King County Real Estate Analysis

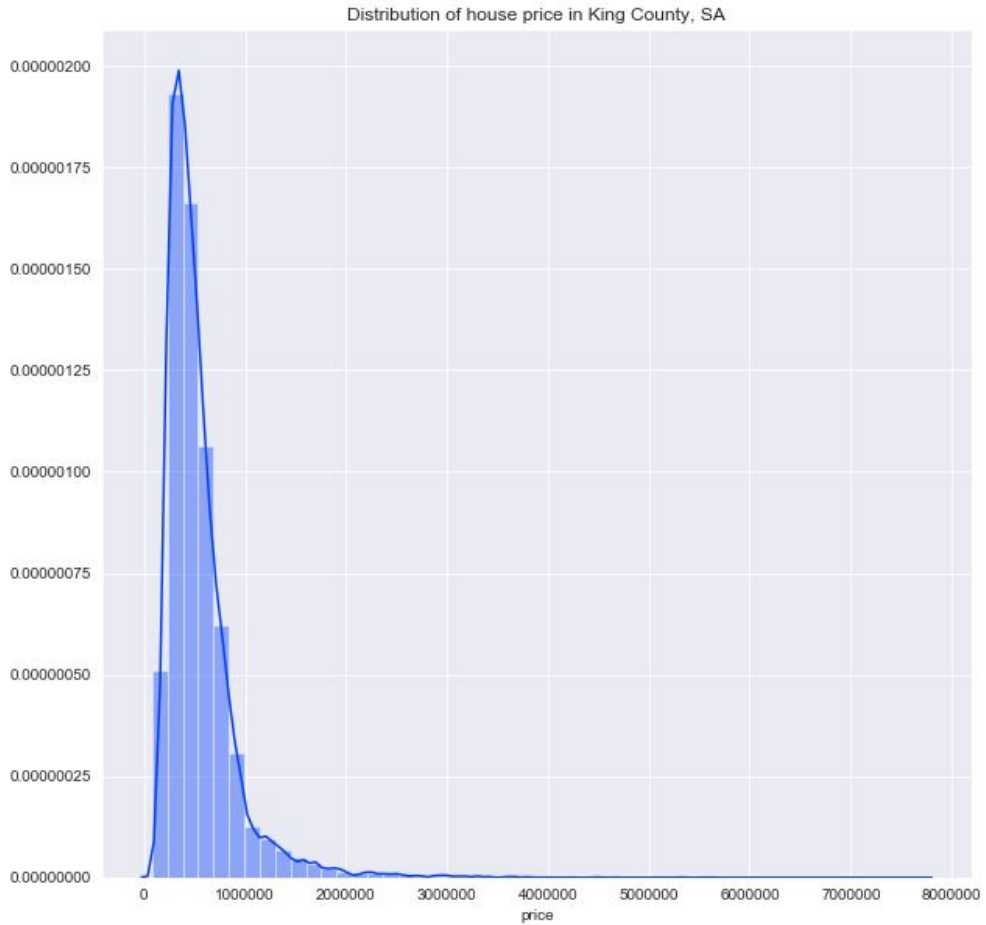
Our findings, our narrative, our *future*

Stakeholder Overview

Real Estate Companies E.G Savils	Housing Development Firms E.G Taylor Wimpey
Focus on maximising: Sales, Profits	Focussed on maximising sale price after spending on renovations or extensions
Focussed on efficiency in: Costs related to marketing and sales.	Minimising cost when investing in house developemnts

Adjusting the data

- Non-normal distribution
- Data heavily skewed by outliers
- Took the logarithm of our price for final models

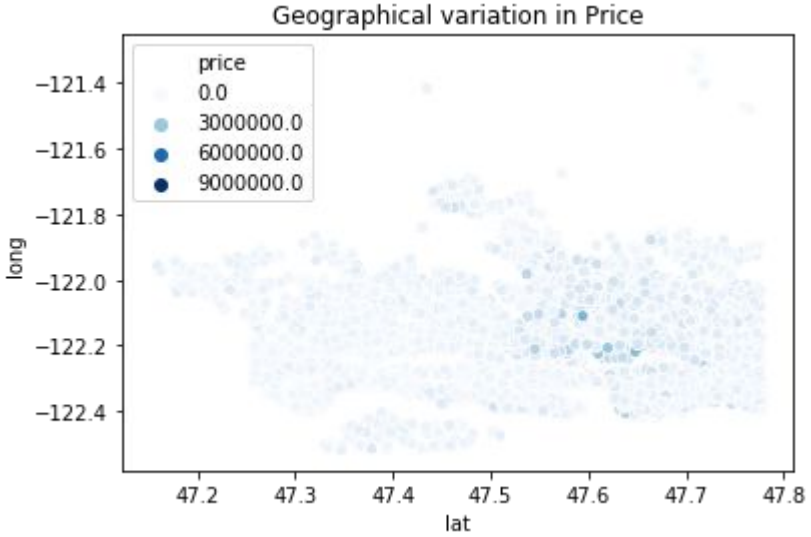


Size: An Efficient Price Predictor?

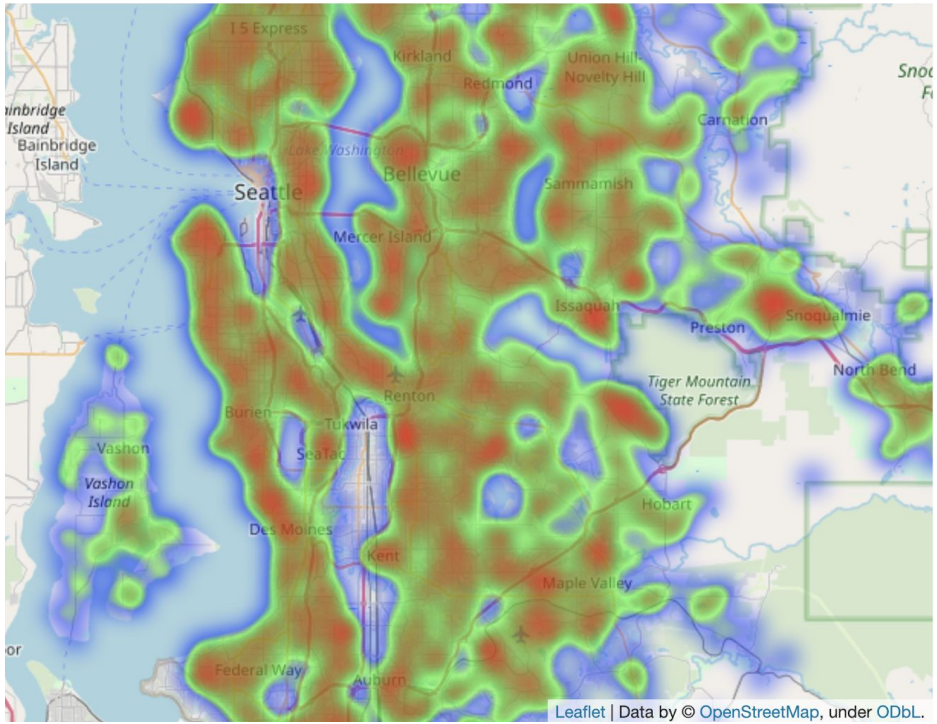
Living Space of a property Vs Price

- Initial data exploration showed a high correlation between living space and price.
- A scatter graph helped to visualize the strength of this.
- Further regression analysis showed it to be the strongest predictor of house price, out of all variables included in our model.

Location, location, location ...

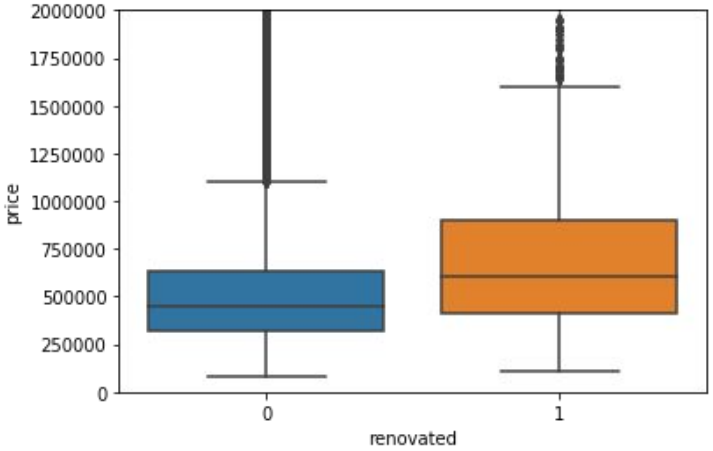


- We spotted clusters of high prices around specific locational points.
- Locational price data impacts both of our stakeholders:
  - Enabling real estate companies to appropriately price their properties
  - Calculation for a housing development profit margin, based on maximum cost per square foot of building houses or extensions
- This led us into further analysis and mapping.



- Our initial visualisation suggested a cluster of high price points around a central area
- Mapping on price per square foot subsets the data, while removing variation based on total property size.
- This sets a benchmark ceiling of spending on cost per square foot in various areas, for a housing development firm to still profit after a build.
- However, more in depth mapping showed there was actually multiple clusters of high priced areas across the dataset.
- Key:
    - Blue: $231.5 / sqft or less
    - Green: $231.5 - $270 /sqft
    - Red: : $405/sqft +

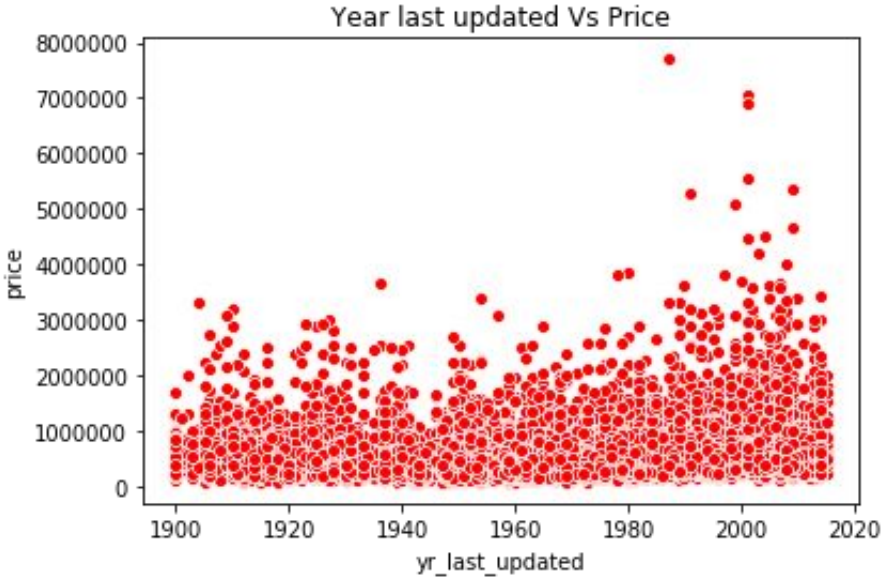
To renovate or not to renovate



Does Renovation affect house price?

- Initial data exploration and visualization showed that the subset of houses that had been renovated in the past were on average a higher price at point of sale.
- This led us to include it in our predictive model, which proved less useful
- In conclusion: house renovations on average increase the price, however did not yield useful predictive qualities at a later stage/

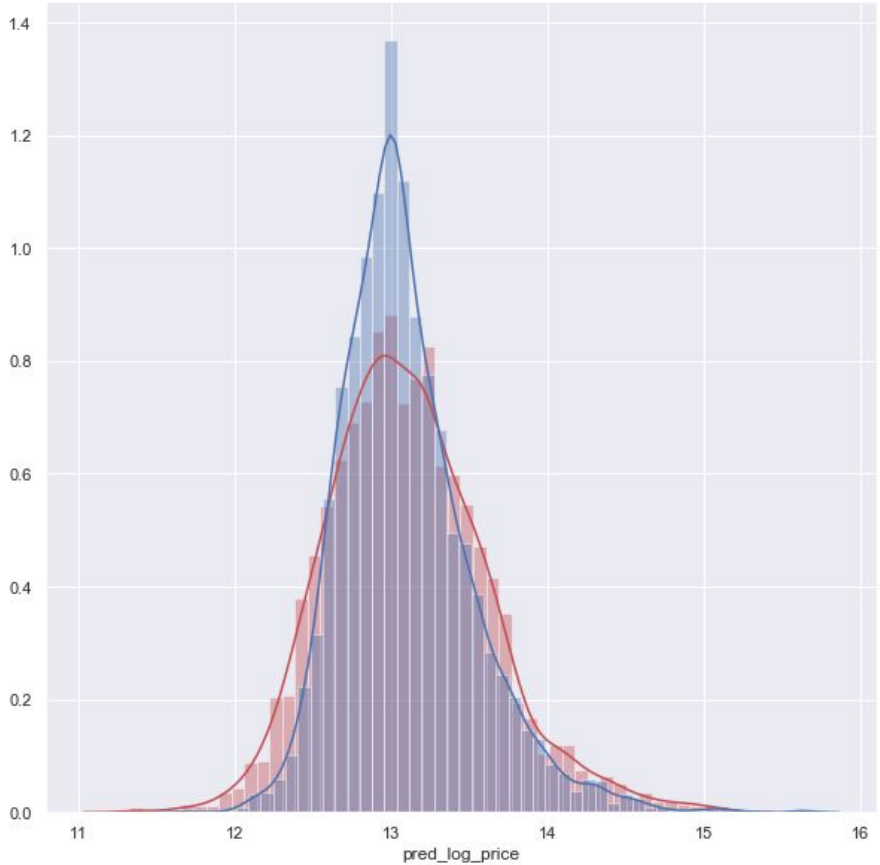
Further exploration around renovations



- Our previous slide led us to further analysis around renovations, and building age.
- We created a new variable to test our hypothesis that buildings that had been recently updated (either through initial build or renovation) would be a higher price.
- If this was the case, it would be useful to include in our predictive model.
- While the scatter plot showed a potential positive correlation, it was very weak.

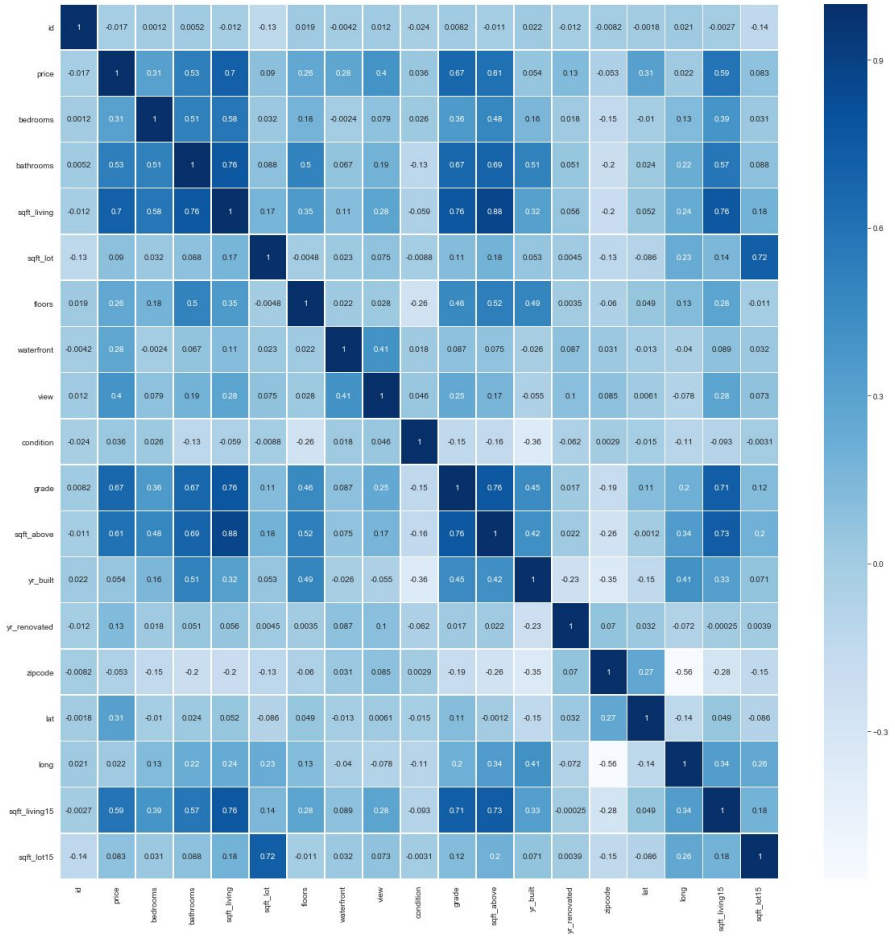
Price Prediction Model

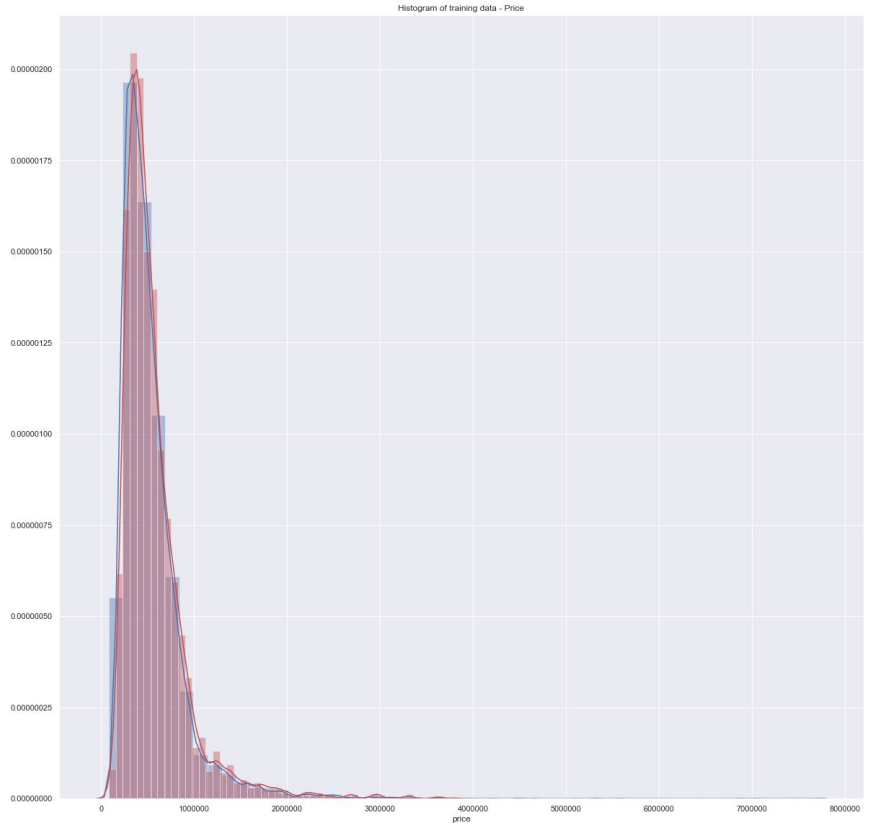
1. Utilize our model for most property price assessment
2. Both absolute price and cost per square foot are dependent on location
    a. This relationship is not focussed around a central point
3. Total square foot of a property is the most effective predictor for house price
4. Renovation has some effect on average property price, but limited predictive capabilities
5. We are quite confident in our results, however would have achieved similar using purely square footage - other variables have a limited impact.

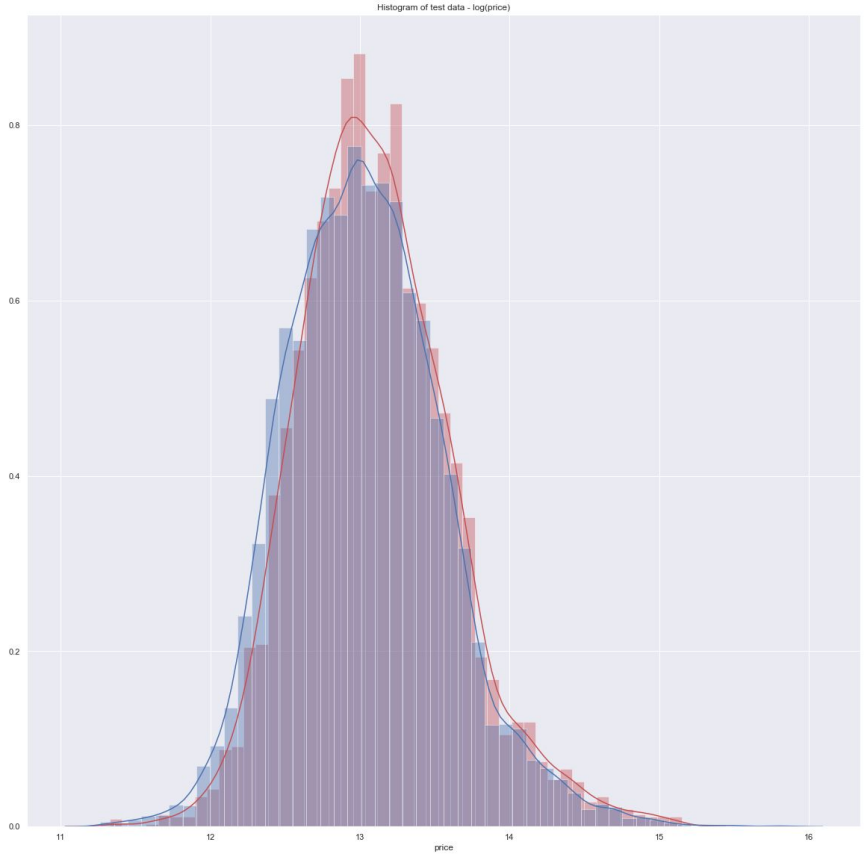


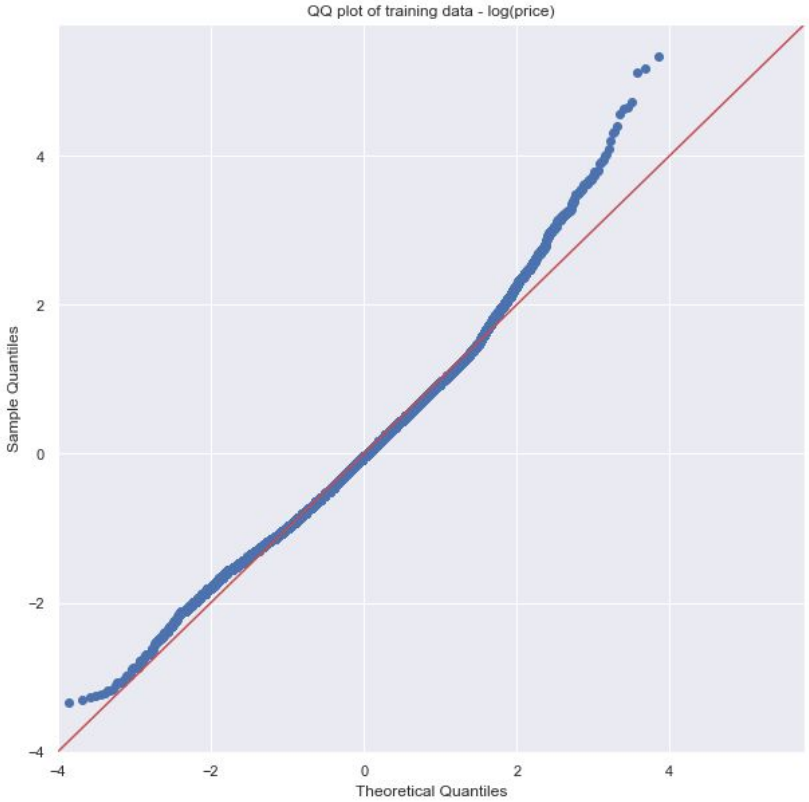
Thank you

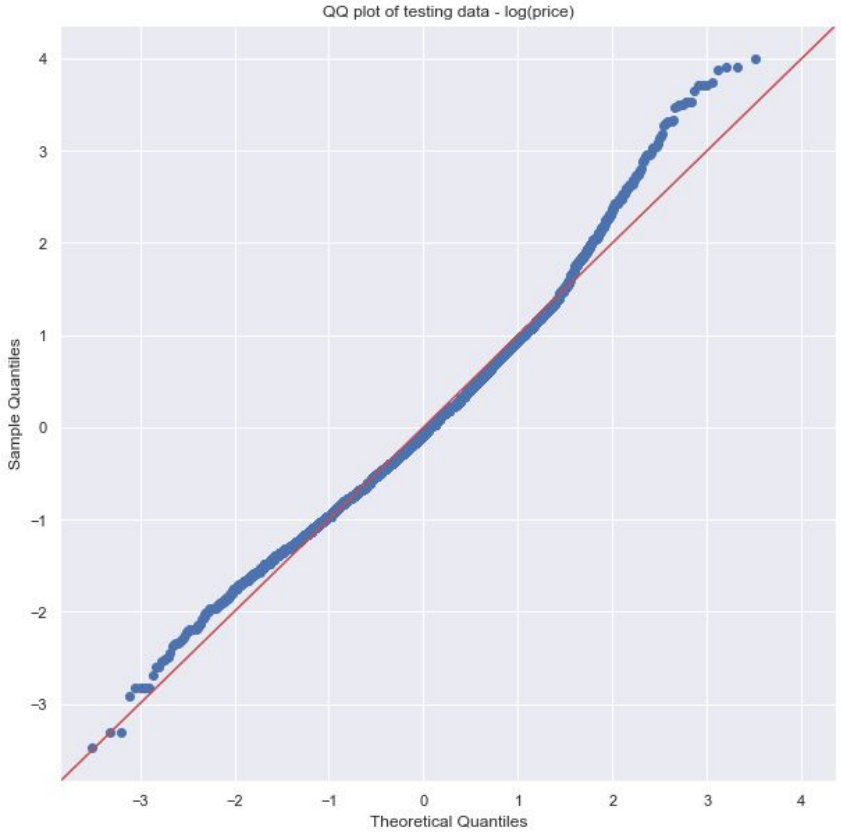
Questions, please


id 1 -0.017 0.0012 0.0052 -0.012 -0.13 0.019 -0.0042 0.012 -0.024 0.0082 -0.011 0.022 -0.012 -0.0082 -0.0018 0.021 -0.0027 -0.14
price -0.017 1 0.31 0.53 0.7 0.09 0.26 0.28 0.4 0.036 0.67 0.61 0.054 0.13 -0.053 0.31 0.022 0.59 0.083
bedrooms 0.0012 0.31 1 0.51 0.58 0.032 0.18 -0.0024 0.079 0.026 0.36 0.48 0.16 0.018 -0.15 -0.01 0.13 0.39 0.031
bathrooms 0.0052 0.53 0.51 1 0.76 0.088 0.5 0.067 0.19 -0.13 0.67 0.69 0.51 0.051 -0.2 0.024 0.22 0.57 0.088
sqft_living -0.012 0.7 0.58 0.76 1 0.17 0.35 0.11 0.28 -0.059 0.76 0.88 0.32 0.056 -0.2 0.052 0.24 0.76 0.18
sqft_lot -0.13 0.09 0.032 0.088 0.17 1 -0.0048 0.023 0.075 -0.0088 0.11 0.18 0.053 0.0045 -0.13 -0.086 0.23 0.14 0.72
floors 0.019 0.26 0.18 0.5 0.35 -0.0048 1 0.022 0.028 -0.26 0.46 0.52 0.49 0.0035 -0.06 0.049 0.13 0.28 -0.011
waterfront -0.0042 0.28 -0.0024 0.067 0.11 0.023 0.022 1 0.41 0.018 0.087 0.075 -0.026 0.087 0.031 -0.013 -0.04 0.089 0.032
view 0.012 0.4 0.079 0.19 0.28 0.075 0.028 0.41 1 0.046 0.25 0.17 -0.055 0.1 0.085 0.0061 -0.078 0.28 0.073
condition -0.024 0.036 0.026 -0.13 -0.059 -0.0088 -0.26 0.018 0.046 1 -0.15 -0.16 -0.36 -0.062 0.0029 -0.015 -0.11 -0.093 -0.0031
grade 0.0082 0.67 0.36 0.67 0.76 0.11 0.46 0.087 0.25 -0.15 1 0.76 0.45 0.017 -0.19 0.11 0.2 0.71 0.12
sqft_above -0.011 0.61 0.48 0.69 0.88 0.18 0.52 0.075 0.17 -0.16 0.76 1 0.42 0.022 -0.26 -0.0012 0.34 0.73 0.2
yr_built 0.022 0.054 0.16 0.51 0.32 0.053 0.49 -0.026 -0.055 -0.36 0.45 0.42 1 -0.23 -0.35 -0.15 0.41 0.33 0.071
yr_renovated -0.012 0.13 0.018 0.051 0.056 0.0045 0.0035 0.087 0.1 -0.062 0.017 0.022 -0.23 1 0.07 0.032 -0.072 -0.00025 0.0039
zipcode -0.0082 -0.053 -0.15 -0.2 -0.2 -0.13 -0.06 0.031 0.085 0.0029 -0.19 -0.26 -0.35 0.07 1 0.27 -0.56 -0.28 -0.15
lat -0.0018 0.31 -0.01 0.024 0.052 -0.086 0.049 -0.013 0.0061 -0.015 0.11 -0.0012 -0.15 0.032 0.27 1 -0.14 0.049 -0.086
long 0.021 0.022 0.13 0.22 0.24 0.23 0.13 -0.04 -0.078 -0.11 0.2 0.34 0.41 -0.072 -0.56 -0.14 1 0.34 0.26
sqft_living15 -0.0027 0.59 0.39 0.57 0.76 0.14 0.28 0.089 0.28 -0.093 0.71 0.73 0.33 -0.00025 -0.28 0.049 0.34 1 0.18
sqft_lot15 -0.14 0.083 0.031 0.088 0.18 0.72 -0.011 0.032 0.073 -0.0031 0.12 0.2 0.071 0.0039 -0.15 -0.086 0.26 0.18 1
id price bedrooms bathrooms sqft_living sqft_lot floors waterfront view condition grade sqft_above yr_built yr_renovated zipcode lat long sqft_living15 sqft_lot15
0.9
0.6
0.3
0.0
−0.3


Histogram of training data - Price
0.00000200
0.00000175
0.00000150
0.00000125
0.00000100
0.00000075
0.00000050
0.00000025
0.00000000
0
1000000
2000000
3000000
4000000
5000000
6000000
7000000
8000000
price


Histogram of test data - log(price)
0.8
0.6
0.4
0.2
0.0
11
12
13
14
15
16
price


QQ plot of training data - log(price)
Sample Quantiles
Theoretical Quantiles
4
2
0
−2
−4
−4
−2
0
2
4


QQ plot of testing data - log(price)
Sample Quantiles
Theoretical Quantiles
4
3
2
1
0
−1
−2
−3
−3
−2
−1
0
1
2
3
4