

Question:

If the annual interest rate (discretely compounded) is 12%, then what is the equivalent monthly interest rate?

1. The Quick Way

We simply take 12%, and we divide it by 12. This gives 1%, which is approximately correct. For the majority of project evaluation work, this will suffice. This is an overestimate, since a nominal monthly interest rate of 1% will cause compounding every month, but 12% annual interest rate causes compounding only once a year. Exhibit 1 illustrates the error.

2. The Mathy Way

If we want the money to grow at a rate of 12% per year, what is the percentage rate I must grow the money at every month, to arrive at a 12% growth at the end of the year? Supposing we had \$1.00, and it needs to be \$1.12 at the end of this year, what's the monthly growth rate, compounded every month? This is a mathematical problem:

$$\$1.12 = \$1.00 * (1 + i_{monthly})^{12}$$

To obtain $i_{monthly}$, we solve (either analytically, or using Excel's Solver) the endecintic equation:

$$i_{monthly} = (1 + i_{year})^{(1/12)} - 1$$

The result is shown in Exhibit 2.

	A	B	C	D
1				
2		Annual	Monthly	
3	Nominal	12.0000%	1.0000%	
4				
5	Months	Annual	Monthly	
6	0	\$1.0000	\$1.0000	
7	1		\$1.0100	
8	2		\$1.0201	
9	3		\$1.0303	
10	4		\$1.0406	
11	5		\$1.0510	
12	6		\$1.0615	
13	7		\$1.0721	
14	8		\$1.0829	
15	9		\$1.0937	
16	10		\$1.1046	
17	11		\$1.1157	
18	12	\$1.1200	\$1.1268	

Exhibit 1: The quick way to calculate monthly nominal interest rate from the annual interest rate.

	A	B	C	D
1				
2		Annual	Monthly	
3	Nominal	12.0000%	0.9489%	
4	Periods	1	12	
5				
6	Months	Annual	Monthly	
7	0	100	100	
8	1		100.9489	
9	2		101.9068	
10	3		102.8737	
11	4		103.8499	
12	5		104.8353	
13	6		105.8301	
14	7		106.8343	
15	8		107.848	
16	9		108.8713	
17	10		109.9044	
18	11		110.9472	
19	12	112	112	

Exhibit 2: The right way to calculate monthly nominal interest rate from the annual interest rate.