Seattle
Real Estate Analytics

SEATTLERS BANK

Executive Summary

- The objective of the analysis conducted is to gain an alternative understanding of the Seattle property market for the development of our real estate financing business. This is an experimental in-house analysis.
- The problematics addressed in the analysis will aim to complement the traditional micro level evaluation for real estate financing.
- We are aiming to answer the following questions using regression analysis:
  - ***Will price increase provided we keep the living surface constant and increase the grading by 1?***
  - ***Will price increase provided we increase living surface and keep the grading constant?***
  - ***How do the models compare if we proceed with the removal of outlier values in our variables?***
- We will supplement the analysis with the following:
  - Exploratory Data Analysis (EDA) process
  - Data Visualization
  - Model Testing
  - Conclusions Drawn

Process Timeline

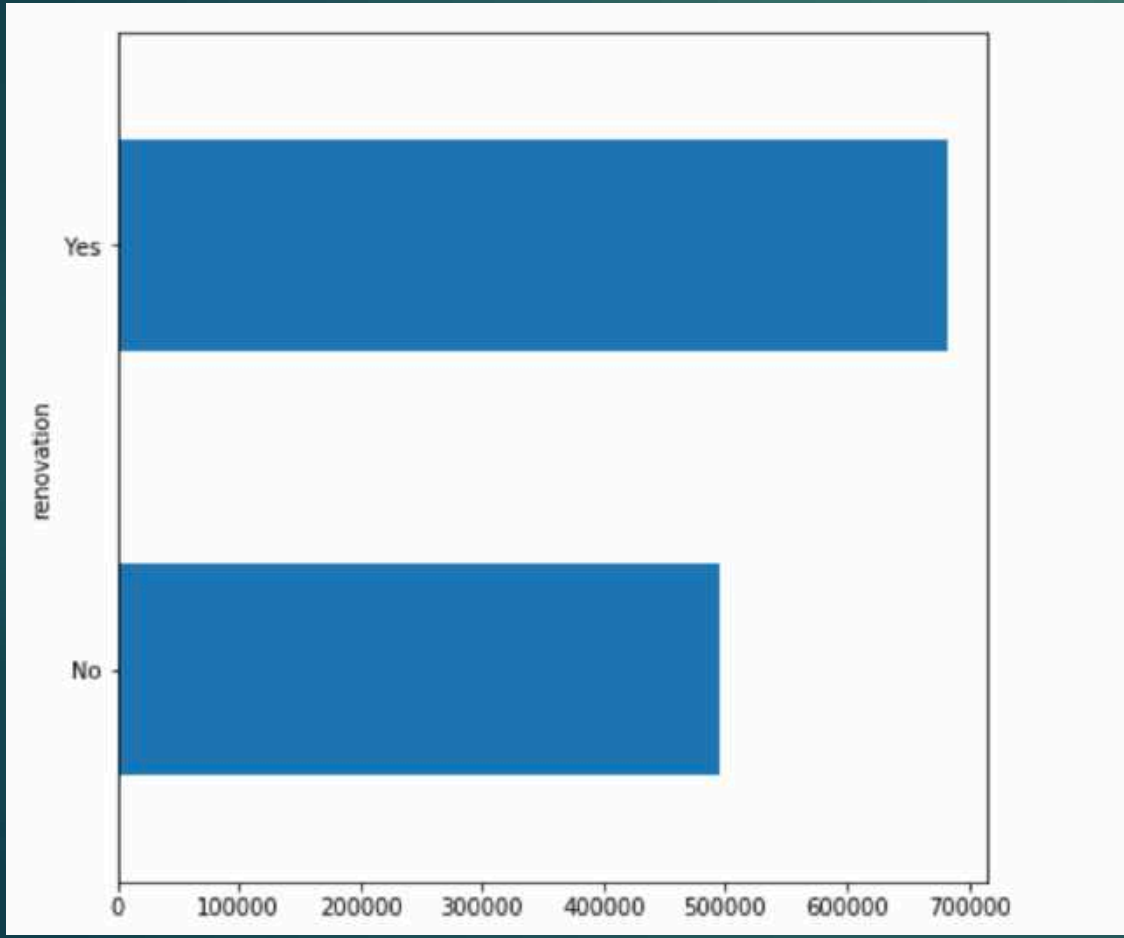
- Step 1: Load the dataset and identify null values
- Step 2: Treatment of null values and special characters
- Step 3: Exploratory Data Analysis / Data Observations
- Step 4: Graph relationship between all relevant variables and price
- Step 5: Model Approach
- Step 6: Choose variables for regression models
- Step 7: Run regression model
- Step 8: interpretation of models
- Step 9: follows ups, correction and questions

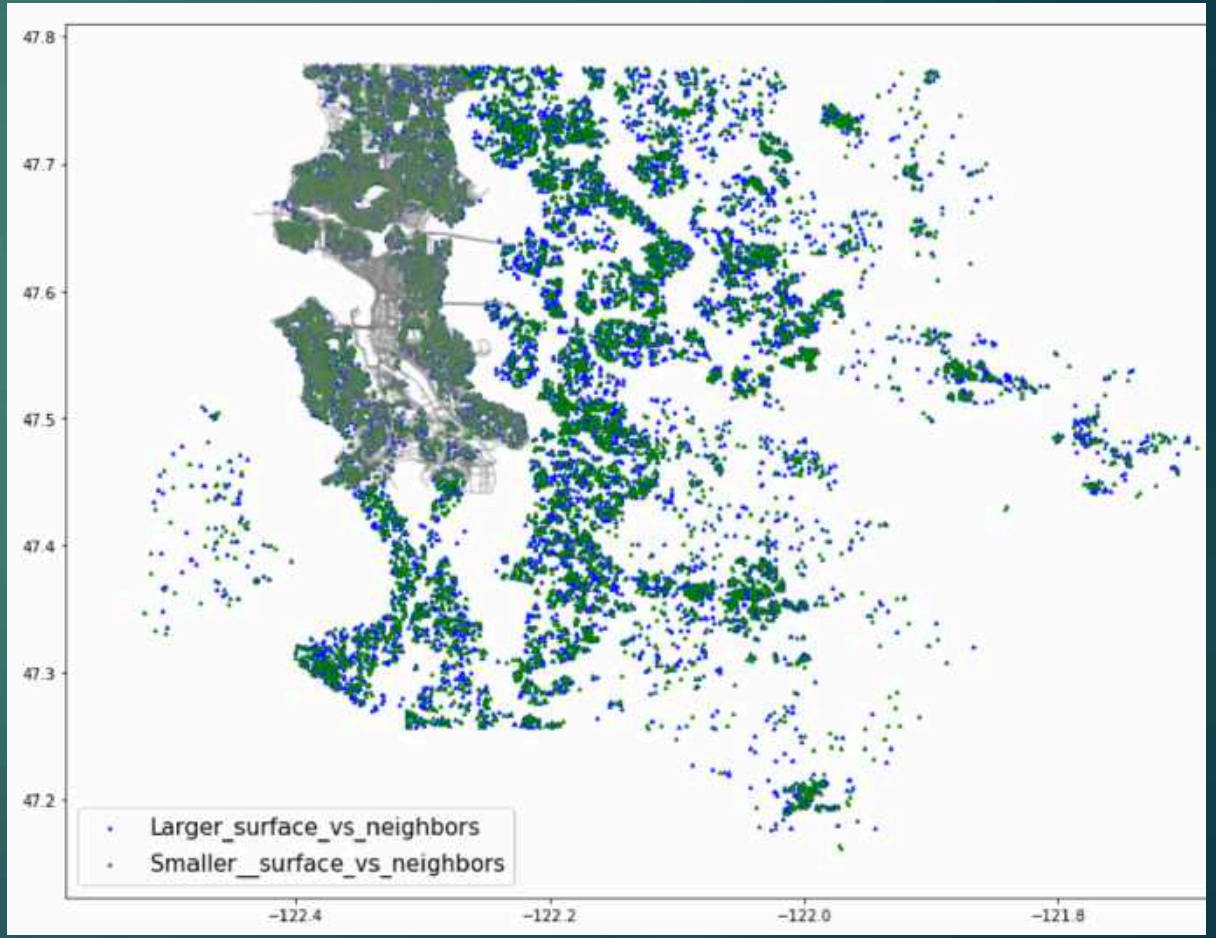
Step 1 & 2: Load the dataset + identify & treat null values

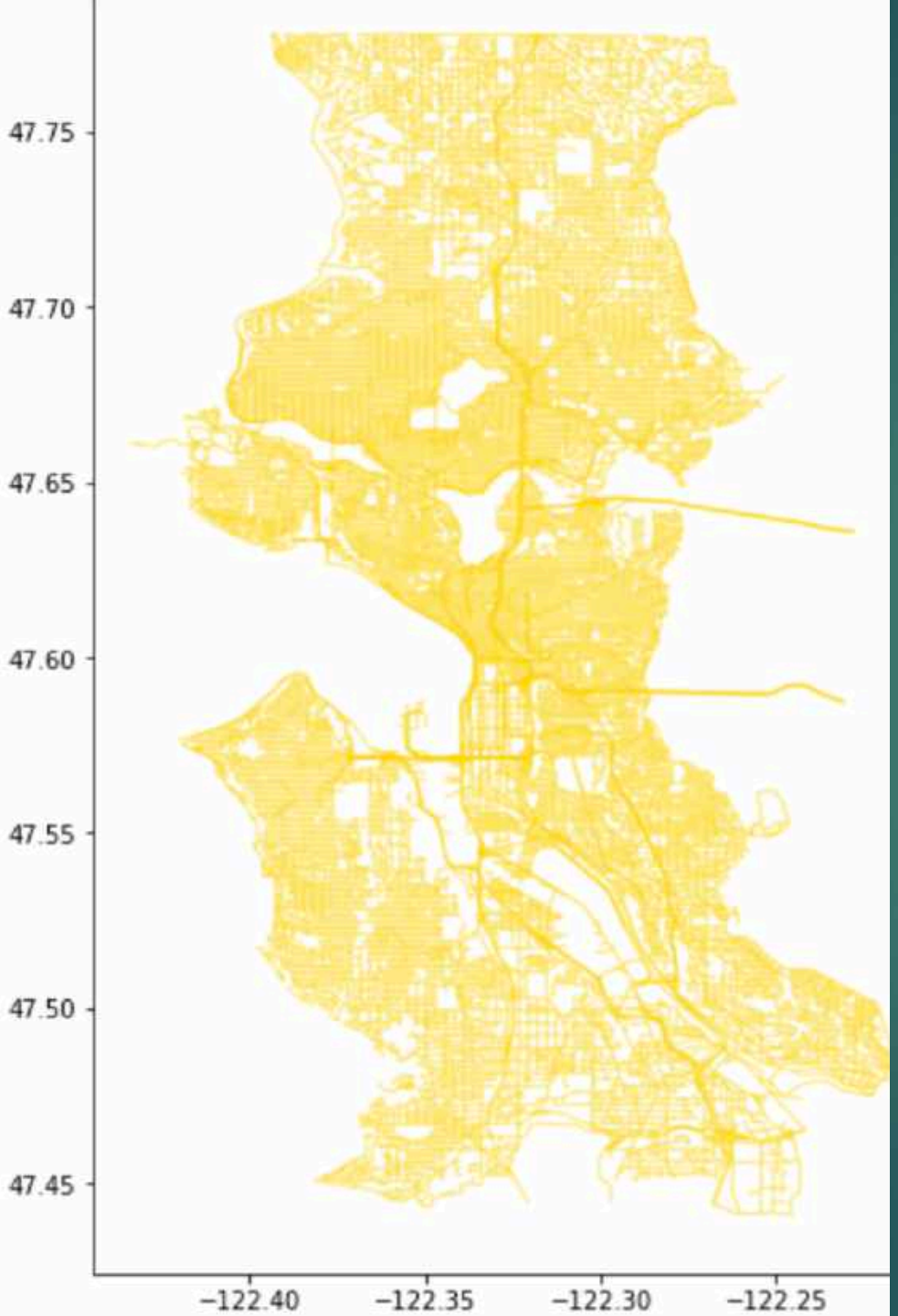
- Pandas data frame was used to load and gain an understanding of the Seattle housing market dataset
- Data frame composition includes 26 columns and nearly 25,000 rows representing properties
- Three approaches to treat null values in *waterfront, view, year renovated*
- We decided to remove the *waterfront* column as we tested it for correlation with price which was low , possibly impaired by null values
- For *view*, we chose to fill the nulls with 0 value as we the 63 nulls observed represent less than 1% of the dataset
- For *year renovated, we chose to assume for 0 and nulls that the build year could be used to replace those values*

Step 3: Data Observations

Here are some of the observations and visual representations of the data we made during the EDA phase



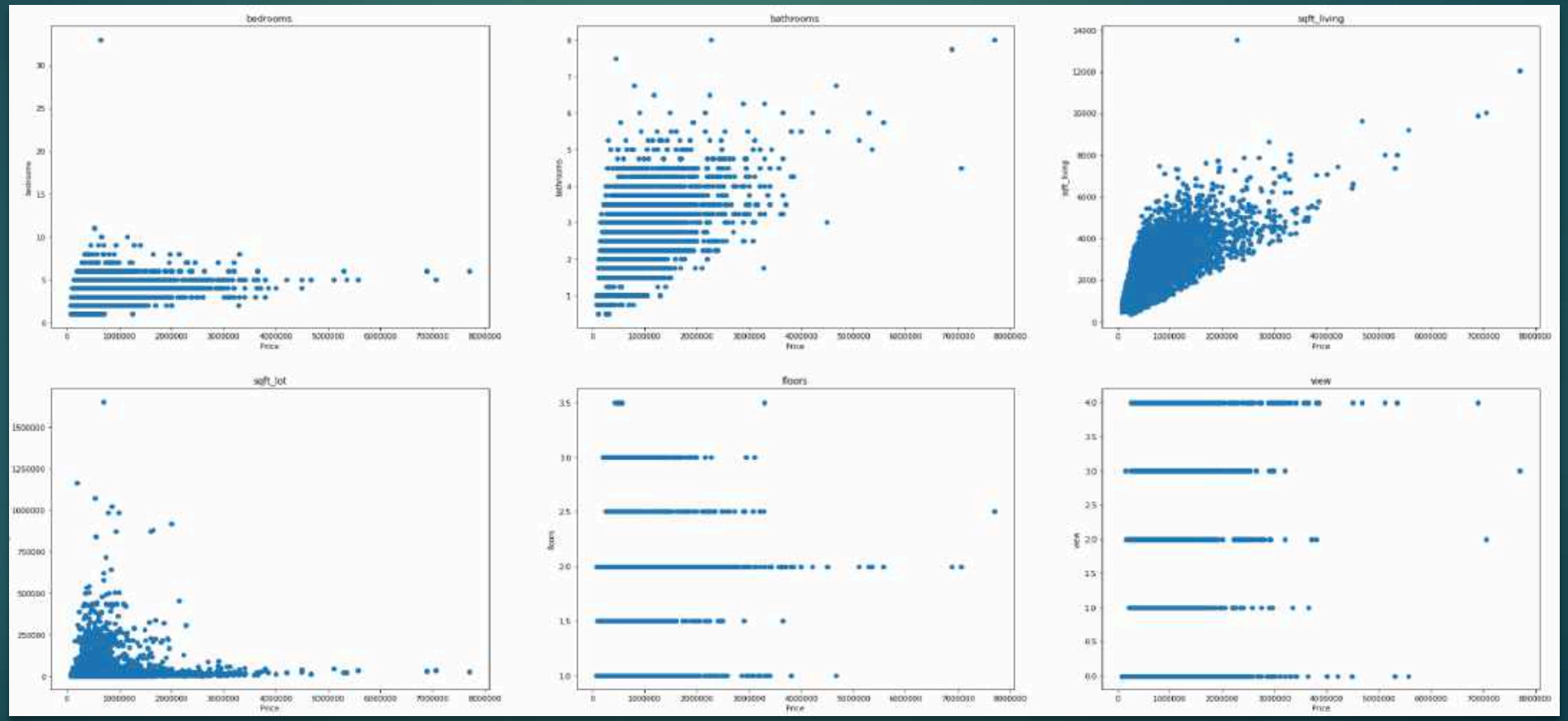




Step 3: Data Observations (continued)

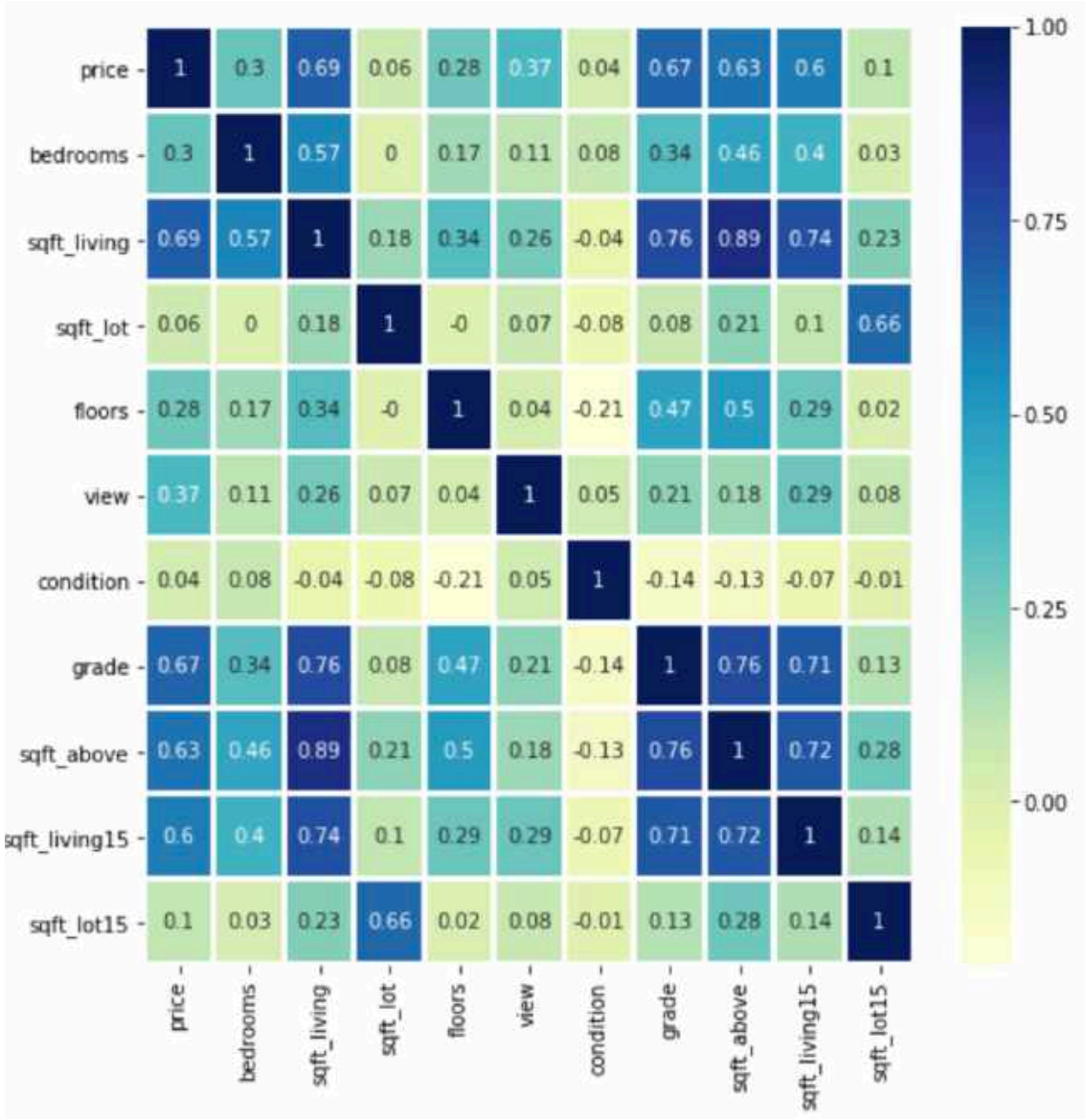
Step 4: Graph relationship between all relevant variables and price

- We tested most variables to establish their relationship with price and identify the relevant ones for model testing



Step 5: Model Approach

- To answer our questions, we decided to run two models with slight alterations.
  - Model 1: Run OLS model on price and two independent variables without removing data outliers before selecting our sample
  - Model 2: Run OLS model on price and two independent variables with outliers removed using standard deviation
- The models were run on a sample of 1000 houses with <15 houses selected at random per zip code.



Step 6: Build correlations table and matrix to get an overview variables & elect variables

A CORRELATION TABLE AND MATRIX TO DETERMINE WHICH VARIABLES WE WOULD ELECT.

ELECTED SQFT_LIVING / GRADE AS THE TWO VARIABLES TO TEST.

Step 7: Run regression model and interpret the results

Model 1 – *Outliers Present in the Data*

P = -710,300 + 185 (sqft =+1) + 146,000 (grade =+1)

Dep. Variable:	price	**R-squared:**	0.535
Model:	OLS	**Adj. R-squared:**	0.534
Method:	Least Squares	**F-statistic:**	601.3
Date:	Tue, 21 Jan 2020	**Prob (F-statistic):**	1.29e-174
Time:	12:49:32	**Log-Likelihood:**	-14615.
No. Observations:	1050	**AIC:**	2.924e+04
Df Residuals:	1047	**BIC:**	2.925e+04
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-7.103e+05	6.31e+04	-11.252	0.000	-8.34e+05	-5.86e+05
sqft_living	185.0059	13.825	13.382	0.000	157.877	212.134
grade	1.146e+05	1.06e+04	10.796	0.000	9.38e+04	1.35e+05

Omnibus:	585.573	**Durbin-Watson:**	1.073
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	6786.525
Skew:	2.329	**Prob(JB):**	0.00
Kurtosis:	14.551	**Cond. No.**	1.74e+04

Model 2 – *Outliers Removed from the Data*

P = -661,000+ 134 (sqft =+1) + 120,700 (grade =+1)

Dep. Variable:	price	**R-squared:**	0.414
Model:	OLS	**Adj. R-squared:**	0.413
Method:	Least Squares	**F-statistic:**	369.6
Date:	Tue, 21 Jan 2020	**Prob (F-statistic):**	3.51e-122
Time:	12:49:44	**Log-Likelihood:**	-14385.
No. Observations:	1050	**AIC:**	2.878e+04
Df Residuals:	1047	**BIC:**	2.879e+04
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-6.618e+05	6.44e+04	-10.275	0.000	-7.88e+05	-5.35e+05
sqft_living	134.3940	12.342	10.889	0.000	110.177	158.611
grade	1.207e+05	1.03e+04	11.672	0.000	1e+05	1.41e+05

Omnibus:	501.034	**Durbin-Watson:**	0.904
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	3650.157
Skew:	2.066	**Prob(JB):**	0.00
Kurtosis:	11.146	**Cond. No.**	2.05e+04

Step 8: interpretation, follows ups and correction of model

- The two models provide us limited conclusions to be drawn.
- Price does increase with both square foot living and grading but the models don't have the best linear fit.
- R-Squared is still relatively low and we may have an issue of multicollinearity as both variables are correlated (0.7)
- We notice that with outliers removed the model looses precision with R squared dropping despite the distribution of data points getting closer to normal.

Step 9: Future work, correction and questions

- Review variable choices – Grade / Square foot living
- Apply correct treatment to categorical variable
- Develop more specific business questions

Thank you for listening! We will do our best to answer any questions you have.