

VBA Semester Project
for MBA 614, Section 2
taught by Dr. Gove Allen

Affordable Home Calculator

by Tim Ehat

Executive Summary

Background: Many students graduating from college are starting their first “real” jobs and embarking on a new adventure, including learning how to best manage their newfound income and make wise financial choices over their coming years as he or she begins to make larger purchases, including the purchase of his or her first home.

Problem Description: A first-time home buyer is often unsure where to begin. “How much money can I borrow?” and “How much money *should* I borrow?” are often among the first questions. “What do all these different terms mean?” often follows next.

Overview of Solution: This project attempts to provide some help to anyone in this situation. The goal of the project is to provide specific numbers for the mortgage a home buyer might be approved to borrow and to contrast these numbers with figures representing more wise and conservative amounts for a mortgage given the borrower’s financial position.

While many calculators that exist online provide a similar functionality, the various terms and questions are often new to a first-time home buyer. This VBA-enabled workbook for Excel provides users with a helpful “wizard” that guides them through the different figures necessary to calculate the desired values. At each point, help is provided to explain terms and provide links to reference websites that can help the user determine how he or she should answer each question.

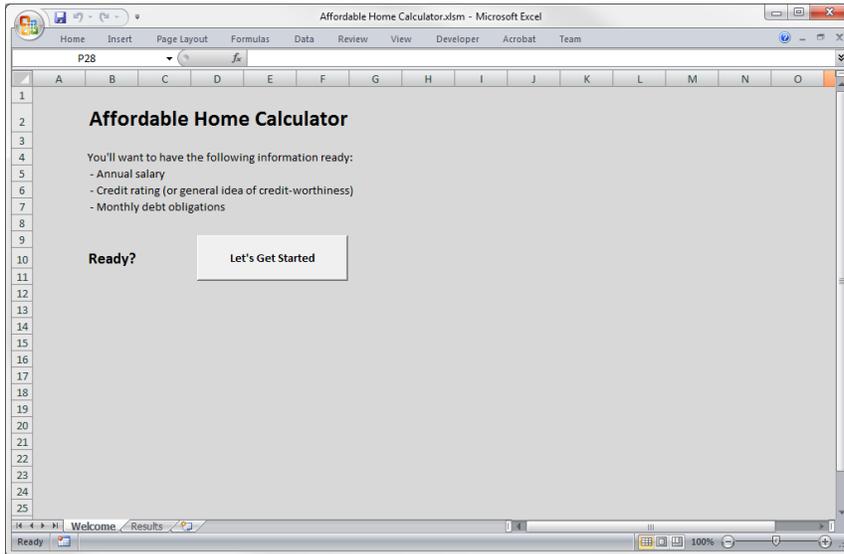
An added benefit of this method is that it allows the user’s answers to the questions to be saved to the workbook so he or she can come back and modify their answers as he or she learns more and knows more about what they want in a home. In addition, personal information is not sent out over the Internet, like with online calculators.

Implementation Documentation

While many Excel spreadsheets exist to calculate the amount of money a potential home buyer can borrow, I felt that with the goal of making this solution as easy to use as possible, it would make sense to replace long spreadsheets with locked cells and spare help with graphical user interfaces that separate the steps of the process into a series of pages with inline help text and links to external sources.

Perhaps the best way to illustrate what was done for this project is to show the various screens that a user will see when using the program and to describe the activity going on behind the scenes for each screen.

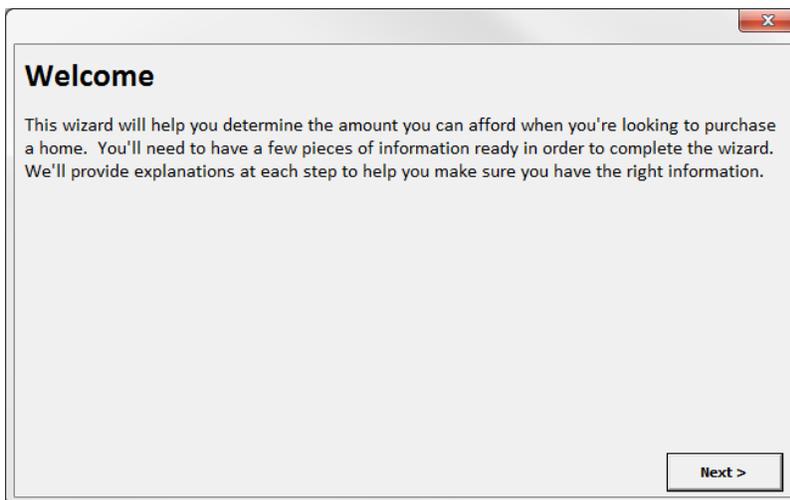
The “Welcome” Page



This simple welcome page describes the information a user will need to have handy when using the program. These represent some of the bits of information that a user will just have to “know.” Other pieces of information will either be calculated, or there will be help text and web resources along the way to guide the user.

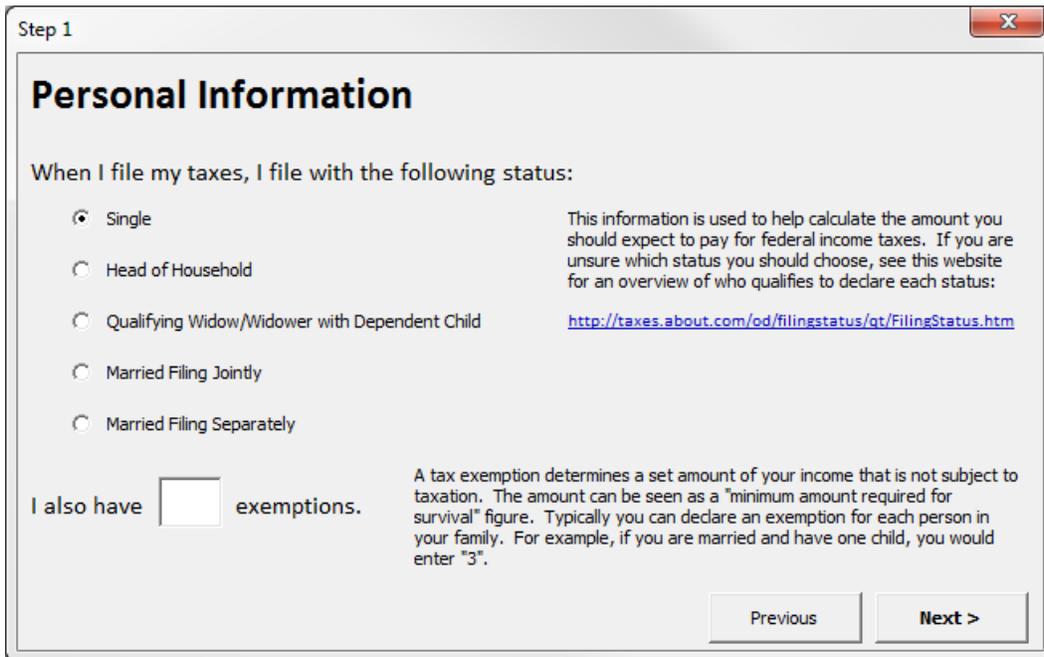
Clicking the “Let’s Get Started” button calls a sub procedure that opens the first User Form.

The “Welcome” Dialog



The welcome dialog describes the purpose, goal, and methodology of the upcoming steps. Each dialog contains buttons in the lower-right hand corner to guide the user forward (and backward, if necessary) through the steps. Clicking these buttons hides and shows the appropriate user forms.

“Step 1” Dialog



The screenshot shows a dialog box titled "Step 1" with a close button in the top right corner. The main heading is "Personal Information". Below this, the text reads "When I file my taxes, I file with the following status:". There are five radio button options: "Single" (selected), "Head of Household", "Qualifying Widow/Widower with Dependent Child", "Married Filing Jointly", and "Married Filing Separately". To the right of these options is explanatory text: "This information is used to help calculate the amount you should expect to pay for federal income taxes. If you are unsure which status you should choose, see this website for an overview of who qualifies to declare each status:" followed by a blue hyperlink: <http://taxes.about.com/od/filingstatus/qt/FilingStatus.htm>. Below the radio buttons, there is a text input field with the label "I also have" and the text "exemptions." to its right. Further right is another block of text: "A tax exemption determines a set amount of your income that is not subject to taxation. The amount can be seen as a 'minimum amount required for survival' figure. Typically you can declare an exemption for each person in your family. For example, if you are married and have one child, you would enter '3'." At the bottom right of the dialog are two buttons: "Previous" and "Next >".

Step one collects personal information to set the stage for the affordability calculation. In particular, these questions will help with the automatic tax calculations that will take place in step two. The radio group allows the user to choose their tax filing status. For users who are unsure of their filing status, help text to the right explains the need for the question and a link to a helpful web resource that explains who qualifies for each status. (See the “Difficulties Encountered” for more about how I created this hyperlink.)

Step one also asks for the number of exemptions (explaining what it means and what number is expected).

When a user clicks the “Next” button, their selections are stored on the “Results” worksheet of the Excel workbook for later review, storage, and for use in later calculations. In this and all the other dialogs, any previous answers stored in the “Results” worksheet are used to pre-populate the fields on the dialog upon initialization.

“Step 2” Dialog

The screenshot shows a dialog box titled "Step 2" with a close button (X) in the top right corner. The main heading is "Annual Income". Below this, there are five rows of input fields and explanatory text:

- Gross Income**: A text box with a dollar sign (\$) and a value of 0. The explanation states: "This represents your annual salary. This amount is pre-tax and before any other expenses or contributions have been taken out."
- Federal Income Tax**: A text box with a value of 0. The explanation states: "This amount is based on 2012 Federal Income Tax tables and assumes the standard deduction and exemptions based on your filing status and family size."
- FICA/Payroll Taxes**: A text box with a value of 0. The explanation states: "This amount represents the employee portion of the social security, medicare, medicaid, and other payroll taxes."
- State Taxes**: A text box with a dollar sign (\$) and a value of 0. The explanation states: "Enter the dollar amount you expect to pay for state taxes. General state tax rates can be found here: <http://www.bankrate.com/finance/taxes/check-taxes-in-your-state.aspx>"
- Other Taxes/Adjustments**: A text box with a dollar sign (\$) and a value of 0. The explanation states: "If you want to adjust any of the figures above, you can enter a dollar amount here as an offset." Below this text are two radio buttons: "Increase" (selected) and "Decrease".

At the bottom of the dialog, there is a "Net Income/Take Home Pay" field with a value of 0. To the right of this field are two buttons: "Previous" and "Next >".

Step two collects information regarding the user’s income and taxes. Each field (including those that are automatically calculated) also has an explanation. The “State Taxes” field cannot be easily calculated automatically since each state has separate tax laws and the required work to support (and track) each state’s tax rates and methods is beyond the scope of this project. Instead, a link to a website maintained by a larger organization provides the user the information he or she will need to make any calculations necessary to complete this question.

Federal income tax is based on the 2012 Federal Income Tax tables stored within the program. The appropriate tax table is selected automatically based upon the user’s filing status chosen in step one. In addition, the appropriate standard deduction and tax exemptions are taken from the user’s stated gross income as part of the calculation in an attempt to determine the appropriate tax as closely as possible. FICA/Payroll taxes represent the employee-paid portion of this tax that is automatically withheld as part of the payroll process. The percentage for the FICA tax is stored within the program and represents the reduced 2012 rates.

A user can choose to adjust the final net income/take home pay figure through the use of the final text field. This field, and other fields in the program, has been limited to numeric characters only (see “Difficulties Encountered” for more information about the technique used to accomplish this). The radio button makes it explicitly clear whether the amount should be added or subtracted in the calculation.

Every interaction with the fields and radio button in this dialog will automatically trigger a re-computation of the various fields, so the user can see the information change as they work.

“Step 3” Dialog

Step 3

Monthly Obligations

Debt Payments \$

Enter the total dollar amount of any monthly credit card debt, car payments, student loan payments, and any other payments for debts. This amount will affect the amount of money a lender will loan you for a mortgage.

Other Adjustments \$ Increase Decrease

Enter the dollar amount of any other monthly amounts you wish to remove from what would otherwise be considered "take home pay". This might include money contributed to a 401k (or other retirement savings plan), amounts spent for health (or other) insurance, and amounts paid as tithes or contributions to a church, charity, or other organization. This amount does not influence the amount a lender will loan you, but will help you evaluate the actual loan amount you wish to take on considering your other spending decisions.

Previous Next >

Step three is a simple step gathering necessary information that will be helpful in determining what actual mortgage payment will be most manageable and appropriate for the user given their complete financial situation. While banks will consider total monthly debt payments when deciding to approve a loan, they sometimes allow total debt payments to go beyond what will be most comfortable for a borrower. This program will take these payments into account in determining what is affordable.

In addition, “Other Adjustments” allows the user to modify their monthly “take home pay” amount based on spending decisions they choose to make—such as savings or charitable contributions (including tithing). When considering that a mortgage payment should be between 25% to 33% of one’s take home pay, significant amounts of money assigned to other interests can reduce the amount of actual take home pay. The values here are used in the final, most conservative calculations. While not necessarily fitting the overall idea of the “25% to 33% take home pay” rule, the final calculation provides a nice reality check.

Again, like other dialogs, these fields are saved to the “Results” spreadsheet, pre-populated with any saved information, and limited to appropriate data. The “increase” or “decrease” radio buttons allow the program to determine how to store the “other adjustments” amount on that spreadsheet for clarity later and are also automatically set based upon any stored information.

“Step 4” Dialog

Step 4

Credit Worthiness/Mortgage Interest Rates

Interest rates are always changing. In addition, your credit score (and other factors) will affect the interest rate you will pay on a mortgage. You can choose the given interest rate below (which has been automatically loaded from Wells Fargo's website containing their interest rates as of today), or you can choose to enter your own interest rate you think you can obtain from a lending institution of your choice.

Use the interest rate from Wells Fargo

4.178% This interest rate is Wells Fargo's stated rate for refinancing a home with a 30 year loan with fixed interest rate. You may choose to use the option below to obtain a potentially more accurate figure.

Enter my own interest rate

% Enter in percentage terms (ie. Enter "4.125" for 4.125%)

There are several helpful websites to help you determine the interest rate you may pay:

[Wells Fargo \(no credit score required\)](#) [BankRate.com](#) [Zillow.com](#)

Previous **Next >**

Step four is perhaps one of the most helpful dialogs for a first-time home buyer. When I was starting to look into the process since I'll likely be making a decision in this area with the next several years, I had no idea what interest rate I'd actually pay. I knew that rates vary based upon credit scores, but wasn't sure what to guess. Are the commercials on the radio typical rates, rates only for those refinancing, rates for those with perfect credit, etc? I wasn't sure.

To help users, the program automatically pulls an interest rate figure from Wells Fargo's website using a web query upon the loading of this dialog. This figure represents their going rate for a 30 year fixed rate on a refinance, but is pretty close to their rates for new home purchases. It's a great starting figure for those who are unsure. The "Enter my own interest rate" item allows users to specify a more exact rate, if they choose to obtain one. Three hyperlinks are provided to help users get a good array of ideas here.

The web query to determine the interest rate is performed only once during the "wizard" process in order to prevent awkward pauses when moving back and forward through the dialogs. The user's choice is saved to the "Results" spreadsheet, of course, and will pre-populate the "enter my own interest rate" box on later visits, allowing the Wells Fargo interest rate to refresh automatically on subsequent revisits to the program.

“Step 5” Dialog

The screenshot shows a dialog box titled "Step 5" with a close button (X) in the top right corner. The main heading is "Property Taxes, Insurance, and Down Payment".

Property Taxes \$ This might feel like a "chicken and the egg" sort of thing, but make a guess as to what your annual property taxes will be. If you enter a value for a home you envision with a \$200,000 appraised value, and that value later seems too high, you might choose to change your value. Property tax rates: [Retirement Living \(Lots of Helpful Tax Rates by State\)](#)

Insurance \$ Include:
Homeowner's insurance. The national average is \$481.
Private mortgage insurance. If your downpayment is less than 20% of the home's value, you'll need to pay PMI. Averages \$50 to \$80.

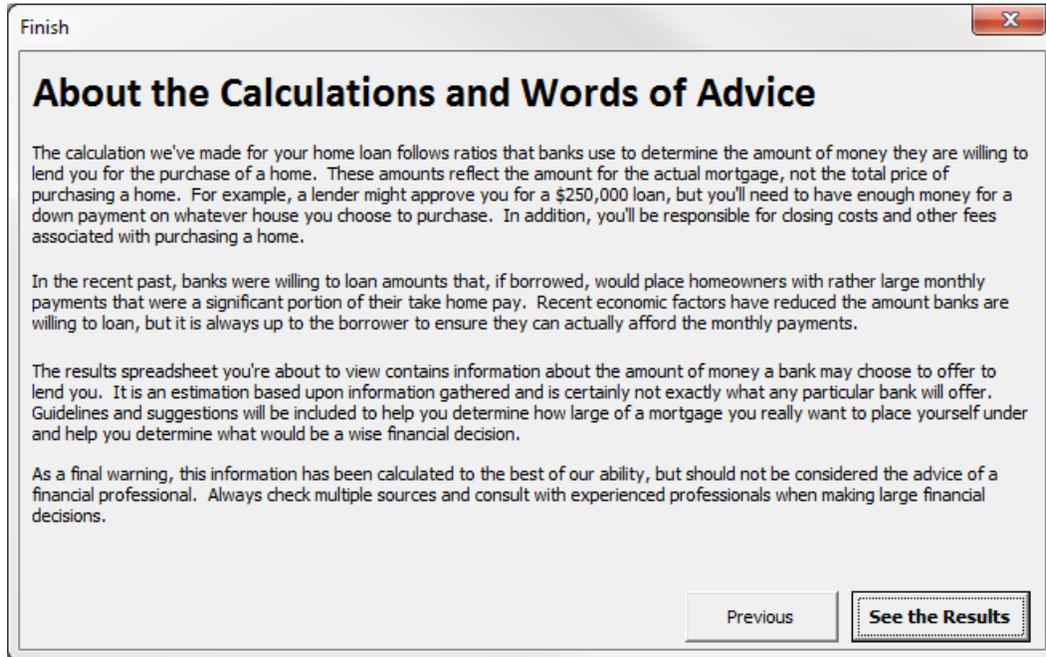
Down Payment Percent Dollars
The amount you have/desire to pay as a downpayment. Enter percentages in percent form (ie. "25" for 25%) and dollar values without the "\$" sign.

At the bottom right, there are two buttons: "Previous" and "Next >".

Step five is the concluding step in the process. These final figures help in determining the actual mortgage value a user might be approved for and in determining what the total value of the home will be including the down payment. Again, help text is given to guide the user through each field. While property taxes are a bit of a “chicken and the egg” sort of a proposition, the amount is often used in calculating the mortgage amount a borrower can be approved for. (How do you know what your property taxes will be unless you know the value of the house? How will you know what house you can afford to buy unless you know how much you’ll be spending each month on property taxes? Not easy, but at least we can take a stab at it and come back later to adjust, if need be.)

Again, like other dialogs, fields are saved upon clicking “Next” and pre-populated with saved values. The “down payment” box allows users to select either a percentage down payment they wish to make, or a dollar amount (if they already have an amount in savings or other idea of the figure they hope to spend).

The “Finish” Dialog



The final dialog gives an overview of what the user is about to see on the “Results” screen. The results screen has several numbers and figures, not just a single final number—it’s not that easy if you’re going to try and fit your exact circumstance.

In addition, the dialog warns that the final information, while valuable, isn’t final and not the advice of a financial professional.

Upon clicking “see the results”, the calculations are ready for view.

The Results Worksheet

Affordable Home Calculator.xlsm - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Developer Acrobat Team

P1

Your Results

Determining Information

Gross Income:	\$	80,000.00
Tax Filing Status:	Single	
Standard Deduction:	\$	5,950.00
Number of exemptions:		1 (calculated automatically)
Federal Income Tax:	\$	12,722.50 (calculated automatically)
FICA/Payroll Taxes:	\$	4,520.00
State Taxes:	\$	4,000.00
Other Taxes/Adjustments:	\$	-
Net Income/Take Home Pay:	\$	58,757.50
Monthly Debt Payments:	\$	350.00
Other Monthly Income Adjustments:		(\$870.00)
Interest Rate:		4.178%
Property Taxes:	\$	4,000.00
Annual homeowner insurance:	\$	650.00
Down payment method:	Percent	
Down payment value:		0.2

Anticipated Approval

Banks use different calculations to determine your ability to pay a mortgage. One of these calculations is called the "back end ratio", which accounts for your income and other debt obligations. The following shows values based on a conservative and an aggressive back-end ratio. You might not be approved for any loan within this range, but it gives a ballpark idea of what you might be looking at.

	Mortgage Amount	Monthly Payment	Purchase Price	Downpayment
Conservative:	\$231,513	\$1,517	\$289,391	\$57,878
Aggressive:	\$299,856	\$1,850	\$374,820	\$74,964

More Affordable Mortgages

Although you might be approved within this range, you should also consider your other expenses. In general, you probably want your monthly payments to represent 25% to 33% of your actual takehome pay. Mortgages above this amount are more likely to place you in a situation where you feel "house poor"--paying so much money on your mortgage, property tax, and insurance payments that you don't have as much money left over for other endeavors.

	Mortgage Amount	Monthly Payment	Purchase Price	Downpayment
25%:	\$171,531	\$1,224	\$214,414	\$42,883
33%:	\$251,845	\$1,616	\$314,806	\$62,961

You'll notice these amounts are probably substantially less than the amounts above. You might follow these guides and buy a bit smaller home than you might like, or you might choose to wait a bit longer before purchasing your home. Remember, there's more to life than the house you live in. Make sure to always plan ahead and have enough money to do the things outside your home that you want to do.

Taking Other Monthly Expenses into Account

If your other monthly expenses are taken out of your "take home pay", the "more affordable" figures above look like this:

	Mortgage Amount	Monthly Payment	Purchase Price	Downpayment
25%:	\$126,937	\$1,007	\$158,671	\$31,734
33%:	\$192,980	\$1,329	\$241,226	\$48,245

Ready

The Results Worksheet (continued)

Seen here with sample data for a single person making \$80,000 a year, the results worksheet provides a wealth of information to help new buyers determine the amount of money they should spend on a new home.

The first section “Determining Information” is the repository for all the questions asked during the “wizard”. These are the values used in the calculations seen below and are used to pre-populate the form fields during any subsequent run of the wizard.

The second section “Anticipated Approval” gives a rough idea of the range that a borrower could expect to be approved for on a mortgage, based upon their income and financial position as considered by a bank.

The third section “More Affordable Mortgages” takes into account the user’s actual take home pay and guidelines for mortgage amounts within those guidelines. It is a good “here’s what I should actually spend” category. These values should be less than those in the “Anticipated Approval” section.

The fourth section “Taking Other Monthly Expenses into Account” does just that. It is the most conservative of the estimates and is generally a bit of a “low ball” figure (largely depending on the amount of “other monthly adjustments” specified in step 3). It’s provided as a quick reality check of what the second section would look like if it were based on take home pay after those “other monthly adjustments” are taken into consideration.

Difficulties Encountered

Hyperlinks in User Form Dialogs

It surprised me that hyperlinks were not available as elements to place user forms. After searching the web, I found that it was possible to change the text of a label to appear as a hyperlink and then to bind an action so that when the label was clicked, the appropriate URL was opened in the user's web browser. (Thanks to http://spreadsheetpage.com/index.php/tip/adding_a_hyperlink_to_a_userform/ for some sample code that I followed.)

Handling non-numeric text in User Form input fields

The "Step 2" dialog automatically performs calculations based upon the data entered into the various forms of the dialog. While my initial idea for the project was to validate all data at the end, removing any non-text characters from numeric fields, these calculations needed the data to be clean immediately (as entered). I expected the form fields to have some property that would allow me to limit the input to specified character sets, but was unable to find such a property. Upon searching the Internet, I found that it simply didn't exist. Some helpful code did show that I could listen to the key press event for each input field and if the character was going to be something I didn't like, I could effectively ignore that character and prevent it from populating the input field.

In addition, during the automatic calculation, I found that empty fields were causing type-mismatch errors as I tried to perform calculations using empty/null values. Adding "0" into the fields when empty seemed like a great idea, but meant that all numbers would essentially be prefixed with "0" in the dialogs since "backspacing" out the 0 would empty the dialog and again add the "0" in. I found that I could simply leave the fields blank and perform calculations with variables that were updated to reflect the values of the fields and accommodated for empty field values.

Federal Income Tax Calculation

The federal income tax calculation was a bit of a tricky one to figure out since we have a nice graduated tax system where different portions of income are taxed at different rates. I found that using a named range with the appropriate tax table (updated using VBA code according to the appropriate filing status) on the "Results" sheet made it easier to loop through and calculate each portion of the tax.

Assistance Report

As mentioned in the previous section, I used Google to help me resolve several difficulties. I used the code on the linked page for adding hyperlinks to the user forms, and I modified code found posed by user “Richie” on this webpage for forcing numeric-only input:

<http://www.mrexcel.com/forum/showthread.php?t=48404>.

In addition, the CNN website “[How much house can you afford?](#)” provided a great check figure and some average values and general guidelines for what constitutes an affordable mortgage.

Other information in the program (such as income tax schedules) was found through various online resources. The analysis and ideas presented are from my research throughout the semester and represent my understanding of that financial material. Many resources were helpful in obtaining and clarifying this knowledge.

Many web searches and VBA websites helped with a lot of the little problems and steps that I needed to figure out to make the whole thing work.