Assignment 2 (Ch. 5-6)

Saturday, May 28, 2016 12:54 PM

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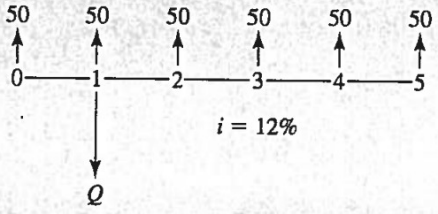
5-5 Find the value of Q that makes the present value = 0.



$50 + 50(P/A, 12\%, 5) - Q(P/F, 12\%, 1) = 0$

$180.2 \qquad 0.8929$

$\hookrightarrow Q = \$257.90$

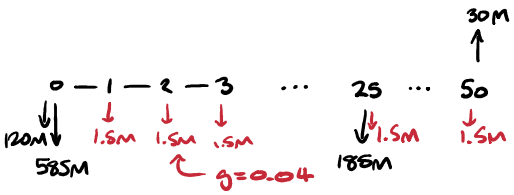
5-39 In order to improve evacuation routes out of New Orleans in the event of another major disaster such as Hurricane Katrina, the Louisiana Department of Transportation (L-DoT) is planning to construct an additional bridge across the Mississippi River. L-DoT is considering two alternatives: a suspension bridge and a cantilever bridge. The department uses an interest rate of 8% and plans a 50-year life for either bridge. Which design has the better PW?

	Suspension Bridge	Cantilever Bridge
Initial construction costs	$585,000,000	$470,000,000
Initial land acquisition costs	120,000,000	95,000,000
Annual O&M costs	1,500,000	2,000,000
Annual growth in O&M	Growing 4%	Growing $300,000
Major maintenance (Year 25)	185,000,000	210,000,000
Salvage cost	30,000,000	27,000,000

$i = 0.08 \qquad n = 50$

PRESENT WORTH ANALYSIS

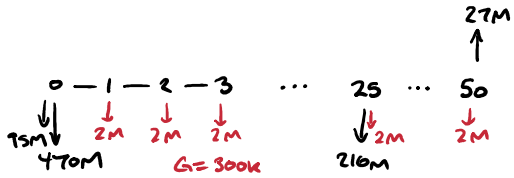
suspension bridge



benefit − cost $= 30M(P/F, 0.08, 50) - [120M + 585M + 185M(P/F, 0.08, 25) + 1.5M(P/A_1, 0.04, 0.08, 50)] = -763.2M$

$639.6k \qquad 27.01M \qquad 31.82M$

cantilever bridge



benefit − cost $= 27M(P/F, 0.08, 50) - [470M + 95M + 210M(P/F, 0.08, 25) + 2M(P/A, 0.08, 50) + 300k(P/G, 0.08, 50)]$

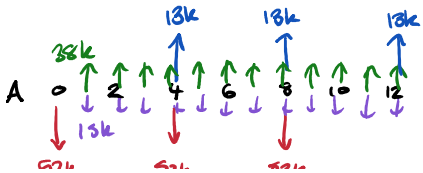
$575.7k \qquad 30.66M \qquad 24.47M \qquad 41.88M$

$= -661.4M$

cantilever bridge costs less

5-75 The following costs are associated with three tomato-peeling machines being considered for use in a canning plant.

If the canning company uses an interest rate of 12%, which is the best alternative? Use NPW to make your decision. (Note



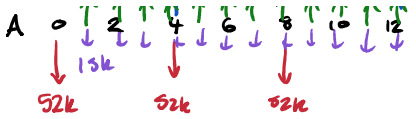
$38k(P/A, 0.12, 12) + 18k(P/F, 0.12, 4) + 18k(P/F, 0.12, 8) + 18k(P/F, 0.12, 12) - 15k(P/A, 0.12, 12) - 52k - 52k(P/F, 0.12, 4) - 52k(P/F, 0.12, 8)$

$= 252.2k - 199k = 53.27k$

If the canning company uses an interest rate of 12%, which is the best alternative? Use NPW to make your decision. (*Note*: Consider the least common multiple as the study period.)

	Machine A	Machine B	Machine C
First cost	$52,000	$63,000	$67,000
Maintenance and operating costs	$15,000	$9,000	$12,000
Annual benefit	$38,000	$31,000	$37,000
Salvage value	$13,000	$19,000	$22,000
Useful life (years)	4	6	12

A

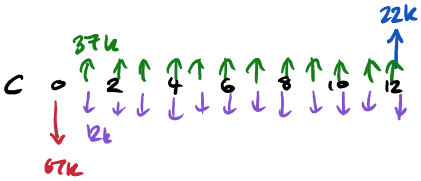


$-15k(P/A,0.12,12) - 52k$
$-52k(P/F,0.12,4) - 52k(P/F,0.12,8)$
$= 252.2k - 199k = 53.27k$

B

$31k(P/A,0.12,12) + 19k(P/F,0.12,6)$
$+ 19k(P/F,0.12,12) - 9k(P/A,0.12,12)$
$-63k - 63k(P/F,0.12,6)$
$= 206.5k - 150.7k = 55.86k$

C



$37k(P/A,0.12,12) + 22k(P/F,0.12,12)$
$-12k(P/A,0.12,12) - 67k$
$= 234.8k - 141.3k = 93.51k$

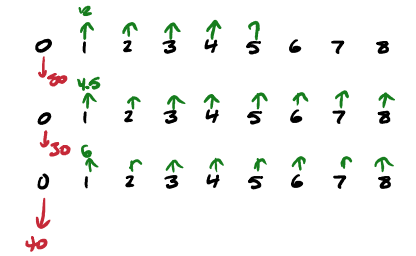
MACHINE C HAS THE HIGHEST NET REVENUE

5-79 Consider the following four alternatives. Three are "do something" and one is "do nothing."

	A	B	C	D
Cost	$0	$50	$30	$40
Net annual benefit	$0	$12	$4.5	$6
Useful life (years)		5	10	10

At the end of the five-year useful life of B, a replacement is not made. If a 10-year analysis period and a 10% interest rate are selected, which is the preferred alternative?

B



$12(P/A,0.1,5) - 50 = -4.511$

C

$4.5(P/A,0.1,10) - 30 = -2.349$

D

$6(P/A,0.1,10) - 40 = -3.133$

the best option is to do nothing,
all others have more cost than benifit.

5-90 A treasury bond with a face value of $5,000 and a coupon rate of 6% payable semi-annually was bought by Kirt when the market's nominal rate was 8%. The bond matures 20 years from now. What did Kirt pay for the bond?

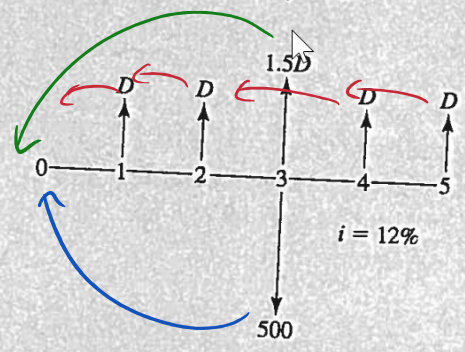
$NPW = FV(P/F,i,n) + r(FV)(P/A,i,n)$

$i = \frac{8\%}{2} = 0.04$ $\quad n = 20.2 = 40$

$r = \frac{6\%}{2} = 0.03$

$NPW = 5k(P/F,0.04,40) + 0.03(5k)(P/A,0.04,40)$
$= 1.041k + 2.969k =$ **4010**

6-9 For the diagram, compute the value of D that results in a net equivalent uniform annual worth (EUAW) of 0.



0.2774 355.9 0.8929

$(A/P, 0.12, 5)[500(P/F, 0.12, 3) - D(P/F, 0.12, 1)$

$- D(P/F, 0.12, 2) - D(P/F, 0.12, 4) - D(P/F, 0.12, 5)$

$- 1.5D(P/F, 0.12, 3)] = \phi$

↳ $D = \boxed{89.86}$

6-17 Amanda and Blake have found a house, which because of a depressed real estate market costs only $201,500. They will put $22,000 down and finance the remainder with a 30-year mortgage loan from the Central Imperial Bank of Canada at 4.65% interest. (nominal, compounded monthly)

(a) How much is their monthly loan payment?

(b) How much interest will they pay in the second payment?

(c) They will also have the following expenses: property taxes of $2,100, homeowners' insurance of $1,625, and $290 mortgage insurance (in case one of them dies before the loan is repaid, a requirement of the bank). These annual amounts are paid in 12 instalments and added to the loan payment. What will Amanda and Blake's full monthly cost be?

(d) If they can afford $1,200 a month, can Amanda and Blake afford this house?

$n = 30$, $i = 4.65\%$ nominal, compounded monthly

annual effective interest $= (1 + \frac{i}{12})^{12} - 1 = 4.75\%$

monthly effective interest $= (1 + \text{annual})^{\frac{1}{12}} - 1 = 0.3875\%$

a) monthly payment $= (201.5k - 22k)(A/P, 0.003875, 30 \cdot 12)$

$= \boxed{925.60}$

b)

c) $2100 + 1625 + 290 = 4015/yr$,,

monthly payment $= \boxed{\quad}$ $(A/P, 0.003875, 30 \cdot 12)$

d) no, they cannot,

6-43 Two possible routes for a power line are under study. Data on the routes are as follows:

	Around the Lake	Under the Lake
Length	15 km	5 km
First cost	$5,000/km	$25,000/km
Maintenance	$200/km/yr	$400/km/yr
Useful life, in years	15	15
Salvage value	$3,000/km	$5,000/km
Yearly power loss	$500/km	$500/km
Annual property taxes	2% of first cost	2% of first cost

If 7% interest is used, should th...

45k

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

75k 3k 7.5k 1.5k

$75k(A/P, 0.07, 15) + 3k + 7.5k + 1.5k - 45k(A/F, 0.07, 15)$

8.235k 1.791k

$= \boxed{18.44k}$ around lake

$25k(5)(A/P, 0.07, 15) + 400 \cdot 5 + 500 \cdot 5 + 0.02(5)25k - 5k(5)(A/F, 0.07, 15)$

13.72k 994.9

$= 19.73k$ under lake

taxes

If 7% interest is used, should the power line be routed around the lake or under the lake?

= 19.73k under lake

6-55 Consider the following three mutually exclusive alternatives:

	A	B	C
Cost	$10,000	$150,000	$20,000
Uniform annual benefit	$1,000	$1,762	$5,548
Useful life, in years	∞	20	5

Assuming that Alternatives B and C are replaced with identical replacements at the end of their useful lives, and an 8% interest rate, which alternative should be selected? Use an annual cash flow analysis in working this problem.

Option A

b/c infinite $A = Pi$, benefit - cost = $1k - 10k(0.08) = 200$

Option B

benefit - cost = $1762 - 150k(A/P, 0.08, 20) = -13.52k$

Option C

benefit - cost = $5548 - 20k(A/P, 0.08, 5) =$ 538.90

CHOOSE OPTION C