

S.10-1 A company is considering an investment that requires an initial cost of \$200,000 and is expected to generate A dollars per year for 5 years, where A is estimated in constant (today's dollars). The investment will be terminated at the end of the fifth year with no additional cash flows. The company is not sure about (i) the value of A , (ii) what MARR to use for this investment, (iii) what inflation rate to adopt. It estimates that the nominal (inflation-adjusted) MARR will be 10% (per year) with probability 30%, 12% with probability 30%, and 15% with probability 40%. The inflation rate has a world of its own, which is independent of the MARR and A . It is estimated that the inflation rate is equally likely to be 2% or 4% per year. The annual revenue A also has its own playground, which is independent of the MARR and the inflation rate. It is estimated that A would be \$50,000 with probability 80%, and \$75,000, otherwise.

- a. What are the expected values of the company's MARR, the inflation rate, and the annual revenue A ?
- b. Should the company engage in this investment?

S.10-2 The heating, ventilating, and air-conditioning (HVAC) system in a commercial building has become unreliable and inefficient. A modern HVAC system is being considered. The estimated initial cost and annual savings in operations and maintenance for the modern system are shown in the following table. The estimated annual increase in rental income with the modern system is also provided in the table. These estimates are considered reliable. The useful life of the modern system, N , however, is quite uncertain. The estimated probabilities of various useful lives, $P\{N = n\}$ are provided. The modern system has no salvage value. The MARR is 12% per year.

Economic Factor	Estimate	Life (n)	$P\{N = n\}$
First Cost (\$)	-521,000	12	0.1
Annual savings (\$/year)	48,600	13	0.2
Increased annual rent (\$/year)	31,000	14	0.3
		15	0.2
		16	0.1
		17	0.05
		18	0.05

- a. Find the expected life of the modern HVAC system.
- b. Do you recommend installing the modern HVAC system? Why?
- c. Find the probability that the present worth of the system is nonnegative, $P\{PW \geq 0\}$.