Solutions to Leasing Problems

Problem #1

a. To determine the lease payments (L) that will provide an after-tax return of 14%, we set the lessor's NPV of leasing to zero and solve for L:

$$\text{NPV} = 0 = -\$17{,}000 + \left[\text{LPVIFA}_{.14,4}\,(1.14) - .30\text{LPVIFA}_{.14,4} + \frac{\$17{,}000\text{x}.25\text{x}.30}{2(.25+.14)}\left(\frac{2+.14}{1+.14}\right)\right]$$

$$= 0 \text{ -}\$17{,}000 + \text{L}(2.914)\,(1.14) \text{ - } .30\text{L}\,(2.914) + \$3{,}068$$

Which gives: L = $5,687

Thus lease payments would have to be $5,687, payable at the beginning of the year.

b. The lease payments provide an after-tax return of 14%. The bank's $10,000 require an after-tax interest rate of (1-.30) 11% = 7.7%. Now, let the return on the remaining $7,000 of equity investment be x. This means that:

$$\frac{\$10{,}000}{\$17{,}000}(7.7\%) + \frac{\$7{,}000}{\$17{,}000}\text{ x} = 14\%$$

Or 4.5294% + .4118 x = 14%

Or .4118 x = 9.4706%

$$\text{Or x} = \frac{9.4706}{.4118}\%$$

x = 22.998%

Thus, the remaining $7,000 equity investment will earn a 22.998% after-tax return.

Problem #2

Weighted average after-tax interest rate r^* is:

$$\frac{\$45{,}000}{\$75{,}000}(1-.40)12\% + \frac{\$30{,}000}{\$75{,}000}(1-.40)14\%$$

= 7.68%

NPV of leasing from the lessee's viewpoint is:

$$\$75{,}000 \text{ - } \left[(1-.40)\,\$11{,}200\,\text{PVIFA}_{.0768,10} + \frac{\$75{,}000\text{x}.20\text{x}.40}{2(.0768+.20)}\left(\frac{2+.0768}{1+.0768}\right)\right]$$

$= \$75,000 - [\$45,750 + \$20,903]$

$= \$8,347$. Since the NPV is positive, leasing is attractive.

Problem 3

$r^* = (1-.35)\ 9.5\% = 6.175\%$

$$\text{NPV of leasing} = \$150,000 - [\$25,000\ \text{PVIFA}_{.06175.10}\ (1.06175) - .35\ (\$25,000\ \text{PVIFA}_{.06175.10}$$

$$+ \frac{\$150,000 \times .10 \times .35}{2(.06175 + .10)}\left(\frac{2 + .06175}{1 + .06175}\right)]]$$

$$= \$150,000 - [\$193,754.78 - \$63,870.19 + \$31,513.65]$$

$$= -\ \$11,398.24$$

Since NPV is negative, leasing is not a better option, borrowing to purchase is.

Problem 4

$r^* = (1-.50)\ 12\% = 6\%$

a. NPV of leasing is:

$$\$1,500,000 - [\$200,000\ \text{PVIFA}_{.06,10}\ (1.06) - .50\ (\$200,000\ \text{PVIFA}_{.06,10} + \frac{\$600,000 \times .10 \times .50}{2(.10 + .06)}\left(\frac{2 + .06}{1 + .06}\right) +$$

PV of residual value of land after capital gain tax]

Now, residual value of land after capital gain tax at year-end 10

$$= \$900,000\ \text{FVIF}_{.05,10} - \frac{1}{2}\left(\text{capital gain}\right) \times 50\%\ \text{tax}$$

$$= \$1,466,005 - \frac{1}{2}\left(\$1,466,005 - \$900,000\right) \times 50\%$$

$$= \$1,324,504$$

PV of $\$1,324,504 = \$1,324,504\ \text{PVIF}_{.14,10} = \$357,277$

Plugging $\$357,277$ in the NPV expression at the top, we get NPV = $\$136,210$.

Since NPV is positive, lease financing is attractive.

b. For Storerite to become indifferent to leasing or borrowing, the NPV of leasing would have to be zero. The PV of the residual value of land after capital gain tax, therefore, would have to increase by the current NPV of leasing, to become \$357,277 + \$136,210 = \$493,487. This means the future value of land, after capital gain tax will be:

$\$493,487\ FVIF_{.14,10} = \$1,829,466$

Let future value of land before capital gain tax be S_{10}. Then, we must have:

$$\$1,829,466 = S_{10} - \frac{1}{2}(S_{10} - \$900,0000) \text{ x } .50$$

Which gives:

$S_{10} = \$2,139,288$

Thus, the average inflation rate i is given by:

$\$900,000\ (1+i)^{10} = \$2,139,288$

Which gives: $(1+i)^{10} = 2.377$

That is: $FVIF_{i,10} = 2.377$ which gives $i = 9\%$

Thus, the inflation rate would have to average 9% per year for Storerite to be indifferent between borrowing to purchase and leasing.

Problem 5

$r^* = (1-.40)15\% = 9\%$. Salvage Value not given, so assumed zero.

Financial Lease

$$NPV = \$50{,}000 - \left[(1-.40)\$13{,}000\, PVIFA_{.09,6} + \frac{\$50{,}000 \times .25 \times .40}{2(.09+.25)}\left(\frac{2+.09}{1+.09}\right)\right]$$

$$= \$50{,}000 - [(1-.40)\$13000(4.486) + \$14{,}099]$$

$$= \$50{,}000 - [\$34{,}991 + 14{,}099]$$

$$= \$50{,}000 - \$49{,}090$$

$$= \$910$$

Operating Lease

Let the useful life be n years.

$$NPV = \$50{,}000 - \left[(1-.40)\$16000\, PVIFA_{.09,n} + \frac{\$50{,}000 \times .25 \times .40}{2(.09+.25)}\left(\frac{2+.09}{1+.09}\right)\right]$$

$$= \$50{,}000 - [\$9{,}600\, PVIFA_{.09,n} + \$14{,}099]$$

$$= \$50{,}000 - \$9{,}600\, PVIFA_{.09,n} - \$14{,}099$$

$$= \$35{,}901 - \$9{,}600\, PVIFA_{.09,n}$$

The financial lease will be as attractive as the operating lease if their NPVs are equal. Thus

$$\$910 = \$35{,}901 - \$9{,}600\, PVIFA_{.09,n}$$, which gives:

$$\$9{,}600\, PVIFA_{.09,n} = \$34{,}991$$

$$PVIFA_{.09,n} = 3.64$$

Using financial calculator, we can solve this equation to get n = 4.61 years. Using time value tables you will find n between 4 and 5 years. Thus the minimum useful life of the operating lease to be as attractive as the financial lease is 4.61 years.