University of Texas at Austin

Quiz #13

Break-even analysis.

Problem 13.1. (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 13.2. (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 13.3. (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., $r = 0.05$.