SOLUTIONS TO SELECTED PROBLEMS

**Student: You should work the problem completely before referring to the solution.**

CHAPTER 11

Solutions included for problems 3, 5, 9, 11, 15, 17, 21, 24, 27, 30, 33, 36, and 39

11.3   The consultant's (external or outsider's) viewpoint is important to provide an unbiased analysis for both the defender and challenger, without owning or using either one.

11.5   P = market value = \$350,000
    AOC = \$125,000 per year
        n = 2 years
        S = \$5,000

11.9   (a) The ESL is 5 years, as in Problem 11.8.
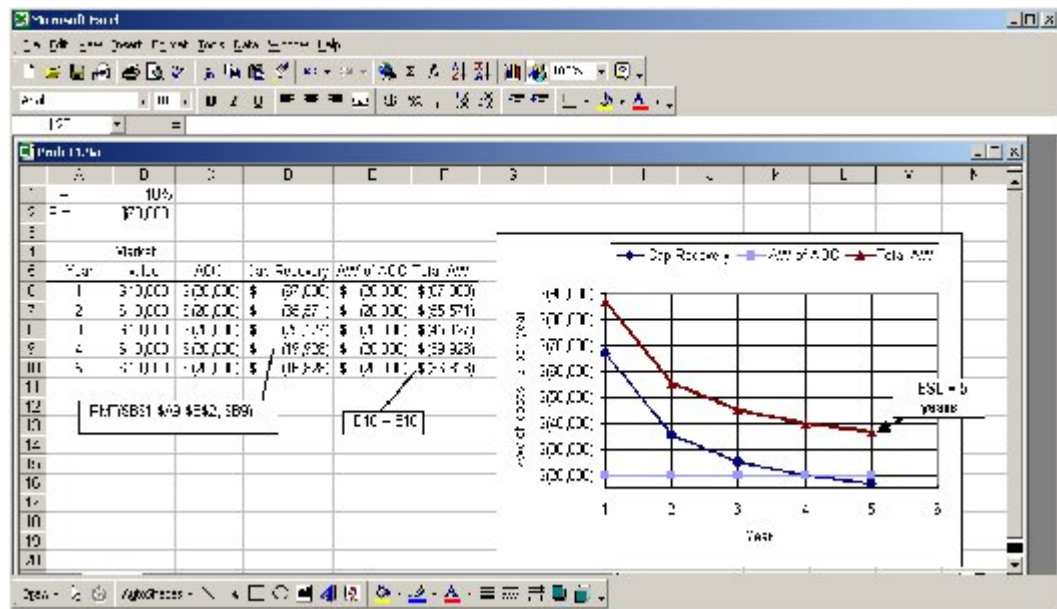
(b) On the same spreadsheet, decrease salvage by \$1000 each year, and increase AOC by 15% per year. Extend the years to 10. The ESL is relatively insensitive between years 5 and 7, but the conclusion is ESL = 6 years.
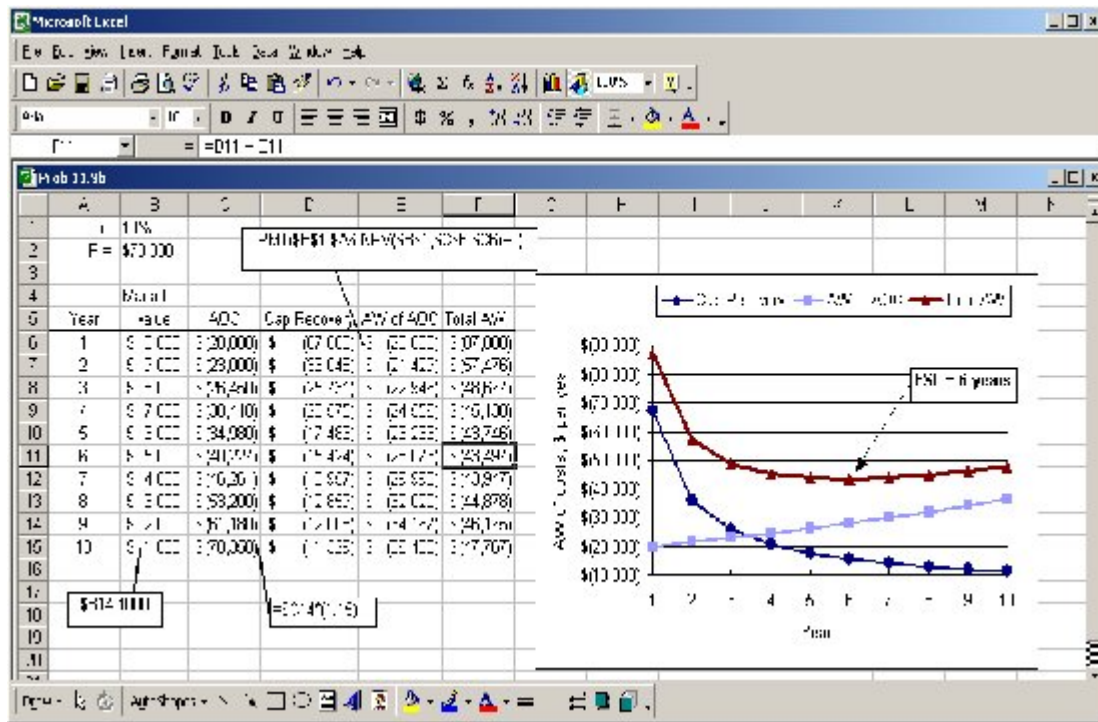
11.11 (a) For n = 1: AW$_1$ = -100,000(A/P,18%,1) – 75,000 + 100,000(0.85)^1(A/F,18%,1)
= $ -108,000

For n = 2: AW$_2$ = -100,000(A/P,18%,2) – 75,000 - 10,000(A/G,18%,2)
+ 100,000(0.85)^2(A/F,18%,2)
= $ - 110,316

ESL is 1 year with AW$_1$ = $-108,000.

(b) Set the AW relation for year 6 equal to AW$_1$ = $-108,000 and solve for P, the required lower first cost.

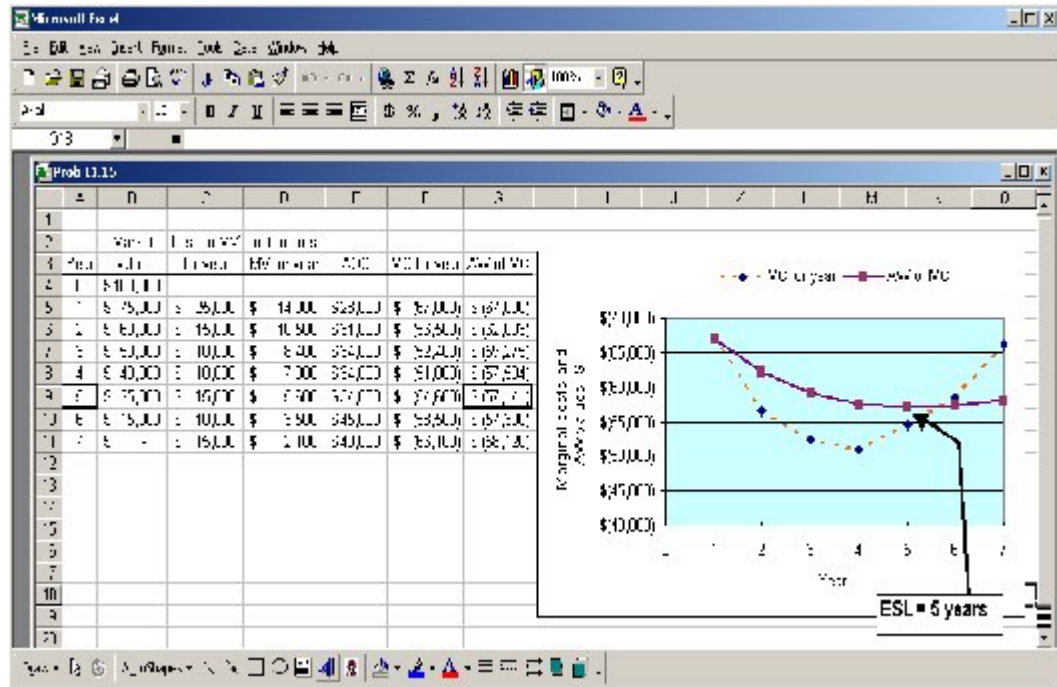AW$_6$ = -108,000 = -P(A/P,18%,6) – 75,000 - 10,000(A/G,18%,6)
+ P(0.85)^6(A/F,18%,6)

-108,000 = -P(0.28591) – 75,000 – 10,000(2.0252) + P(0.37715)(0.10591)

0.24597P = -95,252 + 108,000

P = $51,828

The first cost would have to be reduced from $100,000 to $51,828. This is a quite large reduction.

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11.15 Spreadsheet and marginal costs used to find the ESL of 5 years with
AW = $-57,141.

11.17 Defender: ESL = 3 years with AW_D = $-47,000
Challenger: ESL = 2 years with AW_C = $-49,000

Recommendation now is to retain the defender for 3 years, then replace.

11.21 (a) The n values are set; calculate the AW values directly and select D or C.

$$AW_D = -50,000(A/P,10\%,5) - 160,000$$
$$= \$-173,190$$

$$AW_C = -700,000(A/P,10\%,10) - 150,000 + 50,000(A/F,10\%,10)$$
$$= \$-260,788$$

Retain the current bleaching system for 5 more years.

(b) Find the replacement value for the current process.

$$-RV(A/P,10\%,5) - 160,000 = AW_C = -260,788$$
$$RV = \$382,060$$

This is 85% of the first cost 7 years ago; way too high for a trade-in value now.

11.24 (a) By hand: Find ESL of the defender; compare with AW_C over 5 years.

For n = 1: AW_D = -8000(A/P,15%,1) – 50,000 + 6000(A/F,15%,1)
= $-53,200
For n = 2: AW_D = -8000(A/P,15%,2) – 50,000 + (-3000 + 4000)(A/F,15%,2)
= $-54,456
For n = 3: AW_D = -8000(A/P,15%,3) - [50,000(P/F,15%,1) +
= -$57,089
The ESL is now 1 year with AW_D = $-53,200

AW_C = -125,000(A/P,15%,5) – 31,000 + 10,000(A/F,15%,5)
= $-66,807
Since the ESL AW value is lower that the challenger AW, Richter should keep the defender now and replace it after 1 year.

(b) To make the decision, compare AW values.
AW_D = $-53,200
AW_C = $-66,806
Select the defender now and replaced after one year.

11.27 (a) By hand: Find the replacement value (RV) for the in-place system.

-RV(A/P,12%,7) – 75,000 + 50,000(A/F,12%,7) = -400,000(A/P,12%,12)
– 50,000 + 35,000(A/F,12%,12)
RV = $196,612

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11.27 (cont) (b) By spreadsheet: One approach is to set up the defender cash flows for increasing n values and use the PMT function to find AW. Just over 4 years will give the same AW values.

11.30 (a) If no study period is specified, the three replacement study assumptions in Section 11.1 hold. So, the services of the defender and challenger can be obtained (it is assumed) at their AW values. When a study period is specified these assumptions are not made and repeatability of either D or C alternatives is not a consideration.

(b) If a study period is specified, all viable options must be evaluated. Without a study period, the ESL analysis or the AW values at set n values determine the AW values for D and C. Selection of the best option concludes the study.

11.33 (a)

Option	Defender	Challenger
1	0	5
2	0	6
3	0	7
4	0	8
5	3	2
6	3	3
7	3	4
8	3	5

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A total of 5 options have AW = $-90,000. Several ways to go; defender can be replaced now or after 3 years and challenger can be used from 2 to 5 years, depending on the option chosen.

(b) PW values cannot be used to select best options since the equal-service assumption is violated due to study periods of different lengths. Must us AW values.

11.36 Answer is (a)

11.39 Answer is (c)