DECISION MAKING AND SCENARIOS

MODULE 1.3 – Why is Net Present Value Appropriate for Evaluating Projects?

NPV Analysis of Projects

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Net Present Value Analysis

- Net present value (discounted cash flow) analysis allows comparisons among alternative investment projects when cash flows vary and occur at different times.
- Consider the two following projects – both require an initial investment and both are projects that last 3 years.

Compare Projects A & B

- Alternative A has the higher net income
  (An accountant would conclude that because the sum of the cash flows over the three years is higher)

Alternative	Initial Investment	Annual Cash flows 1	2	3	Net Income for 3 Years
A	-2000	0	0	4500	2500
B	-2000	2000	2000	100	2100

But look at the difference in the timing of the cash flows - which has the higher present value?

Calculate the NPVs of the two projects

- Assume a **10%** interest rate.
  (AKA discount rate; hurdle rate; cost of capital)

$$NPV_A = -2000 + 4500 / 1.1^3$$
$$= -2000 + 3380.85 = 1380.85$$

$$NPV_B = -2000 + 2000 / 1.1 + 2000 / 1.1^2 + 100 / 1.1^3$$
$$= -2000 + 1818 + 1653 + 75 = 1546.1$$

NPV of a Project

- The NPV of the project is the point estimate of the value created by taking the project.
- If we take positive NPV projects, we are increasing the value of the firm.
  - Hence taking positive NPV projects relates directly to the objective of increasing the value of the firm
- If we take negative NPV projects, we are destroying firm value.
- In the case of Projects A and B, if we had to choose just one of the projects because we could not take both (maybe they are two solutions to the same problem or we only have $2,000 to invest), we would take Project B, because it creates the most value.

Compare Projects

- If we hold the cash flows of Projects A and B constant, what would we have to do to the discount rate to have Project A have a higher NPV than Project B?

- With a low enough discount rate, alternative A has the higher present value. (At an interest rate of **6.525%**, the present values of the two projects are equal = $1,722.7.)

$PV_A = 1380.85$

$PV_B = 1546.13$

NOTE: There are many financial functions in spreadsheet packages like Excel to help with these calculations – NPV function

Zero NPV Projects

- Consider a project with an initial investment of $2,000 at time 0, a single cash flow at year 1 of $2,200 and a discount rate of 10%. What is the NPV of this project?
- NPV = 0 = - 2,000 + 2,200/1.1
- So note that a project that earns a rate of return equal to the discount rate does not create any value - even though in this case the Return on Investment is10% ($200/$2000).
- **Thus, managers only create value when they earn a rate of return on invested capital in excess of the discount rate (their cost of capital).**

Cash Flow Perpetuity Model

- Here is how to calculate the present value of an infinite stream of cash flows when you can assume they will grow at constant rate and r is constant

$$V_t = \frac{F_{t+1}}{r - g}$$

Where : r = discount rate

g = constant percentage growth rate for all future periods

Present value of an infinite stream of cash flows

- Note that $r > g$ and F_{t+1} must be positive
- While this assumes an infinite stream of cash flows, in PV terms, we are really talking about 50 to 60 years.
- This shortcut will be useful in certain circumstances later


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