

Assignment 9

100 Points (Due: 5:00PM Wednesday April 20th)

Assessment Goals: (Incremental ROR Analysis of Multiple Alternatives, EXCEL use, Report quality). Show your work. Use 2 decimals for dollar values and 4 decimals for factors if needed. Use formulas, tables, and EXCEL as you wish.

PROBLEM 1: (40 pts)

An international private partnership (iSpace) launches satellites for different clients. To reduce its expenses, NASA has decided to use iSpace to launch its next generation micro satellite. Five satellite manufacturers have provided competing proposals to NASA. Purchasing and launch cost of the competing satellites are given in the table below. All satellites have the useful life of 4 years after which they will be considered inaccurate for NASA's mission. Satellites perform tasks for clients ranging from surveillance to communication to research through which they generate annual revenue for NASA. However, running and maintaining the satellites require annual operating costs too. Both, annual revenue and operating cost depend on the type of satellite selected. Although, satellites are considered not accurate for NASA's mission after 4 years, they still can be used by private contractors for less reliable tasks who buy the satellites at salvage values from NASA. NASA uses a MARR of 14% per year. Determine which satellite NASA should select for launch on the basis of an incremental rate of return analysis.

Satellite Manufacturer	Initial Investment \$1000	Operating Cost \$1000 per Year	Revenue \$1000 per Year	Salvage Value \$1000
APCO Technologies	750	200	520	120
Boeing	600	300	460	85
General Dynamics	550	350	455	80
Lockheed Martin	650	275	480	95
Northrop Grumman	500	400	450	70

Solution

Since all projects have the same lifetime, we can compare them using the same 4-year lifetime. Each project consists of a capital investment in year 0, annual CF of (Revenue – OC) and a salvage value at the end of 4-year life. ROR for each project can be simply calculated using the relationship:

$$PW = 0 = - \text{Initial Investment} + (\text{Revenue} - \text{Operating Cost}) (P/A, i, 4) + \text{Salvage Value} (P/F, i, 4)$$

And then solving for i by trial and error or EXCEL using IRR function.

For example, for APCO Technologies we have:

$$0 = -700 + (520 - 200) (P/A, i, 4) + 120 (P/F, i, 4)$$

Below is the result using EXCEL. ROR values were calculated using IRR function.

	APCO T.	Boeing	General D.	Lockheed M.	Northrop G.
	-750	-600	-550	-650	-500
	320	160	105	205	50
	320	160	105	205	50
	320	160	105	205	50
	440	245	185	300	120
ROR	28.87%	7.47%	-3.39%	14.25%	-18.45%

From above, it is obvious that projects General Dynamic and Northrop Grumman are not profitable at all with negative rate of return. The Boeing proposal is also rejected because its ROR of 7.47% is smaller than MARR of 14%. Two projects have ROR larger than MARR. Therefore, incremental analysis is performed on APTCO T. and Lockheed M. versus DN.

Lockheed M. has a smaller initial cost. Since we already have the calculation for Lockheed M. vs DN to result if ROR of 14.25% which is greater than MARR, then DN is eliminated and we need to analyze APTCO T. vs Lockheed M.

	Lockheed M.	APCO T.	Incremental
	-650	-750	-100
	205	320	115
	205	320	115
	205	320	115
	300	440	140
ROR			110.56%

Again using EXCEL and IRR function the Di for the incremental project is over 110% which is larger than MARR, thus APTCO Technologies alternative is selected and Lockheed is eliminated.

PROBLEM 2: (60 points)

Solve the same problem except that Northrop Grumman and General Dynamics satellites have 3-year life each. All projects can be repeated with the same values as above. (Do not worry about multiple rate of returns, use the first one that you get.)

Solution

One can argue that because both General Dynamics and Northrop Grumman proposals had negative rate of return, then changing their project life from 4 years to 3 years (which is essentially losing the revenue for 3rd year) will make the rate of return even more negative. But because the 4th year cash flow will move one year earlier (to the 3rd year) it might create the impression that ROR will actually improve. Regardless of that, the procedure is to find the LCM for the projects (12 years) and repeat the project.

Result using EXCEL are presented in the next page. ROR values were calculated using IRR function. As expected ROR remained the same for the for APCO, Boeing, and Lockheed Martin but ROR significantly worsened for General Dynamics and Northrop Grumman. In fact, for Northrop Grumman proposal no interest rate can be found at which the PW = 0.

Similar to the previous case an incremental analysis should be performed which will result in APCO Technologies proposal to be selected.

	APCO T.	Boeing	General D.	Lockheed M.	Northrop G.
	-750	-600	-550	-650	-500
	320	160	105	205	50
	320	160	105	205	50
	320	160	-365	205	-380
	-310	-355	105	-350	50
	320	160	105	205	50
	320	160	-365	205	-380
	320	160	105	205	50
	-310	-355	105	-350	50
	320	160	-365	205	-380
	320	160	105	205	50
	320	160	105	205	50
	440	245	185	300	120
ROR	28.87%	7.47%	-13.67%	14.25%	#NUM!