

3 Jan 2017

**Lease Run to Determine the Nominal Annual Interest Rate,
Given a Quoted Monthly Payment Amount**

and

**Lease Run to Determine the Monthly Payment Amount,
Given a Quoted Nominal Annual Interest Rate**

When an executive is negotiating financing terms with original equipment manufacturers, with leasing firms or with banks, he or she may find that the materials presented by the sales people are not as precise as they should be. Effective interest rates on financing arrangements may be understated. Irregular lease terms, such as "two payments up front" or "no payments for 90 days" may create uncertainty as to what the interest rate will actually be. It can be particularly difficult to compare lease proposals from different finance firms, each of which have their own "special feature" or two.

It is appropriate for the executive who representing the purchaser of the equipment to audit whether the proposed lease terms are what they are asserted to be. (On occasion, they are not.)

I created a model to be able to audit the representations made by salespersons who are representing financing firms. I present two examples to demonstrate how an executive can determine exactly what the interest rate is within a particular proposal. Often the act of holding up the exact interest rate results in the sales people countering with a more favorable proposal.

Example:

Assume a customer is purchasing a piece of equipment costing \$500,000. The equipment salesperson asserts that the customer can finance the purchase by making 60 payments, each for \$10,138.20. The salesperson suggests that the nominal annual interest rate is "a bit under 8.0%." Is that indeed the interest rate?

Schedule A displays the deal the salesperson is allegedly proposing. The customer will make 60 payments, each for \$10,138.20. The interest rate will be "about 7.8%." Schedule A was designed

to determine whether those amounts, "\$10,138.20" and "7.8%" are in synch with one another. They are not. If they were, the box with the double lines for borders would read "zero."

The model uses Excel's Goal Seeking feature to determine the nominal annual interest rate, given that monthly payment amount. The user clicks on the box with the double lines for borders and opens the Goal Seeking feature. This feature allows the user to set the amount in that box to zero by changing the Nominal Annual Rate in the cell in the upper left hand corner of the schedule.

Schedule B reveals that the nominal annual interest rate is 8.0%, given payments of \$10,138.20, not 7.8%.

Furthermore, the 8.0% is only a "nominal rate." Once 8.0% is compounded monthly, the actual annual interest rate is nearly 8.3%. (The model converts nominal annual rates to actual annual rates. It also converts actual annual rates to nominal annual rates as a backcheck.)

When a customer can present the salesperson with exact calculations such as these, there is a tendency for the salesperson to take the hint. Typically, the quoted monthly payment is reduced to the amount it should be, given the previously professed interest rate.

Which, of course, is the purpose of the exercise. A sharp pencil can reduce the cost of the deal for the customer.

Another Example:

Again assume a customer is purchasing a piece of equipment costing \$500,000. The equipment salesperson asserts that the customer can finance the purchase by making 60 payments, each for \$11,000. The salesperson suggests that the nominal annual interest rate in such a deal would be "about 8.0%." Does a monthly payment of \$11,000 correspond to an interest rate of 8.0%?

Schedule C indicates that it does not. If it did, the box with the double lines for borders would read zero. (With payments of \$11,000, the nominal annual rate would be about 11.5%.)

Again, the user can turn to Excel's Goal Seeking feature, this time to determine what the monthly payment should be, given a quoted nominal annual rate.

This time the user sets the amount in the box with the double lines to zero by changing the Monthly Payment in the cell in the upper left hand side of the schedule.

Schedule D reveals that the monthly payment should be \$10,138.20 for the nominal annual rate to be 8.0%.

This model can be modified to perform calculations on monthly payments in advance, instead of the monthly payments being paid in arrears.

It can also be modified to calculate the nominal annual rate, given irregular payments. For example, sometimes salespersons ask for the first two or three payments to be made on the spot or at the end of month one.

Then there are "fees" of various kinds. The executive can take the position that fees are simply interest payments in different clothing. He can pack those fees into the model to calculate what the underlying interest rate is, given ancillary "fees" and explicit interest payments. Sometimes that results in the fees being taken off the table.

The model can also be modified to cover any number of payments.

Every time I have used this model, my employer wound up with a better deal than otherwise would have been the case.

Daniel P.Doyle

Lease Run to Determine the Nominal Interest Rate, Given a Quoted Monthly Payment Amount

3 Jan 2017

Nominal Annual Rate 7.800000% Actual Annual Rate 8.084981%
 Actual Annual Rate with Monthly Compounding of Above Nominal Rate → 8.084981% Nominal Annual Rate 7.800000%

Monthly Payment (10,138.20)	Monthly Discount	Outflows Factors, given Before Above Nominal Discounting Rate	Outflows, Discounted	Beginning Principal	Monthly Payment	Interest Paid	Principal Paid	Ending Principal	
0	500,000.00	(608,291.83)	(502,368.13)	(2,368.13)		104,798.56	503,493.27		
0		1.0000	0.00	500,000.00	0.00			500,000.00	
1	(10,138.20)	0.9935	(10,072.72)	500,000.00	10,138.20	3,250.00	6,888.20	493,111.80	
2	(10,138.20)	0.9871	(10,007.67)	493,111.80	10,138.20	3,205.23	6,932.97	486,178.83	
3	(10,138.20)	0.9808	(9,943.04)	486,178.83	10,138.20	3,160.16	6,978.03	479,200.80	
4	(10,138.20)	0.9744	(9,878.83)	479,200.80	10,138.20	3,114.81	7,023.39	472,177.41	
5	(10,138.20)	0.9681	(9,815.03)	472,177.41	10,138.20	3,069.15	7,069.04	465,108.36	
6	(10,138.20)	0.9619	(9,751.65)	465,108.36	10,138.20	3,023.20	7,114.99	457,993.37	
7	(10,138.20)	0.9557	(9,688.67)	457,993.37	10,138.20	2,976.96	7,161.24	450,832.13	
8	(10,138.20)	0.9495	(9,626.10)	450,832.13	10,138.20	2,930.41	7,207.79	443,624.34	
9	(10,138.20)	0.9434	(9,563.94)	443,624.34	10,138.20	2,883.56	7,254.64	436,369.70	
10	(10,138.20)	0.9373	(9,502.17)	436,369.70	10,138.20	2,836.40	7,301.79	429,067.91	
11	(10,138.20)	0.9312	(9,440.81)	429,067.91	10,138.20	2,788.94	7,349.26	421,718.65	
12	(10,138.20)	0.9252	(9,379.84)	421,718.65	10,138.20	2,741.17	7,397.03	414,321.63	

55	(10,138.20)	0.7002	(7,099.09)	56,108.88	10,138.20	364.71	9,773.49	46,335.39	
56	(10,138.20)	0.6957	(7,053.25)	46,335.39	10,138.20	301.18	9,837.02	36,498.38	
57	(10,138.20)	0.6912	(7,007.70)	36,498.38	10,138.20	237.24	9,900.96	26,597.42	
58	(10,138.20)	0.6868	(6,962.44)	26,597.42	10,138.20	172.88	9,965.31	16,632.10	
59	(10,138.20)	0.6823	(6,917.48)	16,632.10	10,138.20	108.11	10,030.09	6,602.02	
60	(10,138.20)	0.6779	(6,872.80)	6,602.02	10,138.20	42.91	10,095.28	(3,493.27)	
Sums, Year					1	35,979.99	85,678.37		
					2	29,052.91	92,605.45		
					3	21,565.78	100,092.59		
					4	13,473.31	108,185.05		
					5	4,726.57	116,931.80		
						104,798.56	503,493.27	608,291.83	
(608,291.83)									

Click on cell L12.
 Click on Data > What If Analysis > Goal Seek . . .
Set goal for cell L12 to a value of 0 by changing cell H2.

Lease Run to Determine the Nominal Interest Rate, Given a Quoted Monthly Payment Amount

3 Jan 2017

Nominal Annual Rate 8.000000% Actual Annual Rate 8.299951%
 Actual Annual Rate with Monthly Compounding of Above Nominal Rate → 8.299951% Nominal Annual Rate 8.000000%

Monthly Payment (10,138.20)	Monthly Discount	Outflows Factors, given Before Above Nominal Discounting Rate	Outflows, Discounted (500,000.00)	Beginning Principal	Monthly Payment	Interest Paid	Principal Paid	Ending Principal	
0			0.00	500,000.00	0.00			500,000.00	
		(608,291.83)				108,291.83	500,000.00		
0			0.00	500,000.00	0.00		0.00	500,000.00	
1	(10,138.20)	0.9934	(10,071.06)	500,000.00	10,138.20	3,333.33	6,804.86	493,195.14	
2	(10,138.20)	0.9868	(10,004.36)	493,195.14	10,138.20	3,287.97	6,850.23	486,344.91	
3	(10,138.20)	0.9803	(9,938.11)	486,344.91	10,138.20	3,242.30	6,895.90	479,449.01	
4	(10,138.20)	0.9738	(9,872.29)	479,449.01	10,138.20	3,196.33	6,941.87	472,507.14	
5	(10,138.20)	0.9673	(9,806.91)	472,507.14	10,138.20	3,150.05	6,988.15	465,518.99	
6	(10,138.20)	0.9609	(9,741.97)	465,518.99	10,138.20	3,103.46	7,034.74	458,484.25	
7	(10,138.20)	0.9546	(9,677.45)	458,484.25	10,138.20	3,056.56	7,081.64	451,402.62	
8	(10,138.20)	0.9482	(9,613.36)	451,402.62	10,138.20	3,009.35	7,128.85	444,273.77	
9	(10,138.20)	0.9420	(9,549.70)	444,273.77	10,138.20	2,961.83	7,176.37	437,097.40	
10	(10,138.20)	0.9357	(9,486.45)	437,097.40	10,138.20	2,913.98	7,224.21	429,873.18	
11	(10,138.20)	0.9295	(9,423.63)	429,873.18	10,138.20	2,865.82	7,272.38	422,600.81	
12	(10,138.20)	0.9234	(9,361.22)	422,600.81	10,138.20	2,817.34	7,320.86	415,279.95	

55	(10,138.20)	0.6939	(7,034.74)	59,434.69	10,138.20	396.23	9,741.97	49,692.73	
56	(10,138.20)	0.6893	(6,988.15)	49,692.73	10,138.20	331.28	9,806.91	39,885.82	
57	(10,138.20)	0.6847	(6,941.87)	39,885.82	10,138.20	265.91	9,872.29	30,013.52	
58	(10,138.20)	0.6802	(6,895.90)	30,013.52	10,138.20	200.09	9,938.11	20,075.42	
59	(10,138.20)	0.6757	(6,850.23)	20,075.42	10,138.20	133.84	10,004.36	10,071.06	
60	(10,138.20)	0.6712	(6,804.86)	10,071.06	10,138.20	67.14	10,071.06	0.00	
Sums, Year					1	36,938.31	84,720.05		
					2	29,906.59	91,751.77		
					3	22,291.24	99,367.13		
					4	14,043.82	107,614.55		
					5	5,111.86	116,546.50		
						108,291.83	500,000.00	608,291.83	

Click on cell L12.
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Set goal for cell L12 to a value of 0 by changing cell H2.

Lease Run to Determine the Monthly Payment Amount, Given a Nominal Annual Interest Rate

3 Jan 2017

Nominal Annual Rate 8.000000% Actual Annual Rate 8.299951%
 Actual Annual Rate with Monthly Compounding of Above Nominal Rate → 8.299951% Nominal Annual Rate 8.000000%

Time	Inflow	Outflows Factors, given Before Above Nominal Discounting	Monthly Discount Rate	Outflows, Discounted	Beginning Principal	Monthly Payment	Interest Paid	Principal Paid	Ending Principal
0	500,000.00	(660,000.00)		(542,502.77)					
				(42,502.77)			96,677.44	563,322.56	
0			1.0000	0.00	500,000.00	0.00			500,000.00
1		(11,000.00)	0.9934	(10,927.15)	500,000.00	11,000.00	3,333.33	7,666.67	492,333.33
2		(11,000.00)	0.9868	(10,854.79)	492,333.33	11,000.00	3,282.22	7,717.78	484,615.56
3		(11,000.00)	0.9803	(10,782.90)	484,615.56	11,000.00	3,230.77	7,769.23	476,846.33
4		(11,000.00)	0.9738	(10,711.49)	476,846.33	11,000.00	3,178.98	7,821.02	469,025.30
5		(11,000.00)	0.9673	(10,640.55)	469,025.30	11,000.00	3,126.84	7,873.16	461,152.14
6		(11,000.00)	0.9609	(10,570.09)	461,152.14	11,000.00	3,074.35	7,925.65	453,226.48
7		(11,000.00)	0.9546	(10,500.09)	453,226.48	11,000.00	3,021.51	7,978.49	445,247.99
8		(11,000.00)	0.9482	(10,430.55)	445,247.99	11,000.00	2,968.32	8,031.68	437,216.31
9		(11,000.00)	0.9420	(10,361.47)	437,216.31	11,000.00	2,914.78	8,085.22	429,131.09
10		(11,000.00)	0.9357	(10,292.85)	429,131.09	11,000.00	2,860.87	8,139.13	420,991.96
11		(11,000.00)	0.9295	(10,224.69)	420,991.96	11,000.00	2,806.61	8,193.39	412,798.58
12		(11,000.00)	0.9234	(10,156.98)	412,798.58	11,000.00	2,751.99	8,248.01	404,550.57

55		(11,000.00)	0.6939	(7,632.73)	3,639.24	11,000.00	24.26	10,975.74	(7,336.49)
56		(11,000.00)	0.6893	(7,582.18)	(7,336.49)	11,000.00	(48.91)	11,048.91	(18,385.40)
57		(11,000.00)	0.6847	(7,531.97)	(18,385.40)	11,000.00	(122.57)	11,122.57	(29,507.97)
58		(11,000.00)	0.6802	(7,482.09)	(29,507.97)	11,000.00	(196.72)	11,196.72	(40,704.69)
59		(11,000.00)	0.6757	(7,432.54)	(40,704.69)	11,000.00	(271.36)	11,271.36	(51,976.06)
60		(11,000.00)	0.6712	(7,383.31)	(51,976.06)	11,000.00	(346.51)	11,346.51	(63,322.56)
					Sums, Year	1	36,550.57	95,449.43	
						2	28,628.31	103,371.69	
						3	20,048.51	111,951.49	
						4	10,756.59	121,243.41	
						5	693.45	131,306.55	
							96,677.44	563,322.56	660,000.00
		(660,000.00)							

Click on cell L12.
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Lease Run to Determine the Monthly Payment Amount, Given a Nominal Annual Interest Rate

3 Jan 2017

Nominal Annual Rate 8.000000% Actual Annual Rate 8.299951%
 Actual Annual Rate with Monthly Compounding of Above Nominal Rate → 8.299951% Nominal Annual Rate 8.000000%

Monthly Payment (10,138.20)	Time	Inflow	Monthly Discount Outflows Factors, given Before Above Nominal Discounting Rate	Outflows, Discounted (500,000.00)	Beginning Principal	Monthly Payment	Interest Paid	Principal Paid	Ending Principal
	0	500,000.00		0.00	500,000.00	0.00			500,000.00
			(608,291.83)				108,291.83	500,000.00	
	0		1.0000	0.00	500,000.00	0.00		0.00	500,000.00
	1		0.9934	(10,071.06)	500,000.00	10,138.20	3,333.33	6,804.86	493,195.14
	2		0.9868	(10,004.36)	493,195.14	10,138.20	3,287.97	6,850.23	486,344.91
	3		0.9803	(9,938.11)	486,344.91	10,138.20	3,242.30	6,895.90	479,449.01
	4		0.9738	(9,872.29)	479,449.01	10,138.20	3,196.33	6,941.87	472,507.14
	5		0.9673	(9,806.91)	472,507.14	10,138.20	3,150.05	6,988.15	465,518.99
	6		0.9609	(9,741.97)	465,518.99	10,138.20	3,103.46	7,034.74	458,484.25
	7		0.9546	(9,677.45)	458,484.25	10,138.20	3,056.56	7,081.64	451,402.62
	8		0.9482	(9,613.36)	451,402.62	10,138.20	3,009.35	7,128.85	444,273.77
	9		0.9420	(9,549.70)	444,273.77	10,138.20	2,961.83	7,176.37	437,097.40
	10		0.9357	(9,486.45)	437,097.40	10,138.20	2,913.98	7,224.21	429,873.18
	11		0.9295	(9,423.63)	429,873.18	10,138.20	2,865.82	7,272.38	422,600.81
	12		0.9234	(9,361.22)	422,600.81	10,138.20	2,817.34	7,320.86	415,279.95

	55		0.6939	(7,034.74)	59,434.69	10,138.20	396.23	9,741.97	49,692.73
	56		0.6893	(6,988.15)	49,692.73	10,138.20	331.28	9,806.91	39,885.82
	57		0.6847	(6,941.87)	39,885.82	10,138.20	265.91	9,872.29	30,013.52
	58		0.6802	(6,895.90)	30,013.52	10,138.20	200.09	9,938.11	20,075.42
	59		0.6757	(6,850.23)	20,075.42	10,138.20	133.84	10,004.36	10,071.06
	60		0.6712	(6,804.86)	10,071.06	10,138.20	67.14	10,071.06	0.00
					Sums, Year	1	36,938.31	84,720.05	
						2	29,906.59	91,751.77	
						3	22,291.24	99,367.13	
						4	14,043.82	107,614.55	
						5	5,111.86	116,546.50	
							108,291.83	500,000.00	608,291.83

Click on cell L12.
 Click on Data > What If Analysis > Goal Seek ...
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