# Case 2: Housing Price Analysis

You currently own a house in Eastville, Connecticut, and are planning to move sometime next year. A friend has suggested that you sell the home on your own. The decision is a difficult one. Real estate commissions can be pretty hefty, but brokers bring a great deal of expertise to the process of selling a house, particularly the ability to set a reasonable asking price. In addition to factoring in things like square footage, the number of rooms, or the local schools, real estate professionals can quantify a variety of other house characteristics, such as that shiny purple wallpaper in the upstairs bathroom and the overall desirability of the neighborhood.

To get an initial feel for the types of houses in your area, you have collected the data in the file named [Housing Data.xls](http://www.sba.uconn.edu/users/stallaert/opim303/data/housedata.xls) (the data is displayed in Exhibit A). This file contains information such as the selling price of the house, square feet, numbers of bedrooms and bathrooms, and other characteristics for 108 homes sold in your town last spring and summer. In the data set:

* SQFT is the variable measuring the total square feet in the house.
* BEDS and BATHS are the number of bedrooms and bathrooms, respectively.
* HEAT and STYLE are categorical variables. HEAT takes on the value of zero for oil heating and one for electric heat. STYLE is the architectural style of the home: zero indicates a Cape Cod style, one indicates a two-story house, and two indicates that the house is a ranch-style home.
* GARAGE is the number of cars that can fit into the garage. We don't know whether it is an attached garage.
* AGE is the age of the home in years.
* FIRE and BASEMENT indicate the presence (one) or absence (zero) of at least one fireplace or basement.
* PRICE is the selling price of the house in thousands of dollars.
* SCHOOL is the school district (0=Plum Ridge school district; 1 =Apple Valley school district). Apple Valley seems to be viewed as the preferred school district.

Your task is to use the data to answer the following questions.

1. Create the descriptive statistics for the data set and provide some analysis of the numbers. Which of the statistics are essential in helping to develop an asking price for a house in Eastville?
2. Are there simple graphs of the data that would help you determine an asking price for your house? Create a few and describe how you would use them.
3. Which model (i.e., variables are included) best predicts the sales price? Which variables are important, which ones are unimportant?
4. Is there a difference in the price in terms of different architectural styles?
5. How does the existence of a basement contribute to the selling price?
6. How does the existence of a fireplace add to the selling price?

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| house | sqft | beds | baths | heat | style | garage | basement | age | fire | price | school |
| 1 | 1,238 | 3 | 2 | 0 | 0 | 1 | 1 | 12 | 1 | 59.900 | 1 |
| 2 | 1,707 | 3 | 2 | 1 | 0 | 2 | 0 | 13 | 1 | 64.000 | 0 |
| 3 | 1,296 | 4 | 2 | 0 | 0 | 2 | 1 | 17 | 0 | 66.500 | 0 |
| 4 | 1,320 | 3 | 2 | 0 | 0 | 2 | 1 | 11 | 1 | 66.500 | 0 |
| 5 | 1,210 | 3 | 2 | 0 | 0 | 1 | 0 | 6 | 1 | 66.900 | 0 |
| 6 | 1,296 | 3 | 2 | 0 | 0 | 2 | 1 | 17 | 1 | 68.000 | 0 |
| 7 | 1,765 | 3 | 2 | 0 | 0 | 2 | 1 | 20 | 0 | 68.500 | 0 |
| 8 | 1,725 | 4 | 3 | 0 | 0 | 2 | 1 | 12 | 0 | 69.000 | 0 |
| 9 | 1,794 | 4 | 2 | 0 | 0 | 2 | 1 | 18 | 0 | 70.950 | 0 |
| 10 | 1,294 | 3 | 2 | 0 | 0 | 2 | 0 | 13 | 1 | 71.000 | 0 |
| 11 | 1,372 | 3 | 2 | 0 | 0 | 2 | 1 | 9 | 0 | 72.692 | 1 |
| 12 | 1,162 | 3 | 2 | 0 | 0 | 1 | 0 | 8 | 1 | 72.801 | 0 |
| 13 | 1,996 | 4 | 2 | 0 | 0 | 2 | 0 | 13 | 1 | 75.207 | 1 |
| 14 | 1,764 | 4 | 2 | 1 | 0 | 2 | 1 | 13 | 1 | 76.000 | 0 |
| 15 | 1,416 | 3 | 2 | 0 | 0 | 2 | 0 | 8 | 0 | 76.000 | 1 |
| 16 | 1,730 | 4 | 2 | 0 | 0 | 2 | 0 | 15 | 1 | 77.500 | 0 |
| 17 | 1,392 | 3 | 2 | 0 | 0 | 2 | 1 | 8 | 1 | 79.900 | 1 |
| 18 | 1,664 | 3 | 3 | 0 | 0 | 2 | 0 | 11 | 1 | 79.900 | 0 |
| 19 | 1,332 | 3 | 2 | 0 | 0 | 2 | 1 | 14 | 0 | 81.000 | 1 |
| 20 | 1,752 | 3 | 3 | 0 | 0 | 2 | 0 | 18 | 1 | 82.800 | 0 |
| 21 | 2,167 | 3 | 3 | 1 | 0 | 2 | 1 | 13 | 1 | 84.900 | 0 |
| 22 | 1,664 | 3 | 2 | 0 | 0 | 2 | 0 | 9 | 1 | 85.000 | 0 |
| 23 | 1,973 | 4 | 3 | 0 | 0 | 2 | 0 | 13 | 1 | 86.000 | 0 |
| 24 | 1,384 | 3 | 2 | 0 | 0 | 2 | 0 | 5 | 1 | 89.280 | 0 |
| 25 | 1,431 | 3 | 2 | 0 | 0 | 2 | 1 | 7 | 1 | 89.900 | 1 |
| 26 | 1,950 | 5 | 3 | 0 | 0 | 2 | 0 | 13 | 1 | 90.000 | 0 |
| 27 | 1,452 | 3 | 2 | 0 | 0 | 2 | 1 | 4 | 1 | 92.000 | 0 |
| 28 | 1,829 | 3 | 2 | 0 | 0 | 2 | 0 | 10 | 1 | 92.439 | 1 |
| 29 | 1,652 | 4 | 3 | 0 | 0 | 2 | 1 | 7 | 1 | 94.646 | 1 |
| 30 | 1,516 | 3 | 2 | 0 | 0 | 2 | 1 | 10 | 1 | 97.293 | 1 |
| 31 | 1,998 | 4 | 3 | 0 | 0 | 2 | 1 | 17 | 1 | 98.100 | 1 |
| 32 | 1,984 | 4 | 3 | 0 | 0 | 2 | 1 | 9 | 1 | 98.149 | 0 |
| 33 | 1,840 | 3 | 3 | 0 | 0 | 2 | 1 | 9 | 1 | 105.000 | 0 |
| 34 | 1,823 | 4 | 3 | 0 | 0 | 2 | 1 | 3 | 1 | 110.000 | 1 |
| 35 | 2,150 | 5 | 3 | 0 | 0 | 2 | 1 | 12 | 1 | 111.900 | 0 |
| 36 | 2,096 | 3 | 3 | 0 | 0 | 2 | 1 | 9 | 1 | 113.000 | 1 |
| 37 | 2,212 | 4 | 3 | 0 | 0 | 3 | 1 | 17 | 1 | 124.000 | 1 |
| 38 | 2,375 | 4 | 3 | 0 | 0 | 2 | 1 | 11 | 1 | 133.000 | 1 |
| 39 | 2,809 | 4 | 3 | 0 | 0 | 3 | 1 | 6 | 1 | 195.000 | 0 |
| 40 | 912 | 4 | 2 | 0 | 1 | 2 | 1 | 19 | 1 | 59.000 | 0 |
| 41 | 816 | 3 | 2 | 0 | 1 | 2 | 1 | 19 | 0 | 61.500 | 0 |
| 42 | 1,008 | 5 | 2 | 0 | 1 | 2 | 1 | 17 | 0 | 63.500 | 0 |
| 43 | 912 | 4 | 2 | 0 | 1 | 2 | 1 | 16 | 1 | 66.950 | 1 |
| 44 | 1,008 | 5 | 2 | 0 | 1 | 2 | 1 | 17 | 1 | 68.000 | 0 |
| 45 | 838 | 4 | 2 | 0 | 1 | 1 | 1 | 11 | 0 | 68.694 | 1 |
| 46 | 1,008 | 4 | 3 | 0 | 1 | 2 | 1 | 19 | 1 | 69.000 | 0 |
| 47 | 1,120 | 3 | 2 | 0 | 1 | 2 | 1 | 11 | 1 | 70.452 | 1 |
| 48 | 1,242 | 4 | 3 | 0 | 1 | 2 | 1 | 12 | 0 | 75.000 | 0 |
| 49 | 912 | 4 | 2 | 0 | 1 | 2 | 1 | 18 | 1 | 76.900 | 1 |
| 50 | 1,316 | 3 | 2 | 0 | 1 | 2 | 1 | 8 | 1 | 83.000 | 0 |
| 51 | 1,490 | 3 | 2 | 0 | 1 | 2 | 1 | 13 | 1 | 88.000 | 0 |
| 52 | 1,118 | 4 | 3 | 0 | 1 | 2 | 1 | 16 | 1 | 88.879 | 1 |
| 53 | 1,278 | 3 | 2 | 0 | 1 | 2 | 1 | 11 | 1 | 89.347 | 0 |
| 54 | 1,490 | 3 | 2 | 0 | 1 | 2 | 1 | 10 | 1 | 89.700 | 1 |
| 55 | 1,418 | 4 | 2 | 0 | 1 | 2 | 1 | 14 | 1 | 90.000 | 1 |
| 56 | 1,250 | 4 | 3 | 0 | 1 | 2 | 1 | 17 | 1 | 90.800 | 1 |
| 57 | 1,881 | 4 | 3 | 0 | 1 | 2 | 1 | 9 | 1 | 91.500 | 1 |
| 58 | 1,355 | 3 | 2 | 0 | 1 | 2 | 1 | 7 | 1 | 95.000 | 1 |
| 59 | 1,518 | 3 | 2 | 0 | 1 | 2 | 1 | 22 | 0 | 98.000 | 1 |
| 60 | 1,606 | 4 | 3 | 0 | 1 | 2 | 1 | 13 | 1 | 99.500 | 0 |
| 61 | 2,124 | 3 | 2 | 0 | 1 | 2 | 1 | 14 | 1 | 107.000 | 0 |
| 62 | 2,099 | 4 | 3 | 0 | 1 | 2 | 1 | 13 | 1 | 113.750 | 1 |
| 63 | 2,232 | 5 | 3 | 0 | 1 | 2 | 1 | 9 | 1 | 125.000 | 1 |
| 64 | 1,608 | 5 | 3 | 0 | 1 | 3 | 1 | 13 | 1 | 132.000 | 1 |
| 65 | 1,320 | 3 | 2 | 0 | 2 | 2 | 1 | 13 | 1 | 76.000 | 1 |
| 66 | 1,680 | 3 | 3 | 0 | 2 | 2 | 0 | 7 | 1 | 79.900 | 1 |
| 67 | 1,434 | 3 | 3 | 0 | 2 | 2 | 1 | 12 | 1 | 79.900 | 1 |
| 68 | 1,664 | 3 | 2 | 0 | 2 | 2 | 1 | 7 | 1 | 85.000 | 1 |
| 69 | 1,379 | 3 | 2 | 0 | 2 | 2 | 1 | 8 | 1 | 87.158 | 1 |
| 70 | 1,634 | 3 | 3 | 0 | 2 | 2 | 1 | 10 | 1 | 87.200 | 1 |
| 71 | 1,400 | 3 | 3 | 0 | 2 | 2 | 0 | 1 | 1 | 91.500 | 1 |
| 72 | 1,664 | 4 | 4 | 0 | 2 | 2 | 1 | 16 | 1 | 91.500 | 1 |
| 73 | 1,548 | 3 | 3 | 0 | 2 | 2 | 1 | 8 | 1 | 92.500 | 1 |
| 74 | 2,040 | 4 | 3 | 0 | 2 | 2 | 1 | 15 | 1 | 93.500 | 0 |
| 75 | 1,792 | 4 | 3 | 0 | 2 | 2 | 1 | 9 | 1 | 94.000 | 1 |
| 76 | 1,865 | 3 | 3 | 0 | 2 | 2 | 1 | 12 | 1 | 96.700 | 0 |
| 77 | 1,833 | 3 | 3 | 0 | 2 | 2 | 1 | 7 | 1 | 97.400 | 1 |
| 78 | 1,627 | 3 | 3 | 0 | 2 | 2 | 1 | 3 | 1 | 98.500 | 1 |
| 79 | 2,198 | 4 | 3 | 0 | 2 | 2 | 1 | 12 | 1 | 99.000 | 0 |
| 80 | 1,707 | 3 | 3 | 0 | 2 | 2 | 1 | 12 | 1 | 99.000 | 0 |
| 81 | 2,096 | 3 | 3 | 0 | 2 | 2 | 1 | 7 | 1 | 102.400 | 1 |
| 82 | 2,004 | 4 | 3 | 0 | 2 | 2 | 1 | 13 | 1 | 104.000 | 0 |
| 83 | 1,818 | 4 | 3 | 0 | 2 | 2 | 1 | 19 | 1 | 107.000 | 1 |
| 84 | 1,935 | 3 | 3 | 0 | 2 | 2 | 1 | 11 | 1 | 107.900 | 1 |
| 85 | 2,381 | 3 | 3 | 0 | 2 | 2 | 0 | 17 | 1 | 109.000 | 1 |
| 86 | 1,977 | 3 | 3 | 0 | 2 | 2 | 1 | 9 | 1 | 110.000 | 1 |
| 87 | 2,317 | 5 | 3 | 0 | 2 | 2 | 1 | 9 | 1 | 110.500 | 1 |
| 88 | 2,072 | 4 | 3 | 0 | 2 | 2 | 1 | 11 | 1 | 112.000 | 1 |
| 89 | 2,108 | 3 | 3 | 0 | 2 | 2 | 1 | 7 | 1 | 112.900 | 0 |
| 90 | 2,060 | 4 | 4 | 0 | 2 | 2 | 1 | 9 | 1 | 113.600 | 1 |
| 91 | 2,064 | 3 | 3 | 0 | 2 | 2 | 1 | 5 | 1 | 114.500 | 1 |
| 92 | 2,148 | 5 | 4 | 0 | 2 | 2 | 1 | 8 | 1 | 114.700 | 1 |
| 93 | 2,170 | 6 | 4 | 0 | 2 | 2 | 1 | 21 | 1 | 115.000 | 1 |
| 94 | 1,984 | 4 | 3 | 1 | 2 | 2 | 1 | 11 | 1 | 121.000 | 1 |
| 95 | 2,130 | 4 | 3 | 0 | 2 | 2 | 1 | 20 | 1 | 121.000 | 1 |
| 96 | 2,049 | 4 | 3 | 0 | 2 | 2 | 1 | 19 | 1 | 125.000 | 1 |
| 97 | 2,035 | 3 | 3 | 0 | 2 | 3 | 1 | 6 | 1 | 128.000 | 1 |
| 98 | 2,264 | 3 | 3 | 0 | 2 | 3 | 1 | 7 | 1 | 130.000 | 1 |
| 99 | 2,264 | 3 | 3 | 0 | 2 | 3 | 1 | 10 | 1 | 131.000 | 1 |
| 100 | 2,362 | 4 | 3 | 0 | 2 | 2 | 1 | 6 | 1 | 132.000 | 0 |
| 101 | 2,262 | 5 | 3 | 0 | 2 | 2 | 1 | 12 | 1 | 132.500 | 1 |
| 102 | 2,353 | 4 | 3 | 0 | 2 | 2 | 1 | 5 | 1 | 132.500 | 0 |
| 103 | 2,298 | 3 | 3 | 0 | 2 | 3 | 1 | 2 | 1 | 144.500 | 1 |
| 104 | 2,282 | 4 | 3 | 0 | 2 | 2 | 1 | 9 | 1 | 150.577 | 1 |
| 105 | 2,542 | 4 | 3 | 0 | 2 | 2 | 1 | 6 | 1 | 153.800 | 1 |
| 106 | 2,380 | 4 | 3 | 0 | 2 | 2 | 1 | 6 | 1 | 155.000 | 1 |
| 107 | 2,505 | 4 | 3 | 0 | 2 | 2 | 1 | 7 | 1 | 156.900 | 1 |
| 108 | 2,804 | 4 | 3 | 0 | 2 | 3 | 1 | 1 | 1 | 192.000 | 1 |

**Exhibit A:** Data about past house sales