Effective Annual Interest Rate from a Nominal Rate

Effective annual rate, rate per compounding period and equivalent continuous rate from a nominal annual rate compounded yearly, monthly, daily or continuously.

Method: Nominal and effective interest

Input parameters

Unit system: SI

Parameter	Value	Unit
Nominal annual rate	12.000	%
Compounding	Monthly	

Calculated results

Parameter	Value	Unit
Effective annual rate	12.683	%
Rate per compounding period	1.0000	%
Equivalent continuous rate	11.940	%
Growth factor over one year	1.1268	

Notes for this case

• A nominal rate r compounded m times a year earns r/m per period, so one year multiplies money by (1 + r/m)ᵐ and the effective rate is i_a = (1 + r/m)ᵐ − 1; continuous compounding gives eʳ − 1. Use the effective rate in present-worth formulas with annual periods, or the period rate with monthly periods. Lenders often quote the nominal rate (APR); the effective rate is what is actually earned or paid.

Formula and method

$$i_a = \left(1 + \frac{r}{m}\right)^m - 1, \quad i_a = e^r - 1 \ (m \to \infty), \quad r_c = \ln(1 + i_a)$$

Variables

r	Nominal annual rate	-
m	Compounding	-
i_a	Effective annual rate	-
i_p	Rate per compounding period	-
r_c	Equivalent continuous rate	-
F/P	Growth factor over one year	-

Method and standards

Effective rate.

Assumptions and limits

- Constant rate through the year.

References

Nominal and effective interest

Report details

Report reference	FCC-T13P-X14E (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/economics/effective-interest-rate

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.