

UNIVERSITY OF TEXAS AT AUSTIN

Quiz #18

Break-even analysis.

Problem 18.1. (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 18.2. (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 18.3. (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., $r = 0.05$.