

## UNIVERSITY OF TEXAS AT AUSTIN

Quiz #14

## Break-even analysis.

**Problem 14.1.** (5 points) Consider a two-year project, where the cost of capital is 5%. There are only three cash flows for this project:

- The first occurs at  $t = 0$ , and is  $-100$ .
- The second occurs at  $t = 1$ , and is  $50$ .
- The third occurs at  $t = 2$ , and is  $X$ .

Determine  $X$ , the level of the cash flow at  $t = 2$ , that leads to the project breaking even.

- (a) \$50
- (b) \$57.75
- (c) \$60
- (d) \$63.25
- (e) None of the above.

**Solution: (b)**

$$X = 100(1.05)^2 - 50(1.05) = 57.75.$$

**Problem 14.2.** (5 points) Consider a two-year project, where the cost of capital is 4%. There are only three cash flows for this project:

- The first occurs at  $t = 0$ , and is  $-100$ .
- The second occurs at  $t = 1$ , and is  $-50$ .
- The third occurs at  $t = 2$ , and is  $X$ .

Determine  $X$ , the level of the cash flow at  $t = 2$ , that leads to the project breaking even.

- (a) -\$160.16
- (b) -\$56.16
- (c) \$56.16
- (d) \$160.16
- (e) None of the above.

**Solution: (d)**

$$X = 100(1.04)^2 + 50(1.04) = 160.16.$$

**Problem 14.3.** (5 points) Consider a two-year project. There are only three cash flows for this project:

- The first occurs at  $t = 0$ , and is  $-100$ .
- The second occurs at  $t = 1$ , and is  $40$ .
- The third occurs at  $t = 2$ , and is  $68.25$ .

Determine  $r$ , the cost of capital, that leads to the project breaking even.

- (a) 0.04
- (b) 0.045
- (c) 0.05
- (d) 0.055
- (e) None of the above.

**Solution: (c)**

The break-even value of the cost of capital must satisfy

$$-100(1+r)^2 + 40(1+r) + 68.25 = 0 \quad \Leftrightarrow \quad (1+r)^2 - 0.4(1+r) - 0.6825 = 0.$$

Solving the quadratic equation, we obtain

$$(1+r)_{1,2} = \frac{0.4 \pm \sqrt{0.4^2 + 4(0.6825)}}{2} = \frac{0.4 \pm \sqrt{2.89}}{2} = \frac{0.4 \pm 1.7}{2}.$$

Our acceptable solution is  $1+r = 1.05$ , i.e.,  $r = 0.05$ .