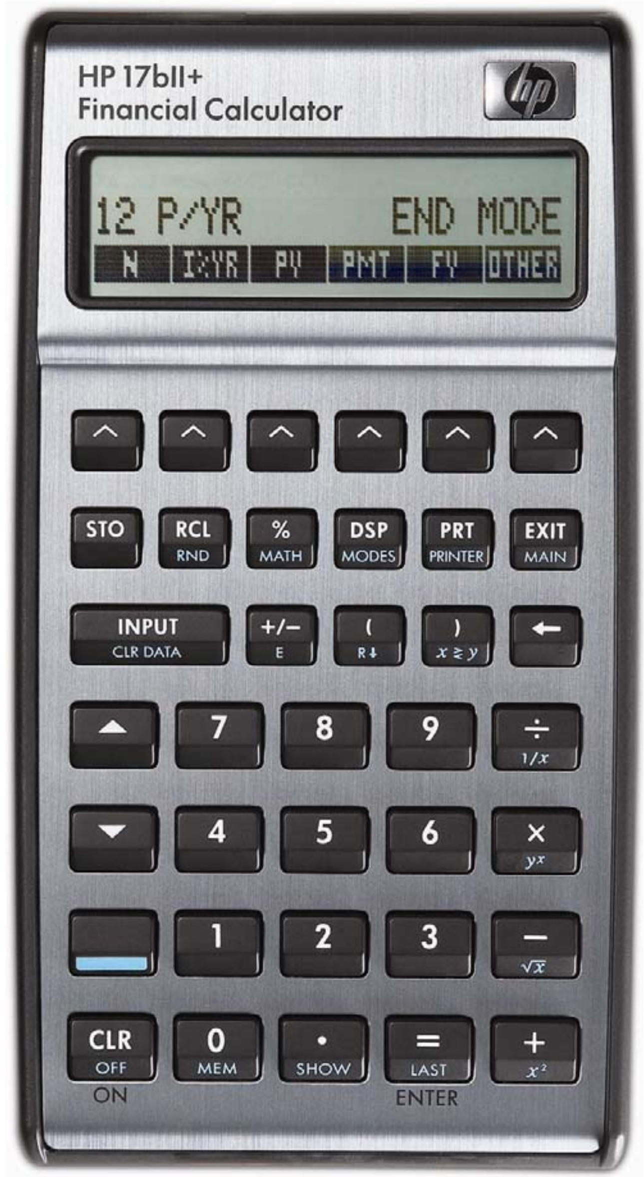
hp calculators

HP 17bII+ Interest rate conversions

Converting interest rates

Converting interest rates on the HP 17bII+

Practice converting interest rates



Converting interest rates

There are many situations where an interest rate with a specified compounding frequency must be converted into an equivalent rate with a different compounding frequency. Examples include situations where a need exists to compare alternative interest rates with different compounding frequencies and where the payment frequency does not match the compounding frequency in an annuity problem.

The basic relationship used to convert interest rates from one compounding frequency to another is shown in figure 1 below.

$$EffectiveRate = \left(\left(1 + \frac{NominalRate}{NumberPeriodsYear} \right)^{NumberPeriodsYear} \right) - 1$$

Figure 1

The effective rate is an annually compounded interest rate that is equivalent to the nominal rate compounded more frequently. The nominal rate is the stated rate in a problem, such as 5%, compounded monthly. The number of periods per year is also stated in most problems. An interest rate compounded monthly involves 12 periods per year, for example.

Using the relationship shown in figure 1 above, any effective annual rate can be converted to a rate compounded more frequently and any rate compounded more frequently than once a year can be converted to an effective annual rate.

Converting an interest rate with continuous compounding uses the formula below. Of course, there is no need for the number of periods per year, which has no meaning under continuous compounding. In the formula below, e is the numeric constant 2.7182818…

$$EffectiveRate = e^{NominalRate} - 1$$

Figure 2

Converting interest rates on the HP 17bII+

The HP 17bII+ calculator has functions that use the relationship shown in figures 1 and 2 built-in and available to the user by pressing FIN ICNV. When pressed, the user must choose between periodic and continuous compounding as shown below in figure 3.

Figure 3

If periodic is chosen, the functions are displayed as shown in figure 4 below.

Figure 4

If continuous is chosen, the functions are displayed as shown in figure 5 below.

Figure 5

Interest rates are entered as they would be written before a percent sign, i.e., 5% is entered as 5 and not as 0 . 0 5.

Practice converting interest rates

Example 1: What annual rate is equivalent to 8%, compounded monthly?

Solution: EXIT FIN ICNV PER
8 NOM% 1 2 P
EFF%

Figure 6

Answer: 8.30%. Over time, an annual rate of 8.30% would produce the same effects as 8%, compounded monthly.

Example 2: What rate, compounded monthly, is equivalent to an effective annual rate of 8.30%?

Solution: EXIT FIN ICNV PER
8 . 3 0 EFF% 1 2 P
NOM%

Figure 7

Answer: 8%

Example 3: Which interest rate would give you better returns as an investor? 4.25%, compounded quarterly or 4.15%, compounded monthly?

Solution: The way to solve problems like these is to convert each rate to an effective annual rate and then compare them.

EXIT FIN ICNV PER
4 . 2 5 NOM% 4 P
EFF%

Figure 8

EXIT FIN ICNV PER
4 . 1 5 NOM% 1 2 P
EFF%

Figure 9

Answer: 4.25% compounded quarterly is equivalent to 4.32% compounded annually (or to an effective rate of 4.32%), while 4.15% compounded monthly is equivalent to 4.23% compounded annually.

Example 4: Convert 5%, compounded monthly to an equivalent semiannual rate.

Solution: First, convert the monthly rate to an effective rate.

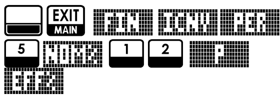


Figure 10

Then convert this rate to a semiannual rate.

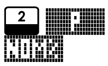
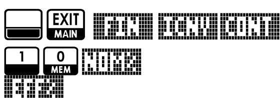


Figure 11

Answer: 5%, compounded monthly is equivalent to 5.05%, compounded semiannually (to more decimal places, it is actually 5.05237359091%, compounded semiannually).

Example 5: What effective interest rate is 10% compounded continuously equal to?

Solution:



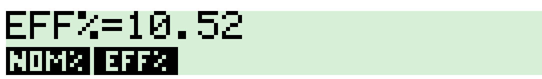


Figure 12

Answer: 10% compounded continuously is equivalent to an effective rate of 10.52% (which is 10.52% compounded annually).