

## Problem Set 2: *Housing Affordability*

**Objective:** The objective of this assignment is to introduce students to the process of purchasing a home from a lender's perspective. This includes but is not limited to preparing amortization tables and qualifying the buyer.

**Assignment:** Please download the spreadsheet *Affordability\_Fall2005.xls* from my website and answer the following questions. Please highlight your answers in **yellow** and turn in a hard copy of your results together with your spreadsheet on a disk. Please print your name clearly on the disk and scan the disk for viruses. ***This is an individual assignment.***

Description of the Neighborhood<sup>1</sup>: Since its first settlement in the early 18th Century and eventual incorporation in 1926, Wyckoff, New Jersey has developed into a lovely tree-lined residential community of approximately 16,000 residents. The Township of Wyckoff comprises seven square miles and is only 27 miles from New York City.

Located in Northwest Bergen County, midway between Saddle River and the Ramapo Valley, the Township of Wyckoff was originally inhabited by the Lenape Indians. In 1720, the first settlers were recorded as John and William Van Voor Haze. There is reason to believe that the name Wyckoff is a derivation of the Indian word "wickoff" meaning high ground or "wickok" meaning water.



The Township was the site of the Sicomac "happy hunting ground" where many of the Lenape, including Oratam, Chief of the Ackingshacys, were buried. The high ridge connecting the present Township with Hawthorne was the place where the Minsis of northern New Jersey met to barter with the Long Island Indians.

Some of the original atmosphere of its rural heritage has been preserved in this peaceful community of Wyckoff. Traditional colonial architecture, a scattering of historic farmhouses, generous size properties, and a large selection of newer homes make Wyckoff a pleasant community in which to live.

There are a total of six public schools in addition to private and parochial schools in the area. High school students attend either the Ramapo High School in Franklin Lakes or the Indian Hills High School in Oakland. The township's recreational program provides year-round family activity for the active family. Soccer, football, baseball, basketball, tennis, plus a full summer program are all well attended with participation increasing each year.

Local and nearby shopping provide the neighborhood with diverse selections. Wyckoff residents also enjoy the unique Country Wildlife Center, the interesting historic

---

<sup>1</sup>Taken verbatim from <http://www.wyckoff-nj.com/> and <http://www.barrycolyer.com/wyckoff.htm#Description>

Zabriskie House and the Zabriskie Pond for winter skating. For a virtual tour of Wyckoff please visit [www.Wyckoff-NJ.com](http://www.Wyckoff-NJ.com) .

Loan Information: Loan rates are found in the worksheet labeled “Loan Rates (20050218)”. These rates are current (as of February 18, 2005 when this case was constructed) and are the rates that you will use in this assignment. The current and historical loan limit on the size of single-family home mortgages that Fannie Mae and Freddie Mac buys from banks is located in the worksheet named “FNMA Limits (20050218)”. Mortgages that fall within these government sponsored enterprises (GSE) purchase limits are called **conforming loans** and are cheaper for consumers<sup>2</sup> because banks and thrifts can readily sell them to Fannie Mae and Freddie Mac or swap them for mortgage-backed securities. The GSEs are able to provide a lower cost largely because their government affiliation allows them to borrow at a lower rate than other finance companies. Fannie Mae and Freddie Mac sell large amounts of bonds and other debt securities and use the proceeds to finance their purchases of home mortgages. Loans that exceed the Fannie Mae/Freddie Mac loan limits are known as non-conforming or **Jumbo loans**.

Other Loan Criteria of the Lender: Like other lenders, your financial institution requires that buyers must purchase private mortgage insurance (PMI)<sup>3</sup> if they put down less than 20% of the purchase price of the home. Currently PMI is .0050 or ½ of 1% of the outstanding loan balance. The buyers are required to maintain their PMI until their loan balance is less than 80% of the contract sales price of the home. (Note: Unless the borrower terminates PMI when the 80% balance is reached, the borrower continues to pay PMI). Any loan whose contract loan amount exceeds the Fannie Mae/Freddie Mac loan limits is considered a Jumbo loan. Borrowers are required to set up an escrow account, which includes principal, interest, property taxes, and insurance, for 3 months.<sup>4</sup> This escrow amount is included in the total closing costs, which is discussed below. The bank requires that all points and fees be paid in cash (this is part of the total closing costs) rather than rolled into the mortgage e.g., the bank will not finance the points and fees by increasing the mortgage amount. The bank uses the following ratios in qualifying the homebuyer:

Housing Expense-to-Gross Income Ratio: 28%

Long Term Debt-to-Gross Income Ratio<sup>5</sup>: 36%

where

---

<sup>2</sup>Mortgages bought by Fannie Mae and Freddie Mac typically have a rate about 0.30 percentage points lower than loans they are not eligible to buy.

<sup>3</sup>For more information on private mortgage insurance, please visit the industry’s website at <http://www.privatemi.com/>

<sup>4</sup>The rationale for this escrow account is in the event that a homebuyer loses his or her job. Time is required to find a new job.

<sup>5</sup>Lenders are sometimes flexible in these ratios. For example, if the LT Debt to Gross Income Ratio is say 36.4% they might round to 36%.

**Monthly housing expenses (PITI):** The sum of monthly payments for principal, interest, property taxes, homeowner's insurance<sup>6</sup>, hazard insurance (if required), private mortgage insurance (if required), and condo or homeowner's fees (if required).

**Monthly Debt Payments:** The sum of monthly payments on long-term debt, including the debt service payments on your potential home (including private mortgage insurance), car payments, student loan payments, and other personal loans requiring a periodic payment. Include your minimum monthly payment required on credit card balances carried over from month-to-month; but do not include credit card balances that you pay off entirely each month. Also, do not include your current mortgage payment if you are selling that property.

**Gross Income:** household's total monthly income before taxes. Alimony and child support payments, whether incoming or outgoing, should be reflected in the estimate.

In evaluating the income/salary of the borrower(s), the bank you go to WILL NOT count any bonus money due to its uncertain nature and frequency of payment (usually a lump sum payment rather than monthly payments).<sup>7</sup> In terms of necessary documentation, the bank requires 3 years of income tax returns, together with one year of receipts for the payment of utilities (phone, water, and electric/gas).

Closing costs: Closing costs are one-time fees paid at closing for the loan and expressed as a percentage of the mortgage amount. This includes points and origination fees paid to the lender and transfer fees required to complete the transaction. Assume that the total closing costs (including points and origination fees) are 3% of the contract loan amount<sup>8</sup>. Note: You should ask your lender for a copy of the "Good Faith Estimate of Closing Costs" which itemizes fees commonly charged in your area. These fees include but are not limited to appraisal fees (\$305 average), credit report (\$37), application fee (\$288), document preparation fee (\$186), and flood certification (\$18) among others. Closing costs to the buyer typically do not include the realtor's commission, which is paid by the seller, in general.

The Homebuyers: Frank Fasi and his wife, Joyce, are recent graduates of the Stern School of Business at New York University. Both have an undergraduate degree in Finance. Frank has worked full-time for City Hall Securities as its vice president for the

---

<sup>6</sup>Like your car insurance the cost of your homeowner's insurance will be dependent on the age, location, and type of home you have. Typically the insurance shouldn't cost more than .5% of the appraised value of your home. In cases of total loss, the insurance would cover the replacement value of the home, excluding the value of the land. For this case, assume that homeowner's insurance per year is .5%\*Purchase Price of House.

<sup>7</sup>Lenders typically include the bonus in the household income if: 1) The bonus is part of a collective bargaining agreement and must be paid; or 2) The bonus is included in the computation of income by the employer or if there is a history of bonuses. If there is a history of bonuses but the applicant does not know if a bonus is planned, nor does the employer divulge its plans for a bonus nor the projected bonus amount, the lender typically uses an average of past two years' bonuses to calculate income. A bonus history for compliance purposes is to be considered one year or more. However, the bonus is NOT included in household income if the bonus is totally discretionary by the employer, there is no previous bonus history, and the wages of the applicant are the basic source of income.

<sup>8</sup>In a typical real estate deal, closing costs total 2% to 5%. Exact fees vary by property cost and location.

past 3 years and earns \$150,000 per year. Joyce works for Beauty Queens of Tokyo and earns \$55,000 a year as a part-time model. They have \$150,000 in savings of which they wish to spend no more than \$80,000 for a downpayment + closing costs on a house. The couple has one car, a Lincoln Continental SUV, which they just purchased on a 4-year lease. Lease payments are \$500 per month. They also have on average a \$50,000 balance on their credit card which charges a 21% annual percentage rate (apr) that they carry over from month to month and for which they typically make payments of \$2,000 per month<sup>9</sup>. In addition to this, Frank has a student loan outstanding. Payment on the student loans is \$750 per month. The outstanding balance on his student loan is \$5,000. This is Frank's second marriage and Joyce's first marriage. They have no other debts outstanding.

The Fasis' have already seen several houses in Wyckoff and have chosen to put in an offer on the house (shown to the right) with a Multiple Listing Service (MLS) number of 2430047. The description of this house is given in the "Listing (Wyckoff)" worksheet. They have come to your firm for financing and would like you to help them in getting the deal done.



1. Home Prices in the Neighborhood (20 points): Homes that have sold recently in Wyckoff are found in the worksheet labeled "Home Prices (Wyckoff,NJ)".
  - a. Constructing New Variables from the Data: Since Frank has taken a course in statistics, he would like to use a regression model in helping him to price the house. Prior to doing a regression, he first transforms the data of sold properties by constructing the following new variables:

Dum Summer: Is a dummy or indicator variable. The variable is equal to 1 if the house that sold between the months of June through August otherwise the variable is set equal to zero (Hint: use the IF function in EXCEL). According to historic data from the U.S. National Association of Realtors, the summer months outpaces the balance of the year in sales since there is more home inventory and variety. It also corresponds to the ending of school, vacation time and nicer weather.

Time: If a house was sold in a given month, then enter the number corresponding to that month. For example, if the house was sold in December (September), then enter the number 12 (9).

---

<sup>9</sup>There are many credit card calculators available on the Internet. One such java applet is <http://www.dinkytown.net/java/DebtAmount.html>. Note that credit card companies calculate interest based on the annual percentage rate (apr) stated on the card. Caveat: Do not be fooled by basing your monthly payments on the low promotional interest rate that is only good for a short period of time. Your minimum monthly payment is typically calculated as 2% of your current outstanding balance. This is one of the most common methods used by credit card companies to calculate minimum payments.

Dum Split: Is a dummy or indicator variable<sup>10</sup>. The variable is equal to 1 if the house that sold is a Split Level otherwise the variable is set equal to zero (i.e., =IF(Q3="Split",1,0). This variable indicates whether buyers tend to put a premium on this style of house. Note: The house that Frank and Joyce are interested in is a Split Level.

Dum Colonial: Is a dummy or indicator variable. The variable is equal to 1 if the house that sold is a Colonial otherwise the variable is set equal to zero This variable indicates whether buyers tend to put a premium on Colonial houses.

Dum Sewer: Is a dummy or indicator variable. The variable is equal to 1 if the house is connected to the Municipal sewer system otherwise the variable is set equal to zero. This variable indicates whether buyers put a discount on houses connected to the local sewer system. The alternative to sewer is having a septic tank.

b. List versus Sale Price.

1) Reduction in List Price from Original List Price: Calculate the reduction in list price from the original list price using the following formula

$$(\text{Reduced List Price} / \text{Original List Price}) - 1$$

2) Discount/Premium from Original List Price: Calculate the Premium/Discount using the following formula

$$(\text{Sold Price}/\text{List Price})-1.$$

In addition to this, calculate the mean, median, standard deviation, maximum, and minimum for both columns of your calculated ratios. Is it likely that a typical seller in Wyckoff will reduce his or her original list price to a lower list price over time on average? What is premium or discount of the sale price from the list price on average (mean and median)? Is it always the case that the sale price is lower than the list price? What was the highest premium paid (if any)? What was the highest discount paid (if any)? Before answering this question, calculate the MAX and MIN of the premium/discount. On average, how good a job do realtors in this market do at pricing a seller's house for sale assuming a 5% margin for error? Please discuss.

c. Relationship between Property Taxes and Sold Prices: First, graph the relationship between property taxes and sold prices using an XY(Scatter) graph option. Add a trendline to this scatterplot by first clicking on the dots to highlight them, right clicking on the mouse and then selecting the add Trendline option (linear). Discuss

---

<sup>10</sup>Recall from statistics that you cannot have as many dummy variables for styles of houses as the number of housing styles that exist in your data set. You must have n-1 dummy variables if you have n housing styles so that the matrix is of full rank.

why a relationship should exist. Next, regress sold prices (y dependent variable) against property taxes (x independent variable) and use the regression to predict the justified price for the house that the Frank and Joyce are interested in (MLS2430047). To do a regression in Excel, pull down the Tools submenu then select Data Analysis and choose the Regression option (Tools → Data Analysis... → Regression). If the Data Analysis option is not shown, go to Tools → Add Ins... → check the box corresponding to Analysis ToolPak). What is the justified house price for MLS2430047?

- d. Relationship between Square Feet and Sold Prices: Using only houses for which the square feet and sold prices are reported, graph the relationship between square feet and sold prices using an XY(Scatter) graph option and adding a linear trendline to the scatterplots then discuss why there should be a positive linear relationship between these two variables. Next, regress sold prices (y dependent variable) against square feet (x independent variable) and use the regression to predict the justified house price for MLS2430047.
- e. Estimating the Sales Price vis-à-vis Regression: Perform a regression of Sales Price (dependent Y-variable) on the following X independent variables: DOM (days on the market), Total Rooms, Bedrooms, Baths, Property Taxes, Lot Square Feet, Dum\_Summer, Time, Dum\_Split, Dum\_Colonial, Dum\_Sewer. What is the estimated sales price of MLS 2430047? Assume that DOM (days on the market) is equal to 35 days, that the Frank and Joyce will purchase the house in February, and that the house has its own septic tank instead of being connected to the Municipal sewer system in Wyckoff.

How good a job does our regression model do in predicting the cross-sectional variation in sold prices to the cross-sectional variation in the independent variables? Should we include all of the variables in our regression estimate even if their T-statistic is not statistically significant at the 5% level (Hint: look at the F-statistic)? Which of our independent variables is statistically significant using the T-test? What is the lower bound of the predicted sale price using one standard error of the estimate? Note: This is the lower bound of the confidence interval of the predicted price that you learned in statistics. What is the likelihood that the sale price will exceed the list price for MLS 2430047?



2. Amortization Table (Base Case) (15 points): If Frank and Joyce put down 10% of the purchase price (1 - Loan to Value Ratio) and want a 30 year fixed rate mortgage, what will their monthly payments be if they were to purchase MLS 2430047 assuming that they agree to the full list price of \$629,000?
- a. Using Excel, construct a 360-month amortization table showing the beginning balance, debt service payment, interest payment, principal payment, and ending balance. Also show what their total monthly payment to the lender will be if this

amount differs from their monthly debt service payment. Given these flows<sup>11</sup>, calculate the annual percentage rate (APR), which is the true borrowing cost. Recall that the lender's IRR is equal to the true borrowing cost. Hint: you might have to put in a guess value such as .001 in order to calculate the IRR. Remember that this IRR is a monthly IRR and as such, you will need to multiply it by 12 in order to obtain the APR. Since there are points and loan origination fees, your APR should exceed the contract interest rate.

- b. Next, graph the interest payments and principal payments using the charting function in Excel. Explain why interest is declining and principal is increasing over time.
  - c. On another graph, plot the outstanding mortgage balance over time. Explain why the outstanding mortgage balance is declining over time. Discuss how a mortgage, which is a type of corporate bond, differs from the traditional corporate bond in terms of its principal amount?
3. Amount of Money Required by Borrowers (Base Case) (5 points): What is the total amount of money including closing costs that the Frank and his wife must come up with (i.e., the amount of equity) assuming that their offer price equals the list price of \$629,000?
4. Qualification of Buyers (5 points): What are the total long-term debt payments per month for Frank and his wife given the facts in question #2 above? What is the monthly housing expense e.g., principal, interest, property taxes, and property & casualty insurance per month? Assume that
- ANNUAL property taxes are 1.12% of the Listing Price
  - Homeowner's Insurance is \$1.93 per \$1,000 of sale price. Example: if the sale price was \$350,000 then the annual insurance is  $\$350,000 \times 1.93 = \$675.50$
  - Private Mortgage Insurance (PMI) is 1/2 of 1% of the outstanding loan balance.

Based on your bank's housing expense-to-total gross income ratio and the long-term debt-to-total gross income ratio, do Frank and Joyce qualify for the mortgage?

5. Some Deal Structuring Alternatives (10 points): Masa, Joyce's uncle, suggests that Frank and Joyce consider the following alternatives:
- Alternative #1: Reduce the offer price by 5% (95% of List Price) with no paying down of any credit card debt or debt on student loans.

---

<sup>11</sup>Even though the lender collects PMI, he passes this payment on to the insurer.

- Alternative #2: Pay the full list price since the seller has undervalued his house and pay down the VISA balance such that their monthly VISA payment is \$1,500 per month.
- Alternative #3: Reduce the offer price by 5% (95% of List Price) and pay down the VISA balance such that their monthly VISA payment is \$1,500 per month.

Do Frank and Joyce qualify for based on any of these three alternatives? Can they qualify without reducing either their credit card debt? Please explain.

6. Creative Financing using a 5/1 Hybrid Arm: Frank's aunt, Mary Souza, a realtor with Pocholinga Realty suggests that they should consider taking out a 5/1 hybrid loan since the monthly payments are lower (at least initially). Under this type of loan, the contract rate of interest is fixed for the first 5 years. It is "as if" they have a fixed rate loan (with the monthly payment calculations the same as taking out a 30 year fixed rate loan) for 5 years. After five years, the loan converts to an adjustable rate mortgage wherein the rate adjusts annually based either on the COFI or treasury rate depending on the index that they choose. Their line of reasoning is that not only would the interest rate be relatively lower but also they can refinance/roll over the mortgage at the end of 5 years into a fixed rate mortgage. What is the total mortgage payment per month for the first 5 years assuming that they can get the seller to agree to accept an offer price of \$597,000? What are the total long-term debt payments per month? What is the monthly housing expense? What are the total housing expense-to-gross income ratio and the long-term debt-to-gross income ratio? Do the Fasis' qualify for the mortgage? Please discuss.
7. Buying Down the Loan: Mufi Hanneman, a financial consultant who owes Frank a political favor, suggests that they buy down the loan for 3 years to a contract interest rate of 5% in lieu of taking out a 5/1-hybrid loan. His reasoning is that at the end of 3 years, both Frank and Joyce should be earning a higher salary and should thus be in a better position to cover the mortgage payments. This is essentially a graduated payment mortgage with one-step or gradation. How much must Frank and Joyce pay to the lender in order to buy down the loan for 3 years assuming that the house price is \$629,000? Do the Fasis' qualify for the mortgage based on the initial payments from the buydown? In particular, what is the total housing expense-to-gross income ratio and the long-term debt-to-gross income ratio based on the initial payments from the buydown? Is this a viable alternative for the Frank and Joyce? Why or why not?
8. Decision: Best Way to Structure the Deal: Assuming that Frank and Joyce want to purchase the house, under what terms (financing and offer price) would they qualify for the house? Which alternative would you recommend that they choose and why? Please explain.

**Reminder:** This is an individual assignment. Please turn in a hardcopy of your printout with the answers highlighted in **yellow**. Also, turn in your disk with your name printed clearly on the disk. Please scan your disk for viruses.