King County Housing Price Analysis

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Summary

Data from King County housing sales was analyzed to determine what housing characteristics correlate to higher housing prices.

Regression Modeling was utilized to come up with a predictive model to determine housing prices.

Insight from the analysis will be used to generate actionable recommendations for the stakeholder.

Outline

- Business Problem
- Data/Methods
- Results
- Conclusions

Business Problem

A King County real estate company wants to increase client acquisition and retention through:

- Identifying key housing price characteristics
- Giving sound recommendations
- Improving client's home sale price

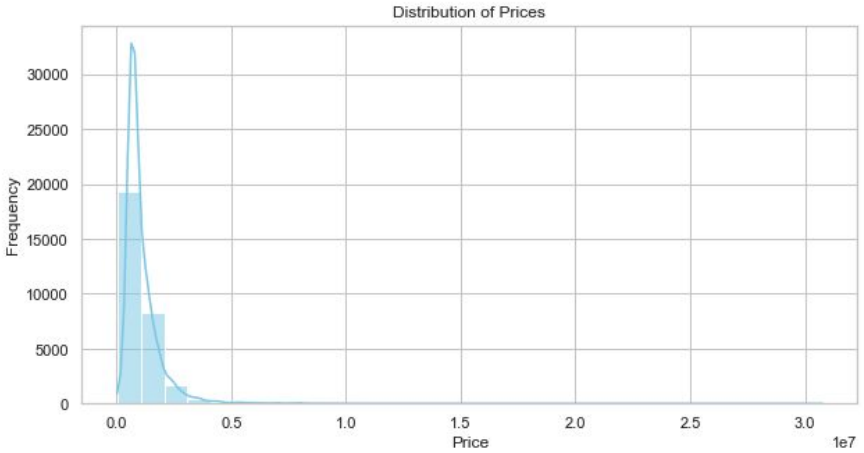
Data/Methods

EDA:

- King County House Sales dataset
- Final dataset:
  - 30,062 entries
  - 21 columns (features)
  - Sqft_living: **correlation = 0.61**

Regression Modeling:

- 6 model iterations were ran
- Target Variable: Price



Results: Baseline Model

R-Squared:

- **0.375** : model explains 37.5% variance in price

Sqft_living:

- 1 sqft increase = **~ 562.53 increase in price (USD)**

High Error Metrics**:**

- MAE of $ 395,915.33
- MSE of $ 706,874.49

OLS Regression Results

Dep. Variable:	price	R-squared:	0.375
Model:	OLS	Adj. R-squared:	0.375
Method:	Least Squares	F-statistic:	1.800e+04
Date:	Thu, 10 Aug 2023	Prob (F-statistic):	0.00
Time:	20:46:46	Log-Likelihood:	-4.4755e+05
No. Observations:	30062	AIC:	8.951e+05
Df Residuals:	30060	BIC:	8.951e+05
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-8.076e+04	9758.256	-8.276	0.000	-9.99e+04	-6.16e+04
sqft_living	562.5261	4.193	134.171	0.000	554.308	570.744

Omnibus:	43093.441	Durbin-Watson:	1.860
Prob(Omnibus):	0.000	Jarque-Bera (JB):	47238386.360
Skew:	8.103	Prob(JB):	0.00
Kurtosis:	196.520	Cond. No.	5.57e+03

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 5.57e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Results

Final Model:

- R-Squared: **0.503**
- **Grade and Waterfront** = highest in price increase per unit
- **Square foot of living space**:
  - Each 1 square foot increase, there is a **0.02% increase** in average price
- **Condition of home**:
  - Improve by 1 rating = **about 4.92% increase** in average price

OLS Regression Results

Dep. Variable:	price	R-squared:	0.503
Model:	OLS	Adj. R-squared:	0.503
Method:	Least Squares	F-statistic:	1791.
Date:	Thu, 10 Aug 2023	Prob (F-statistic):	0.00
Time:	20:54:40	Log-Likelihood:	-15850.
No. Observations:	30062	AIC:	3.174e+04
Df Residuals:	30044	BIC:	3.189e+04
Df Model:	17		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	11.5676	0.030	379.636	0.000	11.508	11.627
bedrooms	-0.0113	0.003	-3.453	0.001	-0.018	-0.005
sqft_living	0.0002	4.52e-06	45.393	0.000	0.000	0.000
sqft_lot	3.442e-07	4.31e-08	7.981	0.000	2.6e-07	4.29e-07
floors	0.0369	0.006	6.659	0.000	0.026	0.048
grade	0.2164	0.003	62.540	0.000	0.210	0.223
Basement	0.0463	0.005	8.942	0.000	0.036	0.056
Garage	-0.0167	0.006	-2.755	0.006	-0.029	-0.005
Patio	0.0196	0.006	3.254	0.001	0.008	0.031
Waterfront	0.2819	0.021	13.733	0.000	0.242	0.322
Nuisance	0.0211	0.006	3.311	0.001	0.009	0.034
view_encoded	0.0365	0.003	11.158	0.000	0.030	0.043
condition_encoded	0.0492	0.004	13.342	0.000	0.042	0.056
heat_source_encoded	-0.0104	0.003	-3.451	0.001	-0.016	-0.004
sewer_system_encoded	-0.1144	0.007	-15.263	0.000	-0.129	-0.100
Month	-0.0149	0.001	-19.526	0.000	-0.016	-0.013
Age	0.0029	0.000	25.512	0.000	0.003	0.003
renovated	0.0564	0.012	4.664	0.000	0.033	0.080

Omnibus:	8730.615	Durbin-Watson:	1.963
Prob(Omnibus):	0.000	Jarque-Bera (JB):	110100.416
Skew:	-1.039	Prob(JB):	0.00
Kurtosis:	12.142	Cond. No.	8.04e+05

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 8.04e+05. This might indicate that there are strong multicollinearity or other numerical problems.

Conclusions/Recommendations

Overall Condition: Optimize the condition of their home.

Square Feet of Living Space: Increase the square footage of living space.

- **1 sqft = ~0.02 % increase in price**
- Scaled out: **1000 sqft = ~ 20% increase in price**

Grade: Hire a high quality contractor and invest in high quality materials when building on to the home or making structure improvements/repairs.

- 1 increase in grade level = **~ 21.6% increase in price**

Limitations/ Future Considerations

- The final R-Squared value is 0.503 which suggests that approximately only 50.3% of the variance. Ideally for confidence in the model we want this higher.

- There were columns eliminated from the dataset which could have impact.

- There are other factors of influence that could be explored in further detail such as location and time of year sold.

Thank You!

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