DECISION MAKING AND SCENARIOS

MODULE 1.2 – Why is Net Present Value Appropriate for Evaluating Projects?

Time Value of Money

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Time Value of Money

$1 today is worth more than $1 tomorrow

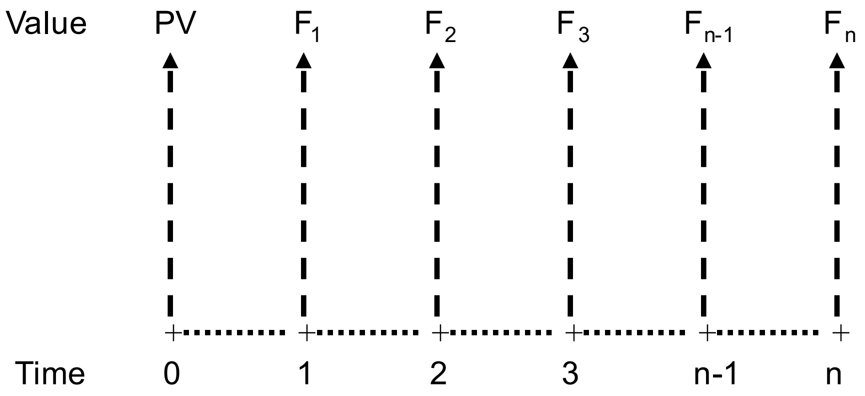
Timeline and Definitions

PV =present value

F_n =future value at period n

r =interest rate per period
(assumed constant through time)

n =number of periods



Future Value of Current Cash On Hand

$$F_n = PV * (1 + r)^n$$

Future Value – Example

- If the interest rate is 10% per year, what amount of money would you have in the bank at the end of one year if you deposited $1,000 in the bank today?

$$F_1 = \$1,000 * 1.10 = \$1,100.00$$

Future Value – Example

- If the interest rate is 10% per year, what amount of money would you have in the bank at the end of two years if you deposited $1,000 in the bank today?

$$F_2 = \$1{,}000 * 1.10^2 = \$1{,}210.00$$

Present Value of Future Cash flow

$$PV = F_n/(1 + r)^n$$

Present Value – Example

- If the interest rate is 10%, what amount of money must be put in the bank today to allow you to withdraw $1,000 a year from today?

$$PV = \$1{,}000 / 1.10 = \$909.09$$

Note: $909.09 x 1.10 = $1,000

Present Value – Example

- If the interest rate is 10% per year, what amount of money must be put in the bank today to allow you to withdraw \$1,000 two years from today?

$$PV = \$1,000 / (1.10)^2 = \$826.45$$

Note: $(\$826.45 \times 1.10) \times 1.10 = \$1,000$

Present Value – Annuity Example

- If the interest rate is 10% per year, what amount of money must be put in the bank today to allow you to withdraw $1,000 at the end of year 1 and the end of year 2?

$$PV = \$1{,}000 / 1.10 + \$1{,}000 / (1.10)^2 = \$1{,}735.54$$

Note: $(\$1{,}735.54 \times 1.10 - \$1{,}000) \times 1.10 = \$1{,}000$

Present Value – Varying cash flows

- If the interest rate is 10% per year, what amount of money must be put in the bank today to allow you to withdraw $1,000 at the end of year 1, $1,500 at the end of year 2 and $2,000 at the end of year 3.

$$PV = \$1{,}000/1.10 + \$1{,}500/(1.10)^2 + \$2{,}000/(1.10)^3$$

$$= \$909.09 + \$1{,}239.67 + \$1{,}502.63 = \$3{,}651.39$$

Present Value – Differing Interest Rates

- If the interest rate is different each year we can still do the calculation, but need a different r for each year

$$PV = F_n/[(1 + r_1)\,(1 + r_2)\ldots\,(1 + r_n)]$$

where $\mathbf{r_n}$ = interest rate for period n
(interest rate can vary from period to period)

Differing Interest Rates

- What amount of money must be put in the bank today to receive $1000 two years from today if the interest rate for year 1 is 5% and the interest rate for year 2 is 15%?

$$PV = \$1000 / [(1.05)(1.15)] = \$828.16$$

Note: $(\$828.16 \times 1.05) \times 1.15 = \$1000$

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