{r(1 + r)^t}\right]$ $FV = C\left[\frac{(1 + r)^t - 1}{r}\right]$
Discount Factor	$DF_n = \frac{1}{(1 + r_n)^n}$
Net Present Value	$NPV = C_0 + \frac{C_1}{(1 + r)}$ C_0 is usually a negative number since it is the cash flow at time 0 (today) $NPV = -C_0 + C_1 AF$
Annuity Factor	$\frac{1}{r} - \frac{1}{r(1 + r)^n}$
Future Value of Annuity	$C\left[\frac{(1 + r)^t - 1}{r}\right]$
Present Value of a Growing Annuity	$PV = \frac{C}{r - g} \times [1 - \frac{(1 + g)^t}{(1 + r)^t}$
Deferred Annuity (x = number of periods before payment occurs)	$PV = \frac{\left[C \times \frac{1 - (1 + r)^{-n}}{r}\right]}{(1 + r)^{x-1}}$

MAKING INVESTMENT DECISIONS WITH NPV RULE

APPLYING THE NPV RULE

RULE 1

Only cash flow is relevant

Capital expenses – record capital expenditures when they occur, add back depreciation & subtract capital expenditure to determine cash flow

Working Capital: The capital company requires to run its day-to-day operations (current assets minus non-interest-bearing current liabilities)

RULE 2

<u>Estimate cash flows on an incremental basis</u>
What to discount:
- Include taxes
- Do not confuse average with incremental payoffs
- Include all incidental effects
- Forecast sales today & recognise after-sales cash flows to come later
- Include opportunity costs
- Forget sunk costs
- Beware of allocated overhead costs
- Remember salvage value

RULE 3
<u>Treat inflation consistently</u>
Be consistent – use nominal rates to discount nominal cash flows or real interest rates to discount real cash flows
N.B. Will calculate same result regardless of whether use nominal or real

$$Real\ discount\ rate = \frac{1 + nominal\ discount\ rate}{1 + inflation\ rate} - 1$$

RULE 4
<u>Separate investment & financing decision</u>
Do not subtract the debt proceeds from the required investment nor recognise the interest & principal payments on the debt as cash outflows
N.B. Financing of project is irrelevant in determining the project's value

CAPITAL BUDGETING PROCESS
Set out in table with years as horizontal top row & categories as horizontal first column
Include lines for revenue, costs, capital expense, depreciation, pre-tax profit, after-tax profit, working capital, operating cash flow, NWC & ΔNWC & net cash flows (salvage net of tax if this is necessary also included)

$$Depreciation = \frac{historical\ cost - residual\ value}{useful\ life}$$

N.B. Question may also give a depreciation rate, in this case do not use above formula but the rate given
- ⇒ This method may mean that do not depreciate asset/product down to 0, this will affect calculation of salvage value/tax

$$Pre - Tax\ Profit = revenue - costs - depreciation$$
$$After - Tax\ Profit = pre - tax\ profit\ \times (1 - \tau_c)$$
$$Operating\ Cash\ Flow = depreciation + after - tax\ profit$$
$$Net\ Cash\ Flow = Operating\ Cash\ Flow - \Delta NWC$$

N.B. To calculate ΔNWC subtract next year NWC value from current year

Depreciation is subtracted from revenue for pre-tax calculation for tax shield affect (tax deductable)

$$Final\ Cash\ Flow = post - tax + depreciation + \Delta NWC + salvage$$

USING THE NPV TO CHOOSE AMONG PROJECTS
THE INVESTMENT TIMING DECISION
Some projects are more valuable if undertaken in the future
Examine start dates (*t*) for investment & calculate net future value for each date
Discount net values back to present

$$NPV\ Investment\ at\ Date\ t = \frac{net\ future\ value\ at\ date\ t}{(1 + r)^t}$$

CHOICE BETWEEN LONG & SHORT-LIVED EQUIPMENT
Equivalent Annual Cash Flow: Cash flow per period with the same PV as the actual cash flow of the project

$$Equivalent\ Annual\ Cost\ (annuity) = \frac{PV\ cash\ flows}{annuity\ factor}$$

WHEN TO REPLACE AN OLD MACHINE

EXAMPLE

A machine is expected to produce a net inflow of $4000 this year & $4000 next year before breaking. Can replace it now with a machine that costs $15 000 & will produce an inflow of $8000 per year for three years. Should you replace now or wait a year?

Cash Flows ($ thousands)					
	C_0	C_1	C_2	C_3	NPV at 6% ($ thousands)
New machine	–15	+8	+8	+8	6.38
Equivalent annual cash flow		+2.387	+2.387	+2.387	6.38

COST OF EXCESS CAPACITY

EXAMPLE

A computer system costs $500 000 to buy & operate at a discount rate of 6% & lasts five years

- Equivalent annual cost of $118 700
- Undertaking project in year 4 has a PV of $118 700/$(1.06)^4$ =$94 000