

Why Do Web Mortgage Calculators and Excel Compute Interest Differently than this Book?

Instructors and some students may discover that when they plug the same variables into this book's formulas and certain web mortgage calculators or Excel, they come up with different answers. And, if they happen to have a mortgage and double check their own loan details, the numbers from the web calculators match their mortgage, not the book's. How can this be? Is the book wrong?

The answer is that mortgage interest rates are not quoted to the general public in the way that naturally fits into an economist's present value calculations. For consistency's sake, the author decided to quote them at compound annual rates.

To illustrate this issue, let's walk through discussion question number 15 on page 87 in the text. (Note this requires use of the chapter appendix on pages 88-89.) The question states:

You are considering buying a new house and have found a 30-year fixed-rate mortgage for \$100,000 with an interest rate of 7 percent. This mortgage requires 360 monthly payments of approximately \$651 each. If the interest rate rises to 8 percent, what will happen to your monthly payment? Compare the percentage change in the monthly payment with the percentage change in the interest rate.

Using Excel or many web interest calculators, students may calculate the payment to be \$665.30. Furthermore, if the interest rate on the \$100,000 loan increased to 8 percent, a student may calculate the new monthly payment as \$733.76, representing an increase of 10.3 % versus an increase in the rate of approximately 14.3 percent. Yet the book answers for the question are \$651 and \$714, respectively.

Walking through the problem step by step, we see that a 7 percent annual rate is a $(1.07)^{(1/12)} = 1.00565414$. Subtracting one and multiplying by 100, you get 0.56414% at a monthly rate. It is not a $7/12 = 0.5833333$ monthly rate, as seen by using Excel.

And using the formula in the appendix to Chapter 4: $(\$100,000 * 0.0056414) / [1 - (1/(1.0056414)^{360})] = \651

As for the 8% interest rate, the computation goes the same way:

$(1.08)^{1/12} - 1 = 0.006434$
and then

$C = (\$100,000 * 0.006434) / [1 - (1/(1.006434)^{360})] = \714

Since financial intermediaries do not quote mortgage rates at compound annual rates, you can't use the mortgage calculators to get to this answer. The Wall Street Journal's mortgage calculator

gives an answer of \$665 -- that's the student's erroneous answer. And at 8 percent, the calculator gives us \$734 -- again, the student's answer.

The author concluded that it was better to teach about compounding interest, rather than suggest to students that you can just multiply the monthly interest rate by the number of months or the annual interest rate by the number of years. This the reason the book calculates answers this way.

