

Exercise AP-111

Present value of a stream of five payments

The Economic Skills Project

1 Problem

Problem

A convention center would cost \$3 million to build (paid in year 0). Conventions would be held in years 2, 4, 6 and 8. They would earn the revenue shown below. Using an interest rate of 5%, what is the net present value of the center? Round to the nearest thousand dollars.

2 Answer

Answer

- \$2.326 million

Year	Revenue
2	\$1M
4	\$1.5M
6	\$2M
8	\$2.5M

3 Method

Solution method

Here's one approach:

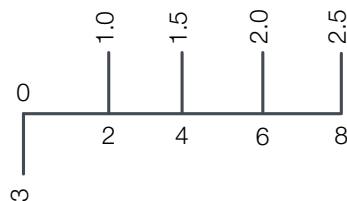
1. Draw the cash flow diagram for the project.
2. Calculate the PV for each payment.
3. Sum the revenue PVs and subtract the cost to get the NPV.

4 Solution

4.1 Step 1

Cash flow diagram

The cash flow diagram looks like this, where all payoffs are measured in millions of dollars:



4.2 Step 2

Calculate the individual PVs

The present value of payment F_t at time t when the interest rate is 5% is given by:

$$PV = \frac{F_t}{1.05^t}$$

Applying that to each of the revenue payments in turn gives:

Year	Revenue	PV
2	\$1M	\$0.907M
4	\$1.5M	\$1.234M
6	\$2M	\$1.492M
8	\$2.5M	\$1.692M

4.3 Step 3

Sum the revenue PVs and subtract the cost

The present value of the revenue stream will be:

$$\text{PVR} = \$0.907\text{M} + \$1.234\text{M} + \$1.492\text{M} + \$1.692\text{M}$$

$$\text{PVR} = \$5.326\text{M}$$

The NPV is thus:

$$\text{NPV} = \text{PVR} - \$3\text{M} = \$2.326\text{M}$$

Done!