

## Economics 104 Homework Module 7

### Calculating Mortgage Payments and Calculating Maximum Loan Size, Given Income

This is a simple homework to be completed in two steps. Each step uses a single page in an Excel workbook labeled Maximum Mortgage Calculator, which will be available on the same page on which this assignment is found as a zip file labeled [MaxMorgCalc.zip](#). Find and open that file and look at the default values before proceeding.

Mortgage Payment Calculator (fixed rate loans)	
Principal:	250,000.00
Points:	2.0
Point Value:	5,000.00
Loan Amount:	255,000.00
Term (yrs):	30
Rate:	5.000%
Payment:	1,368.90

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The first page should look like this (some values may be different). This is a monthly payment calculator for a fixed rate mortgage where the user provides the loan amount (principal), the number of points (see the lecture), the term in years, typically 30 or 15, and the interest rate. The default value tells you that a \$250,000 loan with 2 points financed over 30 years at a fixed rate of 5% will require a monthly payment of \$1,368.90.

The principal value does not include the down payment and therefore does not reflect the value of the home purchased or refinanced, merely the final loan balance after points.

Also, the loan payment shown does include all payment for principal reduction and interest, but does **not** include *impounds*, which is the portion of the monthly payment for property insurance and taxes (see the lecture).

$$MP = \left[ \frac{LP \left(1 + \frac{r}{12}\right)^n \left(\frac{r}{12}\right)}{\left(1 + \frac{r}{12}\right)^n - 1} \right]$$

The solution value (MP) is determined by this reduced-form equation (from a geometric series) shown on the left, where  $r$  is the rate above expressed as a decimal (0.05),  $LP$  is the loan amount after points are added, and  $n$  is the number of years in the loan term (30).

#### Step 1: Use the loan calculator to estimate a monthly payment

This step will be made simple, just to make a point. In the fall of 2012 the Federal Reserve System was

##### 30-Year Fixed (Conforming)

(Maximum Loan: \$417,000)

Rate	APR	Points	Est. Pymt./\$1,000
3.250	3.40%	1.000	\$4.35
3.500	3.57%	0.000	\$4.49
3.625	3.66%	-0.500	\$4.56

pursuing a policy called QE3 that was pushing down long-term fixed-rate loan interest rates to historically low levels. For example, in late November 2012 the **SchoolsFirst Federal Credit Union** offered the low purchase/refinance rates for fixed rate mortgages shown on the left.

Your teacher, the person writing this homework assignment, had a real estate loan outstanding with a current monthly payment of \$1,511.28, financed five years earlier with a 30-year FRM at the then-attractive rate of 4.625%. The current loan balance on that loan is \$278,312.88. As soon as this homework was posted, your teacher began the paperwork to refinance this loan, using the 3.25% loan with one point. Answer these questions:

<b>1a.</b> What will be you teacher's new monthly payment?	
<b>1b.</b> What will be your teacher's monthly savings from refinancing?	

## Step 2: Mudder gets a job and buys a house, or does not buy a house.

That was easy. Now go to the second page of your Excel Workbook and find the Maximum Loan Calculator, which will look like this spread on the left.

<b>Maximum Loan Calculator (fixed rate mortgage)</b>	
Net Monthly Income:	4,000.00
Threshold %:	40
Max Monthly Payment:	1,600.00
Max Monthly:	1600.00
Desired term:	30
Rate (%):	5.000%
UnAdj Max Loan:	298,051
Points (%):	2.0
Net Max Loan Balance:	292,206
Down Payment %:	10
Max Home Value:	<b>324,674</b>
Memo: Down Payment:	32,467

This is based on the part of the lecture where you try to estimate the maximum home value that you can afford given your monthly income (take-home pay), interest rates, and down payment that you have saved.

In the default example, net monthly income (which would *be after-tax joint* (combined) *income* if married) is assumed to be \$4,000 per month where the borrower is using an aggressive 40% income threshold (35% would be more moderate - see the lecture) and is considering financing with a 30-year FRM available at 5% with 2 points. *Assuming that the borrower has the necessary down payment of 10%*, then the maximum home value that this income can afford is a little less than \$325,000.

Obviously if the borrower has a lower down payment than that shown then that would place an upper cap upon the maximum home value. In other words, if the borrower has only \$25,000 for a down payment, if the minimum down payment required is 10%, then obviously the maximum loan value for that borrower is \$225,000, regardless of any income that would qualify for more.

Suppose you graduate from college and you go to work in Portland Oregon for Intel or a tech firm that pays a good salary. You are still single. Suppose your net monthly income equals **\$4,250** per month. Your parents tell



you that they will give you an amount equal to 10% of the value of any home you buy so long as you otherwise qualify for a loan, so you don't have to worry about a down payment. At the time you start looking lending rates have risen some from where they were in November 2012, but are still low at **3.75%** with **1 point** for a 30-year FRM and **3.15%** with **1 point** for a 15-year FRM. It is also clear that the bank will accept a **40%** threshold. You start looking around and you spot the home shown on the left for sale for **\$399,950**. [This was an actual house for sale at this price in Portland in late 2012].

**Question 2a:** Can you afford this home if your parents give you the down payment?

**Question 2b:** What would be your payment on this house if you wanted to finance it on a 15-year FRM? Could you afford that?

**Question 2c:** Suppose you decide to wait for four years and the full effect of QE3 kicks in, producing a modest inflation and a surge in interest rates. Your income keeps up with inflation and you also get married, so your joint combined income climbs to \$9,000 monthly. That's a lot! But this little house is now worth \$520,000, a price that it had in 2005 (literally!) and now the 30-year FRM is 8% at 2 points.

Can you and your new spouse buy the house now?

**Final Exam Question:** If you get a job in Portland Oregon upon graduation and your parents offer to make your down payment on a home loan, will you be able to afford such a purchase? What might happen if you wait? What did your homework tell you about this?