

Problem 8-9

Goal: Determine whether sprinkler system is worth reduction in insurance costs

Given:			Insurance Rate	
	Warehouse value	\$500,000	1.10%	
	Value of goods stored	\$400,000	0.95%	
	Installed Sprinkler System Cost	\$20,000	3/4	reduction in insurance rates
	Annual maintenance cost	\$300		maintenance, inspection, taxes
	Service life, years	n = 20		
	Operation is providing	8.0%		turn on original investment

Approach: Compare annual % ROI return on sprinkler investment, return is insurance savings - maintenance costs
 Compare on annual cost basis (can also be done on total 20 year service life basis)
 Determine Insurance cost without sprinklers on both warehouse + goods
 Determine Insurance cost with sprinklers on both warehouse + sprinkler investment + goods
 ASSUME straight line capital recovery, before tax basis
 Annual installed cost becomes \$20,000 investment / 20 year life

Calculations: Insurance cost without sprinklers

	Annual	Total during life	
Warehouse insurance	\$5,500	\$110,000	= \$500,000 * 0.011 * 20
Goods insurance	\$3,800	\$76,000	= \$400,000 * 0.0095 * 20
Total	\$9,300	\$186,000	sum of Warehouse + Goods

Insurance cost with sprinklers

Warehouse insurance	\$4,290	\$85,800	= (\$500,000 + \$20,000) * 0.011*3/4 * 20
Goods insurance	\$2,850	\$57,000	= \$400,000 * 0.0095*3/4 * 20
Total insurance	\$7,140	\$142,800	sum of Warehouse + Goods
Sprinkler Cost	\$1,300	\$26,000	= \$20,000/20 + 300 * 20
Total Costs	\$8,440	\$168,800	sum of Warehouse + Goods + Sprinkler costs

Savings	\$860	\$17,200	
Investment	\$20,000	\$20,000	
Annual % ROI	4.30%	4.30%	= \$860/\$20,000 * 100 or \$17,200/\$20,000 / 20 years

Answer

Payout Time 10.75 years = Fixed Investment / (Annual Savings + Depreciation) = \$20,000/(\$860 + \$20000/20)

This is much less than the present 8% return, therefore, from the viewpoint of the stockholders the sprinkler system **SHOULD NOT BE PURCHASED**. The payout time is also lengthy.

From the viewpoint of SAFETY and "peace of mind", potential lost customers and lost profit if a fire loss should occur the 4.3% ROI might be a very acceptable return.

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Alternate

If tax information were available, a more detailed After Tax analysis could be conducted.

See attached page for assumed after tax discounted cash flow analysis.

5.56%

Problem 8-9 alt. After Tax

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	Installed Sprinkler System Cost	\$20,000	3/4	reduction in insurance rates
	Annual maintenance cost	\$300		maintenance, inspection, taxes
	Service life, years	n = 20		
	Operation is providing	8.0%		return on original investment

Assume: Annual turnover of goods in warehouse and straight line building depreciation
 Assume Income Tax Rate **38.00%**
 Assume MACRS 7 yr recovery property
 Assume warehouse profit is large enough to absorb negative taxable income, thus negative taxes are a profit credit

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 Compare on annual cost basis (can also be done on total 20 year service life basis)
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 Determine Insurance cost with sprinklers on both warehouse + sprinkler investment + goods

Calculations: Insurance cost without sprinklers

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Total insurance	\$7,140	\$142,800	sum of Warehouse + Goods

Year	Savings	MACRS	depreciatio	taxable income	taxes paid	net after tax income return	cumulative	8% present worth	cumulative
0						(\$20,000)	(\$20,000)	(\$20,000.00)	(\$20,000)
1	\$1,860	0.1429	\$2,858	(\$998)	(\$379)	\$2,239	(\$17,761)	\$2,073.37	(\$17,927)
2	\$1,860	0.2449	\$4,898	(\$3,038)	(\$1,154)	\$3,014	(\$14,746)	\$2,584.40	(\$15,342)
3	\$1,860	0.1749	\$3,498	(\$1,638)	(\$622)	\$2,482	(\$12,264)	\$1,970.64	(\$13,372)
4	\$1,860	0.1249	\$2,498	(\$638)	(\$242)	\$2,102	(\$10,161)	\$1,545.36	(\$11,826)
5	\$1,860	0.0893	\$1,786	\$74	\$28	\$1,832	(\$8,330)	\$1,246.75	(\$10,579)
6	\$1,860	0.0892	\$1,784	\$76	\$29	\$1,831	(\$6,498)	\$1,153.92	(\$9,426)
7	\$1,860	0.0893	\$1,786	\$74	\$28	\$1,832	(\$4,667)	\$1,068.88	(\$8,357)
8	\$1,860	0.0446	\$892	\$968	\$368	\$1,492	(\$3,174)	\$806.17	(\$7,551)
9	\$1,860		\$0	\$1,860	\$707	\$1,153	(\$2,021)	\$576.89	(\$6,974)
10	\$1,860		\$0	\$1,860	\$707	\$1,153	(\$868)	\$534.15	(\$6,439)
11	\$1,860		\$0	\$1,860	\$707	\$1,153	\$285	\$494.59	(\$5,945)
12	\$1,860		\$0	\$1,860	\$707	\$1,153	\$1,438	\$457.95	(\$5,487)
13	\$1,860		\$0	\$1,860	\$707	\$1,153	\$2,592	\$424.03	(\$5,063)
14	\$1,860		\$0	\$1,860	\$707	\$1,153	\$3,745	\$392.62	(\$4,670)
15	\$1,860		\$0	\$1,860	\$707	\$1,153	\$4,898	\$363.54	(\$4,307)
16	\$1,860		\$0	\$1,860	\$707	\$1,153	\$6,051	\$336.61	(\$3,970)
17	\$1,860		\$0	\$1,860	\$707	\$1,153	\$7,204	\$311.67	(\$3,658)
18	\$1,860		\$0	\$1,860	\$707	\$1,153	\$8,358	\$288.59	(\$3,370)
19	\$1,860		\$0	\$1,860	\$707	\$1,153	\$9,511	\$267.21	(\$3,103)
20	\$1,860		\$0	\$1,860	\$707	\$1,153	\$10,664	\$247.42	(\$2,855)

Internal Rate of Return, IRR = 5.56%

prepared by: D. C. Drown

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