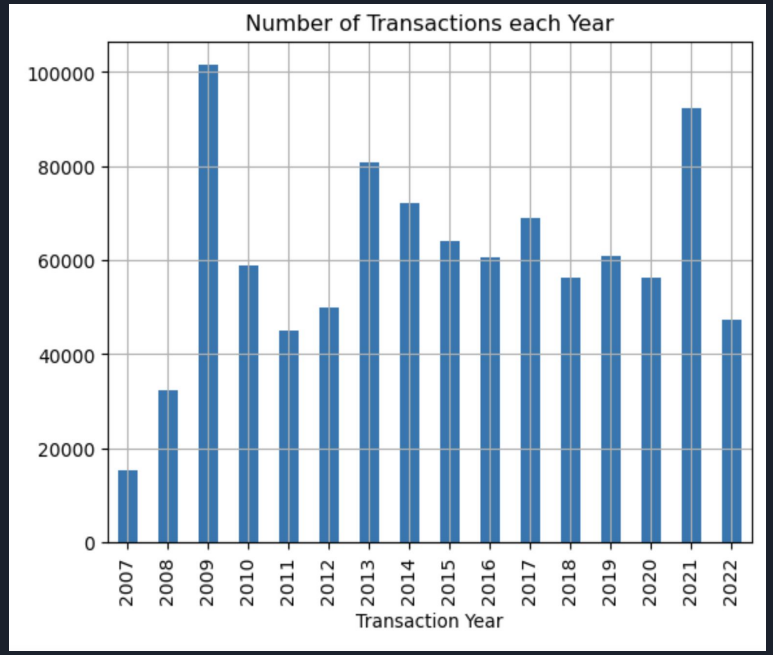
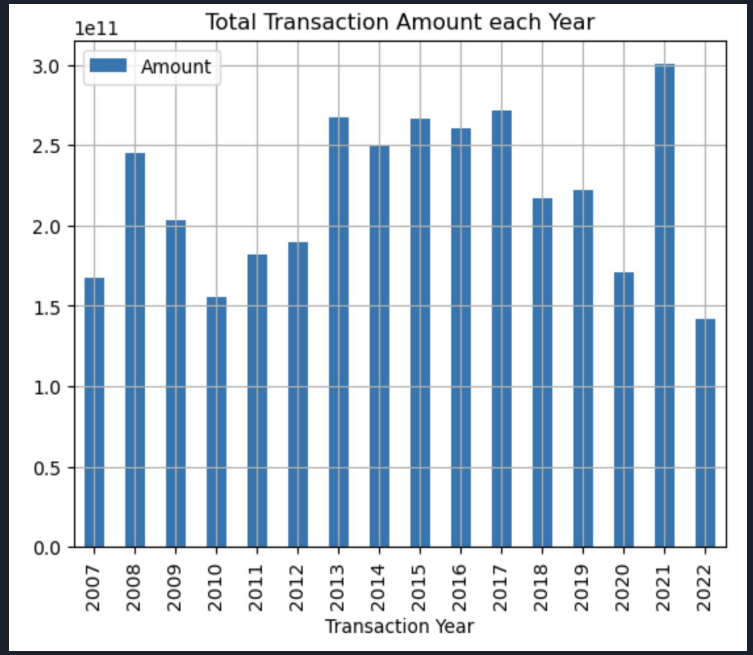
Dubai Real Estate Analysis

Submission: Udit Gupta

Sales Transactions

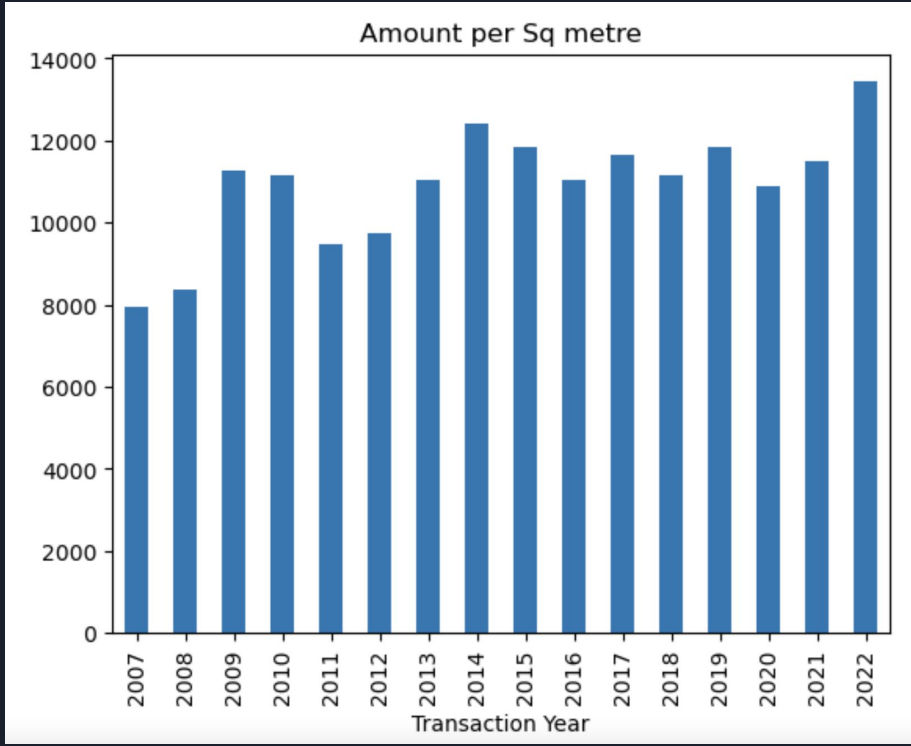
Transaction Count and Amount is showing a Decreasing Trend





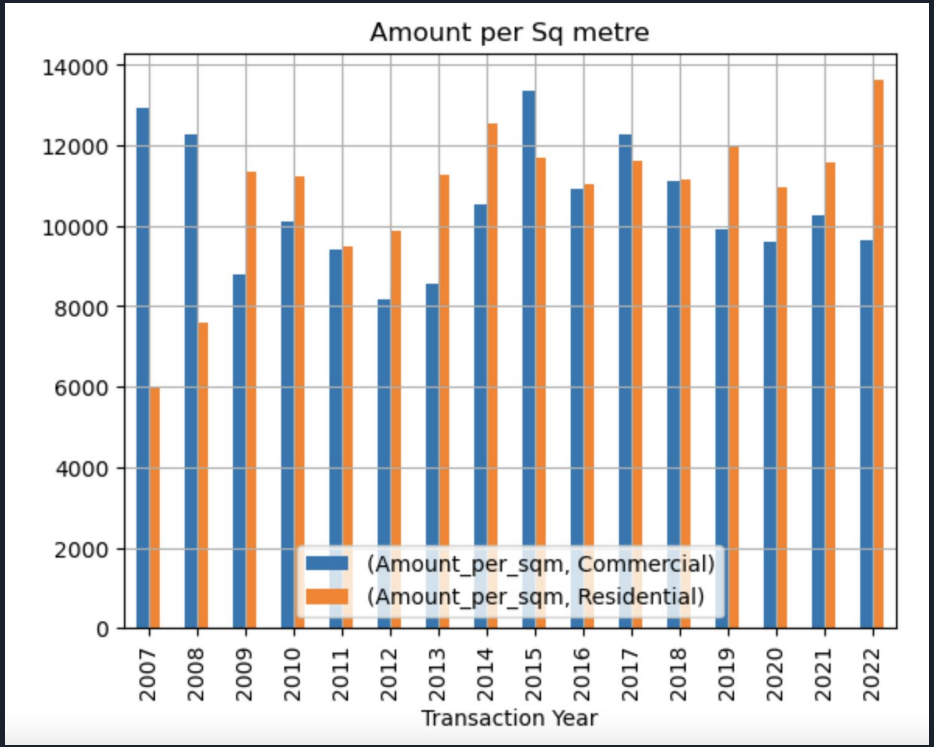
However, the Property Cost (per sq m) has been increasing.

Property Rates have increased by **3.5% CAGR**



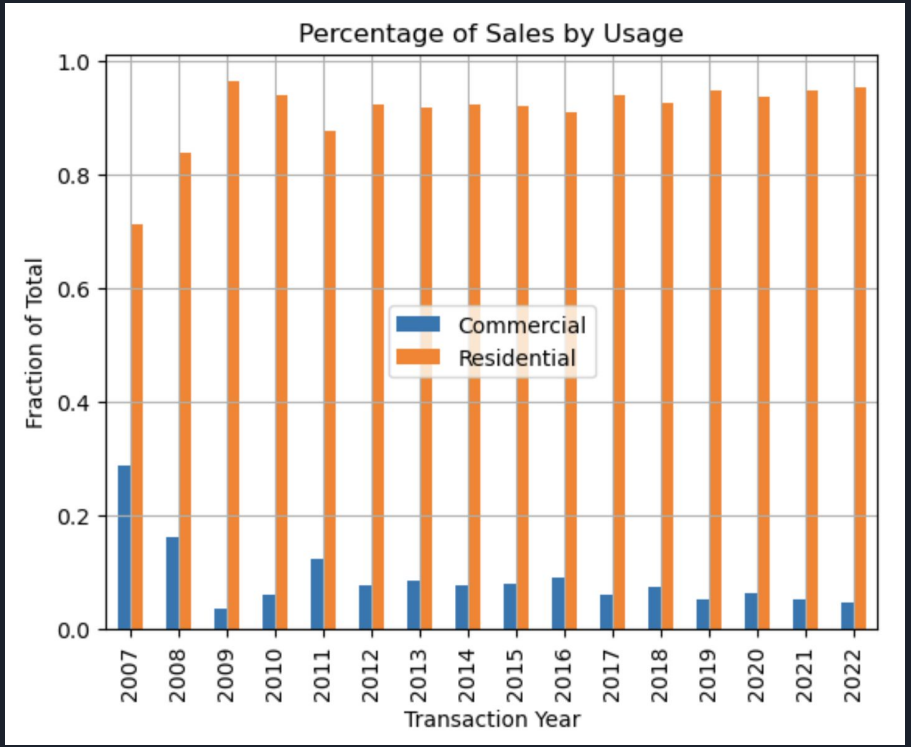
Property Cost (per sq m) for Commercial properties is showing a Decreasing Trend

Commercial Property rates have been falling since 2015



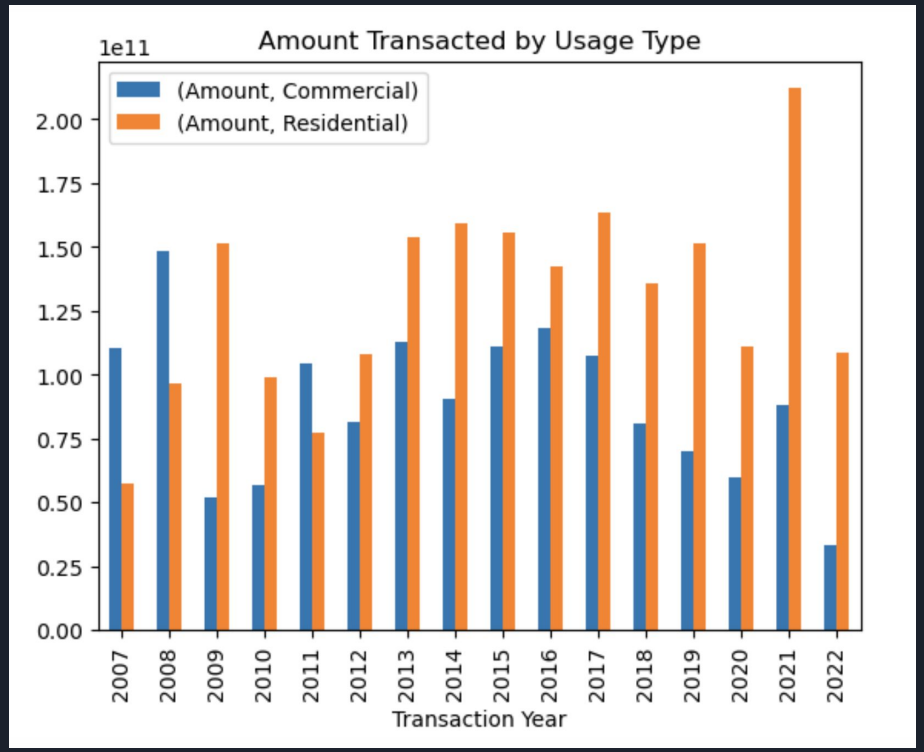
More than 90% transactions are done for Residential properties

- Graph shows the Fraction of Residential and Commercial properties sold.
- There was a big drop in Commercial sales during the 2008 Financial Crisis and Residential sales have dominated post that period.

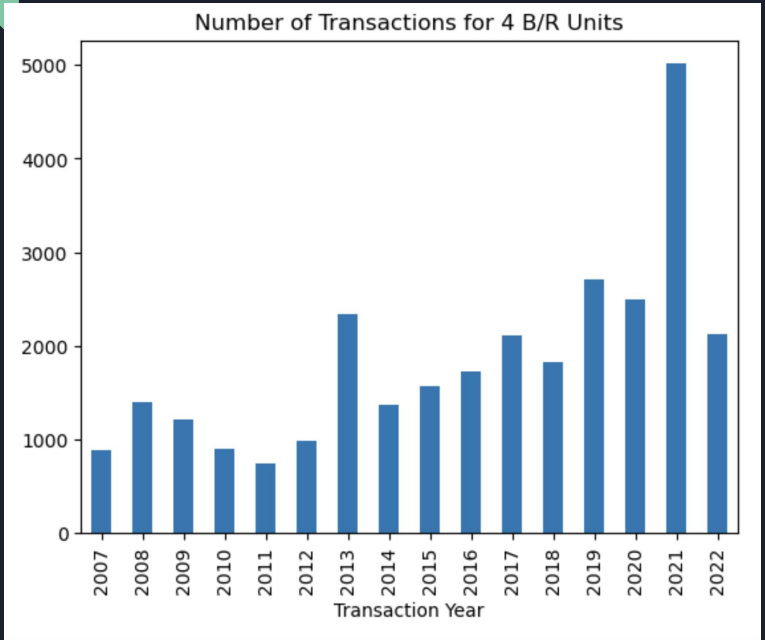


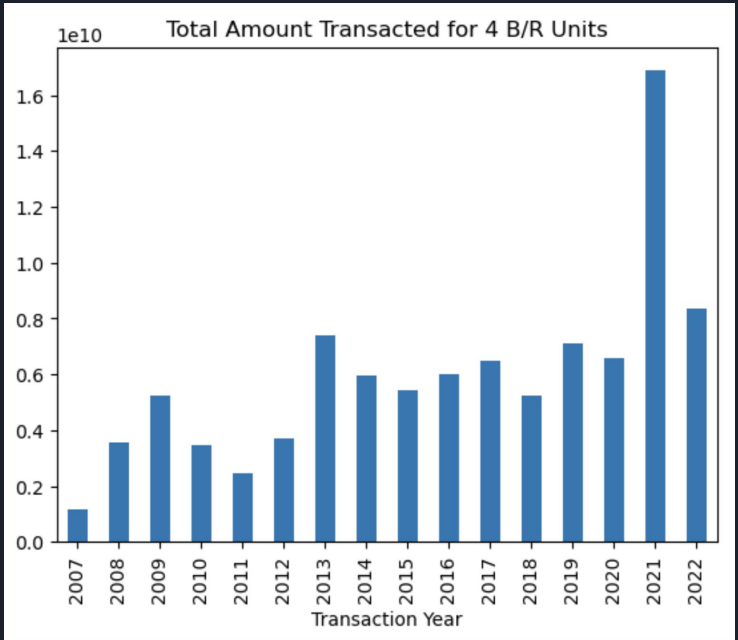
However, the share of Commercial properties in overall Transaction Amount is around 40%

- The Transacted Amount for Commercial properties has been decreasing over the years.
- The Transacted Amount in 2022 was the lowest ever in 15 years. This signifies a lack of interest in buying Commercial Properties.



People are opting for Spacious Flats

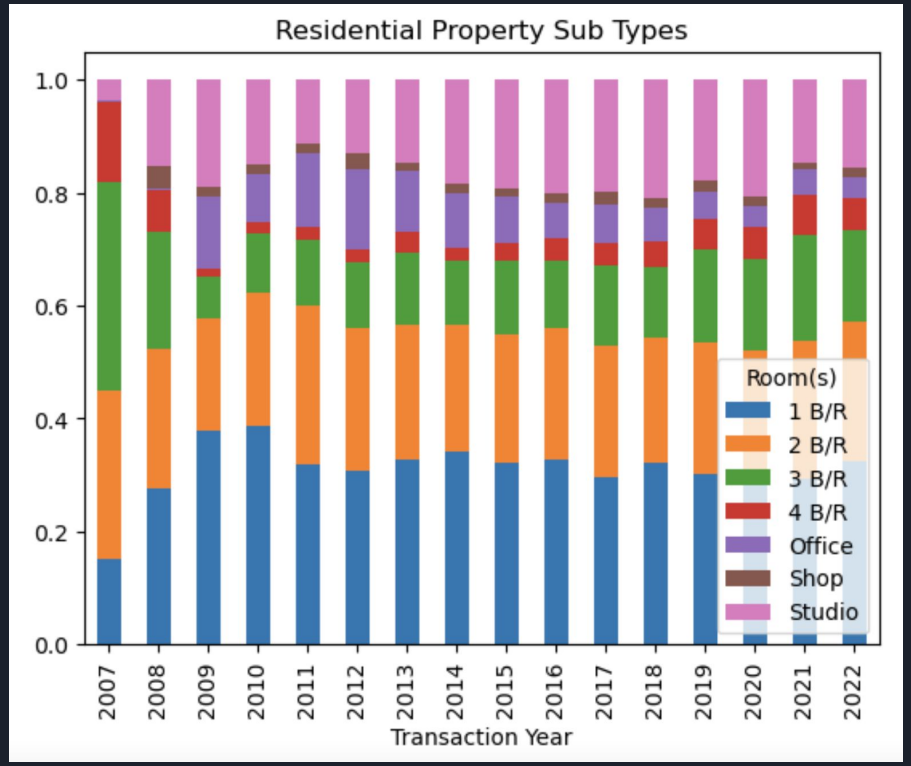




- This Rising trend is only observed for 4 B/R units, and not for smaller units.
- This indicates there is a growing interest in larger accommodations, probably for renting out on AirBnB

Share of Office spaces is shrinking

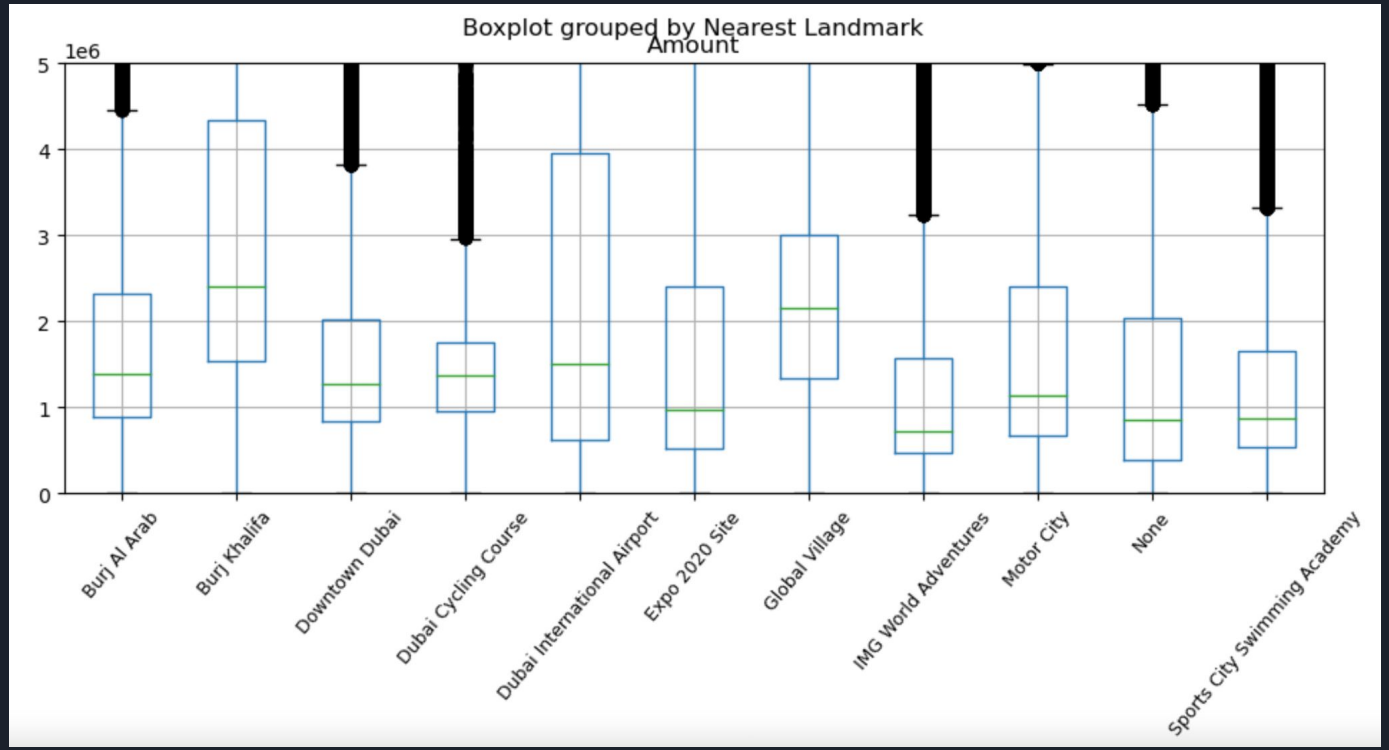
- As depicted by the purple colour, the fraction of Sales for Offices has been decreasing over time.



Properties Near certain landmarks are costlier

Landmarks causing rates to increase:

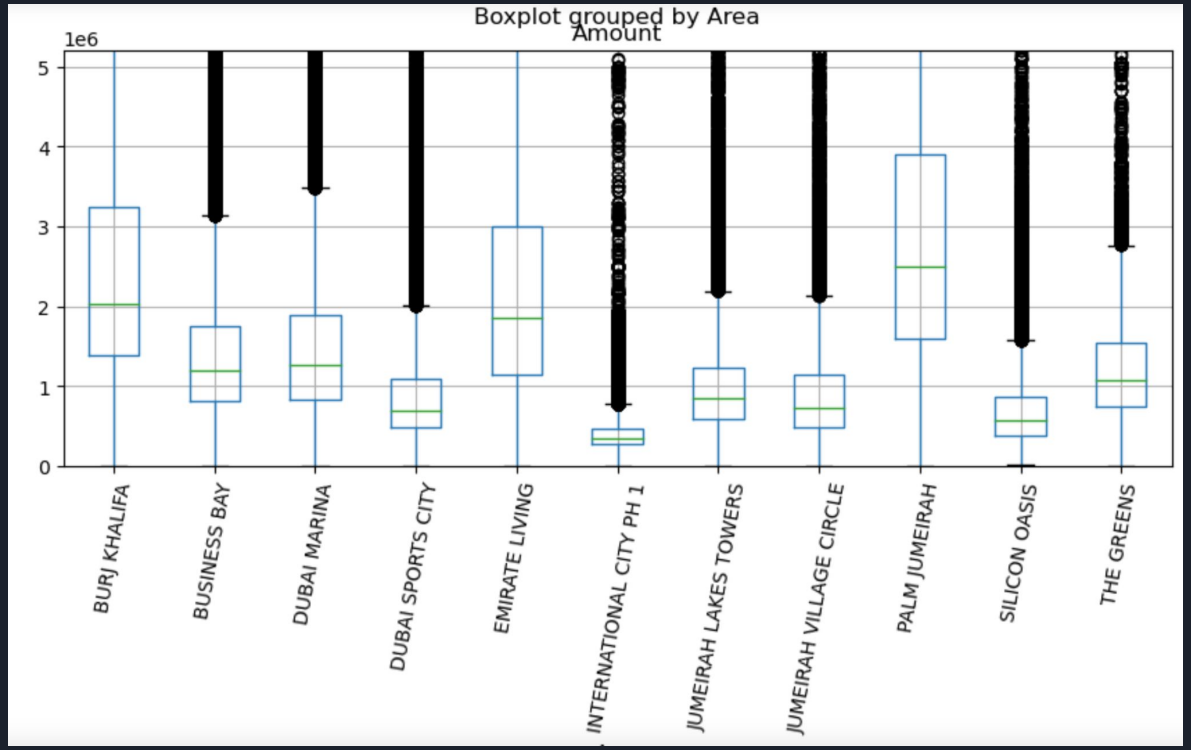
1. **Burj Khalifa**
2. **Dubai International Airport**
3. **Global Village**



Some Areas are costlier than others

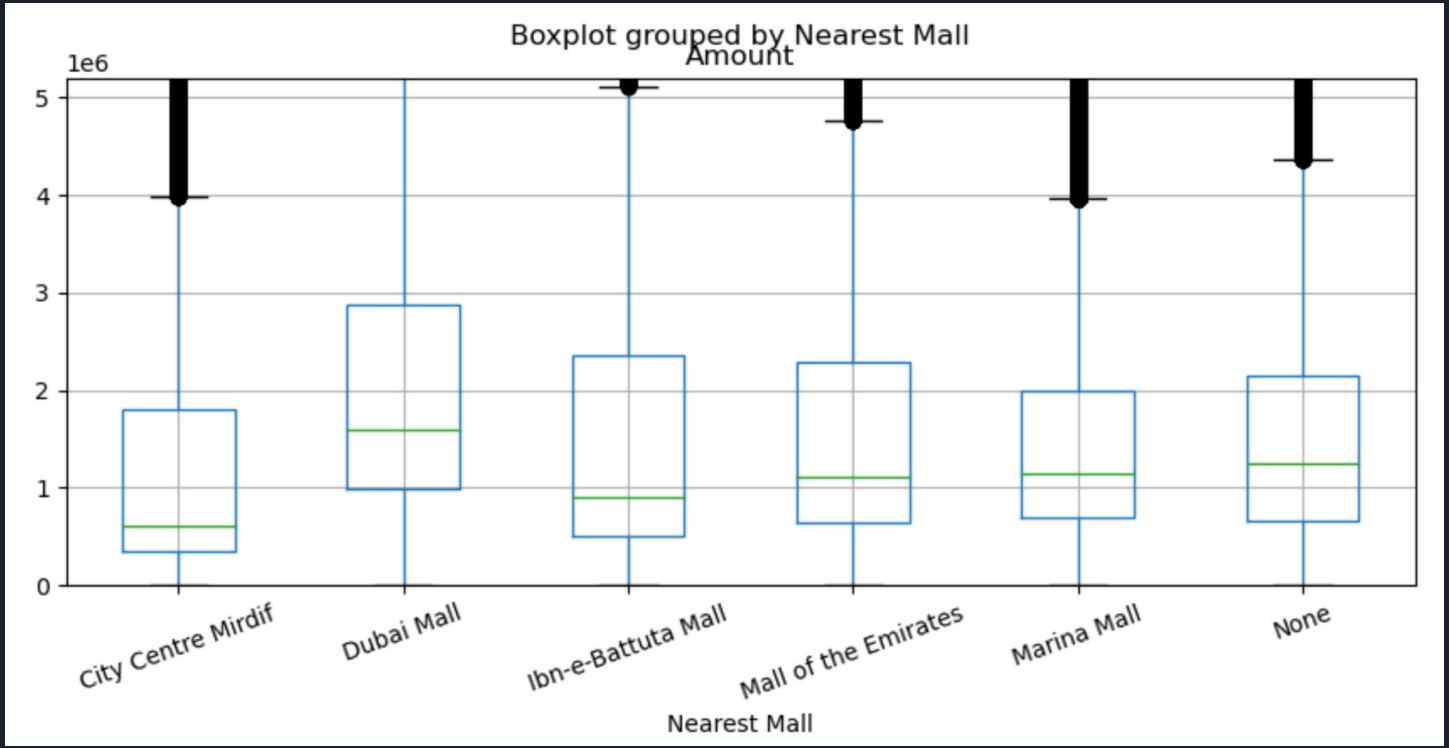
Areas where rates are high:

1. **Burj Khalifa**
2. **Emirate Living**
3. **Palm Jumeriah**



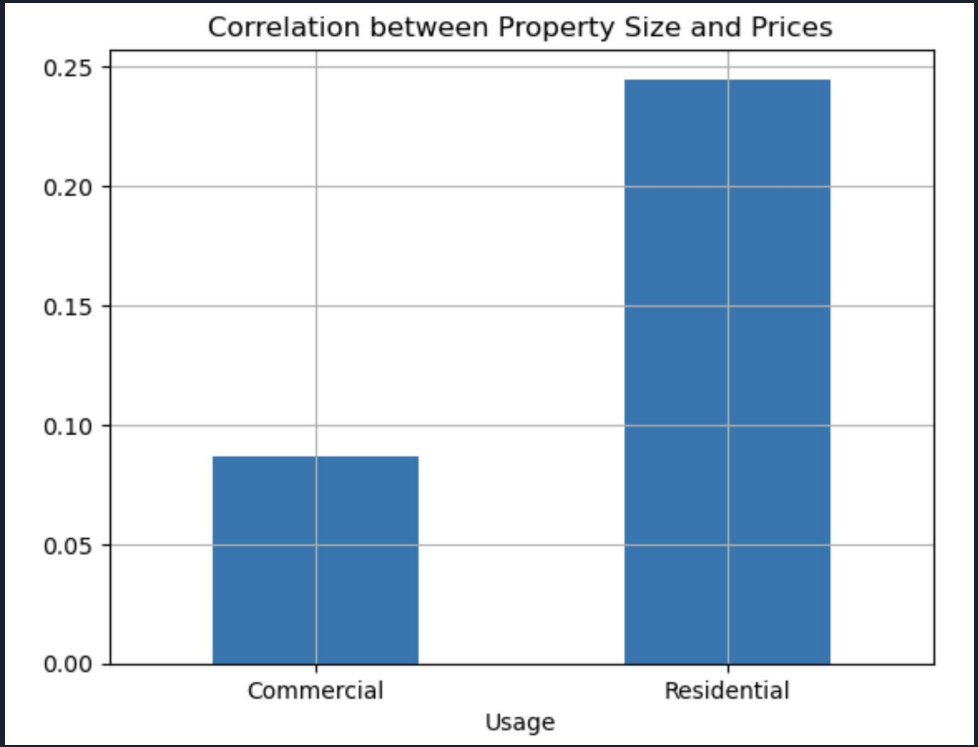
Properties near Dubai Mall are Costlier than others

Properties near Dubai Mall are **50% costlier** on average



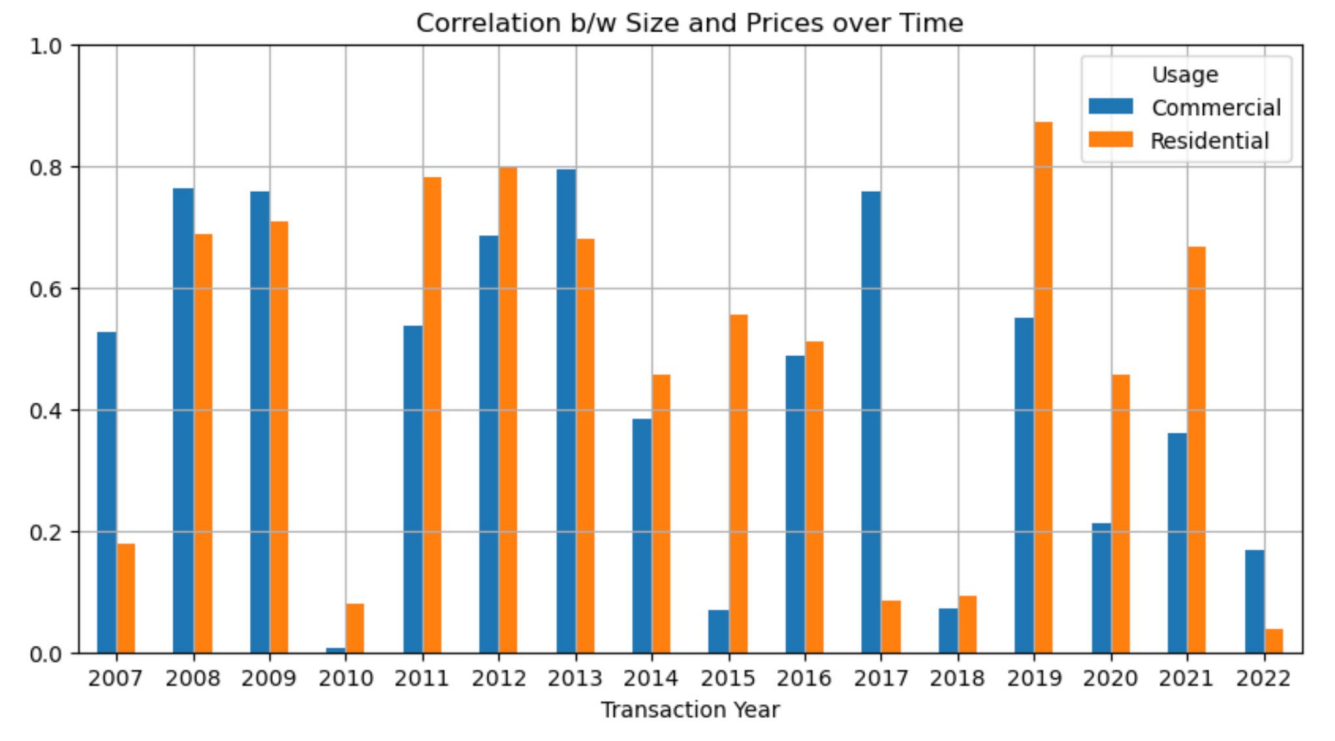
Correlation between Property Size and Prices is higher for Residential Properties

This might indicate that Prices for Commercial Properties are driven more by the Area/Neighborhood than the Size of the Property

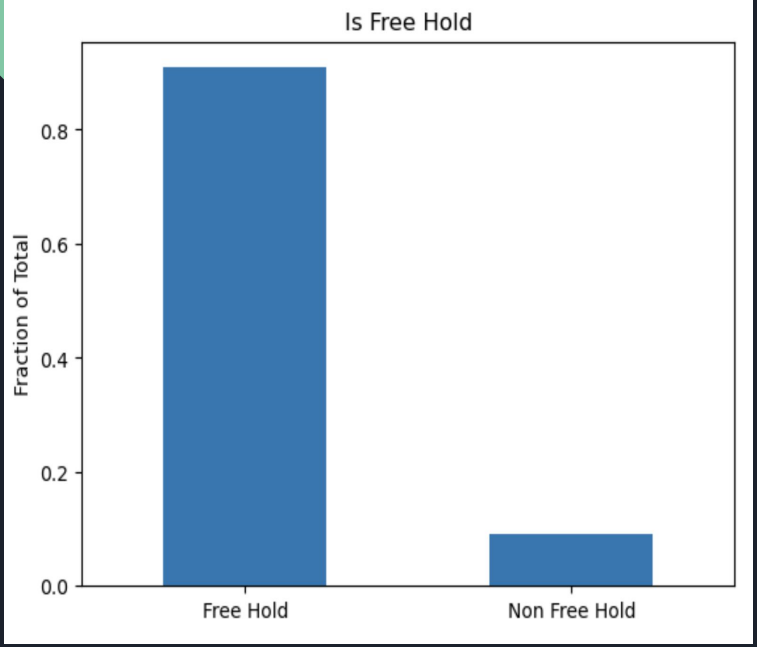


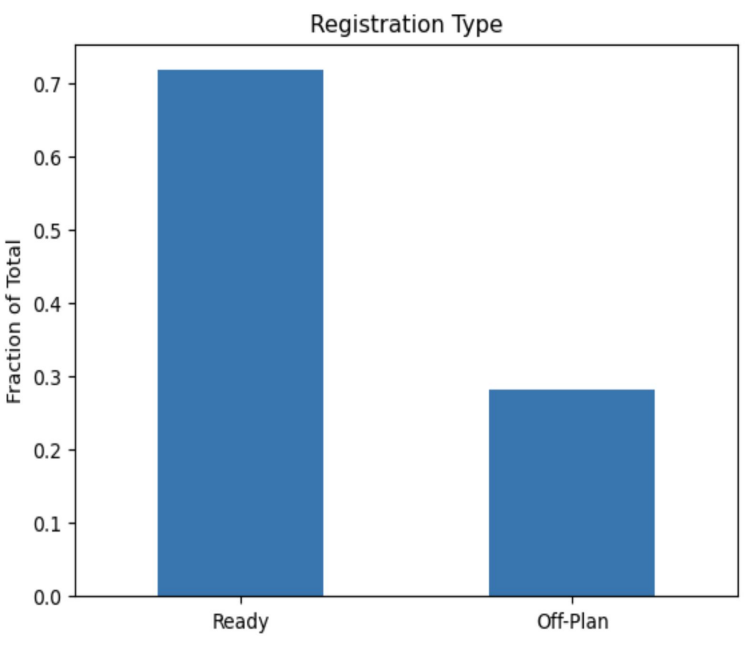
Correlation Fluctuates over the Years

- The Correlation is positive, i.e. Higher Prices for Larger Sizes.
- Correlation has been above 60% in the past years.
- Last year however, the correlation dropped below 20%.



Additional Insights



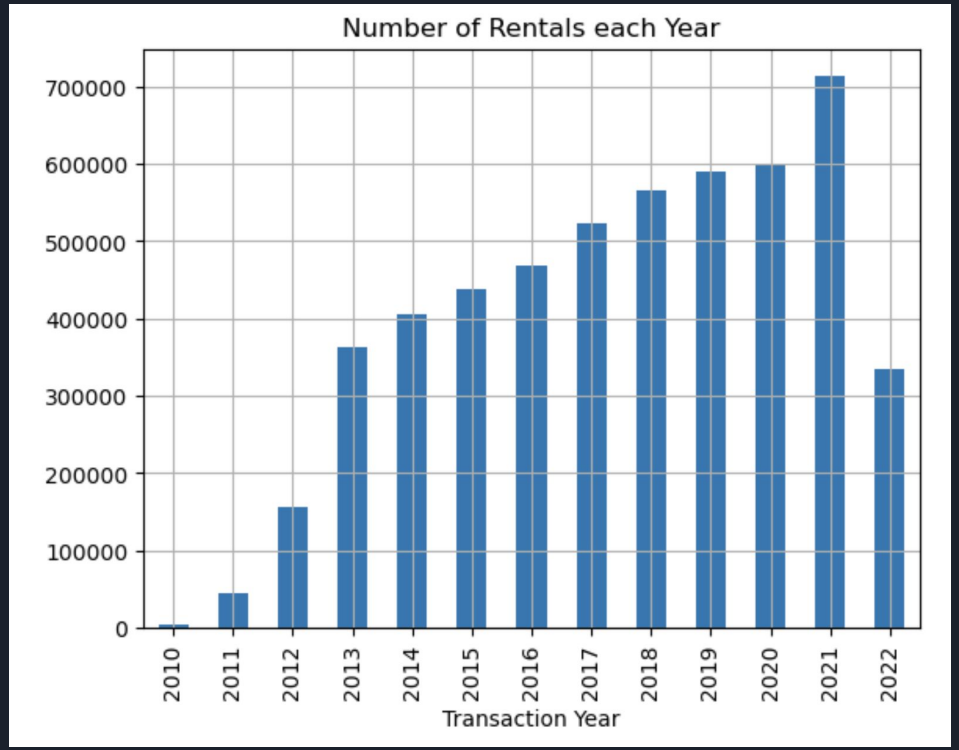


- More Free-Hold properties are sold compared to Non Free Hold.
- People prefer buying Ready for possession properties rather than under-construction properties.

Rentals

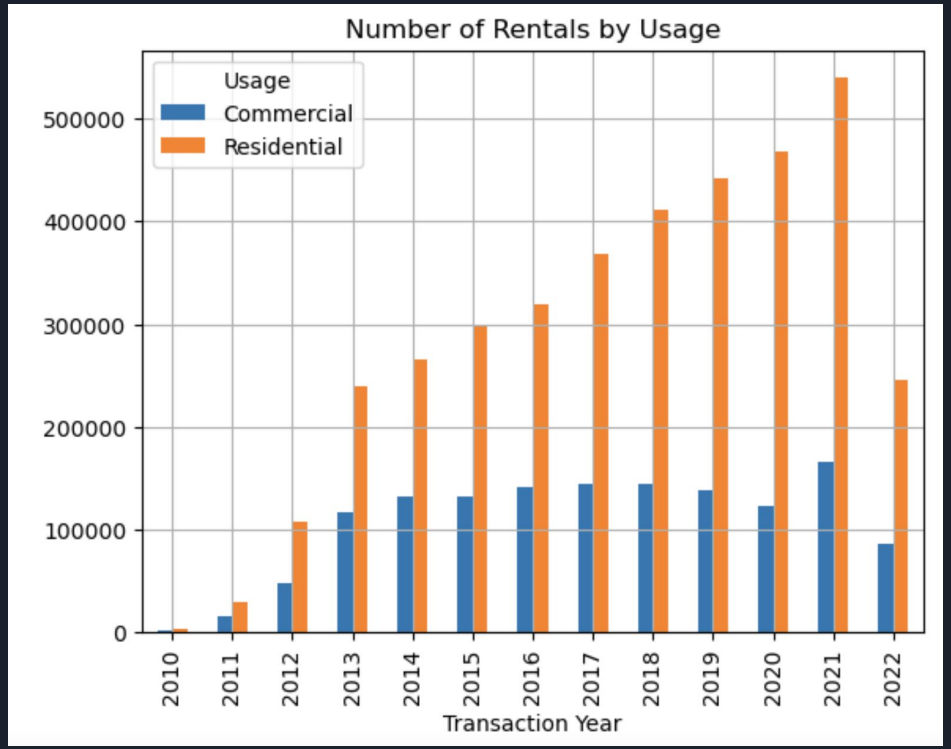
Number of Rental Transactions are showing an increasing trend

- Rentals are showing a **consistent increase**.
- This market has grown at **8.3% CAGR** from 2014 to 2021.

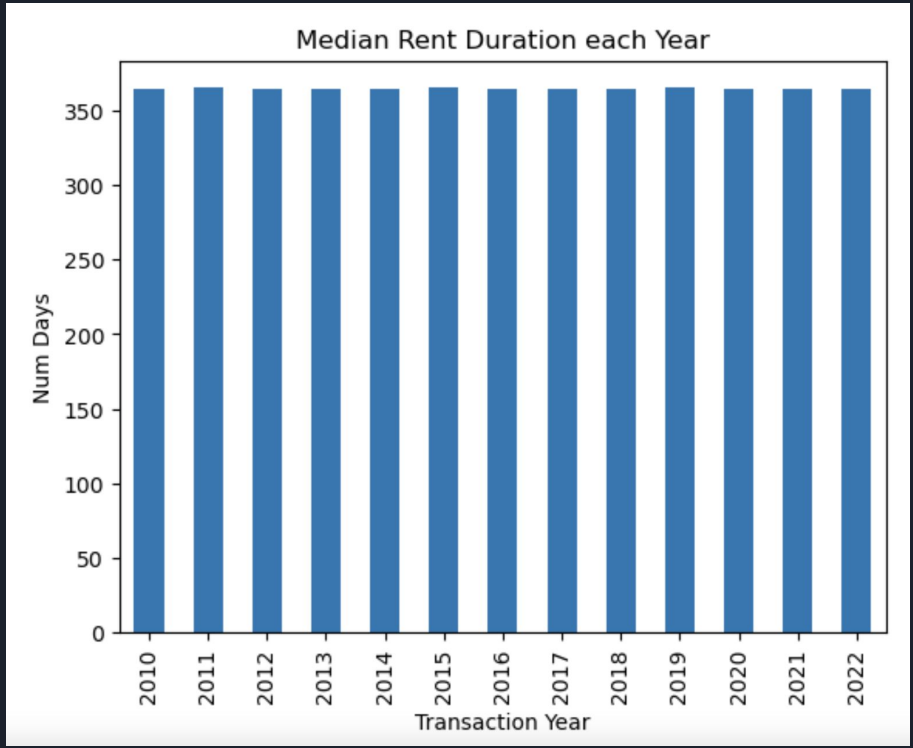


Residential Rentals are in a boom whereas Commercial is stagnating

- Residential Rental transactions have grown at **10.8% CAGR**
- Commercial Rentals are experiencing a slowdown



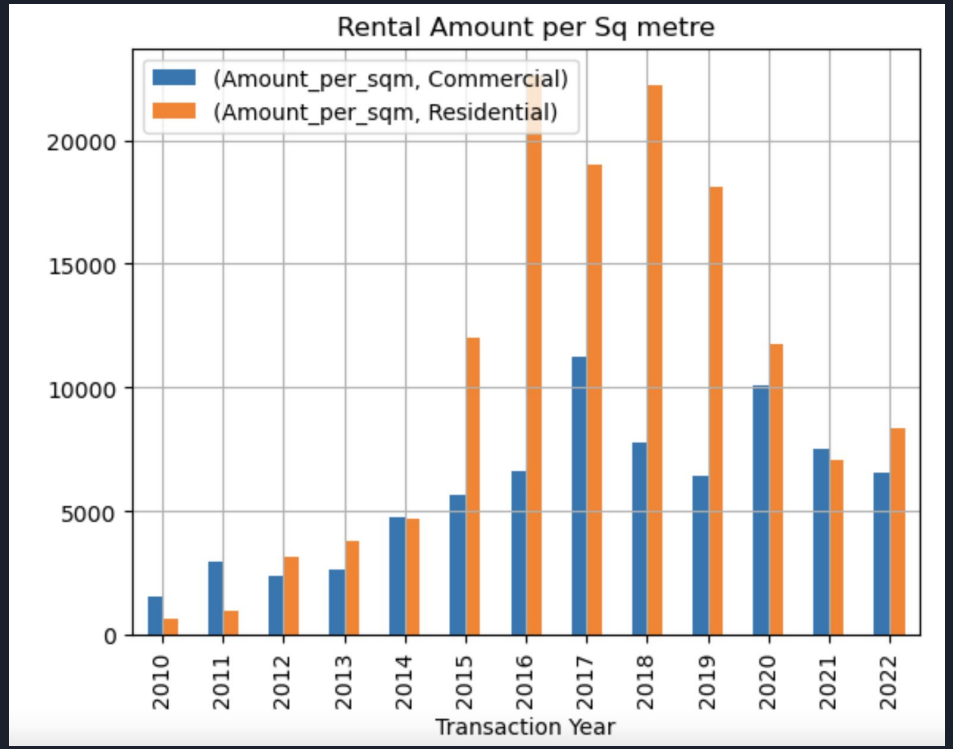
Median Rent Duration is 1 Year



Rents are becoming more affordable since 2017

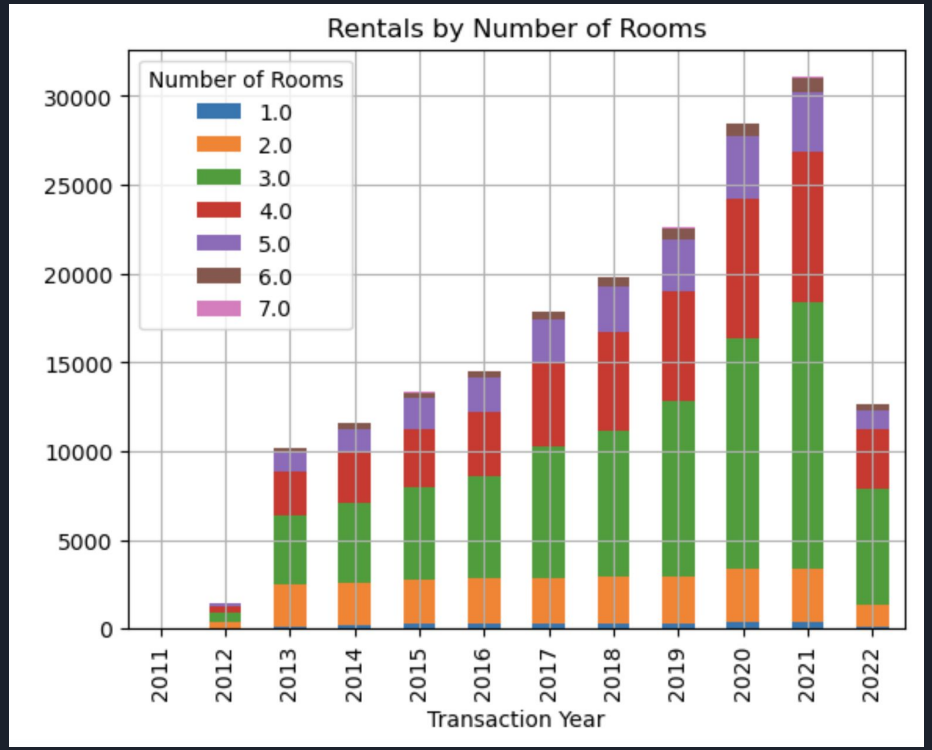
- Rental prices have started to ease since 2017-2018
- Residential Rental rates have been higher than Commercial rentals

Note:
There is error in few data entries where Property Size is shown as 1. It has been taken care here.



3 and 4 Room Rentals are in high demand

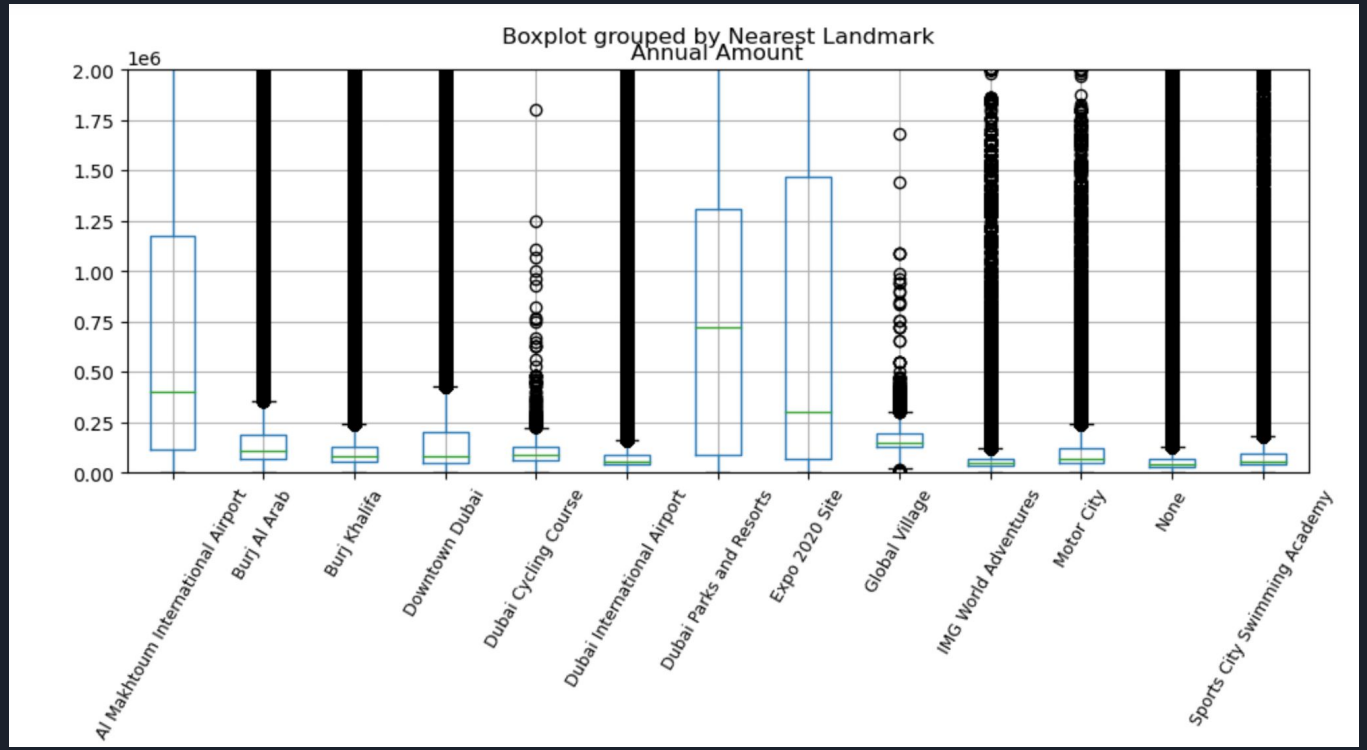
- Number of Rental transactions for 3,4 and 5 Room accommodations in increasing.
- 1 and 2 Room rentals are falling out of favour.



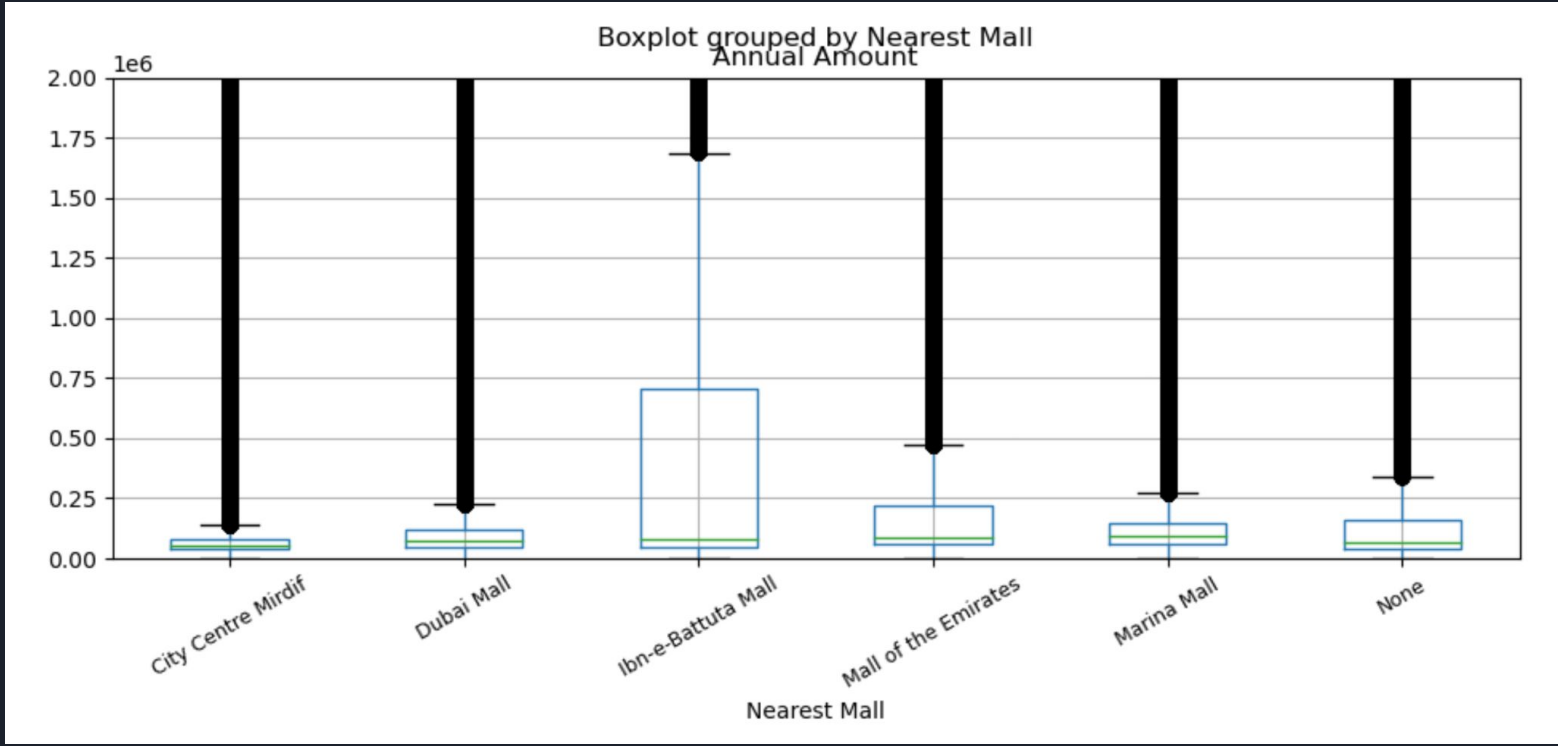
Rental rates near 3 Landmarks are higher than others

Rental Amount near these landmarks are high:

1. Al Makhtoum Airport
2. Dubai Parks and Resorts
3. Expo 2020 Site



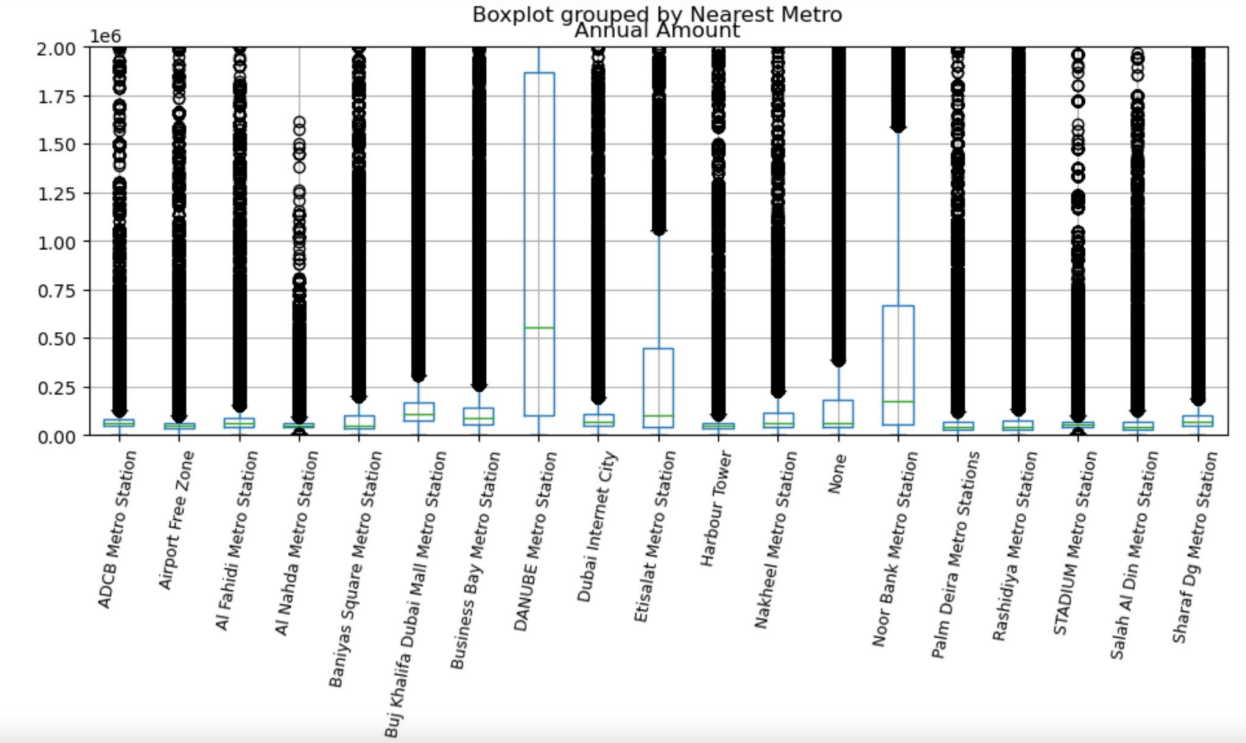
Properties near Ibn-e-Battuta Mall have more lucrative Rental Rates



Rentals near 3 of the Metro stations are high, possibly because of ease of access and commute

Rental Amount near these Metro stations are high:

1. Danube
2. Etisalat
3. Noor bank



Price Prediction using ML for Sales Transactions

Methodology for ML model Creation

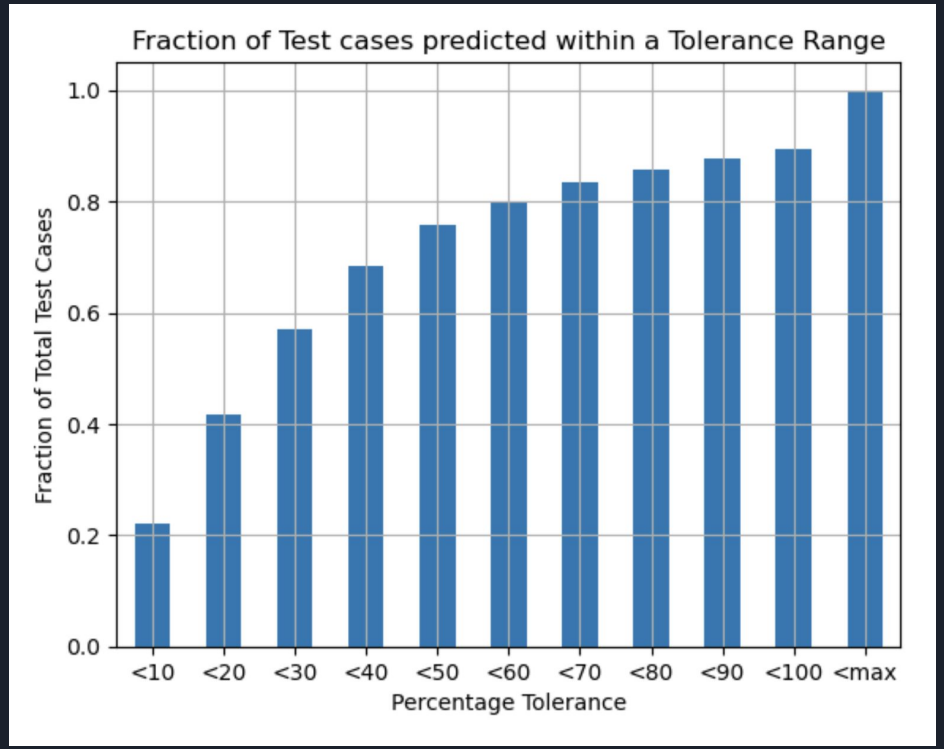
- Randomly split the dataset into Train (80%) and Test(20%)
- Perform a Cross Validation exercise on the Train set.
- Use Optuna library to find the best set of Hyperparameters which maximize the R2 score.
- Train the Model* using the best Hyperparameters.
- Predict on the Test set.
- Evaluate the efficacy:
  - Compute the % change between Actual Amount and Predicted Amount.
  - Show how many instances are predicted within each % range.

Note:

***Gradient boosted tree model from LightGbm package**

ML Model Prediction Performance on Test set

- 60% of the Test Cases are Predicted within the Tolerance of 30%, i.e difference b/w Predictions and Actual Amount is less than 30%.
- R-Squared Score: 0.39



Factors impacting Price over time - Methodology

- Create Train-Test sets based on Transaction Year.
- First Test set only has year 2011 data. Rest of the data goes into the training set.
- Second Test only has year 2022 data and so on.
- This way we make 12 Test Sets; from years 2011 to 2022.
- Importance of Factors is obtained by using **SHAP library** (on each test set).
- The change in Importance of Factors over time is analysed

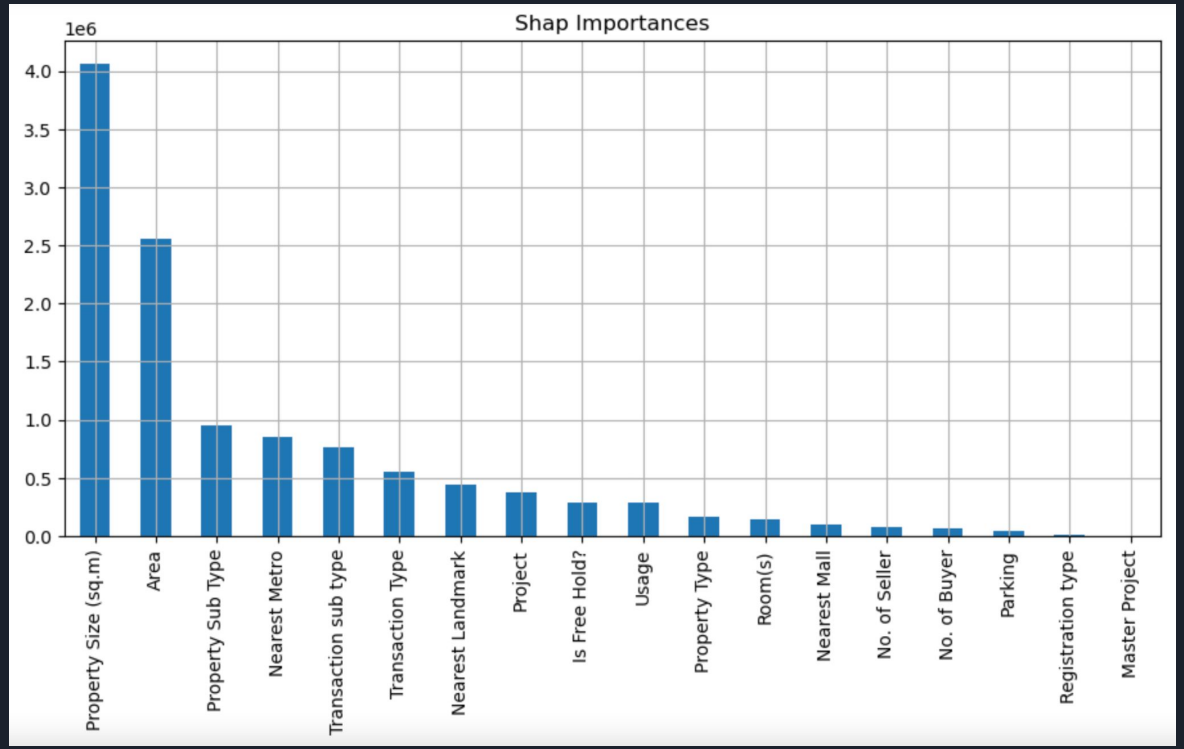
Shap Importance Scores

	Transaction sub type	Nearest Mall	Nearest Landmark	Area	Room(s)	Is Free Hold?	Property Type	Registration type	No. of Buyer	Project	Master Project	Property Size (sq.m)
2011	634415.265	73835.578	434027.741	2414886.403	118239.931	228224.454	143220.356	1520.484	92097.836	257706.775	751.836	3838218.769
2012	655926.824	89152.612	329516.841	2626655.751	165611.891	270006.671	139623.994	3261.516	43544.015	416214.399	545.684	4396738.936
2013	627163.251	120745.752	385401.252	2683330.911	153068.808	279732.972	117587.559	2027.837	40125.641	377238.091	0.000	4110379.732
2014	731796.665	50747.898	365366.319	2312472.832	113000.331	245939.349	219041.123	3602.388	114282.314	290838.099	0.000	3610723.358
2015	612964.872	103139.236	426456.396	2404143.437	115694.730	217364.581	115960.630	3600.709	42728.007	339106.972	493.642	3916953.903
2016	791768.032	106324.817	438922.631	2489035.301	167792.263	328772.169	152382.974	1812.675	66123.682	306905.922	668.476	4481467.438
2017	850163.859	97760.867	494877.994	2599080.771	159354.218	300556.584	155483.214	11400.720	88750.540	595207.293	0.000	4300731.881
2018	1062529.011	160026.864	569976.240	2923792.524	128383.756	331091.217	351608.662	615.889	108280.906	411796.420	492.812	4626909.513
2019	674537.167	79469.069	430278.008	2345546.316	136506.960	267739.980	161296.506	6248.000	78870.726	392117.105	607.410	4196716.661
2020	653343.007	98802.723	394408.322	2055800.265	134534.729	256217.285	146722.694	4339.820	36931.032	348073.600	596.100	3658450.967
2021	690184.025	64810.011	405812.691	2208726.672	151794.478	237965.982	173539.820	6415.086	50862.035	446474.813	0.000	3435076.724
2022	1188792.062	117339.510	584994.615	3566582.272	141801.784	511122.507	133405.069	15118.145	66455.935	338822.814	0.000	4130861.974

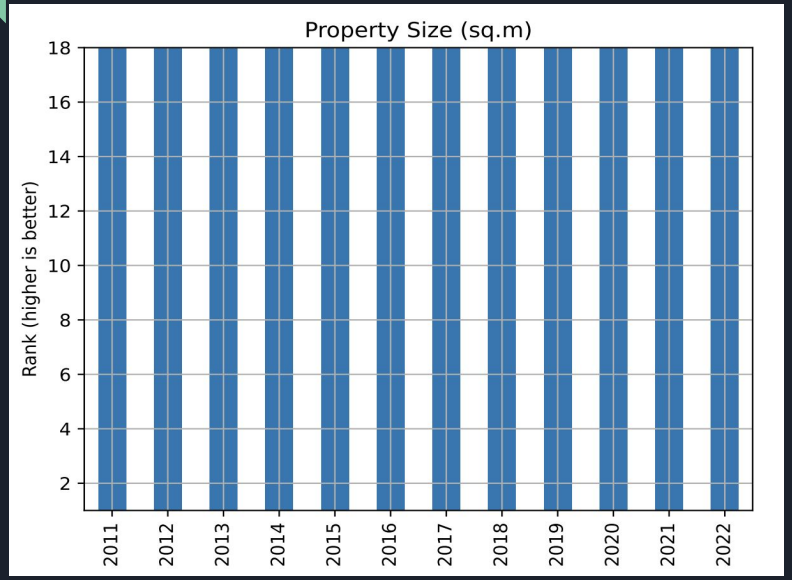
- This is how the Importance scores look for each Year.
- These are analysed in subsequent slides

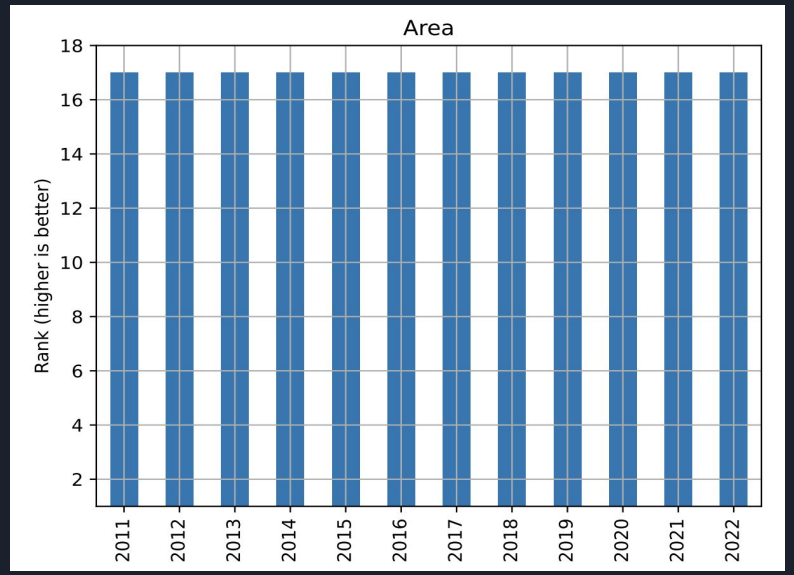
Most Important Factors - Shap Importance

- The Factors are plotted in decreasing order of Importance.
- **Property Size** and **Area** of the Property are the most determining factors about the Price.



Factor Importances stay consistent over time



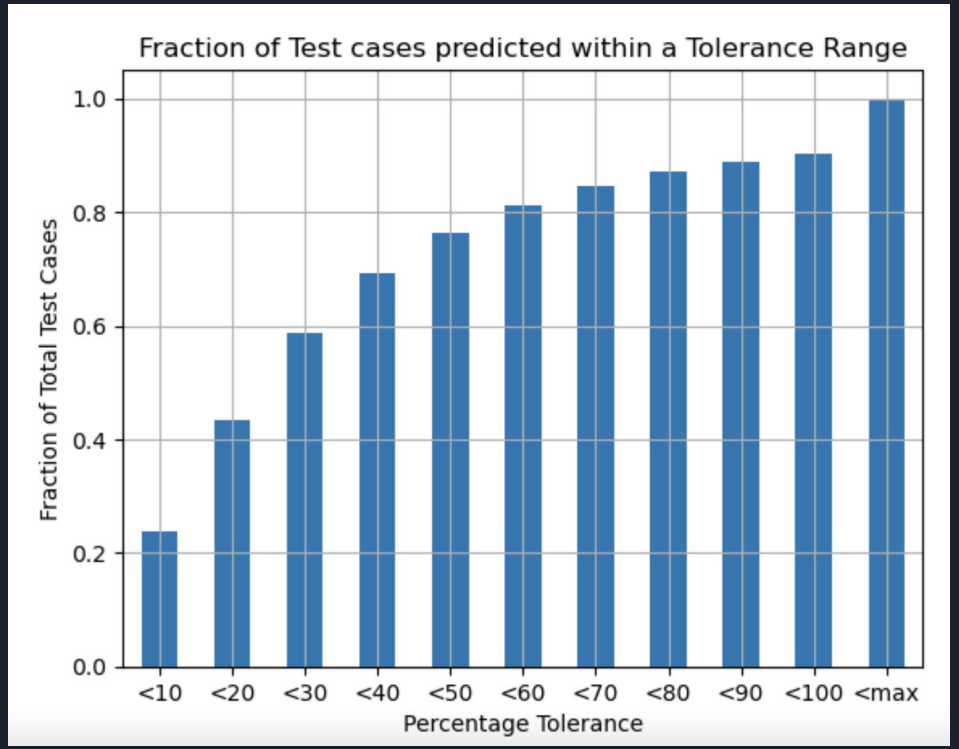


- Rank of most of the factors remains consistent over time.
- Here, Property Size and Area are shown to have consistently high ranks over the span of 12 years
- Plots of all the Factors is saved as a Pdf file. Please refer ‘importance_rank_sales.pdf’

Price Prediction using ML for Rentals

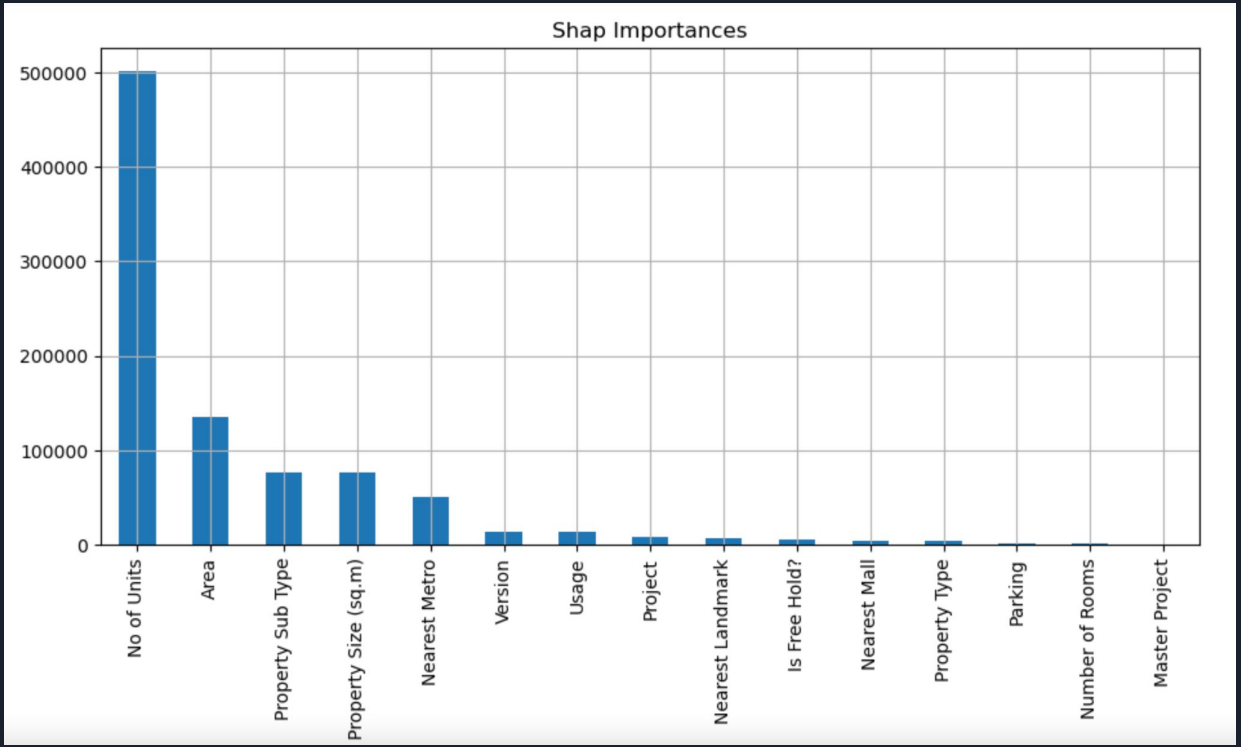
ML Model Prediction Performance on Test set

- 60% of the Test Cases are Predicted within the Tolerance of 30%, i.e difference b/w Predictions and Actual Amount is less than 30%.
- R-Squared Score: 0.58

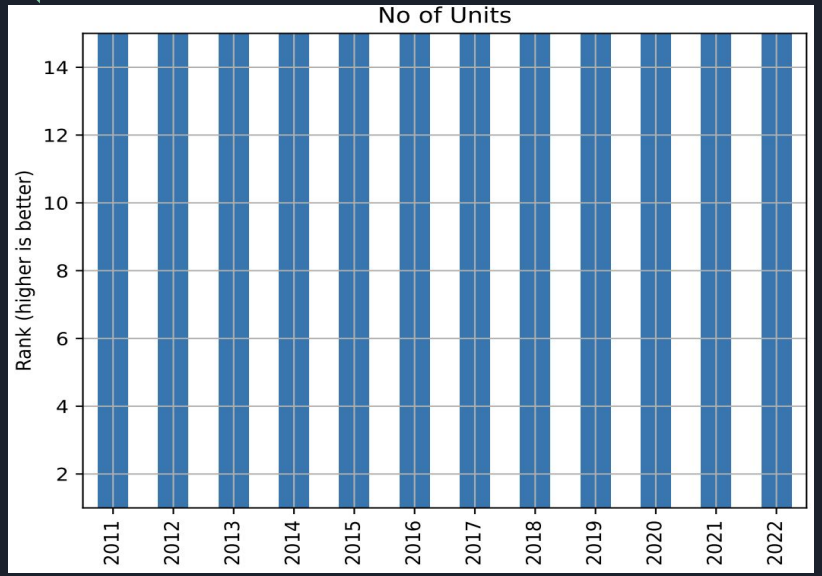


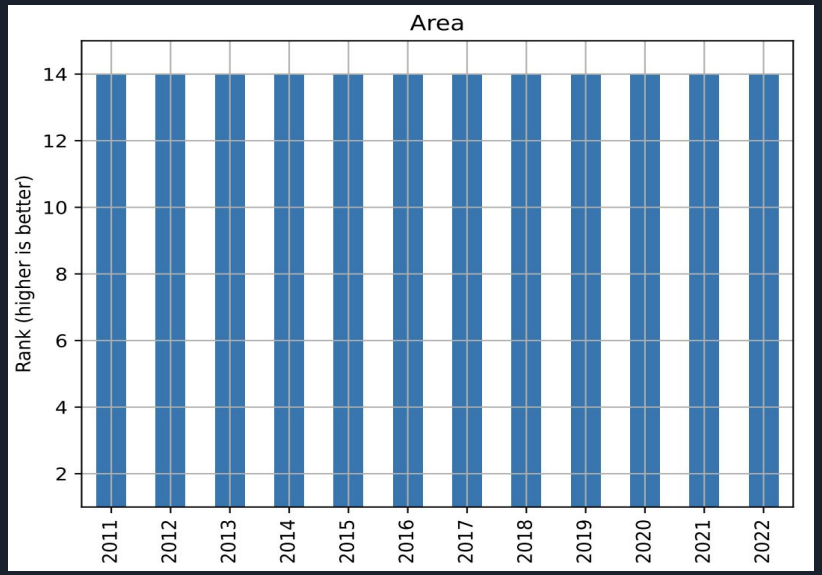
Most Important Factors

- **Num of Units** is the most important factor.
- More Units implies more Rental Price.
- **Area** is the second most important feature.



Factor Importance stays consistent over time





- Rank of most of the factors remains consistent over time.
- Plots of all the Factors is saved as a Pdf file. Please refer ‘importance_rank_rentals.pdf’

Comparison between Sales and Rentals

Similarities - Sales and Rentals

1. Number of Transactions for Commercial Properties is declining.
2. Amount paid for Commercial Properties is showing a decreasing trend.
3. Transaction Volume of Spacious Flats (3, 4 B/R) is Increasing.
4. ML Predictive Model Performance on Sales and Rental datasets is very similar indicating that both Sales and Rental prices can be predicted with similar level of certainty.

Differences - Sales vs Rentals

1. Number of Sales transactions have saturated and even started to decrease, whereas the Rental transactions are increasing.
2. For Residential properties, Price (per sq. m) is increasing for Sales transactions, but decreasing for Rentals.
3. Property Size is an important factor for determining the Price of Property for Sales transactions, whereas for Rental transactions Property Size is less important (Number of units is more important).

Appendix

Files included:

- EDA Notebooks for Sales and Rentals separately.
- ML model prediction Notebooks for Sales and Rentals separately.
- Pdf file for plots of rank of factor importances over time.