1 Data Prep, EDA, and Theory development

1.1 Varaible Selection & Explanation

For the purpoase of analyzing the determinants of prices of home sales in the US, the followign variables were included in the analysis (Table 1):

- Sale Price (DV)
- Total Living Space (IV) & Years Since Remodeling (at point of Sale) (IV)
- Confounders & Controls: Quality, Lot Area, Condition

As can be seen in Table 1, a total of 1,460 house sales were recorded between 2006 and 2010 for the district of Ames, Iowa (USA). The dependent varibale was identified to be SalePrice. As can be observed in Table 1, the mean sale price of a house was (in 1000s) \$180.921 (SD = 79.443). Combined with the range [34,900, 755,000] a positive skewness was to be expected (skew = 1.881), considering that the outcome variable is a of financial nature. The Total Living Area displays a mean of 2,572.89 square feet (SD = 823.598) in addition to a large range of values[334, 11,752]. Years Since remodeling (at time of sale) shows that the average property did not undergo renovations for 22.95 (23) years (SD = 20.950). Contrary to expectation, this varaible distributes reasonably equally across the range, stopping out at a maximum of 60 years (See Figure 1B - quantiles). Furhermore, the variable Quality (and Condition) represents a rating from 1 to 10, similar to a Likert Scale. Quality has to be considered a categorical variable in this case i.a. because the distances between each rating level are not constant and the distribution is skewed **(SEE SUPPLEMENTARY APPENDIX REGRESSION AND PICTURE)**. However, while strictrly speakign there we cannot consider Quality a numerical variable, for the purpose of certain examples at a later point, this variable will be considered as both a categorical and numerical variable (no inference will be made is used as numerical). Finally, Lot Area, will be used as a confounder in the regressions to control for the association larger lot sizes creating larger houses (**AS AN INTERACTION**).

Table 1: Descriptive Statistics of Numeric Varaibles

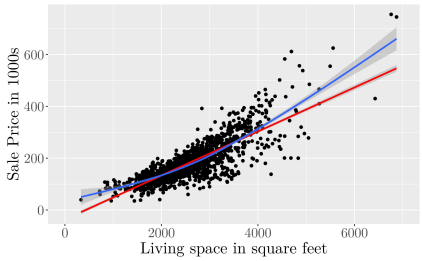
Statistic	Mean	St. Dev.	Min	Pctl(25)	Median	Pctl(75)	Max
SalePrice	180.921	79.443	34.900	129.975	163.000	214.000	755.000
Lot Area	10,516.830	9,981.265	1,300	7,553.5	9,478.5	11,601.5	215,245
Quality	6.099	1.383	1	5	6	7	10
Condition	5.575	1.113	1	5	5	6	9
Total Living Space	2,572.893	823.598	334	2,014	2,479	3,008.5	11,752
Years Since Remodeling	22.950	20.641	0	4	14	41	60

Notes: N = 1460. OLS estimates, robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

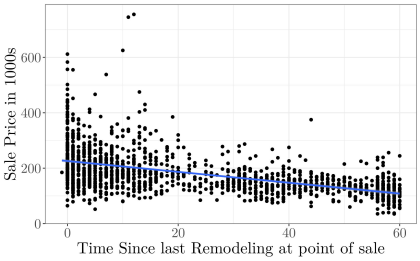
Beyond this table, there are multiple categorical variables **(see Appendix)**, such as Zoning and Year of Sale. The original (MS)Zoning variable contains seven categories, of which five contain data; these zones correspond to the administrative classification of the ground on which the properties are constructed (Commercial, Floating Village, Low-Density, Moderate-Density, High-Density contain data; Residential Low Density Park, Agriculutural, Industrial do not contain records). For the purpose of this analysis, this number was reduced to four categories based on the similar behaviour of Moderate and High Density properties **(SEE SUPLEMENTARY APPENDIX PLOT)** in the data as Ames, Iowa, represents the steretypical picture of a mid-western town in the US, thereby displaying fewer densly populated areas. Thus, the main question of this analysis section focuses on the difference between Low and higher density properties.[1] In addition, year of sale will be used to control for the effect of the 2008/2009 housing cricis.

Finally, the plots are to be considered in the context of the hypothesis in the next section.

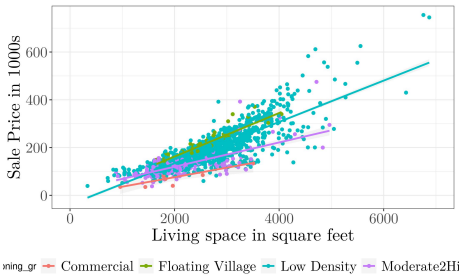
[1] Floating Village and Commercial behave too differently to be merged



(A) Positive association of total Living Space & Sale Price & optimal line



(B) Positive association of total Living Space & Sale Price



(C) Positive association of total Living Space & Sale Price

FIGURE 1: Three Hypothesis Graphs displaying their repective association with the outcome variable

Plot 1: Causal relationship Scheme